

JL
Um2, N26GIE
N41.16.1.
145256



The Indian Geographical Journal

Formerly
THE JOURNAL OF THE MADRAS GEOGRAPHICAL ASSOCIATION

Vol. XVI

January—March, 1941

No. 1

Conservation of India's Natural Resources*

By

S. M. TAHIR RIZVI,

B.A., PH.D., M.A., F.R.G.S., F.R.MET.S.

Ladies and Gentlemen,

I thank you most heartily for the honour you have done me by electing me to preside over the deliberations of the Geography and Geodesy Section of the Indian Science Congress of this session. I am conscious of the great responsibility placed on my shoulders; but, counting upon your kind co-operation and forbearance, I shall try my best to fulfil the task in as best a manner as could be possible.

INTRODUCTION

Few problems in India are of more vital importance than the conservation of the natural resources of the country on a planned basis. To-day, public consciousness needs more than at any other time of Indian history to be rightly educated as to the existence and utilization of abundant natural resources of the country. I have, therefore, selected the conservation of India's natural resources as the subject of my address as it is a subject of general interest as well as of vital importance to our nation.

Whereas the growth, greatness and survival of a nation depend largely on the natural resources of the country, their conservation seeks to insure to society the maximum benefit from their use. Thus conservation of natural resources such as soil, forests, water and minerals, without which the very existence of a nation

* Presidential Address at the Section of Geography and Geodesy, Indian Science Congress, Benares 1941.

may be at stake, should, therefore, unquestionably be one of the most important matters for the consideration of those who are entrusted with the responsibility of formulating programmes of national reconstruction.

Conservation of natural resources is a timely field of action in India. The growth of population in this sub-continent has been accompanied by an unprecedented destruction of the natural landscape. Moreover as the country awakens politically and the limits of its resources and the character of its need begin to appear more fully, the necessity for greater care in the utilization and renewal of resources becomes imperative indeed. The movement is a timely one being in line with a world-wide concern regarding the material bases of national well-being.

There is no doubt that conservation is a field of vast national importance and of such magnitude and range as to demand the co-operation of nearly everyone. Contributions to its theory and practice may be made by the layman and the scientist, by the philosopher and the practical man of affairs, by the social scientist and the natural scientist. In one way or another, each of the natural and social sciences can give, and, indeed, is giving some assistance, directly or indirectly. The scientific geography though still in its infancy in India is contributing to the field of conservation both theoretically and practically. Studies in systematic and regional geography are greatly helping to build up our knowledge of our natural resources and the problems arising from their exploitation. Geographers are also taking an active part in the practical application of their view-point and techniques to problems facing the nation. Moreover, they are imparting useful knowledge of the principles and practices of conservation in the colleges, and in a small measure at elementary and secondary schools. The rising generation is, therefore, learning largely through geography teachers and text-books about the aims and practices of conservation. However, it is not meant, in any sense, to imply that teaching in this field is exclusively the function of geography.

As the subject selected by me is a very wide one it would not be possible for me to discuss it fully in the short time at my disposal. I have, therefore, limited my address to three aspects of the problem, that is to say, conservation of soils, forests and water resources.

SOIL

The soil of a nation is its most material heritage. It nurtures the ever-flowing stream of vegetation from which men and their

animals derive their sustenance. The preponderance of the world's organic raw-materials as well as its food supplies arise from soils through the practice of agriculture. The great civilizations of the centuries have rested fundamentally upon uncountable millions of fields planted and tended by man.

The civilization of this country has been and is based upon its soil resources and great agricultural industries. Our country taken as a whole possesses such a combination of soils and climates that it suits admirably to agriculture and no less than nine-tenths of the population of India to-day is engaged, directly or indirectly, in agricultural pursuits. Soils are subject to certain changes when cultivated or pastured. Change in itself is not a critical matter since eternal change is a fundamental law, for, were this not true, it is doubtful if man could have survived. The critical aspects arise when changes in soils that are subject to human manipulation are left to take a degenerative course, or are improperly directed, and when known means of maintaining the soils near their virgin level or raising them to higher levels of productivity are not employed.

These critical aspects obtain rather generally in India. At the end of several centuries of agriculture and pastoralism, the soils in India are in a lower state of fertility than our scientific and practical knowledge should tolerate. Especially serious is the fact that some soil areas have so seriously deteriorated that their early reclamation will be extremely difficult and costly, if not nearly impossible. This is particularly true of the gross physical destruction of the soil body occasioned by erosion. More subtle but almost equally serious is the state of chemical, physical and biologic degradation into which we have allowed our soils to drift. The causes are many. We have not fully appreciated either the limitations or capabilities of our soils. They were and are looked upon much as a mine, as simply possessing a store of plant food: when these had been extracted there was little we could do except abandon the land until it somehow recuperated. Moreover, since the keynote of Indian agriculture has been primarily self-maintenance, systems of cropping were so shaped as to yield the maximum results regardless of the tolls on the soil. Whatever the causes the general results are equally deplorable.

SOIL EROSION AND ITS CAUSES

Within the last few years we have learnt that erosion, far from being a harmless or completely beneficial process in all its manifestations, is a living, constant menace to our own security and the security of posterity. We have learnt that the process

does not remain at geologic norms when human factors intervene in the natural order of dynamics pertaining to the earth's surface. We know definitely that man's misguided use of the land has accelerated this ancient earth-process until it has overwhelmed enormous areas of once fertile land and impoverished even greater areas. In the light of this knowledge erosion becomes a matter of concern to everyone; since it constitutes a threat to the principal factor in our country's security—our indispensable agricultural lands.

Accelerated erosion is the result of conflict between man and nature—of man's necessary interference with natural processes of land stabilisation in order to provide himself with the necessities of existence. Under a blanket of vegetation, nature protects the soil from the erosive forces of wind and rain and her protection is almost complete. Soil losses under natural conditions of vegetation cover are negligible—so small, in fact, that normal processes of soil building are generally adequate to compensate for them.

Faced with the problems of existence, man strips away the protective cover of vegetation, and thus rudely interferes with nature's balance. Soil is exposed to winds and rain, and rates of erosion are increased almost enormously. Cultivation still further exposes the soil to the cutting force of wind and flowing water, again accelerating the rates of wastage. In the one instance—under natural vegetative conditions—therefore, erosion is normal or geologic; in the other—under cultural practice—the process is speeded to abnormally destructive rates. Soil erosion has thus become a world-wide problem owing to the way in which ploughing and grazing have destroyed the plant cover which Nature originally provided to protect the earth's cover.

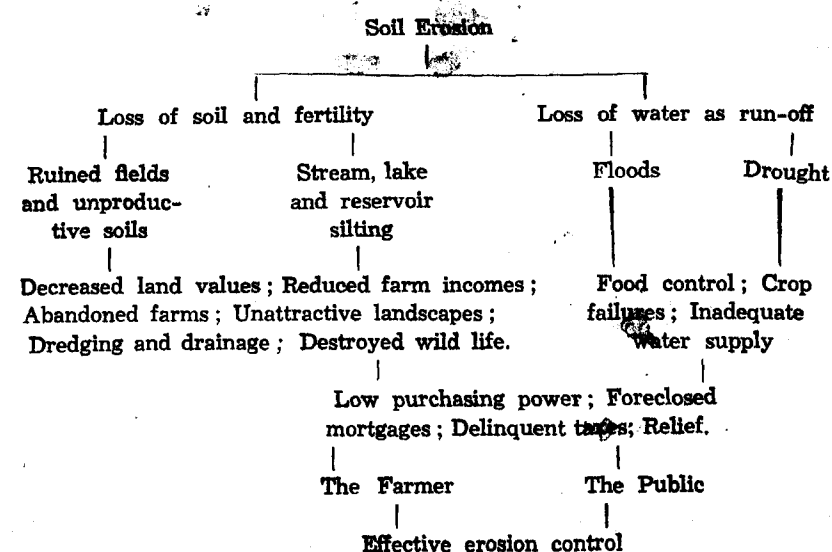
TYPES OF EROSION

There are broadly speaking three types of erosion: sheet erosion, gully erosion and wind erosion.

The first is the most wide-spread and dangerous, being the principal agency of soil impairment, for it can do great damage before it becomes apparent to the farmer. Sheet erosion characteristically proceeds so slowly that farmers themselves generally have not understood it and, accordingly, have given little attention to its effects until out-croppings of infertile sub-soils or bed-rock appear over their sloping fields. The process involves removal of thin sheets of soil over entire extent of unprotected areas with every rain heavy enough to cause water to flow across the slopes.

The first effect which often goes unnoticed, is the removal of the finer soil particles in suspension, leaving the coarser particles behind. These finer parts of the soil are valuable because they help to bind the soil into crumbs. The capacity of the soil to retain moisture and soluble plant food depends largely upon this crumb structure. If the finer particles are lost by sheet erosion the soil deteriorates. In extreme cases the whole of the top soil is removed, bodily, leaving behind only an infertile sub-soil of clay or gravel. Sheet erosion is common throughout India except in areas irrigated by canal or well, but is of course more serious on all sloping land.

Gully erosion is much more obvious and it is easy enough to see and understand the deadly malignancy of it. This type of land devastation frequently follows after sheet erosion as a later stage of deterioration. When there is not enough vegetation to impede the run off of storm water, the proportion of rain not absorbed by the soil finds its way downhill in a series of small torrents. A vicious circle is set up, because each channel is cut wider and deeper by every succeeding downpour, and the torrent tears soil from the sides and bed of the gully. Loss of soil is increased by the cutting back of each branch gully into the higher ground behind. Deeply gullied "bad lands" are to be seen in many parts of India whenever the level of the land surface is at all high above the bed level of nearby rivers.



(Chart showing how soil erosion affects the general public as well as the farmer.)

The Jumna basin provides one of the finest examples of gully or ravine formation in the world. In many parts the vegetation on the neighbouring lands after centuries of abuse is of a very poor description and the rainfall flows away with great rapidity thereby increasing the volume and the violence of the torrents and leaving their beds dry after a few hours of the storm. The accumulated effect of this flood and scouring in a hard Kanker soil has resulted in the banks of the Jumna and the Chambal being violently eroded during the last few hundred years with a corresponding sinking of the water level.

A rough calculation has shown that the total soil erosion of the Jumna-Chambal basin is equivalent to the removal of 12 cusecs or $\frac{1}{2}$ ton of soil per second day and night without stopping for the last 1,000 years.

Both sheet and gully erosion are caused by water action but another form of erosion results from wind action. Open treeless plains of dry light soil are particularly susceptible when the natural grass cover is destroyed by ploughing or heavy grazing, for the exposed soil can then be whipped up and carried away by strong winds.

Ground thus disturbed develops a peculiar topography of low hummocky sand-hills on top of which deep-rooted bushes survive after all other vegetation has given up the unequal struggle. Actually India as a whole does not suffer from wind erosion to the extent that has occurred in the so-called "dust bowl" of the middle Southern States of the United States of America, or in the inland livestock ranches of Australia or along the southern fringe of the Sahara. But in certain restricted areas in India it is a definite menace, for instance, just north of Campbellpur in Attock district and along the Delhi-Lahore road near Doraha.

WIDE-SPREAD EFFECTS OF EROSION

The harmful effect of these three forms of soil erosion go far beyond the removal of the valuable top-soil on which plants depend for their nourishment. One direct effect is of course gradual decline in crop yields which more than off-sets any gains brought about by seed selection and manuring. The direct effect in pastures and grazing lands is to reduce the capacity of land for carrying livestock, for good pasture may carry a cow per every two acres, but the eroded pasture land may not keep a cow properly on ten acres.

Erosion also has indirect results, of which the most important for us in India is the dumping of large quantities of sand in the river beds so that the bed must inevitably be raised and thus aggravate the effect of floods.

Another effect is to increase the severity of the intervening drought periods. This is because each small stream in the foothills discharges perhaps 80 or even 90 per cent of heavy storms within an hour or so, and only a very small part of the rain soaks in the bare ground.

Apart from the rivers therefore the level of the water-table underground is apt to shrink because the amount of percolation or seepage through the soil into the underlying rocks and sub-soil is less. Springs and wells are fed by reserves of water stored underground, but these reserves dwindle because eroded soil will not allow rain to penetrate underground, so that wells dry up, springs are reduced to a trickle, and rivers that once flowed all the year round now fail in the dry period.

Aside from the destruction above-mentioned, erosion carries with it consequences of vast importance to the permanence of investments of large sums of money in navigation, power, municipal water supply and irrigation developments.

DEFORESTATION AND SOIL EROSION

It is admitted by all authorities on erosion that one of the greatest calamities which have overtaken mankind has been the destruction of the forest and the consequent erosion of the land surface. This has already destroyed the fertility of many lands and is at the present day exercising a great influence on the destiny of the people. Deforestation and soil erosion not only intensify floods and reduce the cold weather discharges of surplus streams but they threaten the sub-soil water supply and impoverish the soil and reduce the output of agriculture. In fact, these two demons threaten the very basis of civilization and of human life.

Erosion results from the misuse of the surface covering of the earth, whether it be by the destruction of the forest which covered it, by the misuse of arable or pasture land, by bad methods of cultivation, by burning or by over-grazing.

There is sufficient evidence to show that India is faced with the very grave danger of her river catchments being denuded to such an extent as to increase floods during the periods of heavy rainfall, decrease river supplies for irrigation and navigation during the dry season, increase siltation of the rivers, and throw large areas out of cultivation.

America is now fully alive to the disaster which threatens her and has even formed a special department of engineers to deal with erosion while her foresters are actively fighting deforestation.

There are many indications that in parts of India conditions are, at least, as bad and, sometimes, worse than they are in America. For instance, the Ganges carries to the sea eight times the quantity of silt carried by the Mississippi and that from a catchment area less than one-third the size.

It is not without significance that the highest recorded flood in the Ganges occurred in 1924 and the lowest record of winter discharge occurred in 1929. Records of the Ganges for over 100 years are available and this period is long enough to exclude all seasonal cycles.

AMERICAN RESEARCH

American research has found that during the years 1935-37, the rate of run-off from completely denuded lands, such as is only too common on the banks of some of our rivers, such as the Jumna and the Chambal, is twenty times greater than it is from preserved forests. During one month of the flood season in Southern California a watershed, which had been burnt out 4 years previously, was denuded of 120,000 cubic yards of top soil or a depth of 1.4 inches per square mile. On a similar watershed burnt out 19 years previously, the denudation rate was one-tenth of this while in a watershed fully protected for the last fifty years the same rainfall only gave a denudation rate of one-thirtieth of this.

The fertility of the soil lies in its top crust and the removal of 1.5 inches of the surface soil which Nature takes a long time to create, amounts almost to a disaster. The unproductiveness of newly exposed sub-soil is well known and one might almost say that once the surface has been destroyed, fertility has gone for ever as far as the present generation is concerned. It seems quite reasonable to suppose that one of the most important factors contributing to the low crop yield in India is erosion by wind due to the absence of wind breaks.

EXAMPLES OF DAMAGE

It is generally known that there are extensive waste and ravine lands in Agra, Muttra, Etawah and the adjoining districts. The ravines of the Jumna and the Chambal river form a practically compact mass the extreme length of which is 70 miles and the

width about 13 miles in the centre. It is estimated that in the Etawah district alone there are about 120,000 acres of ravine land and there are large ravine areas in Agra, Muttra, Jalaun and other districts.

THE DESCRIPTION OF RAVINES

The banks of the Jumna and its tributaries are now so completely drained that the greater part of the area has become almost destitute of vegetation. Cultivation beyond this desert belt is precarious even in years of normal rainfall and the presence of these ravines renders irrigation impossible. Throughout the whole extension of this ravine land no water is to be found except in deep wells and in the main rivers. The dry belt is increasing in extent, as the ravines eat into the flat lands at the heads every year. With the hardening effect of the tread of cattle and rapid drainage the monsoon rains penetrate to a depth of only a few inches and this quickly dries up leaving a soil almost destitute of moisture down to the water table 100 feet or more below. It has been found that occasional scattered trees now found are of great age which have continued to reproduce themselves by copice shoots and their root-systems have kept pace with the sinking of the water level, drawing up their necessary moisture from great depths. Natural reproduction invariably dies down as soon as the rains cease. The natural vegetation of the ravine land has been destroyed by uncontrolled cultivation wherever the soil is fit for this, and by uncontrolled grazing, reckless destruction and by fires elsewhere. Large areas are now almost treeless but the original natural vegetation was undoubtedly forest and is still forest except in Kanker and Usar soils. The vegetation consists of small trees, thorny bushes and grass.

THE PANJAB SIWALIKS

Some of the worst erosion is evident in the Panjab Siwaliks, a range of hills skirting the Himalayas where the hill grazier has accompanied or followed the wood-cutter and effectively denuded the soil of its protective plant cover. In many places damage is not confined to the eroded slopes, further destruction being caused by torrents (chos) formed by gully erosion, that sweep down the slopes during the monsoon. The cho is characterized by the steepness of its gradient and the violence and irregularity of its discharge. The torrent carries much suspended material which is deposited on the less steep lower slopes in a characteristic detrital cone which continually increases in radius and width. The chos

debouching on to the cultivated sandy plains silt up the original drainage channels formed when hill erosion started, and the floods are forced out over wide areas. The floods subside as suddenly as they start, and all the water is lost to the land.

There is evidence that a hundred years ago the chos ran between well-defined banks, and in some places perennial streams that could be used for irrigation issued from the hills. To-day, floods are the only source of water. Much of the subsequent erosion has been due to intensified exploitation that occurred when British rule secured some measure of prosperity and security. Reclamation might possibly be effected by closure of the land so that first grass, and then forest, could be re-established, but all the land is required to support the people, who have the right to use it, and the authorities have a natural aversion to interfering with jealously held rights. A drastic reduction in the surplus grazing animals is indispensable before any conservation programme can become effective.

NECESSITY FOR CONTROL

Accelerated soil erosion and its control presents the country with a physical land crisis of enormous importance to the continuing welfare of agriculture in particular and the entire social structure in general. Moreover, beyond the most acute crisis of the whole land problem, there exists the physical fact that there can be no permanent cure of floods or prevention of stream and reservoir silting until run-off is better controlled, all the way from the crust of ridges down across the watersheds where floods originate and silt loads are picked up, on to the very channelways of streams, which have limitations upon their carrying capacity.

Control of erosion is the first and the most essential step in the direction of correct land utilization. It must be performed if the country is to avoid early arrival at an inconceivably bad land situation. The United States of America and the Union of South Africa have reached the same conclusion and are now engaged in a fight against erosion in their country. The Italian Government is carrying out an enormous land reclamation and conservation programme. Japan for many years has been spending many times the value of numerous critically eroding areas in order to protect indispensable valley lands from the erosional debris issuing from such sore spots. There is no reason to assume that India can better afford to neglect this gigantic problem of waning soil productivity than any other country.

FORESTS

One of the most valuable assets of India is her forests both from the point of view of material wealth they represent and their incalculable value to livestock and agriculture, providing food and giving natural protection against floods and dust storms. Their beneficial influence on climate, on the conservation of the water supply, on the flow of streams and rivers and the prevention of the erosion of soil needs no emphasis.

