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A PREPARATORY ALGEBRA

Prepared in accordance with the syllabus in Optical Mathematics
(C. Group) for the Indian S. S. L. C. Paper Examination

By V. RAGHUNATHA AYYAR, B.A., L.
Inspector of Schools

Deputy Inspector of Schools, Tirukurungudi Range (Tinnevely Dt.);
Author of A Course of General Mathematics

D, Crown 16mo. 600 pages with 49 diagrams. Price: Rs. 2.

OPINION.

RAO BAHADUR P. V. SESHU AIYAR, B.A., L.L.B., Retired Principal, Govt. College, Kumbakonam writes:—"I am glad to find that "A Preparatory Algebra" by Mr. V. Raguunatha Aiyar, B.A., L.T. (published by Srinivasa Varadachari & Co.) is well planned and written very carefully so as to meet the requirements of pupils in the S. S. L. C. classes for whom it is mainly intended. The expositions and illustrations are clear and lucid and there is a good collection of nice examples and exercises. The appendices A and B are really well-written and add much to the usefulness of the book. * * * I hope the book will meet with the encouragement it well deserves."

CONTENTS.

1. The Use of Symbols:—The use of symbols as mathematical shorthand. Some additional symbols in common use. The Formula, now derived and used. Exercises; **II. Some Fundamental Laws:**—Addition and Subtraction. Removal of Brackets. Insertion of Brackets. Multiplication and Division. The Laws of Indices. Order of Operations. Exercises; **III. Symbolic Solution of Problems:**—The extended application of the Formula. The Laws of Equality. Reversibility of Steps. Verifying the correctness of results by substitution. The Solution of Problems by means of equations derived from them. Exercises; **IV. Graphical Representation:** Variables and Constants. Dependence of one variable upon another. Graphical Representation. Representation of values by marking points. The Graph, Readings from the Graph. Limitations of the Graph. A few points to be observed in graphical representation. Magnifying portions of a Graph. Exercises; **V. Directed Numbers:** Directed numbers, their meaning and diagrammatic representation. Extended application of Directed Numbers. The New Number-Scale and its Study. The four fundamental operations applied to Directed Numbers—Addition, Subtraction, The Laws of Addition and Subtraction, Multiplication, Division. Some Laws of Multiplication and Division. Application of the Laws of Equality to operations involving Directed Numbers. Algebraic Form. Exercises; **VI. Algebraic Expressions and a few Elementary Processes:**—Distinguishing expressions from terms. Polynomials. Brackets. Exercises. Long Multiplication. Exercises. Long Division. Exercises; **VII. Special Products. VIII. Factors and Multiples:**—The Use of Factors. Factorising expressions of the form $Nx + N$ and $x^2 + 2xy + y^2$ and $x^2 - 2xy + y^2$. Exercises. Factorising expressions of the form $Nx^2 + Nx + N$. Exercises. Factorising expressions of the type $x^2 + px + q$. Exercises. Alternate method of factorising $x^2 + px + q$. Exercises. Factorising expressions of the type $Ax^2 + Bx + C$. Exercises. Highest Common Factor. Exercises. Lowest Common Multiple. Exercises; **IX. Fractions:**—The Algebraic Fraction. The Principles of Equivalent Fractions. Addition and Subtraction of Fractions. Multiplication of Fractions. Division of Fractions. Simplification of Fractions. Complex Fractions. A Continued Fraction. Exercises. **X. Graphs:**—Function of a Variable. Plotting. Exercises. The Straight line Graph. Reading from the Graph. Study of Variation from the Graph. Graph as a Reckoner. Graph as a locus. Choice of Scales to be adopted. Exercises. Graphical Interpretation of the Constants m and c in the Linear Relation $y = mx + c$. Graphical method of determining the Constants in a Linear Law. Exercises. Parabolic Graphs. The Shape of the Graph. Symmetric Properties. Study of Variation from the Graph. Graph as a Ready-Reckoner. Note on the Choice of Scale. 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(d) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (e) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (f) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (g) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (h) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (i) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (j) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (k) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (l) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (m) *The Method of Detectors*—Notation of a Homogeneous Function. 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(w) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (x) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (y) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. (z) *The Method of Detectors*—Notation of a Homogeneous Function. Properties, Applications, Exercises. **Appendix B. Miscellaneous Examples. Answers. Madras C. S. L. U. Examination Question Paper.**

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ஆரம்ப கணிதம்
(முதல் பாகம்.)

(சென்னை வித்யா இலாகா அதிகாரிகளால் தொகுக்கப்பட்ட விலபஸுக்கிணத்தியாசனம்) 50
இஃது கும்பகோணம் கவர்ன்மெண்டு காலேஜ் பிரதம ஆசிரியராயிருந்த அம்மையாசனம் P. V. சேலம்
அய்யர், B.A., L.T. அவர்களாலும், சென்னை பச்சையப்பன் கலாசாலை இயற்புக்கல் துறையின்
V. வெங்கடசுப்பையா, B.A., L.T. அவர்களாலும் ஆங்கிலத்தினை இயற்றப்பெற்ற
Elementary Mathematics, Part I இன் மொழி பெயர்ப்பு.

மொழி பெயர்ப்பாசிரியர் :

சேலம் முனிசிபல் காலேஜ் கணித போதகாசிரியர், S. சிவராமன், B.A., L.T.

முதல் பாகம் 5-வது வகுப்புக்கும் 1-வது பாரதிற்றும், கிரேன் 300 பக்கங்கள், விலை அணை 14.

சைதாப்பேட்டை டீசர்ஸ் காலேஜ் கணிதபோதகாசிரியர் S. பாலகிருஷ்ண அய்யர், B.A., L.T.,
அவர்களுடைய முன்னுரையுடன் கூடியது.

பொருளடக்கம்.

I. எண்மையின் எண் குறிப்பீடு :— எண்கள் : இலக்கங்களில் எண்களைக் குறித்தல் ; எண்களின்
சுய மதிப்பும் ஸ்தான மதிப்பும் : ரோமன் வழி. II. கோடுகளும் புள்ளிகளும் நீள அளவையும் :— கீழ்ப் : ஸர்
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குறித்தலும் கோடுகள் குறித்தலும் ; நீள அளவு ; மைவடங்களின் உபயோகம் : எண்களை நீளத்தால் குறித்தல்.
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தால் காண்பித்தல் ; அடைப்புக் குறிகள் ; கூட்டல் : பெரிய கணக்குகள் ; கழித்தல் ; கழித்தலைப் படத்தால்
காட்டுதல் ; பலவகை கழித்தல் வழிகள் ; கூட்டல் கழித்தலைப்பற்றின சில விதங்கள் ; கலப்புக் கூட்டலும் கழித்
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களால் பெருக்கல் ; எந்த எண்களைக் கொண்டும் பெருக்கல் ; பெருக்கலில் குறுக்கு வழிகள். V. வகுத்தல் :—
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வைகளால் வகுத்தல் ; நீள வகுத்தல் ; வகுத்தலின் இன்னொரு அர்த்தம் ; சில பெருக்கல் வகுத்தல் விதிகள் ;
பெருக்கல் வகுத்தலில் சில குறுக்கு வழிகள் ; ஒன்பதுகளை நீக்குதல். VI. பலவன் வெண்கள் :— அளவை
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கோணம், கோணங்களை ஒப்பிட்டுப் பார்த்தல் ; கோணம் ; சதுரங்களும் ரெக்டாங்கிள்களும் ; வட்டங்கள் ;
கோணங்களின் அளவு ; கோணங்களின் வகைகள் ; ப்ரொட்டாக்டரைக் கொண்டு கோணங்கள் வரைதல் ; ஒரு
புள்ளியிலுள்ள உள்ள கோணங்கள். VIII. டெஸிமல்கள் :— டெஸிமல்களின் அர்த்தம் ; டெஸிமல் குறிப்
பில் ஸ்தான மதிப்பு ; இரண்டாவது டெஸிமல் ஸ்தானம் ; டெஸிமல் குறிப்பு பொது விவரம் ; ஒரு டெஸிமல்
ஸ்தானமுள்ள எண்கள் ; டெஸிமல் கூட்டல் ; டெஸிமல் கழித்தல் ; எந்த எண்களையும் கழித்தல் ; 10, 100
முதலியவைகளால் பெருக்கல் ; ஒரு ஸ்தானமுள்ள முழு எண்ணால் பெருக்கல் ; ஒரு ஸ்தானமுள்ள முழு எண்
னால் வகுத்தல் ; பல ஸ்தான முழு எண்களால் பெருக்கல் ; பல ஸ்தான முழு எண்களால் வகுத்தல்.
IX. உயர்ந்த பெருக்கல் அளவும் தாழ்ந்த பொது மடங்கும் :— அளவும் மடங்கும் ; பொது அளவும் மடங்கும் ;
உயர்ந்த பொது அளவும் தாழ்ந்த பொது மடங்கும் ; பாக்டர்களால் இரண்டு அல்லது இரண்டிற்கு மேற்பட்ட
எண்களின் உ.பொ.அ. உம், தா.பொ.ம. உம் கண்டுபிடிக்கும் வழி ; உ.பொ. அளவைக் கண்டுபிடிக்கும்
பொது வழியைப் படத்தால் காட்டல் ; உ.பொ.அ. பொது வழி. X. சாதாரண பின்னங்கள் :— பலவன்
அளவுகளின் பின்னங்கள் ; ஒரு காண்கீட் அளவை இன்னொரு காண்கீட் அளவின் பின்னமாகச் சொல்லுதல் ;
சமமான பின்னங்கள் ; சமமான பின்னங்களைப் படத்தால் காட்டுதல் ; பின்னங்களின் சமத்துவம் ; தாழ்ந்த
உறுப்புகள் ; பின்னங்களை ஒப்பிடுதல் ; பின்னங்களின் கூட்டலும் கழித்தலும் ; ஒரு சாதாரண பின்னத்தை
ஒரு முழு எண்ணால் பெருக்கல் ; சாதாரண பின்னத்தை ஒரு முழு எண்ணால் வகுத்தல் ; ஒரு பின்னத்தால்
பெருக்கல் ; பின்னத்தின் பின்னம் ; ஒரு பின்னத்தால் வகுத்தல் ; ஒரு எண்ணை ஒரு குறிப்பிட்ட அளவாக
பு. உள்படி மாற்றல் ; பின்னங்களைச் சுருக்கல். IX. வாடிக்கை முறை :— பலமாதிர்க் கணக்குகள்.
பீட்டைக் கேள்விகள். விடைகள்.

PART II for FORM II—Shortly.

PART III for FORM III—in June next.

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FOR the fifth and last time I address you in Convocation. If, as Aristotle tells us, it is difficult to say a second time what one has in essence said before, how can I hope to speak in this Hall for a fifth time without wearying you by repetition or traversing familiar ground? I am encouraged, however, by the knowledge that though the scene is the same as that in which I first spoke in 1923, my audience is a different one. The present Vice-Chancellor is the fourth, with whom I have been privileged to work, and though there are some professors and heads of colleges who have been present at the last four Convocations, the bulk of my audience—the students—come fresh to the scene every year. And since it is for them rather than

for their teachers and professors that this ceremony is held, I may without any apology repeat to this year's recipients of degrees the words of encouragement that I have addressed to their predecessors.

In the first place, Ladies and Gentlemen, let me congratulate you on having successfully passed the examination which has enabled you to receive at the hands of the Vice-Chancellor the certificates which testify to your academic success. Four or six years ago you passed through the entrance gate into the University. To-day you are passing through another gate which is at once the gate of exit from the University and the gate of entrance into life. I wish you all happiness and prosperity in the wider world that lies before you. Tests and competitions of one kind or another will await you even there, for, as Browning had reminded us: "All to the very end is trial in life." So you will find, as

* Delivered by His Excellency the Chancellor at the Senate House, February 19, 1927.

doubtless some of you have found already, that life is one long series of examinations different from those to which you have been accustomed and testing other qualities than those which can be made the subject of paper examinations. I hope that in all these you may meet with the same success which you have achieved so far.

When I recall my own school and college days I am ashamed to confess that very few of the words of advice that were addressed to me by older men of wisdom and experience have remained in my memory. But there was one sermon spoken from the pulpit in my college chapel which set my imagination on fire as I listened to it and which I shall never forget. The preacher on that occasion reminded us of the impressive pageant of Empire which we had recently witnessed in London on the occasion of Queen Victoria's second Jubilee. He described in eloquent terms the representative character of that pageant, he enumerated the many lands, races and peoples who composed the dominions of the great Queen and who had sent their most distinguished men to do her honour; he spoke of the vast responsibilities which the administration of such an Empire entailed, of the qualities of statesmanship required to maintain harmony and unity among its component parts. "And where," he asked in conclusion, "are we to look for the men who will carry on this work, shoulder these responsibilities and maintain unimpaired the great traditions of the past?" Then he thrilled us all with these words: "If they are to be found anywhere they must be found here. They are among those whom I see before me."

So as I gaze upon this gathering of young men and women who are standing upon the

threshold of life, I feel that here, if anywhere, are to be found those of whom India will have need in the years to come. What, then, can I say to you in order to prepare you for this high destiny? There was an old Philosopher once who, when asked by his friends on his death-bed if he had anything to regret, replied, "I have only one regret that in my life I did not praise men more."

I must confess that I have never derived much benefit from those preachers who addressed their congregations as the inheritors of every sin and doomed to perdition, unless they could be saved by a special measure of divine mercy, but I have been much helped and encouraged by those who honoured me with their good opinion. It is as one who believes in you, who expects much of you, that I speak. Emerson says that it is only a friend who can make us be what we can—with a friend "we are easily great, there is a sublime attraction in him to whatever virtue is in us."

It is as a friend then in this sense, as one who pays you the compliment of expecting from you all the virtues, that I would address you to-day, and my only message to you is to remind you of the great possibilities which lie before you, the great things which it is in your power to accomplish—India has a very ancient civilization behind her, but she has also a great future before her. In the modern world she is only just beginning to wake out of long sleep. She has been the cradle of many races but as a nation among nations she has still herself to make and her place to assert. In Industry, in Commerce, in Science, in Literature, in Arts, in Politics, she needs more than ever before men and women with trained minds and upright characters—and the need for women is perhaps even greater

than that for men. India needs you for her service and she expects that already in your college days you shall have acquired some of the qualities which will fit you for that service. Some of you have just received degrees of Master and Bachelor in Law, some in Medicine, some in Arts and all of you have, therefore, begun to qualify for that last degree of all—the degree of Master of Life. I would ask you to believe that in all these matters in which you have specialized it is not the forms you make use of but the spirit in which you use them, the principles rather than the methods you adopt, which will secure for you that last degree. It is not the drugs which you dispense but the extent to which the pursuit of health is your goal that will enable you to bring credit to India as a doctor. It is not the composition of the courts or the forms of law which you practise but the extent to which justice is your aim that will enable you as a lawyer to set your country high in the estimation of the world. India will not thank you for changing the forms of her government and institutions unless thereby you can bring more health, more happiness, more prosperity to her people.

When you come to the end of life you will look back upon your college days and judge them by the rapidity or otherwise with which they brought you to that realization, which Emerson tells us, comes some time in every man's education, "that envy is ignorance; that imitation is suicide; that he must take himself for better, for worse, as his portion; that though the wide universe is full of good, no kernel of nourishing corn can come to him but through his toil bestowed on that plot of ground which is given to him to till." You will each of you have your plot to till in preparing for the harvest of the future, your

part to play in building up the fabric of Indian nationhood. In this work two qualities will be required of you—sincerity and tolerance—to trust yourselves and to trust others. "Trust thyself; every heart vibrates to that iron string. Great men have always done so, and confided themselves child-like to the genius of their age, betraying their perception that the absolutely trustworthy was seated at their heart, working through their hands, predominating in all their being. And we are now men and must accept in the highest mind the same transcendent destiny; as guides, redeemers and benefactors, obeying the Almighty Effort and advancing on Chaos and the Dark." Could any words more fittingly describe the work which awaits the generation which in India to-day is just beginning its life work? When I think of all the problems, insoluble except to the eye of faith, of all the difficulties that have to be overcome, of all the diversities that have to be reconciled, I realize how great is the need for a generation rich in individuality, sincere in purpose, courageous in action.

For individual achievement these qualities may suffice, but if you are to be nation-builders there is another which is equally essential, indeed without which all other qualities are useless. That is tolerance, trust in others equal to the trust in yourself, the willingness to concede to all men the liberty you would yourself enjoy, that power to associate with others for a common good which the Vice-Chancellor has spoken of.

However shapely and well-proportioned a brick may be, however perfect the quality of stone marble, they are useless as building material unless they possess the power to coalesce. The brick that insists on remaining

a brick is useless except for the destructive purpose of being used as a missile. What India needs is not dynamite but cement, not brickbats but walls, men and women who will live for her rather than die for her. It is easy enough to die for a cause but to live for it is harder. To remain true to a cause throughout a life-time, to grow wiser and stronger in its service, to work for it always on the condition that no other is injured thereby—that is a task which will test a man to the utmost.

To such a task I hope you are prepared to devote yourselves and in the accomplishment of it to unite with all who share your ideals, regardless of the barriers of caste or creed.

Gentlemen, I have valued my association with your University during the five years in which it has been my privilege to be your Chancellor. I have sought to serve it. I hope that within the narrow limits which circumstances financial and political permitted I have served it. The Vice-Chancellor has encouraged me to believe that some of the acts of my government during the last five years are recognized as having been beneficial. The stabilization of the Post-Graduate Department and the revision of the Matriculation Regulations by which the Vernacular will be made a medium of instruction and examination are at least I hope solid achievements free from any element of controversy. The establishment of a Board of Secondary Education—a more debatable subject—has not yet been accomplished. We have, however, had several Conferences which have narrowed the issues and brought the Government and the University nearer together. I am hopeful that this question is now ripe for settlement

by agreement and though I may not see it accomplished, I can, I think, regard it when it comes as a legacy of my period of office as Chancellor.

That it has not been given to me to see the achievement of those reforms which the University Commission considered essential will be to me in retirement a source of keen regret. It is sad to think that other Universities have derived more benefit from the labours of that Commission than this one with whose welfare they were exclusively occupied. Many of the weaknesses which they deplored remain unremedied, young lives are still cheated of their highest aspirations by inadequate teaching, the constitution of the University remains unreformed. But I leave you in hope rather than in despair, for, if during my term opinion has not been able to crystallize into action, if the forces opposing change have succeeded in checking not only radical reform but even minor change, yet opinion in favour of reform has, I think, been growing and will before long express itself in an insistent demand for action. For Bengal knows that change in the present constitution of the University is essential, though there is not yet agreement as to the exact nature of the change desired. This University claims the sentiment and devotion of Bengal in a way which no other institution in the Province can hope to emulate, and the public, which can now through their Minister control educational policy will, I am convinced, not tolerate obstruction to reform, for with their pride in the intellectual capacity of the Province, they will not rest satisfied with anything but the best, nor will they allow reform to prejudice the permanent interests of the University. Changes will come and I shall watch them from afar with interest and with sympathy. And so I say farewell in hope and expectancy, confident that the harvest for which I have worked will be brought to maturity before many years have passed and that Bengal, which I have tried to serve will not rest, as I have never rested, until the grain glows golden and ripe for the harvester. —*The Calcutta Review*: April, 1927.

