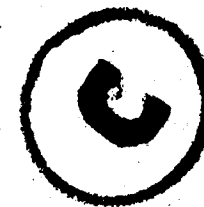


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SHAKESPEARE: THE PRINCE OF BORROWERS.*

1.

IT was once wittily observed that if all the talks of English men and women on "Weather" were put down in books and these books piled on one another, the topmost volume would have reached at least the nearest star. You may be inclined to say that this is an example of occidental hyperbole. I shall, therefore, be more modest in my estimate. If all the books published on Shakespeare are piled on one another, we should have reached at least the moon—I mean, if we had not been moon-struck before the time. So I thought it uncharitable on the part of Mr. Bhandari when he coupled his invitation to lecture before the Association with an ultimatum—so I found it—to lecture on Shakespeare. I naturally demurred, but Mr. Bhandari, who has never been exorable, I told him that not who has never been say would be new, or of any of the Great Universities should be both reduced such great works? But

* A lecture not the monopoly of University men: Mangalore, it is seldom their monopoly. Universities

borrowing from the thousand and one oracles who have written on the subject. But I say my friend was as inexorable as Fate. So, Gentlemen, I stand before you to-night to tell you the same story you have heard, for the nth time—where n is indefinitely large.

Having had no choice of the subject, I thought I could beat out a new path at least in treatment: but some voice like Puck's or Ariel's kept sounding in my ears, "There! That is not yours!", or "There! You are borrowing!", or "There! You have been anticipated!" So I made up my mind at once. I said to myself, "If I cannot be a great borrower like Bassanio or his creator—William Shakespeare,—I shall be at least in that noble category of Borrowers." A borrower that I am, I have, therefore, chosen to talk to you on "Shakespeare: The Prince of Borrowers."

2.

able to... you: and being an absolute Johannes factosus in his own conceit, the only Shake-scene in a country."

There is no doubt that this is a reference to Shakespeare. The line "tiger's heart wrapt in a

"hide" is fashioned upon Shakespeare's line:

"Oh! tiger's heart wrapt in a woman's hide"

And "Shake-scene" leaves no doubt as to who is meant. It seems that even a strike was meditated among the playwrights. But what appeals to me most is the dramatic irony above quotation. It is often said that a dying man has "holy inspirations." In this case it was a prediction happily come out true. The upstart crow beautified with all their feathers has bumbled out blank verse which shall never perish. And he has been the only Shake-scene England has ever produced.

I must tell you, however, that apart from this reference to him excited by the disappointed playwright's jealousy of a rising young rival, there is absolutely no word breathed against Shakespeare. On the other hand, there is ample proof to show that he was the most amiable of men, always gentle and generous in disposition. The invariable epithets which preceded his name in the lips of his contemporaries were either "gentle" or "sweet" or both. Even in spite of his unconquerable jealousy, Ben Jonson wrote: "I loved the man (Shakespeare) and do honour his memory on this side of idolatry, as much as any." Nor is there any reason for wonder in this. The Master of Humourists could not have been but the most amiable of men.

5.

Here I may break off for a moment to tell you an incident—whether apocryphal makes very little difference to us—which is recorded in the great epic of *Mahabharata*. When the Kaurava and Pandava princes had just finished their courses of studies, their *Guru* wanted to examine how far they had benefited by their education. He could not, of course, set at once a three-hours' paper with some six questions on vague criticism and abstruse annotations. On the other

Compare Nerissa's words in the *Merchant of Venice*,

hand he proposed to test them in what appears to be an odd and original way indeed. First he called together the hundred Kaurava princes and said, "I give you, my boys, a year to travel through the nook and corner of all your lands and at the end of the year I want you to tell me how many good people you have in your country and how many bad." After sending them away, he called in the five Pandava brothers, proposed to them the same question and started them away in the opposite direction. The *Guru's* order was implicitly obeyed. Not even an inch of ground was left unvisited. The year passed to a day and there were the princes collected under the roof of their preceptor. The *Guru* then called in the Kaurava brothers and Duryodana spoke for them. "Mighty Sire!" he said, "We left no corner unexamined. But we could not find even one good man in our kingdom. Every one was a rogue and scoundrel." Then the five Pandava princes were called and Yudishtra spoke for them, saying, "Revered sire! We never met with even a single bad man in the kingdom. One and all of them were right and dutiful."

How are we to explain these diametrically opposed views, though both the parties had same opportunities to make their observation? This is the pith and core of the problem of human nature.

The same hard, seemingly insoluble, problem of human nature confronts us at every step in Shakespeare's plays. No sight is more common than two equally eminent critics taking diametrically opposite views with regard to the interpretation of certain situations or characters. The fact that there can be such critics is a tribute to his myriad-mindedness: His world is as complex as the real world. But very often it happens that private judgments are merely due to personal predilections, or to imperfect grasp and hasty conclusions. The life we see around us is but a

[JAN. 1919.] SHAKESPEARE: THE PRINCE OF BORROWERS.

mirror in which we see ourselves. We mostly judge others by our own standard. What we cannot do we cannot conceive of others doing. I shall offer an illustration from the *"Merchant of Venice."*

In a discussion once on the point whether Portia really gives any hint to Bassanio in the Casket Scene, a student tried to maintain that the answer must be in the affirmative, for, he said, "We cannot conceive of anybody in the same position as Portia not giving a sure hint to the lover." What this student explicitly stated, many critics implicitly assume. But is not the right way to find out what Shakespeare says, instead of talking of what we conceive? Let us see what Shakespeare says. In I. ii. when Nerissa says that the six wooers are determined to depart unless Portia can be won in some other way than by the choice of caskets. The latter curtly answers:

"If I live to be as old as Sibylla, I will die as chaste as Diana, unless I be obtained by the manner of my father's will."

The next part of the conversation reveals that her heart is already gone over to Bassanio. And when he comes to make his choice I want you to mark specially the rhythm of Portia's speech. It is evident that a mighty conflict is going on within herself. Like Dashyanta who says:

सतां हि संदेह पदेषु वस्तुषु ।

प्रमाणमन्तःकरण प्रवृत्तयः ॥

she fortifies herself in the mysterious soul-throb which never fails to communicate itself to the pure-hearted. She says:

"There's something tells me, but it is not love, I would not lose you."

She solemnly repeats before love's shrine what she has already said in an earlier scene:

"I could teach you How to choose right, but I am then forsworn; So will I never be."

Again:

"Away then! I am locked in one of them: If you do love me, you will und me out."

Once more:

"Go Hercules!

Live thou, I live: with much more dismay I view the fight than thou that makest the fray."

Is there any hint, I ask, dropped so far? Next comes the song. The question now is: Does it give any hint? It is sung by musicians specially provided for in this scene and if it is intended to convey any hint, the musicians must have been more or less taken into Portia's confidence. This I consider to be most unlikely. The clever girl, who can measure swords with Shylock himself in the trial scene and who can so exquisitely plan the ring episode, if she had only intended to give a hint, could have easily found out a more different and a safer and surer way of doing it. Moreover, what does the song after all say? It simply means: there is true love and false love—let us ring the knell of false love. Can this be a hint?

An ingenious defence was set up once, which illustrates how ingenuity mostly backs the wrong horse. The presence of words, "bred," "head," "shed" and "fed" occurring in the song, it was pointed out, must have surely opened Bassanio's eyes to "lead," unless he was a hopeless fool. If the musicians knew that Portia's portrait was in the leaden casket, what fools must they have been for not having come forward themselves to choose. And if Portia had conveyed any hint, why should she have been so anxious about the result of the choice? Is her anxiety then a mere pretence—mere hypocrisy?

One point more. Bassanio begins with the line:—

"So may the outward shows be least themselves."

"The outward shows." There is no reference to "outward shows" in the song and therefore it can refer only to what he has been thinking of within himself. He has already chosen the leaden casket in his mind. The choice is a matter of his heart and hence the poet has thrown a

veil over it and in the interval introduced the song. The previous suitors failed because they had tried to choose with their head, instead of with their heart. The remaining portion of Bassanio's speech is only an intellectual appreciation of what his heart has fixed itself upon. And when he declares his choice, Portia herself:—

"How all the other passions fleet to air,
As doubtful thoughts and rash embraced despair,
And shuddering fear and green-eyed jealousy."

I want you to note that this is "aside." If there be any doubt left, it vanishes with these lines. Portia remains for us the ideal of womanhood—the ideal daughter, the ideal wife and above all the ideal woman.

(To be continued).

T. A. RAMAIAH.

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THE STUDY AND PRACTICE OF MINERALOGY AS A HOBBY FOR THE SCIENCE TEACHER.

IT is well-known that India is rich in its undeveloped mineral resources and that only comparatively few organised attempts have been made to tap such latent resources. No doubt it must be admitted that to identify the existence of such resources is one thing and to systematically investigate and estimate the commercial possibilities of them is another, for, the former can be carried out as a hobby by people interested in the subject and the latter requires extra leisure and much capital, both of which are at best outside the purview of a science teacher.

The object of this article is to show how the science teachers in this part of India can do an amount of useful and valuable work, if they spend a portion of their time in cultivating the hobby of collecting mineralogical specimens and undertaking their systematic analysis. In fact a collection of such specimens will form a very interesting part of a science teacher's activities, besides giving an air of originality to his work in the laboratory. It must be the aim of the science teacher to collect specimens from every part of the district within which the school is situated. It is not, however, implied that specimens from other districts will not be useful; far from being so, they help classification and comparison—but it should be the special aim of the science teacher to be thoroughly conversant with the mineralogical peculiarities of the taluk or group of taluks for which his school is the centre of educational activities.

One difficulty by way of carrying out the above suggestions is the fact that the science

teachers of High Schools are generally graduates in Physics, who have had no course of instruction in mineralogy in their collegiate career. Again, in some institutions the study of Chemistry is almost omitted except very indifferently, as part of the Elementary Science curriculum, due to the deplorable bifurcation of Physics and Chemistry as separate subjects of Group C of the S. S. L. C. course and as such even the little equipment necessary for a study of mineralogy may not be easily accessible in a High School laboratory. From practical experience it has been found that the study of mineralogy is rather easy even for one entirely new to the subject as it usually involves only simple chemical manipulations. Besides, the interest in the subject once awakened becomes so enlivening that the teacher, anxiously awaiting his leisure hours, most willingly converts them into work of some initiative. There are good and simple manuals on the subject of mineralogy and with their aid an average teacher can become well conversant in the course of a few months of regular practice.

In carrying out this work, one great convenience the teacher has, which the professional mineralogist has not. If the teacher cannot himself find the leisure, funds or opportunity for visiting the different parts of his district, there are his pupils ready to help him in that. Most of them hail from rural tracts and they may, during the vacations or other long leave, be encouraged to collect specimens by excursions into their neighbourhood. Experience shows that this they whole-heartedly do, for it must be certainly enjoyable for them to stroll about the hillocks and mountains near their home. The intelligent among them may even be asked to draw plans of strata of road or railway excavations, or the sides of mountains, of river gorges or of any new and deep well that may be under construction. It has been often

found that much preliminary and even later work proves useless. In fact, the teacher is disappointed to find most of the students, not all, bringing valueless stones, but he should not discourage the students or get discouraged himself; for here as everywhere, something has to be done by way of spadework before anything of value can be found out. It must not also be forgotten that the student has not the critical eye and lacks the mental background of the specialist. In any case, one useful point is gained—the student is made to go out with his eye open and his indifference to apparently trivial things is removed, which, in itself, is a great achievement.

The study of mineralogy, besides bringing genuine pleasure to the person who practises it, gives him ample opportunity to know the special physical features of the locality, in which he is interested. It gives the students, whose help the science teacher takes, some useful and varied occupations during the long hours of leisure in a vacation. The science teacher may also serve as an eye-opener to prospectors with regard to the possible mineral wealth in the neighbourhood.

It appears to me that no Government or private agency however efficient can carry out such a systematic mineralogical survey as an organisation of science teachers and much of the mineral resources of India which remain hidden at present, may possibly be unearthed through the co-operation of science teachers. If science teachers will only make up their minds to do some work in this direction, the charge often levelled against them that they are not practical men, that the knowledge diffused within the class-room has very little in common with the practical affairs of life and that they often lack initiative and enterprise, will have to be withdrawn at least on one count.

V. N. VISWANATHA AIYAR.

INCIDENTS FROM GURUKULA LIFE.

THE Gurukulites regard character as the highest asset in life. The development of body and the refinement of intellect occupy, each, its proper place in the daily routine but to the moral side of nature is attached by far the supremest importance. The invincible physique of a Bhima, and the unmatched ingenuity of a Krishna, form aptly the Gurukula ideal. The danger of it is that these, unless controlled by a wholesome spiritual bias, may rather be instruments of evil than powers for good. By lessons and talks, by harangues and example, by a judicious regulation of the boys' routine, and by a constant watch kept over their conduct, an attempt is continually made to cast the students into an ideal ethical mould. In the Gurukula premises one feels one's self under the influence of an edifying atmosphere, silently working into the life of its inmates.

Below are related a few incidents of which the writer was eye-witness during his short stay at the Mooltan Gurukula. A few of the many instances, he had occasions of daily coming across, they may serve to the reader as an index to the sort of life led in these educational ashramas.

1. Truth, not success.

Success in an examination is the *summum bonum* of a school-boy's existence. What sacrifices is he not willing to make simply that he may get a University pass? Loss of health is the meanest price he offers. His truthfulness, his honesty, his religious scruples—anything that goes in the name of character and honour is lightly laid at the altar of a University success.

In the Gurukula they look beyond intellectual tests. Literary proficiency is treated as only a means for the achievement of a higher and nobler ideal.

The Principal has fixed the date of examination, and has handed the paper of English to the teacher concerned to make a few copies of it. The latter knows little Hindi and writes the translation piece in Urdu character. Somehow, the piece is left in the class, and a boy who knows Urdu catches hold of it. The passage is safe in his hands, as none of his class-fellows can read this Semitic script. He may keep it, master it, and prepare well against the day of examination. Are these the thoughts that run into the boy's head, as in that filthy leaf he smells the fruit forbidden? In the boy's paradise, there is no devil. He takes it straight to the Principal, and knows no rest till he has relieved himself of the unchaste burden. The day of examination comes, and the piece for translation stands unaltered in the paper. It was unholy to look at a question before its proper time, and the boys have carefully eschewed that piece lest it should tarnish their character.

2. In the Lower Forms.

The example cited is of a class which had spent full six years in the Gurukula, and formed now the seventh standard. What of the lower forms?

One by one, the boys are called into the examination room. Each lad is asked the same questions, which answered, he is detained. The ennui of idle hours is too heavy for children to bear. Elsewhere it would be dangerous to let a boy out with the examination paper in his head. In the Gurukula, they purposely lay temptations in the way of students. The world, they say, will offer

these by scores at every step, and unless practised in overcoming them, the young service may find them too strong, and may, in all probability, fall. Young playfals of the second form are allowed to mix freely with their classmates waiting outside, under instructions, of course, to keep the paper secret. And will you believe it, they have, by their conduct, fully justified the trust reposed in their honour?

3. Fallen from the roof.

In the course of their trip round Murree Hills, the *Brahmacharis* came to a point, named Doona Gali. One morning, as we lay in our beds, we heard an uproar accompanied by the sound of a sudden shock. What should we see on hurrying out? A *Brahmachari* had slipped from the roof of a shed, and fallen on a heap of stones. For a moment he lay senseless. He was wrapped in rugs and carried in. On coming to himself he smiled. The vomittings, however, that succeeded every few minutes contained a tinge of blood. Had the lungs received injury? The doctor was called, and he showed his satisfaction that the interior of the body was safe.

How now to tamper with the programme? It was the time fixed for departure and telegrams had been sent ahead for arrangements of food and lodging. The Principal was giving instructions for a *chaprasi* and a teacher to stop with the boy, when lo! our hero was up, tied up fast in clothes and coverlets. The vomittings, however, would not cease. A coolie was hired, and a mile or two were done safely on his back. A short halt was made for refreshments, and some twenty miles more remained to be covered before the advent of evening. A mile more goes the lad on the coolie's back. Now he is tired. Let

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him try a little walking. Finding he can dispense with his conveyance he sends the labourer away; and no less than eighteen miles are done by a *fad* of fifteen, walking *of footed* on a rugged stony road, which *golders*, in their long boots, have pronounced *Can be bloody.* All this after a fair morning's fall from the roof of a mountain house! No more impressive example is needed to emphasise the virtue of forbearance, which forms the key-note of Gurukula Education!

4. Fire allays Fire.

The narration will not be complete without an instance from Kangri, where the highest classes read. For the incident which follows we depend on the *Vedic Magazine*, the esteemed organ of that institution.

Free intercourse with outsiders is forbidden at school, lest raw minds should imbibe impressions which it may be found too late to wipe off. At college the character has been formed, and the time is near to enter the life of a householder. As a preparation for it, *Brahmacharis* at this stage are given opportunities of benefiting their neighbours and seeing for themselves what sort of world it is which they will enter. Occasions of distress are specially opportune for the discharge of these functions.

One night, when every soul in the *Kula* had gone to his rest, somebody espied flames in the distance. There were sounds of cracking furniture, burning dung-hills and loudly wailing villagers. The village adjacent to the *Kula*, was on fire. The alarm was sounded, and the *Brahmacharis*, in hot haste, gathered in the Gurukula play-ground. Led by their professors, they hurried straight to the scene of destruction. Buckets of water were brought, and a belt of land was cleared by pulling out

uninspected schools containing about 8,000 pupils."

He was a kind master and a protector of his subordinates; at the same time he was outspoken in his criticism of any mandate that came from above, and which, in his estimation, was not quite right. Speaking of the refusal of all grants-in-aid, Mr. Woodrow was constrained to write: "If, instead of the order that no increase of expenditure on Government schools and no fresh Grants-in-aid to private schools should be allowed, it had been directed that increase of expense to Government should not be allowed, the results would have been useful and salutary and not as now, mischievous and unpopular. Full scope would have been given for adjustment of grants. When one grant was cancelled, another would have been given; when one aid was diminished another would be increased..... We should have carried the people with us in our reforms, and received their cordial co-operation, whereas now they stand aloof, and give no help... Although it is the duty of a public officer to carry out his orders, yet it is much more satisfactory to him to find the people co-operating gladly and helping him in his work." Later on in the same report he had the courage to observe with a touch of irony eminently befitting the case,—"We have heard of the Irishman spending a shilling to save six pence; but our saving would be like spending a pound to save three pence. To reduce expense by the dismissal of teachers without any fault would be a policy not only odious and unjust, but short-sighted and impetuous."

Mr. Woodrow was for a short time Principal of the Calcutta Presidency College, and in September 1875 went again to officiate in the post of Director where he was eventually made permanent on the demise of Mr. Atkinson. He died at Darjeeling on the 11th October 1876, after suffering for some twelve hours from a violent pain in the chest.

Thus passed away a noble spirit, renowned no less for his educational activities than for his having preserved to posterity the educational minutes of Lord Macaulay. He had earned for himself the title of the "Nurturer of Education," and was truly loved and respected by the people. A fund was started soon after his death, which was handsomely contributed to by his many friends and admirers; and on the 15th March, 1879, his bust was unveiled at the Senate House, Calcutta, by the Hon. Sir A. J. Arbuthnot, Vice-Chancellor of the University. "A distinguished scholar, a successful teacher, an energetic Inspector of Schools, and an efficient Director," records the Government of Bengal in an Educational Memo. bearing date December the 5th, 1876: "Mr. Woodrow devoted to the cause of Education, abilities which were at once stimulated by philanthropy and guided by sound judgment."

I come now to describe the deeds of one who was not even remotely connected with the Education Department but whose princely munificence has brought education within the reach of a vast number of our countrymen. This country, it is true, has never lacked philanthropy in the domain of education; and recompense for the dispensation of learning was a thing long unknown. But these dispensers of learning were sectarian in principle and dared not go beyond their particular sects. It should therefore be noted to the credit of Haji Mahomed Mohsin that the beneficiaries of his property are to be found not only within the pale of Mahomedanism, but even beyond: not only have his co-religionists reaped a rich harvest from his hoarded wealth, but his countrymen generally have benefited by it.

Haji Mahomed Mohsin was the only son of Haji Fazlullah, his mother being the erstwhile widow of Agha Motaher who had amassed fabulous wealth, and re-built the Imambars of Hooghly. In her former marriage this lady had

given birth to an only daughter, Manu Jan Khanum, to whom Agha Motaher bequeathed by will the whole of his property when she was only seven years of age. Mahomed Mohsin was by some eight years the junior of his half-sister, in whose company he was brought up in his father's residence. Manu Jan Khanum watched over her little companion with the tenderest care and devotion which were fully returned by him in after-years.

Early in youth Mahomed Mohsin learnt Persian and Arabic, and was soon placed under the guidance of a tutor, Agha Shirazi by name. This tutor had travelled in many lands, and used to amuse his ward by tales of adventure he himself had experienced in far away climes. The youth caught the infection and came to cherish a yearning for travel; this desire fructified into action when he was thirty-two years old. He visited many up-country towns and went on pilgrimage to Mecca and Medina, which acquired him the title of *Haji*; afterwards he wended his way to other sacred places in Persia, Turkey and Egypt. He finished his travels in his sixtieth year and returned to Marshidabad. In the meantime, Manu Jan Khanum had married and very soon after become a widow. Finding it difficult to manage her estates by herself, she sent for Mahomed Mohsin. "Feeling that it was his duty to come to her assistance, he gave up the life of study and seclusion that he had marked out for himself, and came to Hooghly to undertake the arduous duties of manager of his half-sister's great estates."

Manu Jan Khanum died in 1803, at the age of eighty-one, and left by will the whole of her estate to Mahomed Mohsin. Mahomed Mohsin was seventy-three when he stepped into the possession of this enormous wealth. He was all along a bachelor. The sudden acquisition of this immense property did not turn his head or induce the very least change in the habits of his life. He was throughout his life ardently

religious and proverbially charitable. He died in 1812 at the age of eighty-two. Before his death, on the 26th of April, 1808, he had signed a Deed of Trust assigning the whole of his income to charitable purposes in perpetuity. "... And as I have full wish and desire to keep up and continue the usages and charitable expenditures of the *Fateha*, &c., of the *Huzrat* which have been the established practice of the family, I hereby give purely for the sake of God the whole of the above property, with all its rights, immunities, and privileges, whole and entire, little or much, in it, with it, or from it, and whatever might arise from it, relate or belong to it—as a permanent appropriation for the following expenditures, &c. &c."

By the above Will the proceeds of the testator's estate were divided into nine shares, which were disposed of as follows: three shares were devoted to religious purposes; two were assigned to the *Mutwallies* or Trustees (of which there were two) in equal portion for their personal expenses; and four shares were disbursed to meet establishment expenses and in paying stipends, &c., that is, for the purpose of charities not of a strictly religious nature. The disbursement as was nominated, was no doubt wise and quite free from prejudice. Not long after Mahomed Mohsin's death, however, it appeared that the Trustees were fraudulently disposed; and Government was obliged to put its finger in the pie. The Trustees proving refractory, litigation followed, and eventually the Mahomed Mohsin Trust Estate came into the hands of Government in March 1817. The case was finally decided in 1835, when new regulations were drawn up allotting a large sum to Education and naming it the "Mahomed Mohsin Education Endowment Fund." The money was found by releasing the Trust of some unnecessary or superfluous expenses, without in the least meddling with the charitable spirit of the donor. There remained "at the disposal of Government for general

plants and hedges, to separate the area burnt from the portion left safe. With a fire run the *Brahmacharis* amidst cinders. They scorched their feet, and minded not the danger to their own lives in snatching the villagers and their property from the scourge of flames. Fire had allayed fire. On the representation of the Gurukula authorities, material assistance was granted free to the chief. A subscription was raised in their aid. A few days passed and it appeared as if old cottages had been granted phoenix-like, a new lease of existence, healthier far and happier, by passing through a stage in metempsychosis.

These, gentle reader, are some of the everyday occurrences of Gurukula academies. Apart from physical and intellectual excellence, evidences of which meet the eye on every side, that too is no mean education, which ingrains in the scholars a character, outlines of which have been sketched in the above instances. Let the Universities of India join hands to produce such citizens for the *Bharat-mata*, and the salvation of the mother will not be far. Then may, as says Manu, sit scholars of all climes and countries at the feet of their Preceptor of old, the Primeval Fountain of knowledge and culture, our holy, our heroic, our hoary Aryavarta.

CHAMUPATI RAI.

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EDUCATION—ITS MEANING AND FACTORS.

THE subject of Education occupies not a little attention of the public at the present moment. Various theories have, in consequence, been propounded to explain its scope and meaning. The business in these papers will be to indicate the features of, and the conclusions derived from these theories and their practical bearings on the problems of Education.

The word 'Education' has been on the lips of almost all classes of people since the dawn of the ages, but the meaning conveyed by the term in each case is by no means so clear and definite as may appear. Special tendencies, predilections, professional bias seem to lend their characteristic hues to the interpretations with the result that shades of opinions and ideas, both *extreme and moderate*, have come into being in a sphere where, if there be any thing needful, it is the uniformity of opinion—opinion that shall be steadfast, constant and single. But "just as two faces" says an eminent writer, "are not alike, so two minds are not alike." Thus definitions and descriptions of education have been, so to say, as many, as there are minds to make them. To find the true meaning out of this labyrinth of ten appears to be such a difficult task to the ordinary teacher, that he at last chooses "the broad way" and remains contented, either with the absence of any definite meaning, or, the presence of a wrong one. Education has been thus going on from generation to generation—each teacher or reformer following his own methods, or no methods, theories and science of education notwithstanding. And it will not be too much to say that there is scarcely any school in this country in which a tassel is not at present going on among the trained and the untrained teachers as to 'why and how' of the teaching processes. Looked at from a dispassionate standpoint such wranglings will appear to be due, not so much to dogmatism on

either side, as to the want of a clearly conceived aim of education.

The primary difference is broad enough and may be easily dismissed with a few words. It consists in a wide and a narrow significance of the term 'Education.' In its wide sense education is a life-long process—it begins from the moment the child is ushered into the world and ends with the end of all that is perishable in him. Education, in this sense, may, therefore, be described as the gradual adaptation to the physical, social and spiritual environment in which a human being finds himself. This is what in the language of Rousseau is called "the Education of Nature." The necessity of teachers and schools is not so much felt in this education of man. Every thing depends on nature.

But such is not the object of education in its narrower sense. Account is no doubt taken of the surroundings, but the agencies of teachers and institutions are not the prime factors, education in this sense does not include self-culture and general influences of environment so much as "those special influences which are consciously and designedly brought to bear upon the younger by the adult portion of the community, whether through the family, the school, and the State."

Parents and teachers, schools and seminaries have scarcely anything to do with the education in which Nature plays the prominent, if not, the only part. We are concerned with education in its narrow sense—a sense in which technical skill and material conditions are the only things to be relied upon. To understand education in this sense is by no means a solution of the difficulties. Instead of being the end, it is rather the beginning of our difficulties. For, education, strictly so called, of which we shall henceforth speak, has been refracted through different minds in so many different ways that to recompose them into one single principle, is by no means an easy task. Poets and philosophers, materialists and meta-

physicians, psychologists and teachers, have looked upon the subject each from their own standpoint and have stamped it with the characteristic tinge of their understanding with the result that a mass of literature has grown up round our favourite subject in which the principle of cohesion seems to be still in the nebulous stage.

The materialists hook his ideal on the "bread and butter" question. Education should, according to them, be nothing but a means for earning a decent living. That an over-anxious parent or employer of labour should have no other aim in the education of his son is quite natural. His outlook on life is hedged round by the narrow conception resulting from the occupation in which he is engaged, he cannot look beyond the fence. His view is scanty, uncertain, stunted and polish. The groove in which he moves characterises the ways in which he thinks. The idea of utility overfills his whole being and the only thought that he can entertain for his children is that they should be always in a perpetual hunt after a "few base paltry lucre" in the life that is entrusted to them. That this is a most despicable view of education not worthy of a moment's notice will appear from the fact that judged from this canon of the utilitarians, a cook will be a more estimable being than a poet, and a short-hand typist more glorious specimen of humanity than a philosopher.

A man is endowed with so many faculties and aptitudes that the attempt to direct his growth in a certain restricted channel generally undermines his usefulness as a member of the race to which he belongs. The education he thus receives is timid, but not healthy; one-sided but not liberal. Certain parts of his whole being will lie fallow, parts which he may one day be called upon to bring into prominence even in that sphere of utility in which he so fondly sets his heart. That an artisan or craftsman will do his work better if he has a tolerable knowledge

of Arithmetic or Mechanics, is an admitted fact, while a short-hand typist will add not a little to his technical skill, if he is equipped with a knowledge of the language, both written and spoken. Apart from this, there is no knowing in which sphere of activities a child may be engaged in future life to earn his living. ~~Signs~~ are not wanting even now of a time in which a literary man may find it necessary to run a shop or to manage a factory. The flood-gates of the Universities have been opened and legions of graduates are manufactured every year. But can any sane man think that any Government or private agency in a country, however large and civilised it may be, can make provision even for a quota of these educated men? To-day or to-morrow they must have to shift for themselves, and all that an educationist can do is to devise means that they can decently shift for themselves when the necessity comes. That the education imparted by the Universities is one-sided, is admitted by the Universities themselves, for, otherwise they would not have been pressing for commercial and industrial education as they are doing at present. Whatever may be the defect in the system, it is not our business to discuss here, our only contention is that education should be so devised as not to leave a single department of the mind stunted and starved to the risk of the educator being found at sea when required to vary his course with the varying necessities of time and circumstances.

Besides, there is another consideration which makes "the bread-and-butter" ideal to be quite fatuous. Supposing a man will not have to vary his course in life, but will have to learn his living through the activities in which he has been trained, does it stand to reason that he will neglect the culture of the other sides of his nature? Is bread-winning the only end for which strength and vigour, judgment and rationality, sentiments and feelings have been given to men? Earning a liveli-

hood or following a profession is undoubtedly an important part of a well-regulated life, but to occupy each moment of one's existence with the thought of his calling is neither practicable nor reasonable. A man must have leisure from the thoughts and occupations which tax his energies every day. Out of the narrow cloister or the garret he must look out to the broad canopy of the heavens to breathe the fresh air for a while. So the question arises as to how he spends his leisure. Does he spend it in the almshouse or in the company of his betters? This determines to a very great extent his capacity for work even in the narrow sphere in which he may be engaged. "Recreation" says Smiles, "is creation." But if the recreation or moments of relaxation from labour, be employed to undermine one's bodily and mental health, it will, instead of creating, taking away from his efficiency as a worker. The existence of clubs, circulating libraries, the society of great men has no other meaning but to tone up the energies for the struggle of daily life. But if a man does not avail himself of the opportunities thus afforded to him, resorts himself to undesirable company, or to objectionable habits during the spare moments, his education cannot but be considered as narrow and defective.

If the educational outlook of the anxious parent and the short-sighted economist is narrow enough, not less so is that of the school-master; and what is more fatal to the cause of education is this, that his opinion may be regarded in some quarters as most conclusive. He dispenses education in schools, he is trusted by not a few of the parents who send their sons to these schools, he carries so much learning and all that in his 'small head,' that he naturally becomes an object of awe to the uninitiated and the ignorant. That the opinion of such an important personage will acquire a wide currency in matters educational, is only natural. But after all what is his opinion worth? Bred in the colleges and

the seminaries he naturally identifies education with learning or, more crudely still, with success in examinations, and cares only for a skilful drill in the "intellectual faculties" as if a highly developed intellect is the only thing that can save. If "quips and quiddities", hair-splittings and niceties, be the order of life, then the school-master's prescription is eminently suitable to the needs of education. But alas! there are more things in human life than a swelled head—more things to make it happier than a bloated intellect. The recipe of the schoolmaster may bring about an intellectual cure, but it is likely to induce a sad physical, moral and spiritual atrophy. Such turgidity may be laudable in the school-master but is positively harmful to his pupils. The one-sidedness of which we have complained in the ideal of the over-anxious parent is not removed by the learned pedagogues in the school, but is made to appear in another shape, viz., the worship of knowledge or the "lust of the head." When the net result of life is to be struck, success at examinations, or deep learning may be found to be wanting in the scales of values and a man may almost be tempted to agree with Tony Lumpkin to

"Let Schoolmasters may puzzle their brain
With grammar, nonsense, and learning;"

but it is not grammar or learning alone that will count.

Education has been defined by Herbert Spencer as preparation for complete living and this has again elaborated by some into the harmonious development of the physical, aesthetic, mental and spiritual faculties as the aim of education. The definition of H. Spencer is good so far as its theoretical part goes, but when from this he rushes to prescribe Anatomy, Physiology, the science of child-rearing and child-breeding as part of the curriculum of studies for children, every man dares to accept his practical conclusions. Again, in the harmonious development of the

faculties, physical, intellectual and moral, it is the word "harmony" that presents all the difficulty. It may be used by the theorist with a chuckle of joy, but the crux seems to lie in its practical application at the hands of the teachers who are to face concrete situations in the school-room. Where does the vaunted harmony lie? ~~press~~ the theorist tell us how the balance is to be kept even in a well-organised family or school? On the contrary, is it not every day felt that the "keenness of intellectual pursuits, or the recurrent glow of artistic emotion, or enthusiasm for cricket and football, seems likely to upset the balance and to render life on the whole ineffective—perhaps tragically so?"

Besides, it is a patent fact that one or two of a number of children of the same parents are often found to be born with peculiarly prominent traits. Whether this is due to a special aspect of heredity, or to any other cause as yet dimly realised, does not concern us here. The prominence of a clearly pronounced trait is there and even a feeble stimulus from the environment will react upon it and help to keep it above other aptitudes and tendencies. Even in the absence of any stimulus the prominent traits will grow with the growth of years. It can not be balked or restrained. Do what a parent or teacher can to smooth the faculties into harmony, the future poet will "lisp in numbers, for the numbers come" and an apprentice with a genius for invention will try to look intelligently into the machinery of an engine though he may be brought to task for his audacity. It is fire that can not be quenched. On the other hand it will, if encouraged and fostered, be one day the ruling principle of life. Where does then the merit of harmony lie? Genius is nothing but a strong natural tendency of a particular kind brought to the highest pitch of perfection through education and environment. The theory of the harmonious development thus comes in the way of

uninspected schools containing about 8,000 pupils.

He was a kind master and a protector of his subordinates; at the same time he was outspoken in his criticism of any mandate that came from above, and which, in his estimation, was not quite right. Speaking of the refusal of all grants-in-aid, Mr. Woodrow was constrained to write: "If, instead of the order that no increase of expenditure on Government schools and no fresh Grants-in-aid to private schools should be allowed, it had been directed that increase of expense to Government should not be allowed, the results would have been useful and salutary and not as now, mischievous and unpopular. Full scope would have been given for adjustment of grants. When one grant was cancelled, another would have been given; when one aid was diminished another would be increased..... We should have carried the people with us in our reforms, and received their cordial co-operation, whereas now they stand aloof, and give no help... Although it is the duty of a public officer to carry out his orders, yet it is much more satisfactory to him to find the people co-operating gladly and helping him in his work." Later on in the same report he had the courage to observe with a touch of irony eminently befitting the case,—"We have heard of the Irishman spending a shilling to save six pence; but our saving would be like spending a pound to save three pence. To reduce expense by the dismissal of teachers without any fault would be a policy not only odious and unjust, but short-sighted and impetuous."

Mr. Woodrow was for a short time Principal of the Calcutta Presidency College, and in September 1875 went again to officiate in the post of Director where he was eventually made permanent on the demise of Mr. Atkinson. He died at Darjeeling on the 11th October 1876, after suffering for some twelve hours from a violent pain in the chest.

Thus passed away a noble spirit, renowned no less for his educational activities than for his having preserved to posterity the educational minutes of Lord Macanlay. He had earned for himself the title of the "Nestor of Education," and was truly loved and respected by the people. A fund was started soon after his death, which was handsomely contributed to by his many friends and admirers; and on the 15th March, 1879, his bust was unveiled at the Senate House, Calcutta, by the Hon. Sir A. J. Arbuthnot, Vice-Chancellor of the University. "A distinguished scholar, a successful teacher, an energetic Inspector of Schools, and an efficient Director," records the Government of Bengal in an Educational Memo. bearing date December the 5th, 1876: "Mr. Woodrow devoted to the cause of Education, abilities which were at once stimulated by philanthropy and guided by sound judgment."

I come now to describe the deeds of one who was not even remotely connected with the Education Department but whose princely munificence has brought education within the reach of a vast number of our countrymen. This country, it is true, has never lacked philanthropy in the domain of education; and recompense for the dispensation of learning was a thing long unknown. But these dispensers of learning were sectarian in principle and dared not go beyond their particular sect. It should therefore be noted to the credit of Haji Mahomed Mohsin that the beneficiaries of his property are to be found not only within the pale of Mahomedanism, but even beyond: not only have his co-religionists reaped a rich harvest from his hoarded wealth, but his countrymen generally have benefited by it.

Haji Mahomed Mohsin was the only son of Haji Fazlullah, his mother being the erstwhile widow of Agha Motaher who had amassed fabulous wealth, and re-built the Imambara of Hooghly. In her former marriage this lady had

given birth to an only daughter, Manu Jan Khanum, to whom Agha Motaher bequeathed by will the whole of his property when she was only seven years of age. Mahomed Mohsin was by some eight years the junior of his half-sister, in whose company he was brought up in his father's residence. Manu Jan Khanum watched over her little companion with the tenderest care and devotion which were fully returned by him in after-years.

Early in youth Mahomed Mohsin learnt Persian and Arabic, and was soon placed under the guidance of a tutor, Agha Shirazi by name. This tutor had travelled in many lands, and used to amuse his ward by tales of adventure he himself had experienced in far away climes. The youth caught the infection and came to cherish a yearning for travel; this desire fructified into action when he was thirty-two years old. He visited many up-country towns and went on pilgrimage to Mecca and Medina, which acquired him the title of *Haji*; afterwards he wended his way to other sacred places in Persia, Turkey and Egypt. He finished his travels in his sixtieth year and returned to Marshidabad. In the meantime, Manu Jan Khanum had married and very soon after become a widow. Finding it difficult to manage her estates by herself, she sent for Mahomed Mohsin. "Feeling that it was his duty to come to her assistance, he gave up the life of study and seclusion that he had marked out for himself, and came to Hooghly to undertake the arduous duties of manager of his half-sister's great estates."

Manu Jan Khanum died in 1803, at the age of eighty-one, and left by will the whole of her estate to Mahomed Mohsin. Mahomed Mohsin was seventy-three when he stepped into the possession of this enormous wealth. He was all along a bachelor. The sudden acquisition of this immense property did not turn his head or induce the very least change in the habits of his life. He was throughout his life ardently

religious and proverbially charitable. He died in 1812 at the age of eighty-two. Before his death, on the 26th of April, 1806, he had signed a Deed of Trust assigning the whole of his income to charitable purposes in perpetuity. "And as I have full wish and desire to keep up and continue the usages and charitable expenditures of the *Fateha*, &c., of the Huzrat which have been the established practice of the family, I hereby give purely for the sake of God the whole of the above property, with all its rights, immunities, and privileges, whole and entire, little or much, in it, with it, or from it, and whatever might arise from it, relate or belong to it—as a permanent appropriation for the following expenditures, &c. &c."

By the above Will the proceeds of the testator's estate were divided into nine shares, which were disposed of as follows: three shares were devoted to religious purposes; two were assigned to the *Mutwallies* or Trustees (of which there were two) in equal portion for their personal expenses; and four shares were disbursed to meet establishment expenses and in paying stipends, &c., that is, for the purpose of charities not of a strictly religious nature. The disbursement as was nominated, was no doubt wise and quite free from prejudice. Not long after Mahomed Mohsin's death, however, it appeared that the Trustees were fraudulently disposed; and Government was obliged to put its finger in the pie. The Trustees proving refractory, litigation followed, and eventually the Mahomed Mohsin Trust Estate came into the hands of Government in March 1817. The case was finally decided in 1835, when new regulations were drawn up allotting a largesum to Education and naming it the "Mahomed Mohsin Education Endowment Fund." The money was found by releasing the Trust of some unnecessary or superfluous expenses, without in the least meddling with the charitable spirit of the donor. There remained "at the disposal of Government for general

Reference has now been made in general to the extensive popularity of the humorous man. Now if particular professions or departments of human activity are taken into consideration, it is found that humour is a great desideratum for success. The Gentleman of the Bar who has a capacity to give a few humorous touches to his cases either in connection with the examination of witnesses or in the course of his arguments commands wide practice and fails not to bask in the sunshine of the favour of the serious solemn-faced "Man of the Bench" to whom he renders invaluable aid by relieving His Lordship of the lion's share of the monotony of court drudgery. We are aware of the immense popularity in this Presidency of Mr. Eardley Norton to whose success at the Bar, a keen sense of real humour has made a fair contribution. The Doctor of Physic who greets the suffering patient with a few choice humorous remarks is really administering the sufferer a healing balm whose properties, no text-book on the Science of Asculapins has definitely formulated. The poet and the critic, the historian and the journalist who employ humour profusely in their writings may rest themselves assured that the fame of their compositions will long outlive them. However much serious authors might think of "soaring above the Aonian Mount in things unattempted yet, in prose or rhyme" their works could never become the favourites of the general public to the same extent as Cowper's John Gilpin and Goldsmith's Madam Blaize, the Essays of Elia and the Novels of Dickens. The enviable reputation of even statesmen of the type of Abraham Lincoln was in no small measure due to that fine sense of humour which exhibited itself in their professional activities. The soldier who

maintains an irrepressibly cheerful and humorous spirit at the front, giving the enemy's shells names and nicknames, is sure of avoiding blunders in action which are often occasioned by the excitement of the battle and can be relied on to manifest a similar coolness in the thick of the fight. The school-boy who gives rein to his humour with due deference to the rules of discipline will find himself the favourite not only of the sympathetic teacher who recognises in him at school, the prototype of his little son at home but also of his fellow-chums who are even prepared to pass his blunders for a virtuous type of boldness. The lady of the house who knows a good laugh is according to Thackeray a sunshine in the house while a woman without a laugh in her is the greatest bore in existence—"a wet blanket on the kindly nuptial couch," in the cynical language of that great writer.

From the above, the desirability of all men and women engaged in public or professional work cultivating humours becomes evident. Popularity is generally the criterion the public adopts in judging the success or the failure of an individual's work and there is no surer road than real humour to the gates of popularity.

III.

Though humour is appropriate for all professional men, there is greater appropriateness for it in the pedagogical profession because of the peculiar character of the teacher's environments. While the lawyer's environments are litigants among whom might even be found hardened criminals, while the doctor's are patients some of whom might by the very nature of their complaints have lost their mental equilibrium, the teacher's transactions are with a set of adolescents whose

actually cutting their way through ham and beef, and wading to Liberalism through tumbler of beer." In a committee meeting specially called for the purpose, it was moved that Derozio's "manners and conduct were such as to injure the morals of the boys in touch with him, and that he should be removed from the staff of masters." Dr. H. H. Wilson, the Visitor of the College, communicated to Derozio the charges that were made against him; these he vehemently repudiated: "That I should be called a sceptic and an infidel," he went on to say, "is not surprising, as these names are always given to persons who dare think for themselves in religion; but I assure you that the imputations which you say are alleged against me, I have learnt for the first time from your letter, not having even dreamed that sentiments so opposed to my own could have been ascribed to me. I must trust therefore to your generosity to give the most unqualified contradiction to these ridiculous stories. I am not a greater monster than most people, though I certainly should not know myself were I to credit all that is said of me." But his defence was unavailing; although Mr. Hare and Dr. Wilson were satisfied with the explanation, the native managers urged for his dismissal, as in their opinion "the continuance of his connection with the College would be detrimental to its interests." So Derozio resigned his post. Even after his resignation, however, his pupils came to his place, and he continued to teach at home what he had been teaching at school. Derozio died on the 23rd December 1831 at the very early age of 23. Of his poems, three are included in Capt. D. L. Richardson's "Selections from the British Poets".

GOKULNATH DEB.

TELUGU AUTHORS OF TO-DAY.

THE present period of the history of the Telugus may be justly characterised as their period of renaissance. Every branch of their life is pulsating with a new spirit. There is no Andhra who is not conscious of the touch of the new waves of an altogether impatient thirst for a wider life spreading through the whole community. Leaders have come forward to lead the community on in its triumphal march towards an all-alluring goal. Poets have begun to sing the glory of the mother country. In the very blindness of their zeal, the people have learnt to overlook the errors of their leaders.

But whatever it may be in other branches of their life, we are afraid we cannot entirely shut our eyes to many of the glaring defects in the branch of Literature. Though we are glad for the encouragement given to authors everywhere, we confess we are pained to see that such encouragement is at times misplaced. Writers, who can improve with a little more of application but who are for the present in the experimental stage, receive undue recognition. At times, authors of no merit worthy of a mention come to the front, simply on the certificate of a god-father, either in the embodiment of a member in the Text-Book Committee or in that of an enlogistic writer of the oft-abused "Foreword." Whether we will or no, works of inferior quality are forced upon our notice, and we are at times compelled to give them 'some' consideration, in spite of our conscience, for the sake of 'Policy.' This is one of the deplorable effects of the printing press, side by side with its multifarious merits. We do not mean to say that the present Telugu Literature is all of inferior stuff, far from it,

Reference has now been made in general to the extensive popularity of the humorous man. Now if particular professions or departments of human activity are taken into consideration, it is found that humour is a great desideratum for success. The Gentleman of the Bar who has a capacity to give a few humorous touches to his cases either in connection with the examination of witnesses or in the course of his arguments commands wide practice and fails not to bask in the sunshine of the favour of the serious solemn-faced "Man of the Bench" to whom he renders invaluable aid by relieving His Lordship of the lion's share of the monotony of court drudgery. We are aware of the immense popularity in this Presidency of Mr. Eardley Norton to whose success at the Bar, a keen sense of real humour has made a fair contribution. The Doctor of Physic who greets the suffering patient with a few choice humorous remarks is really administering the sufferer a healing balm whose properties, no text-book on the Science of Æsculapins has definitely formulated. The poet and the critic, the historian and the journalist who employ humour profusely in their writings may rest themselves assured that the fame of their compositions will long outlive them. However much serious authors might think of "soaring above the Aonian Mount in things unattempted yet, in prose or rhyme" their works could never become the favourites of the general public to the same extent as Cowper's John Gilpin and Goldsmith's Madam Blaize, the Essays of Elia and the Novels of Dickens. The enviable reputation of even statesmen of the type of Abraham Lincoln was in no small measure due to that fine sense of humour which exhibited itself in their professional activities. The soldier who

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study of Natural Science, which deals with the various activities in Nature and clearly shows the part played by each one of its members towards the harmony and economy of the whole. Any one who, for instance, knows the basic principles underlying the Natural Sciences—Botany, treating of plant-life, Zoology, of animal life, and Geology, of the inorganic members of Nature, such as minerals and rocks—one who knows some fundamental principles of all these sciences can surely have a better and more intellectual appreciation of Nature and thus derive greater happiness than one who is simply delighted for an instant at seeing a vast panorama of natural scenery.

We know much of Shakespeare through his works, and in fact it is they that unfold to us his varied talents and evince the admiration that all of us have for his genius. "Know an author by his works"—that indeed is the proper procedure in literary study. So it is in the study and appreciation of the greatness of His Almighty. As Cowper said "Nature is but a name for an effect whose cause is God" and the only way in which we could have some concrete idea of His greatness and His skill is to study His works and learn to appreciate them. When, for instance, we come to examine all the details of a flower—its bracts and petals, its stamens and pistils—and realise the valuable and important part played by each one of these members in the successive stages of the life history of the flower, or when we come to study some of the details in the life of the lower animals and see how in each case their habits and mode of life are specially adapted to their environment and how harmonious is the relation between it and its surroundings—when we come to know such other facts of interest—it is then

that we can adequately realise the skill of the Creator—his forethought and his wisdom. It is not the wandering mind which is content with the vague impressions of a dumb pleasure arising from a distant view of a landscape that finds "tongues in trees, books in the running brooks, sermons in stones and good in everything." On the other hand it is one who sits everyday at the feet of Nature, studies her ways and methods in all its details, gradually unfolds her mysteries and begins to understand and admire the beauties and wonders of God's creations as displayed in Nature. It is perhaps possible to form some vague idea of the greatness of God by simply taking a broad survey of Nature and her beauties, but we can never have that genuine admiration and that sincere appreciation which comes only after a close and more detailed study. For instance, if there is a fine ivory carving of say, Sri Krishna in his Gokula—you may, seeing it from a distance, appreciate its beauty and admire the skill of its author, but your admiration and appreciation—and pleasure too—is increased a hundred-fold when you actually have the carved figure in hand and observe it in all its details—its excellent finish, its delicate turns, its life-like realism and its fine filigree work. So it is with God's creations. The more you admire his works, the more you admire him; and the more you understand His creations, the better you understand Him too!

It is a very common impression in certain quarters that all Natural Science is, as a friend of mine recently put it "a mere jumble of long-latinised names." It is time enough that we grow out of such crude notions of these subjects. Though, of course, to the academic student of Natural Science there might be a

fairly long list of "long-latinised names" to master, it is quite easy to avoid these and yet have an exceedingly fine idea of the workings of the organic world or the mineral kingdom. In fact, as suggested above, it is quite enough if one were familiar with the broad generalised principles underlying the Natural Sciences—Geology, Zoology and Botany—to intelligently appreciate the origin of a mountain, the structure of a butterfly or the organisation of a flower. He needn't have any command of "long-latinised names" for that. In short Natural Science is the most "natural" of all the sciences, the study of which is or ought to be the most "natural" for mankind.

So it is desirable, nay necessary that every one should devote a portion of his time for a proper study of Nature. It is almost the only way of combining pleasure with instruction—which seldom go together otherwise. Moreover as a famous Naturalist has said: "Some knowledge of them (the works of Nature) is part of the general body of culture that makes us in the best sense citizens of the world." Above all, the study of Nature is the avenue that leads us to a fuller appreciation and admiration of God, the author of them all.

L. RAMA RAU.

In Active Preparation.

COLLEGE ALGEBRA

A Text-book for the Intermediate and B.A. Classes

BY

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THE TEACHING OF ENGLISH GRAMMAR IN SECONDARY SCHOOLS.*

DURING recent years the old methods of teaching the various subjects of the School Curriculum which were for the most part based upon faulty systems of psychology, have all been replaced by entirely new methods. In mathematics, for instance, we no longer trouble our boys with intricate, unpractical problems. We give him just that amount of mathematical knowledge which will be of use to him in his life around, with the help of such methods as will create an interest in the work he does. Coming to English the time-honoured 'Translation Method' has been found to be defective and the new so called 'Direct Method' has taken its place: The 'Direct Method' has been declared to be the easiest and the most successful method in teaching any language by such writers as Jespersen and Kirkman. The question naturally arises: What should be the status of grammar under the new method? Should grammar be taught as before or should we change our syllabus and so forth.

Since the advent of the 'Direct Method' there has been something like a reaction against grammar. Some have gone even so far as to suggest the banishment of grammar from the school curriculum. The causes, that were at work in bringing about this reaction, were the old crude methods of teaching grammar and the various wrong views about grammar held by pedagogues of old days. First there were those who held that no education could be complete without a study of grammar. Acting on this principle they crammed into their pupils' heads a mass of subtle definitions and logical abstractions under the belief that what they got by heart in their own days must be of immense use to the pupils under them. There were those again who thought that grammar study helps a great deal in improving the reasoning powers of boys. Another type of people thought that grammar being the laws of correct speech should be studied in order that the pupils may express themselves correctly in English. Some also held that grammar study trains the pupil in precision of thought and mental discrimination. For these various reasons grammar was

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assigned as important a place in the curriculum as composition and literature.

But the views of modern educationists have conclusively shown the hollowness of the claims made on behalf of grammar. We now no longer believe in the theory of 'formal discipline' and so to teach grammar with a view to improve the powers of reason of pupils would be foolish. Again the doctrine that grammar study helps the pupils to be correct and idiomatic in their expression, is not based upon facts. Even in these days when a lot of grammar was taught to the boys, horrible mistakes were made by them, as has been remarked by various examining bodies. No doubt the rules were not by heart mechanically, and the pupils could not recite them glibly. The teacher also satisfied himself that the pupils knew their grammar lessons thoroughly. But the aim was not fulfilled. In spite of their mastery of the rules, they could not acquire the habit of employing the usages sanctioned by the literary language. One might as well be a fault-finding mathematician by learning the formulae as a fault-finding speaker or writer of English by studying grammar rules. Further we have seen that people who have studied grammar with care and assiduity, have often been poor talkers and writers. Also those who have not opened a book of grammar in their lives have been great speakers and writers. The reason for this is not far to seek. When we see several words or sentences of the same pattern, or for similar words or sentences of our own. For instance a boy who has often heard superlatives like 'hardest,' 'dearest,' 'highest,' does not need any rule to be able to construct forms like 'purest,' 'ugliest,' 'dirtiest' of his own accord. In fact, we unconsciously copy and imitate good models and constructions that we have come across. It is only through practice and imitation that we can acquire a mastery of the foreign language. So imitation and habit play a large part in enabling the pupils to express themselves in correct English. Fitch, in his 'Lectures on Teaching,' says "It is not as a set of rules that for enabling English people to speak correctly that English Grammar has the least value." Whoever tries to learn or to teach grammar with that object in view is doomed to disappointment. I may also quote Goethe's words on grammar:

"Thus I had learned Latin, just like German, French, English only through practice without rule and without system. Anyone who knows what the state of grammatical instruction was at that time will

not find it strange that I neglected the grammar as well as the rhetoric; everything seemed to come naturally to me. I retained the words, their formations, and transformations in my ear and in my mind and I employed the language with ease for writing and talking." So if our aim in learning a language be merely to express our ideas correctly, then we must devote more attention to composition and literature than to grammar.

Thus we are forced to conclude that the study of grammar does not guarantee correctness of expression. On the other hand much mischief may be done by an over-dose of grammar. Some teachers, in their anxiety to feel the grammatical pulse of their pupils as often as they could have gone to the length of dissecting a fine sonnet or lyric poem and analysing it down to words, giving out their constructions and relations, etc. A sonnet or lyric poem should be so taught that an appeal is made to the pupil's feelings and emotions, and his aesthetic instincts. Such a process of grammatical dissection is pernicious to the extreme and should be avoided. The end of literature is not grammatical analysis and parsing. Further grammar is often a check to free expression. All our ideas exist only in combinations; and so the words which are only symbols of thought exist also only in certain combinations. The words are real to us only so far as they form a group, giving a complete picture to the mind. 'The cat killed a rat' can convey an idea and is remembered. But if you detach the sentence into words as 'the,' 'cat,' 'killed,' 'a,' 'rat,' none of these words alone can convey any complete idea by itself. For grammatical purposes such artificial isolation of words from their surroundings, is a necessary process and is followed by the boys not getting any complete idea. So when the boys begin to write, if they stop at each word and analyse the parts of speech, etc., they will never progress in their work: for their flow of ideas will be necessarily checked. As Jespersen firmly puts it, 'when the mind is occupied with a word as a grammatical phenomenon the word's normal power of calling forth ideas is of course lessened in a considerable degree.' So grammar is something like a hindrance to free expression.

The reaction was therefore mainly against the early instruction in grammar, against the mechanical way in which it has been taught, against the extravagant claims made for its study, as developing correct expression, etc. If it was taught badly in the past and the aims were not achieved, we wouldn't be right in discarding grammar alto-

gether. We should teach only as much as is quite necessary in a mere rational way. Whatever may be said against grammar, it should continue as one of the school subjects for the following reasons:—

(1) It is a means of training in clear thinking. Unlike Latin and Greek, English is largely an uninflected language; and so, the study of grammatical relations between several words in a sentence, throws the mind back on genuine thought relations. Obscurity of thought leads to obscurity of construction and *vice versa*. Hence grammar gives a training in clear thinking as the position of the words is mainly dependent upon their thought relations.

(2) It gives us assistance in understanding language and in clear expression.

Often have we seen that the meaning of a passage is plain if the construction of some word is explained. Difficult and involved constructions, often make a passage rather difficult to understand and with the help of grammar such difficulties are easily explained.

(3) It is a means of correction of the gross errors of speech. It is better that we refer to a set of rules whenever we correct the mistakes of the pupils. Otherwise there would be much waste of time.

(4) In learning a foreign language specially it is of much assistance.

However much we may succeed by imitation and practice to write good English, we are likely to commit faults now and then. Grammar is necessary to warn us against those pitfalls. In teaching grammar, the teacher should bear in mind that it is enough if the boy is able to analyse the structure of a sentence, if he knows to split it into its component parts and re-write it, in some other required pattern if necessary.

So much about the theory of grammar. Let us turn to the methods, and the time to be devoted, etc., with reference to the practical teaching of the subject. The object of teaching the English language is not so much to make philologists of the pupils as to enable him to express himself freely in English. It is only to acquaint him with good literature, to furnish good models before him whereby he could easily write and understand English. All a taste for literature should be cultivated in them, so that they may continue their studies afterwards. For these ends, grammar as has been pointed out already, is far inferior to composition and literature, and so must hold a very subordinate place in the curriculum.

As regards the teaching, we should remember that grammar is a science of abstractions and rules. To young minds, abstractions are naturally very repulsive. So, it is advisable to postpone the systematic treatment of formal theoretical grammar till the pupil enters the high school. To teach 'formal grammar' before that would be futile. No doubt the boys may be made to cram the rules and recite them, but they would not be able to comprehend the meaning of such abstractions, far less to apply them. So in the preliminary stages, the pupil should be furnished with materials, from which he would extract the rules later on. Also at this stage there ought to be no separate periods for grammar. But in the high school, there may be only one period for grammar. Whatever has to be taught, should be introduced in the literature and composition classes, mainly oral composition classes. The grammar lesson should naturally grow out of the literature lesson. The teaching should be concrete as far as possible and abstractions and generalizations should not be indulged in. There should be frequent repetition, as the abstract rules, unless applied often and often, may not stick to the pupils' minds. There is no doubt that grammar taught like this will be much more interesting and beneficial to the boys than under the old system.

The amount of grammar that may be taught in the preliminary stages is that which gives a knowledge of the sentence, sufficient to analyse and parse it down to single words, the several cases, voices, moods, and tenses, a knowledge of the common inflections of nouns, pronouns, adjectives, verbs, the various kinds of nouns, or nouns, etc. and the simple rules of syntax. The teaching in the high school should be only to make the knowledge of these things wider and also to give the boys something about figures of speech, punctuation, transformation of sentences, etc.

As regards the use of a text book, it is not advisable to prescribe books in the lower stage. The boys must have a note book, wherein they should record all the rules and definitions that they learn. It is quite essential that the rules are learnt from the mouth of the teacher. This will have an impressiveness and effect which reading from a book will never have. In the higher classes it is good to have a text-book for consulting now and then. Even here it is a good plan if the teacher gives out everything himself and the book is con-

sulted only occasionally. The rules are better remembered, if the pupils are as it were, made to write a grammar of their own with the teachers' guidance.