To realize how important it is to retain the natural protection afforded by forest, one has only to look round at other countries and to see how large areas of land unsuited for permanent cultivation which were alienated from forest and made into farms, have, now, been abandoned to waste and desolation and in others how forest denudation has led to flooding and dust storms which have brought wide-spread destruction and misery in their trail.

With the steady growth year by year of knowledge of the importance of the part played by forests in the prosperity of countries, particularly an agricultural land like India, the problem has become of national interest.

The character of the forests in India is largely governed by rainfall and elevation. Where the rainfall is heavy ever-green forests are found. Under a less copious rainfall deciduous forests appear, containing teak, sal, and a great variety of other valuable trees. Under a still smaller rainfall the vegetation becomes sparse, containing acacias, tamarind, etc. In the Himalayas, sub-tropical to arctic conditions are found, and the forests contain according to elevation, pines, firs, deodars, oaks, chestnuts, etc. It has been the experience of all countries that the natural processes of growth and reproduction by which forests are kept alive are incapable of keeping pace with man's destructiveness, hence it is necessary to take special measures in the ultimate interests of the country to preserve its forests from reckless destruction.

FOREST INFLUENCES

If you read history, you are bound to believe in the prosperity of the ancient kingdoms, and if you compare their ancient grandeur with their present decay, and their ancient wealth with the amount produced to-day, you can only be driven to one conclusion, and that is that the present decay of these countries is very largely due to the deterioration of the moisture that lies in the earth. Now, just imagine

for a moment, what has happened to Persia. Take the example of the palace of the King of Kings, Darius, who at one time reigned practically over the whole eastern world. Can you imagine a man occupying his position, building his palace in the desert? But to-day, if you see the ruins of the palace of Darius in Susa, they stand in an uninhabited wilderness. Mesopotamia, which for generations produced all the revenues of Persia by which that country was able to wage wars against the Romans, has degenerated into a dreary waste and the hanging gardens of Babylon are a rubbish heap. No doubt the degradation of Babylon was partly due to the destruction of the irrigation works by the invasion of the Mongols, but already at that time, the irrigation system of Mesopotamia was in a state of decay on account of the destruction of the forests on the hills, and the bad regime of the Tigris and Euphrates which supplied the water for the finest irrigation system in the world, a vast system with which the Panjab at the present day cannot compare. The same history has been repeated all over the world. In Greece, Anatolia and Spain, the destruction of the forests has seriously interfered with their climate, with their cultivation, and with the moisture content of their soil. So much has this been the case in ancient history that it has been stated that deforestation, by the lowering of the moisture content of the soil, thus decreasing the water supplies of the country, has done more damage than any war, and has resulted in the destruction of the greatest empires.

UTILITY OF FORESTS

The history of modern civilization is founded upon wood. Despite the increased use of iron and steel and their replacement of wood for many purposes it is a proved fact that the consumption of wood per head of population has been steadily increasing, unless limited by supplies, in all countries in proportion as the material prosperity of the people has increased. In Europe and America the consumption of wood per capita is over 20 cubic feet; in India it is under 2 cubic feet. Prosperity involves increased wood consumption and to supply the ever-growing requirements of the people is one of the most important of the functions of the forests. The great mass of the population of India are not townsmen but agriculturists who live in the country, and those of them who are fortunate enough to live in the vicinities of forests know that the forests mean to them much more than the mere production of timber and that the success of their cultivation of field crops is intimately bound up with the existence of the forests. A supply

of firewood is one of the most essential needs of the people, and where there are no forests from which firewood can be obtained the people have been driven to burn the cowdung which should have been used to fertilize their fields. There are innumerable cases where the destruction of forests have led to the burning of cowdung with serious adverse results on the cultivation of crops. But apart from yielding firewood and poles for building houses the forests yield many other kinds of produce which the agriculturist wants. They yield him timber for making his ploughs and other agricultural implements, bamboos for fencing and other purposes, thatching grass, grazing for his cattle, edible fruits and flowers which help him to live more especially in times of famine, fibres for making ropes, medicines for the sick; and many other articles.

There are numerous indirect benefits conferred by forests whose importance is not readily understood.

Firstly, forests increase the relative humidity of the air, reduce evaporation, and maintain a more continuous degree of moisture in the soil. They also tend to increase precipitation of moisture. These effects are important from the agricultural point of view in a hot dry climate such as is prevalent over most of India.

Secondly, forests assist in regulating the water supply by reducing the violence of floods and by rendering the flow of water in rivers more continuous. They further assist in preventing erosion. On denuded soils the rainfall rushes off the surface in torrents which gather in volume and sweep away the fertile top soil of the land. On forest covered areas the rainwater is held up by the crowns and roots of the trees and the more spongy forest soil with the result that it percolates more slowly into the ground and emerges in the form of springs which supply the rivers more continuously with water. In areas where deforestation has been rapidly proceeding many of the streams which used to run all the year round have now dried up and this has had a bad effect on field crop cultivation. Innumerable examples of the serious effects of the forest destruction on the fertility of the soil and water supply could be quoted from all over India. This valuable effect which forests have in reducing the effect of erosion and floods is not, however, confined to the areas in which the forests are situated. The disastrous floods in the plains have been due to the destruction of the forests in the river watershed. Such floods tend to get greater and greater each year as the destruction of forests in the hill areas in which its tributaries have their source proceeds and unless this progressive destruction of forests is checked the time may one day come when still more disastrous effects of flood will be experienced.

Thirdly, forests reduce the velocity of wind and protect adjoining fields against hot dry winds. They afford shelter to cattle and generally reduce the temperature of the air and render the climate more equable.

Fourthly, forests increase the artistic beauty of the country and exercise a restful effect on the human mind, thus assisting in furthering the happiness of the people.

FOREST AND FLOODS

It has been often stated that a forest cover in a drainage basin materially reduces floods but forested areas are not free from the hazard of flood damage. Although the effect of forests upon run-off has often been overstated their effectiveness should not be depreciated.

Adequate flood protection is largely dependent upon engineering structures but the forest cover should be considered as a supplementary protective measure. A closely forested area with its absorptive leaf-litter delays run-off somewhat and gives greater seasonal uniformity to the discharge of the streams. This slight retardation of run-off may serve to reduce floods provided the subsequent rains are delayed a sufficient length of time to permit the lowering of the water table and a drying out of the litter. If the absorptive capacity of both the litter and the soil is reduced because of saturation heavy downpours of rain will cause floods. Probably the most important effect of the forest cover is not in its effect upon surface run-off but upon its protection of the soil, which in rugged areas is susceptible of removal, and when both the forest cover and the absorptive topsoil have been removed, all rains, no matter what their spacing, yield rapid run-off. These indirect results are of major importance in the prevention of floods and in the maintenance of reservoir capacity whether the reservoirs be used for flood prevention or for other purposes.

DEFORESTATION IN INDIA

There can be little doubt that there were forests stretched all over the greater part of India. In the Vedas, the earliest religious writings of the Hindus, in the epic poems of the Ramayan and the Mahabharat, references are made to dark, dense forest areas situated in the Gangetic Plain, now a vast expanse of cultivation and for a thousand miles or more devoid of forest growth. Similarly the records of the wanderings of Chinese pilgrims (about 600 B.C.) frequently speak of miles and miles of very dense forests

in the now almost treeless districts of Gorakhpur and Western Bengal. As late as the sixteenth century the Moghal Emperor Baber hunted tiger and other big animals of the forests along the Jumna river, in areas which have now become barren ravine deserts of stunted thorny bushes.

In the turbulent days of early Indian history with the rise and fall of dynasties and powers, the areas of forest fluctuated, shrinking to make place for cultivation with the advent of a strong ruler, increasing again with the collapse of central power, or when wars, pestilence and famines reduced the density and pressure of population. Thus we still find ruined and long forgotten cities in some parts of Indian forests. With the advent of the British rule in India, resulting in a great increase of population, with the attendant demand for timber for agricultural implements, constructional purposes, etc., a fierce onslaught was commenced on the forest areas and by the middle of the nineteenth century all traces of primeval forest in the Gangetic Plain disappear except in the mountainous regions. Thus the destruction of the forest area, or rather the diminution in the area of the forests within the boundaries of India, has been going on at a very great rate during the last 150 years. To give you an instance, when the Emperor Jehangir built the castle of Nurpur for his Queen, Nur Jehan, the Light of the World, he writes in his memories that forest was so thick that a bird could hardly spread its wings. But if you go to that place to-day, you will see nothing but a denuded hill country, with hardly more than a few tufts of grass and thorn bush on which a few goats eke out a miserable existence. All that has happened in a period of not more than three hundred years; in that time the dense forest which clothed the outer Himalayas has been reduced to a negligible amount.

Due to the reckless extermination of forests by man or through excessive grazing, fires or over-cultivation, the area covered by forests in the United Provinces has been reduced to 4 per cent of the total area of the province and is confined almost entirely to the hills and sub-montane region. This in itself by all standards is inadequate to meet the diverse demands of a progressive country as it has been estimated that about 20 per cent of the area of a country should be covered by forests.

NECESSITY OF FOREST PROTECTION

There are two main reasons why such protection is necessary. Firstly, forests require protection from man. It is a common failing in human nature that whenever any product is found in abundance

its use is abused without thought for the future. The steady destruction of forests which has taken place in the old and new world is a striking example of this attitude on the part of man. The great Indian epics tell of the mighty forests which used to exist in the Gangetic Plain. At the present day there are only remnants of forests left which are confined to the hilly tracts of the country, and over most of the plains the people are put to hardships as they cannot get the forest produce on the supply of which the success of their cultivation depends. The reclamation of forest land by bringing it under the plough is a sign of agricultural progress as the people must have food to live and the greater the area under cultivation the better. But there are large areas of forest land which have been cleared for cultivation, which should never have been cleared as the soil is poor and incapable of supporting field crops year after year. Good forests can be grown on land which is poor from the agricultural point of view, and on such poor soils forests should be retained because they are more valuable than field crops. The practice of shifting cultivation under which forest areas are cleared and burnt, cultivated for two or three years, and then abandoned, has been responsible for destroying large areas of forests.

Apart from the clearing of forest land for purposes of cultivation there is another factor which has been responsible for the destruction of numerous forest areas in the country, and that is that, left to himself the villager takes no care of the forests. He hacks down the trees indiscriminately and allows his cattle and goats to graze all over the forest thereby preventing any new trees from growing up to take the place of those he has removed. In how many thousands of villages can you see areas of barren waste land which formerly were covered with useful forest and which now do not yield even a scanty supply of grass? It is thus sufficiently evident that forests must be protected from the thoughtless acts of ignorant villagers who would otherwise destroy the forests with dire consequences for future generations.

FOREST CONSERVATION

Forest conservation is a field of vast significance in Indian life. The services which forest can perform are numerous and their influence far-reaching. Moreover, the renewable character of forest makes for a very practical phase of conservation. With sufficient fore-thought, the country's resources can be kept at a level more nearly commensurate with its needs for wood products and other forest services, and, at the same time, much of the land

which is now unproductive but suited to growing trees may be put to use.

WATER RESOURCES

One cannot imagine man separated from water any more than one can imagine him separated from land. Water is an essential part of his being. He uses it in innumerable ways and because in areas of dense population he has been favoured with it, frequently he spends it recklessly, thinks of it as he thinks of air as an unlimited requisite of existence, and gives little heed to its value. In drier regions water is held of great value, and stringent laws governing its use are formulated.

The place of water in the lives of people in arid lands may be realized by the frequent rain ceremonies of the Hopi Indians and by the repeated references in the religious literatures of desert peoples, as the Bible and the Koran, to water as a blessing and to paradise as a place where there is abundant water.

Our water comes from precipitation, and the average rainfall for India is about 42 inches per year. This average will lead us easily to the total amount of water received by the country in one year but it tells nothing about the distribution.

The rainfall varies from almost nothing in the desert tracts of Rajputana to over 100 inches in the outer Himalaya and is profoundly affected by elevation and the distance from the sea. Most of the annual rainfall takes place in July, August and September during the summer monsoon; April and May are dry and intensely hot; the autumn is dry and in winter very little rain falls. Towards the north-west the rainfall decreases and the Punjab, formerly desert, is now irrigated by a network of canals which take their origin from the rivers of the Himalayas.

In regions of scant water-supply, conflicts are likely to arise over water rights, and frequently in densely settled regions there must be a choice between its various uses. One arrangement of the uses of water in order of influence or importance is as follows:—

1. Atmospheric moisture indispensable to organic life.
2. Drinking water for man.
3. Water used in agriculture and animal husbandry.
4. Water as a habitat of fish and sea-food.
5. Water used for generation of power.
6. Water used for mechanical and chemical processes in industry.

7. Water as a means for transportation.
8. Water as a medium for the removal and purification of waste.
9. Water as a recreational asset.
10. Water as a determinant of political boundaries.
11. Water used as ice.

India, for the manifold uses of water, must depend upon its rainfall. The 42 inches of annual rainfall cannot suffice for all of them. About one-half of the rainfall is evaporated and goes back into the atmosphere as water vapour, about one-third of it forms the run-off, draining by streams and rivers to the sea. This is the visible water-supply, and the greater percentage of the use in the above list arises from this portion of the water. One-sixth of the rainfall sinks into the ground and forms ground water; this is a less well-known but very important reservoir of water which acts as a stabilizer of lake levels and stream flow and a source of water-supply for the plant growth.

The problem of the manipulation of the enormous amount of water which falls in India varies with the humidity or the aridity of the area. Evaporation, run-off and ground soakage are not uniform, and unwise practices may increase run-off to a danger point and destroy the balance set up by natural agencies. Among the many problems of water are the control of floods which, for example, have caused great losses of life and property in the eastern Gangetic plain; the control of low water stages which have hindered navigation, as on the Ganges and the Brahmaputra rivers, or have caused losses of crops; its use for navigation, power, water-supply for cities and towns, and the removal of refuse from houses and factories; and erosive tendencies of rain and streams; the silting of streams and consequent deposition when stream flow decreases; its use for irrigation; the maintenance of the ground water-supply and the stabilization of the water table, and the use of water as a recreational appeal. A water policy of the country should be so established as to yield the greatest benefit possible from our water resources and be so regulated as to serve the greatest need. At all events, one needs take the stand that water is a highly valuable source, too precious to be wasted.

IMPORTANCE OF WATER FOR DOMESTIC PURPOSES

Water is one of mankind's most essential needs. Primitive settlements were located around springs and water courses, and when the water failed the people were driven from their homes.

Palmyra, once a city of possibly more than 150,000 people, vying with Damascus for the trade between Egypt and Babylon and reaching great prominence under the reign of Queen Zenobia, consists to-day of a few ruins in a desert landscape while Damascus still exists. Both were oasis cities, but the drying up of the oasis at Palmyra spelled its doom. Later people learnt how to build aqueducts and transport water from distant springs and rivers. When gold was discovered in the Australian desert in 1892 and the towns of Kalgoorlie and Coolgardie were founded, the district was practically waterless. For a while the railway transported water to the towns at a cost of about Rs. 15,000 a day. In 1903, a water line was completed from the Darling Range, 350 miles away, and a delivery of 8,000,000 gallons daily resulted. So long are the pipes that they contain a month's supply of water; in other words, the water takes one month in travelling from Mundaring to Kalgoorlie.

Residents of the Indo-Gangetic Plain have not really appreciated the value of water as the dwellers in more arid regions have. The idea that there was an ample supply has been passed on from generation to generation. To-day it is necessary to combat the idea and treat water as a natural resource of limited though perhaps inexhaustible amount which must be conserved so that the supply at anyone time may be adequate for our needs and particularly so that its misuse may not be a burden to future generations.

SOURCES OF WATER-SUPPLY

Cities and towns in India obtain their water-supply from many sources—Lakes, tanks, wells, springs, tube-wells, and streams. Most rural towns and many urban localities depend on ground water for their domestic supply, and this comes to them in part through springs but largely through ordinary wells. In every rainfall where there is a surface mantle over the rocks a certain percentage of the water is absorbed by the soil (estimated average about 16%). This forms ground water. Its upper surface is known as the water table. The amount of ground water is much greater than is commonly supposed. It has been said that there is enough water under ground so that, if it were brought to the surface, it would form a layer probably 500 to 1,000 feet deep. The depth of the water table varies; in swamps the water table reaches to the surface, and in arid areas it may lie a hundred feet below the surface. Frequently, in the Gangetic Plain, water is struck before one digs to 25-30 ft. The water-table depth in any single

locality varies with the rainfall. A long period of drought takes a serious toll of the ground water, and the water table may be so lowered that it falls below the level of the well bottoms and the wells become dry. If the drain is not heavy the water table is generally brought back to its normal level by succeeding falls of rain. An extended drought, however, may bring serious damage by killing off the vegetable cover and subjecting the soil to wind and later rain erosion. In some localities, the water table has been lowered beyond the level of efficiency by stripping the vegetation cover, as in excessive deforestation, and in the processes of extensive cultivation, soil erosion, and ditching. For example, it is estimated somewhat roughly that the water-table over large areas in India has been lowered by 10 to 20 feet by these methods. As an extreme example may be quoted the serious reduction in the base level of the Jumna River where flooding and scouring has lowered its bed at Etawah sixty feet in the last five centuries with a corresponding fall in the spring level. The cold weather level of the river is often 120—200 feet below the surrounding country. The effect of this upon the ground water supplies is obvious.

IRRIGATION

The arid and semi-arid regions of India like Sind, Rajaputana and the south-west Panjab which are practically rainless have largely been rendered habitable and their latent resources made available to man by the use of water for live-stock subsistence and irrigation. Water, a vital resource in any environment, assumes extra-ordinary significance in regions of less rainfall. In the arid and semi-arid regions of India, the conservancy of water becomes of permanent importance.

The chief characteristics of the Indian rainfall are its unequal distribution throughout the country, seasonal irregularity of precipitation and liability to failure or partial deficiency in many tracts. But, within individual tracts, remarkably wide variations in total annual rainfall are found. Such tracts include practically the whole of the Panjab and North-West Frontier Province, the United Provinces except the sub-montane regions, Sind, a large portion of Bihar, most of the Madras and Bombay Presidencies, omitting the coastal belts, and portions of the Central Provinces. The concentration of the principal rainfall in less than a third of the year places a very definite limit on the agriculture of the country. Thus our agriculture cannot afford to depend exclusively on rainfall and it becomes necessary to provide the agriculturist with suitable irrigation facilities.

The advantages of irrigation are numerous, the principal one being an increase in the yield of crops, the successful introduction of a stable agriculture in arid and precarious tracts, protection from and insurance against famines and scarcity and larger railway profits in agricultural provinces. The Indian canal system is by far the largest in the world. Of the total cultivated area of 280 million acres, no less than 60 million are irrigated from one source or another.

GREATER DEMAND FOR WATER

In view of the rapid increase in India's population and consequent increase of pressure on land the demand for more water for irrigation and for better distribution of the existing supplies becomes annually more insistent.