RIGOUR OR ACCURACY IN MATHEMATICAL TEACHING*

By

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THE heading of the topic for discussion is given by me as Rigour (or Accuracy) in Mathematical Teaching. I should have used only the word rigour, but it unnecessarily frightens people and accuracy does not connote all that I want. What I mean is that we should be exact and accurate in imparting the fundamental notions of Mathematics, such as Limits, Continuity, etc., so that the students do not carry with them any wrong notions of things which they may have to unlearn as they go up to higher studies. Then it may be asked whether we are not imparting now correct notions of things; I am afraid I have to say No, as judged (1) from the language used in the Examination papers, (2) from the exchange of ideas I had with some lecturers, and (3) from the text-books used by them.

Taking the Examination papers first, here we have not to depend upon reports and guesses. There are the printed papers. Here are some examples of questions. "Show that $\sum U_n$ is convergent or divergent according as $\frac{U_n}{U_{n+1}} > 1$." This appeared in the Madras University September 1925 paper for the B.A. degree. Anybody who is acquainted with the subject knows that the wording should be that $\lim_{n \rightarrow \infty} \left(\frac{U_n}{U_{n+1}} \right) > 1$. Here one may say that it is a mere slip. I am not inclined to think so.

* A paper read before the Mathematical Conference held at Bangalore in April 1926.

The Examiner has been careless and when such people happen to teach, they are likely to be even more indifferent as regards accuracy. Again here is another question:

Find the value of $\frac{x^n - a^n}{x - a}$ when $x = a$. To

be accurate $\frac{x^n - a^n}{x - a}$ is not defined for the value

$x = a$, and hence the question is meaningless. Here again one may say that it is only a looseness of language. Yes! But looseness in language leads to loose thinking and indefinite ideas. Also loose thinking results in loose language. It is such loose language and bad notation that is responsible for so much of inaccurate and incorrect notions. Another question was: Evaluate

$$\frac{\left(1 - \frac{1}{n}\right) \left(1 - \frac{2}{n}\right) \dots \left(1 - \frac{r}{n}\right)}{Lr}$$

when n is infinite and r finite. Here again I should certainly object to the expression "when n is infinite." Because to a modern mathematician "to make n infinite" is meaningless.

Nextly coming to the lecturers in colleges, I am sorry to have to remark that the generality of them, though there are very many honourable exceptions, are not, in some cases, sufficiently well acquainted with the modern work in the foundations of Mathematics and the others are loath to effect a departure in the teaching of Mathematics so as to impart clear and correct notions to their students.

One lecturer in Mathematics in a first-grade college, when I expressed to him that I could not find a suitable text-book in Algebra for the B.A. students which contains correct and accurate ideas on Limits and Infinite Series, at once told me that the Tutorial Algebra by Briggs and Bryan was a very satisfactory

book from that standpoint and that he was himself using it as a text-book in his college. I told him that the old edition of Briggs and Bryan was not satisfactory from my standpoint and asked him if there was a new edition giving correct notions of these things. He said that the new edition has been well revised and re-written and assured me that I would find it to be very satisfactory. I at once got the new edition and looked into it and to my surprise I found it to be not satisfactory. I shall presently give you some instances of mistakes in that book. When I wrote to him that the book did not come up to my standard, he wrote back to say that it was rigorous enough for B. A. students, as though there was one standard of accuracy for one set of students and another standard for another set.

A second lecturer, when I asked him as to what book he was using for Algebra, said he was using C. Smith's book and when I questioned him as to whether he found it to be satisfactory, told me that for rigorous treatment of some of the topics he was following Chrystal and when I told him there were inaccuracies even in Chrystal, he could not believe me; he was one of those who thought that Chrystal has said the last word so far as Algebra was concerned.

Another lecturer in a first-grade college which is having Davison's Algebra as the text plainly admitted that he was not well-acquainted with the Modern Rigorous Treatment of Limits, Infinite Series, etc., and suggested that I would do well to write a small pamphlet on these topics and circulate it amongst the lecturers in colleges.

Next I proceed to point out the inaccuracies found in some of these text-books mentioned

above, *viz.*, Smith's Algebra, Tutorial Algebra, and Chrystal's Algebra.

First of all let us take the treatment about Zero and Infinity. Two meanings of zero are given in the Tutorial Algebra: (1) the ordinary meaning of zero, namely, zero is the result obtained by subtracting a number from another absolutely equal to it or in symbols $(a-a)$; (2) zero may be defined as a number which is smaller than any assignable fraction of unity, in other words, 'a quantity which is infinitely small.' In modern Mathematics, there is no infinitesimal, *i.e.*, there is no definite number which can be called infinitesimal or infinitely small. Zero as a number which is infinitely small is meaningless. If the meaning of zero as a number which is smaller than any assignable $+ve$ quantity be taken as the *Lt* of a quantity which diminishes indefinitely, the same can also be said of any other number. And this property of zero is not a meaning of zero, but a property derived from its definition like the corresponding property of any other number, for example 1. I mean 1 is a number smaller than $1+x$ where x is a positive quantity, however small.

Next $\frac{a}{0}$ is often given as equal to infinity.

As Prof. Hardy puts it, "there is no number 'infinity.' Such an equation as $n = \infty$ is as it stands absolutely meaningless. n cannot be equal to infinity, because "equal to infinity" means nothing." Very many books say: 'infinity is a quantity greater than any assignable quantity' as though they can think of such a quantity; and because infinity as a number is meaningless,

$\therefore \frac{a}{0} = \infty$ is meaningless too. Modern mathe-

matics requires that the symbol $\frac{a}{0}$ should be regarded as indicating an impossible operation, in other words, division by zero is excepted.

Nextly, Tutorial Algebra gives as a heading (P-5) "to prove that a^0 represents unity." No one can *prove* that it is equal to unity, though, assuming the Law of Indices $a^m \times a^n = a^{m+n}$, for all values of m and n , an interpretation can be given to a^0 . In that connection I would also draw your attention to a principle often given in books as the "Principle of the Permanence of Equivalent Forms." Modern mathematics does not recognise any such principle and would not accept any proof based on that principle—for instance, Euler's Proof of the Binomial Theorem.

Next, taking the definition of a "Limit," this is what all these books say—when by causing x to differ sufficiently little from a (or in the case of a sequence or a series by increasing n indefinitely) we can make $f(x)$ (or S_n) differ from l by less than any assignable quantity, then l is said to be the *Lt* of $f(x)$ (or S_n) when $x = a$ (or $n = \infty$). This definition of a *Lt* is defective inasmuch as it does not say, as is necessary, that the difference $|f(x) - l|$ remains less than ϵ , for all values of x nearer to a (or for all greater values of n). For example, take $S_n = \frac{1}{n}$ for all values of n except when n is a multiple of 100 when it is equal to 1. Then it is no longer true that

$Lt S_n = 0$, even though you can find an $n \rightarrow \infty$

n such that S_n is less than ϵ . Similarly, the case of $\sin \frac{1}{x}$ as $x \rightarrow 0$.

Nextly, Tutorial Algebra says that "when- ever the value $f(a)$ which is taken by $f(x)$ when $x = a$ is finite and can be found by direct substitution, this value satisfies the ordinary definition for $Lt f(x)$ ". This is wrong.

Take for example $f(x) = [x]$ where $[x]$ means the greatest integer contained in x . Here by actual substitution $f(x) = 1$, when $x = 1$. But as x approaches 1 from below,

$$Lt_{x \rightarrow 1} f(x) = 0.$$

In the discussion of the convergence of infinite series, Chrystal has argued as follows: Since S_n is finite for all values of n , the *Lt* of S_n cannot be infinite. This again is not true. Take $S_n = n$. This is finite for all values of n and yet $Lt S_n$ is infinite.

Another mistake often committed in books in connection with convergence of series is the following. If for all values of n , $\frac{U_n}{V_n}$ is finite, then $\sum U_n$ is convergent if $\sum V_n$ is convergent. This is not true. Take $V_n = \frac{1}{n^2}$ and $U_n = \frac{1}{n}$.

Here $\frac{U_n}{V_n} = n$, and is finite for all values of n , and $\sum V_n$ is convergent. But $\sum U_n$ is divergent. And the proof generally given for this must necessarily be wrong. The argument given is this: Since $\frac{U_n}{V_n}$ is finite and since

$$\frac{\sum_{r=n+1}^{r+m} U_r}{\sum_{r=n+1}^{r+m} V_r}$$

lies between the greatest and the least of the fractions $\frac{U_{n+1}}{V_{n+1}}$, $\frac{U_{n+2}}{V_{n+2}}$, etc., hence we must

have $\frac{R_n}{R_n} = C$, when C is a finite quantity whatever values we assign to m and n . The fallacy lies in taking C to be independent of m and n .

Other loose proofs given in the ordinary books are in connection with the Exponential Theorem, etc.

To take one instance from Trigonometry in proving that Odes of $\odot$ s vary as their radii, they prove that the Lt of the perimeter of polygon inscribed in a $\odot =$ the Ode. That proof is unsatisfactory because the measure of the Ode is not generally defined, much less evaluated. To prove that $A = B$, we must know A , we must know B and we must establish the equality, and therefore to prove that the Lt of the perimeter is equal to the Ode, we must have defined and evaluated the length of the Ode, which is nowhere done. What should be done is that the length of the Ode should be defined as the Lt of the perimeter of a polygon, etc.

To conclude, I don't say that at the earlier stages rigorous proofs should be given, but what I contend is, wherever there are any rigorous proofs or definitions involved, but could not be given from an educational or psychological point of view, I want that the students must be clearly told of the assumptions made and that formal proofs are omitted as being too elaborate or too high for their stage, so that they may not go with wrong notions of things which they may have to unlearn later on.

THE MADRAS UNIVERSITY CHAIR OF INDIAN HISTORY UNDER THE ACT OF 1904.

BY

DR. S. KRISHNASWAMI AIYANGAR, M.A.

I REQUEST the hospitality of your columns for a little space to say something about one part of my friend, Mr. K. V. Krishnaswami Aiyar's illuminating article on "The Madras University." I should not ordinarily have troubled you, but for the fact that, coming from a member of the Syndicate and written therefore with the authority and full knowledge of the matter a member of the Syndicate is expected to possess, the part of the article relating to the Chair of Indian History is likely to produce an impression which he may not have contemplated. There are a few errors of fact in the retrospect in general to which attention may be drawn; and these are that the Sir William Meyer Endowment of £3,000 is said to be for the study of Economics. It is for the study of History and Economics according to his own testament. In the third paragraph following, he speaks of *two temporary Chairs*, one for Economics and the other for Sanskrit and Comparative Philology. It was the Economics Chair that was temporary, as it was founded on a non-recurring grant of Rs. 40,000 as a nucleus; the other Chair was intended to be permanent as it came from the annual recurring grant by the Government of India of Rs. 65,000. This grant, according to my friend, is regarded as almost temporary as he says there, that there is no guarantee of continuance of such grants. The Government of India Grant of Rs. 65,000 came out of an annual grant of a crore of rupees made on the occasion of the Coronation of Their Im-

perial Majesties in Delhi, of which grant every University enjoyed its own share continuously, and the Madras University statutory grant of Rs. 85,000 contains this sum under the new Act. Then follows in the same paragraph another statement that the University also undertook in 1920, at the instance of the Government, the publication of the Tamil Lexicon. The Syndicate took over the publication of the Tamil Lexicon in 1912, if I remember right. Speaking of the Economics Department, it is said that the Chair was founded on a suggestion made by Government. Members of the Senate of those days will remember that it was the Senate that instituted a Chair, in the first instance for a period of five years, and it was no more an obligation that the Government imposed that the Professor should train students in the methods of economic study and research. It will be found on an examination of the records that that was precisely the purpose for which the Professorship was instituted by the Senate for a period of five years, as they had not the money to make it permanent. Then in a further paragraph, 1911 is said to be the year in which the Regulations were remodelled. The Regulations under the Act of 1904 were made in 1906 and brought into force the following year. The first Honours Degree examination was held in 1914. The retrospect concludes that "*the period of twenty years under the old Act passed without any notable output of work by the University.*"

Concerning the Chair of Indian History, the following statements appear:—

"University Professors were expected to conduct research, and to give lectures."

"The Chair of Indian History requires also a brief mention. A Professor was no doubt

appointed in 1915. But there was not sufficient equipment to utilise to the full the services of the Professor. There was no school, no body of young men attached to the Professor and enthused with the spirit of research. During the whole period there were only six research students. The Chair was but a vestige of a teaching University." This paragraph together with the general remark that the twenty years' period under the Act of 1904 "passed without any notable output of work by the University" is likely to create the impression that the University did nothing good; that all was chaos before the coming in of the new Act, and the new Act, during the short period of three years in which it had been in existence, has evolved a very handsome-looking cosmos from out of this chaos. Passing over whatever may be the implication, or meaning even, that the Chair of Indian History "was but a vestige of a teaching University," we may state at once that the Chair of Indian History was the earliest to be sanctioned from out of the Government of India grant of Rs. 65,000. The first appointment was made in August of the year 1914, and as a considerable amount of correspondence had to be carried on between the University and the Government of Mysore, I was able to enter on my duties on the 1st of November, 1914, and have held the office continuously, after two renewals, for a little over twelve years. Soon after taking charge of office, I obtained the approval of the University for work in the following sections, having regard to the fact that the Chair was a creation with the definite object of making a nearer approach to the creation of a teaching University at Madras, which hitherto had remained a purely affiliating one. With a

view to attaining this object two distinct aims had to be kept before the University:— (1) the character of the colleges had to be maintained as bodies providing full instruction for the courses of study that they had undertaken to provide; (2) the University was to provide such instruction as may certainly be of use to students even for purposes of examination; but they must be such as not to supersede actual college teaching. Having these aims in view, I recommended, and the University adopted, that the Professor deliver (1) lectures of an advanced character to University students, chiefly those in the Honours classes; (2) train students in the work of research and supervise their work in the course of training; and (3) conduct research work himself and publish the results of such research from time to time. Every annual report of the Professor since then deals with his work during the year under these three heads primarily. Under the first head, I have been delivering at least one course of ordinary lectures, sometimes two, from year to year. The lectures are of a more advanced character than could be given in colleges in Indian History, dealing with a comparatively narrow period and carrying the work to an advanced degree. Taking up definite periods from year to year, I have now covered the ground from the beginnings of Indian History in the Vedic Period down to the Muhammadan Conquest with the lectures on the Gurjara Empire last year. In regard to the second, under research students, it certainly is matter for regret, studentships allotted to the subject were not more than the actual number. The actual number so far sanctioned is not six, but only five. This is undoubtedly a small number, but a certain number of valid reasons could be adduced for this

shortage of number. The ideal of research set up was comparatively high, and required qualifications, having regard to the fact that South Indian History came in for special attention, that the graduates of the University from the nature of the courses did not ordinarily possess, in the shape of language qualifications for one thing. Secondly, for the first five years, Indian History did not form a compulsory subject for the Honours Course, and Madras colleges did not elect to teach the subject. Students with qualifications in Indian History could not be had in any number. It is with a view to remedying this somewhat anomalous state of things that Indian History had to be made compulsory for the Honours Course. Even so, the other difficulty remained. Thirdly, Indian History did not meet with an overflowing amount of sympathy either from the Syndicate itself or from others concerned, and Syndicate members could be found even now who could not understand what there is to do by way of research work in Indian History, and I had this illuminating question from a member of the Syndicate whether German and French could contain anything relating to Indian History. This may be due to ignorance; the innate difficulty of work in the subject only adds to that drawback. There was a further drawback in connection with the subject that, at the time, Economics was considered to lead to something very much like a land flowing with milk and honey, and Indian History led nowhere. Notwithstanding these difficulties, the work done in the Department by the students was regarded as particularly good, as Vice-Chancellor Oldfield remarked that in that Department at least there was tangible work done. He had before him only the first of the Madras University Historical

Series, "Sources of Vijayanagar History" compiled by the first Research Student, Mr. A. Rangaswami Sarasvati, edited for the University by me and published by the University. The second of the series is the "History of the Nayaks of Madura," the work of the next Research Student, Mr. R. Satyanatha Aiyar. The third is on the "History of the Pallavas of Kanchi," by Research Student, Mr. R. Gopalan, which is just now passing through the press. These are books which constitute more or less treatises of importance on the subject concerned, providing a thesis with appendices of assorted, organised and documented sources of history for the particular period. This plan received the warm approval of high authorities among whom mention must be made of Dr. F. W. Thomas of the India Office who straightaway wrote to the University congratulating them upon the inauguration of the series. The fourth student is at work on his thesis upon the "Administrative Institutions of the Hindus," and the student and myself are both engaged upon the final stages of the draft. It is only one student that fell off because he secured an appointment, and it is on my report on that occasion that the rules were recast so as to prevent these studentships being made the stepping-stones to other things. Without meaning in the slightest degree any under-rating of work in other departments, it may be said that this department has publications to its credit quite worthy of a University, some of these having been published by the Oxford University Press.

Under the third head, my own research work during the period, 1914-1923, covered by the retrospect of my friend, I had

delivered eight courses of special lectures, all of which have been published in one form or another. If the University had had a publication department and a well-understood policy in regard to their publications, these could have been published by the University. As it was, however, I had to do all the publication, and therefore much that could have been to the credit of the University does not appear to be so at present, although no one that knows anything about this kind of work could say that it does not redound to the credit of the University. The following are the subjects and the form in which they were published:—

- (1) The Antiquities of Mahabalipur—published in the *Indian Antiquary*.
- (2) A Little Known Chapter of Vijayanagar History—published in the *Mythic Society's Journal* and then in the form of a book.
- (3) Beginnings of South Indian History—published as a book.
- (4) Early History of Vaishnavism in South India—published by the Oxford University Press.
- (5) South India and her Muhammadan Invaders—Oxford University Press.
- (6) Rajendra, the Gangaikonda Chola—published in the *Journal of Indian History*.
- (7) The Origin and Early History of the Pallavas—published in the *Journal of Indian History*.
- (8) The Vakatakas and their Place in Indian History—in the *Annals of the Bhandarkar Oriental Research Institute, Poona*.

Besides these, I made my own contributions to the various Oriental Conferences, Historical Records Commissions, and even occasional publications like the "History and Antiquities of Penugonda" which was written for presentation to His Excellency Lord Willingdon on the occasion of his visit to the historic city at the instance of my friend, Mr. T. Sivasankaram, at whose request I visited the place. Under research work, I might mention "An Account of King Krishnadevaraya of Vijayanagar," a lecture delivered in Mysore under the presidency of the Vice-Chancellor of Mysore; "The Satvatas, and the History of their Movement" presented to the Second Oriental Conference as a representative of the University; the "Tamil Texts bearing on the Mauryan Invasion of South India" as representing the Madura Tamil Sangam, and last, but certainly the most important from the University point of view, one chapter for the third volume of the *Cambridge History of India*. There is besides the work published by the Calcutta University, "Some Contributions of South India to Indian Culture." This was a course of lectures that I delivered at the invitation of the Calcutta University, as a result of my nomination as Reader by the Calcutta University, under the same Government of India grant as that under which I hold the Chair at Madras.