The old method of teaching grammar was purely deductive. The order of procedure was first the rule or definition, second, examples and third, application. Text-books were then largely used which treated grammar for the most part deductively. For example, in such books, teaching grammar deductively, we find first the definition of a noun, then some examples of nouns and then exercises in picking out the nouns. But the natural order seems to be examples: definition or rule and then application to fresh cases. In other words we must follow the inductive method. Under this method, the teacher puts down on the Board some examples and asks the boys to collect similar examples from their reading books. The rule or definition is derived from the examples and the pupils record it in their own note-books. In teaching the definition of nouns, for instance, the teacher may write down a number of words like Rama, Krishna, etc., and then get from the boys that these are the names of persons and also some more examples from them; London, Chicago, Benares, etc. names of places; cat, dog, chair, knife, justice, etc. names of things. The teacher may then say that these are called 'nouns' and make the boys themselves define a noun as the name of a person, place or thing. The rules that are thus learnt are never forgotten, for the pupils themselves have derived the rules, the teacher only guiding them. Since the examples have always preceded the rule, the abstractions are always concrete to the boys who remember the rule and examples together, and what is more, in applying it to a fresh case, they will not commit mistakes for we have made the boys give some examples themselves before formulating the rule. In Germany, which has been declared the home of pedagogy, grammar is taught inductively and since we know of the efficiency of the methods employed by professors in Germany, the inductive method should necessarily be superior to the deductive in the teaching of grammar. Some may contend that the progress will be slow and the results achieved will be out of all proportion to the time spent. Of course it is far more easy and much progress can be made, if the teacher opens a book, explains some rules and sets a lesson for the morrow. Modern psychologists want that the teacher should only guide the pupils and that their self-activity and thinking should be exer-

cised as far as possible. He is a good teacher who does not tell the boys anything until there is a necessity felt by the pupil himself. If we bear this in mind for a moment—that the pupil should be led to discover everything for himself—then the inductive method should be followed in preference to the deductive method. Of course, either extreme is bad: to stick to the deductive method, would be to teach grammar mechanically and to descend to rote-work: to stick to the inductive method at all costs would mean enormous waste of time and energy. The wise teacher can of course see when to bring in the deductive method and when not.

So much for the methods of teaching grammar. Passing now to the plan of work, the old plan was to take up orthography, then etymology, go through the whole of nouns, verbs, adjectives, adverbs, etc., and then syntax; as though one couldn't understand anything about adjectives, if he had not previously finished nouns—or as though one couldn't understand syntax, if etymology had not been finished. The division is mainly artificial and only for convenience. At each stage of the course in all that he utters and writes, the pupil is framing whole sentences: and so it would be but natural that the sentence should be taken up first involving several parts of speech. He has to know the whole of grammar at each stage—of course his knowledge of any one topic getting wider and wider as he advances more and more in his studies. The logical order no doubt will be, first to study simple words, then in combinations, etc., i.e., from orthography to etymology and then to syntax. But the logical order is not always the best order in which the subject is to be taught. The logical order would go on gradually from parsing to the goal which is analysis of involved sentences. We would prefer to study the sentence first, to analyse it into parts and then parse individual words and phrases. The sentences are concrete to the boys, and when we deal with the analysis of the sentence and parse the individual words the pupil sees that he is dealing with parts of a concrete sentence, instead of mere ghosts of words, taken out of their surroundings by the grammarian.

Before concluding, I shall make a reference to some of the important topics of grammar. The first important topic in grammar is the different kinds of parts of speech. The best way to teach the parts of speech is to take a complete sentence and study the functions performed by the several words therein. The subject and predicate are thus introduced: the

former as something about which a statement is made, and the latter as that which helps us to make the statement. Nouns and pronouns are then introduced as those kinds of words which can be the subjects of a sentence. Predicates are 'verbs.' Adjectives and adverbs follow as modifiers of subjects and predicates. We must make the conception include not only the individual words, but also groups of words which perform these functions. The emphasis upon this function aspect of words is very important, as the same word is often used as different parts of speech in English. Substantives are freely used as verbs, adjectives as nouns, etc., and it is not advisable to speak of a certain word as belonging to a certain part of speech, irrespective of the context, which should determine its function. Prepositions and conjunctions need not be completely defined in the initial stages. If the teacher puts down a list of conjunctions and prepositions, then the pupils will get a working knowledge of the preposition and conjunction. Any attempt at defining these would only result in confusion.

As regards the subject of parsing, it was carried to extreme in the past and the mode of parsing was such as to make the boys believe that a certain word should belong to only one class. Parsing need not go into minute details. It would be enough if the parsing is simple. The boys should state the class of words to which the word belongs and its function in the sentence. The teacher should particularly guard against the pupils getting into the knack of parsing away every word mechanically. Parsing is only analysis on a small scale. In analysis we split up long and involved sentences into its component parts and in parsing we find out the functions performed by each word in each of these parts.

As regards analysis, it should also be as simple as possible. Though in the initial stages, a diagram may be constructed, in the advanced stages, it would be better to do away with the columns and diagrams, which are often filled in mechanically. Some of the columns are so ingenious that pupils often find it difficult where to put in a phrase or word and instead of serving as a handy instrument, it is often a bugbear to the pupils.

More attention may be paid to that part of etymology which treats of word formation, by suffixes, prefixes, terminations, from a common root.

This would greatly interest the pupils and in a way improve their vocabulary to a remarkable extent. The structure of some words may now and then be studied with advantage and it is well that an attempt in this direction is made even in the lower classes in the course of oral composition lessons. A reference to the divided usage in grammar may not be out of place. English is a growing language and we find everyday new idioms and constructions coming into fashion. For sometime the grammarians consider the new coming word or idiom as an outcast, but as time goes on, when a large number of people begin to use it, it has to be quietly approved by grammarians though under protest. The split infinitive which has been condemned as bad but largely used and "had rather," instead of "would rather," are instances of this divided usage. In such cases the teacher should point out the divided usage, and explain to the pupils why he considers one of the two to be preferable to the other.

In conclusion the teacher of English Grammar should bear in mind that what he calls 'English Grammar' is not 'Grammar in the strict sense of the term,' as Latin Grammar or Greek Grammar or the Sanskrit Vyakaraṇa. The inflections, terminations and laws of concord and agreement are few and the so-called grammar is but a collection of some approved forms of expression. Everything depends upon usage and it would be impossible to teach everything through grammar. For instance the uses of 'shall' and 'will' can never be learnt by any set rules. So let us not bother our pupils, as was done in the past, with long lists of rules regarding the use of shall and will or masculine and feminine forms, comparative and superlative forms, past participles, etc. If they should meet any of these, let them get acquainted with them. We would have practically no occasion to use the word 'vixen' the feminine of 'fox' or even the common word 'bitch,' the feminine of dog. It is enough if we give them just the amount he wants, always remembering Goethe's golden words:

'Still all that we can remember of our studies in the end is only what we have been able to find practical use for.'

SOME SUGGESTIONS TO MAKE THE SCHOOL INTERESTING AND ATTRACTIVE.*

GENTLEMEN,

I FOUND no difficulty in choosing the subject. In attempting to read this paper, I have taken many extracts from the several essays, published in the *Educational Review*, now and then; hence, I am greatly indebted to the Editor of the "*Educational Review*" and to the President, Teachers' Association of the Hope High School, Madanapalle.

I have tried my best to put before you, all the defects and advantages of the present educational system and some suggestions to rectify the defects, and then to make the school interesting and attractive.

Education may be regarded as the art of making an environment suitable to each individual and to each stage of his life, so that he will bring into play all his talents and capacities.

Though there were in existence many colleges and schools, imparting education in European science and literature, the introduction and adoption of English education in India, have been ascribed to Lord Macaulay, for he brought order out of chaos in the educational policy of the land.

Education then was confined to the four walls of the room. The attention of the boys was centered round the texts only. The factors that really go to make up life were totally neglected.

A man has to move with the people in the world. He has to buy or sell things; he has to enjoy or suffer with them. He has to govern the people and the country or to serve God, crown and country. Hence, these things must be taught to the pupils. Life must be infused into them. A man has to be taught the means of understanding the persons and things in the world, and the way of appreciating the nature and its works. The educationists of today realize that the knowledge one can gather from books and teachers cannot bear fruit in action. So

* This is a paper read recently before the Hope High School Teachers' Association by Mr. Chouthai Sreenivasa Rao, Assistant, Hope High School, Madanapalle (Chittoor District).

a man has to go out into the world and try to overcome all the difficulties by his own efforts. A man cannot learn the art of living, just as a man cannot learn the swimming by studying books on the subject or by observing others swim in water or without trying it himself. So, it is the duty of the teacher to teach him the art of living at least to meet the half-way in order to fit him for after-life.

Students are in the school room for only a few hours. It is, of course, a difficult task for the teacher to bring him round. It is also his duty to watch the progress of the students outside the school; and in this direction, the co-operation of the parents is quite necessary.

The present system of cramming the text, and neglecting the games and out-door exercises, far from enabling the student to earn a livelihood, makes him positively unfit to earn an honest living. Educated unemployed are common. A graduate is the cheapest commodity in the market. The education that he has received, has brought on him physical unfitness. He thinks that he is fit for the professions of quill-driving or for the profession of a teacher. When these people offer their services on a low salary, the half-educated have either to work on still lower salaries or to take up no work. So they become a burden to the family estate or property; and make the joint family system a curse at present. This unfitness for other work again has created party jealousies between Brahmins and Non-Brahmins in their competition for service, whether Government or private. All these are the results of the present system of whole-time general education. This system of whole-time general education should go, giving place to vocation study. Then the boys take up subjects suited to their taste and requirement. The experience has taught us that many take up the commercial line and study books on those subjects, since these are introduced in the curricula and for subjects under Group C for the S. S. L. C. Examination. They may take any manual training, or any other profession, making their own choice.

There was a time, when only a section of the population was engaged in learning. The number of educated men rose quickly; but the number of the appointments could not rise in proportion. The

uneducated as well as educated unemployed presented grave problems both to the people and the Government. Our industries are dying. Since there are none to encourage our own industries, we are becoming poorer and poorer whereas the foreigners are becoming richer and richer.

How can we expect our nation to rise, when the system of education, commerce and other industries are all in the hands of foreigners who look to their own comforts?

How can we expect the nation at least the present generation to improve when the education is not in the hands of our nation, and when education does not suit our needs and when instruction is not given in our own vernaculars?

There is now a cry for National Education. What sort of education is best suited to the present time is fully explained by Lord Haldane when he spoke in the House of Lords on July 12, 1916. He says "the ideal of national education is an organisation, giving every single individual, a chance, to attain a maximum of culture and social efficiency according to his natural gifts and the strength of his will."

How can this be attained when all the time is spent in the mastery of English idiom and when no time is spared to the study of nature, real history and geography of the land? Mr. Haldane in his speech has also said: "The time is ripe for a great and fundamental change in our methods and means of education. Modern needs demand that sciences should be given prominent place in the curricula. The status and the rewards of the teacher should be raised and made more attractive." This aptly applies to the state of India. Though this extract is elsewhere published in the Educational Reviews, but I place this before you to consider it, and discuss it fully.

Education should now be in the hands of the people and should be one suiting all. The philanthropists of the old days maintained schools in their own villages, where a great many were educated. Many hardworking and intelligent pupils distinguished themselves in one branch or the other suiting to their tastes and requirements. The people helped the Gurus with their easy contributions. The rich and the poor without any distinction,

and whether they paid or not, attended the schools. The education was given to them not at the cost of training for a profession but along with it at the students' leisure. Such schools have died because English is not taught there.

It is now our duty to revive such schools, whether national, recognised or not recognised. Those who need Government employment go to Government schools; but many, I mean, the majority of the population need only education to earn their living and to elevate themselves by adopting for their own profession. If we want to claim to have done our duty to God, crown and country, we the teachers must be prepared to sacrifice our wealth and be prepared to undergo some difficulty for the sake of uplifting the nation. The teachers must realise the necessity of mass education which can be made easy and within the reach of all, only by this way.

In this direction, the teachers' work is to prepare the ground himself by appealing to the people, by pointing out the disastrous effects of their children attending the schools outside their homes, such as inhaling the impure air, raising the house rent and spending more money for their maintenance and dress. It is the duty of the teacher to take the people into his confidence, and thereafter secure boys for his school.

It is also advantageous for the teacher to stay in a village, for the living is cheap and the people can spare to him whatever they could. He can also adopt himself to the needs of the country and pay individual attention to each, as there are only a handful. Even students engaged in earning might take advantage of the school.

During the regime of H. E. Lord Curzon's Viceroyalty, private study was discouraged, and concessions to appear for higher examinations with private study were put a stop to. This has done a marvellous thing in the educational field. Teachers without up-to-date information are not fit to handle any class and they are expected to be conversant with all up-to-date methods and information on all the subjects of the curricula. How can this be done when there is no aspiration? Unless there is an aim, nothing can be done. None go to the church, mosque or temple who

ever might be, purely for the sake of Faith in God or 'Bhakti' but with some other motive. So also the teacher. If he is permitted to read for higher examinations and tests, he will not only elevate himself in position and salary but also improves the state of affairs in the school, for he has necessary information to impart to. He can benefit himself and also others socially, financially and intellectually.

A concession has been granted by the S. S. L. C. Board to the candidates who had appeared for the S. S. L. C. Examination on more than two occasions, to appear for the same examination with private study. Candidates, who had once appeared for the Intermediate Examination in Arts or F. A. or B. A. Examinations, are permitted by the University to appear for the examinations privately. In the sister University of Allahabad, teachers, with two years' experience, are permitted to go up for the next higher examination, since this concession applies to those who are entertained in the schools in the jurisdiction of that University, we are at a loss to take advantage of it.

I therefore appeal to the members of the Legislative Council, to all the lovers of the country, and to those that are interested in the welfare of our young men and women, who have taken up this noble but poor profession of teaching, and to all sympathisers to move this resolution in the Council, to initiate and to get us concessions to appear for all the University Examinations with private study and without putting regular attendance in the colleges.

Such concessions give stimulus for the teachers to work well. If not the teacher finds his life monotonous and dull, and as his teaching becomes inefficient and even detrimental to the progress of the nation at large when these wants are fulfilled, a school can be turned to maximum usefulness.

Having established schools of this sort, it is our duty to find for the situation of the school, conveniently placed with reference to the majority of the population of the school children. A school must be located in a quiet and retired spot with agreeable neighbourhood. It should also be surrounded with extensive open space, which is

essential, not only for the passage of air but also to serve as a playground and a garden.

Here I need not mention the sensation and joy felt by many young boys going to a High School located in a decent storied building. I need not here describe the lively faces and actions of the old and the young in the playground which is open, dry, levelled and fenced; and where life is infused and the boys take keen interest to play at foot-ball, cricket or hockey or any other games, practise drill and gymnastics, giving full scope for the teacher to judge their character, conduct and movements. Such a playground with trees and ever greens is a necessity for ornament and shade in the athletic educational field. It is only the place where boys gain physical training, strength and pleasure, and where implicit obedience to the call of duty is fostered.

Our schools should also boast of possessing a good library where all kinds of books and on all subjects can be secured easily by every one for ready reference. A list of books should be maintained with great care and prudence. In leisure hours and in vocations, the boys should be asked to read some general books and maintain a full record of their library work. This should be encouraged by the teacher by basing his composition exercises on the library books.

Laboratories, museums and gardens form also important adjuncts to the school. Without sufficient monetary help these cannot be done. The apparatus, the specimens of a more costly nature, geographical aids, such as maps, plans, charts and pictures for nature study, coins and inscriptions that help the study of history, leaves, stones and bones that help the study of all sciences, drawing and other subjects cannot be secured easily. The get-up of the museum and the garden must be purely through the efforts of the students with the aid of teachers and gardeners, who are only agents for taking care of the things in those places and for guiding the observation of the pupils. The idea of boys supplying materials to all sections of the museum, the garden, an aquarium and an aviary, should be well fostered by the teacher. To encourage this, it is the duty of the teacher to

THE FUNCTION OF PLAY IN SCHOOLS.

THE notion of school as a place where mere book-learning is acquired has been from long ago up to the XIX Century subject to sporadic corrections by such thinkers as Plato and Montaigne; and it is now coming to be systematically given up by modern educationists as being one-sided, harmful and unsound. The knowledge gained in the last half-century from the physiological and the biological sciences points to the danger of viewing life as made up of distinct departments of activity put together without any correlation. The old idea—it is not so very old, after all—that the school is a theory of which life is an after-application is found to be false. Not only books are to be learnt, but the right way of living also. The Play-movement in modern education is one of the expressions of this conception.

In commending the Boy Scout Movement of Sir Robert Baden-Powell to the approval of thinking men, in an Essay on "Scouting Education" in the "Educational Review" of June 1917, James Russell says: 'The test that passes pupils from grade to grade does not take into account growth in character or moral strength.' He works out the average school hours of a school-going child to be 4 hours out of school to 1 hr. spent in it. And yet the 4 hours are held of no account while the wall-ed up one hour is looked upon as supremely important. His advocacy of the Boy Scout Movement is based on its vigorous self-activity. The Boy Scout Movement may be considered as part of the general Play-movement; it is the outcome of the wisdom of a few progressivists who have been disgusted with the lack of initiative and opportunity of school-masters.

The function, the control and the uses of play in regard to the growing child cannot be discussed without first defining the terms used. A hundred interpretations of play have been given from 'the first poetry of the human soul' (Richter) to 'the system of ideographic hieroglyphics' (Mr. Arrowsmith). What is play? A brief summary of the most important theories follows.

§ 2. THE PLAY THEORIES.

The Play-Theories can be divided into two classes, physiological and biological theories. The former class includes (1) Spencer-Schiller Theory of Surplus Energy; and (2) Lazarus' Recreation Theory. The latter class includes (3) Karl Groos' Biological or Utility Theory, and (4) Dr. Stanley Hall's Recapitulatory Theory.

(1) The Surplus Energy Theory explains play as a discharge of surplus energy. The young of animals are protected by their parents, and the human child is immune from economic pressure. The form which the activity of the disintegrating nerve cells over and above the needs of sustenance assumes is play. . . . The drawbacks of this theory are three: (a) its neglect of the mental aspect of the problem; (b) the fact that children often play long after the point of exhaustion is reached; (c) each species has its own special forms of play.

(2) The Recreation Theory is this: When mental and physical powers are tried, play recuperates them. . . . The objections to this theory are: (a) play does give recreation, but recreation cannot therefore be made the *raison d'être* of play; (b) it sharply separates play from work, hence its application is confined specially to adults.

(3) The Utility Theory of Groos explains play as being 'a preparation and practice for

the special instincts, in contrast with later serious exercise' (Groos, *Play of Animals: Preface*). Play is a drilling ground for the instincts to develop and perfect and give rise to such activities as will be useful in the serious pursuits of later life. Groos bases his theory on the conception of instinct being the foundation of all, at least the necessary condition of all, biological activity. The instincts comprising tendencies and capacities are undeveloped in the young. He believes with Weismann and the Neo-Darwinians that hereditary instincts alone and not acquired characters also, are inherited. Hence in every new infant, the instincts have to practice anew through motor-activity and become prepared for the struggle of life. Such practice and development is afforded by play. Rather play is the expression of the instincts in their attempt to manifest themselves in motor-activity. 'The animal does not play because he is young, he has a period of youth because he must play' (*Play of Animals: Preface*).

The only valid objection to this theory is in Mr. McDougall's criticism. But he does not reject the theory totally, he only wants to modify it on the ground that a few plays of youth have not an utilitarian bearing.

(4) Dr. Hall's Recapitulatory Theory is that play is prompted by the inherited habitual activities of the race. 'Stage by stage we re-enact the lives of our forebears.' Accordingly a human child's play is made to conform to these graded stages: Animal, Savage, Nomad, Patriarchal and Tribal.

Each of the above theories has some truth, the fullest and most satisfactory being Groos' Biological Theory. The biological side of education is neglected too much, says G. E.

Johnson (*Education by Plays and Games*). The two physiological theories, however, may be looked upon as the causal, and the two biological theories as the valuatory explanation of play. One caution must be given in this comparative method of interpretation of one set of phenomena in the light of another. Man's psycho-motor impulses are compared with those of animals; but an identity cannot therefore be established. 'The chief difficulty', says Mitchell (*The Childhood of Animals*), 'is that we are disposed to interpret the actions of animals too much in the same fashion as those of human beings, and suppose the presence of a conscious factor which may not exist.' The reverse of this must equally well be guarded against. The reaction of man on environment and his power of "subjective selection" must be reckoned with. The evolution of the mind in man has also to be taken into account.

The above theories give us the following data. The complex instincts of man which are the starting points for all experience are undeveloped in the child. Play exercises and develops these instincts up to the point where intelligence born of gathering experience comes in and takes up, so to say, in its hands the vital forces of the individual. Surplus energy is doubtless a favourable condition for play, which in its turn recreates the tired mind and recuperates the ebbing energy. Play is also the means by which the racial historical activities are transmitted to us. Thus play has a very intimate relation to instinct. The word instinct is here used in the sense of complex reflex actions. Through play man's instincts are exercised, controlled, guided and developed. Thus the play expressions of a child are in Fröbel's language "the germinal leaves of

all later life." Hence the value of play in the Education of Man.

Before appraising the educational value of play, we will do well to remember James' Law of Transiency of Instincts. Many hereditary characteristics are conserved by instincts. The instinct conserves the characteristic only when habit is formed. Unutilised instinct does not give rise to habit. Now, certain instincts rise up in the individual in certain periods and seem to wait to be used, and after a time fade away and disappear. A favourable environment uses the instinct to form a habit. If the opportunity is let slip it may never come again.

§ 3. THE USES OF PLAY.

We now proceed to the uses of play. Play can be used in two ways in education: by introducing a playful element into work, or by employing free play itself. Free play is more and more used in the schools of to-day, and the playful element is dominant in every Kindergarten worth the name. But the great significance of play has not yet been fully recognized. The modern movement of concentration into towns is a serious bar in the way, since out-door life is not easily possible, and even if possible is so cramped in cities. The best work in this direction is done in America. But how far short of its real value the play-ground now abides may be inferred from the fact that even in the country schools there, as Dresslar points out (School Hygiene), only 15% provide grounds.

Play socialized is game. 'Phylogenetically and ontogenetically informal play precedes formal play (games)' (Cyclopædia of Education). Games grow out of experience; what is at first purely individual free play becomes

in time related to others. The educational value of play, both formal and informal, will be considered under the four heads: Physical, Mental, Moral and Social.

(1) *Physical*. From the age of 2 to past adolescence growth under exercise continues. Each stage will require a certain kind of stimuli, and hence appropriate games must greatly help the growth and development of the body. Again, the emotional joy in games has influence on the vaso-motor system, through which it brings about a condition of full nutrition to the organs.

(2) *Mental*. The Recreational Theory has this much of truth in it, viz., that mental and muscular fatigue are closely connected. Fitness of the body is a favourable condition for fitness of the mind. Muscular movement is the expression of the activity of the nerves. Ultimately in some complex way the nerves perform the process of correlation and co-ordination. Dr. Hughlings-Jackson is said to have successfully applied the evolutionary theory of motor-activity (viz. that it develops from the fundamental to the accessory movements) to the treatment of mental diseases, postulating three levels of the nervous system: the lowest, controlling reflex movement; the middle, the more complex; and the highest, the universal and complete co-ordinations (G. E. Johnson, Education by Plays and Games). The power of application and quickly adjusted reaction to analogous situations are developed in games.

(3) *Moral*. Froebel insists on the child's living each stage in all its fullness. The evolutionary theory of life helps us here again. Mankind has progressed from the simple to the more complex moral virtues. The child "re-enacts" the race. Therefore an

infant's play is characterized by its attempt through motor-activity to separate and feel its self from the non-self; this grows into the adult's individuality. A boy's play is characterized by wilfulness and egotism, which are the adult's determination, persistence and will. The games of youth are the transition through which the boy is carried over into the man, and in which the individual learns to co-operate and subordinate his interest to that of the whole.

(4) *Social*. The social values of play are sociability, the instinct of competition, joy in emulation and honest rivalry, co-operation and sympathy.

It may be mentioned that besides these primary values play has a recreational and a prophylactic value.

§ 4. THE EDUCATION OF GIRLS.

Throughout the above discussion, one consideration was left out—the education of girls. How is play to benefit them? Are girls to be excluded from its advantages? The question of exercise of body for girls is a complicated one, but the essential outlines are clear.

A girl till 12 ought to have equal chances for free play with the boy. She may select and depart from the repertory of boys' games. But she must be able to run about, hop, shout, jump, breathe freely, and give her limbs large movements. As she grows towards puberty, the differences of organism between the sexes should be taken into account: the differences in strength, the weaker spinal column, the less capacious chest, etc.

Games were introduced into girls' education about 1890, and on the whole the reports of various schools give a cheerful pic-

ture. But notes of caution and warning never cease to be heard. Thus Sara Burstall: 'The very charm of games, of play, are themselves a danger. Life is not all amusement. Games for girls must have the dangerous element eliminated. Games thus become delightful. Too much absorption in them is the result at the cost of art, home and society.' (English High Schools for Girls). But how much a judicious control may do may be seen from the account given of the Hampstead School on 'The Practical Solution of Co-educational Problems' by C. E. Rice (Co-Education, edited by Alice Woods).

§ 5. This topic brings us to the part of the teacher in the play of his pupils. The child has no power of selection. Games must be selected by the teacher in the light of the facts of evolutionary psychology and physiology. Activity has to be guided into proper channels. Morbid overgrowths of particular aptitudes, particularly during the period before puberty, should be cut off. 'The supreme duty of youth is to try all things, to experiment with everything, to be scatter-brained rather than concentrated' (Mitchell, Childhood of Animals). The Law of Transiency is especially to be kept always in mind and the necessary environment should be provided to form the habits most necessary to the proper discharge of the duties of later life. Everywhere in education the need is felt for the fit, the satisfactory teacher. Where great strides are apparently taken, there dearth of good material in school staffing seems to be greatest (James Russell: Scout-ing Educn.: Educational Review, June '17).

§ 6. THE PLAY PERIODS.

(1) Period 0—6. This is characterized by experimentation and acquisition of muscular

control. Dramatic games, a few playthings, bright objects are the instruments of development.

(2) Period 6—10. This is the individualistic period of competition and self-assertion, slow physical development, motor co-ordinations and sense judgments. Chasing, hunting, throwing, etc., dolls, ring games are the instruments.

(3) Period 10—puberty. This is a period of rapid structural development and appearance of sex differences. Running games, clubs, exploring, gymnastics, swimming and elementary team games are the instruments.

(4) Period Puberty-Adolescence. The most important period. It is one of emotional instability, reverie, dreams of greatness, beginning of correct social co-ordinations and judgments. Swimming, rowing, football and similar team games, with dancing and gymnastics in measure, are the instruments.

§ 7. HISTORY OF PLAY IN EDUCATION.

In conclusion a brief outline of the history of play in education may be sketched. The value of play must have been appreciated by primitive man. According to Falkner most

games are of religious origin. The Greeks were the first to have a thorough-going system of educational games: in the nursery, in the palaestra, in the gymnasium. Plato desired to exercise children by rhythmic games at the temples. Even before him Aristotle had acknowledged the value of play and admiringly commended 'the rattle of Arobytas.' The Middle Ages present a confused and sporadic recognition of play. Rabelais' Gargantua had 'nothing he did not do to give agility to his limbs and strengthen his muscles.' Erasmus admiringly talks of the swallowing of the alphabet in the form of dainties. We come down the line of Fénelon, Locke, Montaigne, Richter, Rousseau to Pestalozzi and Fröbel. The conception of education of Pestalozzi and Fröbel was that it was an outward evolution of an inward life. It must be laid to the credit of Fröbel that, though he did not give his ideas scientific expression, he understood child nature better than most others, and his intentions are unmistakable. He and Pestalozzi and Rousseau are the immediate fathers of the modern play-movement.

T. N. RAMANATHAN.

A Text-book of Tamil Composition

Specially adapted to meet the requirements of
S.S.L.C. and Intermediate Examinations
(Prepared in accordance with the recommendations of the University of Madras)

BY
G. DAMODARA MUDALIAR, B.A.

Tamil Reader, Office of the Registrar of Books, Madras,
(sometime an Assistant in the Wesley College, Madras).

Price Rs. 12.

Approved as a Text-book for Schools and Colleges.
(Fort St. George Gazette, 21st October 1913.)

SRINIVASA VARADACHARI & CO., TRIPPLICANE, MADRAS.

THE FUTURE GOVERNMENT OF INDIA. FROM THE SCOTTISH EDUCATIONAL JOURNAL.

Mr. Vyasa Rao belongs to an important school of Indian political activity, and he defines its position in the following sentences:—

It is our conviction that the future of India lies in making the British Government subserve all the purposes of a national rule:—and again,

To become self-governing, it is India that needs England indispensably.

Mr. Rao's book is a discussion of how Indian self government can emerge from the British occupation, and mean not a separate political entity, but one placed in the fabric of the Empire.

He lays down as the foundation of his claims that India was never conquered by the sword, but subdued, if not exactly by consent, by something approaching it. "There was not a single battle in which Indian troops did not largely outnumber and stand side-by-side with the British soldiery, and fight for the triumph of a common cause." But when the British came in they proceeded to govern India as they thought fit. The organisation of the village, with particular fatal-ity, was destroyed, and India, from being a Government depending upon the prosperity and activity of masses of practically self-governing communities, became a type of a centralised bureaucracy, with a Civil Service charged not only with administration, but holding the authority of both a legislature and executive. At the centre of both is a Viceroy, holding, on account of the nature of the Government, the triple position of impartial representative of the Government, head of a political Government, and Minister in his own administration. The Council of the Secretary of State in London is also the creation of administration by a Civil Service, is controlled by retired Civil Servants of a considerable age, and has great power without any representative responsibility. Time, the pressure of events, and the development of the Indian mind have led to modifi-

cations in this system of consistent bureaucracy. The Civil Service has had to consider how to open its doors more widely to Indians, the working reforms had to come, the war and the Mesopotamia Report have hastened changes by half a century. Now, in making these changes, let us be quite certain of one thing. We cannot impose even free institutions on India. We must consult Indian opinion.

Mr. Rao does not only explain what India suffers; he details the general lines of reconstruction. He wishes the Viceroy to be a member of the Royal Family, and to be relieved of all political functions, he wishes Legislatures established that are controlled by representative and elected members, with no special communal voting; he wishes an Executive Service created alongside the Indian Civil Service, which will be exclusively Indian, and will steadily take over the work of the existing Service; he wishes the Indian Legislatures to have powers to impose fiscal schemes, in accordance with Indian interests; he wishes the Secretary of State's Council abolished, and the Secretary made directly responsible to Parliament, with two departmental heads, one of whom should be an Indian. Other details are discussed, but these are the fundamental ones.

The distinction between Mr. Vyasa Rao's scheme, and that of the Montagu-Chelmsford report in general is that the former is such that by its own evolution it would elbow out the bureaucracy, whereas the latter will require revision and readjustment from time to time, with alterations in the balance of authority, each one of which will be the subject of attack and of controversy.

The chapter on "The Problems of Indian Education" may be taken to illustrate Mr. Rao's general position. He considers that we were guilty of two capital errors of judgment: first, in believing that the British method, from the infant standard of instruction upward, could be transplanted to India; and second, in the name of efficiency in bringing even primary education under a centralised control.

subject. Geography was given a separate place in the Western Universities where a degree was instituted for the subject. The subject was essential for the economical, industrial and commercial development of the country. Geography was the science of all sciences; it could be made interesting even to the most casual reader. Mr. T. K. Sundararaja Rao said that the syllabus in B. E. G. was intended to make us have a wide outlook as citizens of the British Empire. The amount of interest taken in the subject depended on the personality of the teacher. The Headmaster must attach importance to the subject, though it was in Group B, Mr. Venkatakrishnaia pointed out that Indian History was not taught well and that heroic deeds of Indians were not sufficiently presented to pupils. A select committee should be appointed to discuss the syllabus in its details and draft a memorial. Mr. K. S. Sambamoorti Aiyar said that the history of great Indian heroes was neglected and that a proper teaching of the History of India would develop patriotism and enable pupils at the same time to make a good study of the histories of other countries. No reason was given by the authorities for not attending to the History of India and Geography sufficiently in framing the B. E. G. syllabus. Syllabuses should be framed by men that actually worked in schools. Mr. G. Ramam Pillai observed that the syllabus in B. E. G. should be cut short and that the subject should be taught in the vernaculars. The old Matric-syllabus in Indian History was better as in its earlier periods were attended to. Mr. N. Varadachari said that the S.S.L.C. holder was now equipped with better knowledge, that there was only the language difficulty which could be set right by teaching in the vernacular and that lower forms should be taught by trained graduates who could be more resourceful. Mr. S. Ramachandra Aiyar (Perambore) then spoke on the subject. At this stage the meeting was adjourned to 5.30 P.M. on Thursday the 19th December.

The adjourned meeting of the Guild was held on Thursday, the 19th of December 1918 at Pachaiyappa's College with M. R. Ry. Rao Sahib S. Krishnaaswami Aiyangar Ayl, in the chair. Mr. K.A. Viraraghavachari, S.A., after tracing the history of the B. Group syllabuses referred to the opinion of the Calcutta University Commission as regards the

syllabuses and said that no two opinions could be given about the unfortunate position of the syllabuses in Indian History and Geography in the S.S.L.C. Scheme. We ourselves could mend matters somewhat by teaching the history of ancient India in the IV Form and by treating R. E. G. with reference to India in a proper manner. We must go on agitating till the subjects got a better position in the scheme and we must regain the liberty that had been lost as regards the syllabuses in these subjects. Mr. M. B. Subba Rao, B.A., L.T. was of opinion that the doing away with of the public examination was not in practical politics, that in other words, the abolition of the public examination would be only at a distant date. The subject should not be transferred to Group A. A memorandum should be drawn up about the matter. Mr. K. S. Sambamoorti Aiyar, B.A., L.T., said that we should agitate for the abolition of the public examination and that meanwhile History of India and Geography should be transferred to Group A and that Elementary Mathematics might be brought over to Group B. Mr. T. G. Srinivasachari, B.A., L.T., also spoke on the subject. Mr. V. Sitapati Naidu, B.A., L.T., said that there was now no position for Geography and Indian History in the scheme in the V & VI Forms. The History of India could not be finished in the IV Form; the study of it must be pushed through to the end of VI Form. So long as there were different groups, pupils would not attach equal importance to the different subjects. Even in Group A all the subjects were not paid equal amounts of attention by all pupils. In Group C more importance was paid to one of the two optional subjects. Either the examination should be abolished altogether or all the subjects should be put together in one group. The Chairman made valuable suggestions throughout the discussion. The meeting resolved that with a view to give more prominence to the study of the History of India and Geography, a Committee consisting of seven gentlemen with Mr. S. K. Krishnamoorti Aiyar, B.A., L.T., as convener, be appointed to draw up a syllabus of the History of India and Geography for secondary schools as a substitute for the one drawn up in the subjects by the S.S.L.C. Board and place it before the Guild on or before the 1st February 1912 with the request that the syllabus may be submitted to the authorities for acceptance.

After a short speech made by the Chairman the meeting was dissolved at about 7.45 p.m.

**GOVERNMENT'S HIGH
APPRECIATION.**

In their Order No. 2303, Home (Judicial), dated the 11th October 1918, the Government of Madras have expressed their high appreciation of the assistance rendered by the military and by certain civilians in connection with the looting which recently took place in the City of Madras. Mr. Armitage, the Commissioner of Police, has been requested by Government to convey their appreciation to them. We note with impartial pleasure that among the civilians whose assistance has been appreciated, there is one who is employed in the Department of Education. He is Mr. B. Krishna Rao Bhonsle, Manager, Office of the Commissioner for Government Examinations, Madras. He in the words of Mr. Armitage and as reported by him to Government "did most useful work in inducing rice bazaar-men in Wall Tax Road and Choolai to open their bazaars." We may add that it is no easy task to do this piece of work in a serious situation in a disturbed area. The Indian public are accused of not co-operating with the Police in times of disturbance and it is very gratifying that one whose association is with a quiet department like that of Education has managed "to do most useful work." We offer our congratulations to Mr. Bhonsle and other gentlemen whose valuable help has been appreciated by Government.

Reviews and Notices.

Reviews and Notices.
THE FUTURE OF PUBLIC SCHOOL EDUCATION, BY
D. B. SOMERVILLE, M.A. (OXFORD UNIVERSITY
PRESS). 1s. 6d. net.

What should the average educated man know? This question which is of importance at any time has special significance just now when schemes of reforms and reconstruction are being earnestly considered on all sides. Mr. Somervell has serious faults to find with the system under which he was himself educated which he charges with having caused waste of time, and even induced intellectual laziness. The condemnation would seem to be too severe, although there will be a general agreement, that there has been an overdoing of the languages,—the classics. The author outlines his own scheme the details of which he supports with reference to what he regards should be the main objects of education. The pamphlet is a modest contribution—it is not quite thirty pages, but it contains a clear statement of the

author's position under which the work of the
class room will not be far removed from life.

FROM A KINDERGARTEN WINDOW, BY CORRIE
GORDON, MADRAS: (SRINIVASA VARADACHARI &
Co.) Price Re. 1 as. 8.

Under this significant and inviting title Miss Gordon has brought out another choice collection of her essays. They cover a wide range of connected topics, and even such as are already familiar to the readers have gained a fresh value on account of the setting in which they are now presented. The exposition of the philosophy of Froebel and of the principles and practice of the Kindergarten methods is lucid and masterly. The essays are of a high order of merit and the style is lofty and inspiring; and the reader is sure to rise up from a perusal of this book deeply impressed with the sacredness of his high and holy calling.

INSTRUCTION IN INDIAN SECONDARY SCHOOLS,
EDITED BY A. H. MACKENZIE, M.A., B. SC.
(OXFORD UNIVERSITY PRESS).

We recommend this as a most suitable textbook for use in Training institutions. The subject of education is now engaging most earnest attention, and nothing would seem to be more urgent than increasing the number of competent teachers properly equipped for their task. During recent years we have entered upon quite a new era of educational schemes and methods; the curriculum has been widened, and improved methods of teaching have come to be adopted. The essential purpose of any book on 'School Management and Methods of Teaching' is to help the teachers in their actual daily work, and this help the present publication is sure to render to an eminent degree. The special merit of the book is the regard it has for the needs and conditions of Indian schools and schoolmasters. The methods of teaching each subject have been treated in great detail, and the writers are practical educationists and specialists in their respective subjects. A study of this book is sure to bring the practical teacher quite up to date. The short bibliography at the end of each article greatly adds to the value of the section.

Thus we have built schools with unnecessary substantiality and apparatus; we have destroyed the old Indian relation between teacher and pupil from one of family familiarity and respect to one of official contact. In a word, we have ended the old system of Indian education, and, so far as the great mass of the people are concerned, we have put nothing in its place. To adapt our Western system of education to India entails enormous and needless cost which the localities cannot face. This is the real problem of elementary education in India. Upon the schools themselves our Inspectors are imposing a discipline altogether foreign to the Indian mind. "The primary schoolmaster of those days," says Mr. Rao, "would have thought one of his calling a dangerous lunatic if he had kept his school still and silent." Mental processes have become mechanical exercises worked out on paper, and the old religious lessons (such as they were) have disappeared. Here is the fault of the Western mind working up centralisation. Nor is this all. The Government first interested itself in education because it needed officials, so it paid special attention to literary schools and colleges. Those have grown up without an elementary foundation, with English as a medium of instruction, and examination results as tests of its success. So when we deplore the rash for examinations, and the fevers of the candidates, we ought to remember that we are criticising our own products. Now, the Government is

anxious to control the development of college and university education and gives grants on conditions, and until quite recently has taken no interest in technical instruction. Upon all this Mr. Rao pronounces the judgment that it has "yielded the minimum of benefit and the maximum of evil,"—although the "minimum" must not be minimised. Mr. Rao advocates a return to the Indian system, the *choultry* school, the old method of teaching improved but not supplanted.

The education of children is almost like the cultivation of the soil, which is bound up with the physical features and meteorological conditions. He favours compulsory attendance but recognises that poverty must limit it for some time to come, and the Government must busy itself to meet this; there must be a system of training schools and technical institutions to divert the stream of youths running towards literary education alone; the claims of vernacular tongues and languages must be reconsidered with greater knowledge than that upon which Macaulay traded; the Educational Service must be transformed from an official department of Civil Servants to a free body of educationalists, and the Universities must be self-governing on the lines of great educational institutions and not of Government departments.

We are told in the preface that Sir Subramanya Iyer strongly recommended this book to Mr. Montagu. We venture to hope that the recommendation has not been set aside.

LECTURES IN LOGIC

FOR THE USE OF THE INTERMEDIATE CLASSES

PREPARED IN ACCORDANCE WITH THE UNIVERSITY SYLLABUS

BY
RAO BAHADUR S. MANGESH RAU, B.A.
late Professor of Mental and Moral Science, Presidency College, Madras
and Fellow of the University of Madras.

Price—Rs. 2-8-0.

SRINIVASA VARADACHARI & CO., TRIPPLICANE, MADRAS.

THE MADRAS TEACHERS' GUILD.

A meeting of the Madras Teachers' Guild was held on Saturday, the 14th of December 1918, at the Madras Progressive Union School with M. R. By. Rao Sahib S. Krishnaswami Aiyangar Avl., M.A., M.R.A.S., F.R.H.S., University Professor of Indian History, in the chair.

A discussion on the position of the History of India and Geography in the S.S.L.C. Scheme was opened by Mr. S. K. Krishnamoorti Aiyar, B.A., L.T. (of the C.R.C. High School, Perambore) the Secretary of the History Section of the Guild. After referring to the abnormal failures in the University Matriculation examination and the appointment of the Matric. Failure Committee and tracing the other circumstances that led to the introduction of the S.S.L.C. Scheme, he pointed out that as the syllabus were in the B. Group, earlier History of India and Geography were relegated. He compared the teaching of the subjects now with the teaching in the past and observed that good text-books, maps, etc., were now available and that they were much benefited by a number of researches made in the field. When the syllabuses were recently revised, History the syllabuses were not discussed in detail; History and Geography were jumbled and the syllabus was rather ambitious. The Department was not right in forcing a syllabus on schools in the B. Group. The history of the mother-country was nowhere else neglected so much. Lessons of patriotism and citizenship could be given by teaching the history of the mother country. A knowledge of the geography of the mother-country was necessary for industrial advancement. The Report of the recent Industrial Commission, especially the minute therein of the Hon. Pandit Madan Mohan Malaviya showed clearly the importance of Geography. The opener said in conclusion that the S.S.L.C. Scheme was intended to relieve the tension of the mind of the pupil and that therefore as the syllabuses in the other subjects stood, History of India and Geography could not be transferred to Group A. The subjects might be included in Group A only if the syllabus in English was reduced. He was of opinion that there was no use of asking for a public examination in the subjects and that they should only ask for a better syllabus in them.

XXV

In the course of preliminary speech on the subject the Chairman said:—The working of the S.S.L.C. Scheme depended on the good-will with which the teaching profession treated it and adopted it in every subject. Syllabuses were only instruments of an humble kind, the evil that could be done by a syllabus was great. The real bane in the S.S.L.C. Scheme was the domination of a public examination at the end of a ten years' course. The Madras S.S.L.C. Scheme and the Mysore S.S.L.C. Scheme were ushered in with a little haste. Education now required much specialisation. The important factor for success in education was the personality of the teacher. The public examination was required by the department for administrative purposes; but it dominated more than the Matric. examination, though intended to put an end to the evils of the latter. Another evil in the present system was that the University began to legislate, being unable to control the examination itself and that a complicated algebraic formula had to be adopted. The dominance of the public examination was the cause of the neglect of the subjects in Group B. Often people were somewhat one-sided in saying that we must attend more to the scientific side of education than to the literary in earlier stages. Scientific education in earlier stages was only the creation of the scientific habit of mind which could well be done by good classical lessons; there was no use of loading the mind of a young pupil with mere facts. This point was to be thought of before considering whether a subject should be included in Group A or B or C in the Scheme. The Chairman was much interested in the position of the History of India in secondary schools. A constructive programme should be drawn up and definite changes should be pointed out in the syllabus.

The following remarks on Geography that had been sent in writing by Mr. S. Viraraghavachari, B.A., M.R.S.G.S., were read:—The position of Geography was very deplorable; it was not included on even rudimentary lines in the S.S.L.C. Syllabus. Professor Gregory of the Calcutta University Commission was of that view; he had succeeded in getting that subject included in the Intermediate Course at Calcutta and attempts were being made to get the colleges there affiliated in the

AN ENGLISH GRAMMAR, WITH A SECTION ON COMMON ERRORS, BY T. S. STERLING, M. A. (CAN. TAB). (LONGMANS, GREEN AND CO) Price Rs. 1-4-0.

The author of this excellent little Grammar has made use of the inductive method, and a specially useful feature of his treatment of the subject is that he expects the student to co-operate with him in constructing examples and framing the rules which they illustrate, thus stimulating interest and compelling intelligent work. The scope of the work is, however, rather limited, and it is doubtful whether it contains sufficient matter to satisfy the requirements of the highest classes of High Schools. The chapter on 'Common Errors,' though admittedly intended to deal with such blunders as are peculiar to Bengali students of English, contains nevertheless many things that would be useful to all Indian students. It is a pity, however, that some of the commonest blunders made by Urdu-speaking boys are not included in the collection. We have not been able to find, for instance, the well-known *but after though*, or the strange *one one, two two*, and so on in the sense of *one each, two each*. Nor is there any mention of the famous "Is it?" that one hears all over the Madras Presidency.

DANTE GABRIEL ROSSETTI: THE PRE-RAPHAELITE PAINTER-POET, BY MR. N. K. VENKATESAN, M.A., L.T. (MESSRS. SRINIVASA VARADACHARI & CO., MADRAS, 1918).

This booklet is a reprint of the articles which have already appeared in the pages of the *Educational Review*. The greater part of it is devoted to giving an account of Rossetti as a painter and the present reviewer, having had no first-hand acquaintance with Rossetti's portraits and paintings—which presumably Mr. Venkatesan has had,—does not feel confident to offer any criticism on the general estimates. The portion dealing with Rossetti as a poet is bound to be more interesting to Indian readers, but the account vouchsafed is, to say the least of it, meagre. May it be suggested here to the author that, if he issues a second edition, he will do well to devote more attention to those qualities which make Rossetti one of the great English poets,—his intensity of feeling, radiance of imagination, and brilliancy and picturesqueness of expression? While realising that anything like adequate justice cannot be done in a booklet of some thirty pages, one cannot but feel that no attempt has been

made to penetrate into the sweet and subtle genius of the poet, nor into his beautiful images and mastery over words. Perhaps Mr. Venkatesan aimed merely at a succinct account of Rossetti's works both in poetry and painting. In that case the booklet seems to be just the one suited to the class of readers for whom it is intended.

MANUAL TRAINING FOR INDIAN SCHOOLS, BY J. Y. BUCHANAN. (OXFORD UNIVERSITY PRESS) Price Rs. 3-8-0.

This is an excellent little book and supplies need in this country, where *Manual Training* only now being introduced into schools.

Educational handwork is not a subject, it is a method, which has for its object the training of the eye to accurate observation, the hand to skill in execution, and the mind to a sense of the importance and the dignity of labour.

Educational handwork must not be confused with industrial work, which aims at training the boy in one particular trade, rather, educational handwork aims at giving the boy a general training, and for this reason, there being many forms of educational handwork, we should like to have had some reference to the other forms of handwork which might be introduced into schools. But no doubt the writer intends to publish other books dealing with these different kinds of handwork.

The suggestions for the Manual Training Centre System are admirable and could with advantage be followed by Educational bodies. The fittings for a Manual Training room have been given with great forethought, for the practical difficulty of Indian schools, viz., lack of money, only necessary furniture has been put down and plates showing the plans of the furniture make the matter as simple as possible for the manager wishing to introduce handwork into his school. The chapter of the Manual Training Teacher deserves commendation. It deals with practical difficulties and how to overcome them.

The chapter on correlation is a useful one for all teachers and the schemes of work should help teachers in the formation of handwork schemes.

Altogether it is an excellent little book and we thoroughly recommend it to all schools and training colleges.

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The Educational Review.

One cannot plead too often for the grateful recognition of the heroism and sacrifice of our countrymen in the recent war and we are delighted to see that Government have been so mindful of them, as to issue instructions for the free education of their children. The benefits of the scheme will apply to the children of Indian soldiers and followers who have since August 1914 died while on active service or become permanently incapacitated owing to wounds or disease contracted while on active service. A list of all such persons showing their place of residence will be sent by the Adjutant-General to the Collector of each district in British territory, and in the case of Native States, to the Secretary to the Political Department. The Collector on receipt of the list will record the names and ages of all children under sixteen years of age, of men mentioned in the list and will furnish their guardians with certificates for each child, stating that he or she is entitled to the benefit of these rules, provided that the child has attended school before attaining the age of ten. Any child producing such a certificate at an educational institution will be entitled to free primary education, plus an annual allowance not exceeding six rupees to cover incidental expenses. There is also a scheme of scholarships provided for, to enable promising pupils among them to continue their studies. We hope that full advan-

tage will be taken of these concessions and the children of noble warriors fallen in the war will be enabled to play a useful and successful part in life.

The Calcutta University has some exciting sensation or other in its life, during almost every session. The latest is a violent controversy over the question of the leakage of examination papers last year. The Sub-Committee appointed to consider the matter, presided over by the Hon'ble Justice Sir Ashutosh Mukherjee, came to the conclusion that it was not possible to bring the responsibility home to any individual or individuals concerned, rather a futile finding, after repeated sittings of the body. This roused the wrath of another section of people associated with the work of the University who demanded a further enquiry, making the apparent insinuation that the Committee was anxious to shield those responsible for the negligence or the commission. An exciting debate in the Senate was the result and the report was ultimately recorded. We confess that all these incidents are not exactly calculated to enhance the prestige of the University and we trust academical bodies will always maintain a high degree of decorum and sobriety rising above suspicions of any kind.

Convocation utterances tend to be monotonous, but it cannot be denied that by presenting periodical ré-

Convocation Addresses.

sumés of work done and inspiring ideas for future progress, they can be of very great value and usefulness. Some of the addresses delivered recently before various Universities in India, deserve appreciation from this standpoint. Far away in the North-West, in the Punjab University, the Hon'ble Mr. Maynard, the Vice-Chancellor, struck a lofty note, pleading for mutual forbearance and toleration impressing the lessons of patriotism and national service, on the large number of young men assembled before him for receiving their degrees, and we make no apology for extracting the following passage from his excellent address:—

Man needs a vocation but he needs more. He is a man and he is a citizen before he is a lawyer or an official or a farmer or manufacturer or trader. The University must consider him as a man and a citizen as well as a potential bread-winner. Let me take you with me for a moment to a higher plane where distinctions merge in a larger unity. What is a lawyer or an official or practitioner of any art or profession, however good a lawyer or official or other functionary he may be, unless he is first a good and a wise man, a public-spirited and understanding citizen? Merely the possessor of a valuable equipment which he used badly or uses not at all, a soldier who does not fight or fights with lassitude or fights on the wrong side, is an enemy or a faint-hearted friend. It is not enough to say that your motherland is India, though a beginning has indeed been made when that thought has found expression. You must, when you say it, have before your imagination the picture of what India is. You must see her as she is with weakness as well as her virtues, a reality not a phantasm, and you must see her as including the sectarian adversary whom your

favourite newspaper holds up to reprobation, distant tribesmen speaking a language and following a rule of life different from yours, low-caste men whom long semi-sacred tradition has shut out from participation in the water of the well from which you drink and whose complexion is many shades fairer than your own and man who is many shades darker—your Motherland includes all these and when you love her you must love her not as a phrase, not as a shadow, but as a substance, a reality. When you have seen and loved your Motherland as she is and pictured clearly what is public good, you must have strength of will to follow the vision. Set your faces against corruption. That needs courage, for a man who sets his face against corruption makes powerful enemies. Set your faces against family claims when they conflict with public interest. That needs strength—to stand against social pressure even when coming from the nearest and dearest and even when threatening isolation and reprisals. Set your faces against clamour and call for wrong action even when the opposition will bring danger and dislike upon you, against all tyranny, even the tyranny of popular majorities and communal conventions. Play your part even though it seems a small one in the spirit of those words of the Ramayana—'Kshatriya carries his bow in order that distress may not exist upon the earth.'

The address delivered by His Honour Sir Harcourt Butler was remarkable not only for the very valuable advice to the rising generation that it contained, but also for the further educational programmes for the Provinces foreshadowed in it. He contemplated the possibility of opening new Universities at Agra and Lucknow and promised to appoint a Committee to consider the subject soon after the publication of the Report of the Calcutta University Commission. He was

also willing to finance a chair in the University for the subject of Geography, and with the possibility of the opening of a Technological College at Cawnpore, it is a programme that will be welcomed by the people outside the Provinces as much as by those directly benefiting by it. Reserving the Convocation Addresses of the Benares Hindu University for separate treatment elsewhere, we pass on to the addresses of Sir Lancelot Sanderson and His Excellency Lord Chelmsford at the University of Calcutta. If the Report of the present Calcutta University Commission was *unanimous*, the Viceroy promised to take immediate action. We have reason to believe it is and the delay in the publication of the report is only due to its expansion in the process of composition. It was also satisfactory to know that the recommendations of the recent Industrial Commission will also not be forgotten. It has often been felt by students of Indian educational activities, that the laudable sentiments expressed on Convocation platforms vanish into nothingness, without reducing themselves to practical action and we hope that these utterances will not encourage such a belief, by not leading to substantial benefits. Sir Lancelot Sanderson's address does not call for any special remarks, as it only contained the usual exhortations about the zealous pursuit of knowledge and kindred matters and one missed the informing accounts of progress for the years that used to form a regular feature of the addresses of one of his distinguished predecessors, the Hon. Justice Sir Ashutosh Mukherjee.

The Public Instruction Report of Burma for 1917-18 will have special interest for readers in Southern India, as it is signed by Mr. Mark Hunter whose distinguished connection with educational work in this Presidency will continue to be remembered with gratitude. If progress has been the general rule in the other provinces of India, despite the war, Mr. Hunter has got to record a distinct falling-off in education during the year, the attendance of students having been reduced from 592,528 to 584,298. This fact must be an eye-opener to those who will easily take it for granted that education will continue to develop year after year, without any special efforts on the part of the agencies concerned. That Burma has not been keeping pace with the rest of British India, in the progress of Local Self-Government, should be patent from the statement that during the year that the control of several schools was transferred from Municipalities to Government. The proposal of starting a University for Burma has apparently not made much progress, being held up for want of funds and however much one may agree with the remark, "that a University must grow: it cannot be bought ready made," it will probably be felt that a determined effort on the part of the Government will mean much in the fruition of the scheme.

The unwieldy nature of some of our Indian Universities and the pressing need there is for furnishing them with our Unwieldy Universities.

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with some relief by the starting of new Universities, are brought home to our minds by some of the statistics with regard to the Calcutta University placed before the last annual meeting of its Senate. The total number of candidates who appeared at this year's examinations was 31,810 against 34,538 in the previous year. The number of candidates registered for the Matriculation Examination was 14,675 of whom 8,611 passed. The number of candidates registered for the Intermediate Examination was 5,711 of whom 3,030 passed, while the number of candidates who appeared for the Intermediate Examination in Science was 1,516 of whom 935 passed, the total number of candidates at the Intermediate Examination being thus over 7,000. Some further idea of the magnitude of the work before the University may be gathered by the number of students appearing at the B. A. Examination, which was 3,565. Is it any wonder that University education is not more efficient in India and we are troubled with problems that have not got to be confronted elsewhere?

We congratulate the organisers of the Students' Convention at Salem, on the success that has attended their efforts. It will be remembered that the Students' Convention did not start under the best of auspices in the Presidency and fears were entertained in various quarters of the young men being subjected to influences as injurious

ultimately to national interests as to their own. We are glad to see that the Salem sessions show the turning of a new leaf in the career of the institution and we hope it will not go back to its old associations. The Rev. Alan Gardiner of Trichinopoly, one of the ablest and most sympathetic of our educationists, who presided on the occasion, gave valuable advice to the students, warning them against the attitude of flattery shown towards them by some persons. We hope the students of Southern India will set their faces manfully, against those who may try to use them as tools for self-advertisement and pursue their educational work in unruffled peace, laying broad and deep the foundations on which a useful and successful life may rise later.

Another event which is calculated to exercise a healthy influence on the student world of Southern India is the recent opening of the University Students' Club in Georgetown, Madras. Recreation and meeting rooms for students are an invariable feature of all Universities in the West, and it is a pity that students in the Universities in India should be denied such facilities.

They have to shift for themselves in such matters and the result has been that they have either gone on without enjoying such conveniences (whose educational value cannot be exaggerated), or have fallen into the hands of private

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organisations which have not always been of the most desirable kind. While feeling thankful for the financial and other help that has been extended by Government, in fact the institution could not have come into existence without it, we feel it necessary to sound a note of warning against too much officialising of a social institution that may happen in the future. The Government have probably done the best they could in the circumstances, but it should soon be possible to find a suitable Indian professor to reside on the premises instead of a European. It is only the former that can possess the intimate acquaintance with Indian life and conditions necessary for managing such an institution.

In spite of the opposition shown to the idea of a separate **The Rajkumar College** in Madras—we have been against it ourselves—it is evidently an accomplished fact as H. E. Lord Pentland laid the foundation-stone for the prospective buildings at Adyar the other day. May we impress on the organisers the desirability of securing an *Indian atmosphere* for the College? More than for members of the Middle classes, it is necessary for gentlemen of the landed aristocracy to be in touch with the best currents of national life, instead of being brought up in an isolated hot-house of foreign teachers and foreign social life. Whatever good features the present Newington Institute may boast

of, it has been felt by a wide circle of its well-wishers that it is not Indian at all in spirit and there has been a subtle process of denationalisation, operating on those who have passed under its influence. We know that the subject has caused some anxiety in the minds of some elder members of the Zemindar community itself in Southern India. We hope that the defect will not be perpetuated in the new institution and the young Zemindars coming there to seek education will be able to look up with reverence and affection to some distinguished Indians on the staff, whose culture and character will serve as a noble inspiration. Examples of greatness among one's own people will be a richer influence than those among foreigners, and when the latter are rarely to be secured, it is even more imperative to secure the former.

Sir Ibrahim Rahimtullah who presided over the last Muhammadan Educational Conference expounded a manly policy of self-help and strenuous endeavour whose value for the Muhammadan community cannot be exaggerated. He had no hesitation in saying that, if the Mussalmans of India could take their rightful place in the progress of the world, it must be through education and education alone. Mussalmans ought to be able on merit and merit alone to take their place in Self-governing India. "It was humiliating,"

he said, "to be always in need of special protection." A valuable part of the speech was devoted to show, not only that the Muhamadan scriptures were not against education, but had even enjoined it as a special duty on the people. It was significant that the Prophet should have said that "the ink of the scholar was more precious than the blood of the martyr." We hope that the Muhammadians, especially of Southern India, who are very much more backward than their compatriots in the North, will respond to the appeal by active endeavours for educational expansion among the members of their community.

It was somewhat a novel resolution that was moved before the Legislative Council of Behar and Orissa the other day, when the Hon. Mr. Das proposed, "that this Council represents to the Lieutenant-Governor in Council, that in Primary and Secondary schools of this Province, open-air conditions of living and teaching be as far as practicable encouraged and that costly buildings of the type planned as the condition for the recognition of a school, be dispensed with, if the school can be run on open-air lines with advantage." It is interesting to note that the resolution was accepted by the Government, though the Hon. Mr. Le Mesurier, in doing so, pointed out some of the limitations which would reduce the sphere of its application. Any one familiar with the extreme variations of the temperature in Northern India,

the excruciating cold in winter, and the scorching heat in summer will know that it will not be possible to carry out the recommendation to its fullest extent. But the conditions of hygienic efficiency implied in it are such, that they must commend themselves to all those who wish to safeguard the health of the younger generations and we fancy that in view of the milder climate of Southern India, even a wider adoption of the principle should be possible here.