WATER POWER AND ITS CONSERVATION

Importance of Power

Mechanical power is the heart of modern civilization. Until means of mechanical power were developed man was unable to gain any definite control over the elements. The power-driven machine and its accompanying division of labour have almost entirely replaced the self-reliant workman of former decades. Man's welfare and comfort depend upon a continued and uninterrupted supply of power. Power is as essential a part of the necessities of modern life as are food, clothing, and homes. Indeed, without the use of mechanical power man's necessities and luxuries would be limited to the products of his immediate locale. The use of power allows him to live where he desires, to have his wants carried to his home, and to be transported to and from his work.

SOURCES OF POWER.

The principal sources of power available in India are coal, wood-fuel, oil, wind and water. Coal is India's most important mineral and India produces more coal than any other part of the British Empire with the exception of the United Kingdom. Most of the coal raised in India comes from Bengal, Bihar and Orissa (the Gondwana coal-fields). Outside these provinces, coal is obtained from Hyderabad State, Central Provinces, Assam, the Panjab and Baluchistan. Rajputana, Bikaner and Central India also contribute a small amount to the total coal supplies of India. Indian coal is thus very unevenly distributed, the deficiency being especially marked in the case of the peninsula. The absence of coal supplies

coupled with the high cost of railway transport acted as a great handicap to the growth of industries and this had to be overcome partially by the use of hydro-electric power. The utility of forests as supplier of wood-fuel has already been referred. Many of the Indian forests are, however, confined to hilly tracts from which transport is a matter of great difficulty and expense. Moreover, it is doubtful whether the supply of wood-fuel could keep pace with the demand for it for industrial purposes. The position with regard to India's oil resources has completely changed due to the separation from India of Burma from which nine-tenth of the indigenous petroleum was obtained. As the possibility of the oil-bearing areas in Baluchistan, the Panjab, Assam, etc., must still be regarded as problematical, it would be unwise to place much reliance on this particular form of power.

WATER POWER

As is evident the situation in India with regard to the supply of coal, wood-fuel or oil for purposes of generation of power is not quite so favourable as might be desired. There are, however, fair prospects for the development of water power resources at its command. These have been limited so far on account of the seasonal character of the rainfall making costly storage works indispensable. In spite of this limitation, there are many potential possibilities of tremendous importance and within recent years considerable attention has been given to large hydro-electric power schemes. It is hoped that these schemes will not only serve the purpose of supplying power to the industries but also of extending the irrigation facilities in India.

ELECTRICITY FOR VILLAGES

We may even be tempted to dream of a time when every village within a reasonable distance from a hydro-electric power station will receive its supply of electric current to help the development of rural industries and increase the amenities of rural life. A start has been made and development on these lines has been undertaken extensively in the United Provinces. The power available at falls on perennial irrigation canals has been harnessed and converted into electrical energy. The power so generated is being utilized for commercial, domestic and agricultural purposes. But on the whole there are great obstacles in the path of realization of all these bright visions. The initial expense of most of the hydro-electric schemes in India is heavy. The rainfall being seasonal, costly storage constructions are necessary and the expenditure

thus incurred makes it difficult to supply power sufficiently cheaply. Whether science will be able to remove this difficulty, the future alone can show.

FLOODS AND FLOOD CONTROL

Rivers come into existence as a result of precipitation falling upon the earth's surface, and have as their chief function the drainage of the excess waters to the sea. The lands receive their precipitation at very irregular intervals, and as a result the river with a uniform discharge does not exist. If all precipitation could be absorbed into the earth to become a part of the ground water and then discharged more or less evenly the streams probably could be confined to their channels. But an important proportion of the precipitation never becomes a part of the ground water but flows quickly to the water courses, swelling the streams beyond their constraining banks. The placid stream fed largely by underground waters becomes in times of flood a raging torrent. With its capacity and its competency greatly increased, the river in flood becomes a powerful agent of destruction. Streams vary greatly in their capacity for destruction, but none is without its flood problem.

The fertile alluvial lands of the Nile, the Tigris-Euphrates, the Hwang Ho, and the Mississippi—the creation of their respective rivers—are repeatedly inundated, bringing death to millions and destruction to the works of man. The great rivers are, at the same time, the giver and destroyer of life and property. Smaller streams suffer from recurring floods, and the damage done is locally very great. The flood problem may be said to have its beginning when waters derived from run-off and underground sources spread beyond the restricting channel of the stream.

FLOOD DESTRUCTION

The predisposition of the people to pre-empt the rich riverine lands for both agricultural, industrial and commercial purposes subjects them to the hazards of the recurring floods. Many of our large cities such as Delhi, Agra, Cawnpore, Lucknow, Benares and Patna were founded upon rivers when the water courses were the principal highways of commerce. The use of lowlands for industrial and commercial purposes has caused excessive damage at times of flood, due both to the destruction of property and the suspension of business. Lands once used for private purposes are not easily relinquished, for the owners, especially if individual land-holders,

can hardly afford to abandon the properties to the use of the river. In such areas the recurring floods cause increased damage due to an increase in property values through the years. Urban areas subject to floods are abandoned only with great difficulty; for both industries seeking lowland values and people of the low income class seeking low rentals are likely to locate on these cheaper lands along the rivers. Protection against floods is sought before abandonment is considered. If protective embankments prove adequate, property values increase and the utilization of land is intensified. Then an unprecedented flood which breaks through the embankments causes great damage. The increased property damage in many cities is due to man's encroachment upon the river.

In agricultural areas the amount of damage depends upon the intensive economic use to which the land is subjected. The inundation of the crop lands may greatly reduce the yield or completely ruin the crop. The losses in rural areas are off-set in part by the enrichment of the lands by the deposition of silts. The fertile topsoil eroded from the slope land within the drainage basin is deposited in part along the alluvial plains of the master stream and the major tributaries if they are aggrading streams. In some areas the spreading of coarse sand and gravels along a floodplain may depreciate the value of the land for crops.

CAUSES OF FLOODS

Floods are results of many conditions working singly or in combination. Usually no single cause can be assigned the whole responsibility. The immediate cause of most floods, however, is the excessive run-off from precipitation of high intensity, though many other conditions may be necessary to cause a great flood.

FLOOD CONTROL

To escape from the danger of floods various control measures either singly or in combination have been utilized to provide the necessary protection. Probably—one of the earliest methods used to escape from floods was to evacuate the area at the first warnings of impending danger. Flight to safe areas could hardly be interpreted as flood protection but it did mean the protection of life and a limited amount of property. This method is still used when other methods of protection fail. Throughout the history of civilized man the fertile lowlands have been preferred areas of habitation; and as high water menaced periodically the homes of the people the protecting dyke or embankment became one of the first methods

of defence against floods. In other countries the flood problems are being attacked by various methods. One of the simplest and most individual methods of flood protection is channel improvement. Embankments are very commonly associated with other local preventive measures used along the smaller as well as the major streams. Further the problem of flood protection may be partially solved by the use of preventive works in the head stream area of a drainage basin. Under certain conditions these storage reservoirs not only provide a solution to flood problems but may be used for other purposes such as water-supply, power, irrigation, etc.

THE RESPONSIBILITY FOR FLOOD CONTROL

The control of floods is a responsibility which extends beyond the limits of the inundated area. Floods have no respect for political jurisdictions, just as political boundaries show little relation to hydrographic boundaries. Since flooded areas seldom coincide precisely with political areas, the existing minor civil divisions such as tahsils and districts are unable individually to cope with the flood problem.

INDIVIDUAL RESPONSIBILITY

The flood problem begins with the formation of tiny rivulet in the farmer's field. Its control is both a personal and a social responsibility. His personal interest is not confined to the hazard of floods on his farm but to the associated loss of soil as the run-off gathers into rivulets which converge into larger and more devastating streams, producing both water and soil damage.

The individual land-owner, though he may have a humanitarian interest in the flood hazards of the drainage basin in which he lives, can do little towards the solution of the problem, especially if he lives beside a large stream. In rural areas when streams are small individual farms may, by channel improvements and the construction of embankments, give protection to their low-lying lands. The clearing of a stream channel of driftwood, trees, and other obstructions may so facilitate the flow during the time of high water that the channel is widened, thus increasing its capacity.

Imperceptibly the personal responsibility of many individuals enlarges to a regional responsibility co-extensive with each important drainage basin.

REGIONAL ASPECTS OF FLOOD CONTROL

Planning for the best use of water resources is essentially a regional responsibility, the region being coincident with the drainage basin of the streams concerned. This concept of the planning region cannot be adhered to rigidly, for the transmission of water-power in the form of electricity and the distribution of water for irrigation and municipal purposes extend far beyond the limits of the drainage basin, and require a modification of the hydrographic region to include adjacent areas which constitute the peripheral sections of an economic region.

The problem of flood control, however, is rather strictly confined to the drainage basin. So long as control measures involve only riverine works the plan would require the co-operation of river-side communities; but as control is extended to include preventive measures the whole drainage basin should be organised into a unit. The obstacles which make difficult the realization of this ideal are many, and probably will stand in the way of a strictly regional organisation based upon the hydrographic basin.

RESPONSIBILITY OF THE PROVINCES AND THE CENTRAL GOVERNMENT

Where a drainage basin lies entirely within a single province the responsibility of handling the many water problems lies on it. Flood problems which involve two or more provinces may require inter-provincial co-operation in order that a flood-control programme may be extended to all parts of the drainage basin. The co-operation should include not only an inter-provincial agreement but also a uniformity of laws to facilitate the work connected with flood control. The state's responsibility also extends to finance the operations. For such purposes excessive expenditures may be justified, but there should be a careful scrutiny of all flood-control plans to make certain that the benefits to be gained equal or exceed the cost of the protective works.

CONCLUSION

In conclusion I would emphasise that soil erosion in India has become a matter of vital concern and demands immediate attention. The improvement and fertility of Indian soils is another important problem. Planning on a wide scale to maintain soil fertility is, therefore, of supreme importance to the country in her campaign of rural reconstruction. The rapid increase in population since British occupation has greatly intensified pressure on

the land, caused the cultivation of much unsuitable ground and shortened the resting periods between cultivation that are frequently necessary for the stability of tropical soils. The human population of India is increasing at the rate of about 4 to 5 millions per annum. Much of this increase is occurring in the tract where nature in the first place provided easy conditions for human settlements, namely rainfall not too heavy for the ordinary farm crops, and natural grasslands in which cattle thrive. Therefore, much of the weight of this increasing population is falling upon the tension belt where grassland can persist only under reasonable treatment, and if once destroyed cannot reinstate itself as easily as it can under a slightly heavier or better distributed rainfall. Hence over very large tracts of country natural grasslands have already disappeared and village livestock are dependent upon bush and tree growth for their day-to-day existence. The amount of erosion caused directly through over-cultivation and over-grazing has become a national menace.

The conservation of forests and water resources of India are also vitally connected with the problem of ever-increasing population of the country and require a sound planning.

We should, therefore, recognise that problems of conservation are vital to each and every citizen of the nation. To one who is alive to the significance and magnitude of the problem of providing the posterity with the means of a richer and happier life, the conservation of the natural resources and their economic exploitation will appeal to be the only possible solution. The development and administration of conservation projects will demand the full time of a large staff of experts maintained by the State, and it is gratifying to note that the Imperial Council of Agricultural Research and Provincial Governments are directing their strenuous efforts towards the execution of such project; yet much cannot be achieved without the cordial support and co-operation of all citizens whether they are developing natural resources which they own privately or developing resources on public lands. The spirit of conservation demands that we recognize limitations to our personal rights in the utilization of gifts made by nature and render best services in the execution of local, provincial and national projects of conservation.

Agricultural Marketing in Western United Provinces

By

V. S. MATHUR, M.A., (LONDON), DIP: ED: (CANTAB), F.R.G.S.

When the crops have been harvested the next step is to dispose them off profitably and without any damage to the grain. This primarily involves a study of the marketing and storing practices of the region and then a study of the means of communication and transportation.

The common practice that has been prevalent in our region and in India as a whole is quite simple. The farmer, after keeping enough food for his family, sells his grain to the village 'bania' or wholesale purchaser, who very frequently is in the know of things and pays a very low price to the farmer who is always in an immediate hurry to dispose off his goods lest they be damaged owing to faulty methods of storing. The 'bania,' who knows all about the outside prices, earns huge profits.

Of late years marketing in Western countries has become advanced, scientific and complicated, and is not a simple exchange between the producer, the bania and the consumer, but not much of this can be applied to India. We can hardly claim our marketing to be systematic. And in the marketing process mentioned above, the producer is the loser. He has to submit to the terms dictated by the 'bania' who is very often the man to whom the farmer is very heavily indebted.

It is obvious that the more common practice if not the universal one, in pre-British India, when there were no railways and post-offices, was for the grower to exchange his produce for the goods he required. If rent was to be paid to the landlord, it usually took the form of payment in kind. The marketing was based on the isolated efforts of the peasant and the Bania. Organised business centres were non-existent. The cultivator had practically no chances of marketing successfully. The farmer is a necessitous creature and he hurries to sell his crops soon after the harvest and does not wait for better prices because his immediate need is cash to pay the rent and to pay back some of his ever increasing debt, and secondly because there being no good storage available, he is afraid lest his goods get spoilt.

Perhaps he did not want to go to the distant markets which inevitably involved high expenses; and perhaps he did not know of any profitable means of grain-storage. The regular construction of roads and railways has shortened distances. The opening of the Suez Canal in 1869 has linked him with European and subsequently American markets. His bargaining power is gradually increasing.

The English eye realised the role of efficient marketing in the rural and agricultural development of the country and appointed from time to time several commissions,* to suggest improvement.

The United Provinces were the first to appoint local marketing officers to collaborate with the central marketing staff. A series of marketing surveys with special reference to the more important commodities, e.g. wheat, sugar-cane, cotton, etc., have been planned out.

Specialised markets are very few, and those that exist serve as central stations for the collection and distribution of the various crops of the neighbouring areas.

At the top is the Chamber of Commerce, Cawnpore, then come the wholesale markets generally called 'Mandis.' The bigger 'Mandis' have their own organisation, while the rest including rural markets are not controlled. The buyers and sellers are left to deal between themselves.

The appended map shows the position of the bigger commodity markets in our area. They are (*vide* map) :—

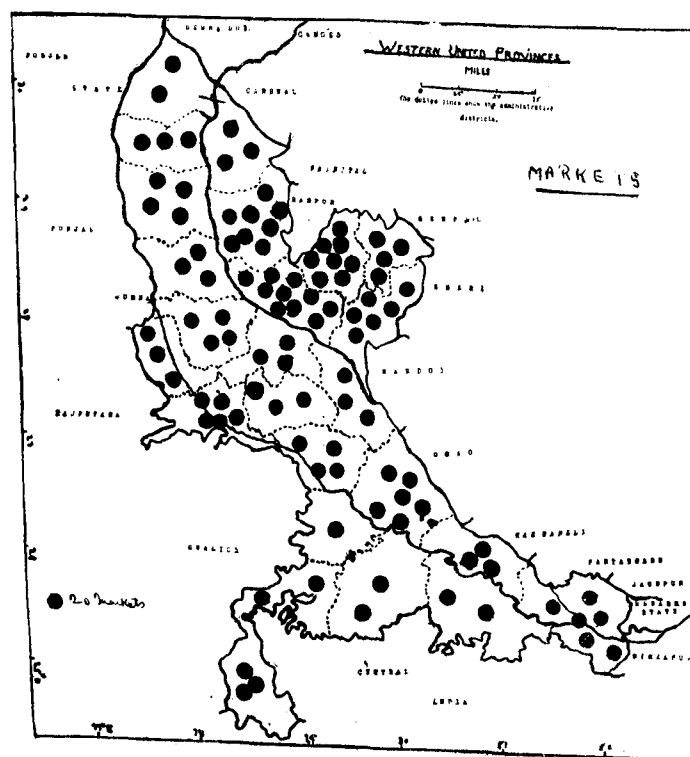
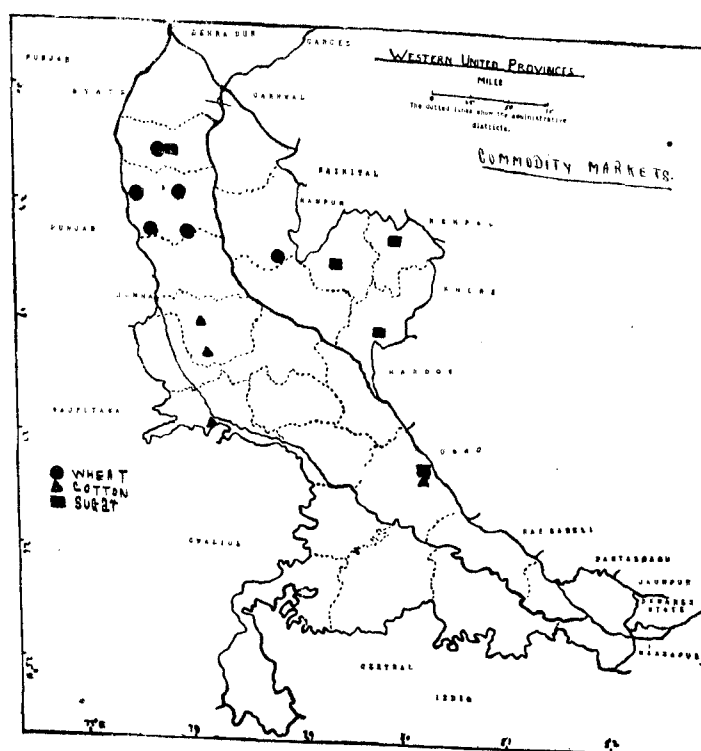
Wheat: Meerut, Muzaffarnagar, Chandausi, Hapur, Hathras, Ghaziabad.

Cotton: Agra, Aligarh, Hathras, Cawnpore.

Sugar-cane: Bareilly, Shahjiharapur, Cawnpore, Muzaffarnagar.

Hapur is the biggest 'Mandi' in U.P., and together with Amritsar in the Punjab has snatched from Bombay the place of honour in the matter of supremacy in the wheat trade. It has its own Chamber of Commerce, its daily trade news bulletin and its forward transaction. The 'Mandi' also makes efforts towards preventing adulteration of produce, simplifying marketing charge and organising trade on a better footing.

* The Famine Commissions of 1880, 1898, 1901; the Irrigation Commission of 1903 and the Committee of co-operation of 1915; also the Royal Commission on Agriculture in India, 1926.



In some villages are found a few local markets where the producers take their produce for disposal. The map showing the distribution of village markets tallies fully with the map showing the distribution of cultivated area. Distribution of grain markets is essentially controlled by the distribution of agriculture and ultimately by geographical environment.

The village markets involve 'bazar-like' dealings rather than organised trade. Mostly the markets are held once or twice a week in some open space, and that day is a day of holiday in the village when all go shopping. They are without a system and involve arduous travels over rough and unmetalled roads which however the farmer prefers to going to bigger markets by rail or motor. And the villager prefers selling his produce in these village markets because bringing produce in the big 'Mandis' involves a good amount of money for transport and carriage charges, and then the wholesale dealers quote their own terms which are seldom reasonable, with the result that either the villager has to take back his goods or sell them at a loss.