Apart from this recital of actual items of work, the influence of the existence of a Chair at the University is to be seen in the interest that has been created in the subject of Indian History, and the eagerness with which students take to it now as compared with the difficulties of fifteen years ago. The University recognised the importance of the subject by making it compulsory because the

very metropolitan colleges gave the go-bye to the subject. This compulsion necessarily involved adequate provision for teaching, and colleges were quite glad to make use of the University teaching as far as it could go without weakening their responsibility to provide the whole of the teaching themselves. Notwithstanding the fact that the lectures at the University, if not actually outside of their courses, subserve the ends of University courses only indirectly, the attendance at these lectures has on the whole been quite good, having regard to their character and advantages measured by marks at University examinations. It is now possible to get an audience to follow advanced courses in Indian History, and the influence exercised on the teaching of the subject though indirect is not inconsiderable. More than all this, the South Indian point of view in Indian History has now become recognised the world over and that is a great deal due to this departure of the Madras University. While one could therefore appreciate my friend's anxiety "for a school, for a body of young men attached to the Professor and enthused with the spirit of research," it may still be asserted with some confidence that the work so far done will compare to advantage with work done elsewhere under similar circumstances, and there is hardly any justification for regarding that the "Chair of Indian History is but a vestige of a teaching University," whatever the expression may be intended to, or may actually, mean.

In connection with this subject, there is only one other point on which it may be worth while making a remark. There is a reference to the creation of a Professor trained "in the work of historical research," and in the second reference it is actually stated that

the University have accepted proposals therefor. The proposal made in this behalf was turned down by Committee No. XIV on Research, etc. As far as could be gathered there is no proposal to that effect. It is hardly necessary to go into the details of it any further. I do not wish to discuss the rest of the paper for the present, as it is no very particular concern of mine. The purpose of this note is merely to correct the possibility of a wrong impression that the remarks relating to the Chair of Indian History coming from a member of the Syndicate are likely to make, and I felt it was called for undoubtedly in justice to myself, and I might at the same time claim, in fairness, for the University under the Act of 1904, which could not be said either in this department or in the others to have exhibited sterility for good as the retrospect would indicate.

SOME DRAGONS OF THE PAST—THE DINOSAURS.

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THE object of this paper is to give a brief account of one of the most interesting and most remarkable groups of animals that inhabited the earth's surface at a very remote period in the past—animals the like of which we know not at the present day. It may be mentioned at the very outset that the period in the geological past with which we have to deal in connection with the existence of these animals is so remote, and the intervening period of time between those days and the present is so vast, that, if we use our ordinary unit of time, the year, it would have to be expressed in several millions; and as most of us would realise, our capacity to conceive of long periods of time beyond a certain limit is very poor indeed. An event which took place a hundred years back is, to us, old; five hundred years back, of course, very old; a thousand years, very, very old; two thousand years back—why, we are getting to pre-historic times—thus you go on stretching your limit to five thousand, ten thousand, a hundred thousand years and you will soon see that our concepts of the duration of these periods become more and more vague, and beyond a certain remoteness of antiquity even differences of long periods of time fail to strike us with the same specificness as when we are dealing with smaller and more recent periods. It is difficult, nay impossible, for us to have any concrete idea of such vast periods of time! If, therefore, I say that the group of animals we are now dealing with, existed on the earth's surface in the Mesozoic epoch, that is, about 15 million

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years back, I am afraid that beyond impressing us with the idea that they are very very ancient, we do not form any more definite or concrete conception of their antiquity; and it does not seem to make any material difference, so far as our conception of the period is concerned, whether we had to think of 15 million or 50 million years. This reminds me of a humorous story told of an itinerant scientific lecturer who was once addressing a village audience in a remote corner of England, and in the course of the lecture made the rather startling announcement that the sun would cool down completely in about twenty million years. An old bearded man in the audience suddenly woke up, interrupted the lecturer and asked: "In how many years, did you say?" "I said twenty million years", the speaker replied. "Oh! then, it is all right" said the old man "it made me rather anxious—I thought you said two million." This old man must have had a very great concern for posterity indeed! or else his conception of time must have been very wonderful! To make this point about the antiquity of these animals clear, therefore, I shall use a sort of *scale* in measuring these periods of time, which will probably serve to give us a more appreciable estimate of these periods. If we represent the time during which the earth has been in existence, by a period of 24 hours (which is, of course, short and familiar enough to give us a very definite idea of the duration involved) then, the time that has elapsed since these animals were living about on the earth's surface is about 3 to 3½ hours! By the way, this also shows us that compared with the age of the earth, the advent of these animals on the earth's surface is a fairly recent event. It would be interesting to know that, on the same scale, the time that

has elapsed since Man has come into existence on the earth is just 10 minutes! and the period of time since History has come to be written, hardly 10 seconds!

At the very outset, it may seem rather astounding—to some, even ridiculous—that we should presume at the present day, to describe the characters, habits and modes of life of these and other animals which lived and ceased to exist several millions of years before Man himself came into existence—that all such work is therefore, the result of mere fancy or imagination. No; far from it. It is the proudest triumph of the subject of Geology to have unravelled the past history of the earth and its inhabitants during all the millions of years that it has been in existence—every conclusion being based on evidence and material as reliable and as indisputable as those of any modern historian. As to the actual nature of the material and how they are dealt with in this study—is much out of our present concern. To put it briefly in the words of Emerson: "Everything in Nature is engaged in writing its own history: the planet and the pebble are attended by their shadows, the rolling rock leaves its furrows on the mountain side, the river, its channel in the soil, the animal, its bones in the stratum, the fern and the leaf inscribe their modest epitaphs on the coal, the falling drop sculpts its story on the sand and on the stone—not a footstep on the snow or on the ground—but traces in characters more or less enduring the record of its progress." The following words of Dr. G. A. Mantell, one of the most eminent of palaeontologists, probably put the same idea even better. He says, "Fossils (i.e., the remains of ancient plants and animals buried in the rocks of the earth's crust) have been

eloquently and appropriately termed "Medals of Creation;" for, as an accomplished numismatist, even when the inscription of an ancient and unknown coin is illegible, can, from the half-obliterated effigy, and from the style of art, determine with precision the people by whom, and the period when, it was struck; in like manner, the geologist can decipher these natural memorials, interpret the hieroglyphics with which they are inscribed and from apparently the most insignificant relics, trace the history of beings of whom no other records are extant and ascertain the forms and habits of unknown types of organisation, whose races are swept from the face of the earth, ere the creation of man and the creatures which are his contemporaries."

Without, therefore, going into any more details of how exactly such a vast amount of information regarding these extinct animals has been collected, I shall proceed to describe some of the more interesting features in the life and habits of these animals, called the Dinosaurs. In describing them as *dragons* of the past, I have used the time-honoured word 'dragon' to convey, however slightly, the idea of their monstrous forms and characters. The Dinosaurs (meaning the terrible lizards) are an extinct order comprising the largest terrestrial and semi-aquatic animals that ever lived, belonging to the great group of Reptiles—the group which includes at the present-day, animals such as the lizard, the snake, the crocodile, the alligator, the tortoise, etc. While some of the Dinosaurs, in a general way, resembled the crocodiles, others show in the bony structures they have left behind, a very remarkable and interesting resemblance to birds of the ostrich type. This curious fact, first brought into

notice by Prof. Huxley, has been variously interpreted, some concluding with Prof. Huxley that here, in these remains, we have evidence that the higher group of Birds are descended from Dinosaurian ancestors, while others like Prof. Owen, consider the resemblance accidental and in no way implying relationship.

Dinosaurs must have formerly inhabited a large part of the primeval world; for their remains have been found not only in Europe but in Africa, India, North and South America and even in Australia; and the geologist finds that they reigned supreme on the earth throughout the whole of the Mesozoic epoch. "When any tribe of plants or animals becomes very flourishing and spreads over the face of the earth, occupying regions far apart from one another where the geographical and other conditions, such as climate, are unlike, its members will inevitably develop considerable differences among themselves." Thus during the great Mesozoic period, the Dinosaurs spread over a large part of the world and became very numerous and powerful. They show an almost endless variety, according to the circumstances in which they were placed and were, so to say, the lords of creation,—“the monarchs of all they surveyed.”

Generally speaking, all the Dinosaurs have two pairs of limbs and in many cases, the hind pair were very large, compared to the fore limbs. They varied enormously in size, as well as in appearance. Thus certain of the smaller type were only two feet long and lightly built; while others were truly colossal in size far out-rivalling our modern whales, rhinoceroses and elephants. These animals lived mostly on land, but several of them lived along the seashore and not infrequently

migrated into the shallower regions of the sea water where they could move about with comparative ease. The late Sir Richard Owen, in his monumental work on the British Fossil Reptiles, has made some valuable remarks on the probable habits of these Dinosaurs. He points out that their chief swimming organ, as in the modern crocodiles, is, of course, the tail, which is both long and powerful; and in some, is flattened in a vertical direction. For purposes of this paper I shall divide the whole group of Dinosaurs into two divisions, according to the nature of their food material: (i) the Carnivorous and (ii) the Herbivorous. Under each of these, I shall describe only a few of the more interesting forms.

Carnivorous types:—Of the carnivorous types, probably the best known is the interesting form called *Megalosaurus* or the great lizard. It was in the year 1824, that that keen observer and thinker, Rev. Dr. Buckland, described before the Geological Society of London, the first remains of this strange and formidable reptile found in the rocks at Stonesfield, 12 miles from Oxford. The portions of the skeleton first described, consisted of a part of a lower-jaw, with teeth, a thigh bone, a series of vertebrae of the trunk, a few ribs and some other fragments. The structure of the teeth leaves no doubt as to the carnivorous habits of the creature. The genus *Megalosaurus*, now rendered classic through the labours of Profs. Buckland, Phillips, Owen and Marsh, may be regarded as the type of the carnivorous Dinosaurs; and it affords an excellent and instructive instance of the gradual restoration of the skeleton of a new monster from more or less fragmentary remains. With a length of about 30 feet, capable of free and rapid

movement on land with a kangaroo-like carriage, with strong hind limbs, short head with long pointed teeth, the *Megalosaurus* must have been without a rival among the carnivorous reptiles, at least so far as Europe was concerned; and it must have hunted down and fed upon the herbivorous Dinosaurs as lions and tigers hunt and eat the antelope and the buffalo to-day. The large bones of the limbs were hollow, and many other parts of the skeleton contained cavities or were otherwise lightened in order to give a greater power of rapid movement. "It is not very difficult to imagine a *Megalosaurus* lying in wait for his prey (perhaps a slender harmless little mammal) with his hind limbs bent under his body, so as to bring the heels to the ground, and then with one terrific bound from the long legs, spring on to the prey and hold the victim tight in its clawed fore-limbs as a cat might hold a mouse; then the sabre like teeth would be brought into action by the powerful jaws and soon the flesh and the bones of the victim would be gone!"

It may be mentioned here that by far the largest number of remains of these Dinosaurs have also been discovered in America; and as a matter of fact, the remains unearthed in that country are very much more numerous, better preserved, and more representative than those found in Europe. The immense profusion in which the bones of these huge creatures have been found in the Mesozoic strata in the United States of America is astonishing; no less remarkable is the skill and success with which American naturalists, chief among them Prof. Marsh of Yale and Prof. Cope of Philadelphia, have collected, fitted together, and drawn every detail of more than 30 different kinds of these monsters.

Remains of animals closely allied to the *Megalosaurus* of Europe have also been discovered in large numbers in America—of which the best known form is *Ceratosaurus* or the horned lizard—so called because its skull supported a prominent horn. Externally the *Ceratosaurus* differed from other members of the carnivorous group, for its body was partly protected by large plates in the skin, such as the crocodiles have. An almost complete skeleton of this animal has been found, which indicates a length of about 22 feet. The fore limbs, as in the *Megalosaurus*, were small and some of the fingers ended in powerful claws, which no doubt, it could use to good purpose.

But by far the greatest of all the carnivorous Dinosaurs was the huge and fierce beast known as *Tyrannosaurus*. Its length was about 39 feet and height, in the normal position, about 17 feet! It was discovered in 1902, by the members of an expedition for the American Museum of Natural History. This "King of the tyrant saurians" is, in respect to speed, size, power and ferocity, the most destructive life engine which has ever evolved. The animal possessed an excessively small brain, probably weighing less than a pound, while the entire animal itself was about 4000 pounds; and this fact indicates that in animals, mechanical evolution is quite independent of the evolution of their intelligence.

Another interesting carnivorous Dinosaur, which probably is the earliest representative of its kind, is *Anchisaurus*, a portion of the skeleton of which was discovered in America so far back as 1818. But it was only very much later, in 1893, that the form was completely studied and described. It was a comparatively small animal about 6 to 7 feet

in length and is one of the most slender and delicate of all the Dinosaurs yet discovered. The animal hopped about on its hind feet like a bird, but could also progress on all-fours.

Herbivorous types:—We shall now turn our attention to the next and more interesting group of herbivorous Dinosaurs. It is in this group that we find some of the biggest types of animals that were ever created on the earth's surface. One of the best known forms in this group is *Brontosaurus*, a vegetable-feeding lizard, but very different from the lizards of the present day. This monster, the *Brontosaurus*, possessed a massive body about six to eight times the body of the modern elephant, with a long neck which itself was nearly 15 feet long, ending in a tiny and disproportionately small head. Posteriorly, and "as if partly to balance the neck," the body ended in a long tapering tail, nearly 20 feet long. The entire animal attained a length of 60 feet and more, and when alive, probably weighed more than 38 tons! The most interesting and striking character, which it shares in common with all other Dinosaurs, whether herbivorous or carnivorous, is, as Sir Lankester put it, the "ridiculously small head" for an animal of its size. These animals naturally therefore possessed very small brains; and by taking casts of the brain cavities in the skulls of these extinct animals, it has been possible to obtain a very good idea of the nature and capacity of their brains; and, in this way, important evidence is obtained, which throws a lot of light upon their habits and general intelligence. With a body of this size and so small a brain to control it, the *Brontosaurus* must have been a very slow and stupid creature indeed! Prof. Marsh believes

this animal to have been more or less amphibious in its habits, feeding upon aquatic and other succulent vegetation. The huge and massive body was supported on four short, strong and massive legs. The animal must have been, of course, a voracious feeder and "the task of providing food for such a body must have been a severe tax on so small a head." How this apparently helpless and awkward animal escaped so long in the struggle for existence, it is not easy to conjecture; but since there is reason to believe that it was more or less at home in the water and could use its powerful tail in swimming, we may perhaps find a way out of the difficulty by supposing that, when alarmed by dangerous flesh-eating foes, it took to the water and found discretion to be the better part of valour.

Another animal closely similar to the *Brontosaurus*, but very much bigger, is the *Atlantosaurus*. The thigh bone itself of this animal measures nearly 6 feet 3 inches in length, which is about $1\frac{1}{2}$ times the size of that of the biggest elephant known. Prof. Marsh, the discoverer of this wonderful bone, calculates that the *Atlantosaurus* must have attained a length of over 80 feet and assuming that it walked upon its hind feet—a height of 30 feet!

More wonderful and more monstrous is the next member of this group that we proceed to consider, *i.e.*, the *Diplodocus*, which is about the largest fossil reptile that has yet been discovered. No *one* complete skeleton of this animal has ever been found; but through the labours of Marsh, Hatcher and Holland, enough material has been collected to build up a complete model or reconstruction of the skeleton of this truly wonderful

giant reptile; and through the generosity of Andrew Carnegie, the well-known millionaire, an exact copy of the restored skeleton in plaster of paris, of the original, found in America, was made over to the Natural History Museum, London. The reptile measured nearly 85 feet in length, with the same massive build of the body that we noticed in the previous cases. With regard to what may be called the architecture of this huge skeleton, Prof. Osborn, the well-known American palaeontologist, writes: "The backbone is indeed a marvel. The fitness of the construction consists like that of the American truss bridge, in attaining the maximum of strength with the minimum of weight." As usual with other Dinosaurs, the animal possessed a disproportionately small brain in a tiny head; and in spite of its size must have been a harmless, placid beast. In his interesting book—"The Romance of Modern Geology"—Mr. E. S. Grew writes in describing this animal: "It has been calculated that impulses travel along the nerves to the brain at the rate of about 12 yards a second. The rate may have been much less in the case of the sluggish *Diplodocus*; but, in any case, it would evidently take at least 2 seconds for a nerve impulse to travel the length of this reptile, so that, if any enemy attacked him at the end of his tail it would be 2 seconds before the *Diplodocus* would realise the fact and perhaps four seconds before he could begin to turn round to defend himself." The animal is estimated to have required 8 to 10 minutes to turn completely round! The huge and unwieldy size of these reptiles may be taken as reaching the point when bulk becomes a burden, and as signalling an approach to the limit of evolution in the line of size. This fact, together with the small size of their brains

and their consequent very limited brain-power, had much to do with their racial extinction. Animals, with smaller bodies but with bigger and ever-increasing brains, soon outdid them in the struggle for existence.

We will next pass on to another interesting form, the *Stegosaurus*, the remains of which were first described in 1876 by Prof. Marsh in the "American Journal of Science." While they were less gigantic than some of those just described, this animal was remarkable in possessing a peculiar armour, as it were, of bony plates and spines covering the skin. Some of the plates were from 2 to 3 feet in diameter and the spines, some of them, more than 2 feet long! "Doubtless when this animal was attacked, it drew its head and limbs under its body like the armadillo or the porcupine and relied for protection upon its dorsal armature, aided by rapid lateral motions of the great spines of the tail to ward off its enemies." The skull was very small, the jaws short and massive. All told, the *Stegosaurus* was probably the most hideous to look upon.

We will close our study of these Dinosaurs by a brief reference to another very interesting form, the *Iguanodon*, about which a very large amount of information has been collected through the labours of a series of eminent palaeontologists. The history of the gradual reconstruction of its skeleton is probably the best instance of the results that may be obtained by a careful and patient study of fragmentary remains. The first remains of this animal, in the form of teeth, were found in Sussex by Mrs. Mantell in 1822. More complete and very valuable remains of this animal were found only very much later, in 1878, when the skeletons of no less than 23 *Iguanodons* were unearthed in the

rocks near Belgium. The animal stood like a kangaroo, and was about 26 feet in length and in the standing position, was 14 feet in height. The hind feet were very much like a bird's and had only three toes; and the bones of the hip girdle were extraordinarily like those of a bird. In fact, when Prof. Huxley first examined the *Iguanodon's* remains, he was inclined to believe them to be those of a gigantic bird. The more detailed study of the skeletons of these and similar extinct animals has served to throw a flood of light on the perplexing problem of the evolutionist—the origin of Birds.

Such are some of the wonderful creatures among the Dinosaurs that were the towering inhabitants on the earth's surface in ages long gone-by; animals, which by their weirdness and enormous size recall to our minds the strange monsters that we read in connection with the labours of Hercules or the wanderings of Ulysses; but unlike the dragons in the fairy book, these animals were real, in every sense of the term; and when the evidences furnished by the actual remains of these animals have been duly considered, even the most sceptical man cannot but admit the reality of their existence.