There was a fairly good proportion of educationists among the recipients of this year's New Year's Honours, to all of whom we offer our hearty congratulations. Mr. J. H. Stone, who needs no introduction to our readers and who has just retired after a long and meritorious service in the Madras Presidency, receives a Knighthood, an honour probably more well-deserved by him than by his predecessor in office. Dr. P. C. Ray, the distinguished scientist of Bengal, well-known for the eminence of his intellectual achievements and life of the most self-denying sacrifice, receives similar distinction and so does the Indian Vice-Chancellor of Bombay, Mr. C. H. Setalwad. One of the most welcome honours on the list is the C.I.E. conferred on Dr. W. Skinner of the Christian College, the veteran Principal, who will soon lay down his office and enjoy a well-earned retirement. Mr. A. I. Mayhew, whose work as Director of Public Instruction in the Central Provinces is already

making itself felt is also admitted to the same order. The distinction of Rao Bahadur has been conferred on Professor K. Ramunni Menon of the Madras Presidency College as well as on Mr. O. Kandaswami Chetti of the Madras Christian College, though we have more than a suspicion that in the latter case, it was for political activities of a peculiar type more than for educational work.

The vexed question of the proper treatment of Indian students in England and the opening out of facilities for their admission, have recently been reconsidered by the Government of India, in the light of a Conference of the Secretaries of the Advisory Committees in the various Provinces, and the resolution issued on the subject on the 25th January shows the possibility of some early reforms in the matter. Each Province will hereafter have a small executive committee of experts in educational matters, including not merely educationists, but also men who are in touch with business, industrial and other affairs. The authorities in Oxford and Cambridge will be moved for two changes, (1) to waive the condition of waiting for the Government scholar's testimonials as in the ordinary course they are already checked and considered by the University and Local Government concerned; (2) in considering

vacancies at Oxford and Cambridge to be allotted to Indians not to count those Indians who have received school education in England. The Imperial Government, after consultation with the Secretary of State for India, adhere to the opinion that the official guardianship in England is of great value, but propose certain alterations which will go some way to meet the adverse criticisms that have been made on the institution in recent years.

The reports of the first Convocation of the Benares Hindu University will send a thrill of delight in the minds of all members of the great Hindu community in India. It may be a matter of some special satisfaction to the people of Southern India, that the Chancellor and Vice-Chancellor of the University who presided over this first visible demonstration of its work, were H.H. the Maharajah of Mysore and Sir Sivasawmi Iyer, K.C.S.I., both of this Presidency. Their addresses, published elsewhere, bear testimony to the high ideals with which the University inaugurates its work, as well as to the great value of the educational ideas placed by them for the consideration of the Indian public. We wish the University all success and prosperity, in its career so well begun.

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UNIVERSITY AND RESEARCH.

"SCIENTIFIC Research and National Prosperity" was the subject of the presidential address delivered by Dr. C. F. Juritz before the South African Association for the Advancement of Science in July 1918. A catechism of the address will be found in *Nature* dated 19.9.1918. The facts are of such extreme significance to the teaching public and the universities that I venture to give wide publicity to them by writing the following few lines to the 'Educational Review' of which I presume there are many readers of the school and college departments.

The present age is the age of the scientist amongst whom ranks first the chemist. The term 'chemist' was till late closely associated with 'druggist' or 'pharmacist' and it will be no wonder to see still the placards hung up in a druggist shop boldly speaking to the walking public "Chemists and Druggists." If the present war which has fortunately come to a successful end—thanks to His Almighty—has taught us anything, it is that the chemist is as

much a druggist or a pharmacist as he is a baker, a plumber, a washerman or what not. There is hardly any avocation in which the chemist is not concerned. The chemist has never before had such an opportunity for the application of his knowledge to the betterment of material conditions nor has he had—and let us hope—nor will he have a better opportunity to utilise it with a damaging effect. Now that the war has run its course, all the resourcefulness, energy and persistence of the chemist will be required to repair the damages done and to open new lines of industry for the exhausted nations. In fine, it can be boldly asserted that every branch of industry is at the mercy of the chemist.

It can therefore be asserted without much trespass, that the present age is the age of the chemist. The clothing we wear, the dyes that colour it, the drugs that cure the sick, the soaps that clean us, the candles that give us light, the razors that shave us, the gold and diamond that decorate our person, the making of jam, the drying of fruit, the preservation of

foods, the disinfectants, the anaesthetics, the aeroplanes and submarines, and a host of other things too numerous to mention—all are subservient, in one way or the other, to the chemist. There is hardly any industry in which the services of the chemist are not needed. Chemical operations are fundamental to every branch of agriculture both in the manufacture of fertilisers and the utilisation of the agricultural products.

The recent achievements of the chemist are still more striking and wonderful. The truth that 'opportunity makes the man' or 'necessity is the mother of invention' is amply justified in some of the most recent discoveries. The expansion of the jute industry in Bengal, the output of tea in Assam, the production of steel and iron articles in Tata's Iron Works at Sacchi, the manufacture of stationery articles, the tanning and leather industry,—these are only a few of the more important improvements made in our own country. Elsewhere, the discoveries are remarkable. The fixation of atmospheric nitrogen and a satisfactory solution of the problem of fertilisers, the technical production of hydrogen on a large scale and its use in the hydrogenation of oils and fats for the production of lard and butter-substitutes, the utilisation of the by-products of coke-ovens and coal tar industries, the synthesis of artificial rubber, artificial indigo, camphor, silk and diamonds—these are a few of the most prominent discoveries effected.

'Four years of war have done more than a century of peace.' So much of our national resources have been recently organised by the Munitions Board, that for national prosperity scientific research will be indispensable. Now that the present Titanic struggle has happily terminated, it is sure to be followed by a commercial struggle. A trade war with Germany seems inevitable after the conclusion of peace. And success in the impending economic struggle will be assured only if it is possible to continue the organisation so far carried out. There is

now everywhere talk about reconstruction after the war. The Prime Minister of Great Britain emphasised the point on September 12th in receiving the freedom of the city of Manchester when he delivered an address on 'War and Peace and National Policy after the War.' "The moment the struggle is over and the unseen hand casts the rainbow of peace on the sky, the reconstruction must begin. We must have reconstruction when we have the lessons of the war fresh in our minds. We must reconstruct when the national limbs are supple with endeavour and before they become stiff with repose and slumber. You must reconstruct when you have got behind you the momentum of victory to carry you through to an even greater triumph. Let us have it when the nation is riding the chariot of a high purpose ere it comes down to the dusty road. That is the time to reconstruct. That is the time to build." Reconstruction and reorganisation are then the two watchwords of success in the ensuing commercial struggle.

How can they be effected and who is at the bottom of the ladder to effect them? It is, without an atom of doubt, the chemist with his knowledge of research, though, no less the botanist, the physicist, the geologist and the zoologist. Let us, at this juncture, ask the most pertinent question whether we have competent persons and a sufficient number of them to meet the demands; and if we have not, where can we look for them and to whom can we appeal for turning out a sufficient number in the minimum time possible? The demand for research in almost every field is growing with a rapidity wholly unprecedented and to the universities alone can we look for men able to cope with the future work of reconstruction.

It comes to this, then, that we should see to it that our schools are well staffed with earnest workers and our universities well equipped with scientific research-workers. It is pre-eminently desirable that a system of research-professor-

ships should be instituted, the chairs to be occupied by men of extreme sympathy and of enthusiasm, men who will inspire a like zeal and devotion amongst those of the younger generation—men of personality and character who will kindle in the breasts of the research students, feelings of admiration and respect for them and their work. The University must be the custodian and the promoter of pure scientific research. Research in pure science is invaluable as a preliminary qualification to all other researches, whether industrial or national. University chemical laboratories have often been places of the most utilitarian discoveries from research students.

Therefore the chief function of a University, if it be not a mere examining body, is to train research men. The pith of the 'rather lengthy discourse' delivered to the graduates at the Convocation of the University of Madras, 1917, by His Excellency Monsieur Martineau, Governor of the French Settlements in India, is the necessity for research work "if every one should devote himself to his own work with all the requisite guarantees of fitness."

Why is it that we have so few persons doing research work in India? Is it because only few are qualified or is it because there has been no scope and no impetus? There seems to be no necessity for the two questions. There is a large percentage of our students quite fitted for research work, if properly started along the line in a well-equipped laboratory. Only, the University has all along been an examining body. It must change its attitude, as it seems to do, and become a teaching body providing ample facilities for research and possessing a laboratory manned by able professors.

Besides, there are two other factors of no less importance to utilise university students to the fullest extent possible and to attain the maximum of benefit. They can be summed up

in two words co-ordination and co-operation—co-ordination amongst those who work in the same field and co-operation between pure science and industry and between one branch of science and another. Regarding the first, there are the science and mathematical conferences holding their sittings annually in some central place. But the other factor has not been recognised to a desirable extent and much less in our presidency. Industry should recognise that it must depend primarily upon the Universities for its trained research men and co-operate to the fullest possible extent to the end that properly trained men be turned out. A close contact between science and science is another indispensable factor. Chemistry never operates in isolation. In a study of the chemistry of the vegetable kingdom, the science of botany affords extensive help. For an investigation of the country's mineral products, a knowledge of the science of geology is indispensable. Of still greater importance is the contact between the various workers in one and the same science. The waste of time and energy that arises from overlapping is lamentably and incredibly great. To avoid such a waste, it is absolutely necessary that the different workers should collaborate frequently at science congresses, several branches of which should exist. His Excellency Monsieur Martineau emphasised its importance thus: "It might perhaps be suggested that the university should decide upon having, every five years, a meeting similar to this one in the course of which the work done during that period should be reviewed. Such reunions mark stages in intellectual life. A quinquennial review of this kind would be a precious encouragement to many writers and workers."

With regard to this most important matter of a research chemist who seems to be at the basis of the work of reconstruction that lies in our immediate future more than anyone else, the University seems to have a greater responsibility

than it poses to possess at present. As a teaching body which seems to be the function of a modern university, it should endow research chairs at the university for every branch of science and see that they are occupied by men of zeal and sufficient capacity. It should be the fountain of all knowledge and progress and to effect such a progress as advantageously as possible, it should bear in mind the fundamental factors of co-operation, co-ordination and organisation without which all work turned out at the university would be sporadic, isolated and futile.

P. A. NARAYANA Aiyar.

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PERSONAL FACTOR IN EDUCATION.*

I NEED not apologise for beginning with a definition of Education. Education has been defined by various men in so many various ways that the relative values of the personal factor have been materially affected by them. The personal factor almost becomes a negligible quantity, when education is identified with instruction. A Harry, or a Hariharan, will be found to be as good an educator as a Sandow, or a Ramamurthi. Again, when education is taken to mean learning, the monitor under the memorising method, plays a part scarcely distinguishable from that of his master. Others there are, who, in effect, regard education as synonymous with information, and here, the success of the German system in which a Drill Sergeant counts as much as a Dr. Schols, loses much of its mystery. There are yet others who consider knowledge as the end and aim of education; for, was it not Prof. Huxley who said: "We study in these days not to know but to pass, the consequence being that we pass and don't know." Despite the "spoon-feeding," which to however small an extent, such a system naturally implies, the master's personality slowly emerges to our view, as a necessary factor to be reckoned with. There is one more school of thinkers as represented by America, whose aim of education in the words of the late Mr. Mosely is "to make everybody fit for some definite calling in life." With this ever-widening outlook on education, one is delighted to read C. Hensford

* A paper read before the Masters' Association Victoria College, Palghat, by Mr. P. N. Unni Krishnan, First Assistant, Victoria College, Palghat.

Henderson's words that education, "the unfolding and perfecting of the human spirit should rest, on the essential foundation of religion and economics—a man's attitude towards life, his religion, and the method by which he gains his bread, his economics."

So much so we see at a glance the magnetic personality of a Dewey or an Atwater in America; an Arnold or a Lord Acton in England; a Montessori, a Comenius and a Pestalozzi in Europe, and coming down to more familiar regions nearer home, we see a Gokhale and a Paranjpye vying with a Ranganatha Mudaliar and Gopal Rao; a Miller, a Cooper, and a Skinner, in friendly rivalry with a Mofussil Barrow or Cruickshank and a Presidency Powell, Duncan and Allen. These are the teachers that count. Though dead, many of them, they live. We treasure them in our minds as suggestive educators.

It will serve no useful purpose to enquire into the metaphysical question, as to whether this subtle quality is a gift or an acquired habit, apart from the difficulty of following a thing so variable, and elusive. While the silent appeal of Dr. Cooper's presence had delayed the outburst of the Christian College Commotion by paralysing the efforts of the ring-leaders for a moment, and the gentle wave of my master's hand arrested the onrush of boisterous boyish breakers over the staircase, causing the unfortunate Anderson Hall disaster, there were occasions when this magic was not found in them. As however the born teacher, like the born-general, so much talked about but so seldom seen, displays certain characteristics common to all real teachers, an analysis of these features may not be without some advantage. The first thing that strikes us is the reserve. It is not that cold and callous aloofness, often the

result of self-conceit or vanity, whose superficial veneer deceives nobody; but, springing as it does, from self-control, it is free and easy, without being too familiar.

Next the element of inscrutability stands out in bold relief. The inscrutable master fascinates the immature mind, making it remarkably impressionable. It also clothes the master in a mysterious awe, so very helpful in the formation of character.

Enthusiasm is another potent factor. Without it the dreariness of a dull teacher dries up the springs of all human activity. But enthusiasm pre-supposes imagination and feeling, which are themselves dependent upon exposition and expression. Speaking well, therefore, is a prime necessity. However keenly the idea may be felt, it won't make any way, much less headway, unless it is conveyed to the hearer through the medium of words. Gestures, no doubt, have their place, but are by themselves, too primordial to be taken into serious account.

Closely connected with expression is knowledge, which gives expression its abiding beauty. Mere words will soon lose their charm, unless they have a setting of thought behind.

Besides the wide reading that commands respect, there should be a business-like habit, which without any unnecessary fuss and fume, exercises a subtle influence that lasts through life.

After this brief analysis of the qualities of a true teacher, a consideration of the meaning and method of suggestion may be of help in estimating the influence of the master upon his pupil. First of all, suggestion should be distinguished from imitation, to which it is very nearly allied. Imitation is more external,

while suggestion may be viewed as an essentially mental process. Imitation is more among equals, or in the technical language of the logician is "between similars, rather than between dis-similars." A flock of sheep following one another into the field instead of a herd of cows or buffaloes, is too well-known to deserve more than a passing mention. Nor should suggestion be confounded with emulation. Emulation never takes place between persons divided by a great gulf of inequality. We emulate those who only are slightly ahead of us, not greatly our superiors. Suggestion thus differs both from imitation and emulation. It is not 'persuasion' either. It is the introduction of an idea which sets in motion a flow of similar ideas by association inhibiting contrariant ideas. It therefore directly leads to action or belief. The sight of the mother returning home after a few hours' absence is enough to make the child run towards her. For an idea to be suggestive, it should first "be massive." This is especially useful in the teaching of geography and mathematics. As Keatinge says, failure to recognise this 'massive' tone is responsible for the 'sham knowledge that schools produce in such abundance.' How many of our young Newtons and Livingstones, that measure distances on maps and squared paper scoring high percentages, do ever realise them, is a painful question to answer.

Secondly, a suggestive idea should stand somewhat opposed to other ideas, lest the teacher or preacher should fall into monotony. The master who has to present the same facts, over and over again, would find his task more profitable, if remembering the law of contrast, he should place them before the boys in a variety of ways, viewing them from various standpoints. The re-

sponsibility of the master presenting a new subject, therefore, is very great indeed; for, upon that presentation depends the future attitude of the boy towards that subject, as first impressions last longest. The method of presentation thus assumes an importance demanding our immediate consideration. How best may a suggestive idea be presented? Mr. A. J. Balfour has, I think, supplied the right answer. That great political philosopher has said somewhere that if, to prevent smoking among boys, a tax on cigarettes was levied, juvenile smoking would increase a hundred-fold. It will be evident from this that direct suggestion is fraught with danger as it frequently defeats its own end. This view is borne out by the psychological experiments conducted in Parisian schools by M. Binet, and still more by the convincing proofs adduced by Dr. Boris Sidis in his *Child Laboratories*. The experiments of the latter further bear ample testimony to the value of indirect suggestion, in view of the wholesome influence, that surely follows, under its snip-pet doses. Instances of the marvellous transformations in the character of young men, brought about by a casual word, or a whispered praise from a beloved master, so crowd in upon the mind as to make a selection not only hard but also unnecessary.

I shall, therefore, dismiss from our consideration, as being based upon an antiquated psychology of the question,—however pleasing—as to whether character is innate and consequently inalterable, notwithstanding the great names, which such a theory includes among its supporters. "It is easier for a blonde to convert herself into a brunette, than for a man to change his character." This utterance of Rousseau finds a fitting parallel in Voltaire, whose words have almost

passed into a proverb: "Can a man change his character?" "Yes, if he changes his body," says Voltaire. Fortunately for us schoolmasters, who have either grown, or under the abnormal pressure of curriculum and method, are fast growing grey in service, this doctrine, giving character a physiological basis, do not meet with many modern supporters; for, we should, in that case, have had to seek means of livelihood, other than that to which we have so long been wedded.

Our thanks are especially due to M. Ribbot, whose "intellectualised impulse" or "passion," contains all the marks of character, as understood by educationists. "Its basis may have been organic, but the finished product," to quote Keatinge again, "is psychic, and the means by which it is reached, are concerned with mental, rather than with physiological factors." As action is impossible without impulses, it becomes the duty of the educator to control them. Undesirable impulses should be suppressed, and desirable ones fostered, by calling up to the front favourable ideas. Therein lies the influence of the master upon the pupil. He should try to be 'thorough' in what he does, and insist upon a certain amount of thoroughness on the part of his pupils: for, never was this truth more clearly and forcibly expressed than when Mr. Lloyd George said the other day, that "there is nothing so fatal to character as half-finished tasks."

The master should introduce the suggestive idea in so silent a manner, as to be afterwards accepted as an auto-suggestion, thereby increasing the mental energy to withstand opposing forces, until they are atrophied through sheer lack of functioning. Here, he gets help from least expected quarters, from his very pupils. In addition to the easy susceptibility to external stimuli of the human mind, much more so in its

early stages, contagion of numbers, gives the suggestive idea, its dynamic force. Every word that the teacher speaks, every gesture that he makes, is spoken or made to a whole class, who returns the shock individually and conjointly, under the influence of imitation and emulation, immensely intensified. That is the reason, why man in isolation differs so much from man in the middle of a crowd. As Espinas, so epigrammatically put it, "the buzzing of one wasp in anger induces the other wasps to buzz in unison, and then evolve the feeling of anger that originated the first buzz." So the larger classes really become sources of strength to the educator, who finds consolation in the words of Comenius: "it is better that the young should be taught together and in large classes since better results and more pleasure are to be obtained, when one pupil serves as an example and stimulus for another. For to do what we see others do, to go where others go, to follow those who are ahead of us, and to keep in front of those who are behind, is the course of action, to which we are most naturally inclined. Young children, especially, are always more easily led by example than precept. If you give them a precept, it makes but little impression; if you point out that others are doing something, they imitate without being told to do so."

Hence habits of attention, hard work, and punctuality, should be drilled early into the nervous system, and new meanings infused into the mental content, causing newer and fresher developments. Thus the master becomes not merely a director, but an out-and-out creator. So in the words of Mr. J. L. Patton, "the main factor in education must be the personal factor of the teacher." Or, to quote the rousing words of the schoolmaster-statesman Mr. Fisher: "In education, almost everything depends upon the personal element."

THE REFORM OF ENGLISH SPELLING.

THE English language is now more widely spoken than any other language of the world, and it may be confidently affirmed that it is destined to be the language of international communication in future. This unique distinction is by no means undeserved. For English has a grammar infinitely simpler than that of most other languages; its vocabulary is the richest and the most varied; and its literature is undoubtedly the most splendid of all modern literatures. It has, however, one marked defect, a defect all the more glaring because of its merits in other respects,—namely, the thoroughly unsatisfactory character of its spelling.

“One sign, one sound” should be the rule in every good system of spelling. The spelling and the pronunciation should always be consistent with each other; so that we may be able to read any word the moment it is seen, and to write down any word as soon as it is heard. We know how woefully defective English spelling is in this respect. As Dr. Macan, Master of University College, Oxford, says: “Our spelling has become a mystery, a convention without rules or reason; a constant recourse to the dictionary, a constant exercise of memory, a perpetual setting of conundrums, a tiresome waste of time and material and energy which might be very much better employed.” That this account of the existing state of things is hardly an exaggeration will be seen from the following consideration of some of the glaring defects in the spelling:—

Taking first the consonants, we find (1) that they are not pronounced at all in many cases,—initially as in *gnat*, *knee*, *heir*, *psalm*; medially as in *calf*, *castle*, *light*; or finally as

in *lamb*, *high*, *autumn*; (2) that the same letters stand for different sounds, e.g., *s* in *sea*, *measure*, *sugar*, *easy*; *ough* in *though*, *tough*, *through*, *cough*, *bough*, *brought*; or *ch* in *chin*, *machine*, *lichen*; (3) that the same sound is represented by different signs, e.g. *she*, *sugar*, *ocean*, *machine*, *mention*, *special*, *version*, *mission*, *anxious*, *conscience*; (4) that two letters are written where only one is sounded, e.g. *fell*, *ebb*, *add*, *chaff*, *spelling*.

When we turn to the vowels, we find that things are still worse. Thus (1) one sound is represented by ten different signs in *aim*, *great*, *cake*, *hay*, *baby*, *obey*, *weigh*, *veil*, *gauge*, *gaol*; by eleven different symbols in *do*, *true*, *truth*, *youth*, *chew*, *school*, *through*, *shoe*, *fruit*, *rheumatism*, *manœuvre*; and by no less than twelve in *go*, *hoe*, *owe*, *toe*, *load*, *soul*, *brooch*, *sew*, *yeoman*, *mauve*, *bureau*, *though*. (2) The same letters stand for many sounds as in *so*, *do*, *woman*, *women*, *son*, *shone*, *bone*, or *pea*, *pear*, *head*, *heart*. (3) In many cases vowels are silent, e.g. *head*, *guard*, *sieve*, *buoy*, *fatigue*.

An exhaustive examination of the anomalies of English orthography will require much more space than we can give here; but the instances given above are sufficient to vindicate the strong condemnation of Dr. Macan. It has been calculated by experienced teachers that, on an average, from one to two years in the school life of every English child is being wasted in memorising the spellings of words; it is obvious then that, in the case of Indian children (to whom English is a thoroughly new language) considerably more than two years must be wasted. The school-life of our children is much too short already, and it is most lamentable that even of this short period much has to be wasted. If this waste could be avoided, the time thus saved could be

utilised for the study of intrinsically valuable subjects, and the gain to the intellectual and moral equipment of the nation would be incalculable.

From still another point of view, the present state of spelling is fraught with injurious results. The object of all education is (or, at least, should be) to enable human beings to exercise their faculty of reason; but this is simply impossible when the first thing which the child is asked to do is to accept unquestioningly all the absurdities and irrationalities of the present spelling. The child who is forced to acquiesce in these things cannot be expected to develop his logical faculty. When he is faced with never-ending anomalies like *go*, *do*: *sea*, *see*; *put*, *cut*; he is naturally driven to despair. The inevitable effect of this on the growing mind of the child can easily be imagined.

So long as the present arbitrary system is continued, it is inevitable that correct spelling and pronunciation should be the aristocratic privilege of the few. All the so-called rules for “correct spelling” must be futile in the present state of chaos. There can be no improvement unless and until a radical reform is effected in the whole system of spelling.

While admitting the present chaotic state of things as well as the enormous gain that would result from the simplification of the spelling, many people would, strangely enough, object to anything like a radical change. All sorts of objections are advanced by such persons, but it can be easily shown that not one of them can hold water. We shall now examine these objections one by one, and see how far they are reasonable.

The very first objection that would naturally suggest itself to those who have been

long accustomed to the present spelling is that the reformed spelling must be “queer” or “ugly.” This is merely a matter of sentiment; it is wholly due to the instinctive aversion to any change in the established order of things which is always found in most men. This prejudice against change is so deep-rooted that some persons would not even hesitate to assert in all solemnity that all the beauty of language and all the charm of poetry would be lost to them if words were to be written in the new spelling! Surely that sense of beauty which can admire such abominations as *rough* (for *ruf*) and *through* (for *throo*) must be a strangely perverted one! And as for the charm of poetry, we know that it depends wholly on the sounds, and not at all on the appearance of the words. And it is certain that poetry will not cease to be beautiful simply because it is written in a new garb. To take a concrete instance, if we examine the First Folio edition of Shakespeare’s plays, we shall find that many spellings are different from the present ones, but no one can contend that the beauty of the plays is thereby diminished in any degree. This objection, therefore, is purely sentimental; but, unfortunately, sentiment is so much more powerful than reason with most men, so that, however weighty may be the arguments for reform, there is sure to be some opposition to it. This opposition will cease only when the new spelling has become sufficiently familiar, and its existence only shows that the reform should be introduced at once.

Another strange argument against any reform is that the existing books will all be rendered useless. In the first place, the introduction of the reformed spelling cannot be a matter of a day or two; there must

necessarily be a transition stage, so that no one will find the slightest difficulty in reading the existing books. But even supposing that the new spelling is bodily adopted in a day, there will still be no difficulty in reading the present books. Those who have learnt only the new spelling may not be able to stand an examination in the "old spelling" (as it will then be called), but this is entirely different from reading it. Thus, then, the existing books will still be read for the wealth of knowledge that is enshrined in them, although nobody outside the lunatic asylum is likely to admire it!

A third argument is that in the new spelling, many words, which are now distinct in spelling though identical in sound, will be written alike, thus leading to confusion. It is quite true that *rode*, *rowed*, *road*, and *rite*, *right*, *write* will be spelt alike. But why should this lead to any confusion? Do they ever puzzle anybody when they are spoken? Moreover, are there not words of this kind now,—words like *bear*, *box*, which bear more than one meaning? These never cause confusion, since the context settles the sense in every case. So the identity of spelling can never be a source of confusion. On the other hand, words like *slough* which have different pronunciations in different meanings will be distinct in the new system.

Still another objection is that there can be no fixity of spelling even under a phonetic system, owing to the absence of a standard speech, as well as the inevitability of sound-change in the future. It is partly true that there is no standard or uniform speech at present; but phoneticians have agreed to take as the standard the pronunciation which is heard from most educa-

ted Englishmen in the south of England, and there is surely enough of agreement among educated Englishmen as to the pronunciation of words. The tendency is towards standardisation at present, and the introduction of a phonetic spelling will materially hasten this standardisation. The other argument is that the pronunciation is undergoing unconscious changes from generation to generation, so that very soon even the new spelling will cease to be phonetic. This sounds an almost decisive argument against any change of spelling; but even this has no real basis in fact. Those who have studied the changes that have taken place in English speech-sounds from the earliest times to the present day know that the present pronunciation had practically been arrived at by the end of the 17th century. Thus the change in pronunciation in the course of the last two centuries has been very slight. The tendency to change in the future must be still less, for the universal diffusion of elementary education, and the constant use of the dictionary, must act as a very powerful check on sound-change. Then, again, it is easy to see that the present spelling is in itself a potent factor in the change of pronunciation, since now the spellings of words give no clue to their pronunciation; but when once the spelling is made phonetic, it will give an accurate idea of the sounds, so that there will be no chance of the latter changing with time. Thus the influence of education, and the phonetic character of the spelling will between them obviate the possibility of any appreciable change in the pronunciation.

A fifth, and apparently conclusive, argument is that the present spelling is "etymological," and that we shall not be able to find out the derivations of words if this is changed.

In the first place, the child in the elementary school is not the least interested in the derivations of words; his object is simply to be able to read and write the language in the least possible time. For the matter of that, the vast majority of even the grown-up never once think of these derivations when they are reading and writing. Only a few scholars take the trouble to think about them, but surely they do not require the perpetuation of the present spelling. Those who are interested in etymology will still have the "old spelling" at their disposal, for the present books are not going to be swept away. So far we have been taking it for granted that the present spelling is really etymological; but that the veneration claimed for the existing spelling on the ground of its supposed etymological character is wholly misplaced is conclusively shown by the single fact that all those scholars who have made a life-study of the language—men like Dr. Skeat, Dr. Sweet, Dr. Whitney (who certainly cannot be accused of indifference to etymology!)—have been determined opponents of the present system. Those who have made even a superficial study of the history of the English language know that the present spelling is, in many cases, far from being etymological, and that, in other cases, it is glaringly inconsistent in its etymology. Thus the spellings of *sovereign* and *rhyme* are the result of etymological ignorance; the *b* in *debt* and *doubt* is due to etymological pedantry; the use of *f* in *fancy*, side by side with the *ph* of *phantasy* is totally illogical! The answer, then, to the "etymological argument" is that scholars will know the origins of words without the present irrational spelling, while the ignorant will not be able to know them with it.

There still remain at least two arguments

used very often by opponents of Spelling Reform. Both these are really too silly to be taken seriously, but, since they have been advanced by at least a few, they have to be answered here. One of them is (it may seem incredible, but I am speaking from experience) that, after all, the present spelling does not impose any appreciable strain on the children who learn it! It is true that we are now able to write this spelling almost mechanically, but that does not indicate that our proficiency was acquired without difficulty or labour. The fact is most of us have forgotten what it cost us in time and energy. If anyone doubts this, he has only to go to the elementary schools, and note the struggle of the children to memorise the spellings of words. The large percentage of "spelling mistakes" will give him an idea of the real labour that is involved in this memorising. But, then, our opponents are still undaunted! They may admit the strain imposed upon the child, but will triumphantly point out that the children are all the better for it and that it is very good discipline to make them work hard. It has been justly pointed out in reply that, using the same argument, it is good to make children write with their feet instead of their hands, for the sake of the discipline that it gives. Difficulties are not necessarily valuable in themselves; they are valuable only if, in overcoming them, certain valuable powers are being exercised. As Prof. Walter Rippman points out, "We have to say *be d = bed*, *he d = head*. If the child asks, why not *hed*? we can give no reason. There is no rule to guide the child. The sounds do not help. This is a difficulty for the child, and remains a difficulty, until repetition has made the unreasonable spelling *head* familiar. What has been the gain? It would be hard to say.

But the loss is obvious; time and effort have been spent which might have been better employed otherwise."

My readers will now see on what solid grounds rests the case for the simplification of English spelling. The gain to those who are learning the language has already been briefly pointed out; but there is still another matter which deserves notice. And that is that a phonetic spelling will effect a marked improvement in the enunciation and develop the capacity for differentiating the sounds from one another. The present state of things makes the acquisition of correct pronunciation well-nigh an impossibility, since the spellings are so misleading. How many of us, for instance, know that the sound represented by *s* in words like *is*, *his*, *these*, *dogs*, *busy* is really an *z* sound? How many know that *past* and *passed* are pronounced exactly alike, that the final sound in words like *hushed*, *laughed*, *locked* is *t* and not *d*? When the sounds come to be consistently represented, this difficulty will be removed, and there will be a vast improvement in the pronunciations of words.

We have now conclusively established that the present system of spelling ought to be completely overhauled in favour of a rational system. The next point to consider is the best way of carrying out this reform. Various schemes have been put forward, but the simplest and least objectionable scheme is that of the Simplified Spelling Society* of London. This Society was founded in 1908, and the very names of the leading spirits of the movement will be the best guarantee of its respectable character. Dr. Skeat was the

* Hereafter, the letters S. S. S. will denote "Simplified Spelling Society".

first President, and Dr. Furnivall the first Treasurer; the present President is Prof. Gilbert Murray, and among the Vice-Presidents are Lord Bryce, Andrew Carnegie, Dr. Macnamara, Prof. Mahaffy, Sir Frederick Pollock, Dr. Sadler, and Sir Robert Baden-Powell. These are some of the greatest men in England to-day, but the fact that they are at the head of the movement does not justify others in keeping aloof from it. On the other hand, without wide support, even these will not be able to do any effective work. It is, therefore, the clear duty of all who are convinced of the imperative need for Spelling Reform to join the Society as members, and thus give their moral support to the movement. [The minimum subscription for membership is only 1 shilling per annum, and there is a South Indian Branch, of which the Secretary is Mr. T. A. Ramaiya, M.A., L.T., Government College, Mangalore]. During the ten years of its existence the Society has done very valuable work in the face of discouraging circumstances. The best tribute to its work is that last year the Supreme Educational Authorities of England and Scotland were persuaded to sanction experiments in Simplified Spelling. These experiments have been (and are being) carried out in many schools, with truly marvellous results. Thus the case for S. S. no longer rests on merely theoretical grounds, but on the solid and unassailable basis of actual results. The scheme of the S. S. S. is given below in brief:—

(1) The same sound is always represented by the same sign, e.g., *too*, *throo*, *shoor*.

(2) Consonants have their usual values. *c* (except in *ch*), *q*, *x* are not used.

(3) Letters not pronounced are not written, e.g., *lern*, *dout*, *spelng*.

(4) Wherever the *z* sound is heard, it is written, e.g., *bizi*, *windz*, *hiz*.

The vowel sounds:—

<i>a</i> (bat, glad)	<i>aa</i> (faather)
<i>e</i> (meni, hevi)	<i>ai</i> (naim)
<i>i</i> (pit, bizi)	<i>ee</i> (eech)
<i>o</i> (kot, dog)	<i>au</i> (baul)
<i>u</i> (but, muther)	<i>oe</i> (baet)
<i>oo</i> (book, good)	<i>oo</i> (boon)
<i>eu</i> (feu, deuti)	<i>oi</i> (boi, koin)
<i>y</i> (fyr, lyt)	<i>ou</i> (found)

It will be seen that the fewest possible number of changes are made in this scheme, and it is no exaggeration to say that it is so simple that any educated man can master it in half an hour. Of course, it does not claim to be perfect, for a perfect scheme will necessitate the addition of several new letters to the alphabet. The addition of new letters means a lot of trouble; it would render the present typewriters useless and will make it impossible to use the present Morse alphabet for signalling; new types will also have to be introduced in our printing-presses. The scheme of the S. S. S. avoids these inconveniences altogether and provides a very good compromise. "It gets rid of most of the anomalies and confusions of the established tyranny; it offers a fairly self-consistent method; it is rational, economical, and easily acquired; it can be adopted *in toto* or in degrees; it has been proved a success in school teaching." In a word, it appeals to commonsense, and comes wonderfully near to the phonetic canon, "One sign, one sound."

It has been the purpose of this article to point out as briefly and as clearly as possible the necessity for the reform of English spelling, to show the benefits that would result from such a reform, and to reply to the

various objections that may be urged against it. I have also given an account of the scheme of spelling that has been put forward by the S. S. S. and that has uniformly stood the test of actual use in schools in the teaching of very young boys and girls. And now, in conclusion, let me quote (in Simplified Spelling) a passage from the admirable pamphlet of the S. S. S., which bears the significant title, "Breaking the Spell: An Appeal to Commonsense."

"It iz no eezi taask that we hav taiken in hand; our apeel iz tu milionz skaterd aul over the erth. We waunt tu establish braanchez in evri important senter whair English iz spoeken. We waunt tu gain the simpatetik help ov evri neuspaiper. We waunt tu dispel prejoodis and prepair the paath for reform. A grait undertaiking needz muni, and we apeel without hezitaishon for pekeuniari help tu thoem hoo kan aford it. But tu aul, rich and poor alyk, we apeel for the ernest konsideraishon ov the kais for simplifyd speling which has been poot forwerd in theez paijez; we beleev that thair ar feu kanzez mor werthi ov suport than this which aimz at the prevenshon ov waist in our skoolz, at beter edukaishonal methodz, and at rendering mor servisabl for aul the English langwj."

A. RAMA IYER.

CLOUD MESSENGER.

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SOME PROBLEMS OF ELEMENTARY EDUCATION.*

ELEMENTARY Schools are increasing in number year by year. During 1916-17, Boys' Elementary Schools increased from 24,034 to 28,867—20 % increase. The increase is not merely in the number of institutions but also in strength, staff and equipment. The importance of these schools can partly be seen in the introduction of Bills for Free Compulsory Primary Education in the Imperial Legislative Council. The Government of Bengal has appointed a special officer to inquire into the condition of elementary education before further steps can be taken. The Municipal Corporation of Bombay is on the eve of taking a forward step in the education of its city children while a Bill is pending in Madras for the introduction of compulsion in certain areas. In these attempts to increase the number there is a tendency to forget the manifold problems that rise up in connection with these village schools. They have almost become a permanent feature in all, at any rate, the most important villages and the questions of efficiency, curricula, and literacy should receive a larger share of attention lest, in the rush for an expansion of schools, quality be lost sight of.

The most important problem is that of the Aided Elementary School. It is to be noted that out of 28,867 schools mentioned above, 12,073 are under private management. Excluding 4,923 Mission schools, 17,150 are under the teacher-manager system. They form 48 % of all the schools while Board and Municipal schools form 21 % and 2 % respectively. During the quinquennium 1912-17, 13.5 lakhs of rupees were spent on Board and Municipal schools while aided institutions received only 5.5 lakhs. Grant

* A paper read before the inaugural meeting of the Senior Teachers' Association, Government Training College, Rajahmundry, by Mr. Isaiah S. Peter, M.A. (Hons.), sometime Personal Assistant to the Assistant Inspector of Schools, Kurnool District.

is assessed in an elementary school at the following rates:—Rs. 36 for an untrained teacher, Rs. 48 for a trained teacher of "Primary" grade and Rs. 60 for one of "Lower Secondary" grade and Rs. 120 for one of S.S.L.C. grade. Pupils' grant is given at as. 8 for an ordinary pupil and Re. 1 for a pupil of the backward classes or a girl. Granting that the teacher is an untrained man—as in the majority of aided schools—granting that the average attendance for the year is 12 ordinary pupils, 8 backward pupils and 2 girls, he is entitled to a grant of Rs. $36 + 6 + 8 + 2 =$ Rs. 52 which does not come to even Rs. 5 a month. In the Kurnool District during 1916-17 there were 391 teacher-manager schools and of those 166 or 42 % were penalised for inefficiency and if the above school happens to be included in such a list, the grant would be reduced. Including petty fees from the pupils an average teacher ekes out probably Rs. 6 a month; but in certain cases, it is the "bare grant" and nothing more. It is very instructive to compare this state of affairs with that in a Board school. The teacher gets a monthly salary of Rs. 11 + an annual capitation allowance. In an aided school it costs the Government Rs. 4-2-0 per pupil, in a Board school Rs. 6-8-8, in a Municipal school Rs. 7-10-8 and in a Government school Rs. 13-2-7. For this reason schools under local bodies are much better managed than aided schools and in the latter inefficiency is a very common sin. Apart from these financial considerations, the teacher-manager has several disadvantages compared with the local bodies and Mission managers. The Board school is for some reason or other supposed to be a "Government" school and the Deputy Collector who is often the President of the Taluk Board can more easily persuade the villagers to send their children to school than a dismissed Constable or a discharged Forest Guard or a Stamp-vendor or a medical quack or the sleeping partner of a busy agricultural family. The Mission manager, on the other hand, so argues the

teacher-manager can correspond with the Inspector or even higher authorities, while he alone is left unthought of and uncared for.

These factors explain all the conditions prevalent in an average teacher-manager school. These schools do not attract the best men under the present circumstances. When an aided school-master finishes his training he invariably seeks work in a Board or a Municipal school. This depletes the aided schools of all trained men. The paucity of trained teachers is so great that a Sub-Asst. Insp. of Schools often appoints such a man to a Board school—apparently callous to the interests of the majority of his schools. This depletion will continue for sometime to come and it is no wonder that the ordinary schoolmaster follows a number of other jobs and gives his leisure hours to school-work. As long as the prospects are poor, so long will it be difficult, nay impossible, to create a body of teachers who will look upon schoolmastering as a profession. I used to ask some of these aided schoolmasters as to which class their school belongs, one held for 10 days out of 30 days, or 20 days out of 30, or 15 or 7 days out of the 30 days in the month. That they are most irregularly held is evidenced by the fact that some of them are found closed when surprise visits are paid by inspecting officers. If anything is to be accomplished, schools must be held regularly and this depends upon the grant allotted to them. "More money and more work" is their motto.

Another defect in these aided schools is the fewness of standards. The grant system is based upon average attendance and not upon the number of standards. It is, of course, open to the inspecting officers to reduce the grant, to withdraw recognition but the teacher has no positive impulse to increase the number of standards. More than 65 % of the schools are all 3rd grade Primary schools with standards up to and including the present 4th standard. To get anything out of village schools, we must have

every school teaching up to the 5th standard at least. It is not uncommon to find a school working for 5 years and never teaching beyond the 3rd standard and such a school can produce very little literacy. Remarks the quinquennial report: "a large number of elementary schools do little or nothing to add to the permanent literacy of the country."

The poverty and wretchedness of accommodation in an aided school interferes to no small extent with the instruction imparted. Some are cattle-shed schools, some verandah-schools, some chavady schools, some temple schools, while a negligible number have pukka buildings. The case with Mission schools is different as the buildings are used both for a chapel and a school. Here is a description of a verandah school. A buffalo and its calf are tied to one of the pillars, an old woman is grinding corn in a corner, people are going in and out of the house, and the pupils, amidst these distracting conditions, will be hammering away at their multiplication tables. The stink of the cattle-sheds invades the schools held in such localities. One refuses to believe that schools are held under such conditions. Either they are held irregularly or held in an open place under a tree and both these facts are true. Schools under a tree are the most hygienic and also cheap: but their chief difficulty is that they are always infested with the idle public of the village. Even in places where the surroundings are clean, space accommodation is almost always insufficient. In one school I had measured, every pupil had $2\frac{1}{2}$ sq. ft. and ill-ventilated and ill-lighted dens are very common. A medical inspection no doubt would reveal horrible results and this wretchedness of accommodation is responsible for a good deal of eye-diseases.

Another remarkable thing about these aided schools is their general instability. Conditions of admission are so very elastic that it has enabled a number of schools to crop up and they impart a nominal instruction in the three R's; that

the conditions are elastic is a very hopeful thing in consequence of the illiteracy and ignorance of villagers. The department errs on the side of generosity and so long as a man can teach what he knows and what the villagers want him to teach, he can be sure of admission for his school. During 1916-17, 10% of the schools were closed, some for fraud, some for inefficiency, and some for irregularity of attendance. More schools are opened every year than closed. The stability can be judged from the fact that out of 12,031 non-Mission schools in 1917, only 41% received grant without break for 5 years, 12% for 4 years, 14% for 3 years and 16% for 2 years, while the remaining 17% were new schools. Out of 15,890 aided schools including Mission schools only 53% received grant for 5 years, 12% for 4 years, 14% for 3 years, and 15% for 2 years, while the remaining 6% were new schools.

Several ways are being tried to make the schools more efficient. One is the system of monthly grants. The ordinary villager especially when he is far away from the Taluk Treasury is unwilling to undertake a long journey every month and so would cash his cheques once in 3 or 4 months. That saves the teacher both trouble and expense. It must also be remembered that the economic conditions in a village are different from those in a town or city. In the latter a cooly earns his daily wage and if given money, say once a week, would spend it partly in drink or in some such fruitless expenditure. In villages people do not buy chillies or onions or salt at so much per pice and systematic buying and selling in cash are not frequent. Even in petty shops, grain instead of money is given for articles. The villager buys corn during March and April or he buys a bull when he gets a lump sum of money. There are however some extravagant teachers whose indebtedness is so great that in spite of the grant in March they are as poor as ever. One of the best ways of helping these schoolmasters is to secure a larger co-

operation of the villagers. First efforts are being utilised in overcoming their apathy and indifference. In some villages there is often an influential man who is anxious to have a son or a nephew educated. Such people should be got hold of. The help of the Revenue Department cannot be exaggerated especially in the question of sites and in securing building materials. A greater co-operation between the Revenue and Educational Departments is essential. In Mysore this has been done on a very commendable scale and with time and zeal it is not impossible to accomplish something of the kind done there.

In spite of all these difficulties and discouragements, the teacher-managers have been carrying on their work. They have been doing, however humbly it may be, a noble and patriotic service to the country. In our country teaching has always been associated with poverty and these schools are an example in their own way of this principle. It is not that they work badly but that they should work so well at all under such circumstances as stated above.

The organisation of elementary schools is rather complex. There is a dual or sometimes a triple kind of control. In schools managed by a Taluk Board, the ultimate responsibility for the welfare of the schools rests upon the President and his Board. The Inspectors are Government servants whose relation to the Board is that of an advising agency. In Municipal Schools, the Council and its members exercise authority with the advice of the inspecting officers. In private schools grants are recommended by them and they are paid out of provincial funds. The details of the administration are settled by the manager himself unless in cases of a drastic necessity when the inspecting officer's recommendation is accepted regarding any changes in the staff. The poorer Taluk Boards are subsidised by provincial revenues and in such cases the Board is a distributive agency not for what it collects but for what it receives. It looks as if it will

tend towards simplicity, if these schools, except those belonging to private bodies, are managed by the inspecting officers themselves. It avoids variety of control but simplicity is attained at the expense of local expert opinion. What is desired really is not simplicity but that schools should avail themselves of all local opinion.

Leaving aside administrative work, the chief party that should have a voice is represented by the parents of the school children. Some propose that local committees of parents should be appointed either for a school or a group of schools. If in a village a school-committee consisting of six men is appointed, what are its advantages? As an experimental measure, the results might be disappointing at first. Are there people in the villages who can be entrusted with certain powers regarding the management of a school? The schoolmaster might chafe at this restriction but that is not the sole consideration. A ryot with property and land qualifications need not necessarily make a good member of such a committee. The men might abuse the power entrusted to them or they might be a discouragingly severe type of men. Steadiness and sympathy on the part of the inspecting officers and the other officials concerned are the only safeguards to the proper working of school-committees. In the Central Provinces, as pointed out by the Hon'ble Mr. Sharp in his "*Rural Schools in the Central Provinces*," this has been so. One of the duties of such committees would be the watching of the regular working of schools. This would lead to the closure of a certain percentage of the teacher-manager schools and it will not be a loss. Some would work much more efficiently and regularly and it would be a great gain.

Probably another way of improving the number of pupils in the higher classes is the abolition of fees. This raises the question of free and with it compulsory education. India is an agricultural country using ancient tools and

ploughs and education is urgently needed to overcome their superstition and ignorance. This is one of the keynotes of the Industrial Commission Report. If compulsion is enforced, schools must be in regular working order and now this is a privilege only of the urban but not of rural areas. In towns free compulsory education will be appreciated but to the majority of villagers it would be an unmeaning tyranny. Apart from the question of irregularly working schools, attention must be immediately paid to curricula and modes of teaching if compulsion is resorted to.

Another great problem is that of the elementary school teacher. Considering their general educational qualifications, the equipment they receive at the training schools and the uphill task to be done in villages, the elementary school teachers can stand a very favourable comparison with the teachers in our High Schools or Colleges. Let us consider each of these factors. Unless it be a Brahmin or a specially exceptional non-Brahmin family, the teacher's parents are ignorant and illiterate. He must have attended the local or a neighbouring school amidst great difficulties and picked up a fair knowledge of the three R's. If it was a good school, he has some knowledge of Civics, Geography and probably History and Drawing. Probably he leaves the school at 10 or 11 after studying in the 5th class and after a year or two, if he finds nothing better he will open a school. If the interval between his leaving the school and taking to teaching is more than a year, he can teach only the three R's and in certain cases he would never proceed beyond the 3rd standard in Arithmetic. The attainments of these teachers can be easily tested when they come to join a training school. They can write and read a little, while some cannot write good composition at all. For this reason, part or whole of the first year's course is intended to increase their general qualifications. In Ger-

many the period of training for an elementary school teacher is from 4 to 6 years which combines both general and special training, while it is only 2 years here. Telugu, Arithmetic, Drawing, Composition, Elocution and teaching methods are some of the subjects taught. The Hon'ble Mr. Sharp declares that unless a student is stupid or lazy, he is sure to get through.

In the villages the conditions for the opening and growth of schools are of a varied character. As some of the schools are under the control of the Taluk Board, the Revenue officials influence the villagers to send their children. In some the villagers themselves are very anxious to have their children educated and the co-operation of such is sometimes responsible for successful work. This desire accounts for some of the petitions addressed to educational and other responsible authorities for opening schools. The ideal condition is that every village including hamlets should have a school. Sometimes a man who can put his hand to nothing else opens a school and applies for aid. The greatest difficulty for teachers is to secure proper attendance of boys after opening schools. More than 70% of the people are agriculturists and agricultural labourers. Poverty is so great that children begin to earn from the time they can attend school, say 6 or 7 years or even earlier. Some go to graze cattle, some during harvest season have to keep watch over fields and do a good deal of allied work. In homes where the father, for example, is a weaver, grown-up children help him in sundry minor operations and keep house for part of the day when the women are away on some out-door work. The teacher, therefore, has certain difficulties to overcome. It is not possible to convince the villager that time spent at school by his boy is not a waste and this lack of a really appealing principle discourages many teachers. Further, the question of curricula is one of a controversial nature. The villager can see that an instruction

in the three R's can help his son to read, write and calculate sundry bazaar accounts. He, however, cannot see that these things should be secured by his immediate sacrifice of the boy's earning capabilities. The teaching of drawing, drill, and nature study do not appeal to him at all. He is accustomed to the old Indian methods of reading in the school all the day in defiance of all psychological principles. Memory and repetition by rote are so deified that intelligence and powers of observation are arrested. The basing of the curriculum on the principles of Froebel and Montessori is a thing in which the teacher has very little faith and consequently his interpretation and application of these principles are half-hearted and sceptical. In spite of these difficulties the enterprising spirit and the capacities for management and discipline displayed by these teachers strike even a superficial observer very markedly.

The expansion of elementary education has resulted in a new vocational opening for the village middle classes. It is also playing an unconscious but powerful part in partly undoing the rigidity of the social system prevalent in Indian villages. The teaching class represents all castes and creeds. As in medieval Europe, in Ancient India educational work was largely in the hands of the priestly class, one finds amongst teachers representatives of the barber caste, of the washerman caste and all the other sects of the Sudras, not to speak, of course, of the higher classes. The position of some of these teachers causes no little grumbling in certain villages. When once a would-be teacher was questioned as to the motive which led him to choose teaching, he remarked that he would have a chair and a table to use—luxuries which he could not command elsewhere. It is very encouraging to find that in schools intended for the depressed classes a substantial number of caste boys sometimes prefer to continue their studies in such a school, if the one intended for

is inefficient. Whether one school cannot meet for all the castes in any village is, however, a question which has a good deal to do with a social system in our country.

Let us now come to the children themselves.

In any village the percentage of the schooling population which attends the local school is dependent upon the popularity of the teacher and the efficiency of the school. On the average, a boy enters the school when he is 6 or 7 and leaves it at 11 or 12. The average period according to the quinquennial report is 2.6 years. In England elementary education means that a pupil remains at school till he is 14 and according to the new Education Bill of Dr. Fisher, schooling is compulsory till 18. The early age of the pupils when they leave the school accounts for a little for their misfortune of lapsing from literacy to illiteracy. The parents of the children are most anxious that they should progress in the least possible time. They are practically interned for the major part of the day in ill-lighted and ill-ventilated dens. On the whole the children are precocious and this is responsible for the early arresting of their intelligence. If you inquire about their home and school environments, they are simply appalling. Some houses consist of a cattle-shed, a kitchen, a bed-room, all comprised in one single hall. The danger of these conditions can be realised from the fact that certain philanthropic societies advocate the thorough demolition of all such houses and in Mysore, the Town Improvement Committees have been insisting on the separation of the cattle-shed from the house proper. The high percentage of infantile mortality testifies to the ignorance of women and to the bad conditions of health in general. Before long an investigation into all these conditions has to be undertaken. A scientific investigation of these problems will mean a greater understanding of Indian children and a consequent adjustment of educational methods. A word may be said about the education of the

depressed classes. At present this seems to be the only way of coming into contact with their social and economic conditions. Schools amongst such classes work much better when they are means to an end rather than an end themselves. Their status is a social question and the lessons on cleanliness, hygiene and sanitation are as needful to them as they are to the other classes in the villages of this country. Because of their low social status, the children are not allowed to mix with those of the other castes and that education equalizes social differences is not yet true. A school intended for such people but conducted by a society like the Madras Social Service League has a prosperous career. Co-operative Societies have been started for them; indebtedness and drunkenness are gradually given up and then the people themselves express a desire for a school. One often wonders whether a nominal education in the three R's is likely to improve their condition; for education has a good deal to do with the economic conditions, the social position and the traditional outlook of the people. Booker T. Washington says: "Too often it seems to me the Missionary and educational work among the undeveloped races, people yield to the temptation of doing that which was done a hundred years before; or is being done in other communities a thousand miles away. The temptation often is to run each individual through a certain educational mould regardless of the conditions of the subject or of the end to be accomplished."

The above quotation raises the whole question of the purpose of our village elementary schools. Why should our children in villages attend school? Is it worth their while to learn the three R's as taught there? One might think of several aims. Probably our aim is to make the people better villagers, to make them better labourers, better farmers and better coolies. To give them an instruction which makes them think that they are above these is courting disaster. Education, no doubt, should teach people

Regular number lessons succeed these lessons, and the important point to be kept in the teacher's mind is that the method employed should not tax the pupils too much. In so far the pupils understand it is all right. But, when a difficulty arises, all the efforts put forth by a teacher are at a disadvantage. Taking the case of addition there are many methods. One method holds up the use of concrete objects throughout, the second emphasises on the drawing of diagrams and wall charts, and a third says that the boys will in their own natural course learn the process involved in addition and subtraction. Taking the case of the first, ordinary tamarind seeds which are the only concrete material available in a village school, it would rather be an irksome thing to go through the same tamarind seeds every day. The children like to have a variety of materials coloured things, etc., which attract their attention and it is the same case of tediousness in counting the squares drawn on the black-board. There is another method that is talked about, and it is this: To add 6 and 7, the children have to split up 7 into two parts so that one part added to 6 makes it ten and then count the other part. By putting this into practice with children of ages $4\frac{1}{2}$ to $5\frac{1}{2}$ great difficulty will be met with by the teacher in order to carry out these two processes of addition and subtraction in one and the same sum. Here the children can resort to objects. Some raise great objections in counting with fingers. Is that because the children always resort to fingers in counting, or resort to a more mechanical way, or is it anything else? Ten fingers and ten toes are the gifts of God and what then, is the use for them, if the teacher should scold a boy when a child can naturally take interest in his limbs and count with them. These are the concrete objects provided for the boy by Nature. Counting with fingers may be encouraged except in the fourth and fifth classes. Mental exercises play a great part in stimulating the boy for addition and sub-

traction of numbers. The teacher has to frame what are known as "Number Stories" which take the form of problems in the later stages. Addition and subtraction are taught to them simultaneously with concrete objects.

Then comes Multiplication and the Multiplication tables. Multiplication tables are to be formed by the pupils themselves, noted in their books and only then ought to be memorised. Moreover, all the classes in an Elementary school should not be asked to memorise all the tables from 1×1 to 16×16 . The teacher should set apart in different groups, the tables which might suit the age and the capability of the children in their various grades. As for example boys in class II may be asked to form tables 1, 2, 5, and 10, while in the next senior class tables 3, 4, 6, 7, 8 and 9 including the others memorised in the lower classes up to 10×10 . How to form these tables is the next question. As for one, any concrete material will be enough. As for two, each boy has 2 hands, two legs, two eyes, etc., and so, questions like: How many legs have 6 or 7 or 8 boys respectively? may be put to them, at the same time practically counting the legs of 6 or 7 or 8 boys. In this way all the Multiplication tables are to be made up. Supposing, we have to form the multiplication-table 8 and we refer to the number of ollocks in a measure. The natural questions would be to find out the number of ollocks in two measures, three measures, four measures, etc., and so the natural method for writing down the multiplication tables ought to be

$$\begin{array}{rcl} 2 & \text{times} & 8 = 16 \\ 3 & " & 8 = 24 \\ 4 & " & 8 = 32 \end{array}$$

and this may also otherwise be understood as two measures containing 16 ollocks at the rate of 8 ollocks a measure, 3 measures containing 24 ollocks, etc. A difficulty may arise in forming the multiplication-tables with respect to the numbers 9, 11, 13 and 14.

them is inefficient. Whether one school cannot suffice for all the castes in any village is, however, a question which has a good deal to do with the social system in our country.

Let us now come to the children themselves. In any village the percentage of the school-going population which attends the local school is dependent upon the popularity of the teacher and the efficiency of the school. On the average, a boy enters the school when he is 6 or 7 and leaves it at 11 or 12. The average period according to the quinquennial report is 2.6 years. In England elementary education means that a pupil remains at school till he is 14 and according to the new Education Bill of Dr. Fisher, schooling is compulsory till 18. The early age of the pupils when they leave the school accounts not a little for their misfortune of lapsing from literacy to illiteracy. The parents of the children are most anxious that they should progress in the least possible time. They are practically interned for the major part of the day in ill-lighted and ill-ventilated dens. On the whole the children are precocious and this is responsible for the early arresting of their intelligence. If you inquire about their home and school environments, they are simply appalling. Some houses consist of a cattle-shed, a kitchen, a bed-room, all comprised in one single hall. The danger of these conditions can be realised from the fact that certain philanthropic societies advocate the thorough demolition of all such houses and in Mysore, the Town Improvement Committees have been insisting on the separation of the cattle-shed from the house proper. The high percentage of infantile mortality testifies to the ignorance of women and to the bad conditions of health in general. Before long an investigation into all these conditions has to be undertaken. A scientific investigation of these problems will mean a greater understanding of Indian children and a consequent adjustment of educational methods.

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the dignity of labour and has it been associated enough with manual work to teach them such an ideal?

Let us take a very definite example. The son of a weaver attends a school, say for four years, while his younger brother remains at home and substantially helps his father in his daily work. When the elder returns after his 4 years' study, his younger brother is much ahead of him in the help which can be rendered to their father. During his school days, the boy has lost or has not developed the manipulation of his fingers which is most essential in all industrial enterprise. It is likely that the son who has had the schooling will have the same disadvantage in building a wall, in stacking hay, in milking a cow, and in short all those occupations which are an essential feature of our village life. The essay takes for granted throughout that we all recognize what Lord Ronaldshay once termed the abiding significance of Indian village life. Our modern industrial mania is beset with the greatest danger of breaking up village family life. It draws away the best part of the labouring population to the towns and these begin to prefer the excitements offered in a town to a peaceful and an uneventful village life. The consequent disgust of village life is a grave economic and national danger. Whether we can prevent our present economic transitional conditions from effecting the impending changes is a question which time will decide.

If it is then our aim to turn out better villagers it is interesting to find that the work of Booker T. Washington has great lessons for us. He was the manager of the Tuskegee Institute where his brother Negroes were taught brick-burning, house building, farming and dairy work. He bought several acres of land and received boarders both from the north and the south of the U.S.A. At the beginning he was very much discouraged as the Negroes looked down upon the manual work done at the institute. It is very

inspiring to read in his autobiography how he made his boys cook their own food, make their own beds, build their houses and he combined elementary education with a highly useful course of vocational training. Probably the greatest feature of American institutions is the increasing emphasis laid upon a vocational training in schools. Even in the secondary schools of England, attention is being paid to the absence of manual work and ways are being devised for its introduction. It is also being recognized that the elementary school teacher should be more of an artisan and a craftsman than anything else. The opening of vocational schools in our country will help us in preserving the solidarity of our villages and it is therefore a question of the highest national importance.