There is no marked tendency towards co-operative marketing of agricultural produce. Solitary institutions work here and there, but they are hardly able to cope with the demand. More co-operative societies could function on these lines to the great advantage of the cultivator. They could give advance money to the producers until they get a fair value for their produce. Besides, they could educate the cultivator in improved methods of production and preparation of his produce, facilitate the grading of produce and put the backward village farmer in touch with the bigger markets.

The holding of surplus supplies from periods of plenty for periods of scarcity is one of the most essential items in profitable marketing. The economic advantage of storage is that it aids in adjusting variable supplies to the relatively constant needs of the buyer.

Unless storage is safe and free from damage by insects, rodents etc., it cannot prove profitable. Cultivators store grain in their houses in earthen pots or in a corner of a small living room. Both the practices are practicable only for small quantities. For bigger amounts 'Khattis' or cells in the ground, or barns are preferred but in both places there is danger of damage. The bigger merchants generally use the latter places. Even in normal years there is a considerable amount of deterioration in the quality of the grain, besides the damage on account of rats, sub-soil damp and the consequent chemical reactions. At Muzaffarnagar the author was

shown round by an official of the Grain Chamber some of the newly built 'Khattis' or storage pits made of reinforced concrete. The official said that these scientific pits were water-proof, insect-proof and hygienic. There is a tendency in that market to abandon the old 'Khattis.' These new storage chambers of reinforced concrete in Muzaffarnagar are the first of their kind in Northern India and it is hoped that other big markets like Hapur will soon follow suit.

Both marketing and storage development should be a concern of the agriculturalist and the wholesale dealer; and organised marketing, direct dealing, thereby eliminating the village 'bania' or the middleman, should be encouraged as it brings village prices into greater accord with local 'Mandi' prices, to the benefit of both the producer and the buyer. That private enterprise is not forthcoming is to be regretted. Any scheme planned and financed by the Government can hardly succeed without the co-operation of the people.

This line of improvement is directly connected with the agricultural development of the region. It will not be very wrong to say that the development in marketing (to enable the producer of the crop to have some profit out of his produce) has a direct bearing on the subject of agricultural development and should go parallel with that of the latter. Unless he gets profit and is sure that if he grows more, he will earn more money, the cultivator will be very reluctant in trying to increase his acreage under crop, or make better use of the irrigational facilities or the other improvements introduced hitherto.

An Appeal to the Universities of India for Considering the Position of Geography as a Science

By

PROFESSOR M. B. PITHAWALLA, D.Sc. (GEOGRAPHY), Karachi.

It is high time now to make an earnest appeal, through the medium of this popular Journal, to the authorities of all the Universities of India, for considering seriously the position of *Geography as a Science* and for developing its studies in the Faculties of Arts, Science, Commerce, Agriculture and Technology. Though Geography is a science of recent growth, it is not to be regarded in any way to be less important than the other branches of Science; on the contrary its claims are superior to those of some branches at least, and in this respect it must be remembered that its studies are greatly neglected by our Universities, unlike those of the West, which prescribe it not only as an independent subject of study and research but also as a subject allied to history, economics, ecology, anthropology, military science, etc. Hitherto Geography has been considered as a dry subject of no great importance, a mere matter of facts and figures to be crammed up at the Matriculation or Intermediate Arts examination only. But this state of affairs must now change and it must be regarded as a science of vital importance to India.

Comparative Statements of Indian and Foreign Universities

In support of my views, I give below a Statement (marked A) showing the position of Geography in all the 19 Indian Universities and another (marked B) showing its position in some foreign Universities. From these it will be clearly seen that while some advanced Universities have introduced Geography not only as a subject for examinations in the Arts as well as Science Faculties but also as a subject of research for higher degrees, others have done practically nothing in the matter, e.g. Bombay. By them just a spoonful of it has been prescribed for the Matriculation examination as a minor section of a paper and as an optional subject merely for the First Year or Intermediate Arts but without any practical test or examination, so that full scope has been given to the candidates for mugging up the subject, for examination

purposes. Such an attitude of a great University towards a subject of vital importance to students is indeed deplorable. I have, since 1932, made frequent appeals to the authorities in this connection in my own individual capacity but have invariably failed and papers have been merely filed or recorded.

Importance of Geography as a Science in these times

Geographical studies, in my opinion, must be considered to be particularly important especially in these days of a world conflagration. Mr. N. Subrahmanyam, the Editor of this Journal has cleverly called it a *Geography War*. The League of Nations did their level best to popularise it. This is indeed a War in which geographical circumstances and geographical factors are performing a most prominent function. It is the geography of Europe and other affected parts of the world that has been the director of all land, sea and air operations. Several of the British and other professors of Geography are now working with the R.A.F., Fleet and Army at many places. Great nations such as U.S.A. are making defence preparations based upon the geography of their lands. But, unfortunately for our country, the students are kept painfully ignorant of these vital factors. For India particularly, Geography, must be of far more importance to them than even history, because the present position of the world affairs shows an ever-increasing interdependence of one nation upon another, and the more they know about each other's outlook, the better would it be for all, as the more likely we will all be to come to an amicable understanding and friendly relationships. I make bold even to say that the political and social problems in India itself can be easily solved, if our young men and women are made really to understand the *natural factors* working behind all human struggles and endeavours. It is, therefore, that many foreign Universities, which are up-to-date, encourage Geography and geographical research at their centres.

Utilitarian Value

Geography has an *educative* as well as *utilitarian* value. There is an increasing demand for specialist Geography teachers in all our Schools, Primary and Secondary. The Madras University diploma has been so highly valued in South India and the Madras Geographical Association has shown the way to workers in the other parts of India, by means of the Vacation and Refresher Courses, how we can make our school teaching ever fresh and ever living. More than anything else, our students should know all

about the natural resources of our country and of other countries coming in contact with it, so that they may, when their time comes, give their share in the proper regeneration and development of their mother land which has such vast potentialities. Even the weathers and climates of India are so poorly understood by many; there is a great loss of knowledge and consequently the rising generation is becoming more and more powerless and restless.

Geography has an Interpretative Function

Geography has also an *interpretative* function. It elucidates and re-interprets the *complex* relations between the physical environment on the one hand and the distribution, mode of life and economic and social activities of man on the other hand, both in the present and the historic past. Such an elucidation of new relationships is accepted by Western geographers as a contribution to Science; but in this respect also our Indian Universities are very backward.

An Aid to other Sciences

The aid, which geographical research can render to allied subjects, history, economics, sociology, commerce, agriculture, etc., is valuable. No study of these subjects could be *complete* or *thorough* without the *background* of *Geography* given to it. This aspect of our Science has been well emphasised by foreign Universities, such as London, Oxford and Cambridge, as will be seen from the Statement B.

India's Contribution to Indian Geography

Not depending upon outsiders, our University students should soon learn to give their share in producing a reliable, and scientific Geography of India, which yet remains to be explored. This requires specialistic knowledge which we must foster at our University centres. (*Vide* My note on M.A. and M.Sc. courses). Instead of making our students dreamers and idle dabblers in politics, we must help them to turn out good and useful work for the advancement of our country. In this direction, a good beginning has been made by local Indian geographers at Madras, Aligarh and Calcutta who deserve our grateful thanks.

Practical Side of Geography

It is a grave mistake to suppose that there is no practical side of Geography. All our teaching is ruined on this account and the

science of Geography is murdered. While there is always a practical University examination in connection with other Science subjects viz., Physics, Chemistry, Biology and Geology, there is no practical examination held, even at the Intermediate stage, by some of our Universities. The result is that students are tempted to *cram* the facts of geography without knowing their bearing on daily and practical life. Students have much to learn and do practical work both in the laboratory and in the field. Among the practical aspects of Geography are field surveying, aerial surveying river, lake and ocean explorations, mountain expeditions, map making and map reading, enlarging and reducing maps, cartographical representation of data and statistics and identification of specimens of various kinds in different physiographic regions of India and other lands. All this requires *laborious* laboratory and field work and exercises which no other branch of Science needs. It is, therefore, absolutely necessary that with every theoretical Paper in Geography, there must be a *practical and oral test* so that the whole study may become *realistic*.

Board of Studies in Geography

All this cannot be achieved unless a *special and competent* Board of Studies in Geography is instituted by the Universities. Hitherto the work has been relegated to other Boards of Studies *indifferent* to the interests of Geography or to persons *incompetent* to deal with the subject adequately. Unlike other subjects of study, Geography has many branches, all of which should be properly represented on the special Board; otherwise the subject would suffer considerably. In the University of London, for example, there are as many as 18 Members, representing physical, historical, economic, biological, agricultural, ecological, anthropological, archaeological, commercial, and human geography, etc. With such a Board there must also be made provision for a representative of it on the Academic Council and the Executive Body of every University, so that plans made by experts in the line may not be thrown aside by *laymen* and *interested parties*, as has been the case hitherto.

To sum up

I earnestly desire that Geography and geographical teaching in our Indian Universities should be placed on proper and sound lines without unnecessary delay, so that the rising generation in our country may not suffer and their education may not be defective.

For this purpose only and with no other motive, I appeal to the authorities to achieve the following as soon as possible:

- (1) Separation of Geography from History at the Matriculation Examination, as a compulsory subject.
- (2) Introduction of Geography at the Intermediate Arts, Intermediate Science, Intermediate Commerce, B.A., B.Sc., B.Com. and B.Sc. (Economics) as an optional subject with Papers as well as Practical Examinations.
- (3) Encouragement of geographical research side by side with allied subjects of Ancient and Modern History, Economics, Sociology, Anthropology, Archaeology, etc., at the University Schools and Departments of Economics, Sociology etc., and at other Institutions affiliated to the Universities for post-graduate research.
- (4) Introduction of Geography in the Department of Military Science as a compulsory subject.
- (5) Institution of a Diploma in Geography for School Teachers (for a 2-years' course after Matriculation), if it is not yet done.
- (6) Establishment of a Chair of Geography in the Universities for all Honours and postgraduate teaching, or in case it is already established, its expansion into a University Department of Geography in relation to Economics, Sociology and History on the Art side and to Geology and Biology on the Science side, with a well-equipped laboratory and facilities for field work.
- (7) Institution of a special Board of Studies in Geography, or if one is already in existence, its expansion in such a manner as to serve the interests of *all the branches* of Geography, and its proper representation on the Academic Council and the Syndicate.

STATEMENT A

*Position of Geography in Indian Universities (those marked * have developed the Science well)*

No.	Name of University.	Inter Arts.	Inter Science.	B. A.	B. Sc.	Other Exams.	M. A. , M.Sc.	Ph. D.	Remarks,
1	AGRA	.....	.....	B.A. (2 Papers)	.....	Inter Com. (1 Paper)	.....	.....	.....
*2	ALIGARH	Inter Arts (2 Papers)	Inter Sci. (2 Papers)	B.A. Pass (2 Prs., 1 Pr.) B.A. Hons. (5 Prs., 1 Pr.)	B. Sc. Pass (2 Prs., 1 Pr.) B.Sc. Hons. (5 Prs., 1 Pr.)	B. Com. (3 Papers) B.T. (1 Paper) B.A., B.Sc. Eco. (1 Paper)	M.A., M.Sc. (8 Prs., 1 Pr.)	Ph. D. Thesis	1 Uni. Reader 4 Lecturers 4 Demonstrators.
3	ALLAHABAD	.....	.....	B.A. Pass (2 Papers)	.....	B. Com. (1 Paper)	.....	.....	Allied with Commerce. 1 Reader 3 Lecturers.
4	ANDHRA	Inter Arts (2 Papers)	Inter Sci. (2 Papers)	.....	.....	B. Com. (1 Paper)	.....	.....	.....
5	ANNAMALAI	Inter Arts (2 Papers)	Inter Sci. (2 Papers)	.....	.....	.....	.....	.....	.....
6	BENARES	.....	.....	.....	.....	B.T. (1 Paper) Inter Com. (1 Paper)	.....	.....	.....
7	BOMBAY	.....	.....	.....	.....	F. Y. A. (2 Papers) B.T. (1 Paper)	.....	.....	D.Sc. can be taken by published Research.
*8	CALCUTTA	Inter Arts (2 Prs., 1 Pr.)	Inter Sci. (2 Prs., 1 Pr.)	B.A. Pass (2 Prs., 1 Pr.) B.A. Hons. (4 Prs., 2 Pr.)	B.Sc. Pass (3 Prs., 1 Pr.) B.Sc. Hons. (4 Prs., 2 Pr.)	B.T. (1 Paper) Military Cer. (1 Paper)	Proposed M.A., M.Sc. (5 Papers) (3 Practicals)	.....	1 University Lecturer-in-charge.
9	DACCA	.....	.....	.....	.....	B. Com. (1 Paper)	.....	.....	.....
10	DELHI	Inter Arts (2 Papers)	.....	.....	.....	.....	.....	.....	.....
11	LUCKNOW	.....	.....	.....	.....	.....	.....	.....	.....
*12	MADRAS	Inter Arts (2 Papers)	Inter Sci. (2 Papers)	B.A. Pass (5 Prs., 1 Pr.)	.....	L.T. (2 Papers) Dip. Ed. (1 Paper) Dip. Geo. & Ec. (5 Prs., 1 Pr. with Thesis)	.....	.....	2 University Lecturers.
13	MYSORE	Inter Arts (2 Papers)	Inter Sci. (2 Papers)	.....	.....	B.T. (1 Paper)	.....	.....	2 University Lecturers B.A. & B.Sc. Courses are contemplated.
14	NAGPUR	Inter Arts (2 Papers)	.....	B.A. Pass (2 Papers allied with History)	.....	.....	.....	.....	.....
15	OSMANIA	Inter Arts (2 Papers)	.....	.....	.....	Dip. Ed. (1 Paper)	.....	.....	.....
16	PUNJAB	Inter Arts (2 Papers)	.....	B.A. Pass Hon. (2 Prs., 1 Pr.)	.....	B.T. (1 Paper)	.....	.....	Questions of making Geography as a Science subject & of introducing it in M.A. are under consideration.
17	PATNA	Inter Arts (2 Papers)	.....	B.A. Pass Hon. (3 Papers)	.....	.....	.....	.....	.....
*18	RANGOON	Inter Arts (2 Papers) 1 Practical	Inter Sci. (2 Papers) 1 Practical	B.A. Pass Hon. (3 Papers) 1 Practical	B.Sc. Pass (3 Papers) (1 Practical)	B. Com. (1 Paper) B. Ed. (1 Paper)	M.A. Thesis	.....	1 University Professor. 2 Lecturers and 2 Demonstrators.
19	TRAVANCORE	Inter Arts (2 Papers)	Inter Sci. (2 Papers)	.....	.....	L.T. (1 Paper)	.....	.....	.....

N.B.—1. The above information has been gathered by me from the latest edition (1940) of Handbook of Indian Universities (Inter-University Board, India) and by personal inquiries.

2. In some of the above Universities, Geography is prescribed only on paper, but the Colleges affiliated to them have not seriously started its teaching. Though there is dearth of qualified University Teachers of Geography, an attempt is not yet made by the authorities to induce men of Science to take up geographical research.

STATEMENT B

Position of Geography in Foreign Universities

N.B.—In well-known foreign Universities of Great Britain, Europe and America, Geography and geographical research have a prominent position in various Faculties, Arts, Science, Commerce, Economics, Agriculture etc.

University of London.

1. Geography is an optional subject for all Arts and Science examinations from the Intermediate to the final degree stage.
2. There is a special Academic Diploma in Geography instituted for Teachers.
3. Geography is a subject of research for postgraduate degrees of M.A., Ph.D., D.Litt., and D.Sc.
4. For B.Sc. (Economics), Geography is a *compulsory* subject at the Intermediate stage and again an optional subject at the degree stage e.g. Geographical discussions and geographical background of International Relations.
5. For M.Sc. (Economics), there is prescribed a detailed economic geography of an area or some aspect of geography chosen from agricultural, industrial or historical geography of a major region, population problems etc.
6. For B.A. Final Honours in Anthropology, there is a *compulsory* course of geological and geographical conditions of racial and cultural developments and the distribution of races.
7. At the London School of Economics especially, provision has been made for maintaining one Professorship, two Readerships and three Lectureships in Geography, besides similar posts in other University and affiliated Colleges for Arts and Science.

University of Cambridge.

1. Geography is prescribed for Intermediate Arts and Science, B.A. B.Sc., Intermediate Commerce and B.Sc. (Economics).
2. In the Final Honours and Post-graduate courses, there are prescribed Historical Geography, Agricultural Geography, Current Literature on Geography, Geographical Distribution of British Industries, etc.
3. Research Seminars in History teach *Historical Geography* especially.
4. There is a Diploma in Geography for Secondary Teachers.

5. The University maintains a Professorship and a staff to carry on Laboratory and Field Work for Geography.

University of Oxford.

1. This University maintains a special Honours School of Geography, designed to provide a course of instruction in Geography which may afford a preparation for further study and for geographical exploration.
2. In the Honours School of Modern History, *all* candidates are expected to have some knowledge of political and descriptive Geography.
3. There is a Diploma in Geography instituted and candidates for it are required to present a *thesis* of geographical description of a selected district as a part of their examination.
4. Special Certificates are issued for Proficiency in Surveying and General and Regional Geography.
5. At the B.A. and B.Sc. examinations, Geography is an optional subject.
6. Research and Superior degrees e.g. D. Phil. can be taken in Geography.
7. A Professorship and Staff are maintained at the Honours School.

N. B. Information has been gathered from the University Calendars or Handbooks.

Geographical Distribution of Religious Places in Tamil Nad*

By

RAO BAHADUR C. M. RAMACHANDRA CHETTIAR, B.A., B.L., F.R.G.S.

The TAMILIAN scholar divided the country into 5 natural divisions according to its physical features. In his poetical imagination he carried such ideas into his daily life. It entered into the manners and customs of the people. In course of time such divisions and the attributes to them became conventional. If a poet dealt with a particular region in his poem he always associated his thoughts to the particular sect of people who inhabited it, to the particular products growing in the tract, to the particular kind of song, amusement, festivity, food, dress, musical instruments and other ideas connected with the region. The grammarians developed these ideas into a hard and fast convention which has been left to their successors as an inheritance. Even in modern Tamil poetry, we find the poets adopting such conventions and forms. The ancient scholar named such regions by the name of a particular flower or plant which grew extensively in that region. Hence we find that the sea coast and the sandy tract along side of it, was known by the name of the water plant, 'Neithal' and the river bank with the fertile wet lands and civilised cities by the name of the tree known as 'Marutham'. The grassy plains where dry crops are grown and where shepherd used to graze his cattle and sheep by the name of the flowering creeper 'Mullai'. The hills and the forest country by the name of the forest plant 'Kurinji' and lastly the deserts and the wastes by the name of the tree 'Palai'. These poetic divisions are based on nature and but for the water-tight conventions developed by poetical imaginations based on such conceptions such divisions would have been more natural than any other kind of division.