In this connection, one is reminded of a very humorous incident, of an eminent palaeontologist, who was once lecturing to a village audience about these same animals, the Dinosaurs. At the conclusion of the lecture, he said that he would be glad to clear any doubts or answer any questions which anybody in the audience would like to ask relating to the subject. His lecture was so lucid, and he had put such convincing evidences before his audience, in support of the several statements he had made, that there was practically no point on which any

question might be asked. After a few minutes of silence, however, an old Irishman stood up in one corner and said "I quite see Sir, the force of all the points mentioned by you, and fully believe with you in all your conclusions, regarding these pre-historic animals. But what I really cannot understand is this: If these monsters lived, as you say, millions of years before we ourselves came into existence, how on earth, then, are you so sure about the correct names of each one of these animals!" This point of view is very similar to that of the old lady, who, after having listened to a learned lecture on astronomy, was heard to admire the marvels of science in the following words: "Science is so interesting, so wonderful. Take astronomy, for example. Astronomers are such marvelous men! I can understand how they have been able to estimate the distance to the sun, to the moon, and to all the other planets, and the size of the sun, the size of the earth and how fast it travels—but how clever! they have found out the right names of every one of those stars."

Before we conclude this account of the Dinosaurs, we must refer to another remarkable discovery in recent years, a discovery which forms the very crowning glory, as it were, of palaeontological exploration, *i.e.*, the finding of the eggs of these ancient monsters, preserved in the fossil condition, probably as they were laid several millions of years back. The first discovery of Dinosaur eggs in Mongolia, was made in the year 1923 by the Asiatic Expedition of the American Museum of Natural History, under the leadership of Roy Chapman Andrews; but owing to several adverse conditions of life in the midst of the Mongolian desert, the party could not stay there as long as was desirable, but had to

return early. In 1925, however, Mr. Andrews led another expedition to this historic place and the valuable remains of Dinosaur eggs, that have been unearthed during this expedition, have amply repaid all the troubles, which the party had to undergo. The exact locality where these Dinosaur eggs have been found, known as Shabarakh Ussu (meaning, place of muddy waters) is in the midst of the Gobi desert, and the whole party with their bag and baggage, had to do a distance of 800 miles across the desert to get to this scene of action, which was effected under the most trying conditions of food and climate. The entire expedition travelled in two sections—the scientific party under Mr. Roy Chapman Andrews, with their equipment in motor-cars, and a camel caravan with supplies, in charge of a native leader named Merin. Regarding the journey across the desert, Mr. Andrews writes: "For motors, it was splendid; for camels, it was awful. The vegetation would hardly feed a sand rat; the wells were a hundred miles apart; our camels would have to draw nourishment from the fat stored in their humps." The following extracts regarding the success of the expedition from the pen of Mr. Roy Chapman Andrews himself will be interesting: "We hoped our expedition would be more successful, and our hopes came true. There were more Dinosaur eggs—nests of them, singles, whole ones, broken ones, big ones, and little ones; eggs with smooth paper-thin shells, eggs with thick striated shells; in short, more eggs, different kinds, and bigger and better eggs, than any we had found the first year * * * * * As soon as we arrived at the place, I promised a bottle of real "pre-war" to the man who first found the eggs. (We had only 3 or 4 bottles for medicinal purposes.) The honour

of the first find went to Norman Lovell, one of the motor-transport experts, who located one of these eggs, literally by an accident.

"These eggs are almost perfectly elliptical, and about 9 inches long. The beautifully striated shell shows a variety of patterns on different parts of the same egg. Although the shell of this type is $\frac{1}{8}$ inch thick and very solid, another group had shells of almost paper thinness. They are only 4 inches long and remarkably slender, with pointed ends. Then, there is a smooth shelled type, a trifle larger in size, and others, with pebbled or pitted surfaces. Without a doubt, these varieties represent different species and genera of Dinosaurs. The abundance of eggs, in this single locality is most surprising. In 1923, we obtained 30 specimens, in a more or less fragmentary condition. This year at least 40 have been discovered of which 15 or 20 are well preserved." These eggs are not those of the huge monsters of this group, such as *Diplodocus* or *Brontosaurus*, but of much smaller animals like *Protoceratops*, which were not more than 8 to 10 feet in length.

All the eggs, which have been collected from this locality have been and are being studied in great detail—this work being mostly in the hands of Dr. Van Straelen of Brussels—the most eminent authority on the subject. Enough work has been done to answer the question raised by many: why these eggs should be attributed to Dinosaurs, rather than to crocodiles or some other reptiles or even to primitive birds? On the authority of Dr. Van Straelen's work, Dr. Bather, Keeper of Geology in the British Museum, has recently made it clear, that these eggs are not of any other group of animals and, that we must conclude they were really

laid by the Dinosaurs, whose remains are found with them.

In conclusion, I should like to state that what we have described so far represents merely the most outstanding features of only a few of these extinct monsters. To the serious student of palaeontology, the amount of literature that has grown round this subject during recent years, will strike as something enormous. It is certainly one of the highest achievements of the science of palaeontology to have made these extinct monsters of the remote past, so familiar to us in every detail of their structure and organisation. And it is only when one comes to know of the number and variety of the several generations of animals and plants that inhabited the earth's surface from time to time in the geological past, that one begins to realise the wonders of creation, and recognise that what we see at the present-day, and we ourselves, are merely a passing phase in the course of life's progress; and the truth of the old saying is brought home to us: "What we know is but little; what we do not know is immense."

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By Mr. D. S. GORDON, M.A., LL.B.,
Mysore Educational Service.

IN the last Convocation of the Mysore University over two hundred graduates were granted degrees; and since the inception of that university over a thousand graduates of all kinds have been produced. It is not generally known, however, what has become of the men so turned out. To my mind, there are few gatherings of intellectually distinguished people which are grander and at the same time more melancholy than a present-day university Convocation. A considerable section of the youth of the country comes up on that occasion to take the various degrees or other distinctions. The hall is crowded with men engaged in training youth, and spectators interested in education. The sight is indeed grand and impressive. But whither are the young men being led? Shortly after they leave this sublime atmosphere they will go out into the work-a-day world. In what measure are they equipped to earn their livelihood?

In Greek mythology we come across the story of the Minotaur. Every year a hundred of the choicest youths of Greece had to be sacrificed to this monster. But are we sending our young men to a better doom? Perhaps not; for we know that many of them will be devoured by that modern monster, unemployment. The comparison is no doubt fantastic, but there is a good deal of truth in it.

Educationists sometimes argue that it is unfair to criticise a university from the point

* A Paper read before the Teachers' Association, M. C. H. S., Mysore.

of view of employment. They say that the duty of a university is to hold up the torch-light of culture. It has no concern at all with the question of livelihood. All that I can say to this argument is that if this is the only function of universities, we in India cannot afford to have them. We want bread first, and afterwards the so-called intangible thing, culture. The materially well-advanced nations of the West may aspire for culture, but ours is a perpetual struggle for very existence. And after all, what is this boasted culture of our university graduates? Is their life in any way very different from that of the rest of the community who have stopped with the High School? Not at all; for in India academical studies and personal life do not touch each other. They run in parallel grooves. Our social life, our social ideals and outlook, these have hardly changed very greatly during the past half a century. So, then, it is useless to boast of our universities as fountain-heads of culture. The only justification for their existence ought to be that they fit in with the economic structure of the community. In other words, the community should find a ready use for the men turned out by the universities.

What can a university-educated man look forward to in these days? The first thing that occurs to him is, of course, the inevitable Government Service. But it is already overcrowded and difficult to get in. The next thing to try is perhaps one of the learned professions: Law, Medicine, Engineering and Teaching. Of these Teaching alone does not seem to require any technical training—at any rate, not immediately. So he applies for a schoolmaster's job and probably gets it; but the young man soon finds that this is a very unsatisfactory profession and that

it does not answer his ambitions. What next? There is Law; but the bar is already overcrowded and the chance of earning a decent livelihood is remote. Medicine? No; they do not want doctors until the next great war. Engineering? The public does not want any of their kind; building contractors of experience are enough. Government has already discharged a considerable number of engineers from service so that there is no hope in that quarter.

What then is the educated man to do? The ordinary professions and services do not open out a career for him. The truth is that there is a wasteful excess of brain-workers in the country. They do not fit into the economic structure of the present day. Unfortunately with us physical labour is held to be less dignified so that anyone who has read up to the High School prefers a quill-driver's place on a mere pittance to manual work on decent wages. This perversity is so deep-rooted that some thinking men are inclined to oppose the spread of literary education among the agricultural and artisan classes lest these should deem their labour undignified and turn their attention to clerkships and the already overmanned "learned" professions.

In Mysore, as in the Madras Presidency where the conditions are even worse, a Committee was appointed to suggest measures in order to solve the problem of unemployment among the educated middle classes. From time to time, several useful schemes and suggestions have also appeared in the newspapers; and one of them seems to be full of possibilities, more especially for Mysore. It is, that the educated classes should take more to agriculture. Much

valuable land in this State is crying for the plough. This peaceful and eminently healthy occupation has been relegated to traditional methods and an ignorant peasantry. How much better, and more productive can it be rendered if only our educated classes will give up all their preconceived notions and devote their attention to it! As it is, we sadly notice that a considerable number of the people have an instinctive fear of the Malnad and have been content to leave those valuable coffee-growing lands to foreign enterprise.

So too in mining. There is a vast field here for indigenous talent and scientific enterprise. But it is indeed very strange that hardly any Geology graduate of our university has taken to prospecting for minerals. Similarly, few, if any, of the men turned out in the Government Agricultural School have taken to independent scientific farming. It cannot be due in all cases to want of capital. In large measure I believe it is due to paucity of the enterprising spirit and to the pernicious glamour of Government employment. Every student who got into any of the technical schools of Government such as Forestry, Engineering, or Agriculture, has unfortunately been taught to look forward to some apparently lucrative job. The spirit of self-reliance and venturesomeness has thus been crushed out of him.

In Europe and America industry and commerce are the very life-blood of the people. Huge numbers are engaged in them. There economic undertakings are scrupulously left to private enterprise. In backward countries like ours, however, Government may come forward with assistance, but it is always with the hope that the public will take them up ultimately. But unfortunately

In India the classes of people who take advantage of Government's assistance and the classes who take advantage of its educational facilities are distinct. The men who pass out of our colleges and other educational institutions are generally not those who will devote their energies to industry and trade. They are commonly job-seekers in offices or recruits to the learned professions. Equally serious with this defect is the vast cleavage that exists between our educational system and economic organisation. Unless education and enterprise are wedded together progress is impossible.

The root-cause of unemployment among our educated men can thus be traced to this fundamental defect. But it is sometimes urged that the problem of unemployment is a world-problem and that it is not one peculiar to this country alone. This argument, however, is unsound; for the causes of unemployment in Europe and elsewhere are entirely different from those in this country. At any rate, unemployment elsewhere is not due to want of conscious attempt to correlate education to economic enterprise. This becomes apparent when one notices that unemployment here is largely confined to the educated classes.

Most educationists seem to be agreed that the present system of education should be overhauled, but they are apparently not agreed as to how it should be done. So far as the existing educated men are concerned there seems to be no hope; for it is impossible to discover fresh avenues of employment answering to their talents and training. There is a general, and probably well-founded impression that university men are unfit for business which absorbs so many men in other

countries. The Army and the Navy, the Mercantile Marine, the Consular Service, and the Church which provide employment for such large numbers in the West do not afford suitable openings in this country.

But succeeding generations at least can be saved from misery if proper measures are taken now. Some time ago a member of the Popular Assembly of Travancore (which country probably contains the largest percentage of educated people in India) seriously proposed that the schools and colleges in the State should be closed for a period of ten years or more, until the existing men of education should find suitable berths. The proposal is not so absurd as it seems; for what are we to do with so many unwanted men of education? The market value of university degrees is already far below par; from the bread-winning point of view, its utility has almost disappeared.

The question now is on what lines educational reform should proceed. The first and most fundamental defect in our educational system universally acknowledged is that it makes no attempt to produce men of character and discipline. It is true that the spread of the Scout movement in recent years has in some measure remedied this defect, but it has not gone deep and broad enough to transform the character of young men. Education without character is like a flower without beauty and without fragrance. Any student with ordinary intelligence and industry can pass his examinations without the help of a teacher. Teachers therefore are not absolutely necessary for merely imparting the knowledge which is in the books; but they are required for the higher and nobler task of "building" young men. It is not denied that there is a vast difference between the spoken word of the teacher and the written letter of the books;

but the superiority of the former to the latter, largely depends upon the character of the person who utters the word. The schools of the West are far in advance of us in character-forming. We read of so many youths trained in British schools who have gone out into the world and distinguished themselves in various walks of life and who have afterwards acknowledged that whatever was good in them was due in large measure to their early school influences. Not many of our young men can say that.

Character-building, however, must not be confused with religious and moral instruction as has been done in some provinces in India. In a country where the people are divided into innumerable sects, and where religion means little more than the mere performance of certain rites and ceremonies at certain times and hardly has any relation to personal life, any attempt to build character through religion is bound to fail. Character, again, is not, as is often thought, mere ethical conduct, but it includes what the Englishman calls "grit." And this is to be taught not from the ancient mythical heroes and demigods who performed impossibilities, nor from religious leaders whose characters are reported to have been on a plane outside the reach of ordinary men, but from the personal example of the teacher and through the biographies of good and enterprising men who have been the heroes of every-day life.

The formative period of a youth's character is generally believed to be his High School and early College days. But it is exactly here that our educational system is very unsatisfactory. Our High Schools which were formerly producing finished matriculates have now deteriorated and produce only half-finished S.S.L.C. holders. In other respects

there is hardly any difference. The High School course, as usual, has no character-building value; nor is it always a preparation for technical studies.

The old matriculation, again, being a very stiff examination, automatically filtered down almost all unsuitables, leaving excellent material for the College to work upon. But this is not the case now. Politicians have everywhere got control of universities and they are in favour of spreading a worthless higher education by lowering the standards of examinations. Higher education is now, more than ever before, seen through the spectacles of Government employment. Too many men take to it. Naturally, therefore, in such a crowded atmosphere of varied capacities no adequate attention can be paid to bring out the best in the young men.

The first educational reform, therefore, that is immediately necessary, is to reduce the craze for university training. Unemployment and the starvation wages of many of our graduates has already done much to take away the glamour of a university degree. But this is learning wisdom through misfortune. Our educational leaders can avoid it by directing the energies of youth into channels that are more profitable. By applying the pruning knife to the universities a considerable sum can be made available for mass and technical education which is the crying need of the country at present.

In regard to technical education, however, one error must be avoided. It is often believed that this problem is solved when a few vocational courses have been introduced into the already existing general educational institutions. But this is a mistake; for not only is such training bound to be inadequate,

but it is also incapable of giving a definite bent to the student's career. It would never occur to such a student to utilize his technical attainments in order to earn his livelihood. Moreover, we are living in an age of extreme specialisation and scientific production in which mere physical skill is of little use. Manufacture now means the use of large capital, machinery and mechanical power. The technical training given in our schools should therefore be of a high order, and this can only be provided by special institutions. Technical education is not training in the handicrafts.

Lastly, in any scheme of technical education agriculture should have a prominent place. At present it is an occupation largely in the hands of ignorant classes and frequently thought to be unfit for others. That tilling the soil should be considered an undignified employment in a land whose existence and prosperity so completely depends upon agriculture is really deplorable. It is essential that there should be a profound change of attitude in this matter among the literate classes.

To summarise. Reduce the craze for higher education by strictly limiting it to those who show decided aptitude. Introduce mass education. Start technical schools of a high order and divert into them the energies of the large majority of students. Educate public opinion in regard to agriculture. If these and other reforms are immediately undertaken it is possible that a large number of our young men who are blindly groping in the colleges may be saved from much misery.

THE DALTON PLAN.*

By Mr. L. N. MATHUR, B.A., L.T.

EVERY year at the time of the annual promotion of boys from class to class, hard cases of failures always came up for discussion between teachers and myself, cases of those who had obtained fairly high marks in all subjects but one. It seemed very hard to detain them and it was taking risk to promote them. There were, again, cases of boys who though otherwise bright or hard-working could not come up to the requirements of examiners on account of long-continued illness or other reasons over which they had no control. Either they had to be detained for no fault of theirs or promote under cover of the undefined remark 'past record satisfactory.' Arrivals in the school late in the year also presented similar difficulties. The writer had searchings of heart and again and again devised means to find out solutions, but none proved satisfactory. It was also a problem to make boys work regularly from the very first day of the school session to be better prepared for examination or to make up their deficiency, at the same time developing a sense of responsibility, let alone work for work's sake. The Dalton Laboratory Plan seems to have come to our aid. I need not try in this paper to set forth how the idea to experiment with the plan grew in me. I need only tell this much that the underlying principle of the plan struck me as eminently capable of application to the conditions of this school. These conditions are:

- (1) There is a great disparity between the capacity of a boy and a boy of the same

* As worked at the Janki Prasad A. S. High School, Khurja, U. P.

class. This is due to the fact that the environments from which boys in this school are recruited vary vastly in intellectual equipment. Some come directly from the ploughshare, others have purely literary mouldings, while yet others have exclusively 'Arithmetic' atmosphere, *i. e.*, Khurja being a town of shopkeepers (banias). In big centres like Agra, Lucknow, Allahabad, where mostly sons of the official and legal class attend school as day scholars such probably is not the case, the level of general education at home in these places being practically the same.

- (2) The parent when he has once put his child into school never comes to get to know what the boy is doing, what subject he is weak or strong in and how he organises his work at home until the annual day of judgment. He is then probably disillusioned about his work and it is then too late to mend.

- (3) The standard of promotion being in the nature of things not the same in all schools, it is of no avail 'steeling' your heart against parents, for the boy leaves the school for another, probably to the dismay of those in charge of the school purse.

- (4) The school, on the whole, has a fairly good tone about it. The plan demands enthusiasm and, what is still more important, loyal co-operation on the part of the teaching staff and a flexible, smooth-working system of organisation. The writer is glad to be able to say that there is an ungrudging offer of the former in a measure which few headmasters in a private aided school receive. Flexibility in organisation is due to the fact that the management has left a wide scope for it to the sense of responsibility of the headmaster.

- (5) The plan means very hard work not only for the staff but the boys; and the boys here, though not quite as intelligent as those in big cities, are very hard-working indeed.

- (6) Hostels are a feature of this school and no less than 75% of scholars working under the plan reside in hostels. It is easier to carry out the plan in a residential school than in a day-school.