With the present state of our elementary schools, it is now apparent that we must take a more comprehensive view of our village schools and the village schoolmasters. The teacher is there not merely to instruct the pupils in the three R's, but also to attend to the larger needs of the village. He is in a way the most educated man of the village and he can help his fellow-villagers not a little if he is put into the way of doing it. The schools no doubt are popular when efficient instruction is imparted; but what is emphasised is that the teacher can make himself more useful in (i) certain agricultural problems, (ii) doing something towards medical relief and (iii) general education of the villagers.

If to every school are attached two or three acres of land and if the teacher has an elementary knowledge of agriculture, practical gardening can be taught. Practical gardening is a very important problem in Indian villages. Every ryot could raise a crop of vegetables and thus save money. It is, as Mr. Sam Higginbottom pointed out at the Delhi Agricultural Conference, what is not done by an average villager. A little training in "first aid in accidents" to these teachers will be a great source of

help to the villagers. It is almost pathetic to find that even ordinary cases which can be attended to by a layman are so neglected that they develop into serious diseases. The teacher can not only help his pupils to learn something of agriculture but can help the local ryot if he is sympathetic and tries to get acquainted with the conditions either by study or by reference to higher authorities. A few selected teachers will be immensely benefited if they undergo some practical training in an agricultural farm for a short period. It is almost a commonplace of Indian Economics that the Indian ryot follows a new device in agriculture if the truth of it is only demonstrated to him. The number of agricultural farms is infinitely small for the demands of the country. It is no exaggeration to say that with proper co-operation of the Agricultural, the Educational and the Revenue Departments, the elementary school teacher is in a position to be a great source of help.

The villagers because of lack of education move slowly like peasants in general. The teacher can here also do his bit to dispel this ignorance. It is not impossible to hold evening classes or night schools for the villagers, who wish to be informed of principles of hygiene, ordinary agricultural questions and questions of general importance like the war. The villagers have begun to take a lively interest in current problems but what one fears is that it might not help him to reconcile himself to village conditions. The question of evening classes is so important that the Haldane Commission of the University of London declares that the State must spend its money in opening special laboratories and technical classes for the working men of London. Let us take a school with two teachers. It may be experimented if one of the teachers can work only in the morning and then hold a night class under the direct auspices of the school authorities. In a range in which I was working there were three schools in which the

teachers used to have classes every Saturday night. I used to write essays on subjects like malaria, manures and they were read at those classes. Several pamphlets from the Agricultural Department were secured, read and explained to them. These classes were much appreciated by the people who attended them and a propaganda of this kind will result in a greater literacy of the people. When the pupil leaves the school at an early age, he has a tendency to lapse from literacy to illiteracy. Such a boy is like one who builds the walls of a house but neglects to raise the roof.

To keep up the literacy of people, the use of newspapers is an invaluable aid. At present, a paper like the *Andra Patrika* can be read by the few and not by the many. The editorial, a man of average attainments can never stumble through. The difference can be seen at once in an ordinary English newspaper which can be understood by a man who has read up to the 5th or the 6th form. Readable and intelligent newspapers are great necessities in the rural parts. Some association, officially or unofficially, can publish a sheet of news once a week or a fortnight and the distribution of such papers at a cheap rate will be welcomed by the villagers. This leads to the question of village libraries and reading-rooms which would create a real public opinion and furnish a new link of unity. Magic lantern lectures under the auspices of these associations would tend to raise the general culture and intelligence of the people.

The corporate life of a village school need not be neglected. At present, as most of the schools have been started recently, attention is being paid to their numerical expansion rather than to any details. The corporate life of any school is largely dependent upon a hostel or a boarding-home attached to it and upon certain out-door exercises played by the boys. In villages there is no necessity for a hostel; only in special cases where the boys come from villages of 7 or 8 miles

Reference has now been made in general to the extensive popularity of the humorous man. Now if particular professions or departments of human activity are taken into consideration, it is found that humour is a great desideratum for success. The Gentleman of the Bar who has a capacity to give a few humorous touches to his cases either in connection with the examination of witnesses or in the course of his arguments commands wide practice and fails not to bask in the sunshine of the favour of the serious solemn-faced "Man of the Bench" to whom he renders invaluable aid by relieving His Lordship of the lion's share of the monotony of court drudgery. We are aware of the immense popularity in this Presidency of Mr. Eardley Norton to whose success at the Bar, a keen sense of real humour has made a fair contribution. The Doctor of Physic who greets the suffering patient with a few choice humorous remarks is really administering the sufferer a healing balm whose properties, no text-book on the Science of Æsculapius has definitely formulated. The poet and the critic, the historian and the journalist who employ humour profusely in their writings may rest themselves assured that the fame of their compositions will long outlive them. However much serious authors might think of "soaring above the Aonian Mount in things unattempted yet, in prose or rhyme" their works could never become the favourites of the general public to the same extent as Cowper's John Gilpin and Goldsmith's Madam Blaize, the Essays of Elia and the Novels of Dickens. The enviable reputation of even statesmen of the type of Abraham Lincoln was in no small measure due to that fine sense of humour which exhibited itself in their professional activities. The soldier who

maintains an irrepressibly cheerful and humorous spirit at the front, giving the enemy's shells names and nicknames, is sure of avoiding blunders in action which are often occasioned by the excitement of the battle and can be relied on to manifest a similar coolness in the thick of the fight. The school-boy who gives rein to his humour with due deference to the rules of discipline will find himself the favourite not only of the sympathetic teacher who recognises in him at school, the prototype of his little son at home but also of his fellow-chums who are even prepared to pass his blunders for a virtuous type of boldness. The lady of the house who knows a good laugh is according to Thackeray a sunshine in the house while a woman without a laugh in her is the greatest bore in existence—"a wet blanket on the kindly nuptial couch," in the cynical language of that great writer.

From the above, the desirability of all men and women engaged in public or professional work cultivating humours becomes evident. Popularity is generally the criterion the public adopts in judging the success or the failure of an individual's work and there is no surer road than real humour to the gates of popularity.

III.

Though humour is appropriate for all professional men, there is greater appropriateness for it in the pedagogical profession because of the peculiar character of the teacher's environments. While the lawyer's environments are litigants among whom might even be found hardened criminals, while the doctor's are patients some of whom might by the very nature of their complaints have lost their mental equilibrium, the teacher's transactions are with a set of adolescents whose

activities are characterised by a lively sense of optimism. So while a considerable portion of the lawyer's and the doctor's wit and humour may turn out to be pointless and irrelevant, may fall flat on or be not properly relished by their clients and customers, the teacher can have the full consolation of satisfying the requirements of his environments whose very nature makes them more fitted to revel in mirthful ideas. Psychologists like Professor Stanley Hall have very elaborately taught us the manifold forms in which the unbounded enthusiasm of the adolescent period exhibits itself. The inquisitive mind that at this stage likes to dabble in puzzles and problems, riddles and conundrums, will also be attracted irresistibly to any manifestation of humour or wit. In these circumstances, the teacher has decidedly an advantage and therefore the need for his cultivating humour is undoubtedly more imperative.

What then are the special advantages of a teacher being humorous? The quality of humour is twice blest—it blesseth him that gives and him that takes—it showers its beneficial effects both upon the teacher and the taught.

So far as its effects upon the person of the teacher himself are concerned, it may be pointed out that humour acts as a stumbling-block to the development of such vices as self-conceit, pedantry, and mental dejection with which the profession of teaching is often credited. That the necessity for moving with intellectual pygmies during the major portion of their lives has fostered the growth of pedantry and conceit in teachers is evidenced by what Charles Lamb himself, whose humour induced him to hate all affectations, has to say. Says he, "We are never at our ease in the presence of a schoolmaster because

we know he is not at his ease in ours. He comes like Gulliver from among his little people and he cannot fit the stature of his understanding to you. He is so used to teaching that he wants to be teaching you." Teachers who can boast of real humour will never fall victims to such weaknesses as their sense of humour will only instigate them as in the case of Lamb to despise all such artificialities. There is a good deal of truth in the statement made by a great writer that a humorous man can never be self-conceited. The possession of humour pre-supposes the existence of a keen spirit which, though it sees things in unusual combinations, understands them in their true proportions.

Again, we have heard it often asserted that the teaching profession, though the noblest of all professions, is the sorriest of all trades—that it is a case of "milking the bull" leading to material difficulties and mental disappointments. If this be true, teachers in the natural course of things may deteriorate into a set of ill-tempered and unsympathetic specimens of humanity, with inclination for neither work nor society. Imagine then for a moment the still more pitiable condition of the country's prospective citizens, committed to his care! This side of the picture has been properly represented by Dr. Channing who contends that a boy compelled for six hours a day to see the countenance and hear the voice of a fretful, unkind, hard, or passionate man is placed in a school of vice and by Sir Joshua Fitch who says that if the pupil discovers that the acquirement of learning has made the teacher's life gloomy he will surely acquire a dislike for knowledge and arrive at the conclusion that it cannot be such a cheering and beautiful thing after all. The need therefore for a cheerful and buoyant

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attitude on the part of the teacher in order to induce in his pupils a similar agreeable frame of mind for study is apparent. But how to assume and maintain it if he has his own cares and anxieties becomes an interesting problem for the teacher. Then it is that the cultivation and demonstration of humorous and gay habits will rush to his rescue. While the serious teacher is easily influenced by the Frowns of Fortune and the Marks of Melancholy, the humorous good-humoured teacher can make a bolder stand—can bear the cross more lightly in his professional life.

So far as the effects of humour upon class-work is concerned, it may be said at the outset that it gives a good deal of relief to the hum-drum nature of class-lessons and makes the teacher's performance a display of real intellectual fireworks. "To be wearisome," says Herbart, "is the cardinal sin of instruction. Nothing can stimulate the interest of the pupils in the lesson so keenly, can excite their attention to it so strongly, can impress it so vividly, and can lead them to assimilate it so diligently as the teacher's humour. A humorous teacher finds it an easy task to invest even the driest subject with the greatest interest. Certain topics are very hard nuts for boys to crack; leave them to the humorous teacher who has studied them—be they the flora and fauna of a foreign land or the economic legislation of a distant age. He knows how and when and where to insert the plums that would make the cakes attractive. "Promise children some pleasure," says Fitch, and they will find no difficulty in remembering things. Lessons like those on Literature and History in the course of which the teacher has often a tendency to adopt the expository method of instruction can rarely be effective unless he relies

upon his sense of humour which selects for him the most effective epithets and expressions for the occasion—which adds a charm to his similes and metaphors, his epigrams and explanations—which infuses life into his illustrations and narratives—which enables him to inspire his boys with appropriate gestures and tones. There is no strain in following even the most abstract subject, if the lecture upon it is delivered by a man of real humour. On the other hand how often could we ourselves plead guilty to the charge of having given way to the "honey-heavy dew of slumber" when attending to even easy arguments, owing to a little lack of humour on the part of their erudite exponent?

It should not also be forgotten that the training received by the pupils from the class-room of a humorous teacher is of such a nature as to develop in them various valuable powers as of observation, imagination, and criticism—powers that will surely stand them in good stead when they grow up. Such a training will also instil in young minds a mania for the study of literature for it goes without saying that a considerable portion of the best literature of every civilised country or community consists of compositions wherein the humorous element predominates.

Mention must now be made of humour as a mild weapon at the disposal of the teacher for preserving discipline in the class-room. A humorous teacher as a rule will have only very few occasions to notice flagrant breaches of discipline in his class for he is generally very popular among his boys. Humour, if it be of the right kind, is surely an evidence of sympathy. Charles Lamb never hated another and was never hated by anybody. The humorous schoolmaster is in close sympathy with his pupils whose sympathy he enlists in

return and therefore it is that he seldom falls a victim to any unpleasantness that may be occasioned by strikes or similar strained relations between the teacher and the taught. And if at all there be a boy in his class making faces at another or screwing the ears of a fellow-chum when the lesson is being taught, he can easily reclaim him by a dose of humour from his mischief, without making him resent the punishment and much interruption to the continuity of the lesson.

IV.

Thus far, I have been speaking of humour in general and its suitability to form part of the mental equipment of a teacher. A few remarks here, before concluding, by way of caution will not be out of place. Some teachers are fond of indiscriminate joking and as Burnett says, "it is contrary to sound theory," and is a somewhat dangerous expedient. We would do well therefore to bear in mind three important principles before giving free-play to our humour.

The first is that the humour should be 'real'—that is, it should belong to the types singled out in the beginning as forms of genuine humour. It should be light—should never border on irony on the one hand; it should be born or artificial—never be unconscious on the other hand. Teachers who employ satire of the most despicable kind as punishments intended to work upon the sense of shame are according to Fitch only degrading an entire community when they enable its members to get any amusement out of the procedure of justice or out of the sufferings of a criminal.

It was only a few days back that I happened to hear of a teacher working in an orphanage asylum who, seeing a barber-boy not holding his pencil properly, flung one of his ironical darts at him to be enjoyed by his class-mates—"He does not know to hold his

pencil properly but he may wield his razor very well." However such a punishment is surely barbarous and the proper place for that teacher is an 'asylum' other than the orphanage.

Again, sometimes teachers fall victims to unconscious humour in the class-room, either owing to the force of habit or mannerisms, or inability to keep discipline or want of previous preparation at home. Sometimes, unconscious humour exhibits itself in the class-room when in every sentence you utter, you introduce a number of "of courses" or "you sees" or "so forths"—their exact number being counted only by your boys. Sometimes again, it shows itself in oddities of movement or eccentricities of manner. Text-books on method have rightly denounced them outright and our training institutions have rightly attached a great importance to this manner-aspect of a teacher's training.

This kind of unconscious humour is as unpardonable as satirical humour. If satirical humour of the abominable kind alluded to before, would make the teacher an inveterate enemy of his pupils, unconscious humour would make him a merry-Andrew in their estimation. Burnett in his "Essentials of Teaching" refers to the incident of a teacher who was discovered by his seniors in the midst of a scene of hurly-burly and confusion blindly groping with outstretched arms round the walls across the floor in order to illustrate the story of Blind Bartimaeus and Joseph Landon mentions an incident of a whole class being thrown into shouts of laughter by a very short teacher standing on tip-toe against the black-board and saying in all earnestness to his class: "The elephant is fifteen feet high and fancy an elephant three times as big as I am." Though children will work all the better for an occasional laugh 'with' the teacher, they should not be made to laugh 'at' him. Such incidents of unconscious humour

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EDUCATION—ITS MEANING AND FACTORS—II.

By BEFIN B. BANERJI, B.A., B.T.

POPULAR belief always tends to estimate the worth of a man's education by its effect upon his practical life. An educated man is, according to this view, a man whose conduct and behaviour should be more refined, more elevated than that of an uneducated man. But the philosophers from Aristotle and Plato downwards have sought to interpret education in terms of intellectual perfection. "Man's supreme glory" they have said, "is to be a rational being, to know absolute, and eternal and universal truth."

Viewed in the light of modern Psychology, the popular view seems to have a better claim on our attention.

Modern Psychology is principally based on Physiology and Biology. The most important, if not the only principle, on which the whole fabric of the science of Biology is based is the theory of Evolution. According to this theory man is descended from ultra-human ancestors in whom reason hardly existed, if at all, and whose life is a perpetual struggle for adaptation to the environment so as to escape from destruction. Deep down in the biological foundation of our nature, this struggle still persists. "Our sensations are there to attract us or to deter us, our memories to warn or to encourage us, our feelings to impel and our thoughts to restrain our behaviour, so that on the whole we may prosper and our days be long in the land."*

Looked at from the physiological standpoint, we arrive at the same conclusions. "Every current that runs into the brain from skin or eye or ear, runs out again into muscles, glands, viscera and helps to adapt the animal to the environment from which the current came."* The pleasurable or the

painful sensations reach the brain and come out again into smiles or tears. The mental actions are thus conditioned by brain actions. That the mind is influenced by the body is an oft-repeated commonplace. Thus the adaptability to environment depends, to no small extent, on the physiological conditions to which it is subject.

Biology may, therefore, be said to teach us how to adapt ourselves to the surroundings, while physiology determines the difference of degrees of this adaptation in different individuals. And it is on these two sciences that the practical psychologist is trying to build the superstructure of education of the present day all over the world.

Now what is this adaptation to external circumstances? Expressed in every day language it is nothing but conduct or behaviour—behaviour not in the narrow sense of manners, but in the widest possible sense, including every sort of fit reaction on the circumstances into which a man may find himself during his journey through life. And what is the general belief about the end of education? Analysed a little more closely it will be found to accord with the view we have stated above. For, what are our ideas of an educated man? Is it not that he is more capable of adjusting himself to the situation in which he may find himself? His ideas are, we say, more refined, his sentiments more restrained, and his actions better executed. But what do all these mean? Do they not mean that placed in the same situation with an ignorant man, he will more creditably acquit himself in all spheres in which either intellect, sentiment or will is called into play? To enable him to do this in all that he is called upon to do, will, therefore, be the aim of education, or, in other words, the object of education will be to organise resources, or habits, or powers of conduct in man which shall fit him to his social and physical world.

* James—Talks to Teachers.

The economist, the schoolmaster, and the theorist, all took cognisance, though unconsciously it should be said, of this unifying principle in education. But their recognition was narrow and one-sided. The economist aimed at sharpening faculties into earning a decent livelihood, the schoolmaster into sounding the depth of learning, and the theorist into smoothening the powers into an unnatural uniformity.

Again, it is a patent fact that external nature reacts differently on different individuals. The drooping plant which is an object of superstitious awe to the vulgar is an illustration of the nervous response to the scientist. An apple falling from a tree had nothing to attract the notice of generations of men, till a genius found in it the key-note to the planetary movements, the position of the "star-spangled firmament" and even the very existence of the universe itself. The growth of genius which the theorist could not explain through "the harmonious development of the faculties" is, according to the psychological view we have adopted, nothing but a special adaptation of a prominent trait to the external circumstances with which he may come in contact. Such adaptations may appear miraculous to an ordinary man, but to the genius himself, it is as natural as a slap bringing tears to the baby's face, and an addition of wealth, a beam of delight to the miser's countenance.

(To be continued)

In Active Preparation.

COLLEGE ALGEBRA

A Text-book for the Intermediate and

B.A. Classes

BY

K. R. RAMASWAMI AIYANGAR, M.A., L.T.,
Professor of Mathematics, College of Engineering, Madras.

Printed by Varadachari & Co., Madras

HISTORY OF CHEMICAL ELEMENTS.

IN the ancient days, men with pursuits in politics, philosophy and mathematics were reputed and became famous. Dyeing, tanning and bronze founding, etc., are all industries which boast of a remote antiquity, but the early practice of these arts was confined to men with no social status. Even to-day in India, the actual practice of what we now call the "Commercial Chemistry" is in the hands of the uneducated. Saltpetre industry in India forms an excellent example of a purely empirical method which has been elaborated by the accumulated evidence of centuries, but the *rational* of which has been made clear by Modern Biological Science. The philosophers theorised and speculated, but seldom experimented themselves and observed in a systematic manner and thus they failed to obtain an insight into the true nature of things.

Men at last recognized that it is only by systematic observation and experiment that progress could be made and it is to the recognition of this truth and the new departure of ideas that we owe much of what we value in modern civilisation.

I shall now trace, in one direction only, the steps which have been made in our knowledge of the composition of matter from the ancient times to the present day.

We shall do this by examining what ideas the old philosophers entertained, and how these views have been changed, by the gradual application of these modern instruments—observation and experiment.

About the 6th century B.C., there were two schools of philosophers in Greece—Ionists and Eleatics.

The former believed that diverse things around them as made out of one common principle, and they sought to evolve order and simplicity out of the apparent diversity in

terms of this common principle. Thales of Miletus asserted that water was the substratum (first principal element) of all things from his observation of natural phenomena, while Anaximenes, on the other hand, regarded air as the primary element and Pythagoras selected number as the one real thing in nature. The latter (Eleatic) school founded by Xenophanes did not attempt to explain the material universe, but they espoused a philosophy of an essentially negative character. Assuming unity and immutability in the universe without attempting to specify or explain further either the one or the other, they maintained that change and the apparent diversity of things are inexplicable delusions of the senses.

Later in 440 B.C., Empedocles took the *via media* and aimed at a rational explanation of the diversity and change in the universe, and introduced the idea that all things were made up of four elements—air, fire, water and earth. To explain the changes taking place in diverse materials, he introduced two other rival elements—love and strife—the former causing attraction and the latter disruption.

We now come to the days of Aristotle (385—322 B.C.) who popularized the views of Empedocles in a modified form. All substances were regarded as portions of one and the same fundamental matter modified by the greater or less quantities of the four "elementary principles"—air, fire, water and earth—which it had impressed on it. It must not be supposed that Aristotle expressed the exact ideas we now attach to these terms, but rather intended to typify the conditions of matter than to describe the different forms of matter itself.

This purely abstract conception of elementary principles might have been possibly borrowed from us who have five principles—*Pancha Maha Bhudhas*: Prithvi, Appu,

Theyu, Vayu and Akhasa, with properties Saptha, Sparisa, Rupa, Rasa and Ghantha. "But for the sake of historic accuracy it is well to remark that the fundamental conception on the nature of the universe attributed by almost all historians to the Greek philosophers, have their origin in India. The Indian civilization was in some of its manifestations, especially in the realm of arts, superior to that of Egypt. It is maintained in various Indian writings even previous to the days of Thales and Anaximenes, that the whole world is composed of four elements—air, fire, water and earth; and that everything is produced by their union. To the Philosophy the sect of the Djainas added a fifth element—the ether, whilst Buddha (623—543 B.C.) introduced a sixth, consciousness."

(1) Akhasa (ether)—represents the property (Saptha) audibleness.

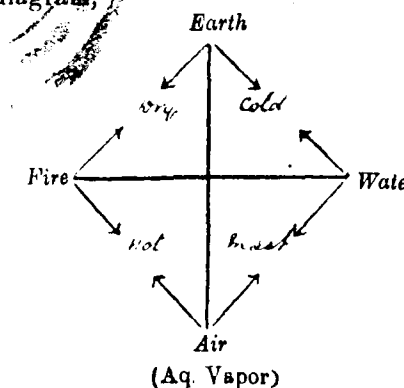
(2) Air—(Saptha and Sparsa) audibleness and tangibility.

(3) Fire—(Saptha, Sparsa and Rupa) audibleness, tangibility and colour.

(4) Water—(Saptha, Sparsa, Rupa and Rasa) audibleness, tangibility, colour and savour.

(5) Earth—(Saptha, Sparsa, Rupa, Rasa and Ghantha) audibleness, tangibility, colour, savour and smell.

But to the Aristotelians, as exemplified in this diagram,



Earth signified dryness and coldness; Water, coldness and moistness; Air, moistness and hotness; Fire, hotness and dryness. Accordingly, it was held that one specific kind of matter could be totally changed into another by altering the proportion in which the principles had been impressed on the fundamental matter of the first substance. They exemplified their ideas by showing that water became air by increasing heat (i.e.) decreasing coldness, and became earth (*Rock-crystal*) by increasing coldness and removing moisture.

One important point to note here is, according to their ideas, as these four elementary states or conditions are mutually convertible—*transmutation is possible*.

Thus, we see the philosophers having no recourse to experiments and exact observations asserting purely out of reasoning, the possibility of transmutation.

Sir H. E. Roscoe and others think that the universal acceptance of transmutation retarded the true progress of science for 20 centuries, but we have to view from another standpoint. It led people to experiment and observe having as their sole aim the transmutation of material things—especially baser metals into gold.

The practice of Alchemy had been carried out in the East—India and Arabia. I shall not trace now the processes of the alchemists in their attempts to prepare a powder—*Philosopher's stone*, which was to have the power of fermenting millions of times of its own weight of fused base metals into gold.

There is no record in the history of the Western Chemists till the 15th century A.D., but undeniable proofs have been adduced by Sir P. C. Ray, of the practice of alchemy, metallurgy, medicine and surgery even before the 3rd or 4th century A.D. not to speak of the pre-Christian era.

At least in the West, alchemy was kept in abeyance during the 15th to 17th century in preference to the search of *elixir vitae*, a medicine to grant perpetual youth. But still alchemy was not given up entirely and there were eminent scientists—Davy, Dumas, Bergmann and Woulfe who could not bring themselves to utterly reject the idea of the possibility of transmutation. When one recalls the modern work on the marvellous effects of "*traces of impurities*" in altering the properties of large masses of matter, one can scarcely be surprised at the attitude of the alchemists.

In view of the many transformations which radium undergoes, many view that transmutation of metals is a possibility. But it is more reasonable to suppose that our definition of elements must be altered to suit the present ideas as we may presently see.

To continue our discourse, we shall now consider how the truth was arrived at, and when men became convinced that such transmutations as air into fire and water into earth could not take place.

It must, however, be remembered that the supporters of the theory of Transmutation were not without their experiments, although their conclusions were erroneous. The experiments from which they drew their conclusions that water could be converted into earth were of two kinds—(i) one based on the growth of plants, (ii) the other based on the frequent distillation of water in glass vessels.

The foremost among those who during the middle ages supported this doctrine of Thales—that water was the basis of all things—was Jean Baptiste van Helmont who lived in the 17th century.

He took a given weight of dry soil—200 lbs., and into this soil he planted a willow tree that weighed 5 lbs., and he watered this carefully from time to time with pure rain-

water, taking care to prevent dust or dirt falling on to the earth in which the plant grew. He allowed this to go on growing for 5 years, and at the end of that period, thinking that his experiment had been conducted sufficiently long, he pulled up his tree by the roots, shook all the earth off, dried the earth again and weighed the dry earth and plant separately. He found that the plant now weighed 169 lbs. 3 oz., whereas that of the soil remained very nearly what it was—about 200 lbs. It had lost only 2 oz. in weight.

He therefore concluded—and very rationally according to his lights—that the whole plant, the roots, the leaves, the bark, and branches were all produced from the pure rain water which he had added from time to time.

But we now know that his explanation was an erroneous one. We are now aware that the main source of the food of plants is in the colourless gas—carbon dioxide—contained in the air, the presence of which may be easily shown by the formation of a white deposit when a little limewater is shaken with air. Plants and animals respire—breathing in air and breathing out air containing more of carbon dioxide and less of oxygen. The plant in the sunlight is able to decompose carbon dioxide, and from it forms its branches, its leaves, its bark, or the greater portion of these substances, and this is the true source of the carbon contained in the plant.

(2) The second of the experiments to show that water turned into earth was that of distillation. Robert Boyle whose name is familiar to every one of us, describes a series of experiments in which he distilled pure rain water, very frequently in a glass

vessel, and on re-distilling it several times he found that a white powdery substance was left behind each time the water was evaporated. The oftener he distilled the water in this vessel, the larger became the quantity of this white powder.

Now then, the question arises, how were these views put an end to, and how did we arrive at the conclusion that this white powder which was formed after the distillation was nothing else than a portion of the chemical constituent of the glass which had been dissolved by the water in its boiling in the glass vessel? This investigation was undertaken by the great French chemist, Lavoisier, nearly a century later in 1770. For you to-day, it is a simple matter; but it was in those days not plain and was a very important matter to decide.

Lavoisier weighed an empty glass vessel, placed some water in it, and fastened it up very carefully, and reweighed. He kept the whole apparatus over an olive oil lamp kept at a temperature below the boiling point of water. After a few days, he observed turbidity in the water, and little white specks separated and floated about. He began his experiment on the 24th October, 1768, and kept the water hot, day and night till the 1st February 1769—full 101 days. The object of this experiment was more to decide the truth of the statement prevalent in those days (1) that an increase of weight is observed in a heated body, (2) and that this is due to the action of the heat upon the body inside the glass. It was one of the suppositions of Boyle that some igneous particles were able to pass through the glass into water and they were precipitated as white powder when they came into contact with water!

Lavoisier argued that if any new thing is introduced into the water, after prolonged heating for 101 days, the whole apparatus must weigh more, and so he weighed the apparatus immediately after the experiment. Before the experiment, the apparatus weighed 5 lbs. 9 oz. 4 dwts. and 41.75 grains and after 5 lbs. 9 oz. 4 dwts. 41.50 grains—showing a loss of weight—0.25 grains which he attributed to the error of his balance. Hence he concluded that the white particles, be they caused by what they may, are not caused by the igneous particles passing through the glass.

To see where they came from, he weighed the particles alone and they weighed 4½ grains. Before the experiment the glass vessel weighed 1 lb. 10 oz. 7 dwts. 21.5 grains and afterwards 1 lb. 10 oz. 7 dwts. 4.12 grains, so that there had been a loss of 17.38 grains, showing quite clearly that something disappeared from the glass. He evaporated to dryness the water and this left 13.26 grains (actually 15.5 grains owing to further dissolution) making up the total loss in weight of the vessel.

Thus he proved that the idea of transmutation of water into earth is incorrect.

At the same time that Lavoisier made this experiment, Scheele (Swedish apothecary and discoverer of chlorine) made analogous experiments independent of those of Lavoisier, and he was able to do more. He analysed both the white powder and the substance dissolved in the water and showed specifically that they were both made up of the same substances which are contained in the glass. Now to trace the progress of chemical knowledge about the composition of bodies, the dawn of scientific chemistry begins with the Hon. Robert Boyle (1626—1691) and

the publication of his book "The Sceptical Chymist."

Boyle upholds the modern view of elements defining them as certain primitive and simple bodies which, not being made up of other bodies or of one another, are the ingredients of which all those called perfectly mixed bodies (compounds) are compounded and into which they are ultimately resolved.

Since Boyle's days, the steady growth of the conviction that gold and silver and all the other metals are simple, undecomposable, indestructible forms of matter created once for all in fixed and unalterable quantities by a special act of creation has been contemporaneous with the gradual recognition by the public of the futility of alchemic aims and of the deceptions practised by the pseudo-alchemists. As I have already told you, even to-day there are men among us and in the West who firmly believe in the quadrature of the circle, possibility of perpetual motion and philosopher's stone.

But Boyle was the first to draw a line of demarcation between mixtures and compounds, and to distinctly state that peculiar properties of substances disappear on the occurrence of chemical combination. He further advocated the pursuance of the science of chemistry independently of utilitarian ends.

It is not possible for me, in the short space at my disposal, to give an account of the chemical elements in their turn. I can only explain to you some of the general facts at which the chemists have arrived with regard to the elementary bodies. It is absolutely impossible to state definitely the number of elements; indeed the practical proof of the simplicity of a given matter is one of the hardest tasks that falls to the lot of the chemists. Some of these elements are very

well known to you, such as sulphur, copper, etc., some are less known, such as beryllium, lithium, selenium, tellurium, etc., most of them are solids, a few liquids, whilst some, such as oxygen, nitrogen, hydrogen are colourless gases, and so on.

At the time of Lavoisier, the list of elements contained only twenty-six members, including heat and light which are now known to be forms of energy. To-day the number of unequivocal elements is about 88. This uncertainty arises from the fact that it has been found, in recent years, to open a suspense list for the temporary accommodation while *sub judice* of the many new claimants for elementary distinction, and opinion is divided as to the exact number of elements which ought to be suspended.

To give you some instances from the earlier period until 1811 when Davy introduced the powerful analytic method of electrolysis into chemistry, the alkalis, potash and soda, and the alkaline earths, baryta, strontia and lime, were regarded as elements and chlorine as an oxide of a hypothetical element—*murium*. The establishment of the compound nature of the alkalis and alkaline earths, and the simple nature of chlorine was attended by important modifications in the theories of chemistry. Nitrogen was for a time deprived of its elementary dignity,—being regarded as an oxide of the unknown element *nitricum* and even the elementary nature of undoubtedly simple substances as hydrogen, phosphorus, and sulphur, was for a time called into question by Berzelius.

Even when two naturalists agree to the absolute number of unequivocal elements, it does not follow that they favour exactly the same elements. One may favour the advancement of the element A from the suspense to

the established list, while the other may think the evidence incomplete in the case of A but satisfactory in the case of another claimant B.

As I already told you, it is impossible to say the number of elements existing on the earth. Man has the power of penetrating only a small fraction of the total bulk of the earth, so that looking at the extremely small portion of the earth's crust with which we are practically acquainted, it is very likely that there may be a greater number of elements existing whose presence we have not yet recognized. There is one more reason for coming to the conclusion. Our methods of examination are in many cases very crude and it is possible that, under these circumstances, we altogether ignore the presence of some elementary body which with other substances we may be handling every day.

I shall try to make this clear by analogy.

Imagine that I take a dozen cart-loads of common salt to the Red Hills and empty them into the tank there which supplies you with drinking water. You cannot find any difference in taste although the whole of the salt is evenly distributed. The presence of the same in the water may be made evident by the addition of a few drops of silver nitrate solution. If instead of 12 cart-loads I put in one cart-load, silver nitrate may not indicate the presence unless I concentrate the same water to a small quantity and then try the experiment. But if I should put in only a handful of salt or one crystal of salt, how can we detect its presence?

A test, similar to the silver nitrate test, for the detection of minute quantities of elements is the spectroscopic examination and the finer X-ray spectrum examination. But we have

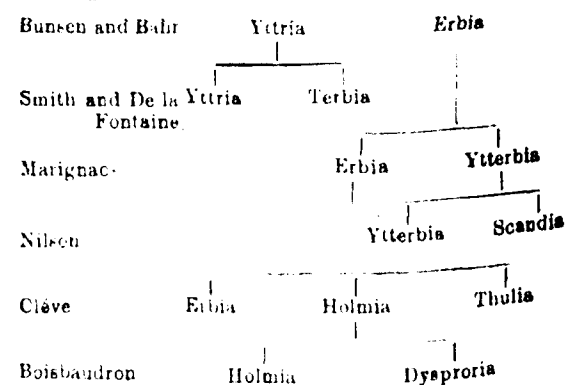
nothing analogous to find the presence of a very small quantity of salt in a lake of fresh water.

Many of the elements constituting the suspense list are not known in the free state but only in combination with oxygen in the form of very refractory (*i.e.* difficultly reducible) oxides—rare earths. The most important sources of these rare and doubtful elements are the minerals gadolinite, cerite and samarskite.

From gadolinite, Bunsen and Bahr isolated the two new earths *yttria* and *erbia*. These they regarded as the pure oxides of new elements which they called *yttrium* and *erbium*, but they did not isolate these elements. Soon after this isolation, Smith and De la Fontaine succeeded in separating from *yttria*, a new orange coloured earth, *terbia*, leaving a residue of perfectly white *yttria*. Marignac succeeded in resolving the *erbia* of Bunsen and Bahr into what he called true *erbia* and *ytterbia*.

Nilson then found that *ytterbia* was non-homogeneous and split it up into true *ytterbia* and the earth *Scandia*. Clève, in making a spectroscopic study of Marignac's *erbia*, came to the conclusion that it was not homogeneous, but was a mixture of true *erbia* and two new oxides, *holmia* and *thulia*. Finally, de Boisbaudron brought forward reasons for suspecting the integrity of *holmia* which he ultimately resolved into true *holmia* and *dysproria*. [Note:—This little sketch does not include all nor nearly all the rare earths but it is intended to be illustrative rather than encyclopædic.]

To give an illustrative sketch:—



Thus Bunsen and Bahr's original two alleged simple earths were proved to be mixtures of at least seven distinct oxides.

Many of these oxides and therefore presumably the metals which they contain, are so similar in their chemical properties that they can neither be separated nor distinguished from one another by ordinary chemical operations or tests. Their discrimination would demand the subtle searching power of the spectroscope with X-rays and even then our most refined experimental methods would fail to establish conclusively any difference in their atomic weights.

To give you an idea of spectrum analysis, according to the modern theories, light is produced by periodic vibrations of the ether; and light waves in the ether can be inaugurated by the motions of very small particles—atoms or infra-atoms—vibrating. Each particle of matter vibrating with the right frequency can set up the periodic vibrations in the ether which we call light. The different vibrations are sorted by a glass prism as spectral bands and lines—each particular band or line as an effect of the periodic vibrations of the atoms. In X-ray spectra, it is found that when X-rays fall upon a crystal, a diffraction spectrum is pro-

duced, in just the same way as when ordinary light falls upon a ruled grating the two phenomena are similar to one another, but in the case of X-rays the linear dimensions are about 10,000 times smaller. The constancy of the spectral lines in the spectrum of a gas shows that the internal motions of the atoms of a molecule must be remarkably regular. The large number of spectral lines in the spectra of many elements, *e.g.* iron, show that the structure of the atom must be remarkably complex. This implies that the atom is a complex system made up of vibrating corpuscles like a planetary system. This leads some chemists to suppose that there are indications of non-homogeneity of elements.

Periodic law is perhaps the greatest chemical generalization of modern times. In the tabular scheme of Mendeleeff as the expression of this law, only 6 rare earths Y, Yb, La, Ce, Th, Zr, are admitted and there are vacancies left for a limited number of other elements, unless the new elements have atomic weights greater than that of V, which has the highest at. wt. 240 of all known elements.

Generally the upholders of this law are averse to the idea of any great increase in our commonly accepted number of elements. None of the above noted rare earths, yttria, etc., would be accommodated in the table.

The recent work on the rare earths, combined with the results of application of the spectroscope to the investigation of the stars and nebulae has resulted in the modern view of the nature of elements which approximates to the ideas of the early Greeks, in so far as they postulate one fundamental matter. The philosopher Anaximenes regarded air as the primal element, Herakleitos, fire; Pherekides, earth; Thales of

Miletus, water; later Prout in 1815, 1816, hydrogen; and modern chemists, electrons, magnetons, and possibly ether.

I may say a few words about Prout's *Hydrogen Theory*—the elements are different aggregates of the atoms of primordial hydrogen; and in consequence, within the limits of experimental error the atomic weights of the different elements should be expressible by whole numbers when the atomic weight of hydrogen is unity. Many scientists were attracted by the apparent simplicity of Prout's hypothesis until Dumas, Marignac, Stas (1860—65), with more refined data proved the hypothesis to be mere illusion.

The atom of an element can to-day be defined as a substance whose parts are held together by a force superior to any which has yet been brought to bear upon it but representing the limit of chemical decomposition. Much circumstantial evidence has accumulated in recent years which makes us believe that all different elements have been formed from one homogeneous simple primal form of matter which Sir W. Crookes calls protyle (1886).

He regards all elements as having been gradually evolved from this protyle; the heavier elements such as bismuth, thorium and uranium, being the younger species; and the lighter elements lithium, boron, etc., being the older. This is from the analogy of nebulae. Sir N. Lockyer (1887) states that "the spectra of the earlier nebulae consist of 3 lines: one corresponds with hydrogen, while the others belong to two unknown elements. As the nebulae grow older and more compact, two more corresponding with hydrogen and helium appear."

A consequence of the adaptation of this theory is that what we are accustomed to call

elements ought really to be called "elementary groups;" that what we are accustomed to regard as the atomic weight of an element does not accurately represent the weight of each atom constituting that element but the mean of the weights of the atoms making up a definite mass of the element. Such elements are called *isotopes*.

Elements made up of the same kind of atoms would be defined as "pure" and those comprising different kinds of isotopic atoms as "mixed." Of course such a conception is contrary to the fundamental idea implied by the term element. It must be pointed out that this new conception, like the old, rests on purely experimental basis. Our analysis of matter can never be ultimate as the term elements imply, but whether pure or mixed, it represents the ultimate limit of chemical analysis.

I may now summarize the present views regarding elements and their isotopic forms from the known fact.

1. The number of the elements is 92, four of which are as yet unknown;
2. Each of these elements is characterized by definite chemical and electro-chemical properties by its ordinary and X-ray spectra, and by its nuclear change;
3. The atomic weight and radio-active properties are not characteristic constants;
4. The number of varieties of atoms is greater than the number of elements, and up to the present some one hundred and twenty varieties have been identified;
5. An element may be pure or mixed; the constituent atoms of a pure element are similar, whereas a mixed element contains two or more kinds of atoms which differ in weight

and in radio-active properties or possibly in respect of both these qualities;

6. In chemical reactions, the active mass of mixed elements is represented by the sum of the active masses of the different varieties of atoms.

If we accept the bold application of the evolution of the elements, we are *not at all justified in speaking of matter as inanimate*.

According to the radio-active advocates, the atoms of the elements are born, undergo secular vicissitudes, and die. The rare elements may be strictly compared to rare plants and animals, in that they are simply examples of special kinds of atoms that have failed to harmonize with environments. The experiments of Sir J. C. Bose that metals have sensation and that they can be poisoned and killed like plants and animals, further support this view.

T. S. NATARAJAN.

Lower Secondary Arithmetic

BY

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THE CHARACTER OF RICHARD IN SHAKESPEARE'S RICHARD III*.

IN Richard we meet with a man, for one thing, of the strongest possible will-power. He clings to his purposes with a pertinacity and singleness of aim rare to be found elsewhere. And of no man else could it be more truly said, than of Richard, that where there is a will there is a way. For in order to put into execution what his will determines upon, he calls up from his inexhaustible resources, ways and means which strike dismay in his enemies and admiration in third parties. To put Clarence out of the way,

Plots has he (have I) laid, and inductions dangerous,
To set his (my) brother Clarence and the king
In deadly hate, the one against the other.

And in order to gain his end he counts on Edward being as 'true and just' as he is "subtle, false and treacherous." Again to foist the guilt of the murder on the queen's party, he counts on their stupidity. He also takes time by the forelock, employs fit engines of crime and murder and before the countermand reaches the Lieutenant of the Tower sees that poor Clarence is consigned to the "malmsey-butt." But this side of his character is seen in greatest relief in his wooing and winning Lady Anne. He is, as Prof. Boas well observes, sure of his success from the first, and goes about his work as carelessly as a master-workman about a trifling piece of his professional task. He first denies his guilt in the murder at Tewkesbury. But, presently seeing that that does not succeed, and that Anne could cite the evidence of eye-witnesses, he changes front, confesses the whole guilt, brings forward pathetic self-accusations, flatters his opponent's beauty, sets down his crimes to the influence of that beauty on him, goes so far as to offer to be killed for her love and accomplishes his purpose with a measure of success which Satan

dealing with Eve might well have envied. The whole piece is a minute study in psychology.

Turning to Richard's moral nature, one feels called upon to observe that it is as crooked as his physical frame was twisted and contorted. And this crooked moral nature offers a grave difficulty to those that seek to analyse it. In fact its very existence is extremely difficult of discovery. The one idea which is likely to strike all readers of the play is that Richard has absolutely none such. He does not show, as far as appears on the surface, any the least tinge of morality. He seems to look on murder but as a thing of ordinary occurrence in deciding the fate of kingdoms. He is the most self-centred wretch imaginable. He promises rewards to those who wink at and back up his iniquities; but when the time for rewarding comes he either orders off their heads or is "not in the giving vein." But here crops up a difficulty. It is the question of his dreams. The visions he sees, the appalling nightmares which oppress him and which deny him the balmy sleep are inconsistent with the idea of his being altogether without conscience. The solution to the difficulty here presented can be got, however, from an analysis of the deeper springs of action in Richard. Evidently he effectively curbs the promptings of his conscience with his strong will. He represses it almost to the point of entire annihilation. But conscience has got an opportunity of revenge on him. It takes possession of him in his weakest moments. It seizes him while he is asleep and overmasters him when his will is powerless against his troubled imagination. It gives rise to all sorts of oppressive dreams and succeeds in making a perfect toy of him. And in the final act of the drama he confesses to himself the many misdeeds he stood guilty of and says that if he came out unscathed, from the trial at Bosworth, he would repent and live well. Here then is evidence enough for one to assert that Richard did have a moral side to his character however "cribbed, cabined, and confined" it was.

In this connection, one question of crucial

* Part of a lecture delivered by Mr. P. A. Subramanya Ayyar, M.A., under the auspices of the Shakespeare Society, S. P. G. College, Trichinopoly.

importance in a study of *Richard III* suggests itself. It has been said on very high authority that Richard is the ideal villain in literature; that his villainy is unsurpassed. Now in itself this question does not offer any very serious difficulty. We can easily appreciate and explain the statement if it merely has reference to the cool and deliberate way in which he contrives and commits his murders. He has not got the least compunction in cutting the throat of Clarence. The second murderer is annoyed and made to turn away from his purpose at the sound of the words "judgment day"; he actually foregoes the reward and flies; but Richard not only counsels but himself practises the idea of weeping mill-stones. Again he evinces absolutely no trace of pity in his relations with his nephews in the Tower. Dighton and Forrest,

"Although they were fleshed villains, bloody dogs,
Melting with tenderness and kind compassion,
Wept like two children in their death's sad stories."

Tyrrel too genuinely echoes these feelings. But Richard, on hearing of the murders, expresses his heart's satisfaction and reminds us of Macbeth patting on the back of Banquo's first murderer and saying "thou art the best of the cut-throats." In this sense then Richard is an ideal villain.

His villainy is ideal also in that it takes place entirely under ideal circumstances. The necessities and the opportunities for Richard's villainies are kept remote from the prosaic course of ordinary life so that they are idealised, and in turn idealise the villainies themselves.

But to say that Richard is an ideal villain, because his malignity was bottomed on no motive is to commit a violation of the express meaning of the text. To declare, with Prof. Moulton, that Richard delighted in bloodshed for its own sake seems to be altogether erroneous. Richard has got every intelligible motive for the murders he commits. His ambition for the throne is inordinate. But birth disentitles him to it. He has therefore to remove all those that stand between him and the object of his ambition. Hence the

murder of Clarence and the welcoming of Edward's death. And again, after getting the throne he had to say with Macbeth,

"To be thus is nothing
But to be safely thus."

His fears in the two princes therefore necessarily "stuck deep." And without making short work of them, he could not be

"Whole as the marble, founded as the rock,
As broad and general as the casing air."

The same argument applies also to the death-sentences on Hastings and Buckingham. Richard then committed his murders even for the very reason why Macbeth butchered Macduff's family and Edmund chased away Edgar and winked at the blinding of his own father Gloucester.

It is not quite correct, again, to say that Richard enjoyed the sight of his victims while they were dying. There can of course be no defence of the conduct of Richard in the play. But his confessions of crimes and promises of reform, made to himself in the V Act run counter to the statement that he enjoyed bloodshed. It is true that these confessions and promises were made after a certain change had come over his character; after he had, at the sight of a prospective defeat and death in the battlefield, begun to take stock of the situation and to vow reparation. But they are instances to prove that he did not find his pleasure in the needless shedding of blood. He would refrain from murder if the exigencies of his situation demanded none.

It is therefore never wrong to say that, from the view-point of his contriving and completing his murders and from the ideal circumstances in which his lot was cast and his villainous career set, Richard is an ideal villain. But it seems to be far from correct to attribute motiveless malignity and absolute depravity to him.

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PRACTICAL METHOD IN NUMBER AND SPACE-WORK.

IT is often found that a boy coming from a village school possesses more knowledge of number than a boy in the town school. The former has learnt the multiplication table by heart and the Tamil *arivayal* he has committed to memory and he is so quick at multiplication that he can multiply a number of 6 or 7 digits by a number of 5 or 6 digits. So some of us think that number-work in other schools is not so well attended to. But on the other hand, we have to consider the other side of the question. What we want at number is to make what he has learnt in the school useful to him in his life afterwards. Supposing the former multiplies a certain number by another number which leaves a multiplicand containing 10 digits. What we have to consider in this case is whether the boy is able to express the value of the number, and whether he at that age, would be able to recognise the value, in rupees, seers, or miles, denoted by such a number. Why then should we unnecessarily tax him by giving such mechanical sums? We are to equip him for his future life by way of giving practical sums that will enable him to meet with problems that occur in buying and selling, giving and taking, borrowing and lending, etc.

The practical, the rational or the natural method is that method which does not involve too many processes and complications in arriving at a result, but is the method, which without any difficulty either to the teacher or the taught, conveys the knowledge for easily arriving at the result. In order that the boy may be taught to work out sums in a practical way, it is the teacher's duty to begin number from the infant class in a practical manner. There are many up-to-date books which deal with practical method, while each is lacking in that method which ought to be in the case of the little child natural and practical to him. Practical does not alone mean drawing

lines and squares and counting them, practical does not mean complicated processes in arriving at a result, though they may appear to be reasonable to a reasonable being such as an adult. But, on the other hand, we are forgetting that we are dealing with a young child, and the method adopted to convince us should not be the method adopted by us to convince the latter.

Number concept in block-building, etc. It has been already observed in a previous issue under the head: "Handwork—its place in the Kindergarten Scheme," that the children gain the conception of number in their early period of hand and eye-training. The children are provided with a set of "The Didactic Materials" and other blocks, toys, etc., for their free-play. Through play they learn that a figure of the type $\square$ has four sides, that the figure $\triangle$ has three sides, and that a staircase they have constructed contains four or five blocks of wood as the case may be and in all these cases they are undergoing a training in the conception of number. Moreover they learn the ideas big, bigger and biggest, long, longer and longest, etc., by comparative observation and handling of blocks of various sizes and lengths, etc. Hence they are also being trained to observe that there is a corresponding value to the number, either the one is of greater or of lesser value than the other. Exercises with Montessori's "Geometrical Insets" also impart to them practical experience in drawing, writing, tracing, comparing, etc.

There are other number games as, buying and selling, marching in rows of two or four horses, etc., which each in its own way goes to lay the foundation for exact and practical exercises in arithmetic and these come to them in the most natural way possible. There is no need for the teacher to have a regular lesson in arithmetic set apart in the time-table for some months in the beginning of the school year, and such periods may profitably and more usefully spent in hand and eye-training which has a double-fold advantage.

Regular number lessons succeed these lessons, and the important point to be kept in the teacher's mind is that the method employed should not tax the pupils too much. In so far the pupils understand it is all right. But, when a difficulty arises, all the efforts put forth by a teacher are at a disadvantage. Taking the case of addition there are many methods. One method holds up the use of concrete objects throughout, the second emphasises on the drawing of diagrams and wall charts, and a third says that the boys will in their own natural course learn the process involved in addition and subtraction. Taking the case of the first, ordinary tamarind seeds which are the only concrete material available in a village school, it would rather be an irksome thing to go through the same tamarind seeds every day. The children like to have a variety of materials coloured things, etc., which attract their attention and it is the same case of tediousness in counting the squares drawn on the black-board. There is another method that is talked about, and it is this: To add 6 and 7, the children have to split up 7 into two parts so that one part added to 6 makes it ten and then count the other part. By putting this into practice with children of ages $4\frac{1}{2}$ to $5\frac{1}{2}$ great difficulty will be met with by the teacher in order to carry out these two processes of addition and subtraction in one and the same sum. Here the children can resort to objects. Some raise great objections in counting with fingers. Is that because the children always resort to fingers in counting, or resort to a more mechanical way, or is it anything else? Ten fingers and ten toes are the gifts of God and what then, is the use for them, if the teacher should scold a boy when a child can naturally take interest in his limbs and count with them. These are the concrete objects provided for the boy by Nature. Counting with fingers may be encouraged except in the fourth and fifth classes. Mental exercises play a great part in stimulating the boy for addition and sub-

traction of numbers. The teacher has to frame what are known as "Number Stories" which take the form of problems in the later stages. Addition and subtraction are taught to them simultaneously with concrete objects.

Then comes Multiplication and the Multiplication tables. Multiplication tables are to be formed by the pupils themselves, noted in their books and only then ought to be memorised. Moreover, all the classes in an Elementary school should not be asked to memorise all the tables from 1×1 to 16×16 . The teacher should set apart in different groups, the tables which might suit the age and the capability of the children in their various grades. As for example boys in class II may be asked to form tables 1, 2, 5, and 10, while in the next senior class tables 3, 4, 6, 7, 8 and 9 including the others memorised in the lower classes up to 10×10 . How to form these tables is the next question. As for one, any concrete material will be enough. As for two, each boy has 2 hands, two legs, two eyes, etc., and so, questions like: How many legs have 6 or 7 or 8 boys respectively? may be put to them, at the same time practically counting the legs of 6 or 7 or 8 boys. In this way all the Multiplication tables are to be made up. Supposing, we have to form the multiplication-table 8 and we refer to the number of ollocks in a measure. The natural questions would be to find out the number of ollocks in two measures, three measures, four measures, etc., and so the natural method for writing down the multiplication tables ought to be

2	times	8	=	16
3	"	8	=	24
4	"	8	=	32

and this may also otherwise be understood as two measures containing 16 ollocks at the rate of 8 ollocks a measure, 3 measures containing 24 ollocks, etc. A difficulty may arise in forming the multiplication-tables with respect to the numbers 9, 11, 13 and 14.

The best method would be to deduce these tables from the tables already formed, noted and memorised

9 times	2	=	18
11 "	3	=	33
13 "	4	=	52
14 "	5	=	70
will be same as			
2 times	9	=	18
3 "	11	=	33
4 "	13	=	52
5 "	14	=	70

and these are to be actually demonstrated to the class and then inferred.

It is perhaps known to all that multiplication and division go together and the idea of division or sharing must be brought home to them in the succeeding lessons after the multiplication tables are formed and memorised.

Now then comes the introduction of the compound quantities. The boys should actually be taught to buy and sell with token coins and give change, for rupees and annas, in the class room. These actual problems give them interest in working sums. Otherwise arithmetic in the class-room will be a dull routine every day, and we have seen boys complaining of want of taste for mathematics when they go up to the higher classes. Balances should be brought to the class and things weighed actually in the class-room and then the tables may be formed and written on the black-board. Let them see before their eyes that the weight of three rupees is equal to the weight of one palam and so on. All these might have occurred to them in their daily life at home. Our work is only a systematising and arranging of mixed and confused ideas in the children's mind.

Measuring of paper, measuring of rooms, and verandahs with foot-rule and yard-stick will stimulate enthusiasm for actual field-work and also a knowledge in accuracy. One will surely try his best and tell the teacher the exact

measurement. But the teachers' duty is not to be silent by pocketing all the various answers thinking that all the answers are nearly approximate. He should himself measure, verify the results and point out the mistakes committed by the children.

We have seen books speaking of sums like,

Candies	mds.	vs.	seers,	palam	folas	
965	17	8	2	6	2	$\times 865$
Bales	reams	quires	sheets			$\times 265$
8657	5	16	19			etc.

Of course we teach him the method of multiplication involved here, and naturally he works the sums in a mechanical way. But it is doubtful whether he at that stage will comprehend 360000 candies of sugar or potatoes as the case may be, or 2300000 bales of paper. Geographers say that we should not give the children the idea in number of miles the diameter or the circumference of the earth; because they cannot comprehend such a distance. But he knows that London is many miles away from Madras, that steamers, men, women and children go to London and back to Madras and things like these are either heard or experienced by the pupils while in the other cases, they are quite unimaginable at that stage. Hence, it will be quite sufficient if he is taught the method of working sums involving the four simple rules and that sums are given to them in the shape of problems coming under the actual experience of the children.

Boys should be taught to deduce in a general way from a series of sums worked out on the black-board.

(a) The circumference of a wheel is 3 yards. How many revolutions would it have made in 3 miles or another wheel which is five yds. in circumference in a distance of five miles?

(b) What will be the cost of one seer of oil if one १८० (64 seers) costs 6 Rs., or 7 Rs. and 8 Rs. respectively?

In the first case the boy knows that both the wheels make 1760 rounds and so must be made to infer the secret. In the latter case he must be taught to infer that the cost of one seer of oil (0-1-6 or six quarter annas, 0-1-9 or seven quarter annas, 0-2-0 or eight quarter annas respectively) has some bearing on the number of quarter annas in a rupee. These are all interesting problems to be worked out and the child will be quite surprised when he sees that the same result has been obtained in a number of cases and also when he is thus taught to deduce the shortest method involved in working out sums. Such a method would give him an insight into arithmetic, and will encourage him for deeper thinking and finding out easier or shorter methods of working.

Again the pupils must be taught to write the figures under different heads in order, that they may themselves see the beauty of keeping accounts in their home. Here comes the training for neat arrangement, accuracy in writing figures, etc.

Then comes the Indian measures of capacity—ollocks, measures, etc., should always be connected with the purchase of ghee, oil, milk, curd, rice, etc., and should be in the form of problems occurring in daily life.

Boys must be made to read the time in a model of a watch fitted with the two hands of a clock. They may calculate theirs and the ages of their class-mates from the date of birth and then calculate the number of days they have spent in the school, etc. They may be taught to prepare the calendar for different months in different years so that they may remember the exact number of days in the respective months both in leap years and ordinary years. These are practical exercises, also exercises which involve some thinking on the part of the pupils. What is the use of calculating seconds and minutes for thousands of years while the same method is involved in calculating the number of days in 12 years 6 months and 17 days. We have to impart to them the method

of arriving at a result through problems which are of a practical nature that will appeal to him in his daily work at home and at school.

Dozens, gross, etc., may be taught to them in a similar way—always keeping in our minds that these are presented to them in a concrete rather than in an abstract form.

Next come Fractions—we are not to judge a boy whether he has learnt fractions by giving him a sum like $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{13}{12}$, etc. As for the boys in the Kindergarten and the Elementary school it is enough they know $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ and $\frac{3}{4}$; $\frac{1}{3}$, $\frac{1}{6}$, $\frac{1}{12}$. How to give them the idea of fractions. They can fold paper into two or four or eight equal parts. They know that a rupee contains two eight-anna pieces, four four-anna pieces, and eight two-anna pieces. They also know that four ollocks is half a measure, two ollocks is quarter of a measure and one ollock is one-eighth of a measure and these have been quite familiar to them at home. We can take advantage of their own experiences and dwell upon them as we choose. We have eight furlongs in one mile, eight visses in one maund and so on. From these we have to introduce them to the way of denoting these fractions and the significance or the meaning of both the numerator and the denominator.

Next we come to the multiplication table of fractions. As suggested already with regard to the ordinary multiplication table, this too ought to be made up by the pupils themselves, noted in their books and then memorised. Problems involving the use of fractions should not be presented to them in the form of dry bony skeletons, but should be given to them in the form of actual life problems—(e.g.) Two boys of the first class pay at the rate of $\frac{1}{2}$ Re. each, three boys in the fifth class pay at $1\frac{1}{2}$ Re. each, five boys in the first form pay at $2\frac{1}{4}$ Rs. each, three boys in the fourth form pay at $5\frac{1}{2}$ Rs. each. How many rupees has the teacher collected from the above boys?

or

A sum on multiplication of fractions would be to find the cost of $5\frac{1}{2}$ yds. of coating cloth or $10\frac{1}{4}$ yds. at $4\frac{1}{2}$ Rs. and $2\frac{1}{2}$ Rs. respectively.

As for $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$ teachers may resort to the foot-rule divided into twelve inches, or one anna piece (containing 12 pies), or one year (containing 12 months), or to one dozen (containing 12 units) etc., and problems may be framed involving the use of the compound quantities mentioned above. $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ of a rupee may be formed and it will be useful to them in their daily mental work.

Mental sums go to make a good deal in the enriching of the children's knowledge for mathematics. It is a way to train memory and to find out easier methods of working and arriving at the results. All the new lessons in the class-room should be preceded by a series of mental sums involving the principle to be worked out later on. Mental sums should be given to them in the shape of interesting problems as running races, giving and taking, calculating time, measuring and weighing, counting in dozens, etc. Even examinations at the end of the year should not be restricted to written examinations, but should give room to oral examinations as well. It is only here that the children's quickness can be judged.

Then comes the last stage of working problems. The boys may be taught to prepare bazaar bills. The most important point that ought to be attended to, is the method of working, calculating, totalling and drawing up the balance sheet. The whole page in the note-book should so appear that somebody may mistake it for an account book. As previously observed they are trained as to how to keep accounts. Instead of boys writing down the problems for nearly half the page, the following method may be suggested and this will be also in a way similar to cash-bills issued by firms and stores.