On the other hand the politically minded TAMILIAN divided the country into divisions based upon the extent of land reigned by certain tribal heads. In the early days, TAMILIANS were ruled by three regal tribes known as Chera, Chola and Pandya. The heads of these tribes were known by the particular title of "Ko". The other

chieftains who were subordinate or rather feudatory to them, were never dubbed with the honorific title 'KO'. The capitals of these three reigning monarchs were 'Vanji', 'Woriyur' and 'Madura'. In later days the capitals of the latter two were shifted to such places as Puhar and Korkai. These political divisions often changed in extent and in boundary according to the growth and decline of various dynasties. About the 4th century A.D. a new power appeared in the Tamil country under the name of Pallava with its capital at Kanchi. Though the boundaries of these kingdoms were often described with a sort of definiteness as Chera, Chola, Pandya and Thondai Nadus, yet we find in the political history of the land that their extent varied often. Hence we find that though the nucleus of the division was somewhat fixed and definite, the extent of the kingdom was never constant. Sometimes we even find one country being swallowed up by another. During the time of the imperial Cholas of the Vijayalaya Dynasty the Pandya and the Pallava territories came under their suzerainty. During the 13th century Maravarman Sundra Pandya swallowed Chola and Pallava territories. In this way we find that the political units were never the same throughout history.

On the other hand, we find that there was a constancy in the division of land based upon religious ideas. During the 3 centuries following the Saiva and Vaishnavite revival in the early part of the 6th century, Saints appeared in the country and revived the two great religions and suppressed the then prevalent Buddhism and Jainism. The four great Saivite saints and the twelve Alvars travelled throughout the length and breadth of the land for the purpose of instilling religious spirit among the people, visited a large number of temples and have sung songs about them. While so doing they had mentioned the names of the divisions in the land. The other Saints and poets who followed them developed the idea still further and have fixed the extent of the divisions while mentioning the temple which they visited. In this way the division of land into various sub-divisions on religious basis became settled and were in vogue among the people. Such divisions which were fixed definitely by the religious Saints are as follows:—

1. A set of 3 maps of South India and Ceylon with the 7 Nadus and Siva and Vishnu sacred places and routes recorded and published by the Madras Survey Department, can be had from N. M. Subraya Mudaliar of Palur, Chingleput District.

2. A Tamil hand-map showing the abovesaid details with a guide can be had for annas four at Saiva Siddhanta Mahasamajam, Kallukaran Street, Mylapore.

* A paper read before the Association on 23-11-1940.

Chera Nadu.—Malabar, Cochin and Travancore.
 Chola Nadu.—Trichinopoly and Tanjore.
 Pandya.—Madura, Ramnad and Tinnevely.
 Kongu Nadu.—Coimbatore, Salem, a part of Trichy and a part of Madura.
 Thondai Nadu.—Chingleput, North Arcot and a portion of Chittoor.
 Tulava Nadu.—Kanara.
 Vada Nadu.—The country north of Tamil Land.

Besides these divisions, in later days, South Arcot which originally formed part of Thondai Nadu became known as 'Nadu Nadu'. There are a number of stanzas found in literature which give the extent of these Nadus. Moreover, we find that each temple is associated with a particular Nadu to which it belonged. Not only by tradition but also in *sthalapurāṇams* which give an account of the temple, a description of the Nadu in which it lay has been given. As a result of this classification we find that though the political divisions of the country increased and decreased according to the growth and decline of a dynasty the religious divisions of the land never changed, either in extent or in name. During Chola period, we find that the names of territories were being constantly changed according to the whims and fancies of the conquerors. The victorious Monarch desired to perpetuate his name as well as the names of his relatives in christening the newly conquered territory with their names. But the people do not seem to have approved the new-fangled ideas of the Monarch and never brought them into practice. But for the inscriptions found in temples, we have no opportunity of knowing the names given by these Monarchs. The people at large have retained the names of divisions given by the religious saints, preserving them till the modern times traditionally. Hence we find that for the last 14 centuries divisions according to religious ideas only have been prevalent among the Tamilians.

Such being the case, we can classify the divisions of the country according to the number of religious institutions found in them, and study how far religious spirit had existed in the land. The Saints who lived in the country from the 7th to the 10th centuries have left a record of the number of institutions visited by them. From this list we can say that these were the most prominent institutions which existed in those days. Subsequently a good number of institutions have come into existence for various reasons which we shall discuss later on. Herein we give a list of the number of temples which existed during the time of the Saints:—

Division.	Saiva.	Vaishnava.
Chera	1	13
Chola	192	40
Pandya	14	18
Kongu	7	—
Nadu	22	2
Thondai	32	22
Thulu	1	—
Vada	5	13
	—	—
Total	274	108
	—	—

From the above list we can easily grasp the idea how religious institutions came into existence more in certain tracts and less in others.

At this juncture, we should remember that temples came to prominence by their contact with saints and their being recognised and consecrated in their songs. The mere visit by a saint exalted the sacredness of the place in the eyes of the devotees. The temples which had the honour of being sung by saints were known as 'Padal Petra Sthalam' in Saivite lore and 'Mangala Sasanam Petra Sthalam' in Vaishnavite Literature. The other minor temples which were merely mentioned casually in the songs were dubbed by the name 'Vaippu Sthalam' in Saivite literature. The importance of a temple which was a Padal Petra Sthalam can be easily understood from the fact that even in modern days a rich and pious money-lender of Nagarathar Community would never consider to renovate any other temple than that which was sanctified in the songs of a saint. Such being the case, we can easily understand how places became sacred by the tread of the feet of the saints.

That a certain saint was born in a certain tract, that he preached in a certain tract and that he left the mortal coil in a certain tract, will always be an indication to the increased number of institutions in those tracts. *For instance Nadu Nadu (South Arcot) was famous as the birth-place of the two saints, Appar and Sundarar; Chola Nadu of Sambandar; Pandya Nadu of Manicka Vasa-

*Appar	..	Tiruvamur
Sundarar	..	Tirunavaler
Sambandar	..	Shiyali
Manikkavasagar	..	Vadavur

gar. As a result of such an importance, we find groups of temples round about the birth-places of those saints. Similarly in Vaishnavism we find, Ten Pandya Nadu being the birth-place of Alvars, Nammalwar, Perialwar, and Andal. Madurakavi also belongs to Pandya Nadu. Chera Nadu gave birth to Kulasekhara, Chola Nadu to Tirumangai Alwar, Thondai Nadu to the first three Alvars and Tirumazhisai. About the 12th century A.D. the Vaishnava Acharyas Ramanuja, Tirukachi Nambi, Tirumalai Nambi and a number of others appeared in Thondai Nadu. As a result of such births we find that a good number of Vaishnavite shrines springing up into importance round about the birth-places of these saints. Hence we find that the existence of religious reformers gave not a little incentive to the growth of religious institutions in various places. In later days we find a number of saints and religious poets appearing in the land and sanctifying other places. Moreover the Imperial Cholas, Pandyas, Vijayanagar Emperors and their vassals Tanjore and Madura Nayaks nurtured temple renovation work to a great extent. In this way temples increased in the land. I am giving in the end the number of religious institutions in each district as are found at the present day with the revenue which they pay to the Hindu Religious Endowment Board.

In this connection it would be interesting to bestow our attention to the origin of temples and their gradual growth. We will first consider the traditional origin of temples in our country and later on about the historical aspect of it. In Tamil Land there are a good number of traditional accounts as well as folklore tales about the origin of temples. We need not reject them as merely fanciful ideas. In many of them there may be bits of truth from which we can deduce a good deal of knowledge. When I made a study of the folklore tales in Kongu country, I found that similar traditional tales occurred with regard to various temples in the length and breadth of the land. Regarding some of those tales we find actual record of them in the temple Sthalapuranams as well as in the relief figures found on the dwajasthambams on the temple walls. One such story is found in the temple of Perur in Kongu Nadu. A cowherd was grazing his cows in a forest. One cow was

Nammalwar	..	Alwartirunagari
Peria Alwar and Andal	..	Srivilliputtur
Tirumangai Alwar	..	Tiruvai
Ramanuja	..	Sriperumbudur
Tirukachi Nambi	..	Poonamalle
Tirumalai Nambi	..	Tirupati

not yielding milk. While reprimanded by his master he went along with the cow to find out the truth. The cow was found milking of its own accord on a round piece of stone under a bush. The infuriated cowherd boy gave a lash on the cow, which jumped and hit the stone. Blood came out of it. The boy fell unconscious. The master coming to know about the incident cleared the bush and built a temple over the lingam thus manifested. This is the origin of the temple at Perur. Similar stories are found in a number of other temples in Tamil Country. Similarly a villager was digging to get a root of Valli Creeper and his axe struck a round stone and blood came out of it. It was found that it was a lingam and a temple was constructed on it. This is the origin of Annur in Avanashi Taluk. While a tribe emigrates from one country to another due to repression or famine they carry all their belongings to their new homestead. Tradition always says that along with their movables one stone is always found in a basket carried by a woman and comes back even if thrown out. Later on the tribe learns that it is their family deity and at their new home a temple is constructed. These are a few oft-quoted traditional accounts current about the temples.

While such are the natural traditional accounts, we find in various other places, constructed temples where the images of deities made by a sculptor were installed. Devotees established new temples out of mere piety or when their desires were fulfilled by any divine act. Recovery from small-pox, cholera, plague and other dire diseases often prompted devotionally minded folk to establish new temples. Victory, sudden affluence, daring act are some of the common causes for new construction of temples. Heroic act by a warrior or a brave villager in fighting with an enemy or with a wild beast in order to protect the public often formed an incentive to erect a temple on the remains of the person. Similarly temples arise in the spot where a widow burnt herself with the corpse of her husband in order to keep up her chastity. Such are some of the instances in which temples were formed in the country.

Coming to the historical side of the origin of temples, we are told that temple construction in the Tamil land came into existence only after the 4th and 5th centuries of the Christian era. The ancient Tamilians worshipped Nature and natural objects; and later on they used to instil a few rough stones as objects of worship under the shade of trees. Buddhists and Jains came to the south and brought their ideas of image worship. Rough stones began to develop themselves into fine figures. Tree shades gave place to

mud construction with thatched and tiled roofs. The Chalukyas dug cave temples for their Gods in the Deccan in imitation of Jain Monasteries. The Pallavas followed them in the 5th and 6th centuries in the South. In course of time cave temples gave place to cut-stone granite temples. The Imperial Cholas developed them into artistic ones with huge gopurams. Pandyas, Hoysalas and the petty chiefs who followed them, developed single-room temples into temples with good many halls or mandapams. Vijianagar kings lavished good deal of their wealth on gopurams, mandapams and compound walls. The result of such a development was that the shade of a banyan tree developed in course of time into a religious fortress with 7 huge ramparts round it. This is in brief the history of temple development, in the Tamil country.

The frequency of temples in Tamil country owes much to the conception of division of land by them. As already told, the Tamilian divided his country into 5 natural divisions. Among them the tract which favoured temple construction was Marutham i.e. river side and the fertile country near it. Due to the fertility of rivers and channels and lakes formed out of such channels, population increased and along with the density of population temples increased. Villages and towns grew mostly near the rivers and lakes and hence the places of devotion also improved. We find the largest number of temples along the river valleys. The Cauvery Valley had 192 Saivite and 40 Vaishnavite consecrated temples. The Vaigai valley in Pandya Nadu and the Tambaraparni valley have 14 and 18 Saiva and Vaishnavite temples. The 7 Kongu temples are on the banks of the Noyyal, Bhavani, Cauvery and Amara-vathi rivers. Most of the temples in Nadu Nadu and Thondai Nadu are near rivers or big lakes. Madurantakam, Koovam and Elambayamkottur owe their existence to big tanks.

Next comes the sea coast and the sandy tracts. Often we find back-waters and lagoons intercepting the sandy tracts. Along these places a good number of temples have sprung up. The 13 Vaishnava temples and 1 Saiva temple of the West coast owe their existence to water communications. Similarly have arisen the temples of Tiruv-ida Venthai, Porur and Mamallapuram on the eastern coast. Tiruvotthiyur, Tiruvanmiyur, Mylapore, Tiruvallicani, Tiruppapuliyur, Nagapatnam, Karaikal and Vedaranyam are on the sandy eastern coast.

Next comes the hilly tract. Throughout the Tamil country stray hills are found everywhere. None of them are allowed to escape. Every one of them is associated with a temple, especially that of the

Tamil God Muruga. There are a few exceptions where Perumal and Siva are installed. The poet Arunagirinathar has sanctified all these temples with his popular songs of Tirupugal. Besides these stray hills, we find long and high ranges of hills wherein also temples are constructed. The hills of Tirupathi, Kollimalai, Javvathumalai, Servaraya hills and Western Ghats contain famous shrines.

Among the other two tracts the up-lands or Mullai has very little fertility and temples are also few here. The 5th region Palai or desert is practically nil in the Tamil country.

Hence we find that the nature of the soil as well as that of the physical features influence largely the number of temples in the Tamil country.

We have already indicated that religious spirit, patronage of royalty, devotion of people, and nature of the land form some of the causes for the establishment of temples in the land. Besides these causes, economic conditions and resources of the people also form a good incentive for the establishment of temples. Trade and industry make people wealthy. Communications help the trade and the consequent prosperity of the people. While in early days rivers formed easy means of communication, in later days canals were constructed which helped transport to a considerable extent. The temples of Malabar owe their existence to such easy communications. Tiruvanchaikazham, Tirupunathurai, Alwaye, Vaikom, Etrumanur, Alapizhai, Ambalapizhai, Varkalai and Trivandrum owe their existence to canal back-waters. Similarly there are Kovilam, Tiruvidaventhai, Tiruporur and Sadras on the Eastern coast.

Roads form an important means of communication for transport and pilgrimage. They form easy passages from one town to another. We always find that each big cathedral city is a nodal centre for a number of roads from the neighbouring country. Trade and commerce owed much of their existence to such roads. The big towns of Chidambaram, Kumbakonam, Tanjore, Trichinopoly and Madura were centres for such road connections and their temples grew rich, powerful and attractive. Recently railway junctions made the sacred places more and more popular. From time immemorial Rameswaram was the centre of pilgrimage for the entire population of India. Long before railway communication was introduced, there was a trunk road leading from northern districts along Tanjore and Ramnad to the island of Rameswaram. This road was known as Chatram Road for the reason that a number of Chatrams or centres of pilgrims halts were constructed by the then

rulers of the country. This is an interesting item which helped the pilgrims with all the conveniences which they needed. It is natural that along such tracts small temples began to rise.

As a result of the above discussion we can easily understand how temples began to grow in the country and in what way they are found distributed throughout the length and breadth of the Tamil land.

APPENDIX: (A)
Temples district-wise:

Kingdom.	District	Major temples	Minor temples	Maths.
Pandya	Tinnevelly	597	1418	30
	Madura	211	275	4
	Ramnad	422	424	6
Chola	Trichinopoly	623	590	7
	Tanjore	977	2147	19
Nadu	S. Arcot	477	349	13
Thondai	Chinglepet	289	170	6
	N. Arcot	324	660	12
Kongu	Salem	251	238	5
	Coimbatore	619	325	3
	Nilgiris	26	4	-
*Chera or malai	Malabar	1030	180	9

* Before 10th century—Tamil; later on—Malayalam.

APPENDIX: (B)
Revenue from temples at 1½ and 3% of income.

District.	(Year 1938—39) in rupees.
Tinnevelly	15663
Madura	10206
Ramnad	20669
Trichinopoly	12235
Tanjore	36445
S. Arcot	7055
Chinglepet	6985
N. Arcot	3862
Salem	3480
Coimbatore	7987
Nilgiris	
Malabar	
Total	40368

Northern Hunters*

By

ROBERT BENTHAM, B.Sc., F.R.G.S.

Geologist of the Oxford University, Ellesmere Land Expedition.

Between the northern shores of the continents of the eastern and western hemispheres lies one of the few remaining unexplored areas of the world—the Arctic Ocean. Compared with the other oceans it is remarkable neither for its size nor its depth, but its covering of ice has so effectively hindered exploratory effort that only once has a surface ship crossed it namely Nansen in the 'Fram'. Numerous voyages have, however, been made round its edges, along the Siberian coast and among the islands of the Arctic Archipelago, but only at high cost in men and ships, and the result has been an unsavoury reputation for the Polar Ocean.

In spite of temperatures so low that in places the sea never thaws and the fact that night and day are measured by weeks and months and not hours, animal life abounds round the shores of the Arctic Ocean; and the prospect of an abundant food supply has led man too, to adapt himself to these unusual conditions. It is the object of this lecture to give a brief description of some of these northern hunters, the Eskimos of Greenland and the Canadian Arctic Islands.

It is to the old Norse sagas that we are indebted for our first records of the Eskimo. In 982 A.D., over thirty years before Canute became king of Britain, Erik the Red set out on a westerly voyage from Iceland that resulted in the discovery of Greenland and its Eskimo inhabitants. Later, other Norsemen from both Iceland and Norway followed in his footsteps and established settlements in the comparatively fertile south-west. It was while on a voyage to these settlements that Leif Ericsson was driven off his course and in 1000 A.D. discovered North America—the vinland of the Norsemen.

The Greenland colonies flourished for many years; they managed to keep cattle and sheep, run small farms and trade with their neighbours and their homeland—exchanging skins, oil and furs for much needed iron, wood and cattle. Later, however, they

* A Lecture delivered before the Association on 11-2-1941.

began to be less prosperous, when with the decline of the Norsemen, ships became few and far between and finally ceased altogether, the colonists being forgotten. Of the later history of the colonies there is no written record, but from archaeology we know that they became steadily more impoverished and disease more rampant, until in the end they died out altogether. A number of theories have been propounded to explain the disappearance of these settlements, since in spite of the cessation of communications with Europe, they should have been able to survive. Suggestions include a change in climate and intermarriage or disastrous wars with the Eskimos. The answer may be a combination of all three.

Greenland was re-discovered in 1500 A.D. by the Portuguese, Gaspar Corte-Real, and he was followed during the 16th century by Willoughby, Chancellor, Frobisher, Davis and others, looking for a north-west passage to the wealth of the East. Other expeditions went out during subsequent years, even after the idea of a commercially practicable north-west passage had been given up, culminating in the numerous Franklin search expeditions and Stefansson's and more particularly Rasmussen's work of recent years. All these have contributed something to our knowledge of the Eskimo, until now he is one of the better known races of the world.

To-day the Eskimos are found from the east coast of Greenland to Alaska, while a few have even crossed the Bering Strait and established themselves in Siberia. Over this enormous area there is so little variation in language that a Greenlandic can make himself understood from one end of Eskimo territory to the other, as was proved by Rasmussen during his 1924-29 expedition, when he travelled from Cape York in North Greenland to eastern Siberia (where he was imprisoned by the Russians), visiting practically every settlement on the way.

Half the world population of about 30,000 Eskimos live in Greenland and, with the exception of a small settlement on the east coast at Angmassalik, all these are distributed along the west coast between Cape Farewell in the South and Smith Sound in the North. The remainder are scattered over the North American coast between Labrador, Hudson Bay and Alaska and on various islands, principally Baffin, Southampton, Somerset and Victoria. Other islands, such as North Devon and Ellesmere, show frequent signs of having once supported thriving populations, but for reasons unknown they have long been deserted.