The plan recognises the fundamental fact that no two boys in a class possess the same ability, the same likes or dislikes, the same rates of work and methods of attacks, the same types of imagination and the same powers of concentration. The class system puts the same task before all and demands a uniform achievement in a uniform time. The Dalton Plan does nothing of the kind but provides work to suit the needs of each individual to be finished according to individual capacity. This basic principle of *individual* work induced the writer to introduce it in the school where boys as said above vary so much intellectually. The plan is not merely a method, but is the reorganisation of the whole school in a way entirely different from the one that obtains at present. To draw out that which is best in an individual, the machinery of the school is to be set in a way that each boy should keep in personal touch with the teacher in each subject, besides receiving impressions in group and should have ample opportunities for independent work. Miss Parkhurst, the originator of the plan, therefore, makes it an essential feature of the plan to provide Laboratories for each subject where each boy has every facility to work with the material at his disposal, text-books, general reading books, reference books, maps, charts, etc. In fact, she desires that the rooms of the school be

languages, Drawing and Science). This allocation of time to different subjects depended upon the emphasis laid on them by the Departmental Curriculum. From a political and utilitarian point of view, English has been and will be regarded as the most important of all subjects. The detailed allotment is as follows:—

Out of the 36 periods

Oral work under the Dalton Plan.	(A) 6 periods for English Text-books, Rapid Reading and Dict.
	4 " " Vernacular T. B. and R. R.
	4 " " T. B. in Classical languages or Practical work in Science or Model Drawing.
	1 " " Hygiene.

Total 15

Free Study under the Dalton Plan.	(B) 5 " " English Comp., Trans. and Grammar.
	6 " " Mathematics.
	3 " " History.
	3 " " Geography.
	2 " " Vernacular Composition.
	2 " " Optionals (Comp. in Classical languages, Theory work in Science and Free-hand Drawing.)

Total 21

According to the above proportion, oral work in non-Daltonised parts (A group above) of the Daltonised subjects should occupy 66 minutes daily while B group, 94 minutes out of the available time 2 hours and 40 minutes. But the writer for the present thought it fit to divide the time equally between them. We have not yet

been able to rid ourselves of the idea that intensive 'teaching' lessons in text-books, particularly of the foreign language, to the whole class are a necessity. These lessons therefore receive more than their due share.

It is clear, then, that the Daltonised subjects have allotted to them 80 minutes per day for oral work plus 2 hours and 40 minutes for free study, *i. e.*, in all 4 hours. The arrangement for Conferences is that no subject goes without one Conference of 40 minutes at least per week of 4 working days. The following table will now show roughly what, if every boy were normal and worked at the same rate, a unit's (a working day's) work in any particular subject ought to be:—

Subject.	Hours devoted to it per week.	Time for oral instruction, <i>i. e.</i> , Conferences for each.	After deducting time for oral instruction.	Length of unit's work.
English (Comp., Trans. and Gram.)	3 hrs. 12m.	Conferences of 40 minutes each.	1 hr. 52 minutes.	20 min.
Mathematics.	Do.	Do.	Do.	Do.
History.	1 hr. 36m.	one Conference of 40 minutes.	56 m.	14 do.
Geography	Do.	Do.	Do.	Do.
Vernacular (Comp., etc.)	3 hrs. 12m.	2 Conferences of 40 minutes each.	1 hr. 52 minutes.	28 do.
Optionals.	Do.	Do.	Do.	Do.
Total	16 hrs.	6 hrs. 40 m	9 hrs. 20 m.	2h. 40m.

The indication of units is important from both the teacher's and the pupil's point of view. The teacher appreciates the difficulties of the boys and tries to make assignments to

suit their working capacities. The boys, on the other hand, get to know how best to organise their work.

It is not necessary that each boy should devote exactly the same time to the subjects as indicated for each. But he knows exactly how much time to save from strong subject and devote the saved time to his weak subject over and above what is already allotted for it. The plan, therefore, provides an incentive to make up his deficiency in a subject without imposition from above. That is true discipline. The drawing-up of suitable assignments exacts not only great labour from teachers but requires of them ability of a high order and experience. Psychological insight into the mental equipment of pupils is absolutely necessary. We have made mistakes, but these have led us to the following conclusions:—

(1) There should be the minimum assignment in each subject.

(2) The minimum should be a *real* minimum, *i. e.*, an amount of work that a fair student, working with reasonable diligence, may hope to complete within the time limit.

(3) 'Maxima electives' should be provided for the use of good students.

The following arrangement in the assignment is generally adopted:—

(a) Brief introduction to the matter to be studied.

(b) Indication of the reading matter to be gone through and of the methods of attack.

(c) Questions, both 'pivot' and test.

(d) Books for reading at home and in school.

(e) Written work, *e. g.*, writing out of summaries, answers to certain questions, composi-

tion, translation, drawing of maps, mathematical sums and exercises, problems and the like.

In practice it has been found difficult to indicate always *each* unit's 'minimum' and 'maxima' electives, but 4 units' work is invariably indicated. The minimum is to be done by each boy. In this school, the minimum is what is called 'A' type of work, the electives are 'B' and 'C' types of work. The following device is also resorted to as providing incentive to do higher types of work:—

One who does the minimum *satisfactorily* obtains 20 out of the possible

		100 marks.
"	" 'B' type 40	" 100 "
"	" 'C' type 60	" 100 "

The remaining marks to make up the minimum pass-marks are to be obtained in the Terminal Examination. Thus it is evident that the Plan is not worked in its entirety, which is inevitable under the present conditions.

IV. CHECKS.

Very early it was found out that it was impossible to get *individual* work done without proper checks. The following devices have been adopted:—

(a) Scholar's card.

(b) Laboratory graph.

(c) Teachers' Progress Register.

(d) Headmaster's Monthly Register.

(a) A *Scholar's Card* has two sides—one for the drawing of graphs for each subject and the other provided with 5 columns corresponding to five weeks. There are columns for date and day. The boy enters the dates on which he is present and works in the Laboratory, as well as the number serially

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against each date. For example, in the accompanying card, 18th Sep. is the boy's 1st working day, 22nd Sept. is the 2nd working day, and so on. On Oct. 4 he is shown as 'a' i.e., absent. 2 columns are provided for this purpose. Spaces for tests have not yet been used. On both sides of the graphs drawn by this boy there are numbers, and on one side they are accompanied with the letter "T." This means test on such and such a day. This day corresponds with the date given on the other side under teacher's check.

(b) A *Laboratory graph* is a foolscap size sheet meant for the maximum of 35 boys allowed in a class and provided with 20 columns to correspond with 20 units. As the boy proceeds, he draws his graphs both in his card and on this sheet as he leaves the Laboratory.

(c) A *Teacher's Progress Register* has five columns like those in the scholar's card. On completion of each week's (4 units') work he is tested orally or his written work is seen over or the teacher satisfies himself with the way in which he is doing day to day work. The teacher then gives a 'tick' mark on the card with the date, at the same time marking similarly in the Register. Thus a boy can not proceed without being checked after every 4 units. There are also two columns captioned 'B' and 'C' both in this register and the card. These are meant to check 'B' and 'C' type of work.

(d) On completion of the whole assignment, the scholar sees the Headmaster who signs the card and makes the following entries for each. For the form, the writer is indebted to Mr. Lynch, Headmaster of West Green School, Tottenham (London),

Name of the boy.	Date of starting.	Date of completion.	No. of days taken.	Order of finishing.	Days absent.

The writer has got his Register interleaved for his remarks if any on a month's work of each boy.

This last check enables the Headmaster to come into personal touch with each boy and to advise him as to how best to organise his work. This has another useful purpose to serve. He gets to know first-hand where each boy stands and the worries on the occasion of the annual promotions are minimised.

So much briefly as to the actual working of the plan. The writer would, however, like to touch upon a few other points which would be of interest. They are (a) Difficulties, (b) How efforts have been made to overcome them, (c) Question of discipline, (d) Some heartening factors.

DIFFICULTIES.

No useful purpose will be served in detailing those which are inherent in the Plan; most experimenters have done full justice to them. The writer would prefer to refer to those peculiar to this school.

(1) The weak boy below the average run who sometimes gets admission presents a very difficult problem indeed to tackle with.

There are specific reasons for such admissions. If this school were the only school here, strictness in admission could be observed with benefit. The school management is not yet prepared for this strictness and it

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cannot be convinced that ultimately it is paying. Such admissions have, therefore, to be made *nolens volens*. Under the class system, on the other hand, even an unfit boy can 'pull on' under cover of the whole class, but not so under any system of individual work.

(2) Khurja is a malarious place particularly during and after rains and an appreciable percentage of boys falls ill. They get backward in studies. Conferences in the usual course are of no value to such boys. Having been left behind, these boys, say 10 in every class, feel perplexed as they have to face the problem of finishing the assigned job squarely; while the very nature of instruction under 'class' system (which is 'talk a little, chalk a little, talk a little more' as a Daltonian would like to put it)—does not make them feel the poignancy of being left behind until after the annual promotion examination results. Partly for want of experience in organizing groups of boys in various stages of progress for effective work and mostly for want of studious habits among boys whose equipment from home is very meagre, this type of the backward boy has yet been a puzzle for us. Also it is not infrequent in this season that many masters proceed on sick leave at the same time. Formerly boys rejoiced to be free from masters' lessons but now they feel his absence very keenly. The laboratories have to be closed for want of 'specialists' and the planned out *T. T.* of the individual boy gets upset.

(3) The third great difficulty is the unsuitability of books. The Plan has brought home to my mind how very unsuitable the prescribed or recommended books are and how very ungraded the course is. The writer has his own scheme of grading the course

within, of course, the limitations of the departmental curriculum. But the trouble is about the supply of good books of History, Geography, Mathematics and Science in the boys' vernaculars. There are some very good books available in the English language for individual work but the Khurja boy is generally inferior in his knowledge of English to the boys in other centres of education in U. P.

(4) The requirement of the Department that a certain course ought to be finished by all boys by a certain time cuts at the very root of the plan. Ungraded and unsuitable both in quantity and quality as it is, the idea that a boy must finish it off for annual promotion examination is always at the back of his brain to tempt him to do his job by shortcuts, e.g., cramming up ready made bazaar notes. This kills the spirit for self-study at the boy's own rates of speed. It becomes difficult to judge of the genuineness or otherwise of the boy's work. Co-operation of the parent in this respect could minimise the difficulty but the parent, unlike in big centres, cannot look to his boy's work for want of English education and is consequently innocent of what his obligations are towards his son.

B. EFFORTS TO OVERCOME SOME DIFFICULTIES.

(1) A room called the 'Adjustment' Room has been the solvent of some of the difficulties in a remarkable way. The boy, backward either by reason of illness or laziness in a subject or two, makes up much of his fee-way when put in this room. A separate room where he can receive intensive help from the teachers in charge in order to adjust his work—that is an Adjustment Room.

(2) The total number of working days is 210 or thereabouts. Only 160 days are utilised

for work under the Plan, *i.e.*, for 8 Assignments. Out of the remaining 50 days, about 25 are taken up by examinations and other school activities and for 12 days boys are left to work in the old way, *i.e.*, preparation without Laboratory guidance for obtaining the balance of marks in examination paper. This balance is referred to above in connection with 'A,' 'B' or 'C' type of work.

In examination papers 'A,' 'B' or 'C' type of questions are set with the allotment of marks *corresponding to the type*. The procedure helps to smooth the way of the backward boy as well as of the boy who though not up to the mark in *all* the difficulties of the course is still required to master and reproduce them in examinations.

(3) We make our own Calendars each month of 5 weeks of 4 days each. At the end of each month we allow two days as grace days for full free study to make up for backwardness caused by the teacher's absences.

(4) The most irksome task to the teachers was the one of supplying boys with so many copies of Assignments. Printing them was out of question by reason of heavy cost. Moreover, assignments have not yet taken definite shape, and unless this is done, it would be a waste of money to get them printed. The ordinary cyclostyle press with its wheel pen was very tiring and damped teachers' spirit. The Gestetner Machine with its smooth running pen and Durotype No. 6 Stencil paper has come to our great relief. The duplication business is a separate Department under the control of a qualified teacher.

(5) Faculty committees for each subject have been formed with the senior-most

teacher as its President whose duty it is to criticise the assignments and amend them to suit the boys before they come to the Headmaster for final touches. This has led not only to a greater gradation of the assignment in one subject but to greater co-ordination between various subjects. The assignments are all the better for these faculty committees.

C. DISCIPLINE.

It was feared that there would be a pandemonium when boys would move from class to class at their free will during the Free Study periods. The fear was perhaps unfounded. Boys anxious to do their jobs cannot afford to waste their time in aimless loitering. In the beginning there were such cases, but as they have come gradually to realise what waste of time means, they are settling down to work. Unlike previously, they are all like busy bees, though humming bees. Noise has not altogether been eliminated from Laboratories. If by discipline passive listening or martinet discipline is meant, then this Plan bids adieu to such a discipline. If work is properly organised migration from class to class at any time is not distributing. As it is the transitional stage, boys in this school have been advised to work in one laboratory for a definite period before they leave for another.

HEARTENING FACTORS.

The writer is heartened by

(1) the satisfaction which is born of the feeling that the Plan gives him splendid opportunities to act as a personal friend and guide and sometimes a philosopher, too, to the boy struggling on the thorny path of knowledge,

(2) the whole-hearted devotion, loyal co-operation and the spirit of comradeship

shown by teachers in 'envisaging' facts and difficulties and avoiding pitfalls,

(3) the free hand allowed him in this matter by the management of the school,

(4) the wholesome effect that the Plan has so far produced on the pupils and teachers. Though at first the boys rejoicing in their freedom to plan their own time tables, were restless and more talkative than appeared to be desirable; yet responsibility has been gradually sobering them and they are learning to work sincerely and really hard and to do daily work according to a certain plan instead of leaving all work to be done to the last one month or two just before the annual examination. The teachers are discovering for themselves, under the pressure of having to look over individual work, time and energy-saving ways and are learning to make judicious assignments. They cannot neglect making assignments each month and this alone will not only keep up their efficiency but will enhance it. They are also realising that their relations with their pupils are getting more natural and pleasant on account of increased opportunities of personal contact.

ANDHRA UNIVERSITY EXAMINATIONS, 1929.

Intermediate Examination in Arts and Sciences.

PART I.

RS. A.

SHAKESPEARE—AS YOU LIKE IT, with Introduction and Notes, by F.W. K. Lett, M.A. 1 6

MATTHEW ARNOLD—RUGBY CHAPEL, with Introduction and Notes, by E. H. Elliot, B.A. ... 0 4

GRAY—ELEGY, and other poems, with Introduction and Notes, by E.E. Kellett, M.A. 0 12

B. A. Examination.

PART I.

SHAKESPEARE—MACBETH, with Introduction and Notes, by the Rev. J. Morrison, M.A., D.D. Re. 1-6-0 reduced to ... 1 0 (being shop-soiled)

MILTON—PARADISE LOST, Book I, with Introduction and Notes, by T. V. Arogiawamy Pillai, M.A., B.L. ... 0 6

—PARADISE LOST, Book I, with Introduction and Notes, revised by E. H. Elliot, B.A. ... 0 14

SRINIVASA VABADACHARI & CO.,
4, MOUNT ROAD, MADRAS.

THE LOSS OF PRESTIGE OF THE TEACHING PROFESSION AND THE REMEDY.

By Mr. V. RAMACHANDRAYAR, B.A., L.T.,
Govt. Muhammadan High School, Georgetown.

It is not infrequently that teachers feel that they would like to exchange their duties for those of ordinary men and drudge even as a clerk, and when one feels so, it is not always because there are weak brethren in his profession, in fact some amazingly vulgar and amazingly ignorant teachers with whom he does not wish to be classed. We must admit—even the greatest of us—that there are times when one is a little ashamed to be known as a teacher, not at all because of his daily work but because there is a tendency among people to look upon all teachers as professional members of a helpless society. These people conceive of the teacher's life "as narrow if not bigoted, as joyless and severe, censorious, rigid, inflexible in its prejudices, ignorant in its aims" which is an unfair caricature of the teaching profession at large. There are teachers who are not anti-social, who are not low in their efforts and aims; there are teachers who place their whole emphasis on a life of high ideals and due fulfilment of an ideal *Guru*. Nevertheless we must confess that the teaching profession has fallen into public disregard, that schools have decidedly lost prestige and the schools must regain culture, scholarship, character and ideals, if they are to become as effective again as they were.

There are several reasons for this loss of prestige. Freedom—independence—is the cause of the prestige of nations amongst one another and so it is in the case of teachers. That teachers are more bound than free—in school and out of it—regarding their work

for which they are paid, as well as their individual opinions, is too well-known to need any citing of illustrations here. By freedom I do not mean licence but being allowed to go on without being tied all round and pulled or dragged along. As a contrast we may mention the lawyer who may be able to enjoy the greater respect of the public even though of inferior abilities or poorer income. That is how even pitiable lawyer-politicians are applauded in their anti-teacher gibes.

The lack of a proper organization of teachers strong enough to protect its members and press forth its claims is another reason; perhaps also because the possibility of effective service with at the same time adequate salaries is so small that the finest type of men are not often enough attracted to the teaching profession, and when they do come even the best of them sometimes grow discouraged and disheartened. This means an inevitable loss of ideals—the teacher slips back intellectually, spiritually, even morally. Only the strongest can stand firm against the general down-grade tendency. Again, most of the entrants have only drifted on to the teaching profession, other departments refusing to open their doors for them and naturally they are not rated high. In constant contact with young boys and lack of association with equals in intellect and age in other society is a sure cause of their deterioration and so should I warn them to avoid it by mingling in local associations and activities and thus grow and not stunt becoming boys in mind and movements.

This defection or cutting off from other society does in turn bring on them narrowness of outlook, ignorance and a morose spirit. In consequence few know them or care to regard their opinions and so in spite of their best efforts they fail to make any impression with the people around them. Unfortunately in some, lack of scholarship and culture and the failure to make pace with times, this contented and peaceful stagnation leaves them in a lonely battle with neither the support of the public nor their notice but they are suffered to go on with profound indifference.

To add to these causes, we have the humility of the teachers themselves who are

content with the last seat anywhere or rather are shy to occupy a front row. No, this is not humility, we want the humility of pride and not of darkness and obscurity. They must be self-conscious of the dignity of their profession. Besides they must get out into the public and reach them by their speeches or writings and help the movements set afoot for the general good of the people.

One other thing is this—they think too seriously of the results of their work unlike the lawyer who is possessed with more initiative, pluck and push and the happy go-lucky spirit. These are very necessary if the lost prestige is to be regained. Adequate wages and security of tenure are also main items. In this matter, the ignorance and indifference of the public must be dispelled—not only that, they must be roused to take an active share in the direction and progress of education and be made to realise that without their co-operation their boys' education cannot become all that they desire it to be.

In conclusion, to regain its prestige the teaching profession must return to the conviction that it exists as a cultural centre of influence, a moral and intellectual dynamic. Everything that weakens its cultural greatness and moral perfection lessens its real power. We have to break away with our seemingly contented ways and assert ourselves to be useful. There must be service as well as sacrifice, work as well as wages. Yet it seems to many of us that *the supreme need of to-day is a revival of the desire for culture and scholarship, the spirit of reverence for knowledge.* The decline of these is a fearful symptom of the weakening that has set in now-a-days in the field of education. So then with this revival will increase the prestige of the schools and the teaching profession. And if we aim at real culture and character in our efforts, we need not worry ourselves about prestige. Fortunately, the consciousness of this aspect of the question has been of late growing rapidly and we may look to the future with hopes of fulfilment.