No.	Name of article.	Cost	Quantity required.	Total cost.	
1	Paper ...	0-5-6 per quire ...	1 Ream ...		Margin for working out difficult processes in Multiplication and Division.
2	Dolls ...	0-14-6 per pair ...	16 pairs ...		
3	Card-board...	0-1-9 each	2½ dozens.		
4	Nibs ...	4-8-0 per gross	½ gross ...		
			Grand Total.		

NOTE.—The teacher fills in the first four columns, and the boys copy them in their note-books, fill in fifth and arrive at the 'Grand Total.'

There are other problems such as calculating interest, division of property, working out sums by the unitary method, time and distance, rotation of wheels, etc., that would find great interest in pupils. The teacher has to frame such problems, as may appeal to them quite reasonable and as are actually taking place outside the school. A rich boy will certainly take interest in working problems dealing on simple interest. A boy, that comes to school every day by train from some place far away from the school will naturally take interest in calculating the time taken by the train to cover the distance between the two stations.

There are other boys who come walking from villages far and near, and from streets far and near, and these boys are also put in the way for calculating the time to walk the distance from their homes. These are all interesting things for the boys, when they are asked to do something by way of practical work.

During recent years an attempt has been made to introduce the Decimal notation in the Kindergarten and the Elementary schools as well. This involves a knowledge of the value of the numbers with regard to the units, tens or hundreds' place. A knowledge of Decimals and how to denote them may be given to them. Now the boys may be taught to measure lines correct to one-tenth of

an inch and note the measurement as 4·7", 5·6", etc. Hence arises a necessity for the boys to equip themselves with that kind of foot-rule with inches divided into tenths.

Both in the Kindergarten and in the Elementary school scheme of work, side by side with number comes in what we call "Space-work." Each school should frame a definite scheme in space-work as will suit the children in their various stages in the school and the necessities of the locality in which they are reading.

Boys in the first class will have only paper-folding and cutting while the same is taught in the fourth class under space-work. The point of difference is that the latter folds or cuts according to some measurement, and the result so obtained is naturally more accurate than the former. Both the boys of the third and the fifth classes measure with the foot-rule and the point of difference is that the latter measure correct to half an inch at least, while the former may altogether omit parts of an inch. Even the foot-rule may not be given them. They may be asked to cut a piece of paper equal to the length of another piece or equal to the length of their pencils, slates, or books.

It would not be improper here to mention that the exercises in hand and eye-training do a great deal in laying the foundation for the idea of space-work. They recognise circles, three and four-sided figures. They can draw similar figures on the black-board or on their slates. The same figures (circles, squares and rectangles) are drawn by the boys of the fourth class according to some measurement. The fifth class do the same in connection with drawing plans to scale. They draw plans of square rooms, rectangular fields, etc. How then to give them the idea of scale? Reference may be made to small drawings, plans of class-rooms, town-maps, etc. The teacher has to bring home to them their knowledge of the multiplication tables when selecting a suitable scale. In order

to find out suitable scales when drawing plans of verandahs 42×42 , 84×60 , 40×40 , 54×45 , etc., they are to be trained so as to recollect their multiplication tables 7, 12, 10 and 9 respectively. The next and the most important point is that the scale should be so selected that they may not find themselves out of their wits by selecting either a bigger or a smaller scale. They come to understand their folly when they find that the paper is not quite sufficient for the plan or the plan too small to the size of the paper. One word more. It is not at all necessary for the boys, either in the Kindergarten or the Elementary school, to have a complete geometrical instrument box.

These lessons are correlated with hand-work. What they do in their regular arithmetic lessons by way of drawing plans, etc., they do models of houses, trays, boxes, etc., in their hand-work lessons. They draw the lines on the coloured paper and then only fold or cut as the case may be. So far for space-work.

There are other things to which attention ought to be drawn by the teacher. First of all the equipment of the school with regard to apparatus and appliances, then the boys' note-books and lastly the desirability of a text-book for the boys. With regard to the equipment of the school, the school must provide itself with one set of "The Didactic Materials," the different uses of which have been already brought to light in various books. The other materials that can be got for the school, with regard to the teaching of number and space-work, are Indian measures of weight and capacity especially those current in the locality, a set of token coins, a ball-frame, a balance, a model of a clock cut out in cardboard, a foot-rule, a yard-stick. There are other sundries, such as pen-knives, scissors, and coloured paper, which might have already found a place in the school with regard to the equipment for hand-work.

Secondly come the children's note-books and the attention paid to them. The children's note-books for the year should form a regular text-book at the end of the year. The problems, how they have worked them, the multiplication table and that of fractions, the plans drawn to scale, the geometrical forms they have drawn and everything they have done in the class-room, should find a place therein. The constant use of rubbers should by degrees be put an end to, as by the same the pupils are prone to spoil their note-books. Whenever they go wrong they are to be instructed to score it off with a pencil line and then continue to work correctly. They are not to be ashamed when they commit mistakes, but should be taught to rectify the mistakes sooner.

When the boys write down the problems given to them and work out correctly in the school and have understood the principles involved, they may be given one or at the most two sums a week for home-work. Home-work does not mean haphazard work but should show careful and neat arrangement in setting down the various steps. Under such circumstances a text-book for boys is not essential.

"The Groundwork of Arithmetic" by Punnet points out simple methods in teaching number to the beginners and the same author's Books for Pupils suggest practical problems which the teachers can resort to for model problems when setting to pupils.

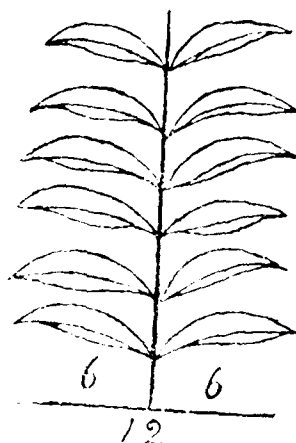
"Book of Constructive Work," by Ed. Lay explains how to connect space-work with hand-work and how to deal with space-work in a practical manner.

In conclusion we are to observe that whatever is done in the class-room with regard to number and space-work has some bearing on practical life and not restricted to mechanical ways alone.

The following will show how a lesson on addition of same numbers as $6+6$, $7+7$, $8+8$, etc. up to $10+10$ may be given to the infants outside

the class room. Young children do like to spend a few hours outside the class and this time can profitably be utilised in a lesson like this.

Boys are supplied with margosa leaves or leaves of the rain-tree whichever is common in the locality.



Boys count the number of leaflets on one side of the mid-rib and enter the result at the bottom. Similarly they count the leaflets on the other and enter the result [6 and 6] as shown in the diagram).

The teacher asks them as to the number of leaflets on each side. Boys answer 6 and 6, 7 and 7, etc. The teacher asks them to count the number of leaflets in the whole leaf. Boys count 12, 14, etc., and tabulate the result as shown in the diagram. The teacher summarises and brings home to the pupils that 6 leaflets on one side and 6 on the other count 12 and so on. The boys will naturally take delight and this may be taken up as the beginning in the process of addition.

S. JAGANNADHAN.

FEB. 1919.]

THE MADRAS TEACHERS' GUILD.

A meeting of the Guild was held on 22.1.19 with the President Mr. Rao Bahadur K. B. Ramanatha Aiyar, M.A., B.L., I.R., in the chair. The following business was done:—

(1) It was resolved that a Conference of the Teachers of Madras be arranged under the auspices of the Guild (in March next, as fixed by the Council later); (2) It was resolved that the Madras Teachers' Guild cordially congratulates Sir J. H. Stone on his having been conferred a knighthood for his valuable services in the field of education in South India and that the Guild feels proud of the honour done to one who was connected with it as President for many years; (3) The rates of subscriptions were reduced as recommended by the Council; (4) The Insurance Scheme for members was explained; (5) After a short speech from the chair about the finding of a permanent habitation for the Guild Library, a Committee was appointed to consider the matter; (6) A Committee was appointed to arrange to use the Library (containing about 3530 volumes and now located at the Tondaimandalam T. V. School) immediately.

EXTRACTS FROM THE INSURANCE SCHEME

The Council as represented by the Honorary Secretaries has been appointed by the Oriental Government Security Life Assurance Company, Limited, Sub-Agent to that Company, and as such is entitled to receive commission on the premiums paid by those who take out policies in that Company through it.

2. This arrangement will enable the Council to make a rebate to all members and associates of the Guild who insure in that Company hereafter, subject to the following conditions:—

- (1) The ability of the Council to make the rebate depends on its receiving the commission from the Company; and it cannot guarantee members against default for which it is not responsible.
- (2) When members and associates apply to the Company to be received as policy-

holders, they must take care (1) to apply direct to the Branch Secretary, Oriental Government Security Life Assurance Company, Ltd., Oriental Assurance Buildings, Post Box No. 2, Madras, and (2) to state in their application that they are members of the Guild.

- (3) The Premiums must be paid to the Branch Secretary.
- (4) When any policy-holder ceases to be a member or associate of the Guild, the rebate will no longer be paid to him or her.

3. The rebate due to each policy-holder under these arrangements will be paid to him or her annually as soon as possible after the close of the year.

The rebate will be at the following rates:—
3% on the first premium; 4% on renewals or subsequent premiums; 2% on single premiums; on policies issued under Limited Payments, Endowment Assurances, and Whole Life Assurances (Tables 1, 2, 3, 4, 5, 6 of the 1911 Prospectus), and 2% on the purchase money for Immediate Annuities.

12, S. M. VINAYAKAR ST.,
TRIPPLICANE,
19-2-19.

V. SUBBAIYA,
Jt. Secretary.

Reviews and Notices.

"A HEALTH READER FOR GIRLS," BY A. L. STENHOUSE AND E. STENHOUSE. (PUBLISHED BY MACMILLAN). Price 3s.

This is an excellent little book which fulfills a great need in this country in these days in which the education of girls is occupying the attention of all educationists and social workers.

In the book the broad principles of healthy living are considered from the girl's point of view, and with regard to her particular needs and opportunities, to this end attention has been paid to such feminine interests as the care of infants, the planning and cooking of meals, clothing, etc.

The book is excellently printed and illustrated, and should find a place in every Girls' School Library. We highly recommend it.

hope to revert to some other interesting aspects of the report in our next issue.

A book which all teachers in India must make it a point to read and digest is the new exposition of the principles underlying *Examinations and their Relation to Culture and Efficiency** by Mr. P. J. Hartog, C.I.E., the learned and experienced Academic Registrar of the University of London, now in India as a member of the Calcutta University Commission. There is probably no country in the world where examinations have such unquestioned sway over the educational system as in India. They are often mere ingenious devices, to prevent students from entering upon advanced courses of instruction; ill-conceived tests examining the memory and not a real grasp of subjects; and elaborate structures weighing heavily upon real culture and efficiency. We have not known any attempt more successful than Mr. Hartog's, in trying to understand the proper bases on which examinations should rest and we have no doubt that an application of its principles to educational work will bring about valuable results. We confess that members of the teaching profession in India do not enjoy much freedom in the matter of examinations and have to adjust themselves to the imperious demands of Government Inspectors on one side and the importunities of guardians on the other who crave only for success in examinations for their wards.

* Constable, 3s. 6d. net.

There is probably no calling in life in which the person needs greater cheerfulness and inspiration than in that of the teacher and it is precisely in that, by a curious irony of circumstances, that the routine of heavy work tends to stifle all zest in work. Speaking before the inaugural meeting of the Conference of Educational Associations in England, the Rt. Hon. Mr. Fisher applied himself to this aspect of the teacher's life and gave some very valuable advice to the members of the teaching profession. Who will deny that the picture he painted of the average member of the teaching profession is substantially correct:

Next to poverty, the force which had most powerfully contributed in the past to depress the vitality of the teacher was the sense of isolation. The company of the young did not altogether make up to him for the loss of opportunities of entering into the rich and varied life of his coevals. The teacher was liable to feel that the years were passing by, crowded with great events. Empires fell, Governments came and went, vast legislative projects entertained the brains of the active and operative part of Society, there was stir and movement in art and letters, and yet of all this brilliant activity, how little did the teacher know? Taking no share in the public life of his neighbourhood, unversed in economic and political principles, having no acquaintance among those who concern themselves with the larger interests of the community, and possessing no key to understanding the forces which are moving the peoples, he lived in a narrow little world of his own, practising his slender gift and, after some mutinies of an aspiring spirit, acquiescing, through force of circumstances, in the modest round of his scholastic duties.

If that could be the gloomy picture of

The Educational Review.

The seventh quinquennial report of Indian Education that has just been issued by the Hon. Mr. H. Sharp, C.S.I., is of more than usual interest, as in addition to the statistical information, there is a valuable introductory note on the characteristics of Indian education which deserves the careful study of publicists all over the country. The remarks on the top-heaviness of the system of education in this country illustrated by unmistakable facts and figures will come as a great revelation even to those who have bestowed some attention on the subject. It is clear that the country is far behind the other civilised countries of the world in the education of the masses as is demonstrated by the following comparative statement of the percentage of the population undergoing instruction in elementary schools:

United States	...	...	19.87
England and Wales	...	...	16.52
German Empire...	...	...	16.30
France	...	...	13.90
Japan	...	...	13.07
Ceylon	...	...	8.94
Russia	...	...	3.71
Brazil	...	...	2.61
India	...	...	2.38

If the conditions of elementary education are so discouraging, it is some consolation to know that in the matter of secondary and collegiate education we are not so badly off, the percentages of the populations enrolled in the two classes of the schools being:

Secondary Schools.

United States	...	...	1.502
German Empire...	...	...	0.988
England and Wales	...	...	0.62
India	...	...	0.486
Japan	...	...	0.354
France	...	...	0.32

Collegiate Education.

England and Wales	...	...	0.054
France	...	...	0.106
Italy	...	...	0.063
Netherlands	...	...	0.066
United States	...	...	0.218
Japan	...	...	0.014
India	...	...	0.024

It is refreshing to note that Mr. Sharp does not scan these statistics in any mood of self-gratulation, but only as an interesting revelation of characteristics. It is realised that the work of expansion and reformation has to be as strenuous in the departments of Secondary and Collegiate education as in that of elementary education and so long as that consciousness pervades the minds of those entrusted with the work of educational administration, there is great hope for the future of Indian Education. It will be granted that Mr. Sharp's description will be considered to be sound in the main: "India is often described as a land of extremes. The truth of the description is borne out by the conditions of education—a middle class widely instructed in those arts which qualify for the learned professions; a proletariat of which only a fraction is literate; a whole sex almost totally devoid of any education whatever." W.

the teacher's condition in Great Britain, one can imagine the conditions in India, where educational life is more cramped and the Educational Department constitutes itself into a Jupiter on Olympus claiming unquestioning homage. The directions which Mr. Fisher gave for counteracting the narrowing tendencies of a teacher's life, do not at first sight appear to have any special relation to the calling, but are nevertheless valuable and deserve the wide attention of teachers in India:

- (1) Plan your holiday carefully but be ready to abandon your plan on the slightest provocation.
- (2) Never go north when you can go south.
- (3) A change of work is itself a holiday.
- (4) Never drive when you can walk, and never walk when you can ride.
- (5) In a cross country walk there is seldom time for short cuts.
- (6) A good holiday is like eternity; there is no reckoning of time.
- (7) One of the best fruits of a holiday is a new friendship.
- (8) Stay where you are happy.
- (9) Soak yourself in the atmosphere of a new place before you study the details.
- (10) The best holiday is that which contains the largest amount of new experience.
- (11) Holidays come up for judgment before the next term's work.
- (12) In the choice of holiday books act on the principle that one of the main uses of leisure is to feed the imagination.
- (13) The principal experts in the act of taking holidays are painters, naturalists, travellers, and historians; the worst person to consult is a golfer.
- (14) On occasions a very good holiday can be taken at home if you change the hour of breakfast.

We do not wish to underestimate the good work done by the non-official members of the Madras Legislative Council, but we are constrained to observe that there has not been much of valuable, constructive work done by them in recent sessions in the department of education. Want of expert knowledge and careful thought seem to be responsible for many of the pointless and inconsequential resolutions moved at the last session of the Council. One member moved for the opening of a Forest School in the Agency Tracts of Vizagapatam and it had to be pointed out that there were practically no candidates from them in some years and such an institution would be unnecessary. The resolution for provincialising the Sub-Assistant Inspectors who were doing the duties of District Assistant Inspectors was undoubtedly a very desirable one and its acceptance would have meant the barest measure of justice to a class of hard-worked educational subordinates, and we trust that Government will give effect to it after receiving the necessary sanction from the Secretary of State for India, a circumstance which was put forward as a formidable obstacle. There was an exciting debate on the resolution of the Hon. Mr. Yakub Hasan Sahib about the Muhammadan College in Madras. We have given unmistakable proofs of our sympathy with the ideal of starting a centre of Moslem culture in India under non-official auspices, but we confess to a sense of surprise at the extraordinary demand in the

matter that the Honourable member coolly made upon the Government. The Government expressed its readiness long ago to support any scheme for the starting of a Muhammadan College in Southern India. Owing however to certain unseemly squabbles among the members of the community, the scheme never materialised and after all this provoking disappointment Government started a College for the Muhammadan community from its own resources and has striven its best to keep it up in a fairly satisfactory condition of efficiency. Now the Hon. Mr. Yakub Hasan Sahib steps in valiantly and makes the preposterous demand that the Government College should not seek affiliation at the hands of the University, that the present students of the college should be turned out that they may appear at the University Examinations as private candidates and that the budget allotment for the institution should be transferred to the non-official Moslem College that may be started at Vaniyambadi, a matter in which at least the Hon. Mr. Yakub Hasan Sahib could not give any assurance. We confess we do not see much statesmanship in these proposals and we trust that the member will apply himself on the other hand to the task of getting the non-official college started and then seek the usual grants from Government. Non-official members have no reason to feel chagrined if such resolutions are lost and the cause of education, we can assure them, will not be poorer. Various members made requests for certain educational facilities in the localities represented by them; for grants for acquiring sites for schools in the Madura Municipality, for Secondary Schools for Girls in Nellore and the Ceded Districts and so on. The needs for them are probably real, but we would impress on the members that it is the business of Government to make an equal distribution of such facilities over the Presidency, without merely complying with the requests of localities which have the privilege of representatives in the Council. The resolutions of the Hon. Mr. P. Siva Row and the Hon. Mr. Venkatapathi Raju about the increase of pay for teachers and the reduction of school fees were delightfully vague and were little more than the mere expression of pious opinions on which no immediate practical action could reasonably be expected. Similar remarks would apply to the resolutions demanding scholarships to indigent pupils; grants to Muhammadan Secondary Schools; scholarships to students; scholarships for scientific and technical education; technical scholarships abroad; free boarding houses for the depressed classes, etc. There is nothing to be said against the raising of the Karkal Middle School to a Secondary School, the opening of a Medical School at Bellary, or the raising of the Medical School at Vizagapatam to the status of a College except the principle about the need for an impartial distribution over the Presidency enunciated already. We have followed closely the educational proceedings of the local Legislative Council for the last several years, but we confess we do not re-

member any session when amidst such a plethora of resolutions such little practicable wisdom could be discovered. There is evidently a falling-off in the capacity necessary for the efficient study and presentation of educational questions. May we make the practical suggestion that when the time comes for giving notice of resolutions to the Legislative Council, non-official members should try to convene private conferences at which they may have the opportunity of meeting some of the leading Indian educationists of this part of the country? Otherwise their work is likely to be as inconsequential as the series of resolutions moved at the last meeting.

The address given by Sir Ronald Ross before the recent Conference of Public School Science-masters in England deserves study for the numerous failings of the educational systems of to-day to which he drew attention. He advocated a period of open-air military training to all students who passed through our schools and colleges. If it was feared that this species of military conscription would lead to an undesirable hardening of life and an excessive fondness for war of which the world has had enough recently, he had an alternative suggestion to make that there might be "a health conscription," consisting of at least a fortnight's compulsory physical training, under discipline in the open air, for both the sexes every year, for five years between the ages of fifteen and

twenty. Sir Ronald Ross was also of opinion that too much attention was paid to details in educational work and was for concentrating attention on the inspiring outlines of work. We are not sure if he was not right when he said that the teacher was apt "to bother about the porch and never look into the temple."

One year is too small a period in the educational progress of a Presidency and it is not possible to draw any inferences from the statistics relating to it. The latest general report of Public Instruction in the United Provinces, in spite of its being a record of progress, cannot be read as going a long way to remedy their backward condition. The total number of institutions, both public and private, has increased by 247. The number of public institutions rose by 373 while that of private institutions diminished by 126, which latter is not very satisfactory, though such fluctuations are not very uncommon. The number of scholars has increased from 8,94,886 to 9,18,258 while the expenditure on education from all sources has increased from Rs. 1,47,45,922 to Rs. 1,52,89,179. The report has, we are glad to see, stimulated the Government to a determination towards further effort, especially in view of the low percentage of education in all its stages in the Provinces.

The total percentage of pupils in elementary schools in the United Provinces to the total male population is 2.80 compared with an average of 4.50 for all India. The percentage of the United Provinces is only about half of what it is in Madras, Bengal and Bombay and is in fact the lowest of any of the major provinces in India. We hope that with the present advent of Sir Harcourt Butler as head of the Provinces they will see rapid educational advancement.

The Imperial idea in Universities can be made to yield valuable benefits to the cause of education as well as to the unity of the British Empire, provided if it is interpreted in the proper spirit and is not made to help the cause of racial arrogance or advertise the privileges of Empire. An effort has been made in recent weeks by the Imperial Studies Committee of the Royal Colonial Institute in England, to educate public opinion in the Universities of the United Kingdom in this direction. We trust that the idea will spread to other parts of the Empire and there will be a glorious sisterhood of Universities uniting the remotest parts of the Empire in bonds of mutual goodwill and active intellectual endeavour of the highest type. Some of the recommendations made by the Committee are worthy of consideration as a tentative basis:—

1. In every University in the Mother Country, the Dominions, and Dependencies there should be a chair of Colonial and Imperial history, with adequate salaries to the professor and staff.

2. In all Universities there should be adequate arrangements, including specialized libraries and properly endowed studentships, for post-graduate work in Colonial and Imperial history.

3. In such Universities there should also be a chair of the history and organization of commerce.

4. Professors of the above subjects should once at least in each complete period of seven years be allowed one year's period of special leave on full salary, that they may travel to investigate and report on the prevailing of trade and industry, the natural resources, methods of administration, and progressive organization and development of the different parts of the Empire.

5. During such period of special leave the professors concerned should have facilities afforded for conference with the staffs of the Universities visited, for delivering lectures in such Universities, and address to the general public. Suitable travelling allowance should be made, and each such professor should be accredited by his own State and University.

6. The system of travelling fellowships should be completely organized and greatly extended throughout the entire Empire.

We read with some little surprise the Order issued by the Government of His Highness the Maharaja of Mysore in the Educational Department, which was telegraphed to the local papers here. From the telegraphic summary we make out that the circumstances that evoked the Order were somewhat as follows:—

A curious Educational Order.

The Government of Mysore maintain an Anglo-Vernacular School in Sringeri, the head-quarters of the successor of the Sankarachariar. The caste citizens of the place apparently objected to the admission of students of the depressed classes into the school, and the Government issued the Order that State institutions are open to all. The Order under reference complains that the attitude of the inhabitants makes an unwelcome break in the peaceful and growing introduction of measures of social reform, which was gradually coming in among the educated and enlightened, and this unenlightened attitude of the people in this small locality might, it is apparently feared, set a bad example and re-introduce the darkness where light was unmistakably dawning. Government therefore lay it down that as the State school is maintained from out of the public revenues of the State to which all classes contribute alike, the benefits of the school should be open to all classes similarly. So far we believe the Government of His Highness the Maharaja are quite right in their attitude. We hold no particular brief for anybody. We are not hostile to social reform as such. We do not advocate the maintenance of untouchability and other systems of differentiation, which work unfairly against particular classes. But with all that, we feel rather disappointed that the said G.O. should have let itself go beyond this. If there are communities among the citizens of Sringeri or elsewhere who do not wish to accept this position in regard to the education of their youths and decline to go to that school, that body of citizens wherever they be merely exercise an elementary right that belongs to them. If they go further and set up schools of their own, paying for its expenses from out of their pockets and educate their children in that school according to their lights, why the Government Order should penalise the school by declining it such Grant-in-Aid as other schools do get, we are quite unable to understand. It does not follow logically from the previous position. That institutions maintained at the expense of the public revenues should shed their light alike upon all the inhabitants of the locality has a support of principle in it. But to say that people who would not educate themselves in such an institution under all conditions should be penalised to any the slightest degree by fiat of authority is subversive of the principle contained in the above. We do not overlook the fact that in the last clause

of the Order comes in the statement that the schools started newly by these disobedient citizens did not obtain the previous sanction of the Inspector-General of Education, and the penalty therefore is sought to be penalty for this want of procedure. This is far too trifling a circumstance for the wide break that this penalising corollary introduces into the G.O. The ordinary argument of schools competing to the detriment of efficiency does not apply in a case like this. It is a question of communities differing from each other, and each seeking to educate itself in its own particular way. There is nothing shown that the education offered in the new school is of a character subversive of authority or morality. It emanates very strangely from the Government of the enlightened prince, who not long ago said "it is far from my desire that any community should be penalised on account of its caste, simply because it was the first to educate itself and utilise fully the opportunities for advancement offered to all my subjects alike." in another connection. Enthusiasm for social reform may be good, but very good things

run the risk of degenerating into a pernicious evil by misapplication or mistiming. It gives us great pain to have to write this against an administration for which in many particulars we have nothing but admiration. The responsibility taken here is great, and we do write the words above with the gravest sense of responsibility for the welfare of the community as a whole.

We have received the first two numbers of this periodical, The "Boys' Own," edited by Messrs. A.M.S. Raghavan and V. Natarajan. From the first two issues now before us we have no hesitation in saying that it contains very useful matter to those for whom it is intended. The names of the editors are a sufficient guarantee for its maintaining the same level in future. Taking the present prices of printing materials the subscription Re. 1-8-0 per annum is very low and it should be within the reach of all. We welcome it most heartily as it supplies a want to the students and wish it prosperity. Communications, etc., may be addressed to the Manager, Post Box No. 414, Triplicane, Madras.

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SHAKESPEARE: THE PRINCE OF BORROWERS.

7.

SOME critics ask: "Does the fortune-hunter of a Bassanio deserve Portia?" Well, who is to decide here? What guarantee is there that, if these critics are allowed to choose, they will not choose themselves? Here again the critics go wrong, because they have not studied Shakespeare carefully. The Bassanio they think of is not Shakespeare's Bassanio, but their own. If Bassanio has shown by his choice that appearance is deceptive, he has illustrated the principle even with his own character. No doubt in the first scene he strikes us as a fortune-hunter who induces his friend, with all the dexterity of a confirmed borrower, "to shoot another arrow that self way which you [Antonio] did shoot the first." But this is deceptive appearance. He has sterling qualities of head and heart which become evident as the story proceeds. But I must pass on to Shylock.

8.

From about the middle of the last century it has almost become the fashion in some quarters

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to regard Shylock as a tragic character, "more sinned against than sinning." By a tragic character we generally mean one who is essentially heroic and noble, but who through a slight defect in his character is brought to a ruin which he does not deserve. Is Shylock heroic? Is he noble? These are the questions we have to answer. What are the cardinal principles which guide Shylock's life? When the play opens, it is "moneys" and as it proceeds "revenge." If a miser has the best title for "heroic," then Shylock deserves it most. If a would-be cold-blooded murderer has the best title for "noble," then Shylock is one of the noblest characters that we have come across. We shall see what Shakespeare himself makes of Shylock.

The very first impression created by Shylock is that he is an intellectual giant, always cold, calculating and deliberate. Dissimulation is the very stuff of which he is made. He hates Antonio from the bottom of his heart, but pretends that he would be friends with him and have his love. When Bassanio is naturally suspicious, Shylock exclaims:

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1' "Oh! Father Abram! what these Christians are,
Whose own hard dealings teaches them suspect
The thoughts of others."

And this disarms opposition. But when the bond expires, the same "pound of flesh taken from a man" which elsewhere he says "is not so estimable, profitable neither, as flesh of mutt ons, beefs, or goats," will be used according to him—perhaps to "bait fish withal," to feed his revenge. His daughter's flight with a Christian is not the reason for his exacting the penalty on which he has from the first determined, but it is only one of the specious reasonings he uses to stifle his conscience. He says elsewhere that Antonio hates "our sacred nation," but from the line "the curse never fell upon our nation till now" (I. i.), we can understand what he means. He is the "sacred nation." Also refer to the lines where he says:

"I would my daughter were dead at my foot, and the jewels in her ear: would she were hearsed at my foot and the ducats in her coffin."

To me these lines clearly show that his sense of loss is more about the money than about the daughter and if in the trial scene he withstands the temptation of even thrice his money, it is because he considers that if Antonio is, once removed from his way, he can very easily make up for the trifle of a loss.

Again, in the trial scene, if he takes his stand upon the letter of the law, it is not that he stands there as the pillar of abstract law, but that it suits him. Much has been written on this subject, but I may perhaps point out that all laws are first based upon equity and that if a judicious murder is planned under the shelter of law, it is but fair that the condition of the contract is subjected to the strictest construction. What Shylock wants is Antonio's life, but he cunningly seeks it through "just a pound of flesh." And he is overthrown by the very phrase he wants to hide his crime under. So the discomfiture of the Jew is not the unfortunate downfall of a noble hero, but is merely a case of being

worsted in a business of diamond cutting diamond. His cunning is overcome by greater cunning. And if he is entirely ruined by being deprived of his ducats and daughter and by being forced to become a pork-eater, it is but the work of Nemesis.

If I have come to the above conclusion, it is not that I do not feel pity for Shylock. I quite sympathise with the old man who is driven to bay with the whole world against him. I quite appreciate why he has come to love his "moneys" so much. I quite understand how the thirst for revenge has sprung up. But I cannot but realise that the position in which he finds himself at last is the result of trying to do wrong under the shield of law. The majesty of law is violated and comes down upon him with a crashing force. And I believe that Shylock in whom though conscience is warped it is not dead, realises here that he has done wrong and repents. Portia asks him: "Art thou contented, Jew? What dost thou say?" Had there not been a change going on within himself, he would still have made an attempt to extricate himself. As it is, he simply says: "I am content." And further:

"I pray you, give me leave to go from hence;
I am not well: Send the deed after me,
And I will sign it."

Is it too much to expect that after passing through this ordeal of fire, as it were, he is reconciled to the Christians and to his daughter? Is it improbable? Have there not been many such instances? And can it not be hoped that Antonio also benefits by having been brought to the brink of ruin and shakes off the self-sufficiency and sense of religious superiority which are his bane?

9.

I may here draw your attention to the great difference that lies between Shakespeare's Jew and the Jew as understood and interpreted by the dramatist's contemporaries. I may in particular refer to Marlowe's *Jew of Malta*, where Barabbas is painted as a veritable monster. He is a con-

summate and blood-thirsty villain, exceedingly fond of gold and as equally fond of revenge, with a daughter whose happiness must be subservient to his villainy. It is a certain fact that this Barabbas is the prototype of Shylock. But what a world of difference there is between this "monster of medieval imagination" and Shylock who with all his faults, with all his hard-hearted and deep-laid cunningness, is felt to be one of ourselves! Here then is the art of the Prince of Borrowers. Where Marlowe heaps on his Jew all the atrocious elements of character he can think of, Shakespeare has completely humanised him. We can easily understand, without however approving, why he is what he is. If his heart is hardened it is because of the treatment he has received at the hands of the pious Christians. "If he seeks an almost inhuman form of revenge, he is partly driven to it by the age and circumstances in which he lives. If he is so fond of his "moneys," it is because with them alone he can hold his head up among his enemies. If he cringes and bows and smiles and seems to be but a servile dog as the Christians call him, it is because he, being horn'a Jew, has to put up with all such insults. But all the same there is the blood of the born aristocrat coursing in his veins. He is inwardly a strong character. If he seems to meekly bear the taunts and gibes and insults of the Christians, he is only waiting for an opportunity to break out with the least possible danger to himself. We can easily realise how a nature once great and perhaps noble too, has come to lose all the milk of human kindness owing to heaped up injuries. We can feel for such a nature, though we should not allow our feeling to make a hero of that nature. Shylock's fault is his rapturous hymn of hate. If therefore he is overwhelmed, it is also in the very nature of things. The mills of Heaven grind slowly, but exceedingly small.

Shakespeare, it would appear, wants to keep Shylock's criminality as much veiled over as

possible. He wants us to realise that Shylock is not a monster, but merely a bad man. For instance, the Jew appears to have laid his plans more deeply than we at first recognise. He is sure to have thought twice before lending money on the very intangible condition of obtaining a pound of flesh and there is evidence to show that he has laid other plans for getting Antonio into his clutches. Additional proof is offered in Portia's speech that he has "indirectly and directly, too, contrived against the very life of the defendant." He must have, therefore, been the cause of the various rumours about Antonio's losses and of his creditors pressing him in all directions—if not the cause of something worse still. And the fact that the Jew yields after this without making one effort to extricate himself lends support to this belief. Shylock's machinations, we may therefore conclude, are kept in the background, firstly because any insistence on them would spoil the comedy as a whole, and secondly because the author wants to keep Shylock within the bounds of humanity. This seems to be also the reason why we are vouchsafed an all-round view of the Jew—at the synagogue and at the Rialto, at home and in the street, and lastly at the court. This accounts also for the fact that the dramatist has endowed him with a wealth of ideas and felicity of expression which may be considered almost unique. In other words, Shakespeare has in Shylock portrayed the character of a strong man not necessarily evil by nature, but made evil by the not very humane treatment he has received at the hands of the intolerant Christians.

10.

If I have been so long dwelling upon the character of Shylock, it is only to show you how it is easily possible for us to be sentimentally inclined to misunderstand the dramatist. I have next to warn you against some critics who conveniently forget the very important fact that all Shakespeare's comedies are *romantic comedies*.

and who glibly talk of the "improbabilities" and "absurdities" in *the Merchant of Venice*. They tell us, for instance, that Shylock's claim would not have been admitted in any modern courts of justice, and that, having been once admitted, it would not have been rejected on the strength of a quibble. They point out that no "royal merchant" would have subscribed to such a bond as was demanded of Antonio and having once subscribed, failed to keep his day. They wonder how the plaintiff could have been converted into the defendant in the course of the same trial. They are astonished at the way in which the Jew was turned into a pork-eater and at the position occupied by Portia in the court. They finish by pronouncing the play to be a tragedy with a comic episode inappropriately dovetailed into it at the end.

Some of these "improbabilities" will vanish if we remember the age and civilisation of the society to which these characters are supposed to have belonged. And the remainder will become probable if we remind ourselves that we are in the realm of *romance*. In this region, everything without ceasing to be probable is as far removed as possible from everyday experience. Imagination is allowed a holiday of rambling along running brooks, listening to the sweet melodies of singing birds and revelling in the idea of beauty—beauty above, below, around and everywhere, where life is presented with all the rain, bow tints of the evening; where the magic webs of idealism clothe everything in mystery, love and rapturous joy.

But it is not to be supposed that every thing is vague and shadowy in this sort of dream-land. And Shakespeare knew where exactly to draw the line. Though the situations he creates for his characters are romantic, the characters themselves are akin to real men and women. They are felt to be our own flesh and blood. The situations Shakespeare always took from well-known sources, but in handling them he

displayed his great art. In most cases he had the outline before him, but it was an outline without any signs of life. The bones were intact, but they lacked flesh and blood and pulse. The task of substituting men and women for mere idols clothed in antiquarian garments was Shakespeare's. The new element he introduced was the revivifying one of *characterisation*. And the fact that we have often to quarrel over the interpretation of his characters is a sufficient testimony to show how close are his creations to real men and women.

11.

I may here draw your attention to one of the aspects of Shakespeare's art. It is very often said that art lies in concealing art and this saying is well exemplified in the way in which Shakespeare creates an atmosphere of verisimilitude. Where others work laboriously, he hits off with a word here, a phrase there and a casual allusion somewhere else. His great contemporary, Ben Jonson, with all his ponderous learning at his back, is never able to do anything more than clothe his idols in the well-studied drapery of the age he chooses. But the case is otherwise with Shakespeare. If he lays his scene in Italy, he has the magic of permeating his play with the true Italian aroma. We feel all the time that the figures are moving under the deep blue southern sky, or, in Venice, rowing in a gondola towards the Rialto. We see the doge rising before our very eyes or the yellow turbaned Jew crying in silence that "Sufferance is the badge of our tribe." Jonson depends on his thorough knowledge of manners, customs and peculiarities in dress and speech. He piles words after words and phrases after phrases borrowed from the foreign language and alludes to almost all the places and buildings of interest he has heard of. His whole treatment, as a critic points out, is purely from the outside, wherein the poet is lost in the philologist. It is indeed very

strange that he should have reckoned so much upon the knowledge and intelligence of his public which must have listened to him with open mouths. The scene of his *Volpone* is laid in Venice and every reader cannot but feel that he ought to have furnished it with his own notes and explanatory annotations. But look at the other dramatist's way. Almost every one of the characters in the *Merchant of Venice* is Italian to the core. Their feelings, their passions, their enjoyment of life and their views of life and things are all Italian. We do not feel that we are anywhere else than in Italy and when we meet with references to the "dish of doves" or the "wilderness of monkeys" or the "tranect, the common ferry that trades to Venice," we think they are the most natural things to occur to our mind. Perhaps I may add one or two examples of the casual way in which Shakespeare reminds us that we are in Venice:

"They have in England
A coin that bears the figure of an angel
Stamped in gold but that's insculpt upon."

Again:

I reasoned with a Frenchman yesterday,
Who told me, in the narrow seas that part
The French and English, there miscarried
A vessel of our country richly fraught."

Once again:

"Why, yet it lives there unchecked that Antonio hath
a ship of rich lading wrecked on the narrow sea;
the Goodwins, I think, they call the place, a very
dangerous flat and fatal, where the carcasses of many
a tall ship lie buried, as they say, if my gossip report
be an honest woman of her word."

How different is this from Ben Jonson's manner of laying on thick! Are we not right, then, if we exclaim, "Thank God! Shakespeare knew little Latin, less Greek and perhaps no Italian!" Here again, has not Shakespeare exemplified that borrowing is really an art?

(To be continued).

T. A. RAMAIA.

PREPARATION FOR THE TEACHING OF GEOGRAPHY IN THE KINDERGARTEN.

THINKING of the modern developments in the methods of early education, some of us are inclined to wish that we were born a decade or two later, that we might enjoy in any well-equipped Kindergarten the fruits of the present day rational system of teaching. The inclination is especially felt when we read of the modern methods of teaching Geography and recollect those by which we have acquired our knowledge of the subject. The contrast is simply appalling. Nobody would now-a-days think of introducing to the seven-year old child a text-book of political geography of a particular area, and cram into his head a list of seaports and rivers, peaks and promontories. No attention is now paid to such isolated bits of knowledge which we all acquired, and which we still remember, as that Reading is noted for biscuits, or that Birmingham is noted for cutlery. Knowledge was imparted to us in a dull monotonous manner with nothing else to relieve it than a worn-out map. Nothing was done to stimulate our imagination. We had no conception of the immensity of space or the diversity of human life on this wonderful globe.

2. 'The primary and essential object in all right teaching of geography,' says a modern specialist in the subject, 'is the training of imagination in the sphere of space: Geography is not worth teaching and the time spent over it is mostly a waste if it is not taught in a way calculated to stimulate the imagination of the pupils, to enable them to picture to themselves things which they have not seen and which they cannot hope to see.'

3. But before the imagination of the pupil could be roused, there must be some-

thing to work upon. The child should first have certain clear concepts that will enable him to grasp the new and larger facts concerning the world. Hence, the teaching of geography must be founded on the child's knowledge of his immediate surroundings. It is with the imparting of this knowledge that Froebel began his teaching of geography, and it is in the light of his practice that the knowledge of the child's surroundings, or Home knowledge, as it is called, is even raised to the rank of a special subject in the early education of the German children. Every child knows three places, his home, his school and the road along which he comes and goes between them. He is interested in himself; first and foremost with his own comings and goings; next in his playmates and his relatives and to a less degree in the grown-ups—their appearance, dress and occupations—in the animals he sees in passing and in such inanimate objects as he can make use of. It is with things like these that we should begin. Starting with such small beginnings we should explore all the surroundings of the child and lead him on to a knowledge which is generally implied in the term Nature Study. Weather phenomena such as wind, cloud and rain, heat, cold, moist and dry must be appreciated by the child. Clear conceptions should be given to him, during excursions, when possible, or in the school garden or at the sand tray, of the various land and water forms such as mountain, peak and valley, island, isthmus, and peninsula. He should also have an idea of what is called 'the fundamental geographical process,' viz., the circulation of water from the sea to the cloud and back over the land into the sea. He should, in short, have clear concepts, by a first-hand acquaint-

ance, of the animate and inanimate nature around him.

4. It is not enough merely to give rise to these mental images. Frequent opportunity must be given to reproduce them. Modelling and drawing should be done frequently to fix these concepts in the mind of the child. The pupils must be constantly kept working in the garden or at the sand tray or in the class, modelling, drawing and painting. They can be asked to draw charts and plans of the school-room and the immediate neighbourhood. They can be asked to record weather phenomena. There will at first be simple, dealing with one phenomenon at a time and they will be pictorial;—a yellow dot on a disc of blue will, for instance, stand for a sunny day.

5. Much fineness cannot, however, be expected from the child's handwork. His powers may even be dwarfed by compelling him to bend too long over his crude attempts. His powers of imagination, it must be remembered, are far superior to those of expression, and hence more attempt should be paid to the feeding of his imagination rather than training his motor skill.

6. The best method of nourishing his imagination is agreed by all to be telling the child geographical stories. The child takes an immense delight in places far away; like Stevenson he would like to rise and go

'Where in sunshine reaching out
Eastern cities, miles about
Are with mosque and minaret
Among sandy gardens set
And the rich goods from near and far
Hang for sale in the bazaar.'

The description of Polar glaciers with their white bears, immense deserts with their tribes of camels, sudden avalanches which bury

whole villages, little Eskimo pursuing the seals, Japanese or Chinese with their curious customs, the adventures of explorers like Livingstone, Stanley, Scott, and Sven Hedin and Shackleton, all are well calculated to stimulate the imagination and awaken the spontaneous curiosity of the child.

7. To rouse the interest of the pupils in descriptions and stories, pictures and lantern slides should be constantly ready to hand. Wherever possible, the teacher should refer to the child-life of foreign people. In spite of Johnson's dictum that babies do not like to hear of babies, children do take more interest when we talk to them of children of other lands than of the adults. Lastly the descriptions and stories should always be grouped round some tale of action—the crossing of Sahara on the camel back, the sledge and the chasing of wolves in the Siberian forest, the Eskimo on the ice-field pursuing the seal.

8. Especially in the introductory stages of the teaching of geography the teacher should not tell the pupils that they are going to the study of a political area, but of the people of a particular area. In the infant classes, we shall not, for instance, talk of Japan but of the Japanese. We shall describe those strange yellow people and their light houses with paper partitions. We shall show pictures of them in some characteristic occupations. We shall exhibit, if we can, some specimen of their handwork, a doll, a lantern, a vase, or a fan, to prove that these Japanese are no savages but a clever artistic nation. Of their home we shall say no more than that they live in a sunny land far to the East.

After the student has thus gained some geographical concepts by exploration of his surroundings, by the study of nature around

him, by useful occupations in the garden, beach or sand tray or in the class, by drawing and painting, what is more, after his imagination has been stimulated by stories and descriptions of far-off men and lands, a systematic study of geography may very well be begun. This systematic study does not, however, yet imply the introduction of a textbook of geography of the particular district or country in which the child happens to reside. Previous to this the child should have a conception of the whole earth and the topography of his district or country over it. Hence, the student should be introduced to the painted globe on which the several continents and oceans have been marked. It is desirable also to have a slate globe in which the pupils may be asked to mark out the surfaces of land and water. It should not be encumbered with a mass of details. It is enough, if the continents and oceans, the equator and the poles, are marked. The habitations of the several peoples with whom the pupils have had already an acquaintance, may be marked over the globe, instead of the names of the various countries. With this preparation, regular instruction in the teaching of geography may be begun.

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**"IT IS THE EAGLE ALONE
THAT IS FIT TO TEACH THE
EAGLETS."**

By MR. P. R. KRISHNASWAMI, M.A.

SIR Asutosh Mukerji's recent address at the Mysore University was remarkable in many ways. A University, he said, constitutes the visible manifestation of the activities of the State in the domain of the highest grades of education for the benefit of the people. To retain its continued usefulness it should be wisely articulated to the true requirements of the community. Conservatism was a bane to University institutions. The pity was, "problems of compulsory Greek and obligatory Sanskrit seem veritably insoluble, while the modern sciences, which have silently revolutionised the life of humanity, and profoundly affected its hopes, ideals and aspirations, patiently await academic patronage in the ante-room." Sir Asutosh then proceeded to sketch briefly but brilliantly an outline of an educational policy suited to this country. He took occasion to raise his emphatic protest against all suicidal policy of isolation and stagnation. One of the most striking portions of the speech related to the need for "first-rate teachers, the most eminent, the most earnest, the most independent in their work," and then the principle was enunciated that it is the eagle alone that is fit to teach the eaglets. Eminence, earnestness and independence characterising the teachers should indeed help to render their profession the noblest, including the now absent sense of the greatest, of all professions.

Is it a familiar idea that teachers can be the eagles of society? If that bird implies royalty, are not the intellectual and moral leaders of society to be found in teachers? The idea

should at present seem extremely shocking to the men of all the professions except the teachers. Even the teachers will feel considerable diffidence in swallowing the flattering suggestion. Yet, this suggested superiority of the teacher in society is not absolutely an unexperienced idea. It is said that one of the reasons why the teacher does not take his place in general society with ease is his weakness to fancy himself the cleverest or greatest person in the company he finds himself in. I remember an Indian administrator of experience (now member of the Madras Government), when addressing an audience of young men about to enter on the duties of teachers, warning them against regarding themselves as good enough to teach the parents, of whose children only they were teachers. As far as Universities are concerned, (they have been defined as having to do with the highest grades of education for the people) Sir Asutosh is insistent on eagles alone being the teachers. It is not a bad idea that he who teaches the young should possess abilities, if need arose, to teach the old as well.

In one of Stephen Leacock's interesting essays, discoursing on the Lot of the Schoolmaster, he defines the ideal schoolmaster. "He must be the type of man superior not only to the boys he teaches, but superior to the parents who send their sons to him; able to have been, had he wished it, a better banker than the average bank manager, a better rail-road man than the average one, with brains enough to give points to a lawyer and breadth enough to make even a doctor feel thin. This is the kind of man to be a schoolmaster."

Arguing in this strain Leacock would banish home nine-tenths of the number of men teaching at present. He then fancies himself planning for a school according to his own ideas, with the help of a real fairy like a Car-

THE STUDY OF ANIMAL LIFE.

VII.

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(Continued from page 799, Vol. XXIV,

No. 12, December, 1918).

INTRODUCTION TO THE VERTEBRATES.

negie or Rockefeller. By paying salaries ranging from 30 to 50 thousand dollars a year the services of the following men are expected to be secured for the school:—Woodrow Wilson, Poincaré, Roosevelt (now dead), Sir James Barrie, Rudyard Kipling, etc. The fee for each pupil would be 2,000 dollars a year. A large strength of boys is not despaired even at this rate. "You may stretch a string across any fashionable thoroughfare in any prosperous city and in ten minutes catch enough parents of this kind to fill an asylum. True they don't pay 2,000 dollars now. But that is because nobody asks them for it. They have been accustomed to think of a school teacher as a sort of usher, about half-way up in dignity between a ticket-clerk and a furnace-man."

Leacock's ideal may not be literally practicable, and that only argues we should strike greater consistency between the educational ideals we profess and the actual provisions we are prepared to make to realise them. If we do believe in the personality of the teacher as a matter of supreme importance in educational organisations, and are prepared to talk about it loudly, we should also be prepared to pay sufficiently to attract men who should tower high not among the students only but in human society at large. Nor need we utterly despair at the cost of education involved in such a high ideal. We can suffer considerable mitigation. Sir Asutosh has said that the teachers should be the most eminent, the most earnest and the most independent in their work. Among all these qualities a diminution in eminence may be least harmful in a first-rate teacher. We may allow that after all has been said, self-education is the most potent, at least, in advanced stages of the acquisition of knowledge. Still earnestness and independence are essential in the teachers and are not cheaply bought.

WE now pass on to the highest group of animals, the vertebrata or vertebrates. In these the skeleton is, in the main, an internal skeleton, or endo-skeleton in contra-distinction to the armour-like outer skeleton or exo-skeleton, so commonly met with in the invertebrates. There is difference also in the composition of the skeleton. The skeleton of vertebrates consists of: (i) a highly elastic substance called cartilage, or (ii) of bone, which, usually, is but cartilage, which has undergone a process of hardening. These substances are not met with in the invertebrate skeleton (with the exception of a few cephalopods in which cartilage occurs.) The most important part of the vertebrate skeleton (the part from which the group derives its name) is the vertebral column, or the 'back-bone'. The backbone is not, however, one bone, but a series of ring-like bones, called vertebrae (singular, 'vertebra'). These rings, by juxtaposition, form a long tube in which the central nervous system, the most delicate part of the body, is lodged. In the majority of the vertebrates, the big fore-part of the central nervous system, called the brain, is lodged in a bony box, the cranium or the skull from which proceeds the hinder continuation of the brain, called the spinal cord, which runs through the vertebrae.

In the worms and arthropods, the nerve cord is ventral, that is, is situated along the lower part of the body. In the vertebrates it is dorsal in position, i. e., runs along the back. Some hold that vertebrates are evolved from the worms, while others say they have sprung from the arthropods, the body being turned upside down, in either case.

The phylum vertebrata consists of the following classes:—(i) *pisces*, or fish; (ii) *amphibia*, or frogs and toads; (iii) *Reptilia*, or reptiles, including lizards, snakes, crocodiles, tortoises and turtles; (iv) *aves*, or birds; (v) *mammalia*, or animals that suckle their young.

(The lower chordata, urochorda, adelochorda, &c., and the acrania, are purposely omitted, as they are somewhat out-of-the-way forms, not likely to be of popular interest.)

CLASS I. PISCES.

This class is wholly aquatic; some forms being *fluvialile* (i.e., inhabiting fresh-water,) while others are *marine*. They are also of great interest to man. A good many varieties are eaten. Fishing is an industry that supports millions. Large numbers are caught, salted or otherwise preserved, and exported to other places where they cannot be got. Some varieties yield by-products like isinglass (a preparation made from the swim-bladder of certain fish) and cod-liver-oil (taken from the liver of the cod.) Some are the enemies of man, e.g., sharks. Others, like the gurnard, are remarkable for their bright colouration. Yet others, like the dipnoi, are of purely scientific interest.

Type. Observe some live fish in a fresh water tank, or, better still, in a glass aquarium. The body is fusiform, i.e., broad in the middle, and tapering at the ends. It is laterally flattened, and covered with scales, all directed backwards. All these features help a fish to cut through water easily, like a boat. At the front end is the mouth, which can be observed to be constantly taking in mouthfuls of water. Behind the mouth on either side is a large plate, the 'operculum' from under which the water taken in is seen to escape. (The plural of 'operculum' is 'opercula'.) The anterior end also bears a pair of round eyes, devoid of lids, for they never close. (Compare the Sanskrit word 'Animisha', applied to gods and fish too). The animal swims with the help of extensions of the body, called fins,

supported by delicate rods called 'fin-rays,' which the animal can move at will.

There are two sets of these fins: (i) median fins, and (ii) lateral fins. The median fins are: (1) the dorsal fin, along the back. This may be cut up into a number of small pieces; (2) the caudal fin, forming the tail; (3) the anal or ventral fin, beneath the body, from the anal opening to the tail. Sometimes, there is a continuous median fin extending from the back, round the tail, to the anus. (Vide the dotted lines in fig. 51).



FIG. 51.

1. Dorsal fin; 2. caudal fin; 3. anal fin; 4. left pectoral fin; 5. left pelvic fin; 6. left operculum. Note the lateral line.

The median fins steer the fish along in the water, and correspond to the rudder of a boat. The lateral fins are for propulsion. There are two sets of these, (1) the pectoral fins, immediately behind the opercula, corresponding to the fore limbs of higher animals, and the pelvic fins answering to the hind limbs. The pelvic fins may be behind the pectoral, or may be shifted forwards so as to be below them, or even further forwards. The lateral fins are much like the oars of a boat. In some fish, one or more of the fin rays are developed into stout weapons of offence, and even bear poison.

If we pull off one of the opercula of an ordinary fish, we come across the breathing organs or gills. These are soft red filaments attached to the partitions between a series of openings, the gill-slits. Water charged with oxygen and containing also food matter, is repeatedly swallowed. The food finds its way to the food-passages, while the water containing dissolved oxygen is squeezed out through the gill-slits. As it rushes by, its oxygen is taken up by the blood in the gills, while the carbon dioxide of the blood is carried

off by the water. This process of oxygen being taken into the blood stream from without, while the carbon dioxide of the blood is given out, is called respiration. All living things must respire, whether they are animals or plants. Water-breathing forms take in the oxygen that is dissolved in fresh water, or in sea-water. This is why a fish dies if put into distilled water, for there is no dissolved oxygen in it. There are two nostrils on the head of a fish but these lead to two nasal sacs. These sacs do not communicate with the mouth or pharynx, and hence do not serve for breathing. They are closed cavities, useful for testing the purity of the surrounding water.

The air-bladder or swim-bladder of certain fish, deserves special mention. It is a long sac full of gas, situated beneath the vertebral column. It may be closed, or may communicate with the mouth by a narrow opening. The gases in it assist the fish to float. The swim-bladder, therefore, is hydrostatic in function.

A word about the colouration of fish. Along the sides runs a line from end to end, called the lateral line. Broadly speaking the part of a fish above this line is dark in colour, while the lower region is pale, so that, looked at from above, a fish is much like the dark water around it, whereas, looked at from below, its colour matches that of the pale sky above. The colouration is, therefore, protective.

Let us now consider some common types of fish.

A. Dog-fish, shark, skate, ray. These are called elasmobranchiata. They represent the most primitive type of fishes. The skeleton remains cartilaginous throughout life. The gill-slits are open, and not covered over by an operculum. The skin is very rough, owing to a number of little hard projections. The skin can, therefore, be used much like sand-paper.

The tail needs special mention, for it is of a type peculiar to this sub order. It consists of

two projections. The vertebral column is continued into the upper one, while the lower is extremely reduced. This is called a *heterocercal* tail. (Fig. 52 a).

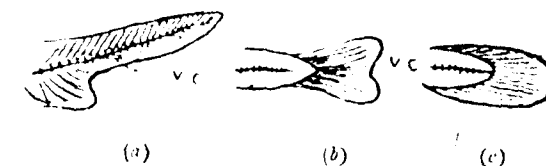


FIG. 52.

Heterocercal, Homocercal, Diphyccercal.
V. C. = vertebral column,
Types of tail fin.

Dog-fish, shark. Small forms are styled dog-fish, while bigger ones are called sharks. The mouth is situated, not at the front end of the body, as in common fish, but below, and some distance behind the tip of the 'snout.' This is why a shark has to turn on its side before it can get a grip of the prey.

These fish are extremely voracious. Their jaws are well suited to their voracity. Each bears a series of close-set pointed teeth. Behind each tooth is a regular pile of reserve teeth. When a tooth is lost, it is quickly replaced by another, so that a shark can never be toothless. Being pointed, the teeth are admirably adapted to tearing flesh off their victims. Several lives are lost at sea on account of sharks.

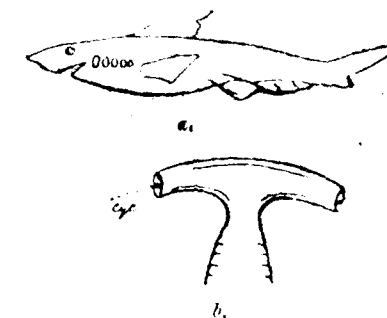


FIG. 53.

a. ordinary shark; b. head of a hammer-head shark.

The hammer-head shark is so-called owing to its head being hammer-shaped, the eyes being set at the ends of the side-extensions.

Skate, ray. These are peculiar looking forms, with big flat expanded bodies, the side extensions being chiefly composed of the pectoral fins. The eyes are set on the back of the head, and the gill openings (except 1 pair) are below. The tail is long and whipcord-like, the lower division being highly reduced. In some varieties, e.g., the sting ray, there is a poisonous sting. These animals eat shelled animals (molluscs), and so the jaws are provided with hard denticles or with plates, for crushing. One peculiar form, the electric ray, deserves special mention, for its muscles can give shocks like electric batteries.

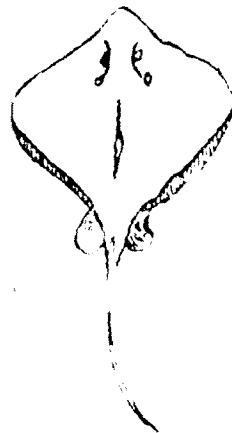


FIG. 54. Skate.

The saw-fish. This is plentiful along our coast. It is so called on account of a saw-like projection of its snout. It may be 6 or 7 ft. in length.

B. Bony fish. This class includes the vast majority of edible fish. The description of a typical specimen has already been given above, and so a few forms of interest will be touched upon now. The tail in these forms is said to be homocercal (vide fig. 52.(b) having two equal lobes, or diphycercal rounded without lobes fig. 52 (c).

The flying fish. This is a marine form, in which the pectoral fins are big and wing like, and help the fish to skip out of the water, and sustain long flights in the air, before falling into the water again. The animal has recourse to this

sort of flight when hard pressed by its enemies under water, but, alas! meets with death not infrequently in another form, for birds of prey often snatch it off in its aerial flight. (Fig. 55).

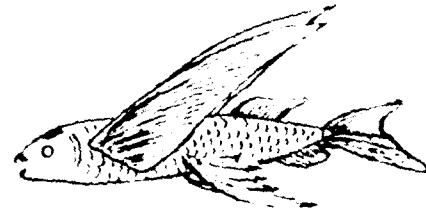


FIG. 55. Flying fish.

The sole fish. This general term includes several varieties, most of which are edible. They are extremely sluggish animals, almost always lying on one side at the bottom of the sea. Hence both the eyes are shifted to one side, the upper side, which is also darker in colour than the other. This is a very good instance of adaptation to environment. (Vide fig. 56.)

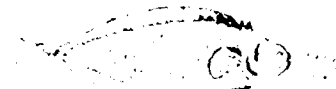


FIG. 56. Sole fish.

The box fish. The body is enclosed in a bony box, with openings, through which the mouth and fins peep out. One variety has a pair of pointed projections in front of the box, and is hence called by Indian fishermen, the sea-cow.

The cat fish. These fish are so called on account of the presence of long feelers near the mouth. Some of them bear poisonous spines.

The climbing perch. This has been known to leave the water, and climb up palm trees, with the help of the opercula, which bear spines along the edges, and the tail fin. A highly developed gill chamber helps it to retain moisture very long, and keep it alive out of water for several hours at a stretch.

The sword fish. This has a long pointed weapon of offence borne on the head. It has been known to run the sword into the hulls of ships,

evidently mistaking them for animals. In the Madras Museum there is a bit of ship-timber, with a broken sword in it.

The fishing frog or angler. This is a sluggish fish. It cannot swim about quickly, and lies with its dirty-looking body just covered over by the mud at the sea-bottom. Its wide mouth probably has got for it the name 'frog.' It bears three filaments on its head one of which has a silvery tip. When its prey, attracted by the glistening bait, comes near, it suddenly finds itself in the mouth of the 'angler.' So nature has given this animal, in the shape of the bait, something that makes up for its sluggishness, and helps it on in the struggle for existence. (Fig. 57.)