The origin of the Eskimo is the excuse for numerous papers by ethnologists, but it is a problem that still awaits solution. There is no doubt, of course, that like the American Indian he came originally from Eastern Asia, but where, in America, he developed his peculiar culture and the routes by which he dispersed remain a mystery. One quite plausible suggestion is that originally he was a forest dweller living somewhere north of Lake Superior, whence he moved north, probably encouraged by warlike Indian tribes in his rear, striking the coast somewhere between Coronation Gulf and Boothia Peninsula. From there the migration split, some going west, some east to Hudson Bay and the Labrador while others continued north-east through Baffin Island, North Devon Island, Ellesmere Island, over to Greenland and then south again down the west coast. It must be emphasised, however, that this migratory plan is largely surmise as many links in the chain of evidence are required before it can be regarded as proved.

Owing to numbers of varying factors, such as interbreeding with white men and different conditions of weather and hunting, Eskimos in various parts of the North differ considerably both in their appearance and mode of life. In Western Greenland from Disko Island southwards, the percentage of white blood is high and many of the inhabitants have fair skins and features almost indistinguishable from Europeans (except in a few cases—the offspring of some African negroes who were whaler's cooks). The short winter season has turned them into a race of fishermen rather than sealers. Around Coronation Gulf, there is alleged to be a tribe of 'blonde' Eskimos, comparatively tall, light skinned and fair haired people who may possibly be the descendants of an old Norse colony. On the whole, however, the Eskimo is a strong type and even though he may have quite a lot of white blood in his veins, he usually retains his Mongoloid characteristics. Differences in the Eskimo mode of life result from the fact that while his economy is usually based on the seal, abundance of other game such as caribou, walrus or whale may cause him to depend mainly on them for food and he develops a different technique for securing his livelihood. Thus it is quite impossible, within the scope of a lecture, to attempt a description of the Eskimos as a whole and the ensuing paragraphs will be limited to giving a brief outline of the life of the most northerly of the Greenland tribes—variously known as the Cape York or Smith Sound tribe or more picturesquely, the Arctic Highlander.

The Smith Sound Eskimo is the purest of his race and owing to his comparative inaccessibility has been the least contaminated

by 'civilising' influences. Physically, though far from being a pygmy, he is short and stocky, with a typically Mongolian face—high cheek bones, small slit-like eyes, small flat nose and a tendency towards prognathicity. As a rule, he is not a hairy man and though he wears his straight black hair down to his shoulders, his beard is thin and wispy and has a very undernourished appearance. His complexion is naturally sallow, but during the spring and early summer it is burnt almost black by the sun. He has a very attractive character, his most striking attribute being a perpetual cheerfulness under almost any conditions, whether of prosperity or starvation—an all too frequent alternation in his life. For the rest he is honest, truthful, loyal and courageous, qualities to which some Arctic explorers owe their lives and many others the success of their endeavours. He has remarkable mechanical aptitude and his intelligence is well up to European standards, though in the way of its development stands his happy go-lucky nature, complete refusal to look beyond the needs of to-day or to do anything but sit in the sun, talk or sleep as long as the larder is full.

The Smith Sound Eskimo lives on a barren coast line where there is little vegetation and no trees or bushes and as a rule little more than a $\frac{1}{4}$ to 1 mile of comparatively low and even country between the sea and the mountains behind; and a few miles further inland is the edge of that great desert, the Greenland ice-cap. Consequently he is dependent entirely on the sea for his livelihood and more particularly on the seal family. The common Greenland seal provides him with food, blubber for fuel and skins for clothing; the larger bearded seal supplies food, and its thicker skin, hide for dog traces, whips and harpoon lines; and the largest of the seal family, the walrus, is a source of dog food and ivory for making implements.

It is not proposed to detail here all his various methods of hunting but the principal ones can be mentioned briefly. Walrus and bearded seal are only killed in numerically small quantities and are usually shot while sleeping on the ice or else harpooned in the water, from kayaks. It is the common seal that occupies most of the Eskimo's hunting time, particularly during that period from the end of April to the end of June, when the sun is warm and the seals come up on to the surface of the ice to bask. These he hunts with rifle and seal screen, the latter consisting of white material stretched over a frame which he holds in front of him to hide him from his quarry. This form of stalking is a slow and laborious process and though in one day he may get as many as half a dozen

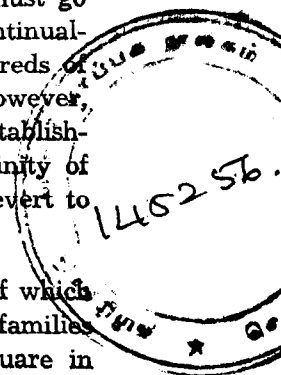
seals, on other days he will get nothing and he has to work long hours to get the scores that he requires to keep his dogs and family through the winter.

Narwhals, white whales and fish also serve to swell the Eskimo larder, but they are regarded as extras and are only obtainable in certain localities. Bird life, however, may form a substantial part of his diet, particularly little auks which fly close to the ground and are caught like butterflies, in nets. They are usually cached and left for a long period, until they are green with age and emit an aroma considered by the white man to be rather pungent. They are then regarded by the Eskimo as a great delicacy. The same applies to eider duck and sea gull eggs which are collected in enormous quantities and eaten when more or less rotten.

Finally there is the white and the blue fox which he traps during the winter, from November to the middle of March. Formerly regarded as a woman's occupation, trapping, next to his sealing, is the Eskimo's important occupation. No longer is the best hunter the wealthiest man in the community, but now it is the most cunning trapper since foxes are the only thing that white man requires of the Eskimo and consequently they are his only means of buying rifle, ammunition, tents, cloth, wood and others of the white man's products that he needs.

Like most hunting races, the Eskimo is a nomad; he has to be, for game conditions may vary from year to year and he must go where his food supply goes. This does not mean that he is continually on the move, but it does mean that he often dies hundreds of miles from the place where he was born. Nowadays, however, there is a tendency for him to settle down owing to the establishment of trading posts, but ultimately the game in the vicinity of a post will be exhausted and he will have no choice but revert to the habits of his forefathers and move on to a better place.

The unit of his social life is the family, three or more of which constitute a village. During the winter, one or two families according to their size, live in one house, circular or square in shape and from eight to twelve feet in diameter. It is constructed by building a low wall round an excavation in the ground, banking it with turf and making a roof from skins and turf, supported by rafters of wood or whale bone. The doorway is usually about two feet high and is approached by a tunnel, built either out of rocks or else snow blocks. Inside, the house, which is about five feet high is paved with flat stones, which may or may not be covered with



peat or skins, and at the back is a raised portion—the sleeping bench where everybody sleeps in a row. The whole place is warmed and lighted by one or two seal oil lamps and usually gets so hot that the inhabitants sit about naked.

With the return of the sun—the end of February in the Smith Sound area—many Eskimos leave their village on bear or walrus hunts. This necessitates another type of dwelling, the igloo. This is too well known to need any description, but it should be pointed out that it is a snow, and not an ice, house as it is so often miscalled. It is built out of blocks of fairly hard drifted snow, two men being able to construct one sufficiently large for their needs in the space of an hour or an hour and a half. Usually an igloo is only sufficiently warm to be habitable for two or three nights since heating the inside results in its icing up, when not only does it become cold but also it begins to drip and wet all the belongings of the occupants. If the hunter wishes to remain in one spot for a number of days, he either builds a new igloo every other day or else initially makes a bigger one than he would ordinarily require and lines it with skins.

The coming of summer and the thaw creates another housing problem for the Eskimo. His permanent house has, during the winter become covered with snow drifts and as it was never intended to be water-tight, it is soon running with water and he has to move out. This he does by moving all his worldly possessions into a tent—either a seal-skin tupek, or a canvas tent bought from the store. Here he stays until the weather once more begins to get chilly, when he reconstructs his winter house and the cycle starts all over again.

No description of the Eskimos would be complete without an examination of the future prospects of the race. For a long time after his first contact with the white man, there was a danger that before many generations had passed, the race would be extinct. After centuries of living in an atmosphere completely free from germs, he came into contact with the diseases of civilisation and small-pox, venereal diseases, tuberculosis and even measles and influenza took their toll. Now, however, it appears that all the susceptibles have been killed off and the remainder have acquired some degree of immunity though in the Cape York area, 50% of all the deaths are still due to tuberculosis.

Although as far as intelligence is concerned, the Eskimo compares favourably with ourselves, he will never develop into a

thriving industrial race. As far as we know there are no resources in the Arctic awaiting development, so he will be forced to remain dependent on an uncertain luxury trade—fur—for the few comforts of civilisation that he can obtain. By some, this would be regarded as a gloomy future, but the Eskimo does not worry. He is far more contented than we, with our crowded cities and high speed life, can ever be. To the troubles of to-morrow he never gives a thought and if things go well he laughs and cracks a joke, but even if they are not so good, he still goes on laughing. Little though he has of this world's goods, he has a philosophy of happiness and what more could any man desire?

The Distribution of Population in the City of Madras

By

GEORGE KURIYAN,
University of Madras.

When Day and Cogan founded the settlement of Madras in 1639, it was Hobson's choice for them and they had to choose a site which no body else would conceivably want. Day could probably have chosen San Thome, 'a fortified town of wealth and importance,' but he chose in preference a narrow strip of land north of San Thome with a shallow lagoon like river running parallel to the sea, at a distance of about a mile from the coast, which rendered the site easily defensible and which therefore seemed to him likely to prove an easier and more permanent holding.¹ The extent of territory occupied in 1639 was a tract about 3¼ miles long, lying to the north of the mouth of the river Cooum, with a mean width of one mile. (Vide Map 1). By about 1645 Narimedu (Hog Hill) was included within the territory of Madras and gradually the outlying villages were assimilated. The first suburban village to be acquired was Triplicane; there is no certainty about the exact date of its acquisition, but the year 1658 seems the likeliest on account of several reasons.² Egmore, Pursewaukam and Tondiarpet although acquired in 1693 were administered only from 1720. In 1708 the northern villages of Trivetore, Shaudium Kuppam, Ernavore, Kuttewaukauw and Aleundacheri were added to the territories. Perambur, Pudupet and Vepery were acquired only in 1742 and San Thome as late as 1749.

The extent of Madras in 1711 is indicated in Pitt's Map of Madras and it shows that even Triplicane was not directly absorbed into the city (Map II). Even as late as 1755, Pursewaukam, Vepery, Choolai and Veyasurpady had not become integral parts of the town as is shown by Conradi, in his map (Map III). The limits of Madras were fixed in 1798 when the Court of the Re-

corder was established (Map IV) and they very nearly correspond with those of the present day except for Theagarayanagar (Mambalam) which came to be included within the city limits in 1923. The City of Madras has not grown up considerably since 1800; actually present-day Madras is larger than the Madras of 1798 only by the extent of territory it acquired in 1923 in Mambalam.

Madras has grown up on a strip of land of very tame topography about 9 miles along the coast and from 3 to 4 miles broad, presenting a uniformly flat appearance, the highest parts being 48' above sea level in Kilpauk and Mylapore. Madras Town is not markedly influenced by variety in geological conditions. The structure of the area shows alternating layers of fluviatile sands and clays to an average depth of 12'. Below 12', there is a stratum, 15' thick, of black stiff buttery clay with recent shells passing down into coarse marine sands. Gneissic bed rock is struck everywhere at about 57'. The subsoil consists of sand in the eastern half of the city and clay, or, sand and clay, mixed in the western portion. Large quantities of subsoil water are encountered within a few feet of the ground surface at all times of the year.³ The soil is a red loam with stretches of sand towards the coast along which there is a considerable body of sea sand travelling from south to north. This travel has been interrupted by the harbour which acts as a huge groyne and consequently there is now continuous accretion to the south and denudation to the north of the harbour.⁴

There seems little doubt that most of the area occupied by Madras was originally cultivated principally with coconut palms and paddy fields, the usual form of tank irrigation being employed.⁵ Although little used for the purpose of irrigation, many of these tanks still remain around the city. The Cooum and Adyar discharge water into the sea only during the wet season; (November and December) for the rest of the year, the waters are stagnant. Originally perhaps the Cooum was organised to retain and utilize almost all the water falling on it. Now that this system of tanks and irrigation has lapsed, water often accumulates in undesirable places.⁶

3. Official Handbook of Madras 1933, page 108.

4. Report on Madras Town by H. V. Lanchester, page 10.

5. This is amply suggested by the following: Spur Tank, Nungumbaukam Tank etc. Further evidence is found in Conradi's map.

6. In the centre and western portions of the town, the river Cooum forms the natural drainage channel and this may be linked up with the northwestern channel so that both may be carried to outlet sluices delivering into the outer harbour.

1. See 'Growth of the City of Madras' by G. Kuriyan, Madras Tercentenary Commemoration Volume, page 295.

2. *Ibid*, page 302.

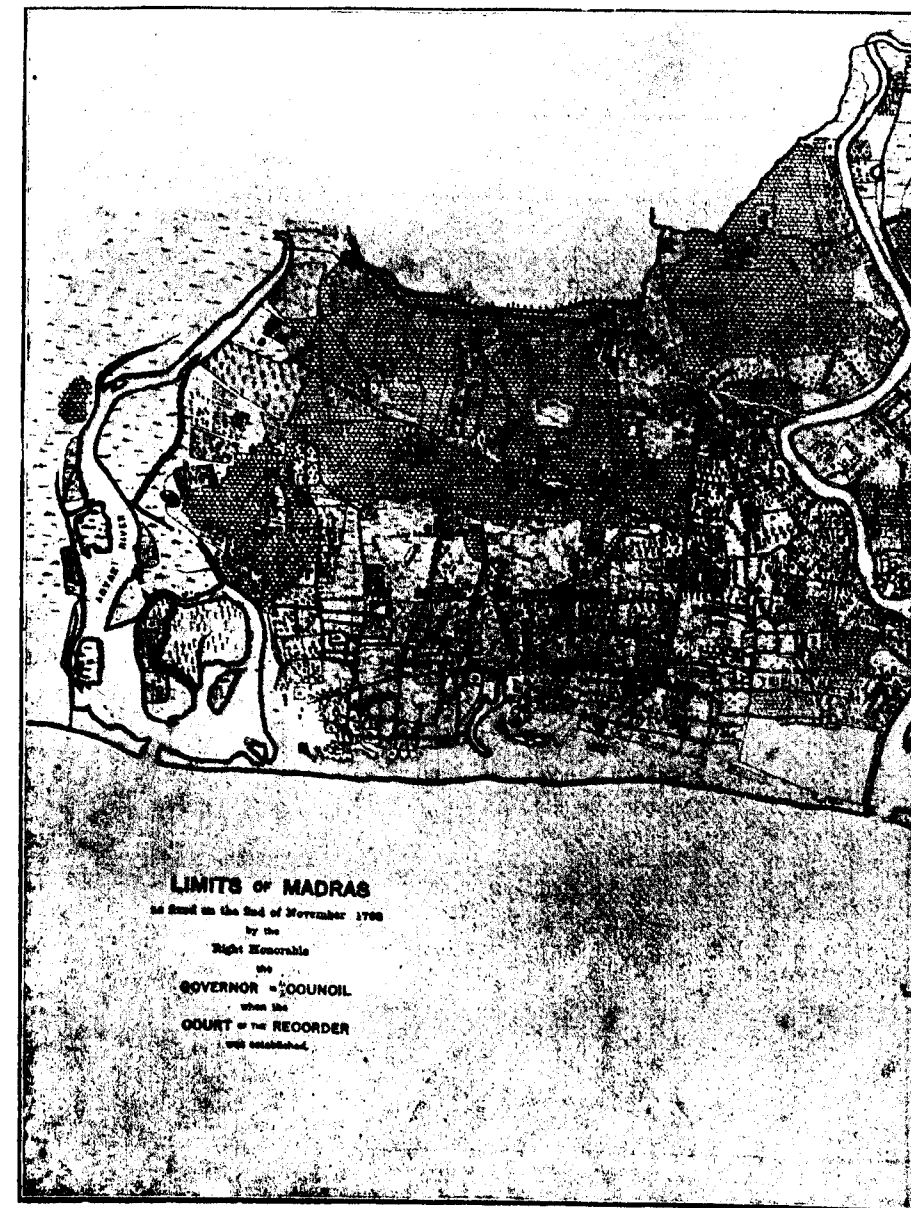
The area within the present boundary of Madras includes no less than three distinct towns,⁷ namely George Town, Triplicane with Chintadripet, and San Thome with Mylapore, while numerous other villages are distributed around these, according as land was found suitable or available for building purposes. To the west and south are the large houses with very large compounds and to the north and northwest are the large factories, while the un-occupied land is either cultivated or unused. The northwest area of the town lies so low that it is still largely undeveloped, in spite of its proximity to the industrial and commercial centres of the city and where portions have been occupied, the conditions are most unsatisfactory. Thus, immediately to the west of George Town is an area but little occupied, owing to its having been cut off by the railways and the Buckingham Canal, which have at the same time put difficulties in the way of surface drainage. If a really adequate scheme of surface drainage were provided, this district would become of immense value for extensions. (Vide Map VI).

It is thus seen that there is a large proportion of unutilised land in the Madras Town area. Apart from the central open spaces which have their value in respect of the congested districts around them, there are also stretches of ground that have ceased to be used owing to the abandonment of irrigation, but have not been rendered suitable for building sites or gardens for want of provision for the disposal of surface water. The tanks themselves form a large proportion of this area and in addition there are extensive compounds of which but little use is made and which are only needed as a protection to the houses they surround, against undesirable developments.

Growth and distribution of Population. An early computation of 1687 gave the population of Madras as 300,000 but this was obviously rather a guess than a count.⁸ In 1802, the population was calculated on the basis of consumption of grain and put at 600,000. The enumeration carried out by the Superintendent of Police in 1822, yielded the total figure of 462,051. An estimate in 1850, the basis of which is not known, suggested a total of 720,000. In 1863, Sir Charles Trevelyan who had been the Governor of Madras informed the Royal Sanitary Commission that the population of Madras City was not less than 1 Million! Based on a consideration

7. Census Reports of Madras 1871, page 67.

8. In 1763 it was estimated that the population was about 1 Million. See Maclean, 'Manual of Administration,' Vol. 2, page 92.



The following Statistics indicate the growth of Madras :—

Year	Population		Total Population	Hindu	Mahomedan	Christian
	Male	Female				
1871	194,676	202,876	397,552	330,052	50,964	15,826
1881	200,170	205,678	405,848	315,527 (77·7%)	50,298 (12·4%)	39,631 (9·8%)
1891	225,817	226,701	452,518	358,997	53,184	39,742
1901	256,730	252,616	509,346	410,648	57,331	40,958
1911	266,465	252,195	518,660	415,910	59,169	41,814
1921	276,107	250,804	526,911	427,722	53,163	44,136
1931	341,223	306,007	647,230	520,176 (80·4%)	70,031 (10·8%)	54,122 (8·4%)

10. Census of Madras 1871, page 16.

TABLE II

Year	Tamil	Telugu	Hindustani	Canarese	Malayalam
1881	239,396 (58.99%)	94,478 (23.3%)	46,426 (11.4%)	1,186 (0.3%)	—
1891	270,970	103,423	46,410	1,393	553
1901	318,993	108,496	51,032	1,947	804
1911	323,360	107,561	53,573	2,913	1,807
1921	336,553	104,117	46,528	3,272	4,093
1931	411,823 (63.6%)	124,649 (19.1%)	62,651 (9.7%)	4,539 (0.7%)	9,229 (1.4%)

TABLE III

Year	No. of Houses	No. of persons per house	Average density per sq. mile	No. of women per 1000 men	% growth in total population
1871	51,741	7.68	14,724	1042	—
1881	48,286	8.30	15,031	1028	2.1
1891	60,103	7.53	15,604	1004	11.4
1901	55,665	9.10	18,865	984	12.0
1911	59,595	8.70	19,210	947	1.0
1921	64,621	8.15	18,169	908	1.0
1931	73,845	8.79	22,318	897	22.0

Madras City is not highly industrialized and this lack of industries perhaps accounts for its slow rate of growth. It does not therefore provide conditions parallel to the other industrial cities of India like Calcutta. The demand for industrial labour is not so great and the proportion of immigrant labour which find employment in the large organised industries is small. The small fluctuations in the movement towards the City cannot be accounted for entirely by the rise and fall of industrial demand.