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reforms needed is the education of the child from childhood. This sort of child-training is imperatively necessary. The teachers by themselves cannot effect the reform without the willing co-operation of parents. The pious wish that such a Conference between teachers and parents will bring about the desired union necessary for the proper education of the child is the sole purpose of this Conference. All parents and others interested in education of the children, including mothers and guardians, are welcome and their presence will be valued and much appreciated.

An exhibition of children's apparatus and children's work in school will be on show.

The notice should preferably be in the vernacular of the locality and should be sent to each parent through the child attending the school. Apart from such notices, the holding of such a Conference should be thoroughly broadcast in the locality and its vicinity by means of tom-tom, wall posters, or handbills. The notice may be printed, cyclostyled, written with carbon paper, or written by teachers themselves, and circulated under the authority of the head of the institution.

INTRODUCTION.

It is a great pleasure for us teachers to see before us quite a large number of parents assembled in the school for listening to a few words of suggestions from the teacher. The ready presence of yours ensures a ready response to the call of the teacher which is the call of the child who is to be the citizen of to-morrow. It also shows the willing co-operation you extend to the teacher when he requires it. You are, by coming to this Conference, though to some extent with

detriment to your other public and private calls, doing a service for yourself, your child, the school, to the teachers and to the nation, and greatly honouring the teaching profession in particular. Even if the suggestions placed before you are of a common place nature, we believe you will surely hear them in the spirit in which they are given and do your bit in helping the teacher to solve his difficulties. This is no way intended to minimise our work and shift our responsibility on you. You will yourself see in the course of their short address that the teacher's responsibility has increased in the present circumstances. The three important problems which should engage your serious consideration are: first, the problem of child education; second, school education and home-training; and third, education of the illiterates.

Under the head of child education, we have to study the need for it, the apparatus, etc., required for the same and such other things that will naturally follow from the above. Enough has been said on the subject in my articles: 'In the Children's World' [Vide "Educational Review," January, February, August, September, 1926].

Herein I note down only some essentials which a parent has to think about and be told about. The following may be circulated to parents in the form of a leaflet:—

Leaflet No. I. Child Education.

A National Problem.

The child has a body and soul.

The child is the seed of the race.

Why then nourish only his body, why not exercise the mind?

Nature is the best educator.

Create best surroundings for learning.

Open the gates of learning—Many are the gates to learning.

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IN THE CHILDREN'S WORLD—III.

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1. Senses.

Freedom of movement, expression and play.

The need of materials.

Materials are an asset to the family.

Money spent on materials is not certainly a loss.

Materials provide opportunities for learning.

They develop the senses, the use of limbs and muscles.

The right of the child to expect a sound education at the hands of the parents.

The parent to meet the demand with good grace.

2. Imitation.

"After birth the child imitates parents and for a considerable number of years entirely depends on them for its growth."—MAHATMA GANDHI.

Parents to set a good example.

Decent language.

Sympathy towards all.

Love all children.

Establish cleanly habits.

Kindness to all men, animals, plants, etc.

Open-air walks, fresh air, exercises, etc.

3. Forming Habits.

1 Cleanliness.

9 Love all.

2 Orderliness.

10 Love for work.

3 Simplicity.

11 Beauty of things.

4 Moderation.

12 Prayer and love of God.

5 Cheerfulness.

13 Systematic daily habits.

6 Owning a fault.

14 Giving and taking.

7 Speaking truth.

15 Courage; self-help.

8 Obeying elders.

16 Perseverance.

What cannot be gained by intelligence can be compensated for by industry and perseverance.

4. Means of securing habits.

1. Example.

2 Good suggestions—Avoid always bad suggestions—The child is pliable.

3 Encouragement.

4 Interest: Creating interest and ourselves taking interest.

5 Repetition. Practice makes perfect.

6 Appreciation.

7 Punishment reduced to a minimum.

8 Avoid undue fear or too much of praise.

9 Avoid temptation.

10 Reasoning when he can be reasoned with.

11 Religious observances; going to temples, etc.

12 Taking not the slightest notice when he gets slightly injured.

5. Curiosity. Possession. Conversation.

Collection of picture-books, leaves, stamps and making an album.

Rearing plants, animals and birds.

6. Memory.

Nursery Rhymes. Prayer Songs. Stories.

7. Bodily health to be considered. Free running, walking, jumping, etc.

Special exercises are also considered necessary, e.g., pupils walking with a hunched back or belly protruded in front. Could these not be rectified by systematic exercises? Correct posture in standing, sitting, writing, reading, etc., to be taught.

8. Is this a new thing in our country?

No, it is not.

Our fathers, grandmothers, etc., practised these.

But we say, 'we have no time for all these'.

The women say, 'we are overworked'.

'A stitch in time saves nine'.

We have great pleasure in possessing a child.

We take all pains to feed it and nourish it.

It is also our primary duty to educate it.

The parent to consider the following:—

- i What is the use of this thing for my child?
- ii How shall I use that for my child?
- iii What would be the best and simple means of conveying this idea to him?

"We labour under a sort of superstition that the child has nothing to learn during the first five years of its age."—Mahatma Gandhi. Hence begin education from childhood.

Freedom and guidance.

Control to be exercised when necessary and tactfully.

9. A vital problem for the nation. Why?

Deterioration of school learning at present recognised by parent and teacher.

- i Teachers to solve it; parents to help teachers.
- ii Parents to recognise the value of education and the methods of approach to knowledge.
- iii Parents to recognise the great and sacred trust reposed in the teacher and realise his immense responsibility.
- iv Child education, if systematically carried, reduces the Elementary school course.
- v It is a great help rendered to the teacher.
- vi Education consists not only in an appeal to the head but to the hand and heart as well.
- vii Parents must view this also very seriously.

Do we not sometimes forego our food, leisure and sleep for the sake of our children?

Watch the child, study his nature, and adapt your methods to particular occasion or situation.

viii Three R's can be taught through songs, games and stories.

Shall we not then consider the value of Infant schools or creches (public nurseries for children)?

ix To those that are inspired to work in this direction the motto will and shall be—"Come, let us live *with* and *for* our children."

Other things required for child education are:—

- | | |
|---------------------------------------|-------------|
| 1. List of materials. | Leaflet II |
| 2. Work with materials. | Leaflet III |
| 3. Prayers, Rhymes, Stories. | Leaflet IV |
| 4. Scheme of work—Record of work. | " V |
| 5. The requirements of Home-training. | " VI |
| 6. Chart of good habits. | " VII |
| 7. Books for study. | " VIII |

Apart from information that could be supplied on these topics from the journals mentioned previously, I outline herein some other features which have to be considered by the parent.

Having shown you the list of apparatus, I do not want to embarrass you either with the large number of articles of their cost. If only we have the enthusiasm in us we will only too readily find a solution for making these things simple and at the same time satisfying the educational needs of our child. Here are two simple and cheap apparatus suggested for the use of children.

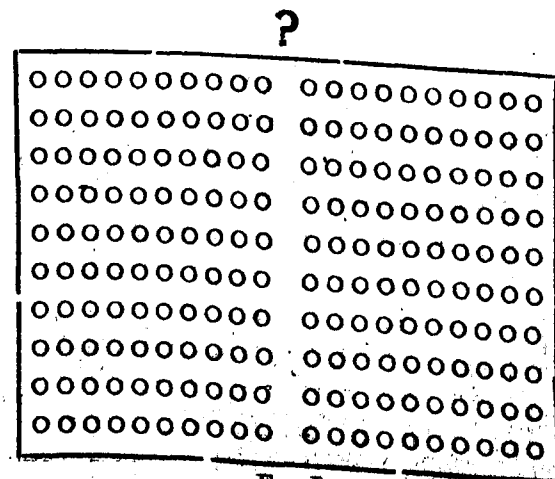


Fig. I.

Fig. I shows a model of a Balar Pallanguzhi (பாலர் பல்லாங்குழி—children's Number-board) and Fig. III shows a reed frame. Fig. II is the picture of the Pallanguzhi (பல்லாங்குழி) used in our homes and is intended to show how the first is evolved out of the second.

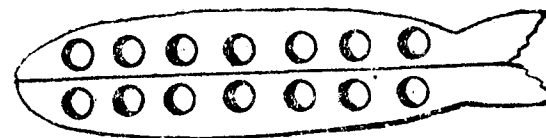


FIG. II.

The making and cost of the apparatus.

- I. i. Cardboard or paper 20" by 10" or ii. Paste paper one over the other and punch holes as in model. Paste a coloured paper underneath.
- iii. Teakwood 1-4-0. Dealwood 0-10-0.
- II. Available in all homes.

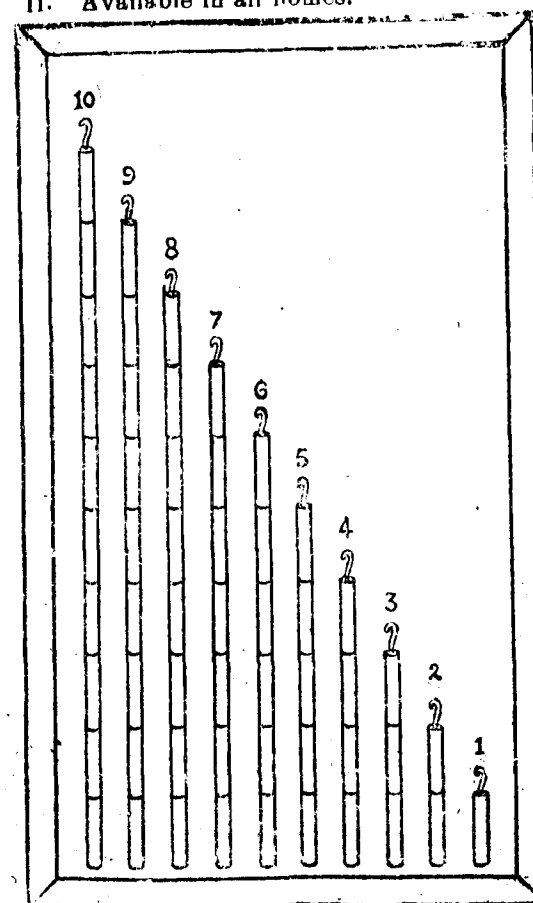


FIG. III.

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III. A kind of reed available in abundance on the banks of rivers, canals. Cut them into pieces of two inches in length each. Thread them in strings as shown above and hang them to nails fixed in a board by tying a book or bead at the end as shown in the diagram.

The use of apparatus.

- I. Free play: Fill in beads or seeds. Designs: Lead bead-laying or seed-laying on the board. The four simple rules:
 - i Counting at a stretch from 1 to 100 by first putting in seeds into holes and then counting.
 - ii Addition tables: $9+1$, $9+2$, $9+3$.
 - iii Continued addition as $6+6$, $6+6+6$.
 - iv The two forms in multiplication $4 \times 3 = 3 \times 4$ can be easily explained.
 - v Division. Share? No. of things among no. of persons?
- II. Two pieces of apparatus, the one known as long stair by Montessori, and the other known as the Folding Scale of Froebel, have been combined in one single apparatus.
 - i Free play: Compare lengths.
 - ii Designs: Any design which the child can do with these reeds.
 - iii Arrange in order of length by finding out the longest each time.
 - iv Learns Nos. 1 to 10.
 - v Relative value of all Nos. up to 10.
 - vi Simple Number exercises; (e.g.)
 - (a) What should be added to 6 to make it equal to 10.

$$\left. \begin{array}{l} (b) \ 8+7=10+5 \\ \quad 9+6=10+5 \\ \quad 9+4=10+3 \end{array} \right\} \begin{array}{l} \text{These could be} \\ \text{easily} \\ \text{illustrated.} \end{array}$$

How we could easily make a bead frame: things required are—

- i Any old frame (e.g.) a frame of an old picture or a broken slate.
- ii Ten pieces of wire (or even broomsticks) cut in equal lengths to match the frame.
- iii 100 beads of assorted colours.

The frame should be so made that the child using it can conveniently pull out the wire, thread it with beads and fix it again. This arrangement is also convenient to substitute one or two beads broken accidentally in use.

Advantages of the materials mentioned above.

- i These are so designed that it is possible to get these in each home if it believes that the education of the child begins from childhood itself and not only at the age of five.
- ii These are educative, at the same time cheap and simple.
- iii The child can learn for himself with some guidance from the parent or the teacher. The child is interested in handling things. These materials make concrete teaching possible even in villages.

(a) He can put the beads into the holes, learn the result and note the result on a piece of paper.

(b) The same is continued the next day and he verifies the result.

(c) Each table is constructed in this way and learnt by heart.

4. The greatest achievement is the memory-training given to the child which the present-day school child is sadly lacking in.

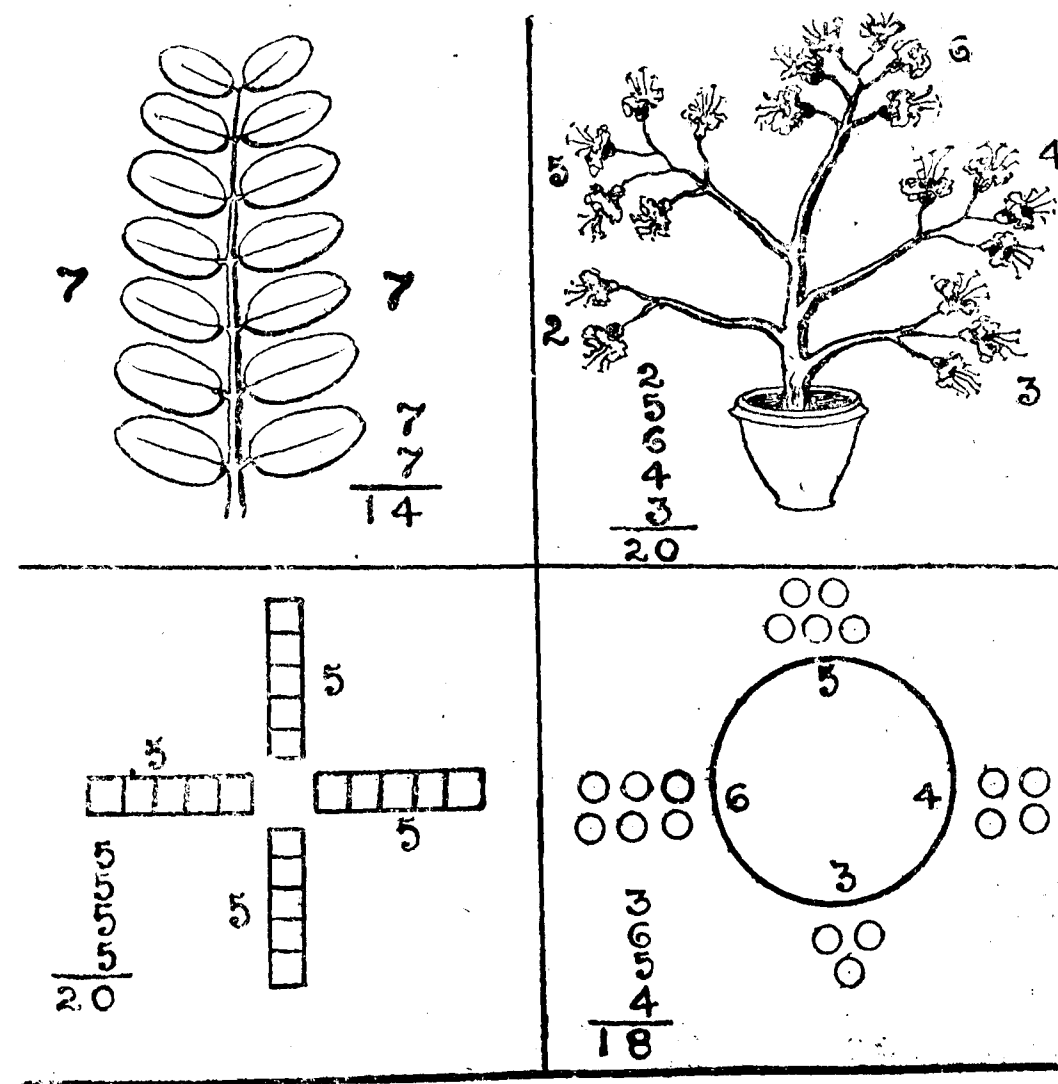
5. A great majority of children leave off school so soon as at the end of their very first school year.

(a) An education begun on the lines indicated here and consequently an interest created in the child and more than all a strong impression produced in the parent who sees his child playing and at the same time learning with these materials—all these will produce a better outlook on the educational possibilities of the child.

Hence some materials are necessary. It is open to all to make experiments in this direction, devise materials suited to the occasion and realise the great importance of this great National Problem of Child Education and its immediate bearing on Elementary education in particular.

The following diagrams show how easily we could get the idea of addition and counting formed in children even without special apparatus. Leaves, flowers, bricks, square and circular, can be used to great advantage. Some time in their open-air walks can be spent on problems like these. Do they not learn during their play here? To one interested in child education, all things seem very useful: Cardboard, rafters, pieces of wood, cloth, coloured paper, etc. The following suggestions may be useful for collecting cardboard:—

- i Old match boxes.
- ii Soap boxes.
- iii Old cardboard used in packages and bundles
- iv Old cardboard boxes wherein things come safely packed.
- v Country cardboard from weavers.
- vi Cardboard used in packing medicine bottles and medicine cases.



FIGS. IV—VII.

In writing this, I am having in my mind the children of the poor, the rich and the middle classes. Necessity is the mother of invention, that is true here. Though not assuming that we have invented a great thing, we shall at least rest content that we have tried to overcome the cost of apparatus which stands in the way of a well-intentioned parent or teacher. We are bent upon systematising child education by resorting to things which we have around us and lay the educational

foundation of our child on a stronger basis than we have till now cared to do.

I also believe that there is a good future for the child education material being made available to us at a low cost if teachers specially trained in Manual and Vocational training consider this problem seriously. By so doing, they will not only be serving themselves and their own children but also be earning the gratitude of thousands of parents and the country as well. We hope

they will respond to this call purely from a philanthropic point of view. Possessed of a scientific knowledge in the technical art of carpentry, etc., they will be better fitted to help the children in respect of making apparatus for them. The sooner they get to know of child education and its importance on general education, the earlier will they begin to concentrate their attention on the value of materials for child education.

Some writing materials are exceedingly necessary. Ordinarily we have slates, slate-pencils. A blackboard is of course costly. Here are some suggestions kindly given to me by one of my friends in the Public Works Department for converting a portion of a wall into a blackboard. I attach so much importance to this writing material inasmuch as the handwriting of our present-day pupils is far from satisfactory. Here is a quotation from the Greatest Son of India, whom we all adore and admire every day. "I am now of opinion that children must first be taught the art of drawing before learning how to write. Let the child learn his letters by observation as he does different objects, birds, etc., and let him learn handwriting only after he has learnt to draw objects. He will then write a beautifully formed hand." Opportunity should be given to the child for free-arm and free-hand drawing.

Suggestions for converting wall space into blackboard.

(1) For 10 square feet we require two measures of sifted slaked lime, one measure of charred cocoanut powder and one measure of sand.