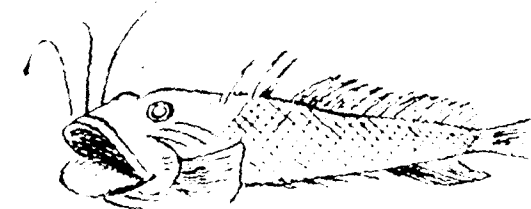


FIG. 57. Fishing frog.

The sea-horse. (Fig. 58.) This is a little animal about five or six inches long. The upper half looks like the fore-part of a horse. The body is covered not with scales but with shields, or little plates fitted edge to edge. The animal has a tail which it can twine round a support (prehensile tail). It is fond of lurking among sea-weeds.



FIG. 58. Sea-horse.

The globe fish. This is not uncommonly found cast ashore on our coast. The body is spiny; and the animal can swallow air and swell itself into a globe.

C. The dipnoi. Though unrepresented in India, this class of fish is of such scientific interest, that it cannot be passed over, without mention. The group includes only three forms all confined to the southern hemisphere. One is met with in Australia, another in Africa, and the third in America in the upper reaches of the Amazon. In these fish there is a continuous median fin, but the skeleton of the lateral fins, deserves study. In the other fish hitherto studied, the skeleton of the lateral fins consists, typically, of a basal plate from which a number of fin rays radiate. In the dipnoi, however, the fin is supported by a row of bones bearing two rows of fin rays, one on either side. This type of limb serves as a transition between the fin (of fish), and the pentadactyl (five-fingered) limb of the higher vertebrates. (Vide figs. 59 and 60).



FIG. 59.

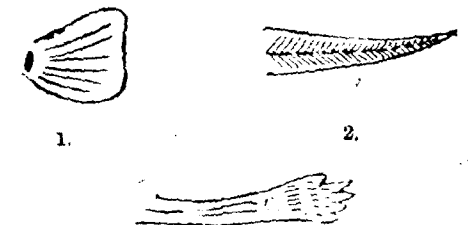


FIG. 60.

Skeleton of {
1. Fish fin,
2. Dipnoi-fin,
3. Pentadactyl limb.

By far the most interesting point about the dipnoi is their breathing. Ordinarily they breathe water through their gills like other fish.

But during certain seasons of the year, when the water is full of decomposing vegetation, owing to over-hanging trees and hence is short of oxygen, these fish come up to the surface and breathe the air. How do they manage to do this? The fact is that, in these fish, the swim-bladder is supplied with a net work of blood vessels, and communicates by means of a narrow passage with the gullet. The air taken in gets into this, and the oxygen is transferred to the blood, and the carbonic acid gas of the blood is given to the air which is breathed out. In other words, the swim-bladder in these fish is modified into a regular lung or air-breathing apparatus. Here, then, is a transition between water-breathing and air-breathing forms, pointing to the fact that the lung of the higher vertebrates is evolved out of the swim-bladder of fish-like ancestors.

This double process of breathing gives the subclass the name, dipnoi, or "double-breathers." How Nature, ever-resourceful, has seized upon a hydrostatic mechanism, and evolved it into an organ of respiration!

Summary. Introduction. Points of difference between vertebrates and invertebrates. Sub-classes of vertebrates.

Pisces. Description of a typical fish—adaptation to life under water—respiration—air-bladder—colouration.

i. *Elasmobranchii.* Dog-fish, shark, skate, ray, saw-fish.

ii. *Bony fish.* Flying fish, sole fish, box fish, cat fish, climbing perch, sword fish, fishing frog, sea-horse, angler, globe-fish.

iii. *Dipnoi.* Peculiarity of the skeleton of the lateral fins, and adaptation of the swim-bladder to air breathing. Scientific importance.

To the teacher. The fresh water forms are best studied in aquaria. Grow some tape-grass (*Valisneria*) in the aquarium to keep the water charged with oxygen. Renew the water frequently, as per suggestions already given. A few pinches

of corn-flour, or minced meat, will do to feed the fish.

Marine fish. Smaller forms can be bottled. A few with a hard exo-skeleton e.g. the sea-horse), can be preserved dry. The rest can be studied when they are being hauled ashore by fishermen, or, best of all, in the Marine Aquarium at Madras. A visit to a Government fish-curing yard is also desirable to see how fish are preserved, for consumption.

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ETHICAL TRAINING IN THE KINDERGARTEN.

THE importance of moral training is coming to be recognised on all hands. As Ruskin says, "Education does not mean teaching pupils what they do not know. It is teaching them to behave as they do not behave." Matthew Arnold's oft-quoted remark that "Conduct is three-fourths of life," is rather an under-statement than an over-statement. That is, conduct is the whole of life. Education is "a preparation for complete living." Our education, if it is to be a preparation for complete living, ought to help us to answer the three great questions which meet us at every turn: viz., Is this right or wrong? Is it true or false? Is it beautiful or ugly? All these aspects, the moral, the intellectual and the aesthetic, ought to be developed. The defective character of the intellectual man whose emotional nature is atrophied and whom undue reflection has well-nigh incapacitated for practical activity, of the man of feeling who has forgotten how to think or act, of the practical man who has no time for thought and to whom the emotional life seems a weakness, is a matter of common observation. In the physical organism the health of any one part depends upon the health of all the other parts. Here also the true development of any part of our nature implies the concurrent development of all the faculties. The purpose of education should therefore be a harmonious development of all the faculties. Only in so far as man makes the most of his nature does he fulfil his function in the Universe, of which he forms a part. Towards this magnificent conception of Hegel educationists are now drifting. Education is the unfolding of personality; it aims at self-realisation. To

the love of knowledge must be added the love of beauty and a lofty conception of conduct. If the strength of men and nations depend upon what the man is, and if what he is, depends upon what the child is, then how important it is that the child should develop all that is good, pure and noble? In the following pages it is our purpose to consider how far the teacher can utilize the forces near at hand, in producing upon the earth a better race of dwellers.

For a right understanding of the way in which the teacher can train the moral sense of boys, a clear conception of the moral act is necessary. The moral life is not a life of impulse, not the aimless striving of the Lotus Eaters, not the being tossed about by circumstances; but it is a life of purpose, a life of self-control. The moral act is an action in "the line of greatest resistance," as Prof. James puts it. An instance of the life of mere impulse is afforded by the life of the habitual drunkard, whose notorious defect is the absence of self-control. The man becomes the slave of the idea of the moment. His life is the nearest approach to that of the animal; the man, we say, "makes a beast of himself." On the contrary, a life, guided by a purpose, is a life in which the idea of the moment is subdued by a larger conception of life's meaning. It is in virtue of this attribute of human activity that we call his life a moral life. And a moral act is defined by moral philosophers as "consciously purposive activity." This teleological character of moral life leads us to another important feature of the moral act to which we have already alluded by talking about the self-control involved. All purposes demand some sacrifice or other. The doctor gives up sleep and the scientist, intent upon his discovery,

gives up society. This sacrifice is very often born of sympathy. The necessity for sympathy is not felt by the immature mind. For example, the boy throws hot water upon insects and pulls off the flies' wings. The cruelty is due to a lack of imagination, because he is quite like Wordsworth's *Peter Bell* :

"A primrose by the river's brim
Is a yellow primrose to him
And it is nothing more."

The boy must be asked to look deeper and comprehensively. Thus, for the development of the moral sense of boys, the cultivation of imagination, the rousing of a feeling of sympathy, and of a spirit of sacrifice or self-denial, and the inculcation of the power of acting for a purpose, are indispensable, and their "conscience" will be educated only to the extent to which we are able to train these faculties. We shall devote the rest of this paper to an examination of the extent to which the subjects of the curriculum and the other influences of the Kindergarten school promote these faculties, and give ideas regulative of conduct.

By thus limiting the question, we are hinting our disapproval of the efficacy of setting up a period or two in the week to regular moral instruction and of the futility of moral precepts and copy-book maxims especially in the lower grades. That is, the first education of the will should be indirect, it should reach the will by *action* rather than by ideas. The emphasis falls on *action* rather than on ideas, certainly, till adolescence. The reason for this is that the emotional and volitional parts of the nature of children predominate over the intellectual. Further, the precepts or moral rules reach the intellect; but the springs of character are

the emotions and the will. It is not enough that men shall know what is right. They must also *will* to do it. The precepts or moral truths give the former; they do not *always* give the latter. Truth is life understood and life is truth embodied. We want a *moral life* and not *moral truths*. As Shakespeare makes the learned Portia say :—

"If to do were as easy as to know what were good
to do

Chapels had been churches and poor men's
cottages princes' palaces."

To do is not so easy as to see what 'twere good to do; because perceiving the truth is easier than the more energetic act of willing the truth. The failure to draw this distinction led the wise Socrates to slip in his famous dictum that "knowledge is virtue." To him it did not seem possible that a man should know what was best for him and yet not do it. Knowledge is indeed a means to virtue, but it is possible for a man to see the light and turn from it and walk in darkness. The theoretic comprehension of truth *solicits* but does *not compel* obedience. Hence the futility of moral rules. Further rules are general, but conduct is particular. A moral situation implies a number of concrete circumstances which are not taken into account by the so-called moral rule. We have what are called "conflicts of duties." For instance, the warrior-prince Arjuna is confronted with two rules:—"To break family ties is a sin," "To leave the people in cruel bondage is also a sin." Where is the right way? To solve the difficulty, the attendant circumstances must be taken into consideration. Mere rules cannot help us here. Therefore, moral instruction must be indirect and incidental.

How is this indirect moral instruction possible? Of all the subjects in the Kindergarten curriculum, the *story* affords the greatest scope for developing the moral sense of the child. Literature exerts a beneficial influence on character, revealing human nature in its broad outlines and in its ideality. The subject calls itself "The Humanities." Literature mostly takes the form of "Stories" in the Kindergarten. These are the first introduction into the world of the ideal in life and character. The first and highest use of the story is that of enabling the child to know what man may be and may do. In stories, the child really sees how kindness is rewarded and greediness punished. The ideals of justice, hope, truth, mercy, retribution, etc., are restored to children's minds. In this respect stories of real life as well as Fairy Tales are very fruitful. For instance, when "The Fairy Tale of a Fox, a Dog, and a Cat" was narrated to children of the fourth class they closely followed the fortunes of the poor dog who first met with rather adverse fortune. But their faces suddenly brightened when they were told that the dog was released and that the scheming fox was outwitted. This is a very good way of inculcating moral ideas. Taking advantage of the boys' thirst for stories, the teacher may improve the behaviour of children; e.g., to a mischievous boy, the teacher may narrate the doings of a naughty child. In most cases the boy quickly recognizes this trick of the teacher and behaves better. The teacher may then narrate the story of an obedient boy. The boy recognizes the badness of his act and grows better. Thus a good foundation of story material offers such a background of moral training as is possible in no other way. The boy does not get merely a catalogue of bloodless or lifeless

categories as is supplied by teaching him to get by heart a number of copy-book maxims. He is given concrete instances of moral life.

A closely allied subject is History, which, at least with children of the Kindergarten age, is merely story. It also takes them to the concrete. From one standpoint, History is a series of vast experiments in living. It is moral philosophy teaching by example. A study of history enables children to learn what they may safely imitate and what they must reject. History teaches them the hardships one has to encounter, and the sacrifices one has to make. It trains their imaginative faculty by referring to various nations and many ages and gives them a clear idea of "a life of purpose," the persistent striving after ends. The ethical aspect is the foremost aim in the teaching of literature and history.

Nature Study, which is a recent introduction into the class-room, is not of less importance. Surely it is time to realize that nature-study is no small part of ethical instruction. Pet animals kept for the children in the Kindergarten to care for and look after promote gentleness and tenderness of feeling, and a pleasure in attending to the wants of animals. The study of plants inculcates in them a love for all living things. Children learn the necessity for sympathy and self-denial, to which we have referred in our analysis of the moral act. Children who have learned to love flowers and plants, to water them and care for them, and to feed animals, will, when they grow old, be capable of making sacrifices for the human beings whom they love.

Now we pass on to *organized games*. Their value from the ethical point of view cannot be overestimated. The playground is the

ideal field for the cultivation of the moral side. Children understand what is meant by the pursuit of an ideal. Further, games afford scope for *actual doing* and not for mere talk of such things as courage, self-denial, obedience, self-control, the pursuit of an ideal. The children come face to face with opportunities of being unselfish. Here, *actual doing* and not mere rote learning is the thing that is wanted. Practice alone leads to perfection as is evidenced by the fact that a soldier who might have learnt what all is contained in every book on military tactics would really be helpless when a critical situation demands a strategic move. Moreover the team-games cultivate a social feeling. The boy learns that his own is not the only will or pleasure in the world. He has to subordinate his individual pleasure to that of the whole team. It is impossible for a boy to play foot-ball hard and persistently without gaining any virtues. Thus games elevate the moral tone of the Kindergarten children.

Of the subjects bearing on the development of character, let us not forget manual training, otherwise known as handwork. This subject takes various forms: Drawing, modelling, paper-folding, paper-cutting, wood-work, needle-work. In all these the ideas of honesty and accuracy are realized in concrete instances. People who handle things are brought nearer reality and life; whereas people who deal exclusively with words, such as language students and philologists tend to become unreal and unpractical. Further manual training, which is so much emphasized in the Kindergarten, has proved itself to be an effective way of dealing with criminals and mentally defective children. It teaches them honesty and accuracy. It is this moral value

of manual training that is taken advantage of by the Reformatories.

Hitherto we were dealing with the subjects which loom large in the time-table. But there are other influences at work which end in the moral development of the little blooming faces. We know that children are very imitative. Being in the most impressionable period of their life, they are imitative beings, par excellence. They are susceptible to all impressions from outside, having not learnt as yet to resist the influence of external pressure. They are open to, what educationists and psychologists would call, "suggestion." To put it more plainly, the personality of the teacher moulds and influences the character of children. This is a more or less unconscious process. "Children learn more from what we are than from what we say." We teach them more by our deeds than by our orations. The teacher, armed with such a wide reaching power, must inspire the young ones with lofty suggestions and noble purposes. He must skilfully present to them suggestions which touch upon such subjects as where to go, what to do, how and what to read, what to see and hear, with what and whom to associate and the like. When rightly handled this is a powerful influence in shaping character.

Again schools teach the pupils certain virtues, chief among them being obedience, punctuality, neatness, regularity of attendance. In other words, they lay the foundations for good habits. The value of such habits is very great from the ethical point of view; because many a lad has been led on to immoral practices simply because his parents or teachers were wanting in management and order and were unable to teach him either by

example or by guidance. Good breeding and early habits are invaluable. It is by *doing* just acts that we become just, by doing temperate acts that we become temperate, and by doing brave deeds that we become brave.

Lastly, we come to *punishment and praise* as agencies working for the moral improvement of children. Till very recently the idea of training children consisted in prohibition or punishment. Too much was read into "Spare the rod and spoil the child." But this is fast passing away. Punishment is a deterrent factor and is very often useful. But coercion for coercion's sake is bad. We can easily convince a boy by showing the consequences of his bad act. For instance, we send a boy to the market, to get some article. He steals an anna. The course to be adopted is this. When the next opportunity for going to the market presents itself, send some other boy and tell the boy who stole the anna, "I cannot send you because you might steal my money." The boy will very likely mend his behaviour. Similarly, in other cases we can try to show the consequences of misdeeds by magnifying them. Too much of punishment makes the immature minds very stubborn. Therefore punishment should be resorted to only very sparingly. We shall next take up praise which is the positive aspect. It is a great stimulus to children. Real efforts to be unselfish and courageous ought to be noticed and encouraged. Very often an approving look might be enough. Of course "praise" must not be for every right action. But without the occasional "that is right," to the child who is helping the weaker no standard would be set up. The spirit of emulation is stimulated by a careful use of this potent instrument. An extravagant and

frequent use of praise is surely to lead the boys to practise hypocrisy. They would do acts simply to be praised by you. And this is not desirable.

In conclusion, we may say that a rough analysis of a moral act reveals to us that it comprises a purpose, a sacrifice demanded by the purpose, a sympathy from which is born that sacrifice, and an imaginative and comprehensive grasp of the situation. To develop these is to educate the conscience of children. The main business of the teacher is to take advantage of every opportunity afforded by the branches of study included under the curriculum and by every incident of school life, to be a pure, sweet and inspiring presence and to judiciously use punishment and praise, as influences by means of which he can develop the moral sense of the pupils entrusted to his care and guidance.

K. R. APPLACHARYA.

Lower Secondary Arithmetic

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SOME ASPECTS OF THE PRESENT DAY SECONDARY EDUCATION.*

I

EDUCATION has at all times been receiving everywhere in the world the greatest amount of attention, and strange as it may seem, even in the anxious period of the most terrible war ever fought, which has now happily come to an end, the belligerent nations while fighting for their very existence were not concentrating their attention solely on the conduct of the war but were seriously considering the ways and means to reconstruct the whole system of education, being prepared to spend even large sums of money in this direction in spite of their greatest financial stress. Mr. Fisher's Education Bill remodelling the system of education in England making radical changes was introduced in the midst of the war. Such being the tendency of the day is it any wonder that it is also a burning question in India at the present time?

The cry of reform and progress is in the air and our popular leaders realising that education alone will bring about the national advancement are seriously discussing the various aspects of it. Those who bestow thought upon the present educational condition of our country may be confronted by various questions. For example, what is the kind of education best suited to our country? Is the present system of education run on sound lines, or does it require to be modified on better and different lines? Who is best fitted to plan and to control the education of our youths? and so on and so forth.

The problem of education is and has ever been a hard one to solve as various factors enter into a proper consideration of it. It is comparatively easy to solve in a country which has a common language, a common religion, a common nationality and a government of their own, as in that

* A paper read by Mr. K. N. Vaidyanatha Iyer, B.A., L.T., of the Victoria College, Palghat, at the Masters' Association of the College on 17th December 1918.

case the question may be left safely in the hands of the Government. But the problem assumes peculiar complications in India with its variety of languages, creeds and races, ruled by an alien government in which the interests of the rulers and the ruled cannot be identical even if they be not often opposed to each other. But the difficulty of a problem can never be an excuse for shelving it, more so when the welfare and progress of the land urgently calls for a sound solution of it.

I do not certainly pretend to be competent to solve such a knotty problem. Nevertheless I shall place before you certain aspects of one stage of education, viz., Secondary education, incidentally suggesting how some of the glaring defects in the present system can be rectified.

The aim of education is to train the body, to cultivate the intellect, to develop character and morals and to elevate and ennoble the soul. A sound education is that which makes a man a better self, a useful social being and a good citizen. It should inspire a passion for the true, the good and the beautiful, should create intellectual, moral and aesthetic tastes and should kindle the desire of service to fellowmen and to the country. Though all this cannot be achieved by secondary education *in toto* without its being supplemented by higher education still it should lay the necessary foundation for these, making it possible for the recipients of it to develop later, as best as they could, on the lines suited to their capacity and tastes. Let us see how far our present system comes up to these ideals.

The English education which has been introduced in our country has undoubtedly done us immense good by giving us a peep into the vast scientific lore of the West, by enlarging our ideas and broadening our outlook and by instilling into our minds through English literature ideas of liberty, equality and fraternity, thereby creating in us a desire to introduce representative political

being but a repetition to them. This too early specialisation which is calculated to dwarf the intellect of boys unduly should not be attempted before boys are able to know the bent of their minds.

The secondary course should include in it various useful subjects taught to all alike, such as English, Vernacular, Mathematics, English and Indian History, Geography including Astronomy, Physics, Chemistry, Botany with Geology, Physiology and Drawing—only a general broad treatment of each of these being attempted. It is also necessary that every subject should be taught with a view to its practical application in life, showing the connection between Mathematics and work-a-day problems, Science and its use in industries, Botany and Geology and their use in gardening, History and its use in constitution making and so forth. In the words of Mr. Statham, the sympathetic Principal of the Kumbakonam College, in his brilliant address on the present system of education here, “teachers should be able to demonstrate in a subject the beauty and genius of the subject.” In fact secondary education should be so planned as to give the pupils a sound general education, at the same time enabling them to form many-sided tastes with a view to their future development in some particular line or lines suited to their ability and aptitudes.

Again, a kind of education which is meant to train the youths of a country should be essentially, though not wholly, national in its nature. It should suit the characteristics and requirements of the nation, make the products of it able easily to further the national cause and to enhance the number and prestige of the country. But in our present system most of the things that are taught have little relation to our country, our environment, our social or domestic life and are mostly alien in their nature. The text-books that are used for various subjects are those which were written for English boys and as such the topics treated therein are intimately connected with English life, customs, manners and institu-

tions and have very little Indian about them. No serious attempt has so far been made to prepare books specially suited to Indian boys with homely and familiar Indian illustrations. The text-books in actual use treat, for example, of icebergs and snow storms, of ship-wrecks and sea adventures, of hunting and shooting expeditions, of swallows and tadpoles—in short, of objects and incidents which are entirely foreign to our soil and to our life and which can hence be hardly intelligible to our Indian youths.

In fact, we are learning more of things and events pertaining to other countries, chiefly Great Britain, and very little of the history or geography, botany or geology of our own land. For example, the little importance that had been attached to the study of Indian History in our schools has now been further reduced, since according to the revised syllabus only the British period of the History of India is to be taught. In one sense there is no need to feel regret at this omission. For, the text-books on Indian History now used in our classes are by no means inspiring and are imperfect being written by foreigners. The history of any country, if it should be a faithful and true record, should be undertaken by the sons of the soil. Because a foreigner will naturally be at a great disadvantage as he cannot be expected to know the view point of the natives of the country. This probably accounts for the History of India, particularly the ancient period of it, being found in our text-books to be very meagre and much in conflict with the Indian presentation of the same. It is therefore necessary that the History of India should be written on true lines by our own people, or by very impartial historians, and the ancient greatness of India in religion, ethics, philosophy, music and fine arts, medicine, mathematics, astronomy and other sciences should be taught to our pupils so as to inspire in them a passionate love of their race and country. In the most impressionable period of their youth our young-

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men should be made to know the ancient greatness and the glorious traditions of the past so that they may feel proud of their country and proud of their ancestors and cherish an ardent longing to redeem the extinct glory of India.

It is also desirable to introduce in our schools an elementary study of civics to teach our young men different forms of government and their working, the growth of representative institutions and the rights and duties of the people in order that they may be prepared to discharge properly their functions as citizens when they enter life. This drawback was pointedly referred to by Mr. Statham, in his lecture on "The Youths of the Tanjore District" that "they were not well-tutored and equipped to become proper citizens when they grew up" and that "they were not tutored in the rudiments of social and public responsibilities."

Again, too much importance is attached to the study of English language in our present curriculum. Much of the time that could be profitably utilised in the acquirement of scientific knowledge is being unduly and unnecessarily devoted to the study of a foreign language. The study of books in English in the Secondary Schools should be reduced to the limits of absolute necessity. While English should no doubt be a compulsory subject, we have to realise that after all language does not constitute knowledge, and from the point of utility what is wanted for the generality of people is merely a working knowledge of English.

The question of language naturally leads to the place of vernaculars in our educational curriculum. While it is true that the department is now encouraging the vernaculars, still more adequate provision needs to be made in view of their being the mother-tongue of the pupils.

Another equally urgent reform to be brought about in High Schools is the introduction of vernaculars as the media of instruction in non-language subjects. Nowhere in the world except in India is the teaching of such subjects impart-

ed in other than the vernaculars of the place. A little reflection will convince anyone that while a great deal of difficulty is now experienced in learning various subjects because of their having to be acquired through a difficult foreign language, much of that difficulty could be obviated by their being taught through the mother-tongue, as in that case, the language difficulty vanishes and only the difficulty to understand the subject-matter remains. To quote Mr. Statham again, "The South Indian students were handicapped in their work. They had to do all their work through the medium of a foreign language. That in itself was fundamentally wrong. In learning things through a foreign language they had to spend energies of thought and time doubly." Sir Rabindranath Tagore, our venerable poet sage, made a very powerful plea for the vernacular to be the vehicle of instruction in our Indian schools, in a spirited article contributed to that excellent Indian journal, "The Modern Review." After remarking that the foremost difficulty in the spread of education lies in English being the medium of education, he shows how our boys, not being able to get anything like a proper grounding in the difficult English language, naturally resort to cramming. In his characteristic fashion he says "Like Hanuman who, not knowing which herb might be wanted, had to carry away the whole mountain top, these boys, unable to use the language intelligently, have to carry in their heads the whole of the book by rote. Those who have extraordinary memories may thus manage to carry on to the end, but this cannot be expected of the fellows with only average brain power. They can neither get through the closed doors of the language barrier, nor have they any means of escape by jumping over it."

"The point is, is the crime committed by this large number of boys, who owing to congenital or accidental causes have been unable to become proficient in the English language, so heinous

that they must be sentenced to perpetual exile by the University? In England at one time thieves used to get hanged. But this penal code is even harsher, because the extreme penalty is imposed for *not* being able to cheat! For if it be cheating to take a book into the examination hall hidden in one's clothes, why not when the whole of its contents is smuggled in within the head?" Professor Karve, the founder of the Indian Women's University of Poona, the special feature of which is the successful imparting of instruction through the vernacular not merely in secondary but also in higher education, in his eloquent address at an Educational Conference in Bombay, exploded the theory that the various advantages we have now derived from education are due to English being the medium of instruction and made a passionate appeal to "follow the system that is most national, follow that which is most natural, follow the one that is followed all over the world by all advanced and free communities, viz., the system of imparting all instruction through the vernaculars, through the mother-tongue of the students." The same opinion has been echoed by M. K. Gandhi and all our leaders and educationists. The Headmasters' Conference held at Madras was in favour of such a change and passed a resolution to request the Department to make a beginning in this respect by allowing the B group subjects to be taught in the vernaculars. But this much-needed reform is being vehemently opposed on flimsy grounds, such as, want of suitable vernacular text-books in Science subjects, as though these could not be easily prepared, or would not come forth in large numbers if only they were in demand.

It is also highly desirable to introduce in our schools some elementary technical education and a system of manual training so that young men may be equipped with a little bit of technical skill, may learn the use of common tools and implements, may be able to help themselves in small handicrafts and may also feel and under-

stand the dignity of labour. It also indirectly improves their health by the physical exertion involved in it and opens out other walks of life to eke out their livelihood by independent labour instead of following the stereotyped calling of quill-driving in a public or private office. A workshop on a small scale should also be attached to every secondary school. A beginning in this respect has now been made in that progressive State of Mysore by including technical education of various forms in the Secondary school curriculum. Realising the importance of the step so taken in Mysore and feeling that our country's material welfare and prosperity requires our attention to be devoted not exclusively to the cultural side of education as at present but also to the technical and commercial side of it which has been a prominent feature in the West, Mr. Seshagiri Iyer of the Madras High Court, who has always been taking a great deal of active interest in the educational problem of the country, has invited through the medium of the press a discussion on this momentous question with a view to focussing public opinion and then to press the Government to initiate such changes in our secondary education. The war has also opened out the eye of the people and of the Government in India to the great importance and urgent need of paying greater attention to technical and scientific education to bring about the industrial regeneration of the land.

I may in passing refer to the marking system prevalent in our schools which while intended to minimise the hardship of a single final examination at the close of the year has given rise to almost daily examinations imperfectly conducted in class-rooms, the boys having ever to dream of examinations only. To lighten the strain on boys and on teachers I think good and reliable marking to indicate the merits of pupils can be secured by holding, say, three well-conducted examinations in the course of the year.

The severity of the public examination, the

MORAL EDUCATION.

DURING the times of the Partition of Bengal when there was a good deal of general restlessness in the country, and of excitement among students, the subject of moral training in schools was very largely discussed in the press and on the platform. The subject was discussed also at the meeting of the International Congress in London in 1908, and it was again discussed at the meeting of the same Congress at the Hague in 1912. To represent Indian opinion at this meeting, a Moral Education Society was formed in Bombay under the able presidency of Dr. Bhandarkar, and an influential committee was also formed with the Hon'ble Sir Narayan Chandavarkar as Chairman. The question of moral education became one of the burning questions of those days, and men were not wanting who thought that it had become one of the pet questions of dreamers and faddists.

It seems strange that this aspect of education has been left very much in the background for the past so many years. The education imparted in schools and colleges has been chiefly professional or intellectual serving as a means of gaining livelihood or as a means of practical self-advancement. The work of character-forming, of instilling high ideals and noble pictures of life into the mind has not been so much attended to, which the importance of the work deserves. No reference is here made to the early times, the hoary past, when undoubtedly this aspect of educational work was receiving its due share of attention in this country and elsewhere, but unfortunately in a way which killed out all individuality on the part of scholars. In those times education was confined to the priestly class all the world over, and, as it ought to be, it was

highly tinged with religious dogmas and moral practice in conformity with the crude notions and ideas of those times. Then came an age of reaction against exclusiveness and monopoly of knowledge, and education became secularised as it remains to-day. During this period of reaction, moral education, closely associated as it was with religious education, came to be ignored in public schools with its partner religion. As it was thought desirable to leave each man's religion to his own conscience, so it was tacitly assumed that morality might also be left to parental care and individual conscience, to the restraint of the prevailing social standard evoking praise or provoking censure for good or bad conduct. From one extreme of morality based on religious sanction, the world seems to have swung round to the other extreme of morality to be empirically learnt in the school of experience. The passionate outbursts of parents, the scoldings of elders, the rude shocks of life, the harsh clash of rival claims and interests, the discipline of disease and ill-health seem to be the stern moral teachers of the present day. There are now unmistakable signs of a fresh reaction setting in. Often is it asked, why can regular moral instruction not be imparted in schools?

If people sometimes think that regular moral instruction is impracticable, nobody can deny the importance of moral training. We have constantly heard it dinned in our ears by every platform speaker and every pamphlet writer that the teacher's profession is the noblest of all professions, that the teacher has to mould the character of the rising generation, that, if there occurs a breach of the peace anywhere among people, the teaching given in schools is bad and requires

root-and-branch reforms. Surely our position as teachers is very critical, and it is to our interests that we look into the question a little below the surface, rather than dismiss it as an idle question invented to serve as a topic of the day.

By no means can it be denied that moral education of an indirect nature is sought to be given in schools and colleges. The order and discipline maintained in the class-room serve as a potent means of moral education. A good disciplinarian enforces the virtues of diligence, regularity in studies, truthfulness, obedience to elders, punctuality in attendance, and many other virtues. If he is a man of tact and personality, the practice of such virtues becomes a matter of love and willing service on the part of students. It is not, however, every teacher that is a teacher of tact and personality, and it is not always that the discipline of the class-room becomes an influence for moral good. Lapses in discipline are often visited with punishments of a deterrent character without any formative element in them. The punishments are not, in the words of Herbert Spencer, the natural reactions of the offences committed. The wilfully negligent and those who are unavoidably negligent are sometimes treated as delinquents of the same class, and justice or injustice is meted out to them with all the solemnity of the Indian Penal Code. The man of previous habits, social surroundings, delivered up for studies at home are not often made a part of, and remedies for the evils arising from such causes are but seldom suggested. The teacher often assumes the attitude of a magistrate invested with criminal powers, and the work of maintaining discipline thereby degenerates into mere police work, with the positive element of sympathy and love,

of persuasion and advice, severely kept out. But even this form of discipline contributes not a mean share to the task of character-forming. Although the methods employed are of a militant order, the effects proposed to be secured are wholesome and beneficial.

Much incidental moral instruction is indirectly given in the course of reading lessons. The text-books we teach teem with lessons which highly lend themselves to moral teaching. It is the prevailing practice with every good teacher in lower classes to wind up every reading lesson with the moral which it suggests. The instruction conveyed in the form of stories silently works its way into the moral composition of the growing mind and in course of time becomes an organic part of it. If we only recall the moral lessons we once learnt at the feet of our teachers, how vividly do they come before the mind even at this remote date! What noble aspirations have they kindled in our hearts! Let us take any lesson in the Reader and consider the possibilities of the lesson as a means of moral training. Take, for instance, the lesson on the rose-flower occurring in one of the Readers. After a description of the loveliness of the flower in question, its rich fragrance and its charm and glory of colour and form, something is said in that lesson about the manufacture of rose-water and the manufacture of the still richer perfume called 'attar of roses.' Something is also said in that lesson about Nurjahan, the favourite queen of Jehangir, how she observed for the first time the richly-scented layer of oil floating in her bath into which roses had been thrown to make the great Queen's bath more enjoyable. Now, we are apt to pass over that lesson in a hurry; and as teachers may be quite satisfied, if their pupils know the

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construction of all difficult words, the meanings of new words and phrases, and are able to write out a short and clear summary of the lesson, anything more than what is necessary from the standpoint of the examination may be neglected. More often than not, we are apt to overlook the morality of the rose flower. The rose has also to teach us moral lessons and principles of a very high order. First and foremost, we have to bestow a passing notice on the old and time-honoured saying, 'there is no rose but has a thorn.' Then we may deduce from the lesson that health and beauty are only for those who lead a life of natural simplicity and cannot be purchased for all the medicine bottles and Kavarajas of the world. Also, we may teach that the lilies in the field and the roses on the bush are arrayed in a manner more glorious and splendid than ever the greatest crowned monarch among us. Furthermore, can we not draw the moral that common things become vastly better and superior by association with what is good, as is evident from the case of rose-water? Lastly, Queen Nurjahan's discovery deserves a brief notice. Her history illustrates the luxurious habits of all the grand personages in the Mogul Court; and the Muse of History points the moral that luxury always indicates a high level of civilization and idle wealth, and is the warning forerunner of coming decline and fall. Thus almost every lesson we have to teach may be made the starting point of a short discourse, in which are discussed the moral principles insinuated by the lesson. Stories and anecdotes employed to convey moral instruction have the sanction of high usage and immemorial custom even with the greatest masters and moralists of the world, and they form one of the best means at the disposal of the

teacher by which to shape and mould the plastic character of the young.

In higher classes, the works of classic authors are taught, and the pure air of virtue and morality that pervades them ennobles the character and purifies the heart. The poems and plays and other writings exercise a potent influence for good on the minds of readers. Literary works are rightly considered as works of power as opposed to scientific treatises and books on trades and manufactures. The latter are valued as works containing useful knowledge and information to be modified in later times in the light of fresh discoveries and newly designed inventions. But works of high literary merit exercise an abiding and healthy influence on all the springs of character. Like the sun and the moon, they call forth the tidal springs of the heart, arm it with powers, fortify it with principles, and spread aloft the banner of noble ideals and aspirations to fight against the temptations of life. Surely the development of character is in no way so much silently and unconsciously promoted as by a course of reading in literature.

There are also other kinds of activities in schools tending to develop character. The play-ground under suitable supervision plays no unimportant part in the work of character-formation. It cultivates the social virtues of sympathy and courtesy, promotes good temper, develops a spirit of give and take, trains the mind to bear the ups and downs of life with becoming modesty and evenness of fulness. Of course, these advantages are realised only when the lower combative tendencies, when all bullying and rowdyism, all meanness and trickery practised for gaining unfair victories, are kept under due control. The drill-master does, not generally

command the respect or confidence of students. It may be rather too much to expect of teachers the continuance of their work of supervision out of school hours. Teachers who are in themselves interested in games may do the work as a matter of love, if not as a matter of necessity. But the best solution of the problem consists in appointing a specialist to promote physical and moral culture among boys, a specialist of the type of a scout-master of superior moral and educational qualifications. The rules relating to the Boy Scouts Movement may, with modifications, be adopted, and the scout-master may be charged with the responsibility of enforcing the rules. A reform of this sort will tend to greater moral excellence and physical improvement.

The debating societies usually attached to the Upper Secondary Department of all good High Schools must be considered as a useful training ground for the welcome growth of civic virtues. No public man of eminence has ever been able to come to the front without those powers of eloquence which command the attention of councils and assemblies and which give their gifted possessors the privilege of guiding and instructing his fellowmen. The little Gokhales and Vivekanandas of our schools receive their early training in the art of elocution in these societies. A certain distinguished countryman of ours in Northern India, in a speech delivered by him, proclaimed that he had made a diagnosis of some of the defects of Indian character. The passage goes on enumerating a vast array of formidable defects in the following strain:—"Our deep-rooted selfishness, our ingrained spirit of dis-union, our blind confidence in the existing state of things, our reluctance to accept the

efficacy of a change, our helplessness in the face of natural evils and sudden difficulties, our short-sighted covetousness that impels us to kill the goose that lays the golden egg, our habits of sheer indolence and procrastination, our loose promises, careless talk and careless assertions, our distrust of each other, and the absence of any feeling of co-operation among us—all conduce to make earnest work slow, difficult, and exasperating." Here the quotation ends, and the commentary shall begin. The gentleman seems to be such a powerful speaker, shouting down in a shrill voice, with all the vehemence of passion with such a fearful aspect of terrible earnestness, these anathemas upon Indian character in an ascending climax, that one is forced to conclude that there must be a soul of truth in these utterances. Now, many of these failings of Indian character, which must be present in a chrysalis condition in our students, will be weeded out in a very large measure in these debating societies. A thorough weeding out of such failings is certainly impossible unless and until the home-influences and the influences of the communities operating on the characters of students become sufficiently refined and tolerant to confirm the liberal tendencies brought to bear upon their sentiments and feelings in public schools. The very atmosphere of modern school-life organised on the basis of collective teaching goes a great way to root out these defects. The debating societies, when maintained in a healthy condition, only act as a more powerful and effective germicide and disinfectant in killing out the disease germs eating into the life and vigour of Indian character. Students of all castes and creeds are brought together in these debating societies for the common purpose of

general culture and self-advancement. As members of such societies, they are made to forget their personal differences, and are taught to tolerate, if not actually to respect, their mutual prejudices growing out of differences of customs and persuasions. Their first lessons in co-operation and concerted action are learnt here; the spirit of self-sacrifice and the desire to render unselfish service are taught here; the free discussion of questions of an historical, a scientific, or a socialistic character, however crude the attempts at such discussion, is at least calculated to awaken in them the intellectual conviction that changes in customs and social institutions are now and then necessary, that the blessings of an ordered and peaceful government deserves to be repaid with loyalty and devotion.

While moral teaching of an indirect nature is given in schools by the four-fold means of order and discipline in the class-room, reading and literature lessons, games and field-sports, and school societies, opinion is still entertained in certain high quarters that separate provision must be made for direct moral teaching. A small minority of men are of further opinion that it is more rational to combine moral teaching with religious instruction. This last opinion may be easily disposed of. It puts forward a scheme, which, as everybody knows it, is not quite practicable. The question of introducing religious instruction has been vetoed by authorities in all places. If, by regular religious instruction, the existing sectarian differences and the spirit of aloofness resulting from them are likely to be accentuated, the desirability of giving instruction in religion is highly questionable. Any form of religious instruction that may be adopted in schools

should be so modified as to suit the present cosmopolitan character of the times; only on that condition should religious teaching be tolerated in schools.

The question that is of greater importance with us is whether or not any special periods must be devoted to moral instruction unmixed with any secular teaching. It is no doubt not a visionary scheme. Moral principles may be taught to students of all castes and creeds on a common basis acceptable to all religions. A few periods of short duration may be devoted to such teaching out of school hours. It is the opinion of intelligent men that such instruction should be through the medium of stories and anecdotes culled from Indian and other oriental sources. It appears that books containing such lessons have been recently brought out. Certainly, an abstract discussion of principles without illustrations taken from national story-books and legends will not exercise such a vitalising influence; it will be something like the old method of teaching science without experiments.

The advocates of the direct system claim certain advantages in its favour. Such a system will not be of a desultory character. It will cover the whole ground of teaching to be gone through in a thorough course of moral instruction. The virtues to be taught may be graduated on the system according to their adaptability to the understanding of young minds. The system of direct teaching is not hampered by the nightmare of examinations. Mr. de la Fosse of the United Provinces has spoken about the disadvantages of the indirect system in the following manner:—"I doubt very much whether the lessons in the Readers of a moral tendency or with a direct moral purpose are read otherwise than as reading lessons. All depends upon the

teacher; and as is well-known the men employed in the Primary classes are poorly paid and poorly educated. It would be too much to expect such men to exert a strong moral force. Their conception of the teaching function does not as a rule include the teaching of morality. In the higher classes, the pressure of examinations banishes all moral teaching." A quotation from Dr. Bain's *Education as a Science* may also be brought in here. "A further condition of successful moral teaching is a command of the stores of language that embrace the topics of moral suasion. This leads us at once to the highest region of spoken address, as exemplified by our own greatest orators. Without a certain compass of expression, and that well-directed to the purpose, no one can produce deep moral impressions by mere teaching; hence very little is to be expected of the common school-master working in his own strength." Now, the foregoing quotations make it clear how indirect moral teaching is not much attended to by school-masters, and how, even when such attention is paid, ordinary specimens of school-masters have not a sufficient command of eloquent language to make themselves very useful as teachers fit for imparting moral instruction.

There is yet one more question to be answered. Supposing we have the right sort of books to help us in our task, we get over the pressure of examinations by adopting the direct system, and we secure the services of teachers richly endowed with the gift of language to deliver sermons to captivate the expanding heart—supposing we fulfil all these conditions, shall we attain the goal? The virtues that adorn character are, after all, not merely to be taught, but should also be put in practice by the taught. By mere teaching or preaching, we can only create an intellectual conviction of what is good or bad.

The emotions remain undisciplined, the impulses uncorrected, and the power of will left to itself in all the strength of its uncultured weakness. Unless we seek to keep these factors under control, we cannot say whether the convictions resulting from mere intellectual teaching will bear fruit in good conduct and steady character. What is therefore wanted is not the conviction alone, but the courage of convictions; not the machine alone for doing the work, but also the power to set it working. It is probably the experience of many of us that although we condemn a particular course of action or a favourite habit at the bar of common sense or reason, yet we cling to it with all the tenacity of a deep-rooted partiality or under the pressure of unreasonable social scandal and odium. To combat unreason and meaningless social reproach, to combat the dictates of selfishness and low desires, besides convictions, sufficient strength of mind is an indispensable weapon. Lessons and lectures and formal instruction will not be of much avail; their effects are soon effaced by our drifting back to the old ways of life by sheer force of habit. A certain amount of healthy ascetism in life, a spice of monastic austerities, the practice of habitual mental concentration are not only beneficial, but also essential. These are the good old ways by which saints and sages of old conquered the realms of feelings and masterful emotions. The schoolmaster is here quite powerless. It is the work of parents to provide the means and facilities for will culture. If parents do not co-operate with teachers, if appeals to the intellect in schools are not supplemented by the enforcement of corresponding habits at home, the work of moral training is surely only a golden dream. As regards students living far away from parental roofs, in the midst of the dissipating pleasures of busy towns, where they come for the prosecution of their studies,

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hostels and boarding houses must take the place of the home. This question of character-forming, of moral instruction is, after all, a very thorny problem. A satisfactory solution seems beset with innumerable practical difficulties, so much so that certain people consider it lying altogether beyond the province of practical realisation. The teacher must, no doubt, do his work efficiently. He must be an ideal character having sufficient regard for high principles of rectitude and good conduct. The social influences at home must also be pure and ennobling. Herbert Spencer rightly lays upon parents the duty of preparing for themselves "for that gravest of

all responsibilities—the management of a family." The foregoing paragraphs cannot be better concluded than by quoting a few lines more from the same author: "Whether as bearing on the happiness of parents themselves, or whether as affecting the characters and lives of their children and descendants, we must admit that a knowledge of the right methods of juvenile culture, physical, intellectual, and moral, is a knowledge of extreme importance. This topic should be the final one in the course of instruction passed through by each man and woman."

M. A. ANANTA AYYER.

IN THE PRESS**MACAULAY'S****LIVES OF****JOHN BUNYAN**

AND

OLIVER GOLDSMITH

WITH

INTRODUCTION AND NOTES

BY

E. H. ELLIOT, B.A.

SRINIVASA VARADACHARI & CO., TRIPPLICANE, MADRAS.

HOW TO GIVE A NATURE LESSON.

THE Deductive method, or the method of just telling facts to children and getting them to memorise them, was the method of teaching used in ancient days. The Inductive method or method of getting children to find out facts for themselves came into use only about 70 years ago; object lessons based on this method were begun to be given in schools about 40 years ago; and only for the last 14 years 'Nature Study' has come into prominence.

"Nature lesson is a lesson on objects in nature, as distinguished from object lesson, a lesson on an object artificially made. A nature lesson being a lesson on a natural object, had best be given with the object in front of the children. Objects can sometimes be brought into the class room, sometimes not; and the latter is always to be preferred, considering the fact that the objects when taken away from their places lose their original form and beauty, e.g., a plant or a leaf withers away a few minutes after it is moved out of its place; and hence it is that a nature lesson should necessarily be given out of the class-room in the open air. Lessons on common animals and birds can be conducted with ease only when the animal or the bird is a tame one. It will, therefore, be a good plan if the school can have 'school-pets,' an aquarium, a terrarium, and a museum. A lesson on a wild animal, therefore, seems to become an impossibility; but it is not so: for a lesson on a lion or a tiger, for instance, can be given at—say park or Rajah's palace if they are available there or at any circus theatre if there should happen to be one near. Excursions to such places are a delight to the children being at the same time of much value to the lesson on hand. The method adopted in a nature lesson is rightly called 'The

Heuristic or the Happy Method.' When giving a nature lesson the teacher has got to remember first, that he (or she) should also play, work and do everything along with children, and not be lazy or indifferent nor think it beneath his (or her) dignity to descend to their level, and next, that he (or she) should make the children observe things for themselves, and by means of suitable questions, which by the way, would vary with the kind and nature of the object to be studied, get them to find out various facts and also reason out their particular structure. Nature lesson has to come in, in the school time-table at a time when the children would be particularly bright and cheerful and the lessons have to be fitted in according to local conditions.

In nearly all school lessons, illustrations of different kinds are a characteristic feature; much more so should it be in a nature-lesson. There is plenty of scope here for black-board sketches, drawings, pictures and models. Perhaps it may be repeated here that it would be best if the class can be taken to the actual object. A teacher should necessarily be able to draw well, and also have at least an elementary knowledge of allied subjects like botany, geology, geography, history, etc. Again, since it is a gift of God that children have acquisitiveness, they should be allowed to acquire knowledge for themselves; but such a knowledge should not be stray. Facts thus acquired, and other subjects in the school curriculum should be correlated one with another, and the teacher should not erroneously believe that a reading lesson must purely be confined to simple reading and questioning on the subject-matter of the lesson, but should freely convert it into a drawing lesson, or any other lesson as it might chance to be. A want of such correlation makes the lessons quite loose and children consequently get lazy and inattentive.

One chief aim of nature lessons is to get the children to acquire a habit of accuracy in statements of facts and naturally therefore to avoid making statements which are untrue or not based upon actual facts.

Y. SURYANARAYANAMURTI.

METEOROLOGY IN THE CLASS ROOM.*

THE Science of Meteorology is the science of weather. Weather-knowledge is all comprehensive and the multitude of ideas that enter into that all-embracing word is the rich source to cause confusion to weather-wise students. This, sensitive to the oppressive weight, has gradually thrown off its confines the phenomena connected with the Science of Astronomy and thus circumscribed, it tries to codify into laws the multifarious facts connected with the atmosphere in its relation to weather and climate. Its all-comprehensive nature becomes at once evident when we come to know that this science is intimately connected with the several branches of Physics and with other sciences. The cause of wind introduces the student to Dynamics and Thermodynamics and to understand the amount of moisture in air and the deposition of it as dew on grass but not on gravel and to comprehend the phenomena of twilight and refraction, he invokes the aid of other sciences. This science should therefore be called the *olla podrida* of sciences—a name given by Huxley to Physiography.

Pity it is that the pioneers of science are subject to the inquisitorial torture before their theories and inventions are accepted and the benefactors of mankind are often given a stone when they do not want it and refused bread when they ask for it. Such was the hard fate of Robert Fitzroy who was at the head of the Meteorological Department of the Board of Trade in the year 1853 and he was laughed to scorn for his predictions. He had to contend against the pious servants of the Church, who, if they bow to the knowledge of Fitzroy would lose their grip over the superstitious minds of their constituents. Only once the good folks of Newcastle were taught a severe lesson and had their eyes opened to the fact that there must be something in the predictions. Fitzroy, as he was a weather-prophet, predicted that a storm was brewing in the South

* A paper read in the Teachers' Association, High School, Tirucattupalle, by Mr. N. Panchapagesa Aiyar, B.A., L.T., First Assistant, High School, Tirucattupalle.

when the sky was clear and weather fine. The fishermen did not heed the signal, they put their skiffs into the sea and lo! the next morning the coast was strewn with wrecks. Many a family had to bewail their impudence. From the year 1867 and after several vicissitudes, the weather science has been slowly and surely rising in its importance and spreading its useful activity to all alike—tradesmen, sea-faring men and agriculturists. In the short space of 50 years, it has emerged from the much reviled art of forecasting into the rank of any first rate science.

The science of meteorology is only 50 years old and is now in the vigour of its prime. The student of that science is baffled by the difficulties in the way and the science itself has not had time enough to build up a solid heritage. The few facts known have yet to be made into an inviolable law of Nature and till then, the exceptions that cannot be explained will appear only as a freak of Nature. The Panchangam predictions, made with no apparatus,—it is said—more often come to pass than those of modern weather-prophets. I do not agree with this wholesale condemnation. An expert in Meteorology uses his eyes, brains and all the instruments he has made to force Nature to reveal herself to him—all these only for the good of humanity to save life and property. During the last 30 years, the inference that can be drawn from the statistics of the Department is that 75 per cent. of the announcements made turns out to be true and only 6 to 12 per cent. is hopelessly wrong. It is better to warn the captain of a ship erroneously of a storm that does not happen than not to give him a warning of a storm that does happen. The agriculturist can time his sowings and reapings after the forecast and a mistake made in the forecast is surely less harmful to him than imprudence which will subject his yield of long expectation to a disastrous rain inclement weather.

This utilitarian view apart, the study of this science is pursued for the excellent disciplinary value which it affords. The student must study

the apparatus and appliances to be detailed later on, must watch unceasingly the vagaries of their readings and must think to evolve out an agreement out of the mass of seeming contradictions. He must never allow his untiring energy to flag in noting how far the future happenings conform to the hypothesis framed by himself and must be prepared to change it as his weather-cock does, till he feels sure that his hypothesis stands on a firm basis never to be brought into question by a future erratic phenomenon. The power of keen observation and the analytical mind which one should possess to be a successful student are virtues by themselves. Therefore if any study disciplines the mind, cultivates the desirable faculty of connecting the cause with effect and creates that attitude of mind that draws the unerring inference from an amazing cloud of contradictions, it is this science; if not this science, it stands on the same footing with other sciences.

What are the apparatus and appliances to be used in the Science of Meteorology? It is not proposed to answer the question by entering into a detailed description of one and all the instruments found in the modern meteorological observatory. It should be conceded that there are many engaging elementary observations on the pressure of air, on its temperature, on its moisture and on the rainfall of the place. It is to the amateur meteorologists that the teachers cater by giving some general account of the barometer, thermometer, hygrometer, pulviometer or rain gauge, and anemometer. There is no necessity to indulge in the luxury of costly instruments but some attention must be paid to some of the cheap appliances found now-a-days in all High School laboratories.

A barometer is a wonderful instrument in which a column of mercury balances a column of air. It may be stated or proved experimentally with the help of an air-pump, that a steady and continuous fall in the barometric reading might be indicative of a storm brewing elsewhere or of a heavy shower. From the observation of the barometer alone, it is difficult to say which is

which but when it is coupled with the hygrometric reading, the cause and effect can be connected. Dry air at a high temperature may bring about a fall in the barometer and this will cause an inflow of air into this low pressure region and equally certain it is that the barometer will fall if the air is full of watery-vapour because the density of water-vapour is 0.68 and an intimate homogenous mixture of dry air and water-vapour must be lighter than an equal volume of dry air.

In the tropics, the minimum reading of the barometer may be put at 27.7 inches. A fall of $\frac{1}{16}$ or $\frac{1}{8}$ inch in one hour or $\frac{1}{16}$ or $\frac{1}{8}$ inch in 4 hours is a sure indication that a storm is approaching. A rapid and considerable fall in the barometer coupled with a very small difference in the wet and dry thermometers is an unmistakable sign of rain when the indications for a storm are noted and when there is no storm, the only possible inference is that a storm is raging somewhere at no great distance. The movement of mercury in the barometer is to be studied always but the reading of the barometer at one time is of no value to determine the future condition of the weather unless it is coupled with the readings of other instruments. How the variation in thermometric reading affects the barometric reading, other conditions remaining the same, must be inferred and brought home to the pupils' minds by observation and selective tabulation.

There are ever so many kinds of thermometers. The corrections that should be applied to a thermometer to secure uniformity of standard may not be of great interest and the thermometric reading correct to a fraction of a degree is unnecessary so far industry and meteorology are concerned and impractical with the cheap thermometers found usually in the laboratories. One who records the weather, busies oneself with the relative changes and an absolute scientific record is not the goal of high school students. As a massive thermometer, with the Fahrenheit scale in single degree gradations, attached to a broad wooden frame has now be-

come an ornamental piece of furniture in the drawing-room of a well-conditioned gentleman, so a self-registering maximum and minimum thermometer either fixed separately or in one piece is a necessary adjunct of the laboratory.

The daily range of temperature in the locality must be recorded in a book. The mean temperature of any day is obtained by taking 24 observations every hour and finding the average and this method is in the very face of it impossible to be attempted. The easiest method to find the mean temperature of the day is to find the average of the maximum and the minimum temperatures of the day and this result is as a rule subject to an error of 1°F. quite negligible in meteorological observations. When the daily range is small especially in the tropics the maximum temperature occurs at about 1.30 p.m. and in the temperate regions it is observed between 2.30—3.30 p.m. in summer. It is left to some select students to prepare a table of mean daily temperature and with it, the mean temperature for a season or a year. The mean annual temperature of Great Britain is 2.2° less than what it was 100 years ago owing to the extensive reclamation of waste-lands and newly created facilities for drainage. Such changes can be recorded here also.

The following facts and rules relating to weather conditions can be verified:—

(1) A sudden and great change of temperature of the atmosphere is generally followed by a rain within 24 hours.

(2) If the thermometer goes up between 9 p.m. and mid-night when the sky is cloudless, the air is getting saturated and rain may be expected.

(3) When the temperature is almost the same in the day and in the night and when there is a small difference between the dry and wet bulb-thermometers rain may fall.

(4) There is one interesting fact connected with thermometer reading, that the high death-rate is intimately connected with an unusual range of temperature in summer and in winter.

Our ideas about weather are only rough estimates of the amount of water-vapour present in air. We often say that the air is sultry and it

means that the air is charged with a lot of watery vapour, that the perspiration in our body does not evaporate and that we are subject to a stifling or oppressive sensation. There are many popular sayings that connect the natural phenomena with heavenly bodies and one such is "It freezes more when the moon shines than when it is hidden by the clouds." The dead moon is cold and it cannot extend its influence to thousands of miles. The saying only speaks of the heat-absorbing power of water-vapour and the sun's heat which the earth receives is absorbed in its passage back by the vapour in air and is thus prevented from radiating into space. In an extremely dry air the water within us will frizz and break open the skin causing chaps or clefts and all of us will then have chappy fingers like the witches in Macbeth. In an extremely wet air, transpiration is slower and a feeling of depression and heaviness is felt not to speak of the inconvenience it will cause to the consumptives. Therefore the importance of watery vapour in air cannot be over-rated. How then can a correct estimate of it be formed?

The hygrometer, the instrument that measures it, is of various types. The dew-point hygrometers taught in the C Group Physics will not interest all and rightly they have been described as philosophical toys. The meteorologists' favourite is the wet and dry bulb thermometer. This is much superior in the matter of accuracy to some of the common forms of hygrometers which give only some relative idea but cannot measure the quantity in absolute units. The boys in the 3rd Form must be taught to use the table supplied with the instrument or prepared by the teacher. The amount of useful labour spent by Glaiseher to find the constant in the preparation of the table, if narrated in the form of a story, will capture their imagination and convey a moral lesson. In the 5th and 6th Forms, an attempt is worth making to teach the rationale of the formula $(p)_{w^s} - x = .008 \times 760 (t_a - t_w)$ where $(p)_{w^s}$ and x respectively represent the maximum tension of the vapour at the temperature of wet bulb and of the vapour actually present in air.

Pulviometer or rain-gauge sits in judgment over the predictions of the weather prophet as much as anemometer does when it measures the predicted storm. The shape of the receiving mouth is not of great importance and circular gauges are preferred because it is easier to make a true circle than a true square and the influence of the rim is less with a circle than with any other form. The one in ordinary use has a regulation size of 5" diameter though funnels with 8" diameter are also used. The funnel fits tightly into a cylindrical vessel that there may be no loss by evaporation—a precaution quite unnecessary when the reading is taken daily.

One inch height of rain-water falling into it is of rare occurrence and any smaller quantity cannot be measured with a scale even granting that we are prepared to put the scale into it and vitiate the thing tested by the test itself. Rain is measured correct to .01 inch. The smallest quantity that is measured will give us a volume of 0.1964 cubic inches and as such a volume of 9.82 cubic inches is divided into 50 equal parts. A graduated jar with such divisions is convenient if not indispensable. The rain water collected in the gauge may be weighed in a balance with advantage. The relations between cubic inch and cubic centimetre being known, the barrettes may be used. One hundred tons per inch per acre is a ready way of remembering the rain-fall and in this there is only an error of one in 100.

Rain-gauges are costly, if they cannot be made locally, on account of the graduated jar that is purchased with it. It is possible to gauge the rain without the jar. One ingenious suggestion was put forward sometime back to use a funnel having a diameter of 4.697 inches. One-tenth of an inch of rain in a receiving area of that diameter will have the volume of a fluid ounce and if that suggestion be adopted ounce glasses and minim glasses may be used to measure the multiples and sub-multiples of $\frac{1}{10}$ " rain.

There are many methods in vogue to measure the velocity of wind. On a cloudy day, the time taken by the shadow of a cloud to pass over a definite length might be found out and the velo-

city of wind calculated. Sir Isaac Newton while he was a boy is said to have compelled that "unseen, inconstant and ungovernable wanderer" the wind to tell him the measure of its strength" by jumping against it, the length of the jump being made a measure of the force of the wind from a gentle breeze to a violent tempest. On a cloudless day, the boys may be trained to adopt the Beaufort scale by observing the effect of the wind on the trees if they cannot do what Newton did. The most usual form of anemometer that measures accurately the velocity of wind in miles per hour is out of question on account of its cost but an earnest and enthusiastic teacher may construct an instrument to measure the pressure of wind. A thin long U-tube containing a light liquid may be made to turn on frictionless supports by a wind-vane attached to the tube and the wind hissing through the tube will raise the level of the liquid in one thus affording a ready means to calculate the pressure.

Some weather signs and facts are worthy to be observed and recorded by the students. These are good in themselves but are not intended to supplant the meteorological observations. It is impossible for any one to neglect the signs with which the whole of the animal kingdom bristles when there is rain or a storm. Our ancestors used no apparatus and read only signs of nature to make tolerable predictions. In the Bible we find "When we see a cloud rise out of the West, straight way ye say there cometh a shower and so it is." The shepherd imparts to the signs of nature the meaning he has learnt by experience: "A rain-bow in the morning is the shepherd's warning. A rain-bow at night, is the shepherd's delight." Cocks crow excessively and the crows retire cawing before the rain, sheep become friaky and ducks and geese are happy. Frogs croak and toads come out of their holes. Bees stay at home. All these happen before rain. The doggerel verse of Darwin summarising a large number of rain predictions may be read out to the boys. When these signs are persistent, change of weather is sure and the changed condition will last long. "Long foretold long last—Short notice, soon past."

come an ornamental piece of furniture in the drawing-room of a well-conditioned gentleman, so a self-registering maximum and minimum thermometer either fixed separately or in one piece is a necessary adjunct of the laboratory.