The rate of growth of the city has been extremely low; during the last sixty years, it has not even doubled itself! The Statistics already cited show:—

- (i) a small growth in population for the period 1871-81;

(ii) a fairly even growth in population between 1881-1901; each part of the city registering an increase;

(iii) an almost stationary population during the period 1901-21 with a less regular internal distribution, the actual increase being noted in Perambur, Pursewaukum, Vepery, Kilpauk, Royappa-
petta, Egmore and Mylapore; i.e., the outer parts of the city; and

(iv) a very rapid growth in population since 1921¹¹ noticed in Tondiarpet, Perambur, Pursewaukum, Nungumbaukum and Royappa-
petta.

It is however found that with low or falling prices of agricultural commodities, city growth is stimulated, while with rising prices, such emigration is generally retarded. During 1871-81, in spite of scarcity and famine in the Presidency, the increase in the city population was small "as a result of the rigid control of migration, combined with the relief provided in the rural areas by the operation of the famine code."¹² But for this, the city growth should have been much greater. In the period 1881-1901 when price levels tended to remain low, the rate of growth was more than 1% per annum resulting in a marked increase in the population of the city. In the period 1901-1921 when the prices were rising and when they soared high during the post-war period, the population remained almost completely stationary, showing a growth of less than 0.2% per annum. The volume of immigration strikingly diminished. During the period 1921-31 when prices dropped rapidly, the population increased enormously showing an average growth in excess of 2.25% per annum.

If the prices of the staple food crops of Rice and Ragi are considered, it is found that the city has grown least when the prices of these food grains showed a persistent tendency to rise. On the other hand, when prices fell down rapidly, the population of the city increased with considerable rapidity.¹³ It is therefore true to conclude that the growth or stagnation of the city was to a considerable extent directly dependent on the tendency of the prices to fall or rise. Rising prices may be due either to scarcity and famine or as a result of inflation. In the former case there

11. Census Tables of Madras. 1931, page 14. The increase of population over the decade (1921-31) was essentially an immigration feature, being illustrated by the quota of adults being well above that of 1921 and earlier years, despite the much stronger juvenile element.

12. Review of Madras Famine 1876 to 78 Pp. 25 et seq.

13. See Ranson 'A City in transition.'

is a definite stimulus to city migrations, while the latter offers a check to such movements. But when both the above causes operate simultaneously to enhance prices, the balance would normally be in favour of a reduced migration to the city.

Low or falling prices may be due to deflation or abundance. Generally deflation provides an enormous stimulus to migration towards the city while abundance as a consequence of a succession of favourable seasons renders agriculture—that work most congenial to the Indian villager—, both abundant and certain and hence would retard such movements.¹⁴ It is thus true to say that the migration which inflates the population of the city is one of despair rather than of hope!¹⁵

Madras is a city which from the beginning has grown up because of immigration and almost every report on the population of the city has clearly shown that the growth of the city is not natural, but due to accretion. Till 1931, the death rate in the city has always been higher than the birth rate.¹⁶ It is also noticed that there is a steady diminution in the proportion of women (Vide Table III, Statistics, p. 62) which cannot be accounted for satisfactorily. It is to a certain measure due to the temporary immigration of unmarried men into the city. The steady downward tendency is notable and is an indication of the extent of and nature of immigration contribution to the population. Madras has the lowest female quota among the cities of the presidency. Even in the predominantly residential divisions like Mylapore and Egmore, the proportion of women to men is low. Royapuram has

14. Census of India, 1911, Vol. XII, Part 1, Report, page 14.

15. Since writing this, I had a discussion with Dr. P. S. Lokanathan, Ag. Professor of Economics of the Madras University, about the exact relationship if any, between migrations to the city and prices of agricultural commodities. He was of the opinion that no relationship between these could be traced, (See Ranson, *op. cit.* for a contrary opinion) because the people who migrate to the city are generally not ryots but are invariably agricultural labourers, to whom variations in prices of agricultural commodities mean little, as they do not stand to profit or lose by such changes. In the absence of any definite statistics to show the type of immigrant into the city—whether he is a ryot or only a labourer—it becomes difficult to arrive at a definite conclusion on this issue.

16. The excess of births over deaths is noticed first, only in the decade 1921 to 1930 and the excess is a very small feature (only 544) and the city growth of 22·8% is far from being due to process of nature. "Madras is a city that grows by outside accretion." Vide City Census of Madras, 1931, page 3.

the highest female quota and is thus apparently the most residential ward in Madras.¹⁷ Yet it is not developing, probably because the area has suffered to some extent from erosion. Some houses may have been lost and nobody is likely to build on the ground overhanging the water-edge. But on going a little inland, there seems to be no reason why this ward should not improve, especially as it is not more unhealthy than the other neighbouring areas. It is likely that the poverty of communications accounts for the low growth.¹⁸ That this conclusion is justified is indicated by the growth of the northern unit in 1931. "The advent of the bus has probably contributed to encouraging people to settle more freely on the city margins. This applies more particularly to north Madras which was ill-served with cheap communications before the advent of the bus".¹⁹ The growth of the city in 1921 to 1931 is most marked in north, west and southwest. The west reflects the great industrial extension of Perambur and the south west, the Mambalam extension.²⁰

The distribution characteristic of the city in 1871 (Vide Map V) has been maintained till to-day, the main concentration of population being still around the fort. In 1871, the main centre of population was in Black Town (now called George Town) with another centre in Triplicane (including Chintadripet) with a third centre a distinct, but more sparsely populated unit occurring as a wedge between Chintadripet and George Town in New Town, Vepery and Pursewaukum. These centres formed a belt encircling *Fort St. George*. The other parts represented the outer belts of the city and were larger in area than the inner semi-circle. Each of them included large tracts of open and uncultivated land and the population was very unevenly distributed, the main concentration being around the scattered villages. As in 1871, so even to-day, Madras possesses extensive and largely undeveloped tracts (Vide Map VI) and thus enjoys a great advantage over other Indian cities like Bombay.

It is seen from a study of the religious composition of the population of the city (Vide Table I p. 61) that in 1881 the Hindus formed 77·7% of the total, the Muslims 12·4%, and Christians 9·8%. In

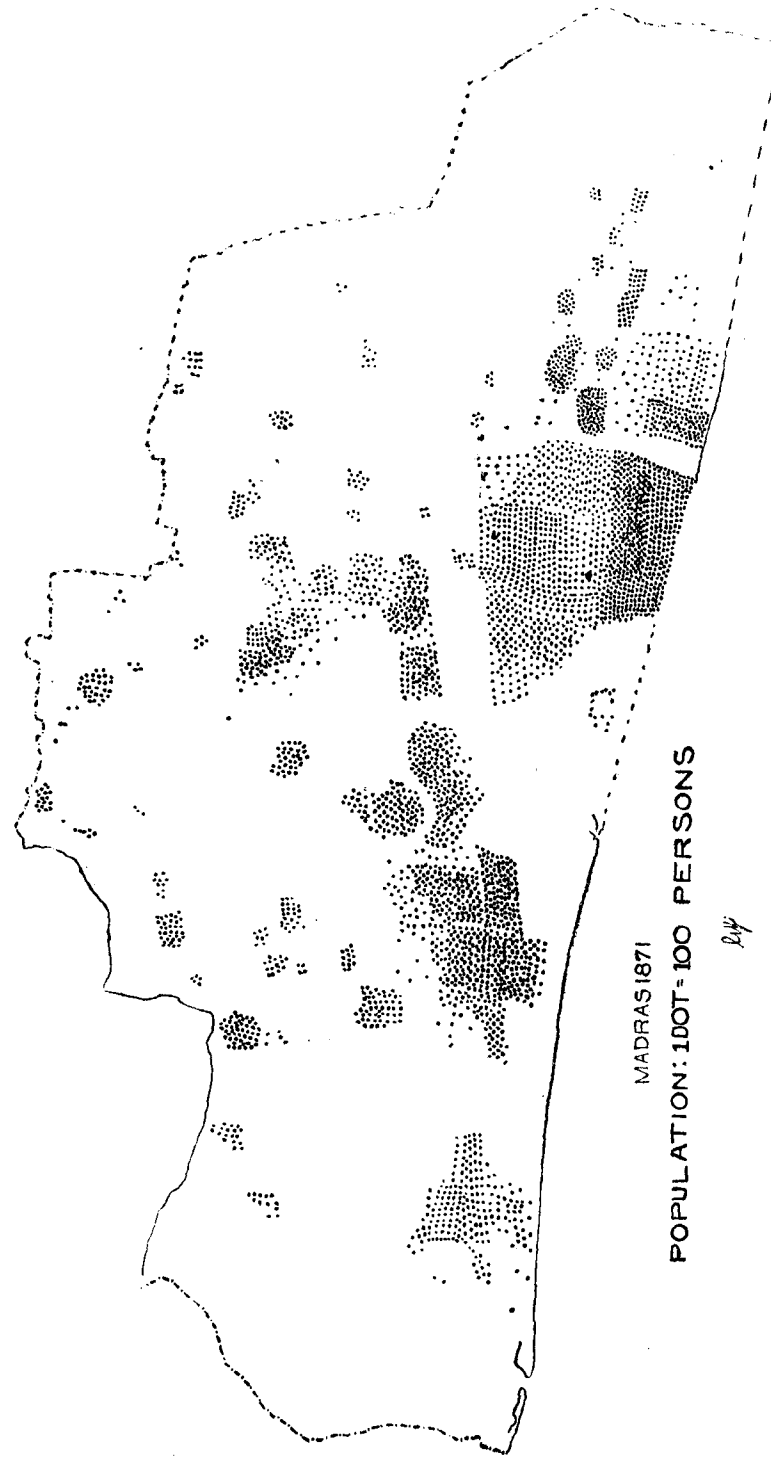
17. Has this anything to do with the distribution of Communities? It is the most Christian of all the wards of Madras.

18. Vide *Molony*, City of Madras Census Statistical Tables 1911, page 4.

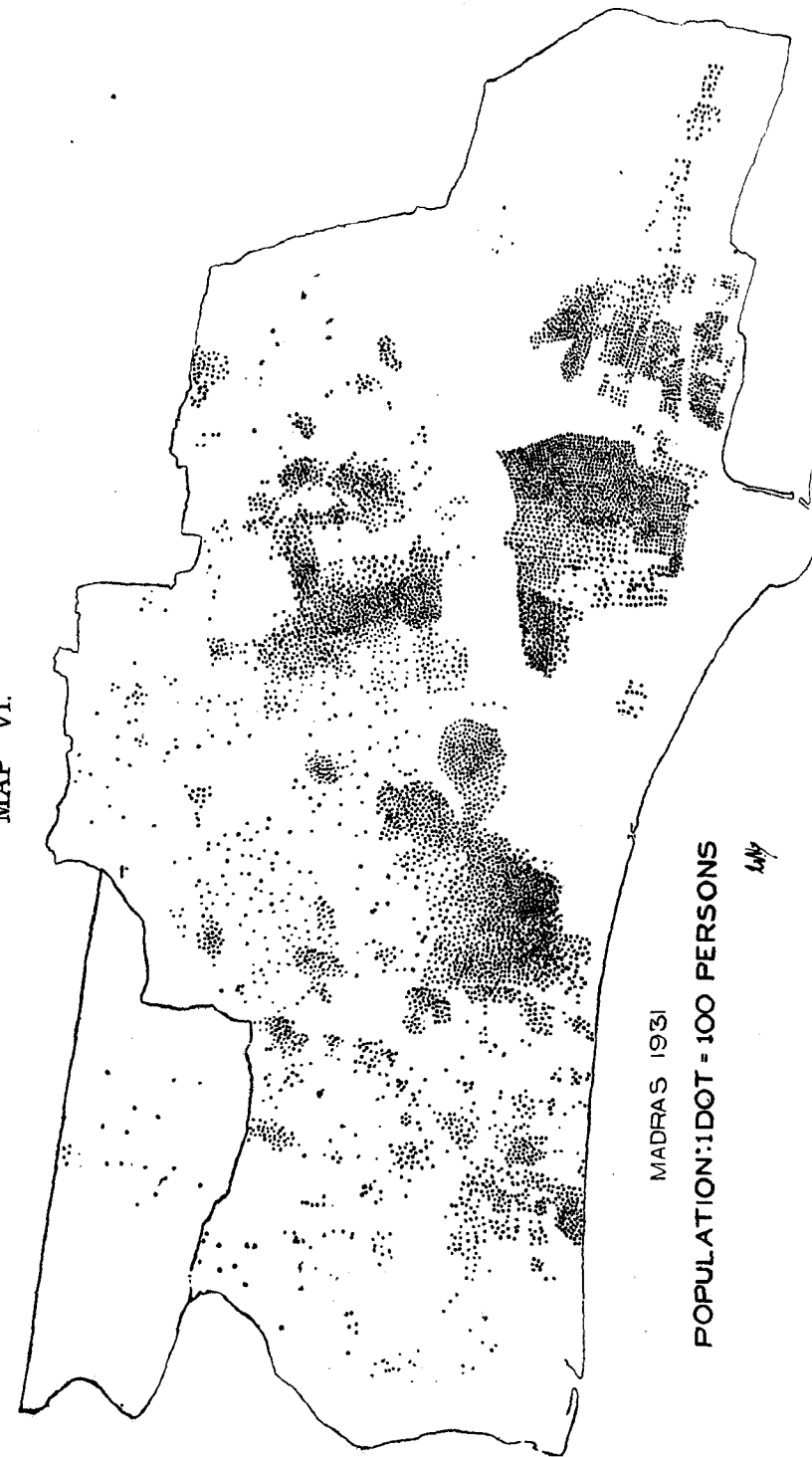
19. *J. C. Molony*, City of Madras, Statistical Tables 1911. Page 4.

20. It is too early to notice the effects of the S.I.Ry. electrification scheme.

MAP V.



MAP VI.



1931 the corresponding proportions were 80.4, 10.8 and 8.4. The minority communities have thus not really grown at a rate faster than the Hindus.²¹ But the city percentage of the Hindus in 1931 is less than that of the Province as a whole and that of the Muslims and Christians is greater. This perhaps tends to illustrate the oft-quoted dictum that minorities generally favour towns!²²

A consideration of the language groups of the city population (Vide Table II page 62) shows that in 1881 Tamil was the mother-tongue of 59.0%, Telugu of 23.3%, Hindusthani of 11.4%, Canarese of 0.3% and Malayalam was not spoken in sufficiently large numbers. In 1931 the respective percentages were 63.1; 19.1; 9.7 and 0.7. In addition Malayalees constituted 1.4% of the total! It is therefore clear that Madras is steadily becoming more and more Tamilian, both Telugu and Hindusthani losing ground.²¹ However, the percentage of the Canarese speaking peoples has more than doubled while the Malayalees who formed 0.16% of the population only in 1901, now constitute about 1.4% of the total.²³

From a perusal of Table III it is seen that with increasing population, the number of houses has not proportionately increased, with the result that the average number of persons per house has been increasing rather than diminishing. It is approximately true to say that the wards of the city showing the highest numbers of occupants per house are huddled together in the centre, while the lowest figures are found in the out-lying divisions. This to a certain extent indicates the difference between the congestion of the centre and the spaciousness of the margins.²⁴

The maps of population (Maps V & VI) show very clearly that congestion is due not to scarcity of land but to failure in providing for an ordered city growth.²⁵ Several suburbs have better commu-

21. Identical conclusions are arrived at by calculating the percentages for the other census decades also.

22. Yeats 'City Census Reports,' 1931. Page 11.

23. *Ibid.*, page 12. "The ubiquitous Malayalee has clearly increased in numbers."

24. See Ranson 'A City in transition' page 84.

25. On the same basis, population maps were prepared for all the census decades and they indicate identical trends and conclusions. They have however not been reproduced to illustrate the article, purely on considerations of economy.

nication with the city centre than the less accessible parts of the city itself and want of good access has militated against the natural development of suitable sites. It is also probable that the lower land prices and rates of taxation, together with the absence of building regulations in the outer suburbs, tend to promote developments which often take very undesirable forms. Land is sold and houses are built without proper provision for roads, sanitary arrangements etc. There is every likelihood of these suburban areas being assimilated by the growing city in years to come; and if particular care is not taken to put them on the same footing as those within the city, they will develop into slums, thereby increasing the burden to be borne by the city.

"Though large parts are strictly urban, the city as a whole is in fact, rather a fortuitous collection of villages separated from the surrounding country by an arbitrary boundary line, than a town in the usual sense of the word. Some of the villages are rural hamlets to this day showing no sign of urban influence beyond the municipal lamp posts and dust bins with which their streets are dotted".²⁶ The 1871 Census of Madras showed that Madras was a conurbation made up of several distinct towns, each densely populated and a loose agglomeration of villages.²⁷ These descriptions are fairly accurate even today, though the improvements in the communications have welded the city into a more unified whole, blurring to some extent the fairly clear division between the several villages of former times. The density of population within the city varies remarkably; its average value has increased from 14,700 per square mile in 1871 to 22,300 in 1931; but the several wards of the city in 1931 had densities ranging from 175 persons to the acre in Ammankovil to 11 persons per acre in Royappetta! Madras City though by far the largest in the province, is by no means the most congested.²⁸

The growth of Madras has taken place under circumstances so abnormal that comparisons with other cities are of less value than in most other cases. These circumstances have resulted in the formation of a number of subsidiary centres, in many cases too accidental to be mutually convenient. The administrative and

26. Imperial Gazetteer of India, Provincial Series 1908, Madras. Vol. 1 page 498.

27. Census Reports of Madras, 1871 page 67 and Ranson *ibid* page 46.

28. Yeatts Census Tables for the City of Madras, 1931 page 5. "Madura is much more congested."

commercial functions of a large city demand more organisation as to locality than is at present found. The government and administrative buildings are widely scattered and the commercial centre around the harbour lacks good communications with the surrounding districts where many of those engaged reside.