(2) For preparing water that has to be used for mixing up these we require one palam of gam, 2 palams of myrobalan (*ambari*)

and 4 palams of jaggery for one big pot of water. Break myrobalan and mix the pieces in water the previous night. This water alone should be used throughout the construction.

(3) Take the mixture as in (1) and moisten it with water prepared as above directed and grind it fairly fine on a flat stone. (Plaster).

(4) Scrape the wall $\frac{1}{4}$ " deep, moisten the surface with this water, apply the plaster and press it down with the trowel.

(5) Smoothen the plaster with a trowel so that it may not bring on a glaze.

(6) Wipe off the exudation of water particles from the second day till the surface is dry, both morning and evening with a clean towel, and then rub the surface for about 10 minutes.

Crayons or ordinary country chalk without grit can be safely used.

A substitute for this which I suggest is this. Nail a big cardboard ($1\frac{1}{2}$ to 3 annas) and nail over it a big piece of thick black paper. Chalk may be wiped off from the paper after use and the same may repeatedly be used. The other side of this paper may be used when one side is made useless. For brushes, we can ourselves make one from the twigs of date trees and for paints or colours we can have ordinary colour powders sold in bazaars and used for colouring walls. These things may be far from the ideal but for the present we shall be content with them.

Chart of good habits. (Leaflet VII)

I believe that by hanging in the wall a chart of good habits, we shall be seeing and reminding the child. Even without our telling, the child sees these on the wall and will be prompted to correct himself and do

what is required of him. No doubt practice goes a great way in establishing good habits and this may be adopted as one of the ways of inducement and suggestion.

1. Wake up from your bed in the morning.
 2. Keep your bed in its place.
 3. Think of God.
 4. Go out—ease yourself—clean your teeth, wash your face, hands, eyes, etc.
 5. Take only what is given unto you.
 6. Play—Read—Write.
 7. Bathe—Always be clean.
 8. Eat without scattering rice here and there.
 9. It is greedy to ask for more and more.
 10. Obey your elders.
 11. Look at the beauty of things. Take care of them. It is sin to break them, cut or tear them.
 12. Own your fault.
 13. A small quarrel ends in a big one.
 14. Mind your work. Help your mother and others.
 15. Give alms to beggars. Have pity on them.
- [God will be pleased with you, if you do all things as above directed].
16. Say your prayer songs, and then go to bed.

Note.—It may not be possible for the child to observe all the rules in a day, but the appeal to God is very strong in the child. 'God will be pleased with you if you do these things correctly'—acts as a great force in the child.

Books for Study.

1. The Supreme Art of bringing up Children—M. R. Hopkinson.
2. Pamphlets by the League of Parents and Teachers—Y.M.I.A., Madras.

3. Child-Training—People's Library.
4. Kindergarten Teaching at Home—People's Library.
5. Child Training through Kindergarten Methods—C.L.S. Book Depôt, Madras.
6. The Child at School—L. Mackenzie.

SOME REMARKS.

1. Putting the child to school.

At what age do we generally put the child to school? Ordinarily we do it when the child is in his fifth year or at least before he completes his fifth year. Generally we celebrate the first school-day of the child surrounded by our relations and friends while the family Priest acts as the *Guru* to the child. It is a day of rejoicing in the house and especially to that child who is put to school. We shall not leave this traditional custom inasmuch as we want our child to learn the traditional customs and the significance of this ceremony, notwithstanding the good auspices under which the education of the child is begun and under the benedictions of his elders and well-wishers.

The chanting of the sacred line

हरिः ओं नमो नारायणाय विद्मः

is highly inspiring and beneficial to the child. Then proceeds the learning of the alphabet. I like that the finishing stroke of the child-education course should be given in the above manner and thenceforth the child learns by the alphabetic method. Till now he has learnt words and short sentences through 'the picture, story and song method' and there may be some letters that might have been omitted. The learning of the alphabet completes the previous learning and I always wish that in each Primer and First Reader the alphabet should respectively appear on the

last and first pages. The latter observation is worth the attention of text-book writers. The child now sees the order and arrangement of the letters of the alphabet already mastered by him. He is no more an infant class pupil but something more than that.

If we say that the child is put into school in his fifth year, how should we then view the Nursery schools. I believe they are necessary if the home cannot undertake to do the task of educating the child from childhood. The next question is whether the child can go to school even as early as his 4th year or still earlier? Yes, there are possibilities of doing it if the school is situated near the home and proper arrangements are made in the school for bringing the child to the school and taking him home again when he needs it. I here quote a few lines by Sir Leslie Mackenzie from his book 'The Child at School': "The age of three is not too early to begin school, if the school provided is of the right type. Such a school equipped in the ways now understood in all good Nursery schools, Kindergartens, and other allied schools, offers to the child an environment more adequate for the organisation of his impulses towards life in a community than the casual life of the streets or the unsupervised life of the back-counts. But even if everything that we can properly term education of the intelligence is left out of the reckoning, there is still a case for bringing the children together for some period of the day. It is a way of offering to the child something that adult companionship cannot bestow."

Even if this pertains to Scottish children, we can seriously ponder over the problem of founding Nursery schools in the light of the remark quoted above.

Some facts about the child.

The teacher or the parent has to take notice of some facts about child-nature; a few of them are:

1. There is a stage in the growth of the child when he asks for stories, when he shows an aversion to reading from a printed book, but likes to see pictures only, and only later on develops an inclination to read from printed books.

2. That number lessons come to him long after his language lessons. In number work first of all he counts rapidly in hot haste irrespective of the number of objects before him, but only after guidance, repetition and experience he points to each thing and counts.

3. Sometimes he likes to be sitting at his book, at some other time at writing on the blackboard, and at some other times at playing with his materials. He likes to be left to himself for a major portion of the day. There are a number of things he sees for himself and tries himself in his free play and it is as important for him for the development of his mind and physique as food and water are.

4. Even in his free play we can approach him provided we act as a child.

5. That the usual goading of the child to read and write produces an aversion to reading and writing. Sufficient inducement has to be shown by creating interest before he is asked to do a piece of work. Therefore we ourselves have to sit with him, watch him doing things, encourage him and offer suggestions when necessary. When he is in this attitude for work, he will do anything we bid him do.

6. That in so sitting with him if we are ourselves tired, it is better to leave him alone and let us mind our own business. Let us

not get irritated and use such indecent expressions as 'I will kick you, beat you, kill you to death,' etc. Though we do not intend anything seriously, it produces a bad impression in the child and as the spirit of imitation is strong in him, he may himself use these expressions towards anybody. We would only then repent the mischief done by ourselves.

7. That in playing with the materials given, the child may indeed overlook some and take a fancy for some. Hence one form of record would be to keep a list of materials and to note down the days on which they are used. The materials not at all handled by the child should be presented to him in a manner which would attract him.

"Happy is the child who is enabled to spend his early years in the home where affection exists and is dispensed with discrimination, where co-operation and self-reliance are equally fostered, where kindness and good-will prevail against impulsive self-will and where the personal patterns of conduct are an inspiration."

Let me now conclude this part of the talk, namely, child education in the following words of Froebel:—"Oh Parents! Let us see that our children get what is wanting in ourselves. Let that creative, life-giving force which we lack be transferred from their lives into ours. Let us learn from our children; let us heed the gentle monitions of their lives, the tacit demands of their minds. Let us live for our children. Then will their lives bring us peace and joy, then shall we ourselves begin to grow into wisdom."

II. SCHOOL AND HOME-TRAINING.

Restore the teacher to his honoured position.

The most important problem that all of us have to consider is the problem of the

teacher. Everyone concedes to the fact that the teacher is the soul of any reform in the general educational policy and hence his position has to be surveyed first and foremost. Though no doubt this problem rests entirely on ourselves, our organisation, co-operation and devotion to work, yet without the hearty and willing co-operation of the parents who reap the best fruits of our work, this has been brought to the notice of this Conference. We have to view the present position of the teacher from three different aspects, namely, (1) the position of the teacher in ancient days, (2) in the days that succeeded the good old days, and then coming to the teacher of the pial school or the village schoolmaster as he is very often called.

(1) *The teacher of the ancient days.*

He was revered by princes and people alike. The children sat under his feet and learnt their lessons. They looked after the household of the teacher and they themselves begged for their food from door to door. Service to their *Guru* was their motto. The children and the teacher moved closely together and one side looked after the interests and welfare of the other side. The teacher had nothing to be anxious for in so far as his living and income were concerned. The princes and people contributed their mite, the teacher was always placed much above his wants. He was a whole-timed worker. No palatial buildings nor costly equipment were considered necessary. Not even text-books were in vogue then. They learnt by repeating after the teacher and writing was done on palm leaves. The teacher led a life of simple living, plain speaking and high thinking, and he was the embodiment of virtue itself and hence the

youths had before them a living example to follow and imitate.

(2) *The next order of teachers: village teachers.*

He was the Jack of all trades. He was the village astrologer, parohit, writer of documents, interpreter of letters, accounts, etc. A knowledge of all these enabled him to assume the position which his ancestor held. The parents and all the villagers looked after the welfare of the teacher and his family. His income consisted of the produce of a common plot of land apportioned in the village in the name of the village teacher and this was sometimes hereditary. When a separate plot is set apart for the teacher, the parents gave the teacher grain and all household articles, a quantity sufficient for a year as soon as the harvest was over. Just previous to all festival days the parents brought to him extra presents in the shape of rice, paddy, oil, fruits and vegetables, and clothing included. The children were eager to see that their parents presented the teacher with something or other. Hence the teacher had nothing to care for in so far as his living was concerned.

Here again the teacher was a whole-timed worker and the children spent almost the whole day in his house. The contact between the teacher and the pupil was very great and the co-operation between the teacher and the parents was really conducive to the welfare of all the three, namely, parent, child and teacher. No costly building nor any appliances were considered necessary and the learning was conducted by the method of rote, i. e., repeating after the teacher. Writing again was done on palm leaves. The motto of the teacher here was exactly similar to that of his ancestor. The children had a

great regard to him when they grew up and cherished in their hearts the great benefit they gained in their youth.

There are some striking features in the above two types which we have to consider well.

1. The teacher was held in great estimation.
2. He was kept above want.
3. He was a whole-timed worker and the contact between the parent and the teacher, and again the teacher and the child, was remarkable. The children loved service to the Guru.
4. The parents had always considered the question of child education as a great preparation for their education under a teacher and this prepared the way for a successful school education.

A third type of teacher.

A third type grew up from the second and these received the same consideration at the hands of the parents as the above two types of teachers received. But they always respected punishments more than their personality as a great factor in the shaping of the education of the individual. Their methods did not attract children and the children contracted a great fear to the teacher and an aversion to school studies. But now the times have considerably changed, the outlook of the teachers is broadening. They are awake to the new changes. Such old types of teachers are either remodelling themselves in the light of the present requirements or are gradually fading away. But the teachers as a whole had been maintained by the villagers and they shared in the first fruits of the harvest. They had a place of honour in the house of the parents during marriages, festivals, etc.

The teacher of the present-day.

We can speak to you about the glory of the past and the present position needs no elaborate survey. You are seeing the school condition of the teacher. His responsibility has not ceased, on the other hand he has increased responsibilities to shoulder. His service has been pronounced to be noble and sacred. People realise that he should be given a living age. Thus he has secured a lip sympathy which is yet to find its way in practice. But there are signs to show that his position will be made more secure than at present. So if each one of you considers the sacredness of the work we are turning out and the extent of the benefit you are deriving, you would all go away with the sincere wish of doing your best in restoring the teacher to the position of honour he once occupied and in ameliorating his present condition.

Faith and Trust in the teacher essential.

Having once secured the services of the teacher, you have to lay faith and trust in him. He has to deal with not four or five but thirty or forty children of various ages, abilities and temperament, at the same time caring for the progress of each child. A parent of four or five young children can only realise the responsibility of the teacher. He has to be always attentive to the needs of his children. Individual attention has become a deep concern with the present-day teachers and they are endeavouring to concert measures so as to secure the progress of each individual on lines suited to the respective child. In this we have to see that one factor we have all neglected is the proper home-training for the child.

The doctor and the teacher compared.

Let us look at the case of a doctor. When we go in for the services of a doctor we all ascertain beforehand whether he is a successful practitioner of long standing repute, whether he is kind and sympathetic and whether by going to him the patient is invariably restored to his proper health. These are some of the qualifications which we expect the doctor to possess. But what about the child's teacher? Anybody and everybody can pass off for a teacher or still a picture tutor. But a sound judgment requires that the teacher should possess also a training in the art of teaching. The teaching has developed into a great science. No doubt there are exceptions in each case. Men of great experience with children are really born teachers. But in a generality of cases a certain amount of training for a teacher is necessary if he should prove to be a successful teacher. Does the doctor always remain with the patient? He examines the patient, prescribes medicines and gives the necessary instructions. Are not the relatives and those that attend upon the patient to take the particular care, to give the proper diet, the necessary encouragement, the physical and mental rest, etc.? Though in the case of the teacher, he can remain with the child much longer, still at the same time he should be viewed as a friend and guide of the child and of the parents as well. In the lower classes it is extremely necessary that the parent should keep in close touch with the child, the teacher and school-work.

Absence of memory-training and the need for practical training.

Two factors that should be emphasised in the new education are (1) the absence of

memory-training which we were once famous for and (2) the requirement of practical training. So one thing is really old and the other thing is new. In keeping with the development of these two features, I lay emphasis on a practical training for the child as outlined already and equally so a good memory training. Why is the latter ignored? Not for the fact that memory training is devised by the modern educational science, that our children lack in it, but for the fact that the home neglected it. If the child training had been proceeded on lines chalked out as above, the child would have cultivated a general aptitude for memorising even without the admonition or the praise of the teacher.

A drawback of the old training was the lack of practical training. There was more mechanical training in the place of a combined mechanical and practical training. So this practical training has taken the form of occupations or 'hand and eye-training' in child-training. So also in school every item in Arithmetic has been made to have an actual bearing on the practical side of life. Our lot has been to blend the new with the old.

The over-crowding of the School Curriculum.

It is a complaint levelled against the present educational system that too much attention is diverted towards the teaching of a great number of subjects other than the Three R's. A number of teachers also share in levelling this complaint. At the outset it must be mentioned that the Three R's should and must receive the greatest attention at the hands of teachers. The teaching of the other subjects will only supplement the knowledge gained in the Three R's and are also taught in

relation to the Three R's. The several reasons why the other subjects are taught are due to the following:—

(1) *Nature-Study.*

It is a subject that trains the powers of observation and thinking. By the teaching of this subject the children learn to admire the beauty of Nature and evince a great interest in things abroad. More than that it creates a great love for the Creator. There is room for language training and increasing the powers of expression. Old Nature myths and fables and stories have also a place in the teaching of this subject.

(2) *History.*

If we want to train our youths in the love of our country and evince an abiding interest in the past history of our country and continue to grow that interest, it cannot but be done by telling them some striking stories from the lives of the illustrious sons and daughters who played their noble parts in the history of our country, whether as kings, warriors or statesmen.

(3) *Geography.*

Geography of one's own country is highly essential to understand the actual work of man in its various aspects, industrial, commercial and economic, and the great service man is doing towards his brethren in this land and other lands as well.

(4) *Hand and Eye-training.*

That we should infuse in children the dignity of labour is one great motto in including this subject in the course of studies, as well as to give our children a training in hand and eye. Do we not certainly chide our children when they are not able to hit a nail, light a lamp or to use any tool for any simple repair in the household? It is also the

means of teaching children to understand how best they could use the several things around them in the best possible manner and, as to be of use to his home.

(5) *Physical Education.*

It is an admitted fact that our children are extremely weak and that we do not see in our children the great power of endurance which we inherited. Though this closely touches the problem of proper feeding and proper nourishment of children, yet the fact that physical education should go hand in hand with mental and moral education cannot be lost sight of. A sound body has a sound mind. If only those who are placed in affluent circumstances take to heart to help the children of the school, the problem of under-feeding can be solved to some extent.

(6) *Moral Instruction.*

We are also aware of the way in which our children grow irreligious and contract bad habits. In order to infuse in them such a spirit, we give them stories from Puranas, etc., to make them acquire better qualities of head and heart than they now possess and exhibit these qualities in actual life. A training in Scouting is intended towards the fulfilment of the above object. An appeal to the inner consciousness is extremely necessary more than the appeal to the outer frame. The latter deals

with the administering of punishments which I deal with later on.

(7) *Gardening.*

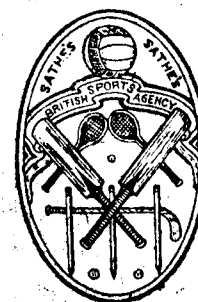
This is taught in schools to make children respect the kitchen-garden and restore it to the position which it once held in all homes in our country. Here again there is self-help and self-learning and appreciation of Nature. Ours being an agricultural country, we should not lose sight of the value of these gardens. Our children think so low of manual labour that they will not stoop to handle the spade in their after-life. On the other hand, there should grow great respect for manual work.

(8) *English.*

This is the last subject in my category. English has come to stay in our country and it is now the *lingua franca* of the whole world including our country. It is the language of the State, court and administrators. Moreover no profession pays any one if he does not possess a working knowledge of English. Many of the parents do like to see their children get hold of a few English expressions and speak in English.

[But there are some difficulties in the way which would be detailed elsewhere]. So you see that the teacher has to face so many problems in his teaching.]

(To be continued.)



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Reviews and Notices

ESSAYS BY WILLIAM HAZLITT, BEING A COLLECTION OF TWENTY ESSAYS, EDITED BY G. E. HOLLINGWORTH, M.A. (LONDON: UNIVERSITY TUTORIAL PRESS). Pp. xv + 280. Price 3s. 6d.

This is an edition of twenty well-known essays from Hazlitt, intended for pupils going up for the London Matriculation. Obviously, this is a re-issue of the same essays originally edited by A. J. Wyatt, in 1925. The writing of 'Notes' for books prescribed for examinations is apparently as popular in England as in India. English editors are also up to giving meanings of simple words: 'wanting: being without.' (Page 235.)

ENGLISH LITERATURE SERIES: SELECTIONS FROM COBBETT'S 'RURAL RIDES,' EDITED WITH AN INTRODUCTION BY GUY BOAS. (MACMILLAN & CO.) Pp. xiii + 152. Price 1s. 9d.

We welcome this book of selections from a famous book of English prose: "Rural Rides," published in 1830, has to be lightened considerably, as in the present form, before it can be well appreciated by young students of literature.

VERSE COMPOSITION FOR CHILDREN, BY HONOR DRURY. (G. G. HARRAP & CO., LTD.) Pp. 86. Price 2s. 6d.

This is an excellently got-up little book and it is a novel kind of a book also. The author writes with five years' experience in teaching verse-making and feels very hopeful about it. There are chapters on Rhythm, Iambic and Trochaic movements, colour and sound and other useful topics. There are also appendices of poetical productions by children.

DAYS BEFORE HISTORY, BY H. R. HALL (GEORGE G. HARRAP AND CO., LTD.) Pp. 159. Price 2s.