The daily range of temperature in the locality must be recorded in a book. The mean temperature of any day is obtained by taking 24 observations every hour and finding the average and this method is in the very face of it impossible to be attempted. The easiest method to find the mean temperature of the day is to find the average of the maximum and the minimum temperatures of the day and this result is as a rule subject to an error of 1°F. quite negligible in meteorological observations. When the daily range is small especially in the tropics the maximum temperature occurs at about 1.30 p.m. and in the temperate regions it is observed between 2.30—3.30 p.m. in summer. It is left to some select students to prepare a table of mean daily temperature and with it, the mean temperature for a season or a year. The mean annual temperature of Great Britain is 2.2° less than what it was 100 years ago owing to the extensive reclamation of waste-lands and newly created facilities for drainage. Such changes can be recorded here also.

The following facts and rules relating to weather conditions can be verified:—

(1) A sudden and great change of temperature of the atmosphere is generally followed by a rain within 24 hours.

(2) If the thermometer goes up between 9 p.m. and mid-night when the sky is cloudless, the air is getting saturated and rain may be expected.

(3) When the temperature is almost the same in the day and in the night and when there is a small difference between the dry and wet bulb-thermometers rain may fall.

(4) There is one interesting fact connected with thermometer reading, that the high death-rate is intimately connected with an unusual range of temperature in summer and in winter.

Our ideas about weather are only rough estimates of the amount of water-vapour present in air. We often say that the air is sultry and it

means that the air is charged with a lot of watery vapour, that the perspiration in our body does not evaporate and that we are subject to a stifling or oppressive sensation. There are many popular sayings that connect the natural phenomena with heavenly bodies and one such is "It freezes more when the moon shines than when it is hidden by the clouds." The dead moon is cold and it cannot extend its influence to thousands of miles. The saying only speaks of the heat-absorbing power of water-vapour and the sun's heat which the earth receives is absorbed in its passage back by the vapour in air and is thus prevented from radiating into space. In an extremely dry air the water within us will frizz and break open the skin causing chaps or clefts and all of us will then have chappy fingers like the witches in Macbeth. In an extremely wet air, transpiration is slower and a feeling of depression and heaviness is felt not to speak of the inconvenience it will cause to the consumptives. Therefore the importance of watery vapour in air cannot be over-rated. How then can a correct estimate of it be formed?

The hygrometer, the instrument that measures it, is of various types. The dew-point hygrometers taught in the C Group Physics will not interest all and rightly they have been described as philosophical toys. The meteorologists' favourite is the wet and dry bulb thermometer. This is much superior in the matter of accuracy to some of the common forms of hygrometers which give only some relative idea but cannot measure the quantity in absolute units. The boys in the 3rd Form must be taught to use the table supplied with the instrument or prepared by the teacher. The amount of useful labour spent by Glaiseher to find the constant in the preparation of the table, if narrated in the form of a story, will capture their imagination and convey a moral lesson. In the 5th and 6th Forms, an attempt is worth making to teach the rationale of the formula $(p)_w - x = .008 \times 760 (t_a - t_w)$ where $(p)_w$ and x respectively represent the maximum tension of the vapour at the temperature of wet bulb and of the vapour actually present in air.

Pulsiometer or rain-gauge sits in judgment over the predictions of the weather prophet as much as anemometer does when it measures the predicted storm. The shape of the receiving mouth is not of great importance and circular gauges are preferred because it is easier to make a true circle than a true square and the influence of the rim is less with a circle than with any other form. The one in ordinary use has a regulation size of 5" diameter though funnels with 8" diameter are also used. The funnel fits tightly into a cylindrical vessel that there may be no loss by evaporation—a precaution quite unnecessary when the reading is taken daily.

One inch height of rain-water falling into it is of rare occurrence and any smaller quantity cannot be measured with a scale even granting that we are prepared to put the scale into it and vitiate the thing tested by the test itself. Rain is measured correct to .01 inch. The smallest quantity that is measured will give us a volume of 0.1964 cubic inches and as such a volume of 9.82 cubic inches is divided into 50 equal parts. A graduated jar with such divisions is convenient if not indispensable. The rain water collected in the gauge may be weighed in a balance with advantage. The relations between cubic inch and cubic centimetre being known, the burettes may be used. One hundred tons per inch per acre is a ready way of remembering the rain-fall and in this there is only an error of one in 100.

Rain-gauges are costly, if they cannot be made locally, on account of the graduated jar that is purchased with it. It is possible to gauge the rain without the jar. One ingenious suggestion was put forward sometime back to use a funnel having a diameter of 4.697 inches. One-tenth of an inch of rain in a receiving area of that diameter will have the volume of a fluid ounce and if that suggestion be adopted ounce glasses and minim glasses may be used to measure the multiples and sub-multiples of $\frac{1}{10}$ " rain.

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∴ To overtake him, the former has to gain over him this distance.

But he gains $\frac{1}{2}$ mile in every 1 hour.

∴ He will gain 6 miles in 6×2 or 12 hour

∴ He will overtake at $8-30 + 12$ or 8-30 P.M.

Since the second gains $\frac{1}{2}$ mile in 1 hour over the first man, before 2 P.M. he would have gained (2 P.M.—8-30 A.M.) or $5\frac{1}{2} \times \frac{1}{2}$ or $2\frac{3}{4}$ miles.

∴ At 2 P.M. they will be $6-2\frac{3}{4}$ or $3\frac{1}{4}$ miles apart.

Example 9. In the above question if the distance between X and Y be 74 miles and if the persons travel in opposite directions, when will they meet each other and how far apart will they be at 2 P.M.?

Now when the second person starts from Y the first has gone a distance of $1\frac{1}{2} \times 4$ or 6 miles.

∴ They have together to run a distance of $74-6$ or 68 miles before they actually meet.

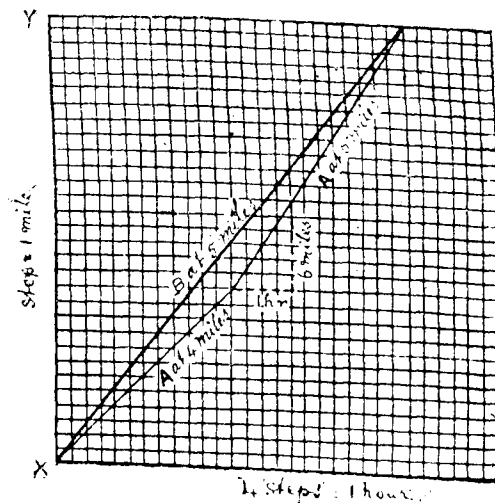
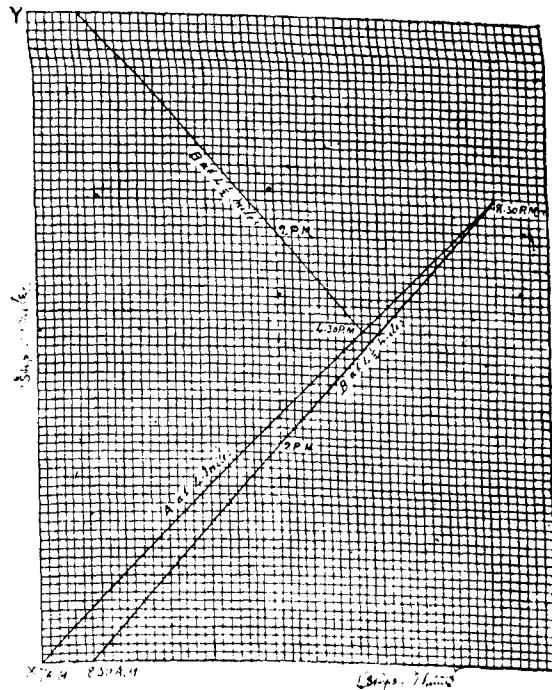
But they together run towards each other a distance of $4 + 4\frac{1}{2}$ or $8\frac{1}{2}$ miles in 1 hour.

∴ They will together run 68 miles in $\frac{68}{8\frac{1}{2}}$ or 8 hours, i.e., they will meet at 4-30 P.M.

From this it follows very easily that at 2 P.M. they are $2\frac{1}{2} \times 8\frac{1}{2}$ or $21\frac{1}{4}$ miles apart.

Graphical representation. Examples of the above kind are more easily and clearly worked with the aid of graphs. The advantage is that the different stages in the journey and the circumstances attending the journey of each object are pictured independent of the several objects in motion, and from this picture the final conclusions are studied. It is recommended that the graphical aid be sought only when the complexity of the question demands it.

By way of easy illustration examples 6, 8 and 9 are worked graphically. See figs. I and II.



NOTE. The graphs will be straight lines, since the distance travelled varies directly as time, $y = kx$ being the equation where y represents the distance, x time and k the rate (constant).

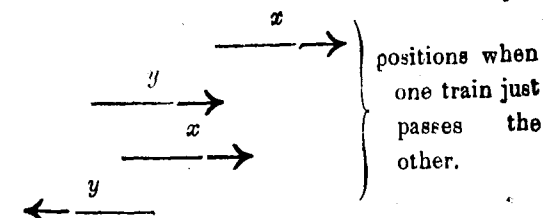
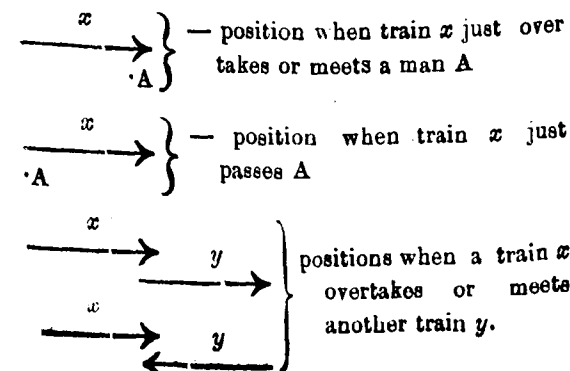
Motion of Trains (i.e. objects having appreciable lengths).

The following table of facts will be of great use in the working of all questions relating to trains:—

1. A train of given length is said to pass a fixed point (say) a man standing. When it has gone a distance of its own length.	2. A train is said to pass a man moving in the same direction. When it has gained over him a distance of its own length.
3. A train and a man moving in opposite directions will pass each other completely. When they have together moved a distance of the length of the train.	4. A train is said to pass a railway platform completely. When it has gone a distance equal to the sum of the lengths of the train and the platform.
5. One train is said to pass completely another moving in the same direction. When the faster train has gained over the slower a distance equal to the sum of their lengths.	6. Two trains moving in opposite directions are said to pass each other completely. When they together have described a distance equal to the sum of their lengths.

NOTE. 1, 2, 3 are special cases of 4, 5, 6 respectively when the length of the platform and also of one of trains in 5, 6 are considered zero.

The following two diagrams illustrate the positions when (1) a train passes a point, (2) one train passes another.



The relations in the above table can be expressed by means of algebraic symbols. Supposing that we are required to find the times of passing of trains under the different circumstances.

Let a miles per hour be the rate of train x , b miles per hour the rate of train y , a being greater than b ; also let their lengths be respectively c and d yards, then if k miles per hour be the rate of walking of the man A .

(1) The time taken by x to pass A who is fixed and not moving = the time of passing its own length

$$= \frac{c}{1760a} \text{ hour} = \frac{3600c}{1760a} \text{ secs.} = \frac{45c}{22a} \text{ secs.}$$

(2) The time taken by x to pass A walking in the same direction = the time of gaining over A a distance equal to the length of the train

$$= \frac{c}{1760(a-k)} \text{ hour} = \frac{45}{22} \cdot \frac{c}{a-k} \text{ secs.}$$

(3) The time taken by x to pass A walking in the opposite direction = the time in which both will together go a distance equal to the length of the train

$$= \frac{c}{1760(a+k)} \text{ hour} = \frac{45}{22} \cdot \frac{c}{a+k} \text{ secs.}$$

(4) The time taken by train x to pass a fixed train (not moving) y = the time taken by it to run a distance equal to the sum of the lengths of the two trains

$$= \frac{c+d}{1760a} \text{ hour} = \frac{45}{22} \cdot \frac{c+d}{a} \text{ secs.}$$

(5) The time taken by train x to pass another train y moving in the same direction = the time taken by it to gain over y a distance equal to the sum of their lengths

$$= \frac{c+d}{1760(a-b)} \text{ hour} = \frac{45}{22} \cdot \frac{c+d}{a-b} \text{ secs.}$$

since the faster gains over the slower $a-b$ miles per hour.

beaten B by 60 yards. A start of more than 80 yards for B would result in the defeat of A, the no. of yards by which he would be beaten being equal to the difference between 80 yards and the number of yards' start given.]

That is when A goes x yards, B goes during the same time $x-80$ yards.

But since A now reduces his speed to $\frac{2}{3}$ of his former speed, he takes $\frac{3}{2}$ times the original time to go x yards.

If B also had reduced his speed to $\frac{2}{3}$ of his original, he would still have gone in the same time as A $x-80$ yards.

But B reduces his speed only to $\frac{1}{2}$ of his original.

$\therefore$ He goes in the same time as A, a distance of $\frac{1}{2} \times \frac{2}{3} \times (x-80)$ yards = $\frac{1}{3}(x-80)$ yards.

Since A goes x yards, and B $\frac{1}{3}(x-80)$.

A beats B by $x - \frac{1}{3}(x-80)$ yards in a race of x yards.

But it is given that A beats B by 20 yards under these circumstances.

$\therefore x - \frac{1}{3}(x-80) = 20$, i.e., $81 - \frac{1}{3}x = 20$.

$\therefore \frac{1}{3}x = 61$, i.e., $x = 61 \times 80$.

$\therefore$ The length of the course = 61×80 or 4880 yards or $2\frac{1}{2}$ miles.

Example 14. A can beat B by 5 yds. in a 100 yds. and B can beat C by 10 yds. in a 200 yards' race. By how many yards can A beat C in a 400 yards' race?

When A runs 100 yds., during the same time B runs 100—5 or 95 yds.

$\therefore$ When A runs 400 yds., during the same time B runs $\frac{400}{100} \times 95$ or 380 yds. We have now to find how many yds. C can run in the time in which A runs 400 yds. or B 380 yds.

But in the time which B takes to run 200 yds., C runs 200—10 or 190 yds.

$\therefore$ When B runs 380 yds., C can run

$$\frac{190}{200} \times 380 = 361 \text{ yds.}$$

$\therefore$ When A runs 400 yds., C can run 361 yds., i.e., A can beat C by 39 yds. in a 400 yards' race.

N.B.—When several persons enter upon the same race, it is necessary to compare the capacities of all the persons to that of one of them, which is given in the question. In the above question, A and C are each compared with B and then their relation is worked out. To take another question.

Example 15. A and B run a mile race and A wins by 20 yds. C and D run over the same course and C wins by 60 yds. B and D run over it, and B wins by 40 yds., if A and C run over it, which will win, and by how much?

Now let us compare the capacities of A, C and D with B.

When A runs 1760 yds., B does in the same time 1740 yds.

But when B runs 1760 yds., D runs 1720 yds.

$\therefore$ When B runs 1740 yds., D runs $\frac{1720}{1760} \times 1740$ yds.

Again it is given that when D runs 1700 yds., C runs 1760 yds., since C beats D by 60 yds.

$\therefore$ When D runs $\frac{1720}{1760} \times 1740$ yds., C runs $\frac{1760}{1700} \times \frac{1720}{1760} \times 1740$ or $1760\frac{1}{17}$ yds.

Thus it will be seen that when

B runs 1740 yds., in the same time

A runs 1760 yds.

D runs $\frac{43 \times 435}{11}$ or $1700\frac{1}{11}$ yds., and C

runs $1760\frac{1}{17}$ yds.

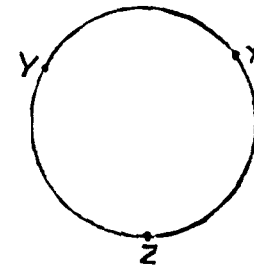
Hence in the same time as A running 1760 yds., C runs $1760\frac{1}{17}$ yds.

i.e., when C runs $1760\frac{1}{17}$ or $\frac{172 \times 174}{17}$ yds., A runs 1760 yds.

$\therefore$ When C runs 1760 yds. or 1 mile, A runs $\frac{1760 \times 1760 \times 17}{172 \times 174} = 1759\frac{1}{17}$ yds.

Hence C wins the race by $1760 - 1759\frac{1}{17}$ or $\frac{17}{17}$ yd.

Example 16. Circular motion. Suppose two



persons A and B move in a circle starting from the same point in the same direction, their rates being as, say, 5 : 2. Then when A goes 5 rounds from the starting point X, B goes only 2 rounds in the same time.

Hence when A goes the first round after starting, in the same time B goes $\frac{2}{5}$ of a round.

Let us see when they will be together after starting. It is clear that A has to gain over B one complete round before he overtakes him. But he gains $\frac{2}{5}$ of a round, when he runs 1 round.

$\therefore$ He gains 1 round, when he runs $\frac{5}{2}$ rounds = $\frac{2}{5}$ of a round after X, that is at Y.

To again be together, the faster runner has to gain over the slower 1 complete round. As before this point is $\frac{2}{5}$ of a round from Y, i.e., $\frac{1}{5}$ of a round from X, marked Z.

Considering that Z is now their starting point, they will be again together for the third time at $\frac{2}{5}$ of a round from Z, which point is X, the original point of starting.

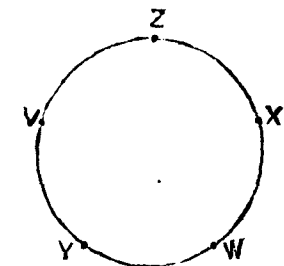
Thus it will be seen that before they come together at the first starting point X, they have been together at two other points Y, Z i.e., $\frac{2}{5}$ of a round and $\frac{1}{5}$ of a round respectively from X.

Also it will be seen, when A and B meet for the first time after starting, A gains 1 round and runs $\frac{5}{2}$ rounds; for the second time after starting, A gains 2 rounds and runs $\frac{10}{2}$ or $\frac{5}{1} \times 2$ rounds for the third time after starting, A gains 3 rounds and runs 5 rounds or $\frac{3}{1} \times 3$ rounds, i.e., to X.

NOTE.—The minimum integral number of rounds that each has to run before they are again at the starting point is 5 for A and 2 for B, i.e., the numbers in the ratio, reduced to the lowest terms.

Example 17. Suppose it is given that the rates of A and B are as 7 : 2.

Working in the same way as before, after



starting from X, A will gain over B 5 rounds, when he has run 7 rounds, i.e., A gains over B 1 round, when he has run $\frac{7}{2}$ rounds i.e., $\frac{1}{2}$ round after X, marked Y.

Taking Y as their present starting point, they will be again together at Z, $\frac{2}{5}$ round after Y or $\frac{1}{5}$ round after X.

Taking Z as their third starting point, they will be together at $\frac{2}{5}$ round after Z, i.e., at W i.e., $\frac{1}{5}$ round after X.

After W, they will be together at V, $\frac{2}{5}$ more round from W i.e., at $\frac{1}{5}$ round from X.

Their next joining is $\frac{2}{5}$ round from V, i.e., at X, the original starting point.

From all these it is clear that they come together 5 times after their first starting. They come together 4 times before they again join at the starting point X.

These points are W, Y, V, Z which are respectively $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$ and $\frac{4}{5}$ of a round from X, when A has gained over B 3, 1, 2 and 4 rounds respectively, and himself has run $\frac{7}{2} \times 3$, $\frac{7}{2}$, $\frac{7}{2} \times 2$, $\frac{7}{2} \times 4$ or $4\frac{1}{2}$, $1\frac{1}{2}$, $2\frac{1}{2}$ and $5\frac{1}{2}$ rounds respectively.

NOTE.—The minimum integral number of rounds each has to run before being again at the starting point is 7 for A and 2 for B.

EDUCATIONAL TOPICS IN THE LOCAL LEGISLATIVE COUNCIL.

We venture to submit certain criticisms on the Resolutions moved by the non-official members of the Local Legislative Council when the Draft Financial Statement for 1919-20 was presented to the Council by the Hon'ble Sir Alexander Cardew, Member of His Excellency's Council. We are of opinion that the discussions that arose in the Council are of paramount interest to the public.

I. FOREST SCHOOL IN THE AGENCY TRACTS.

The Hon'ble Mr. N. Suryanarayana Rao moved the Resolution that the Council recommends to His Excellency the Governor in Council that a sum of Rs. 25,000 be added under IX, Forest, to open a Forest School in the Agency Tracts and a corresponding reduction be made under 45 B, Civil Works.

The Hon'ble Mr. Marjoribanks said that there was a school held every year in the Northern Circars, for training Foresters and Forest Guards. The year before last it was held in Kurnool, and last year in Ganjam. No application to the school for admission had yet been received and he did not know what the Hon'ble member proposed to do with the school he wished to start.

The Hon'ble Mr. Suryanarayana Rao wanted Rangers also to be included along with Foresters and Forest Guards. He would like to have a permanent school instead of an itinerating one. He however did not wish to press the Resolution and withdrew the same.

The above is the summary of the discussion that took place in the Council. It appears that the Hon'ble member and the Government officer who opposed the motion had in view only the training of Forest Guards, Foresters and Rangers. This is in accordance with the existing mamool of the present Educational system. Schools teach subjects and fit them for obtaining a situation in Government service. If more schools are established and more scholars are educated, more appointments are required to be created. This should not be. Then what the country would require is that the Forest Panchayats near reserved forests should be well organized and that they

should be furnished with information how to conserve forests, what forest products of our Presidency are in need in foreign countries and other facts tending to increase the material well being of the country. This should be done by the publication of journals in two languages, Tamil and Telugu. The Government should afford facilities to the Forest Panchayats to undertake this work.

II. ADDITIONAL INSPECTORS OF SCHOOLS

The Hon'ble Mr. Krishna Rao moved a resolution in the local Legislative Council held on the 5th February 1919 recommending that a sum of Rs. 29,400 be provided for the appointment of 11 additional Assistant Inspectors of Schools in the Provincial Educational Service. The Hon'ble member said that he was aware that at present a scheme as regards controlling agency was under consideration and so far as the necessity for supervision was concerned, there was no dispute. The number of Elementary Schools was now increasing rapidly and in the present financial statement provision had been made for 1000 more Elementary Schools and therefore it was essential that arrangements should be made for adequate supervision. He thought that the Government would accept this small reform pending a general scheme on the subject.

The Hon'ble Mr. Littlehales pointed out that there was no necessity for this resolution at present because the whole scheme was now pending before the Government of India. However the local Government would consider the question in a more sympathetic spirit.

No doubt Elementary Schools are increasing. Since the Department insists on these schools being staffed with trained teachers the appointment of a large number of additional Inspectors is not a healthy policy for the additional appointments involve the expenditure of a large amount of money which can well be utilized for giving grants to aided and private schools several of the last class being under schoolmaster managers.

The resolution was withdrawn.

III. PROVISION FOR ADDITIONAL CIRCLE INSPECTOR.

The Hon'ble Mr. Suryanarayana Rao desired that a sum of Rs. 60,000 be allotted towards expenditure for additional Circle Inspectors and this sum be added to the unallotted expenditure.

The Hon'ble Mr. Littlehales pointed out that the amount provided in the Budget was only Rs. 23,000. The work of an Inspector lay in inspecting Secondary Schools and encouraging the promotion of education in the whole of his circle. While there had been an increase in the number of schools there was no increase in the number of Inspectors. The Educational Department had very carefully considered the need for increase in the number of Inspectors.

The mover of the resolution here suggested the desirability of deleting the present provision, until the whole scheme of supervising agency was settled.

His Excellency the President observed that the Department was spending now a certain amount on Secondary education and found that it was not getting full value for the amount spent for want of more Inspectors. In the current year alone there had been 17 more High Schools and 49 more Middle Schools and the existing Inspectors were over-worked.

After the Minto-Morley reforms were introduced in the reconstituted Councils the non-official members of the local Legislative Council strenuously opposed the increase in expenditure on education. It is an irony of fate that the present non-official members should plead for additional expenditure on inspection. The Government takes great care to see that Municipal and Board Schools are staffed properly with trained teachers. Aided schools are required to employ only trained men. When it is the case the appointment of highly paid Inspectors is not desirable. The Department spends a large amount of money on Training Schools and on Inspectors in the shape of grants to schools under private management. The result is that teachers in private schools carry on their cheerless work decade after decade silently with patience and perseverance.

The resolution was by leave withdrawn.

IV. The Hon'ble Mr. B. Venkatapathi Raju moved that a sum of Rs. 1,35,150, i.e., 25 per cent. of the present school and college fees—Revenue shown in XIX a, b, c, d—be deducted and the provision be made in the Budget for scholarships.

The Hon'ble member said that the object of the resolution was to give scope and encouragement to poor and deserving students for prosecuting higher

college courses of study. He pointed out that it could not be the object of the Government that higher education was a luxury and should be secured only by rich people who could afford it and so desired that school-fees should be reduced by 25 per cent. and the amounts allotted for giving scholarships to poor and deserving students.

The Hon'ble Mr. Littlehales in reply said that the resolution was vague. He asked whether the reduction should take place on a uniform scale throughout or otherwise. The policy of reduction of fees had been thoroughly discussed and that policy had been accepted.

The Hon'ble Mr. B. V. Narasimha Ayyar desired to know what was meant by the expression that the policy of reduction of fees had been accepted.

The Hon'ble mover in his reply pressed that there should be a wide-spread of education. He suggested 25 per cent. because he desired that some figure should be given.

The Government must be aware of the fact that the Mysore Government have taken steps to make collegiate education free so that higher education may be within the reach of intelligent students, who should not be deprived of the facilities of college education on account of poverty.

V. SCHOLARSHIPS TO SCIENTIFIC AND TECHNICAL EDUCATION.

The Hon'ble Mr. A. S. Krishna Rao moved that a sum of Rs. 75,000 be added to the allotment made for giving scholarships to students possessing scientific and technical education. He said that many words were not necessary to commend the resolution for the acceptance of the Council. He hoped that the resolution would be accepted and encouragement for technical and scientific education would be given.

The Hon'ble Mr. Littlehales in reply said that there were many scholarships given for technical education. Those were the Government of India Scholarships and the Bombay Victoria Technical Scholarships and many other scholarships. He said that an additional sum of Rs. 9,000 was provided in the Budget for the purpose of providing industrial scholarships to students. The object of the resolution

Reviews and Notices.

THE SCHOOL-BOY LEAGUE OF HONOUR, WRITTEN AND COMPILED BY R. A. B. CHAPMAN, A. G. DIX, AND RAO SAHIB SHEORAM GANESH KATARNI. (OXFORD UNIVERSITY PRESS, 1918). Rs. 3-8-0.

Since the organisation of two branches of the Scout Movement in Madras Presidency we have become accustomed to the sight of Indian lads in Scout uniform, and those who know anything of the spirit of scouting and how it appeals to the imagination of boys all over the world will readily understand that it has come to stay and that what is now but a small shoot appearing above the surface of the ground will, one day, grow up to be a big and fruitful tree.

From this book we learn the welcome news that the League of Honour was started in the Yeotmal District of the Central Provinces as far back as 1914. The book is the outcome of four years' experience in the venture and we desire to congratulate the League and at the same time commend the book to the public. The aim of the book is, of course, to induce those schools, which know nothing of the League, to join it and therefore all the necessary information is given as to how a school may become a member of the League of Honour. But if that were all, it would make very dry reading indeed. The authors evidently know the nature of the folk for whom they are catering. The talks to the boys are so friendly and helpful that they cannot fail to fill them with enthusiasm for all the things that are best in life, and incidentally to interest them in the League of Honour. There are interesting chapters on games and hobbies and the book is made the more useful by the inclusion of plans and diagrams.

THE SILKEN TASSEL, BY ARDESHIR F. KHABHARDAR. (THE THEOSOPHICAL PUBLISHING HOUSE, MADRAS). Price Rs. 2-8-0.

Students of Guzerati literature will have no difficulty in recognising the name of Ardeshir F. Khabhardar, as he is a well-known poet in that language and has won for himself a place in its literature. That he should have been able to write a volume of English verses of merit is not surprising as the essential qualities of poetic genius form a uniform background for all languages and the difference of the modicum is after all a minor matter. Mr. Khabhardar unites a free

command of English vocabulary to a rich imagination and his poetic career in English which has begun in such a promising manner will be watched with great interest.

MEMORANDUM ON ENGLISH INSTRUCTION IN INDIA SCHOOLS, BY MR. CH. V. JOGA RAO (SRINIVAS VARADACHARI & Co., MADRAS, 1918).

The pamphlet before us is a plea for a systematic use of translation and grammar in the teaching of English in Indian schools. It has become more or less common in India to introduce violent changes not merely in the curricula of studies but in the methods of teaching adopted. Very often what is good in the old method is lost sight of. No attempt has yet been made in any of the model schools attached to Government Training Colleges to arrange for systematic progressive experiments on sound scientific lines. We quite agree with the writer when he says that the really scientific method of teaching English to Indian children is yet to be discovered. We hope the pamphlet will be found interesting to all teachers of English.

FIGHTING FOR SEA-POWER IN THE DAYS OF SAIL, BY H. W. HOUSEHOLD, WITH ILLUSTRATIONS. (MACMILLAN & Co., 1918). pp. 226. Price 2s.

This little book is intended to be a companion volume to the author's *Our Sea-Power—Its Story and Meaning* which was reviewed in our columns in November 1917. It describes the stirring tales of sea-fights in the past, when ships of the line, built throughout of solid English oak, with three towering masts, each carrying a cloud of white canvas, fought nobly and bravely with the French, the Dutch and the Spaniards, under great leaders like Blake and Hawke, Rodney and Nelson. Compared with the steel-monsters of the present time, moving under canopies of smoke and exciting wonder by their grim efficiency, the old fleet of sailing-vessels in fair weather was a thing beautiful to look at and 'a sight to move the wonder of the world.' The old ships were wonderful fighters; and the men who manned them handled the ships and fought their enemies to perfection and were not less courageous and enterprising than the seamen of to-day.

The great Four Days' Battle of 1666 against the Dutch displayed two essentially English characteristics of fight:—(1) An impetuous and

headlong attack, and (2) the keeping of the line of ships in perfect order and mobility. The Dutch marvelled that the English could keep in perfect order so well their line of ships and that they were able so easily to bring all their fire to bear upon those who drew near them. "The English fight like a line of cavalry which is handled according to rule, and apply themselves solely to force back those who oppose.....whereas the Dutch advance like cavalry whose squadrons leave their ranks and come separately to their charge."

When Lord Rodney took up the tale, in 1779, there was little left for the English of the proud confidence of victory, and the Empire was fast shrinking. In the battles of Cape St. Vincent (January 1780) and with de Guichen (April 1780) Rodney however displayed that he was the equal of Hawke in daring leadership and that he could rise above routine, and like Nelson, invent and teach new methods. In the Battle of the Saintes (April 1782) with de Grasse, Rodney made his famous manoeuvre and broke the enemy's line; and he thus saved Jamaica, and crippled the power of France.

Lord Howe, in 1794, won the glorious First of June against the French fleet, by matching ship against ship, the whole length of the line. But being an old man of sixty-eight, he did not follow up his victory as Nelson would have done and annihilate the enemy. It was 'an old man's weariness' that saved the French on this occasion. The courage and dash displayed by individual English seamen and captains when pitted against enemy corsairs, also come in for ample treatment in this small book, e.g., the story of the recapture of the *Hermione* by the brave Captain Hamilton who renamed his ship fittingly enough as the *Retribution*. Of one of these individually fighting heroes, Sir Walter Scott wrote in 1803, the following:—"Lord Cochrane.....with his single ship kept the whole coast of Languedoc in alarm.... yet with such consummate prudence, were all Lord Cochrane's enterprises planned and executed that not one of his men were either killed or hurt....."

The book ends with the glorious victory that Nelson won at Copenhagen where the great Admiral showed that he would not be weakly generous and would not agree to accept anything that fell short of what England needed. The whole narrative forms, easy, delightful and interesting reading and is abundantly illustrated.

THE BRITISH NAVY; THE NAVY VIGILANT, BY L. COPE CORNFORD, WITH ILLUSTRATIONS. (MACMILLAN & Co. 1918). pp. 202. Price 2s.

This small book describes the various aspects and activities of the British Navy and the valuable services that it has been rendering, as well as the spirit of the officers and men of the Navy, the fighting uses and capacity of the ships, the various types of daring and efficient sea-officers and finally the achievements of the Navy in the Great War. The book is bound to be very useful to our students and others as they learn so much from it about the real significance and importance of the English Naval Service. Home-truths, of which however many of us in India are ignorant, are prominently brought to us. For instance we are told that there is no title more honourable to Englishmen than that of *seamen*; every ship is to be thought of as a piece of England set afloat; and the Navy is a peculiar personal relation to every English citizen.

The Navy keeps England safe and supplies it with the necessities of life and also maintains order and law on all the vast and wandering roads of the sea and gives help to the distressed of all nations. A capital ship must possess guns, armour and speed which may be combined in various proportions. In the battle-ships of to-day many heavy guns are mounted and these are combined with strong armour and heavy speed. A cruiser is a lighter and swifter battleship; and it has more speed owing to its greater length and less equipment of armour and guns. The armoured cruiser is used for scouting purposes, and has a tactical use in battle. Cruiser-squadrons serve as a screen to protect the battle-fleet against hostile torpedo-destroyers; and large fleets require a large number of light cruisers which patrol every corner of the British sea-frontiers. The torpedo-boat-destroyer is the result of the invention of the torpedo, and has served in the Great War as escort to protect merchant vessels against submarine attack. The submarine has been used by the British only for scouting purposes and for attacking vessels of war; while Germany has employed it for attacking and sinking merchant vessels. The air-plane is used for scouting purposes and the sea-plane is used for this purpose as well as for fighting. Mine-laying and mine-sweeping boats form parts of the immense auxiliary craft. The submarine and air-plane have entered and altered the conditions of sea-warfare.

A chapter describes the exploits of the English Navy in the past; the battle of Copenhagen

the Universities of a country should be of the right type.

The history of Western Universities may be traced back to Pythagoras, Plato and Aristotle, who first gathered together men of adult years for the purposes of study, and Universities have greatly influenced civilization from those days to these. In this long tract of time many types have sprung up, corresponding to various needs and national characteristics. Of these let us consider first the most contrasting types, the federal and the residential University.

The extreme type of federal University is shown by the University of London as it was before its reconstitution in 1900. It was an examining body which had obtained from Parliament the right of conferring degrees on the results of its written and practical examinations and which, from time to time, published syllabuses indicating the scope of the examinations. The restrictions were of the fewest. A minimum age for Matriculation, a certificate of respectable character, and a year's interval between examinations, were the sum of them, except, of course, in the case of Medicine and Law. The degrees were exceedingly difficult of attainment and their reputation was very high. The examiners were selected from the most eminent men in each subject and they were very well paid. Except in the case of Matriculation, they had no assistants. The test of Matriculation was so severe that only promising students entered the degree courses and therefore the proportion of failures in the Intermediate and Final examinations, though great, was not nearly so great as in this country. The University had no function of organizing teaching, or supervising the under-graduates.

An example of the extreme type of residential University is shown by Cambridge, which is more rigid in detail even than the sister University of Oxford. At Cambridge residence in one of the 19 Colleges is compulsory and the Degree examination must be taken at the end of the third year or not at all, after fulfilling so many days of residence. The University is very elastic as to details of syllabuses, but as all its examiners are its own teachers, there is a general agreement as to the courses of study. However, no examiner teaches that branch of the subject in which he is that year examining. The University lectures are common to the students of all the colleges, but each man has a tutor in his own college who directs and supervises his course and personally goes over his written work with him. The importance of the Degree Examination is minimised; many a man leaves without a degree because of some accidental failure to keep his attendances and no disgrace attaches to this. On the other hand, the highest distinctions in the Honours examinations are eagerly sought and win a great reputation. First Class Honours will carry a man far at the beginning of his career and it is not forgotten even in the case of a Cabinet Minister or Ambassador that he "took a First." It has no pecuniary value, but it certainly opens the way to distinction. The University maintains strict discipline extending into minor details of under-graduate life and this discipline is, on the whole, faithfully and cheerfully kept by the students.

Between these two extremes lie a number of intermediate types, varying as to the amount of teaching and discipline which are thought desirable. For instance, the new University of London was reconstituted in

1900 on a plan in many ways resembling the University of Madras. The occasion for the reconstruction was acute dissatisfaction with the idea of a mere examining body, however eminent, constituting a University. The report of the Parliamentary Commission on the University of London says, (paragraph 86):

"There is confusion in the public mind between a University education and a University degree. People believe that every one who has the latter has in some way or other also had the former, and that the examinations that have been passed are a proof of it. This belief is, of course, a mistaken one."

The "Internal University of London" now consists of 29 colleges all within a short radius of the centre of London. (One Women's College alone was exempted from this geographical requirement by special Act of Parliament.) Each college is complete in itself, but all follow the syllabuses and prepare for the examinations of the University. All the colleges are represented on the Boards of Studies and the Faculties; but not all on the Senate. The examiners are mainly the members of the Boards of Studies (that is, the recognised teachers of the Colleges) assisted in each subject by two "external examiners" from other Universities, who hold office for five years. It was intended that there should be a large element of inter-collegiate lecturing and social intercourse. The University keeps a very watchful eye on the appointment of teachers in the colleges and has repeatedly refused "recognition" to men and women whom colleges have wished to appoint. This refusal means that though the person concerned may teach, he may not become a member of a Board of Studies or take part in examining.

The University was thus organized in 1900.

Ten years later a Parliamentary Commission held an enquiry into its progress and strongly recommended greater concentration of teaching and as large as possible arrangements for residence of teachers and students.

Again you may have the University which offers teaching but in no way enforces attendance and regulates the life of its undergraduates. This is the prevalent type in Germany, and, to a certain extent, in Scotland.

Let us now examine these types of University from the point of view of the profit to the student. A University has two functions: to increase the sum of knowledge and to educate young men and women; but in India it is the second function which largely predominates.

Not much can be said in favour of the private student of the type promoted by the old University of London, the student who attends no college at all. Unless he has extraordinary ability he will not be able to master his subject and even the most gifted youth is better for a close contact with able men of riper years. The aim of University education is not to amass facts, though even that is more efficiently done with the help of a teacher than by the use of books alone. The aim includes also the training of the mind and the development of habits of scholarship and for this end nothing can replace the living voice. As a matter of fact, few have attained eminence in science, literature or scholarship unless they have been to College.

The advantages of a system of scattered colleges affiliated to a central University are considerable. This system saves expenses and the young man is not separated from his family. He enjoys home-life, is less open to temptations and his health can receive better attention. He is the centre of affectionate interest. His presence at home ought to be

CULTURE OF THE IMAGINATION.

The fine faculty of imagination, which is a mark of our kinship with angels, is not something which needs to be created in children. It is already a part of their mental equipment, and is spontaneously exercised. The stern realities of life have not yet been thrust upon them, and fancy has free play. It is this endowment which delights us in the poet, who carries with him into manhood the fresh wonder of youth, and who is, as it has been said, "an everlasting child."

What an intense power of make-believe a child has. We see it in his games when he and his fellows represent themselves as soldiers, fiery steeds, engines, teachers, shop-keepers. They can play any part with no limit to the scope. We remember how, in "The Old Curiosity Shop," the poor little Marchioness asks Dick Swiowell whether he had ever tasted orange-peel wine. When he replied that he had not, the recipe given was quite simple. You merely put a piece of orange-peel into a glass of water, it tasted, she said, like wine—if you only made believe very much. What a stroke of genius is this. It has been cleverly said that "Dickens had the key of the street." He also had the key to the heart of the child, and for this reason his charm will never perish. What a gift of God for children is this power of "make-believe." Their enjoyments are all imaginary—seldom real—but how sweet to our thought is the merciful enchantment of "make-believe."

The fancy of children does wonders for them. Fuller tells of a gentleman, who having led a company of little ones beyond their usual journey, they began to be weary, and jointly cried to him to carry them. He told them they were too many for him to carry, but he would provide horses for

them to ride on. Then cutting little wands out of the hedge as nags for them, and a great stake as a gelding for himself, thus mounted, fancy put mettle into their legs and they came cheerfully home."

The imagination is the faculty which appreciates the loveliness of all lovely things, and there can be no question that beauty is one of the elements by which the human soul is sustained and ennobled. To see the glory of God in a sunset and "heaven in a wild flower" is a potent influence for the enrichment of life. It is true that the school-master is abroad, but no methods of education are faulty in the matter of awakening in the child an adequate appreciation of the loveliness of the world we tread. Some of the hours spent by children at the desk would be far more profitably employed, if they were spent in the meadows, with a suitable guide; one who knew something of the beauty, the mystery and the meaning of grasses, weeds, and flowers, together with the flight and song of birds and the wonders of animal life.

The child's natural love of the beautiful should be fostered, for beauty is the sign of God on His creation, and things beautiful rebuke and render distasteful the ugly and the base in life. They are also a never-failing source of joy, a joy which remains with us through life, and one of the few which deepens as the years roll on.

That is a lovely couplet by R. L. Stevenson:

"The world is so full of a number of things,
I'm sure we should all be as happy as kings."

John Ruskin—on of our very noblest teachers—insists upon æsthetic training as absolutely necessary for human development. He holds that education in beauty stands first alike in importance and in time. Primarily "in the beauty of gentle human faces a child," and after that in the fields.

"Without these," he says, "no one can be educated humanly. He may be made a calculating machine—a walk-a-dictionary—a painter of dead bodies—a twanger or scratcher on keys or cutgut—a discoverer of new forms of worms in mud. But a properly so-called human being—never."

Our greatest poet since Milton—William

Wordsworth—writes in lines which we do well to ponder:

"My heart leaps up when I behold
A rainbow in the sky;
So was it when my life began;
So is it now I am a man;
So be it when I shall grow old,
Or let me die."

CORRIE GORDON.

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FOR THE USE OF THE INTERMEDIATE CLASSES

PREPARED IN ACCORDANCE WITH THE UNIVERSITY SYLLABUS

BY

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WITH

INTRODUCTION AND NOTES

BY

E. H. ELLIOT, B.A.

SRINIVASA VARADACHARI & CO., TRIPPLICANE, MADRAS.

SHAKESPEARE: THE PRINCE OF BORROWERS.

12.

I HAVE so far tried to impress upon you how Shakespeare has, in spite of his romantic situations, created not mere shadowy figures, but real men and women. I shall now try to put before you something about the world he has created for them and show how he has made them live and move and have their being before us in a wonderfully life-like manner.

It is not enough if a dramatist produces characters who are attractive and interesting in themselves. He has to provide them with a background wherein they can be seen to the best advantage. This is supplied by the plot. The interest in the characters and the interest in the incidents which make up the plot must go hand in hand. Circumstances react on the characters and the characters in turn react on the circumstances. And in this limited sense it is that we say character is destiny. Shakespeare does not deny that there is an element of chance in life, but he makes us clearly feel that character is more than anything else. He takes special pains to indicate how character grows. Portia may be the same lady who appears in various scenes, but her character has undergone a development, very often almost imperceptible, between scene and scene, between experience and experience. She is not quite the same in the third Casket Scene as she is in the first scene in which she is introduced as expending all her girlhood's liveliness and banter on the six suitors that do not choose. She is not the same Portia again in the Trial Scene where she is unsexed, as it were, to show that intellectual greatness is not the monopoly of any sex. But when she appears last on the scene, her character is the resultant of the previous forces that have acted on her. Her womanhood has blossomed to its fullest. She stands as the ideal of modesty and love—warmth of heart united to vigour of intellect. In other words,

she has grown to the fullest stature of a heroine. The indication of the stages of the development of character is the creation of Shakespeare and, I may add, his monopoly.

13.

Let us examine Shakespeare's canvas a little. There is, first, a pair of merchants as opposite in character as they can well be. One is a Jew and usurer, cunning and consummate: the other is a Christian with more than a touch of bigotry, but otherwise good, kind, amiable and frank. The one makes his money breed as fast as he, the other, in "his low simplicity" according to his opponent, lends his money gratis. The one is a foreigner with all the disadvantages in which a foreigner is placed: the other a native with a contempt for the foreigner which he cannot conceal. A contest is sure to rise when two such men of opposite characters are brought together. Here is material enough for the break of society.

Then come the three pairs of lovers. Portia is an obedient daughter whose happiness, to all appearance, depends on chance: Jessica is a disobedient and seemingly heartless daughter who thinks more of her Christian lover than of her old, forlorn father: Nerissa, on the other hand, is not hedged in any way and yet she makes her happiness depend upon her mistress's. Portia refuses to disobey her dead father: Jessica refuses to obey her living father: Nerissa seems to wish she had a father to obey. Portia, like Shakespeare himself, though eminently practical, has the invincible faith of a romanticist: Jessica is an idealist who, perhaps unconsciously, revolts against rampant materialism and flies into the arms of another idealist: Nerissa merely waits and sees and takes her cue from her mistress. Bassanio has to solve a riddle of the heart: Lorenzo, the idealist, has to summon action to a runaway match with the dark-eyed Jewess: Gratiano has merely to wait and see. Bassanio is prepared to hazard all he has: Lorenzo never gives a thought to the risk he is

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running: Gratiano without any obligations in any way is prepared to stake everything and throw in his lot with his master's. All the three are, however, one in that they really love and, to use the phrase of Portia's father, they love *rightly*. In spite, therefore, of the threatening storm which gathers everywhere, the day closes in glorious moonlight and music.

There are four more characters in the play, of whom two are merely walking gentlemen on the stage. They serve the purpose of the Greek choros and step in whenever the stage is empty. In the later plays of Shakespeare, he rightly gets rid of such hangers-on. Old Gobbo is merely a low-comedy character who is introduced to placate the rabble in Shakespeare's audience. Launcelot, on the other hand, is a necessary character in many respects. He is the first rat to leave the sinking ship. He is the messenger of billet-doux between the pretty Jewess and the visionary Christian. He is the Gratiano of low-comedy. Here again, in Shakespeare's later plays, such characters as Gobbo and Launcelot are woven into the very texture of the story—like Dogberry and Verges in *Much Ado About Nothing* or the fool in *King Lear*.

14.

The first clash of arms occurs in the case of Antonio and Shylock, through one of the lovers, Bassanio. The nature of the clash is determined by the character of the Christian merchant whose "Roman honour"—which stands for self-sufficiency, bigotry and contempt for non-Christians—is pitched against the "patient shrug" of the cunning Jew. Though Bassanio seems to be the reason for Antonio's discomfiture, it is really the latter's own character that brings him to the verge of ruin. What he suffers physically and mentally he has himself mostly to thank for. He violates the principle of society—the principle which makes men something more than mere gregarious animals. He has no business to call Shylock a "misbeliever" and a "cut-throat dog"

and spit on his "Jewish gaberdine." Shylock reacts. And in retaliating, he not merely steps over the limits set by society, but seeks to justify his action by pretending to be within the pale of law. Hence his end is a piece of irony. He thinks he has caught the Christian upon the hip, but he has really caught a Tartar. Christian society in the person of Portia catches him upon the hip. He says, "I will buy with you, sell with you, talk with you, walk with you, and so following," and if he stops there he is in the right. But when he proceeds further to add, "I will not eat with you, drink with you, nor pray with you," when he adds these not merely in words but in actions, there comes the Nemesis. He does eat with the Christians, he does drink with the Christians and finally he does pray with the Christians. He mistrusts his daughter and she repays him with mistrust by running away from him. He sends away Launcelot though that "patch is kind enough." He says, "Drones hive not with me," but that very drone is partly the instrument which helps his daughter to escape. In the Trial Scene he asks: "Hates any man the thing he would not kill?" He takes his stand upon the letter of the contract. And for this he is forced into such circumstances as to say, "You take my life when you do take the means whereby I live." In other words, the whole of this part of the story is one of the interaction of individuals on society and *vice versa*.

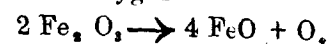
15.

In this disturbed state of society, what is the element which contributes to its equilibrium? My answer is *Portia's character*. She gets the upper hand by first obeying the laws of society. Here is the key then to the whole play. I have already quoted her words on her resolve to be chosen by the caskets as her father has willed. The obedient daughter next shows herself as the obedient wife—

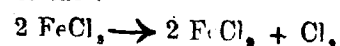
"You see me, Lord Bassanio, where I stand,
Such as I am: though for myself alone

tion by the application of appropriate chemicals.

Observation has shown that nearly every metallic compound undergoes some change or other in the presence of light. In some cases, the change may be visible to the eye, while in others the change might have to be ascertained by subjecting the new substance formed to some chemical change. Speaking generally, the photo-chemical action seems to be one of reduction and those substances are acted upon most which are capable of being easily reduced from a higher state of oxidation to a lower one. But what is reduction? Ferric oxide is reduced to ferrous oxide with the removal of oxygen.



Besides oxygen, other non-metallic elements may be removed from the compound and such reactions also come under the category of reduction; e.g., ferric chloride is reduced to ferrous chloride and this involves the removal of chlorine



Hence reduction is de-oxidation or de-chlorination or de-bromination. And photo-chemical reduction takes place all the more in the presence of a suitable substance which is capable of absorbing the reduction products as soon as they are liberated and which on account of its capacity of accelerating the change by making the original substance more sensitive can be called sensitizers.

As examples of the changes of metallic compounds when exposed to the action of light may be quoted several familiar ones. The salts of iron will however suggest themselves at once. Ferric compounds can be easily reduced to ferrous ones with any suitable reducing agent such as sulphurous acid. The reduction can also be effected by light.

A solution of ferric oxalate is divided into three portions to one of which sulphurous acid is added. The second is exposed to sunlight and the third is kept in the dark. After a while, a few drops of potassium ferri-cyanide are added into each. It will be observed that the one kept in the dark will be unaffected while the other two will give a blue precipitate of ferrous ferri-cyanide or Turnbull's blue as it is also called. The substance ferric-oxalate is purposely chosen; for though all ferric compounds are susceptible of photo-reduction, the presence of sensitizers accelerates the reduction and oxalic acid plays such a part. An alcoholic or ethereal solution of ferric chloride is also easily reduced to ferrous chloride, the alcohol and the ether playing the part of a sensitizer on account of its property of inducing the reduction by fixing to itself the chlorine liberated in the reaction.

This property of ferric salts can be utilised for the production of pictures. Paper is coated with a 10% solution of ammonio-ferric-citrate to which is already added a solution of potassium ferri-cyanide. The paper is then dried, all operations being done in a dark room. If the dried paper is exposed to sunlight for a few minutes under a design or a negative in a photographic printing frame and subsequently washed with very dilute hydrochloric acid, the figure will be printed on the paper. This is the principle involved in the blue prints used so commonly in the Public Works Department. In the above instance, the ferric citrate is reduced to a ferrous salt in the exposed portion and the image is not quite visible. The presence of potassium ferri-cyanide makes it visible or develops it as it is technically called, giving it a blue tinge.

Mercuric chloride in aqueous solution is photo-susceptible and is reduced to the insoluble white compound of mercurous chloride. The decomposition is accelerated by the addition of organic reducing agents such as sugar. It proceeds also at a measurable rate so much so it can be utilised for the quantitative determination of the intensity of light.

Good illustrations of photo-chemical reduction are furnished by the salts of gold and platinum wherein they are converted to the metallic condition. These reactions form the basis of the whole process of toning and can be better understood in that connection.

Again, the chromates are among those salts which are easily reduced by light in the presence of reducing agents and which have been of great importance in photography. A solution of potassium dichromate containing a small quantity of sugar is spread over paper and exposed to light under a design for a short time. The paper is subsequently washed with water. The exposed portion will appear brown. Sugar which plays the part of a sensitizer can be replaced by gelatine. In fact, the action of light upon chromatised gelatine is the foundation of several important printing processes.

The instances quoted above will be sufficient to enable us to realise the general nature of photo-chemical action on reducible substances in the presence of reducing agents. But, among the photo-reducible metallic compounds, those of silver occupy such an important place in photographic processes that we may now turn our attention to an adequate consideration of the action of light on these compounds.

All the salts of silver are more or less decomposed by light and much more in the

presence of oxidisable substances, but we may confine our attention to those of importance in photography, viz.; the chloride, bromide and iodide designated under the name 'silver-haloids.' Silver chloride becomes violet on sufficient exposure to light. A photo-chemical change has been effected. In other words, silver chloride has been reduced. But what the reduction products are is still a controversial point. It will be evident from the following experiment that chlorine is liberated. Precipitated silver chloride prepared by mixing together a soluble chloride such as common salt and a solution of silver-nitrate is kept in a vessel with a starch iodide paper hung over it. The vessel is then exposed to light. The iodide paper is coloured blue from the action of liberated chlorine. If chlorine be one of the products of photo-decomposition, it may be expected that silver is the residue. That it is not is proved by its insolubility in nitric acid. What then is the exact nature of decomposition? We shall not attempt to answer this puzzling question. Silver chloride is reduced, probably to a sub-chloride as some view it or to an oxychloride as some others think. To us the exact nature is not of much importance so long as we bear in mind that it is a lower reduction product. It contains less chlorine than the unaltered chloride. The decomposition also proceeds all the sooner in the presence of a chlorine absorbent to take up the chlorine as soon as liberated. If, on the other hand, the chlorine be allowed to accumulate, the reaction comes to a standstill after a little progress. This latter fact is of great practical importance in photography in connection with restrainers which will be considered a little later.

What has been stated for the chloride applies as well for the bromide and the iodide.

Silver bromide darkens on exposure to light and loses bromine. The decomposition is accelerated in the presence of bromine absorbents which can be found in gelatine and such like organic compounds. In the case of the iodide, the decomposition is very slow and seems to take place only in the presence of iodine absorbents.

Before we leave the region of photochemistry, a word may be said about the kind of light rays that are capable of bringing about the chemical change. To determine as to what rays any particular compound is sensitive, appeal should be made to the spectroscope. It is beyond the limits of this paper. The rainbow colours—divided primarily into violet, indigo, blue, green, yellow, orange, and red that make up white light—do not all act to the same degree. Experience has shown that the rays between the green and the violet cause a change. They are the only actinic ones with reference to the silver halides. Often, it depends also on the particular sensitizer employed, though in general the red rays are chemically non-actinic. This is why a dark room is generally fitted up with ruby glass windows.

With this preliminary knowledge on photochemistry we may fairly enter the region of photographic processes and in brief, their chemistry.

II.

In the short space available, it is not possible to study the evolution of scientific discovery of photography by reviewing the historical portions of the collodion process. We shall commence at once with its offspring, the latest methods of dry plate emulsion photography. Photography proper consists in main of the following different processes:—Preparation of the plates, exposure, and

development to get a negative, printing and toning to get the positive therefrom. It would be well to consider in some detail each one of the items referred to.

The plates:—The sensitive plate consists of a glass plate on one side of which is a sensitive film of gelatino-bromide emulsion. In making such a plate, a glass plate of known dimensions is well cleaned in the usual way by immersing it in dilute nitric acid and subsequently treating it with a solution of caustic soda and water. A dirty plate often causes a fog in certain plates. The clean plate is then coated with gelatino-bromide emulsion.

The gelatino-bromide emulsion is easily prepared. The following experiment will show the emulsification of silver bromide in gelatine. Soak 20 gms. of gelatine in a little water for half an hour and then dissolve completely by the aid of heat in a larger quantity of water. Add 12 gms. of potassium bromide to the solution and make up the whole to about 150 c.c. To the cooled solution is then poured with constant agitation a solution of 15 gms. of silver nitrate in about 150 c.c. of water. The silver bromide precipitated in the gelatine solution emulsifies. The emulsion so obtained requires ripening to make it more sensitive by keeping it in a bath of boiling water with occasional agitation for nearly an hour. The ripened emulsion may contain excess of potassium bromide as well as a little potassium nitrate produced from the interaction of the two reacting substances. Both of them are detrimental to the sensitiveness of the emulsion and are got rid off by repeated washing. The washed emulsion is now ready for use, the plate being coated with a uniform film of the molten emulsion and allowed to dry. But it is un-

necessary to attempt the preparation of sensitive plates in these days when photographic materials are sold ready made at a cheap price and a list of the important dealers can be found in the 'British Journal of Photographic Almanac and Daily Companion' available at all booksellers.

The action of light on such a plate has been told. The silver-bromide in the form of a thin film, resting on a substratum of the sensitizer gelatine, is acted upon with a photochemical reduction in those parts exposed to the action of light. But why do we choose gelatine for the sensitizer? We shall refer here to those properties of gelatine which make it admirably suited as a vehicle for the silver-halide. In contact with cold water, it swells and absorbs a considerable quantity of water. On warming, it gradually dissolves and on cooling it solidifies to a gelatinous mass. It confers on the water in which it is dissolved the necessary degree of viscosity for keeping the finely divided silver haloid in suspension. Moist gelatine however putrefies easily with evolution of ammonia and a consequent destruction of the plate. Gelatine is also one of the best sensitizers being a bromine absorbent; and because of the intimate contact which everywhere exists between the gelatine and the imbedded silver bromide particles, the sensitising action is capable of being exerted in the most perfect conceivable manner. Further the perfect imbedding of the silver-haloid particles in the gelatine enables us to use developers of great strength and thus to make the most out of the impression.

A word of caution may be added in the preparation of the gelatine plates. The quantity of potassium-bromide must be so adjusted as to leave no excess of silver-nitrate. With a deficiency of the salt, the gelatine forms an

emulsion with silver nitrate and the latter acts directly on the developers fogging the plate. With excess of it, the sensitiveness of the plate is diminished and the effect of the developer is restrained.

Exposure:—Perhaps, to an amateur the most difficult part of the gelatine process is to gauge the right exposure to be given in the camera. The time varies very much from one-fiftieth of a second to even an hour sometimes depending mostly on the sensitiveness of the plate, the general nature of light, the available aperture of the lens and the nature of the view. Often, the amateur clinging to the use of the same kind of plate will be able to judge of it from his personal experience. Much help can also be sought in the exposure calculator issued annually along with their diary by Messrs. Welcome Burrows Company.

Development:—On exposure for a suitable period, the picture formed is only invisible and to make it reveal itself, certain substances called 'developers' have to be applied to the film and this process is 'Development.'

Development of a gelatine plate is in reality an art and science combined. The art consists in getting proper gradation and the science in preparing normal solutions. There are in practice only two kinds of exposed plates deserving attention—one that has received normal exposure and the other when it has either under or over-exposure. In a normally exposed plate, the latent image begins to appear in about ten or fifteen seconds with a properly prepared developer. But if the image does not appear for some time, it is a case of under exposure and if it appears immediately, it may be a case of over-exposure.

As for the developers, there are a number of them and the formulae required can be found in any treatise on photographic mani-

pulation. For the convenience of travellers, the developers can all be obtained in the form of tablets which have only to be dissolved in water. We shall not attempt to consider each developer by itself or compare the advantages of different developers. But we may consider some general notions of development.