This is the 2nd and revised edition of the original edition of 1906 which includes six chapters written for the enlarged edition of 1908. The

narrative takes the form of Uncle John reading to Joe and David, and Dick, three boys of a suburb near London, reading to them the story of Tig, a boy of the pre-historic age and how he lived with his mother Gopa, of the life of the people in that age, how Tig grew up and came to use bows and arrows, how men hunted animals with rude weapons of flint, arrows, spears and axes, and how pottery was made and so on. We are shown how the boys Dick and his companions tried to build a hut and made pottery similar to the work of those far off primitive peoples, and also a dug-out. This is an interesting device for making children take some zest in getting to know the lives of primitive folk and how they lived and grew to be gradually civilised. The story is done in very simple English and is illustrated with numerous figures of old flints, weapons and utensils, fights and hunts of those folk, etc.

A SHORT HISTORY OF CEYLON, BY H. W. CODRINGTON, CEYLON CIVIL SERVICE, WITH A CHAPTER ON ARCHAEOLOGY, BY A. M. HOCART, WITH MAPS AND ILLUSTRATIONS. (MACMILLAN AND CO., LTD. 1926). pp. xxii & 202. Price Rs. 2.8.0.

This manual traces for the benefit of the students of schools and colleges the history of Ceylon from the beginnings, i.e., its conversion to Buddhism, down to about 1833 when the present system of British rule might be said to have been created. The union of the whole Island under British rule was the first achieved since the early part of the 13th century. The narrative seems to be too full of compressed matter, rather hard to assimilate by a beginner, but nevertheless of sustained interest throughout. From the days of the traditional King Vijaya descended from princesses of Vanga and Kalinga and a Sinha of Lada (this is disputed now) the history is given in a connected form. Of course the story of Vijaya's ancestry might well point to two streams of immigration, one from the western and the other from the eastern side of India; and on account of the manifest desire to connect the early history of Ceylon with that of the Buddha, the

reigns of Vijaya and his four successors are extended over the incredibly long period of 236 years.

Devanapó Tissa (B. C. 247—207) saw the real conversion of the country to Buddhism. Elāra was a Tamil conqueror after Tissa. Datta Gāmani who slew Elāra was the next heroic figure of Sinhalese history, "the expeller of the foreigner and the restorer of the national religion." The hill of Sīgiriya (Sinhagiri) noted for its frescoes was the capital of the rebel Kassapa (sixth century A. D.) During the mediæval period there was the steady colonisation of the Island in the north and east by the Tamils, due as much to peaceful penetration as to war, as well as the periodical recrudescence of Mahayanist forms of Buddhism which in particular was rooted in the Abhayagiri community.

Chola invasions rent the country for a time; while the Velakkara mercenaries, unwilling to fight their Tamil kinsmen, created trouble for the national leaders. Parakrama Bahu the Great (A. D. 1153 to 1186) was great alike in peace and in war; but strong as he was, he had to employ Tamil soldiers.

The story of the later kings is one of decline, marked by the usurping Kalinga kings, Portuguese conquest made on the crumbling ruins of the Sitawaka realm. The merits and demerits of the Portuguese government had largely been the cause of the Dutch occupation of the Island which lasted from 1656 to 1796. The British occupation of the country and the creation of an efficient system of administration are the last topics dealt with by the author, who gives a note on the Ceylon chronology at the beginning, authorities at the end of each chapter, and the administration as it was, with each epoch. Details are furnished even with regard to such matters as land-tenure, military organisation and equipment, the Portuguese and Dutch systems of rule, etc.

The last chapter is devoted to archaeology and deals in the bulk with Buddhist remains. Specimens

of monuments of the Dravidian style are also given, as well as the irrigation works for which the country has always been noted. Maps are given for each of the more important periods, including Ptolemy's Taprobane, and the illustrations are well chosen. The manual should be one which every student of Indian and Ceylonese history should possess.

THE ANNALS OF THE BHANDARKAR INSTITUTE, 1926-27, VOL. VIII. No. 3.

This number begins with a long article by Prof. F. Edgerton of the Yale University (U. S. A.) on the hour of death and its importance for man's future fate in Hindu and in Western religions. We all believe, in a more or less accepted degree, that the future fate of man depends in some specially intimate way upon the time or place of his death, or upon his state of mind at death. The writer notices the amount of recognition in religious literature that the notions have received, especially the dying state of mind, dying wishes, the *nidāna* in Jainism, the earnest wish in Buddhism, the dying state of mind in Christianity, Judaism and Zoroastrianism; and also the place and time of death in all these religions.

Prof. M. T. Patwardhan writes on Persian Prosody, its derivation from the Arabic system, its metres, its *Rafīya* (rhyming), and its complex character. Mr. H. R. Bengeri has an essay upon the literature and services of the Kannada *Dāsa-Kūta* (*Bhakti-Panthi*) to religion and literature and upon the succession of Dasas from the time of Narahavi Tirtha, Sripada Raya and Vyasa Raya down to the present time, laying special stress on the greatness of Purandara Dasa. Dr. S. K. Belyalkar of Poona translates M. Senart's Introduction to the French translation of the Bhagavad Gita—which is a 'glowing focus' of the religious spirit of India. An obituary sketch of the late Mahamahopadhyaya T. Ganapati Sastri of Trivandrum who has done so much for the Trivandrum Sanskrit Series, by an admirer, Mr. V. B. E. Dilekatar, completes the number

with a few miscellanea among which are notes on the historical position of Namdeva I and on a work on Arthasastra by Madhusudana Sarasvati.

PRACTICAL LESSONS IN ELEMENTARY SCIENCE FOR FORM I, IN TAMIL, BY M. S. SUBRAMANIAN, ASST-MASTER, HINDU SECONDARY SCHOOL, VIRAVALLUR. (A. R. V. PRESS, TRIVANDRUM). Price 10 as.

This book, as stated in the Preface, has been written in conformity with the Government Syllabus for Form I, and the treatment of the subject is calculated to train the pupils' powers of observation and foster in them the inquiring attitude and the desire to learn. Written in a lucid and simple style with a terminology not hard to understand and the teaching based on simple experiments with inexpensive apparatus or recalling the daily observations of pupils, the book is bound to be a useful addition to those already in the field. It is gratifying to find attention paid to moral science here and there. And more of this in a subsequent edition will add to the value of the book especially for village schools.

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MADRAS UNIVERSITY LIBRARY: The number of readers and the number of books issued during the month of April 1927, were 2751 and 4196 respectively. The corresponding figures for the last year were 1837 and 2958.

EGMORE, } S. B. RANGANATHAN,
1st May 27. } Librarian.

The Educational Review

The College and University teachers of Bengal have recently formed themselves into an organisation and have just had a successful Conference under the presidency of Prof. S. Radhakrishnan of the University of Calcutta. Prof. Radhakrishnan's address dealt mainly with ideals of University education and the reform of the Calcutta University which has been a matter of controversy for some time. We are in substantial agreement with Prof. Radhakrishnan's remarks, particularly those relating to the part to be played by educationists in the control of academic matters. Prof. Radhakrishnan said:

"While a great and progressive University should be in active touch with the life of the nation, we have to remember that it exists primarily for the advancement of learning and research. It should therefore consist of a majority of academic representatives. They will be quite competent to deal with administrative questions. The idea that academic men are not suited for administrative work is peculiar to our country. So far as I know, the Universities of Great Britain and America are controlled by academic men. As a corporation of learning, the University should be under the authoritative direction of experts."

We have always been of this opinion and we are glad to find Prof. Radhakrishnan speaking so strongly in support

of this view, with his recent knowledge and experience of the Universities of Great Britain and America. This view cannot be over-emphasised, as with the recent 'reform' of our Universities, there has been a tendency to introduce too much of the democratic element into them and considerable injury has been inflicted on academic efficiency as a consequence. Prof. Radhakrishnan also pleaded for the 'reform' of the Calcutta University. Thanks to the efforts of Prof. Jadunath Sarkar, the new Vice-Chancellor, something has already been done in the direction, but still considerable headway has to be made before satisfactory results can be achieved and the University of Calcutta can occupy the position of importance which it aspires to occupy among the Universities of India.

We are surprised the Government of India should have thought it necessary to appoint a Committee of

Enquiry into the financial condition and needs of the University of Delhi. In spite of the establishment of the University at the Imperial capital, it has received very poor financial support from the Government, and it is amusing to find that instead of giving it adequate financial support, it is giving it a Committee of Enquiry, as if it had mis-spent the large grants made by the Government of India. Verily, the University asked for bread and is being given stone! We are however hoping that the Government of India will realise, as the

result of the enquiry, that very much more money is needed to work and maintain the University. The organisation of a modern University with any attempt at academic efficiency and the advancement of the cause of learning is such an expensive affair that one can easily appreciate the difficulties in which the University has found itself. The establishment of cheap and ineffective Universities has gone on to such an extent in the country in recent years that the time has come to protest against the further organisation of such institutions and insist on the strengthening and consolidation of the existing ones.

The opening of adequate facilities for military service to the youth of our country is a matter in which educationists are as deeply interested as politicians. One of the most effective stimulants for the enrichment of educational life is the opening up of diverse careers to the products of our educational institutions. The publication of the Skeen Committee's Report has been welcomed very widely in India by people of all shades of opinion, in so far as it recommends the further Indianisation of the army and the opening up of additional facilities for military education and service in the country. When reports of Commissions have been condemned by Indians as reactionary and injurious to the best interests of the country, Government has always been actuated by indecent hurry to give effect to the recommendations. But now that a Committee by an acci-

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dent has made recommendations which have met with wide favour, the Government is showing not only strange reluctance in giving effect to the recommendations, but is actually putting all kinds of obstacles in the path! Sir Sivaswami Iyer, who is a great believer in the advantages of the British connection and who cannot be suspected of any want of political sobriety, has welcomed the recommendations of the Committee in the current number of the *Indian Review*. He singles out for special appreciation two recommendations of the Committee: that the commissions to be granted to Indians should be identical with the commissions granted in England and that the young cadets should be attached to British units either in England or in India for the period of one year for purposes of training. We are afraid the Indian public has not yet bestirred itself sufficiently in the matter and we hope that sufficient pressure will be brought to bear on the Government of India to see that the report is not practically nullified either by inaction, or by very partial and meagre execution.

We are glad to find the Government of Madras has taken some action in the matter of financial grants to public libraries. The following order has been issued in the Educational Department:—

"A provision of Rs. 10,000 has been made under "31-E. d. Education—General—Miscellaneous—Grants-in-Aid—Miscellaneous—Non-recurring" in the

[APRIL 1927.]

Civil Budget Estimate for 1927-28 for grants to local bodies for the maintenance of public libraries. The conditions laid down in G.O. No. 689, Law (Education), dated 23rd April 1926, should be observed in the distribution of the grants.

"Local bodies having public libraries under their direct or indirect control are requested to submit applications to Government through the Director of Public Instruction showing (1) a statement of the charges involved; (2) the amount spent out of the grant, if any, distributed as per G. O. No. 2313, Law and Education, dated 16th December 1926; (3) the amount of the unspent balance of the above grant, if any, at their disposal; (4) the amount they are prepared to spend from their own funds; and (5) the amounts of grant required from the Government.

"Private associations having public libraries in their charge should submit their applications to the local bodies concerned who will scrutinize them and forward such as are deserving of support to Government through the Director of Public Instruction with information similar to that required in the case of libraries under local bodies. The applications should reach the Director of Public Instruction before the 15th July next.

"The Director is requested to tabulate the applications received and submit them to Government in a consolidated form with his recommendations."

Ten thousand rupees is not a large sum for grants to public libraries for a whole

year, but one has to feel thankful even for these small advances.

Prof. M. R. Paranjpye of the New College, Poona, an ardent worker in the cause of educational reform in the Bombay

The Tyranny of Text-Book Committees.

Presidency, has just issued a pamphlet on a matter of vital interest to the educational organisation of our schools. Owing apparently to the action of some unsympathetic officers of the Educational Department of the Presidency, there has been trouble in the matter of text-books prescribed for use in schools. Prof. Paranjpye's pamphlet is intended to be an indictment of the Text-Book Committee and the unsatisfactory nature of its work. The remedy he suggests is that Headmasters of schools should be given complete freedom in the choice of books for use in schools and the department should have only a power of veto. Not being sufficiently familiar with the details of the Text-Book Committee's work in the Bombay Presidency, we are not in a position to enter into any elaborate discussion of the matter, but we take it that Prof. Paranjpye's statement of the case is substantially correct. We regret however we are not in a position, at the same time, to accord our unqualified approval to the remedy proposed by him. An expert Committee of educationists can be expected to be more unerring in its judgment than the individual Headmaster, and one feels safer in the hands of such a body. If the constitution of a Text-Book Committee is

defective, it would seem more proper to revise it than end it altogether and entrust its valuable work to the Headmasters themselves. A sufficiently large proportion of non-official teachers, elected by Headmasters, if need be, should be a satisfactory solution. We have always been supporters of freedom in education, but even at the risk of being looked upon as reactionary, we are bound to state that Indian schools are not sufficiently advanced to dispense with departmental Text-Book Committees altogether. The recognition of a very large number of books by the Text-Book Committee, with liberty for Headmasters to choose from, is another reform which should also help in the solution of the trouble.

The proposal to start a School of Journalism in connection with the University of Madras is one which deserves to be welcomed. Many of the advanced countries of the West have institutions for the regular teaching of journalism, and conditions have advanced sufficiently even in India for the serious consideration of a similar step. Madras is a suitable centre for the purpose, as the standard of English is higher there than in any other University in India, and Madrassis already enjoy a high reputation for ability in journalism all over India. If the institution is to materialise, it will of course, have to be worked in close association with the newspapers and the journals in Madras. The School of Journalism at the London

University has attempted such close co-operation between the theory and practice of journalism with much success, and we have no doubt that similar results can be anticipated in Madras. Journalism is still in the growing stage in this country and considerable headway will have to be made before our newspapers and journals can rise to the high level of efficiency observed in the West. An ill-conducted journal or newspaper is more a curse than a blessing to a country and regular training should prevent the existence of such organs. We hope the authorities of the University will take early steps in the matter and the Government will appreciate the proposal and help the enterprise with special grants.

Celebrations have been held all over the country during this month in honour of the tercentenary of Sivaji's

The Sivaji Tercentenary.

birth. It is fitting that the memory of great national heroes should be kept alive and no country can hope to achieve great things if it forgets the achievements of the illustrious dead. Owing to the misrepresentations of foreign historians, our children have not had till recently even the chance of appreciating the greatness of some of our ancestors in their historical studies at school and college. Now that many of the misrepresentations of foreign historians have been cleared and Indian scholars of history have been able to draw special attention to the achievements of India in the past, a regular feature in the teaching of history in our schools should be the training of children in the noblest

lessons of patriotism. Celebrations of this kind serve a useful purpose from the educational stand-point and should go a long way in supplementing the work of the school-room in this direction. We should however sound a note of warning against the teaching of a narrow patriotism obscuring truth and encouraging national exclusiveness from which India has already suffered enough in the past. After all, the interests of truth are higher than those of even patriotism, though there is of course no necessary conflict always between the two.

Teachers of English in our schools and colleges will feel particularly interested in a new publication, *Pomona or the Future of English*, by Basil de Sélincourt (Kegan Paul), in which the writer discusses very ably the essential genius of the English language in comparison and contrast with other languages like French. It is an interesting attempt at connecting the qualities of the language with the genius of the race and affords vivid insight into the English mind and also enables the student to appreciate the peculiarities of English style. It is possible all the detailed expressions of opinions will not command general approval, but Mr. Sélincourt's conclusions are essentially sound. According to him, the English or Anglo-Saxon temperament has from the first been equally remarkable for its "absorptiveness and its idiosyncrasy." The genius of the language has qualities of modesty, deliberation, and mingled with it tolerance, humour and common sense. "All these qualities have passed into the language which has great diversity in its contacts, an admirable economy in its mechanism. It is a comprehensive, a hospitable, pliable language; it is full of inconsistencies, yet it works." There are some penetrating observations on the intimate con-

nection between race and language and it is no exaggeration to say that "race and language stand or fall together." The English have certainly shown themselves in the past to be a people who could live and let live; as the possessors of this rare virtue, they now find themselves living everywhere; but how shall words which have been formed on the lips of the inhabitants of a small island in a soft misty climate, express the lives of men whose homes are the continents of the world and to whom nature is revealed in all her grandiose extremes of heat and cold, drought and flood, bounty and bareness? The birds of the moor and the woodland do not speak alike; they say the same things, it may be, but their tone they borrow from their habitat; and the languages of men have a similar reflectiveness. In Celtic, with its tenderness and wild glamour, we feel the mountain and the valley, the rocks and the rain; in the mellow vowels of the Italian the blue of the Mediterranean and its cloudless skies." We are not sure if Mr. Sélincourt is particularly happy in his remark: "English, it would appear, resembles rather the chirping of the sparrow—a noise capable of following men wherever they go and echoing under any roof with which they protect themselves from the elements." The simile of a sparrow hardly does justice to the strength and power of the English language, though its admirable adaptability to changing conditions is adequately indicated by the description. We are told that the language has "a faculty of almost brutish accommodation, attracts indolence, ignores discomfort and thrives in the absence of the graces." We commend the volume to all those interested in the English language.

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Education (Allahabad), March 1925.

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The Madras Christian College Magazine, January 1926.

The study of child-nature is exceedingly important for both of the sciences of Psychology and Education. Its importance for Psychology is from the genetic point of view. In the child one is able to observe in simpler forms many of the processes at work which in adult experience become so complex as to make them difficult of analysis. Its importance for Education is too obvious to need extended notice, and yet there are some who are so short-sighted as to neglect it. Here in South India there are a great number of schools in charge of teachers who do not know the elementary facts about child-nature. But with the progress of education the time will surely come when it will be considered as dangerous to employ a teacher who is ignorant of child-nature as it is to employ a man for a physician who knows nothing of anatomy and physiology. Such a book as that which Miss Gordon has written will serve a useful purpose in hastening that day by putting teachers in possession of a primer which contains the fundamentals of the subject in a readable style. It is the type of book which we would like to see translated into our South Indian vernaculars, because it not only includes the principles of the science, but states them with special reference to the needs of Indian teachers.

A personality is the outcome of forces which are both hereditary and environmental so that child study must take account of both sets of factors. Much more is to be gained by teachers through the study of children for themselves than the mere perusal of books on the subject, however authoritative they may be. The trouble with so many students of other things as well as of child-nature is the evident desire to be spoon-fed. They desire to get their information at second-hand rather than take the trouble to study for themselves. In many instances teachers have not the technique necessary to observe intelligently. Very valuable, then, is Miss Gordon's chapter on 'How to Study a Child,' particularly for those who are beginners in child study, and it is a matter of vital concern as much for the parent as for the teacher.

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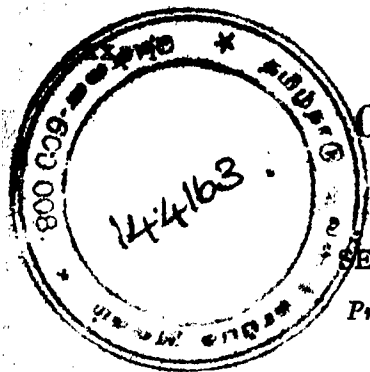
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