It has been stated that when a ferric salt is exposed to light, it is reduced to the ferrous state on the exposed parts, but to make the reduced part visible, it was washed with a solution of potassium ferri-cyanide which, acting differently on the ferric and ferrous salts, was the developing agent. Similarly then the developer in photography exerts an action on those portions of a photo-sensitive compound which have been exposed to light, different to that which it exerts upon the unexposed portions. This difference in action is also associated with a difference in colour. Consequently, a strong contrast is brought out on development. This is the function of a developer in general. We may proceed from the general to the particular instance, *viz.*, the action of developers on the exposed and unexposed parts of a sensitive plate. It has been stated that on exposure of the plate for a suitable period, the image formed is only invisible. What is the exact nature of this image? Has it any relationship to the visible product of reduction—a sub-chloride or an oxy-chloride—resulting from the action of light on the silver-halides in the presence of sensitizers? The invisible image seems to be of the same chemical composition as the reduction product differing from the latter only in degree and not in kind. It is a lower reduction product, the bromine liberated having been absorbed by the sensitizer—which in the dry gelatine emulsion process is

the vehicle itself—to form a brominated compound of unknown constitution. That it should be invisible may be surprising at first thought but the action of light on the sensitive film is purely superficial and the quantity of the reduction product formed is too infinitesimal to appear visible. When the developer is added, the image puts in its appearance in a most fascinating manner and we have to ask ourselves what exactly is the nature of the change. This can be answered only if the developer is known. One important group of developers for the dry plates is the alkaline developer typified by an alkaline solution of pyro-gallol. This substance is a most powerful reducing agent capable of reducing silver salts including the halides. When used alone, it reacts with the silver salts on the sensitive film—the reduction product and the original silver bromide—and often causes a fog. But on the addition of a restrainer like potassium bromide, the original silver bromide forms a double salt with it, the latter being more stable, *i.e.*, less easily reducible than the silver bromide itself. Therefore the potassium bromide mixed with the alkaline pyro-gallol checks the reduction of the unaltered silver halide on the plate and thus prevents the deposition of a film of reduced silver all over the latter. The invisible image consists of a product more easily reducible than the unchanged halide, so that the developer first reduces the reduction product to the metallic state. The amount of reduction product forming the invisible image is so small that its equivalent in metallic silver would give but the faintest of pictures. How does the picture become intense? The density of the deposit in the completely developed picture clearly shows, therefore, that the metallic image is fed from some other source. Whence comes this additional supply of silver?

After the developer has acted on the exposed plate reducing the reduction product on the surface to its equivalent of silver, this metallic image exists in the presence of unaltered bromide in which it is embedded. Silver bromide in contact with silver in the nascent state is reduced to the metallic state and this growing from below adds to the deposit of silver which can be brought to the desired stage by adjusting the time of development and the strength of the developer. This, at least, seems to be the theory of the action of alkaline developers.

Before we leave the subject of development, it may be advisable to state that the development should be proceeded with soon after exposure. If the exposed plate be allowed to stand for a few days and then developed, the image does not often appear. This is due to the fact that the invisible image has been destroyed. The reduction product formed on exposure is also capable of oxidation and reversion to the original silver bromide and this explanation seems quite probable in view of our experience that the invisible image can be destroyed by the application of oxidising agents which will restore the reduction product to the original silver halide.

POST-DEVELOPMENTAL PROCESSES.

Fixing:—The developed image has to be subjected to certain subsequent operations before we can obtain a finished negative herefrom and we may now turn our attention to this part of the subject. The developed image consists of a thick deposit of silver on the exposed part, presenting to us the picture surrounded by the unacted and unaltered silver bromide. The latter has to be removed from the film by the use of a suitable solvent

that does not act at the same time on the silver composing the picture. We fix the image, as we call it. The fixing agent that is commonly used is a solution of sodium thio-sulphate. A strong solution is necessary, as otherwise the thio-sulphate, instead of dissolving out the silver-bromide, forms with it an insoluble compound which would remain in the film. The process of fixing is therefore very simple.

Intensification:—It often happens that the finished negative may be too light to be useful for printing purposes. This defect often arises from under-exposure or under-development and can be easily remedied by a process of intensification. The agents which bring about the change are called 'intensifiers' of which there are many in use. But the one recommended by practical photographers is a solution of mercuric chloride followed by the application of some other substances. How is the image intensified? When the negative is immersed in a solution of mercuric chloride, the dark image consisting of a deposit of silver becomes bleached by the reduction of the soluble salt to the white insoluble mercurous chloride by the silver. Excess of the bleaching solution is washed off and the image now rendered white by a coating of mercurous chloride and silver chloride is again blackened by the application of some reagent that reacts with the white insoluble compound to give a dark product. One such substance is a dilute solution of ammonia which possesses the two-fold properties of dissolving out the silver-chloride and blackening the mercurous chloride. The bleached picture can also be darkened by the application of sodium-sulphite solution which reduces mercurous chloride to metallic mercury. A still better intensifier is a solution of potassium ferrous

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difficulties and found himself almost at a standstill. There were only two courses left to him now: (1) he had to give up his assured conviction that *nature is simple* and works as he determined she should work, and endeavour to find the real ways of natural phenomena; or (2) retain his purely intellectual conviction but express it in terms which would cover his experimental data "when they had been subjected to a not too difficult process of manipulation." As he found it very hard to conduct translations in the laboratory; it was much easier for him to transmute his facts to bring them into harmony with his theory! He was averse to descend to experimental evidence and was satisfied "to discover things *a priori* than *a posteriori*." Therefore he was not very solicitous to gather experiments to prove his doctrines, but was content with a few only, rather to illustrate than to demonstrate.

Here I must mention that from the earliest times alchemy was regarded as a branch of the *art of healing*, and the alchemists were all physicians. It is possible that in the beginning its true aim was only medicine. The alchemists were the professional chemists of their time and as the number of chemical products increased and their value in therapeutics became more and more appreciated, there arose another school of alchemists, whose energies were devoted, not to transmutation of metals—which, however plausible as a belief, seemed hopeless of achievement—but to the more immediate practical benefits which it must follow from the closer association of chemistry and medicine. This school came to be known as the *Iatro-chemists*, and their doctrines exercised a great influence upon the development of chemistry.

According to the *Iatro-chemists* vital phenomena are chemical processes, human illnesses result from abnormal processes within the body and these could only be counteracted by appropriate chemical remedies. Although these ideas did not originate from him, the chief exponent of

this school was a benedictine monk, Basil Valentine. His immediate successor Paracelsus (1493-1540) "carried on the crusade against the old alchemists with vehement intrepidity amounting almost to truculence." He was an extraordinary genius of his time; "genius is not produced by the spirit of the age; it is the spirit of the age which is produced by the genius."

He studied medicine at Basle, wandered over Europe, Egypt, Arabia, and Asia-minor. He was adept in every chemical preparation of his time and became professor of medicine in the University of Basle from hence he was driven by the authorities because of his turbulent spirit. He broke away from the teachers of authority, expressed his contempt for celebrated physicians, Galen and Avicenna, by a public holocaust of their works, abused medical men of his time for seeking their knowledge from ancient books, and besought them and all others to go to nature and learn wisdom.

I must here note that Indians were in advance of Paracelsus. There are two standard works of the 13th or 14th century: *Rasendrachiniamani* by Ramachandra and *Rasaprakasa* Sudhakara by Yasodhara; which abound with passages exhorting experimental faith. Says the former: "That which I have heard of learned men and have read in the Shastras but have not been able to verify by experiment, I have discarded." Yasodhara writes in the latter: "All the chemical operations described in my book have been performed with my own hands—I am not writing from heresay. They are based on my own observations."

Paracelsus tried his best to put this doctrine into practice, to examine natural phenomena first, and to found his theories on the results of observation and experiment. He wrote that chemists "are not given to idleness, nor go in a proud habit, or plush and velvet garments,.... but diligently follow their labours, sweating whole days and nights by their furnaces,...."

They put their fingers among coals, into clay and filth, and not into gold rings. They are sooty and black, like smiths and miners, and do not pride themselves upon clean and beautiful faces." Early in his career, Paracelsus devoted himself to an experimental study of transmutation, but it was not long before he concluded that it was a chimera.

The Peripatetics derided at those who used experiments as their guides as "sooty empiricks."

Lo! After a time, he found the task too hard.

"The life so short; the craft so long to learn;
Th' assay so harde, so sharp the conquering."

We must, of course, remember that he had no accurate instruments, no definite hypothesis to guide him, no tangible clue to the manifold and seemingly contradictory results of his experiments. So he fell into the old error, he looked inwards for all knowledge. Instead of troubling himself with the universe and what it really is, he set his intellect "to the easy business of creating his own world, and soothed but deadened his emotions by looking on the world he had himself created and finding it very good."

The alchemists who experimented had always used salt, sulphur and mercury in their work. Gradually they came to look upon these as things simple, by the admixture whereof many more complex things may be formed.

But these alchemists, as I previously mentioned, were saturated with semi-magical ways of looking at nature. I may cite here what has been written by an alchemist of the seventh century. "Copper is like a man; it has a soul and a body.....the soul is the most subtle part..... The body is the ponderable, material, terrestrial thing, endowed with a shadow.....It is necessary to deprive matter of its qualities in order to draw out its soul."

So these alchemists were forced to think that salt, sulphur and mercury owed their efficacy in bringing about material changes to an inner, hidden soul or essence in each. They therefore

distinguished the ordinary, tangible salt, sulphur and mercury and the efficacious essences of them, but could not give any clear idea of what they meant by the essence or soul of a thing. They seemed to think that the difficulty was overcome by calling salt, sulphur and mercury—the *three principles*—attaching unutterable meanings. The difference between the *Iatro-chemists* and *Peripatetics* became quite marked in that the former asserted that mixed bodies are formed by the compounding of the *three principles*, while the latter remained true to the *four elements*. Now was the time of confusion of ideas, the actual air, fire, water and earth had come to be assumed by many as being actually present in, and as forming real constituents of diverse forms of matter—there had been in fact a resuscitation of the original Empedoclean views!

The transition from the vague and uncurbed phantasies of alchemy and *Iatro-chemistry* into the true science of chemistry was marked by the appearance of a work (in 1677) entitled "The Sceptical Chymist" by Robert Boyle (1626-1691). He felt that the study of chemistry began at the wrong end, and that the *Peripatetics* and "vulgar spagyrist" as he called the *Iatro-chemists*, "played with names at pleasure" and used high-sounding phrases which "distorted their vision and made them see in nature only what they wanted to see." His book is written in the form of an elegant and suggestive discourse on his chemico-physical doubts and paradoxes touching the experiments of the "hermetick philosophers" and the "vulgar spagyrist." The doctrines of the *four elements* and the *three principles* are strongly contested. "Tell me what you mean by your *Principles* and your *Elements*," he cried; "then I can discuss them with you as working instruments for advancing our knowledge." His language has nothing of the mystic and rococo style of alchemical literature, but is lucid and is filled with definite statements, and discreet experiments. He further states,

stance (red lead). These differences in color were supposed to depend upon the varying amount of *phlogiston* expelled.

The *solubility* of a substance depended on the amount of combined *phlogiston*. Thus phosphorus, and sulphur, bodies rich in *phlogiston*, are insoluble in water, but the acids produced from these substances by the escape of *phlogiston* are eminently soluble.

In fact, all properties of a substance—its *activity* or *inertness*, its *stability* or *instability*, its *acidity* or *basicity*, etc.—were all believed to be functions of the amount of combined *phlogiston*.

Indeed, even in the time of Stahl, facts were known which it was difficult or impossible to reconcile with his doctrine; but these were either ignored or their true import explained away. *Phlogiston* was regarded as a definite material substance and Stahl looked forward for its isolation as a *solid earthy body insoluble in water*. But his contemporaries and followers went so far as to identify it with hydrogen, because when metals dissolve in acids a gas is disengaged, which if collected and heated with the calx (really salt) recoverable from the solution restores the metal. As metal is calx and *phlogiston*, the gas disengaged must be *phlogiston*.

We must remember that chemistry was as yet in its purely qualitative stage; the first *phlogistonists* did not notice that the calces and acids, as the case might be, weighed more than the substances from which they had been produced. Boyle seems to have been the first to notice this increase in weight and he ascribed it to the combination of the burning body with igneous particles. (*Vide* Lavoisier's Experiment of Distillation.) To other *phlogistonists* "the fact that metals, when transformed into their calces, increase in weight does not disprove the *phlogiston* theory, but confirms it, because *phlogiston* is lighter than air and in combining with substances, strives to lift them and so decreases their

weight; consequently, a substance which has lost *phlogiston* must be heavier." Perhaps they did not observe that ash from burnt charcoal does not weigh more than the original charcoal by the removal of *phlogiston*!

The doctrine of *phlogiston*, as just sketched, after reigning triumphantly for some half century was given a decent burial by Lavoisier's oxygen theory. The increasing knowledge of the constitution and nature of the atmosphere shed quite a new and certain light on the phenomenon of combustion as co-ordinated by Lavoisier into the present theory of combustion.

We shall now trace the chief stages in the growth of our knowledge of the atmosphere which led to the overthrow of the *phlogistic* theory. The alchemists considered atmosphere as a simple elementary substance, but Boyle wrote that "the air is a confused aggregate of effluvia from such differing bodies that though they all agree in constituting by their minuteness and various motions one great mass of matter yet perhaps there is scarcely a more heterogeneous body in the world."

Robert Hooke (1615—1703), a contemporary of Becher and sometime an assistant to Boyle, published in 1665 a book—*Micrographia*—in which he gave out his conception of combustion. He believed that there existed a gas in the atmosphere very like the one obtained by heating saltpetre or nitre and that combustion consisted in the solution of the combustible body by this gas, as solids dissolve in liquid menstrua. He anticipated Ramford and clearly stated that fire or flame is not an element but a phenomenon due to agitation of particles.

Mayow (1645—1679), an Oxford physician, worked out in more practical details the ideas of Hooke. He observed that there is actual diminution of air when a metal is burnt in it and that the calx weighs more than the original metal. He explained this by suggesting that the metal had combined with the *nitre* air, as he called it,

present as a fraction of the atmosphere and left as residue the inactive air.

It may be seen that the work of these two men and the explanation of Mayow are so much to the point, that one is forced to ask, how it is that their full significance was not recognized till they were practically rediscovered piecemeal a century later. The answer is simple; the *phlogistic* theory was so supremely popular that Mayow's "explanation had no weight against the transcendental artificiality and uniqueness of *phlogistonism*."

The next advance towards the accurate knowledge of the atmosphere was Black's (1728—1799) discovery and investigation of the "fixed air" (carbon dioxide). The physicians of those days made a profuse use of quicklime, magnesia, and allied substances for treatment of stone in the bladder. These were prepared by heating carbonates of lime, magnesia and the alkalis, then considered as simple bodies; that is, they were considered to be compounds of the carbonates with *phlogiston* obtained from the burning coal.

Black first investigated "mild magnesia" (magnesium carbonate) and proved that when the carbonate is heated it loses weight due to expulsion of a gas and not due to combination with *phlogiston* with negative specific gravity. His reason was that it could again be refixed in a sort of latent condition by the resulting "caustic magnesia." He further showed that the same gas is produced when chalk is calcined or treated with acids, that it exists in the breath of animals, and is evolved in large quantities during fermentation. He studied its properties: that animals die when placed in it, and that it does not support combustion, but never even hinted at its composition.

The work of Priestley (1733—1804) evolves us further in the domain of the knowledge of the atmosphere. Priestley, a divine of the Unitarian Church, was employed to the charge of the

Mill Hill Congregation at Leeds. His quarters were next to a public brew-house and he spent his leisure hours there studying the properties of the "fixed air" of Black who had shown it to be produced in large quantities during fermentation. Circumstances compelled him to shift from the parlour of this laboratory but his interest did not shift and he began to prepare the fixed air artificially from chalk as taught by Black. In order to store and examine gases, he made extended use of, and popularized Mayow's method of collecting them over water in what he called a *pneumatic trough*,—a method still in vogue. He soon noticed in his collection that the fixed air dissolved in water to a considerable extent and that such a solution had medicinal properties specially useful for scurvy. We may be right in saying that he was the first to prepare the soda water of to-day. In studying the properties of gases he experimented, Priestley always tried their effects on animal and vegetable lives—mice and sprigs of mint being the chief victims. In this connexion, he distinctly noted that wonderful piece of natural economy whereby the gaseous waste-products of animals serve as the food of plants, and the atmosphere is maintained in a state of freshness and purity compatible with prolonged existence of life.

His experiments may be briefly stated as follows: he put on the 17th of August 1771, a sprig of mint into a quantity of air in which a candle had burnt out, and on the 27th of the same month another candle burnt perfectly well in it. This was a great surprise to Priestley; and further experiments were made to show that this remarkable result was not peculiar to mint but that all green vegetable matter was equally effective. He varied the experiment placing animals in an enclosed volume of air and showed that the air rendered noxious by the respiration of animals could be made fit for breathing again through the agency of vegetation. These experiments further made clear the views held by the

alchemists, that the physical life of an animal is, in some respects, very similar to the burning of a candle,—a process of combustion. Priestley was very fortunate in his discoveries and he says: "In looking for one thing I have generally found another, and sometimes a thing of much greater importance than that which I was in quest of."

After having fairly exhaustively worked out the properties of fixed air, he turned his attention to new airs. A large burning-glass, twelve inches in diameter, had come into his possession, and he eagerly used it, concentrating the sun's rays at haphazard on any compound that he happened to think of or chance upon.

If any gas was produced, he collected the same over mercury and one of the substances experimented on was the so-called red-precipitate. From this, in 1772, he obtained a gas and made his usual "candle and mouse" tests. He found the gas allow the candle to burn vigorously and the mouse lived longer in it. He himself breathed it and he tells us that his breast "felt peculiarly light and easy for some time afterwards." So he concluded that this gas "had all the properties of common air, only in much greater perfection." As a confirmed phlogistonist, he gave it the name of *dephlogisticated air*, regarding it merely as common air free from impurities and admixtures. He had not the truer insight of Mayow and Hooke to regard it as a constituent of air, as to him air was essentially a simple substance.

The advance however, made by Priestley in our knowledge may be summed up as follows: When a substance burns, phlogiston escapes from it into the air, which is invested with a great affinity for this principle of fire. Substances cannot burn out of contact with the air, or other substances, such as nitre, which possess this strong attraction for phlogiston. But in proportion as the air round a burning body becomes more and more charged with

phlogiston, the poorer a supporter of combustion does it become, till finally it may become phlogisticated—so noxious, as he expressed it, that it will actually quench a flame immersed in it. The air obtained from red precipitate was *virgin air*, untainted by any phlogiston, and so energetically did it long for this principle of fire that even at ordinary temperatures it drew it away from several substances, thus causing them to tarnish (iron nails, as we know, soon tarnish (i.e.) rust when immersed in impure oxygen.)

Priestley was essentially a *preparateur* but was quite short-sighted in his inquiries. He did not attempt to explain why the air diminished when combustion took place in a confined space though he describes the experiment without realising its significance. According to Priestley, the air that has surrounded a burning body is richly studded with phlogiston; if then, by a parity of reasoning, ought to reduce metals from their calces. Had he but done this experiment suggested here, he would have realized that phlogiston was only a myth and would not have written his last work: *The Theory of Phlogiston established*.

Priestley also experimented in his own casual way on nitrous air (nitric oxide), vitriolic acid air (sulphur dioxide), muriatic acid air (hydrochloric acid), alkaline air (ammonia) and inflammable air (hydrogen). In his experiments with inflammable air (1762), he very nearly anticipated Cavendish's discovery given out four years afterwards, regarding the composition of water. His blind and undirected discoveries laid some of the foundation-stones of modern chemistry but were little appreciated by a large section of his countrymen in those days.

I referred to you about Cavendish's (1731-1810) discovery of hydrogen and the composition of water in 1766. He found that when about two volumes of inflammable air are exploded with one volume of dephlogisticated air, water

is produced. Further, if ordinary atmospheric air is used instead of dephlogisticated air, water is still produced, but a residue of phlogisticated air (nitrogen) always remains. Hence it was argued, that air is not a simple individual substance but a mixture of phlogisticated and dephlogisticated airs. But it is a pity, that he did not clearly grasp at the evident conclusion from his experiments, viz., that water is a compound of inflammable and dephlogisticated airs. James Watt seems to have been the first to arrive at this conclusion. Cavendish could never thoroughly free himself from the trammels of phlogistonism. Although he saw good reason to suppose that burning of a metal is its combination with the dephlogisticated air, yet he could not find it in his heart to give support to such a heresy. He therefore concluded, with Priestley, that the metal phlogisticated the residual air, but slightly differed from him in admitting that some of air in a dephlogisticated state combines with the metal. Combustion was to him a case of a partial combination associated with and attended by a contamination; and not of a total combination attended by an elimination.

Towards the latter half of the 18th century, clearer views began to be held concerning the relations of atmospheric air to the phenomena of combustion and of calcination. Many half-forgotten facts relating to these phenomena were recalled, and the inconsistencies and insufficiency of phlogiston as a dogma, became gradually manifest. Three cardinal facts conspired to bring about its overthrow—(1) the isolation of oxygen by Priestley; (2) the recognition of the complexity of atmospheric air and of the fact that one of its components is oxygen; and (3) the discovery by Cavendish, that water is a compound, and that its constituents are oxygen and hydrogen.

The significance of these isolated facts was first clearly grasped by Lavoisier, and to him is due the credit of their true interpretation and coordination.

XXV

In connexion with combustion, by reasoning and experiments, he proved conclusively that in the burning of a metal in air, air is absorbed and there is increase in weight equal to the weight of air absorbed; that only a constituent of the air is absorbed, the unabsorbed constituent being different from the common and fixed airs, and that the constituent of the air absorbed by the burning bodies was nothing else than Priestley's dephlogisticated air. He further proved that the gas disengaged when calces of metals were heated with carbon was identical with Black's fixed air, which therefore must consist of carbon and oxygen and which he named carbonic acid (carbon dioxide). Mayow, a century previously, had come to the conclusion, though not in so definite a manner, that carbon dioxide is formed during respiration of animals and it was left for Lavoisier to give experimental proofs for the same.

Since the combination of the dephlogisticated air with the majority of substances he investigated, produced acids, he renamed the gas oxygen or acid producer—which nomenclature is not altogether appropriate as we shall see presently.

On burning phosphorus in a confined volume of air, he found that after about a fifth of the air had disappeared the phosphorus was extinguished and all other combustible substances refused to burn in the residual gas. He regarded this *noxious air* as a true constituent of the atmospheric air, actually present therein before the burning, and called it first *mouffette atmosferique* (poisonous air) and later *azote* because it does not support animal life.

Rutherford (1772) in Edinburgh simultaneously isolated this gas by treating with caustic soda solution, air in which animals have been confined for sometime. Chaptal gave it the popular name nitrogen signifying that the gas was a constituent of nitre.

Lavoisier next repeated the experiments of Cavendish on the composition of water, inter-

preferring the results and completing the proof by passing steam over heated iron and thus obtaining calx of iron and inflammable air which he rechristened thenceforward as *hydrogen*.

We further owe to Lavoisier the recognition of the *principle of conservation of mass*—a principle lying at the basis of chemical science of to-day and familiar to all. This principle was assumed in many of the ancient philosophies; but no special attention was paid to that. As has been stated before, "production of new forms of matter was regarded as an act of special creation, having no quantitative relation to the destruction or annihilation which necessarily preceded it." This principle of conservation of mass which strikes the materialistic mind of to-day so much in the character of truism, involved quite a revolution in the settled views of the chemists of that time.

The great success of Lavoisier in this field of study, must be largely attributed to the importance he placed on the incessant use of the balance as an instrument of research.

Lavoisier was not the first to introduce the use of the balance into chemistry: quantitative chemistry did not actually originate with him. Boyle, Black and Cavendish, as a matter of fact, preceded him in recognising the importance of studying the quantitative relations of substances. Nevertheless, no one before him so clearly foreshadowed the doctrine of indestructibility of matter, and it was mainly through his teaching that the balance came to be recognized as indispensable to the pursuits of chemistry.

The great factor in Lavoisier's success was his unconditional rejection of the old, vague elements and principles of the alchemistic era, and his adoption of the conception of elements and compounds as developed by Boyle and now generally received. The theory of phlogiston was doomed and the new chemistry for a time centred round oxygen—"one fetish was exchanged for the other." His explanations steadily

gained in favor and the year 1785 marked the complete ascendancy of his antiphlogistic views. The views of the French school met with no immediate acceptance in Germany, the home of phlogistonism, or in Sweden or in England—possibly due to national prejudices. Priestley, Cavendish and Scheele who supplied data for Lavoisier's work, could not be induced to accept the new doctrine. It was, however, accepted by Black and its principles taught by him, soon in Edinburgh; and some, like Kirwan, the friend of Priestley, who had energetically opposed the new theory ended by enthusiastically embracing it. Before his untimely death at the guillotine in 1793 he had succeeded in impressing upon science the main features which at present characterize it.

To bring the growth of the knowledge of the atmosphere to our own times, the question as to the homogeneousness of the gaseous residue left after the oxygen, the moisture and the carbon dioxide have all been withdrawn, was considered by Cavendish. I shall quote here what he says in his "Experiments on Air" published in the *Philosophical Transactions* for 1785. "As far as the experiments hitherto published by (to mention a few) himself, Scheele, Rutherford and Lavoisier extend, we scarcely know more of the nature of the phlogisticated part of our atmosphere, than that it is not diminished by lime-water, caustic alkalis, or nitrous acid; that it is unfit to support fire or maintain animal life; and that its specific gravity is not much less than that of common air; so that though the nitrous acid, by being united to phlogiston (i.e. deprived of oxygen) is converted into air possessed of these properties, and consequently, though it was reasonable to suppose that part at least of the phlogisticated air of the atmosphere consists of this acid united to phlogiston, yet it might fairly be doubted whether the whole is of this kind, or whether there are not in reality many different substances compounded together by us under the name of phlogisticated air. I therefore made an experiment

to determine whether the whole of a given quantity of the phlogisticated air of the atmosphere could be reduced to nitrous air or whether there was not a part of a different nature from the rest which would refuse to undergo that change."

He then proceeds to describe his experiment of removal of nitrogen by exploding with oxygen, from which he concludes that if there is any part of the dephlogisticated air of our atmosphere which differs from the rest, and cannot be reduced to nitrous air, we may safely conclude that it is not more than $\frac{1}{10}$ part of the whole. There the question was left for more than a century.

In August 1894, it was answered by the announcement by Lord Rayleigh and Sir William Ramsay of the discovery of a new constituent of the atmosphere, a gas having a density nearly half as large again as that of nitrogen, and distinguished from all their known gases by absolute chemical inertness, being, so far as at present known, incapable of entering into any form of chemical combination. The name *argon* was given to this gas in allusion to its chemical inactivity. At least one of the methods for the removal of nitrogen and isolation of the argon was that used by Cavendish, though with the advantage of modern appliances. Ramsay's attention was next drawn to the statement that certain minerals containing uranium evolve under the action of dilute sulphuric acid a gas which was supposed to be nitrogen. Ramsay intuitively expected that a more productive source of argon, and submitted some of the gas thus obtained to the 'Cavendish method' of sparking in admixture with oxygen. Very little contraction occurred after sparking and it was manifest that the amount of nitrogen was insignificant. Spectroscopic examination of the rarefied gas revealed that it is a mixture of hydrogen, argon and a new gas identified as *helium* which had been detached in the atmosphere of the sun and so

named by Sir N. Lockyer. The gas is chemically inert like argon, and is closely associated with it.

This remarkable discovery does not end here, for early in June 1898, Ramsay and Travers communicated to the Royal Society, an account of their examination of liquid air, in which they announced the discovery of a new constituent of air to which they gave the name *krypton* (hidden). Ten days later, in another paper, they described two other gases, named respectively *neon* (new) and *metargon* among the "companions of argon." But metargon was only a "shadow" and it had to depart as it was afterwards found to be a mixture containing carbon monoxide. Their method of isolation and detection consisted in liquifying a large amount of "impure argon" of the atmosphere and allowing the temperature to rise. The liquid evaporated away, the first portions contained the lightest and most volatile ingredients, and in the least volatile portions of the liquid was discovered, still another *xenon* (the stranger).

The five gases, thus isolated from the air, agree in the common characteristic of chemical inactivity, or inability to form compounds. Small quantities of hydrogen are also said to have been detected in the atmospheric air, so that our atmosphere, a simple element of the alchemists, is a mixture even more complex than had even been previously suspected. The new gases are supposed to be physiologically also inert; but within the last few years the discovery of radioactive matters in the air lays open the question whether such matter may not contribute to those therapeutic effects for which certain localities have a reputation,* just as the Radioactive Natural waters of Jura, Philippines, and Manila Bay.

Now that I have brought down the history of chemical knowledge of the atmospheric air to

* A study of the quantity of the radium emanation in the atmosphere at Freiburg, Switzerland, extending over several years, gave for the mean content 181, with a maximum of 305 and a minimum of 54 ($\times 10^{-16}$ curies per c.c.)

(e.g. nitrogen compounds) are products of vital metabolism, and many of those organic (carbon) compounds, which are products of the life of organisms, have been synthesised, independent of the vital force, in chemical laboratories. Exactly the same laws hold good in the case of carbon compounds as in the realm of inorganic or mineral chemistry. In view of the fact that the compounds of nitrogen are increasing so rapidly, it may be, before long, necessary to study them as a class apart, just as has been the case with carbon compounds.

In physics all definitions can be expressed quite independently of one another in terms of powers of the three fundamental units (centimetre, gram, and second), but in chemistry we have no approach to such a definition. Inorganic compounds may be broadly classified into acids, bases and salts, but it is difficult to give satisfactory definitions of these classes of compounds. Further, we cannot attempt to define one of these independent of the other two, that is, without implying or assuming the definitions of the other two.

Acids.—The earliest acids known were of vegetable origin, but until the middle of the 18th century scarcely any attempt was made to isolate them from the "sour" liquids in which they occur, or even to distinguish between various acids of similar origin. The most familiar of the vegetable acids was sour wine or *vinegar*, which was known to have a remarkable action upon soda. Its power of dissolving chalky materials is illustrated by the story of Cleopatra, and the pearls she dissolved and drank in a cup of vinegar, as well as Livy's exaggerated account of Hannibal's etching a passage over the chalky Alps for his army! *Distilled vinegar* was familiar to the alchemists from the time of Geber, and was frequently used as a solvent, but it was not till 1720 that its acid constituent, *acetic acid*, was isolated by Stahl.

The alchemists knew most of the mineral acids. Geber (800) describes the preparation of *aqua fortis* (nitric acid) and also of *aqua regia*, which

he obtained by dissolving *sal ammoniac* in *aqua fortis*. He also describes the oil of vitriol obtained by the distillation of alum. The Iatro-chemist, Valentine, first made *spiritus salis* (hydrochloric acid) and showed that *aqua regia* can be made by mixing this new *spiritus* with *aqua fortis*. Later Iatro-chemists, Libavius and Glauber, contributed much to an increased knowledge and more extended use of these acids by introducing improved methods of preparation. But as yet no attempt at the classification of bodies by their properties had been made, and the generic name *acid* had not arisen.

Boyle was the first to group together into one class—*acids*—all substances which have the properties: (1) sour taste, (2) great solvent action, (3) the power of precipitating sulphur from alkaline solutions of sulphur (alkaline per-sulphides), (4) reddening action on litmus, (5) the power of acting on wood ashes to produce substances devoid of the astringent solvent properties of acids and the soapy cleansing properties of solutions of wood ashes. Down to the time of Lavoisier, all substances possessing these properties were considered to contain a greater or less amount of a common constituent, the "primordial acid" or the "principle of acidity" associated with it. But, as we have seen, he thought that oxygen was the acid producer, and that therefore every acid owed its acidity to the oxygen which it necessarily contained. It must be noted that Lavoisier did not regard the elements of water, and therefore hydrogen, as necessary constituent of acids; his acids were our present anhydrides.

Up to the year 1787, all substances known to have the properties of acids, according to Boyle's criteria, were considered to be products of the interaction of water with the oxides of non-metals (acidic oxides). In that year, Berthollet, a great friend of Lavoisier, took up the investigation of Prussic acid (discovered some three or four years previously by Scheele who is credited with the preparation of a number of organic and inorganic acids), and came to the conclusion that it was entirely free from oxygen although it had true acid properties. In 1796, he came to the same conclusion for hydrogen sulphide or hydro-sulphuric

acid; but Lavoisier's reputation had more weight than Berthollet's facts.

Matters remained *in statu quo* until, in 1811, Davy clearly proved that hydrochloric acid is a compound of hydrogen and chlorine and that no oxygen could be detected in it. In 1813, Davy also proved that hydriodic acid contained hydrogen and iodine and no oxygen, and that iodic anhydride shows no acid properties until it is dissolved in water. Hence he added "acidity is not connected with the presence of one element oxygen." As a result of Davy's work, the acids came to be classified as *hydracids* (acids free from oxygen) and *oxyacids* (acids formed from acidic oxides.)

In 1815, Davy suggested the possibility, that hydrogen, not oxygen, gives the acid characters to the acids; but regarded the other elements combined with the hydrogen and not on the hydrogen alone responsible for the same. He did not, however, rush to the other extreme and say that all hydrogen compounds are necessarily acids.

Liebig came to the same conclusion as Davy, but went a step farther defining acids as compounds of hydrogen, which hydrogen is replaceable by metals.

The growth of our knowledge, since Davy's time, has not brought us a satisfactory expression of the definition of an acid in terms of its properties or composition. There is no one property which we can use as an absolute criterion. The properties of acids are perfectly conceivable but indefinable; we can enumerate the properties which we agree shall be connoted by the term *acid*, but that is all. The difficulty still remains; several bodies possessing some or may be all, of these properties are, for other reasons, not regarded as acids. For example alum is sour, corrosive, and colors litmus red; sodium bisulphate is sour, corrosive, colors litmus red and contains hydrogen which is replaceable by metals, yet, on account of the methods of their formation, they are not regarded as acids; silicic acid is yet acid although it has no action on blue litmus.

Let us depend on the composition of acids for a definition; there also we meet with equally great difficulties. All acids contain hydrogen but all

hydrogenized bodies are not acids. Evidently the hydrogen must be combined with other radicles and in a definite manner to produce acids. If we examine the 'other radicles' we are again in a maze. They are not non-metals (because ammonia and phosphene are not acids); nor are they groups of non-metals (because the radicles: Pt Cl_6 , Fe (Ox)_3 , MnO_4 , CrO_4 contain metals).

So we cannot define an inorganic acid in terms of its properties alone, nor in terms of its composition alone, nor in terms of both together; *composition, properties and synthetical history* must all be taken into account in deciding a body's claim to rank as an acid.

We can, of course, make a fair definition in terms of the ionic hypothesis, though not different from the above so far as practical applications are concerned, viz.: "All acids, when dissolved in water, furnish as the positive, hydrogen ions and hydrogen ions only." The properties of acids: sour taste, reddening blue litmus, etc., are independent of the negative ions but are due to hydrogen ions alone.

Acids are classified according to their (1) strengths and (2) their basicities. The first classification will be taken under chemical statics and dynamics. The latter classification is due to Liebig, who distinguished acids as mono-, di-, tri- and tetra-basic according as they possessed one, two, three, or four atoms of hydrogen per molecule replaceable by metals. In the ionic parlance, the basicity of an acid is fixed by the number of hydrogen ions furnished by the complete ionization of one molecule of the acid. It is not always true that the replaceable hydrogen atoms are co-equal in number with the total hydrogen atoms present in the molecule. Thus phosphorous acid is di-basic and hypo-phosphorous acid mono-basic, although each of these contains three atoms of hydrogen per molecule.

Bases.—Soda, known from the earliest times as a natural deposit on the shores of the soda-lakes of Egypt, was originally called "nitre," and it was employed as a cleansing agent and in the manufacture of glass. Its property is referred to in the Bible. "As he that taketh away a garment in

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bismuth nitrate $\text{Bi}(\text{OH})_3\text{NO}_3$, and basic mercuric sulphate Hg_2SO_4 ($\text{HgSO}_4 \cdot 2\text{HgO}$) are examples of this class.

As normal salts still retain acidic and basic functions, as seen above, enabling them now to combine with more base to form basic salts; now with more acid to form acidic salts; it may reasonably be asked if normal salts with residual acidic functions may not combine with normal salts possessed of residual basic functions. The compounds so formed are called *double salts* and *complex salts*, and are receiving a good deal of attention. Sodium sulphate (Na_2SO_4), exhibits residual basic property in its interaction with sulphuric acid (H_2SO_4) to form acid sodium sulphate. NaHSO_4 ($\frac{\text{Na}_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4}{2}$).

Zinc sulphate (ZnSO_4) exhibits residual acid property in its interaction with zinc hydroxide [$\text{Zn}(\text{OH})_2$] to form several basic sulphates $\text{ZnSO}_4 \cdot \text{ZnO}$; $\text{ZnSO}_4 \cdot 3\text{ZnO} \cdot 2$ or $10 \text{H}_2\text{O}$; $\text{ZnSO}_4 \cdot 5\text{ZnO} \cdot 10\text{H}_2\text{O}$; $\text{ZnSO}_4 \cdot 7\text{ZnO} \cdot 2\text{H}_2\text{O}$ (with the exception of the first, they are all crystalline bodies.)

Then it is no wonder that we have basic Na_2SO_4 and acidic ZnSO_4 forming the double sulphate $\text{Na}_2\text{SO}_4 \cdot \text{ZnSO}_4 \cdot 4\text{H}_2\text{O}$. (Vide Berzelius' explanation on the formation of alum *supra*.)

The double halides are an especially important class of bodies and much is to be hoped from their further investigations. Their formation and existence admit of a provisional explanation similar to that just employed in connexion with the double sulphates.

These double sulphates and halides are now classed under the ill-defined and artificial class of *molecular compounds* and they ought to remain in that empirical class until the present idea of *valency* is extended.

We have in a way classified the inorganic compounds, but the classification is quite imperfect. We have now a large and rapidly increasing number of little investigated binary bodies, such as selenides and tellurides, nitrides, phosphides, arsenides and antimonides, carbides, silicides and

borides; indifferent bodies like nitric oxide NO ; and several hydrides like SiH_4 , P_2H_4 . Most of the binary compounds of the first class are formed by direct union of the elements at high temperatures and are decomposed by water.

Though in several cases, the nitrides, phosphides, etc., may be considered as substituted ammonias, phosphines, etc., yet they cannot be regarded as salts of the latter because they are not acids with hydrogen atoms directly replaceable by equivalent quantities of other metals.

Inorganic chemistry has still to advance and one may cry with Hunter "Definitions and classifications are the most accursed of all things on the face of the earth."

T. S. NATARAJAN.

NOTICE.

TATA EDUCATION SCHEME.

Two studentships, enabling the recipients to proceed to Europe for the acquirement of special knowledge in any department of Science, Art or Engineering, or for fitting themselves to enter the higher branches of Government Service, are open for competition, by selection only, to graduates who have displayed marked ability throughout their University career. Though both the studentships, this year, are primarily available only for native of India, including Native Christian, will also be considered. Applications will be received not later than 31st May 1919, addressed to the Secretary of the Scheme, "Navaari Buildings," Fort, Bombay, with copies only of certificates as to the applicant's Age, Nationality, Character, Physical Fitness, and Educational Qualifications. No application unaccompanied by satisfactory evidence of guardians to the candidate's proceeding to Europe for the prosecution of his studies should also be annexed to the application, and a copy of his photograph enclosed. A copy of the terms and conditions of the Scheme will, if required, be forwarded to all duly qualified candidates.

Bombay, 14th April 1919.

THE KINDERGARTEN MOVEMENT.

THE Kindergarten movement with its religious ideas and scientific principles of education was a movement of protest against the educational institutions and ideals of the eighteenth century and all preceding times. The advent of the Kindergarten era synchronized with a revolution in the history of the world's education. Many educational theories which formerly commanded universal acceptance were weighed in the new kindergarten balance and found wanting, not the least important of which was the famous simile of Locke which likened the child's mind to a blank sheet of paper. One educational reformer after another was converted from a critic into an ardent admirer. It was inevitable that the kindergarten current should carry everything before it with the result that a complete and radical transformation was soon manifest in the educational outlook, and in the spirit and methods of teaching.

The genuine kindergarten movement—for in the hands of enthusiasts and worshippers it lost its reputation to a degree—was based on religious teachings. The ideas of evolution and development received recognition at its hands. In the place of Locke's simile it substituted Comenius' simile "of the seed that grows into shrub and tree according to the laws of its own nature and the kind and quality of soil and elements which feed it." Its characteristic features were a passionate love of childhood and a lofty pantheism. It proclaimed the "rights" of the child; it declared war on the school of "environment." Its watchword was what Dr. J. Stanley Hall styled as "Paiocentricism," that is, place the child in the forefront in all educational theory and practice. Its philosophy in the words of its immortal founder was as follows: "Nature is visible spirit, and spirit

invisible nature; that matter is only an appearance of which the reality is spirit and therefore cognate with the individual soul; that all nature lives and manifests its life in an infinite productivity, that all creation is one with itself and with its Creator, in that all is spiritual; that the individual spirit craves to find satisfaction in the apprehension of this essential unity."

The importance of the contribution of Froebel's kindergarten to the science of education lay in the fact that it for the first time defined education as an evolving or a drawing out of the powers of man. This was a new doctrine to proclaim much to the pleasant surprise of all educationists. The kindergarten sought to realise the aim of education by placing emphasis on self-education and bodily activity. The function of the teacher was to guide where he instructed before. He thus became a friend and comrade to the child. He came to the level of his pupil and adjusted his pace to his. This meant the introduction of the kindergarten soul into the body of the Elementary school curriculum. Ever since it followed what Socrates said in the "Republic," namely: "Now you know that in every enterprise the beginning is the main thing, especially in dealing with a young and tender nature. For at that time it is most plastic, and into it the stamp which it is desired to impress sinks deepest." And Mulcaster's advice that the kindergarten should employ the most competent and gifted teachers for early work was here and there given effect to, though Froebel's glorious day was not yet. "Let us live for children" would be long before it was understood and realised. The kindergarten movement of such a description has not yet visited India. That means India is still in the eighteenth century educational world with its misleading notions of education, exalted values of instruction and defective conceptions of school discipline,

to speak with an authoritative voice on behalf of all. My anxiety that such a body should be formed is not altogether an unselfish one. At present if I have to make any general proposals, the only way I can obtain any idea of the attitude of the profession as a whole is by consulting individual teachers and of course their opinions vary. Recently I was asked to consult leading Headmasters on a certain point. I consulted eight. Four held one opinion and four held exactly the opposite. If a corporate body had been in existence able to speak with an authoritative voice how much better it would have been. I should like to consider carefully the desirability of forming some such body as I have mentioned. This is the day of Trade Unions and from the old saying we can look upon ourselves as members of either a trade or a profession. A Union of this sort would improve our position from the trade point of view as well as help us professionally. With such a body we should be in a better position to answer our critics and I suppose the teaching profession is the most criticised of all professions. Every parent, or prospective parent, and that means practically every one, is interested in education and so considers himself competent to criticise us and our methods and the whole system of education. Some times, I dare say, we get annoyed at this. Some of you perhaps may do; I know that I do. Of course criticism that is not of the constructive sort has very little value—a thing that I have to bear in mind when I am inspecting schools—but I suppose some slight value does attach to the destructive criticism we suffer under. However, as things are, we have little chance of effectively answering our critics, and a Union of some sort would enable us to do that.

In an address of this kind, I suppose, I ought to make some reference to the educational activities of this Circle as far as Secondary Schools are concerned. As you know this Circle has been developing and becoming so unwieldy that it is shortly to be divided—a division which some of us feared would precede this Conference. There are now some sixty schools in the Circle. One more was recognised last month. That is exactly half as many again as when I came here two years ago. In addition, we shall shortly have some four more.

Four schools have been raised to be High Schools and two more will, I hope, soon be. There is proof that we have not stood still. However we have had our period of expansion and we must now consolidate. I do not mean that we must stand still, but I would offer a word of warning to those responsible for our recently opened Middle Schools. They must be brought to a proper state of efficiency and that can be only done by hearty co-operation between the staff and the managing body whether that be a private body or a Local Board. I need hardly add that there must also be co-operation between those responsible for the schools and the department. That goes without anything, and I honestly say I have no cause to complain as to the manner in which any suggestions of mine have been received. As far as I am concerned the co-operation between schools and the department is as good as it can be.

Another point to which I would draw your attention is that in spite of a very large number of schools opened last year by Government and put under the management of Local Boards and Municipalities, more than half the schools opened in this Circle have been opened from the contributions of the people themselves. I estimate that very nearly a lakh of rupees has been collected by the people themselves in the villages in which these schools are. And in addition there is a considerable number of schools in the process of recognition, which are not yet in a position to comply with departmental requirements. The fact that people are willing to raise money to this extent to provide money for Secondary education in comparatively small villages, and then to pay comparatively high fees, provided in my opinion the best answer to our critics who say that our system of education is entirely wrong and unsuited to the national temperament. It may be wrong, it may be unsuited to the national temperament, but at any rate, it appears to be the one, the people demand.

In discussing this question of the numbers of schools it is worth while bearing in mind that the number of scholars undergoing Secondary education in the country in proportion to the population compares very favourably with the average in Europe. The comparison however is not quite fair to Europe, at any rate as far as England is con-

cerned, as a boy can receive there in an Elementary School a very good education of a type that he cannot get here except in a Secondary School. However we can be sure of one thing, namely, that Secondary education is infinitely more advanced in this country than the Elementary. A meeting of Secondary School teachers, however, is hardly the place to consider whether we should develop Elementary education at the expense of Secondary. I fear the decision would be hardly unprejudiced.

In connection with the increase in the number of schools, I should like to draw attention to the increased facilities for the training of teachers. The Training College at Rajahmundry has now been opened for two years for the training of graduates, and there have also been two training classes at Nellore and Masulipatam, for training Secondary grade men.

I now wish to come to what is the most important part of what I wish to say, and in advance I wish to ask your pardon for any short-comings in the way I say it. I am going to give you some of my ideas on the pay and prospects in the teaching profession. First, I should like to say to the few present who are connected with the management of schools that they must not think that there is any enmity between the teachers and managers and I would ask them to bear in mind what I say and view it with sympathy afterwards. The teaching profession labours under the same disadvantage in this country as it does in England, and England is the only country of which I can speak with first hand knowledge. The disadvantage is this, that a teacher starts on comparatively high pay and has very little chance of rising very far, unless he becomes a headmaster, and not all can become headmasters. In my opinion it would be better for a teacher to start on a lower pay if he had a reasonable certainty of rising to a higher pay. The domestic burdens and responsibilities of a young graduate straight from college are light when compared to what they will be after 15 years' service. At the present time we may put down the minimum for a trained graduate at Rs. 80 and the maximum at Rs. 120 and that maximum is obtained in very few schools. A teacher frequently starts on a higher pay but rarely reaches a higher maximum. I am speaking

now of the ordinary trained graduates with a pass degree. The small difference however between the maximum and the minimum is not the only difficulty under which the teacher labours. The great disadvantage is that if after several years' work he has reached the maximum of his grade and he wished for any reason to leave the school, in which he is serving he has very little hope of being able to obtain a post on the same or higher pay in spite of experience, but he has to revert to his original pay at the start or very near it and then work his way up again. Again the Hindu teacher complains that there is no security of tenure in schools under Mission management, and that as soon as they can be replaced by a Christian teacher this course is adopted. Some of you here to-day have now served long and honourably in Mission schools and your position in them is secure, but in some cases there are grounds for the complaint. There is hardly, however, any way of remedying it, as you must realise that the Christian Mission Societies working in this country are not out here for their health, to use a colloquial expression, but have a very definite object in view. Besides it is, to say the least of it, difficult for a Christian to obtain employment in a non-Mission school.

I have, however, in my mind a scheme somewhat nebulous at present it is true, and which I should like to see worked out on practical lines by some one with more mathematical knowledge than I have myself. I will repeat again the premise with which I started the subject namely that a teacher would not object to starting on a comparatively low pay if he was certain of reaching a comparatively high pay at the end of his service. The figures I shall use are merely tentative and in using them I am only bearing in mind the trained graduates with a pass degree. Honours graduates or M. A.'s would be treated on a different scale. I would suggest that there be a fixed scale of pay starting at Rs. 75 per mensem and rising by annual increments of Rs. 5 to Rs. 175 per mensem. That would enable the teacher to draw the maximum after 20 years' service. This is I consider reasonable and he would of course have the same chance as he has now of becoming a headmaster on higher pay. And I might add in parenthesis that the average pay of headmasters would almost certainly rise in sympathy with the rise in

schools and scholars. The Government have also generously promised to help the aided schools by grants-in-aid towards the expense of the medical inspection.

"The first requisite to success in life is to be a good animal and to be a nation of good animals is the first condition to national prosperity." The ideal that should dominate all methods of instruction should be to develop the best type of manhood. Our aim should be to improve both bodily strength and mental ability. Knowledge is not of much value to the individual without the possession of a sound healthy body, which is the first requisite for the enjoyment of life. The brain is the organ of thought and a healthy brain can only exist in a sound healthy body.

School Hygiene deals with the application of the general principles of Hygiene and Physiology to the general circumstances of school life. It concerns itself with:—

1. The best arrangement of school buildings, ventilation, lighting, conservancy, cleaning, &c.
2. The provision of suitable seats, desks and other appliances for teaching.
3. The school programme of work.
4. The effects of excessive or misdirected work on health.
5. The value of physical exercise.
6. The period of rest and sleep.
7. Discipline.
8. Medical inspection of the school and the pupils.
9. The prevention of the spread of infectious and contagious diseases and in the case of boarding schools and hostels the questions of lodging, feeding, clothing, provision for sickness, &c.

Unless the bodies as well as the minds of the pupils be attended to, the pupils will tend (as they grow) to swell the ranks of the unemployed and the unemployable. Physical training cannot be undertaken without the preliminary medical examination, because the exercise sufficient to develop one child, might be too little for another,

and far too great for a third—so great indeed to bring about irreparable mischief.

Many children attending the public schools are suffering from preventable and remediable diseases. The defects are unrecognised by teachers and parents.

Even the most superficial examination at school undoubtedly tends to prevent much actual ill health owing to the resultant discovery in its early stages of many diseases which might ultimately become serious.

A number of healthy children are injured in health by bad buildings, unsatisfactory discipline, faulty curriculum, or by exposure to infection.

Many pupils are retarded in their educational progress by physical defects, such as, anaemia, general debility, defects of vision, deafness resulting from adenoid growths or discharging ears, &c.

Defective vision accounts for backwardness in some cases, while defective hearing and adenoid growths account for the backwardness in other cases. Slight defects of vision or of hearing might, to some extent, impair a child's mental alertness, and they are sufficient to retard educational progress.

The child may be afflicted with defective eyesight or with astigmatism and no one may realise the seriousness of the defects. In case of astigmatism and hypermetropia, neglect is particularly common. An astigmatic child frequently appears to have normal vision and can generally pass an ordinary test of visual acuity. But he suffers from head-ache and aching or watering eyes with inflammation of the eyelids. These symptoms result from the unnatural strain to which the eye muscles are subjected in order to secure adequate vision. Such a child requires careful attention at the hands of an oculist. Even definite shortness of sight may pass unrecognised for many years. At school the child might have said that he was unable to see the blackboard and might have been allowed to sit in front. The inability to see properly may

be wrongly ascribed to carelessness or to stupidity. In the case of many children slight defects of sight and hearing may pass unrecognised until too late. Although not sufficient to impair their usefulness as citizens, such defects affect their chances and opportunities in later life, entailing, as they do, diminished alertness and power of observation. Again, a languid, drowsy condition of the child, often due to anaemia, may be an expression of general debility and malnutrition, circulatory changes at puberty, rheumatism, or tuberculosis. Each of these conditions should receive careful consideration with a view to proper modification in the routine of school life.

Head-aches are frequently undetected or ignored. They require special investigation by the school doctor. They may be the first signs of acute infectious diseases or may be due to temporary conditions, such as, overwork, want of adequate ventilation, some defect of vision, dyspepsia, nervous disorder, anaemia, malnutrition, decaying teeth, nasal obstruction by adenoids or mental fatigue.

Ill-nourished and weakly children often suffer from inflammation of their eyes, a condition which calls for careful attention from the first. Neglect may lead to an extension of the process of inflammation and corneal ulcers and opacities. Sore eyes, if neglected, may lead to serious injury. Discharging ears, often found after measles, if neglected, may lead to an extension of the disease to the cranial cavity and even loss of life.

Each pupil should undergo a careful individual examination by a school doctor. The teachers cannot be expected to make a satisfactory examination. A gradual and slight deafness and severe unilateral deafness may entirely be overlooked. Chronic discharge may also be missed. In some of the cases there may be little to direct the attention in the way of deafness or profuse loss of the discharge. It is dangerous for

children with perforation of the drum to bathe in the river or the sea. The discharge from the ear may contaminate the water and form a source of danger to other bathers. And the passage of the cold dirty water through the perforation into the middle ear may cause dangerous inflammation of the middle ear or giddiness and death from drowning. Many cases of chronic suppuration of the middle ear may heal, leaving a perforation in the tympanic membrane. In such cases it is possible for the hearing to be very fair or practically normal. These cases would certainly escape detection if a careful examination is not made.

Impairment of hearing is a symptom of disease. The chief causes are adenoids, middle ear suppuration and wax.

Adenoids or the enlargement of tonsils at the back of the nose besides causing deafness may produce repeated ear-aches, inflammation of the middle ear, which is always a menace to life, mouth breathing and a pre-disposition towards infectious diseases especially tuberculosis. The general growth may be hindered and the mental powers may become dull.

Diseases of the ear, nose and throat, in childhood, may cause deafness. As a large proportion of these diseases have their origin at this period of life when they are amenable to treatment, the recognition and treatment of them, as early as possible, is of the utmost importance to the individual.

Medical help is necessary (1) in scrutinising plans of school buildings, (2) in the medical examination of pupils on admission, (3) in watching for defects of growth, effects of mental or physical overstrain and the first signs of any disease, (4) in looking after general sanitation, &c., (5) in diagnosing and preventing the spread of infectious and contagious diseases.

The object of the routine medical examination is the removal, as far as possible, of all conditions which act as obstructions to mental and physical growth.

made by the Royal Geographical Society of London in 1885. The first step was the commission of Dr. Scott Keltie, Secretary of the R. G. S. to the Continent of Europe. His report greatly stimulated the agitation for the introduction of Geography in the British Universities. Soon after, Readerships were appointed in both Oxford and Cambridge Universities. Of these two, the Oxford School of Geography holds the first rank. The first Reader at Oxford was Mr. H. J. Mackinder who had specialised in both Science and History. He was succeeded by the late Dr. A. J. Herbertson who later became Professor of Geography. The school has now so much grown that there are 5 full-time and 3 part-time teachers in it.

The instruction consists of lectures, tutorial, seminar, and practical work in the laboratory and in the field. The recognition given to the successful student is a University Diploma in Geography conferred after two examinations. He may take it in one year or in two or more years. There are ten subjects for the Diploma of which two are compulsory and any two of the remaining eight must also be taken. The two compulsory subjects are—(1) General and Regional Geography; (2) Geographical description of a selected district.

Two more subjects are to be taken out of the following eight:—

1. Special Regional Geography (prescribed annually).
2. Climatology and Oceanography.
3. Geomorphology.
4. Biological Geography.
5. Economic and Political Geography.
6. Ancient Historical Geography.
7. Modern Historical Geography.
8. The History of Geography including the history of discovery. Research degrees (B. Sc. and B. Litt), may be obtained by submitting a geographical thesis. Geography is also one of the subjects for the Pass B.A. and for the I.C.S. Examination. It is also required for the Final

Honours Schools of Modern History, and for the Diplomas in Anthropology and Economics.

At Cambridge, a University Diploma in Geography is conferred on conditions similar to those at Oxford but without the exaction of any geographical thesis or essay.

Geography is also recognised in the other Universities of Britain—London, Manchester, Sheffield, Birmingham, Wales, and the Scottish Universities. London had recognised the subject even before it was made a teaching University under the Act of 1898. There are now four recognised teachers of Geography in the University, two of whom belong to the School of Economics. Geography is one of the qualifying subjects for the Degree of B.Sc. in Economics and that of the M.A. Degree. In 1912 the University of London conferred the first D.Sc. Degree in Geography for a thesis on the 'Climatic limits of wheat cultivation.'

Each of the other Universities mentioned above has a Lecturer in Geography, and Geography is recognised as a subject for the Degree both in Arts and in Commerce.

It will be seen that the subject has been rapidly obtaining recognition in the British Universities not merely by its being more generally adopted as a University subject but also by securing for itself greater respect in the Universities into which it has been introduced. I have no time to speak in detail of the position of Geography in the Universities of Europe and elsewhere. In Europe, Geography had secured a position in the Universities long before it was thought of in Britain.

It is therefore high time that a beginning is made in the University of Madras by the appointment of a Reader, and by instituting a Diploma in Geography.

The three following resolutions were submitted to the Conference and their importance briefly explained. After some discussion they were unanimously passed:—

1. In view of the highly educative value of Geography, this Conference requests the University of Madras to institute a Diploma in Geography and to give the teachers in secondary schools special facilities for getting through the course.

2. This Conference is of opinion that the higher study of Geography should be given a place among the optional subjects in the Intermediate and B.A. Pass courses of the University, and that the study of Economic Geography be made compulsory in the case of students studying History and Economics.

3. This Conference is of opinion that the time has arrived for the appointment of a Reader in Geography in the University of Madras.

SALARIES OF TEACHERS.*

The Committee have to state at the outset that the grants given by Government for Secondary Education have not been on a sufficient scale and the system of allocation of grants has not been elastic enough to suit the needs of the different classes of schools. The salaries of teachers at present are utterly inadequate. The present scale of salaries must be modified on a more liberal basis and it cannot be provided for, unless the Government set apart large sums as grants, earmarked for the improvement of teachers' salaries and a considerable change is made in the principle on which the distribution of grants is based.

The scale of salaries now suggested is based on the economic enquiry conducted last year by the South India Teachers' Union. The minimum salary for each grade is fixed at an amount, that is slightly higher than the average salary that the teacher of the grade is now drawing. The initial salary of a teacher of the L. T. grade alone is fixed at the average salary he is now drawing: the reason for this is that the starting salary of an

*Report of a Committee of the South India Teachers' Union.

L. T. has of late gone up far brisker than the starting salary of teachers of other grades.

In drawing up a scale, the Committee feel that the scale should be so constructed that the salary of a teacher is adequate and suited to each stage of his career. A scale which is short and which leads to an early maximum is undesirable since an early reach to the maximum may not conduce to the increased efficiency of a teacher on account of the few chances of promotion. On the other hand, a long scale leading to a maximum very late in life, is also undesirable in that at a time when the teacher has the greatest responsibilities to bear, the salary he gets is inadequate. Hence the Committee are of opinion that a scale with small annual increments for the first few years of service, then with larger increments leading to a decent salary, is the best from all points of view.

The Committee are of opinion that the increments should be annual and automatic, provided reasonable conditions of service are satisfied. It is also felt that the size of the school should not be a reason for introducing differences in the salaries paid to teachers.

The Committee are further of opinion that there is no necessity for constructing special scales for teachers doing special service. All special service, e.g., that of a First Assistant, Special Assistant, Superintendent of Games, etc., ought to be remunerated by special allowances forming a part of the salaries of teachers. The Committee agree with the Chittoor District Teachers' Guild that a teacher of an institution on his being appointed Headmaster might continue to be in the same grade, but draw a special decent allowance for his work as Headmaster, the amount of allowance depending on the size and grade of the school. This is preferable to fixing a separate scale for Headmasters, for we avoid drawing up a number of scales, e.g. those for Headmasters of Secondary Schools having the III Form as their highest class, the incomplete High School, High Schools large and High Schools small. In the schemes