Madras is a seat of Government, a commercial centre, an educational centre, and a social nucleus. All these ought to define themselves clearly in a city scheme. Although it is desirable to disturb as little as possible, it is none the less essential to endeavour to rectify the present accidental distribution of the buildings. The Government buildings are widely scattered throughout the town and there is no definite administrative centre, Fort St. George and Chempauk having almost equal claims. Education is a strong competitor for the Chempauk area and it is therefore desirable to move all the administrative offices of the government to Fort St. George. Within the Fort there may be no site suitable for large buildings, but around the maidan to the west and to the reclaimed area to the east of the Fort are lands lying unused. These could be utilised to a great advantage to house all the government offices.²⁹ The Gymkhana Club and the M.C.C. grounds could be given over to the educational centres for play grounds, parks etc. It is also important to consider the question of utilisation of the large estate of the Government House. In these days of fast motor transport and telephone communications, there is no particular advantage in the residence of the Governor being within a stone-throw of Fort St. George. The Government House at Guindy would be a better choice! With an intelligent corporation, much of the now unused lands could be utilised to the fuller benefits of the population at large.

29. Probably, during periods of war, it is not safe to advocate the construction of buildings on, or near, the sea front.

Regional Distribution and Relative Growth of the Cities of Tamil Nad*

By

N. SUBRAHMANYAM, M.A., L.T., F.R.G.S.

It is proposed to discuss in this paper the *regional distribution and relative growth of the Cities of Tamilnad* during the 60 years from 1871 to 1931 for which statistics are available and to draw therefrom certain interesting and important conclusions.

At the outset it is necessary to state that the term 'City' is used here in the sense in which it was used by the Government of Madras by applying it to towns under Class I and Class II of the Imperial Census Tables, which have a population of 50,000 and over, for which special statistics regarding age, literacy, birth-place and occupations are published at the desire of that Government and under its orders.

Tamilnad is that part of the Madras Presidency which is predominantly peopled by the Tamils. It consists of all the districts of the east coast plain, roughly south of the latitude of Madras. It excludes the District of Chittor, though the historic boundary of the Tamil country extended right up to the Venkata or Tirupati Hills thus including a part of that district. The Tamil districts are at the present day the following:—Madras, Chingleput, North Arcot, South Arcot, Salem, Coimbatore, Trichinopoly, Tanjore, Madura, Ramnad and Tinnevely.

Within the region thus demarcated the *Census of 1931* showed 13 cities in the order noted in the two tables (Vide Appendix A). Four of them—Madras, Madura, Trichinopoly and Salem—come under Class I, each with a population of over 100,000; and it is interesting to note that these four cities are evenly distributed over each of the four sub-regions, which have also figured as the four historic divisions of the Tamil country, namely, Pallava (Tondaimandalam), Chola, Pandya and Kongu kingdoms.

Of the remaining nine cities, which belong to Class II with a population of over 50,000, *Tinnevely* (57,078) and *Palamcottah*

*A paper read before the Association on 8-3-1941.

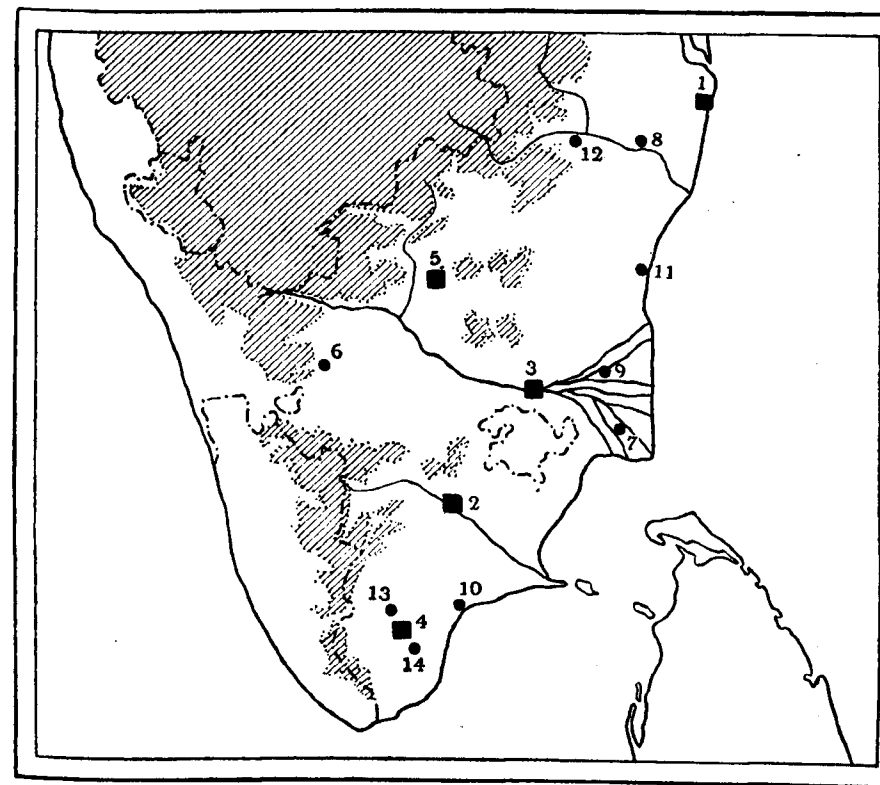
(51,990) occupy the last two places as they happen to be separate Municipalities. But as they are adjoining places, linked by a bridge over the Tambraparni which separates them, it is but proper that they should be treated for purposes of Census as one City (Cf. Calcutta and Howrah), as was suggested in the last Census Report for adoption in the Census of 1941, and not kept separate artificially simply because the two Municipalities do not desire to amalgamate and lose their individuality. If then these two cities are taken as one, there is revealed an interesting result that they are lifted up into a single City under Class I, as the united population comes to over 100,000 (109,068). Accordingly, in this paper, *Tinnevelly and Palamcottah* have been treated as a single unit—as the fourth city of Tamilnad, Salem being shifted to the fifth place. We thus get 5 cities in Class I, each with population over 100,000 and 7 cities in Class II, each with population between 50,000 and 100,000 giving us a total of 12 cities of both classes for the Tamilnad.

Let us next consider their distribution in the land. From a study of the map we find that all these cities are evenly distributed over all the districts, constituting the linguistic area, with the single exception of Ramnad District which goes without any city. This fact stands as a marked contrast to what is found in the Andhra country where six out of seven cities (1931) lie bunched in or near the deltas of the Godavary and the Krishna, the one exception of Vizagapatam being accounted for by its being an improved port with a considerable hinterland and the seat of the Andhra University. This even distribution of the Cities in the Tamilnad goes along with another interesting feature of it, namely, that the urban population and the number of towns of all classes are greater than in other parts of the Presidency. Mr. Yeatts, the Census Superintendent of Madras in 1931, quotes and confirms the remark made by J. C. Molony in 1911 that "the Tamil is more a town-dweller than the other Presidency races," preferring the busy life of the town to the comparatively dull life of the countryside.

Examining closely the distribution of the 12 cities, we find that 8 of them are the nodal centres in important and fertile riverine regions as follows:—the lower Cauvery basin—Trichinopoly, Tanjore and Kumbakonam; the middle and lower Palar—Vellore and Conjeevaram; Lower Pennar—Cuddalore; the Vaigai basin—Madura; the Tambraparni basin—Tinnevelly-Palamcottah. Of the remaining four cities, the coastal situation accounts for the two ports of Madras and Tuticorin, while Coimbatore and Salem on either side of the middle Cauvery basin have grown up as regional

centres in the old Kongu Country with certain peculiar advantages of position.

Before taking up each of these cities and tracing its individual and relative growth during the 60 years from 1871 to 1931, it will be helpful to note the *outstanding influences on the growth of population in each of the six decades*.



CITIES OF TAMIL NAD (census of 1931)

1. Madras, 2. Madura, 3. Trichinopoly, 4. Tinnevelly—Palamcottah, 5. Salem, 6. Coimbatore, 7. Tanjore, 8. Conjeevaram, 9. Kumbakonam, 10. Tuticorin, 11. Cuddalore, 12. Vellore, 13. Tinnevelly and 14. Palamcottah.

In the decade 1871-1881 there occurred one of the most severe famines of South India in 1877-78 which had left its mark in four districts of Tamilnad—North Arcot, Salem, Coimbatore and Madura. While the decade 1881-1891 was on the whole uneventful showing a general rebound of population after the great famine, the next decade 1891-1901 was "one of almost uninterrupted bad seasons" (Sir Frederick Nicholson), resulting in a general drift towards the town in search of employment, thereby leading to a

considerable increase of the urban population of the Presidency, by 25 per cent as compared with the 5 per cent increase of the rural population. In the decade 1901-1911 the prevalence of plague shows its effect in a decrease of population in certain cities like Salem and Coimbatore as a result of evacuation at the time of the Census. Similarly, in the next decade 1911-1921 the effects of the widespread epidemic of influenza in 1918 were perceptible in the decrease of population in certain cities in coastal districts, e.g., Tanjore, Trichinopoly, Kumbakonam and Cuddalore; and the low increase of 1.6 per cent in the decade in Madras. At the same time Salem and Madura showed the effects of plague scare. In the decade 1921-1931 urban population shows a considerable increase all over due to (i) general prevalence of good health, epidemics being rare, (ii) brisk trade after the Great War (iii) industry growing for the most part of the time, and (iv) communications developing greatly in the shape of branch and feeder railway lines as well as improved roads with regular bus and lorry services.

Having discussed the influences at work in the six decades, let us next examine *the relative position and growth of the several cities* one by one during this period, in order of population in 1931.

Madras has of course always held the first place as the Metropolis of the Presidency and as one of the major ports of India, with a population of 397, 552 in 1871 and of 647, 230 in 1931, showing an increase of 68.2 per cent which is nothing remarkable for its position and importance. It was only in the last Census (1931) that the City suddenly shot up with an increase of 22.8 per cent (while in the two previous decades the increase was only 1.6 per cent and 1.8 per cent respectively). This sudden rise in 1931 may be accounted for as follows:—(i) There has been a very marked industrial development as evidenced by the belching chimneys on its western approach; and new miscellaneous industries have sprung up such as the making of pencils, matches, beedies etc.

(ii) There has been an extension of a considerable growing garden city in the shape of Thyagarayanagar.

(iii) The improvement of communications within the town has helped considerably to greater settlement in the formerly rather inaccessible northern areas.

(iv) Several extensions have been growing up in the gaps of the City which was originally but a congeries of villages.

With the construction of the electric railway and the establishment of regular bus service to and from the City, the suburban

areas have considerably increased in population in recent years and if they are also taken into account, the Census of 1941 may show Madras in the ranks of the 'Million' Cities of India.

Madura has since 1901 been occupying the second place in the Presidency, while before that date Trichinopoly was holding that rank. With a population of only 51,987 in 1871, the city had, in 1931, 182,018 persons, which yields a high percentage of 252, in 60 years. The decennial increase was 31 per cent in 1931, though in 1921 the City suffered somewhat from exodus caused by plague scare with a low decennial increase of only 2.8 per cent. 20,000 residents are said to have left the town on this account.

A famous historic capital of the Pandyanad, a regional centre of the Vaigai basin, a well-known shrine and a great centre of an indigenous dyeing industry, Madura has also the external appearance of a large city, visible as the train steams into it from the North. The Periyar Irrigation Scheme has had its influence in the large influx of the bigger landowners who have settled in the City coming from the different parts of the District; and as a pilgrim centre there is a periodical as well as a perennial influx of floating population. But the recent striking increase of its population is undoubtedly due to industrial development, especially in the line of weaving—"an inference," said J. C. Molony even in 1911, "strengthened by the reversal of the sexes during the decade (999 females to 1000 males). The City has one of the largest spinning mills; and during the decade ending 1931 others have sprung up. Consequent on the advent of mill labour there has been an increase of trade of all kinds, which was further helped by railway extension. A large educational centre with two colleges and several high schools, the City also serves as the Headquarters for the two districts of Madura and Ramnad. The further increase of the population of this City is likely to be marked and continuous.

Trichinopoly which held the second place in the Presidency till 1901, slipped to the third place by Madura outstripping it in that year, leaving it far behind. In the 60 years between 1871 and 1932 the City has shown only an increase of 86.6 per cent as against the 252 per cent increase of Madura during the same period; and its decennial rate of increase was far lower than that of Madura. In the Census of 1921, the City actually showed a decrease of 2.5 per cent over the previous census (due no doubt to the prevalence of influenza in 1918); while in 1931 it recovered and showed only an increase of 18.6 per cent.

Trichinopoly is a town of great historic antiquity like Madura with Woriur, a Chola capital as its suburb. Though it possesses no special industry, it has several miscellaneous manufactures such as hand-weaving, metal-work, ornamental silver-ware, cheroots, carpets, tanneries, shoes etc. It is a great centre of trade, a very important railway junction and the headquarters of a considerable railway system—the S.I.Ry. It is also a nodal centre of roads, with important road bridges over the Cauvery and the Coleroon on the Madras Trunk Road. There is a cantonment at Trichy. Besides its administrative importance, Trichinopoly is a bigger educational centre than Madura.

Itself an important temple-town Trichy has in its neighbourhood, across the Cauvery bridge, the great pilgrim centres of Srirangam and Tiruvanaikkaval, the former a Municipality.

The South Indian Railway Colony of Golden Rock in the vicinity of Trichy, with Workshops for both broad and narrow gauge lines, has a peculiar interest for the City as adding to its importance, if not directly to its population. Negapatam where the Workshops were formerly located was pulled down by this transfer from the position of a City under Class II to that of a town under Class III; and distant Podanur also felt the echo of it. "The Government of this Colony is in the hands of the Railway; and with its shaded and well-laid-out streets, neat houses and attractive appearance, it might serve as an example to South Indian Municipalities."—M.W.M. Yeatts (1931). With its population of 13,000, it was no mere growth but a creation, whose effects have been felt as stated above from Negapatam to Podanur. It is interesting to note that if the Golden Rock Colony and Srirangam are included in Trichinopoly, their population come up very nearly to that of Madura.

The twin cities of *Tinnevely* and *Palamcottah* linked by a road bridge on the Tambraparni, like Calcutta and Howrah or Buda and Pesth, each with a population of 57,078 and 51,990 respectively give a total of 109,068, pushing Salem down to the 5th rank in Class I. Nothing but the opposition of the two Municipalities stands in the way of their amalgamation; and as the Census Report of 1931 has itself suggested their being treated as one urban unit in 1941, "though they retain their separate existence and rivalry," it is preferred to treat them as one unit in this paper also. The headquarters of the Tinnevely District, they form also the regional capital of the fertile middle basin of the Tambraparni, and an important route centre with roads and railways radiating in all directions.

Taking the population of the two cities together, we find that it has grown enormously in 60 years, from 38·989 in 1871 to 109,068 in 1931—an increase of 179·7 per cent during the period, which is reflected more or less similarly in the growth of the two cities separately also—*Tinnevely* 171·2 per cent and *Palamcottah* 189·7 per cent. The sudden leap forward has been indicated in the beginning of this century in the Census of 1901, when the decennial percentage of increase was found to be as high as 84·1. This is no doubt due partly to the inclusion of additional areas within the city limits as stated in the Census Report, but must also be attributed to general prosperity, growth of trade, freedom from epidemics like plague, influenza or cholera, and improvement of communications.

Salem, the last of the cities of Class I, has risen from 50,012 in 1871 to 102,179 in 1931, thus more than doubling itself (104·3 per cent) in the 60 years. More interesting to note is the remarkable decrease of population at two intermediate censuses:—18·2 per cent in 1911 and—11·7 per cent in 1921, as the result of plague scare and evacuation at the time of taking the census. When therefore normal conditions of public health were restored, the census of 1931 has shown the considerable increase of 95·6 per cent (almost doubling itself) in the decade, thereby bringing the city into Class I for the first time. Mr. Yeatts suggests that a succession of poor monsoons drove the labourers into the town in search of work, as is evidenced by the clusters of huts in and around the town in recent years. Moreover the cloth trade was flourishing till recently and attracted an unusual number of weavers. The construction of the railway to Cuddalore through the Attur gap may have helped to some extent in the growth of trade in the city; while the magnesite industry has contributed its share to the increase. It is doubtful, however, if Salem will be able to keep up its place in the next census and show a continuous increase.

Coimbatore is the first city under Class II in the Tamilnad that is sure to get into Class I in the next census and most probably far outstrip Salem. With a population of 35,310 in 1871 and of 95,198 in 1931, the city has more than trebled itself in 60 years an increase of 169·6 per cent. The increase was steady, though not high, in the first three decades; and at the census of 1911 there was a setback—a decrease of 11·4 per cent due to evacuation of the city on account of plague scare at the time. It was at the last census in 1931 that a fairly high increase of 44·7 per cent in the decade was in evidence, showing that the city was beginning to take a leap forward after its recovery.

Everything is in favour of Coimbatore's increase. Historically it was a place of high strategic importance, commanding the Palghat Gap in the west and covering the Hasanur Pass in the north. It possesses a very pleasant and healthy climate, and has been free from epidemics since 1911. The centre of a considerable trade, the city has been having a number of miscellaneous industries such as coffee works, oil presses etc. Its position on the edge of a large cotton-growing area has led to the growth of cotton mills, which now number over 25 in and near the city. This rapid growth has no doubt been helped by the great advantage that Coimbatore possesses of being the nearest city from Pykara power station. To cope with the rapid growth of the city, several extensions have been formed; and the railway station is being remodelled as a great junction, practically taking the place of Podanur. This rapid progress of the city is sure to be kept up for some time; and it is expected that it will not only get into Class I but will far outstrip Salem in the next census.

The next three cities of Class II, *Tanjore*, *Conjeevaram* and *Kumbakonam*—present a type largely of residential towns that seem to have reached very near the limit of their expansion. During the 60 years their respective increase has been only 28·2 per cent, 74·8 per cent and 40·2 per cent. The entry of a fresh factor may give them a momentum for a fresh leap forward; but as it is they have reached a relatively stationary stage.

Of these three cities, *Tanjore* has had the smallest increase in 50 years (28·2 per cent) with a slight decrease also at two previous censuses, the highest decennial increase being only 11·6 per cent in 1931. The 4th largest town of the Tamilnad in 1871, *Tanjore* has slipped down to the 7th place in 1931. Though the headquarters of the District, the city has no important industry, except those connected with the old Rajah's court. In fact, *Tanjore* seems to have declined since the death of the last Rajah in 1855, who though only titular, attracted to his court all professions. Their dispersal commenced with the death of the Rajah; and it became more rapid since the demise of the Princess his successor.

Kumbakonam, situated in the middle of the Cauvery delta with its increase of 40·2 per cent in 60 years, has been running more or less the same course as *Tanjore* in the matter of population growth; overtaking it in 1901 as the 6th city in Tamilnad and rising to the 5th rank in 1911; but it was outstripped by *Tanjore* in 1931, after the set-back of the "influenza" census of 1921. Though *Tanjore* is the headquarters of the District, *Kumbakonam* has shown a

higher and steadier increase (except of course in 1921) due to its conspicuous position as an educational and religious centre.

Conjeevaram is another town of the residential type like *Kumbakonam* and is a place of religious importance containing temples which are the objects of constant pilgrimage. The decennial increase of population of this city has been steady without any set-back due to epidemics, showing an increase of 74·8 per cent for 60 years as against the much lower increase of *Tanjore* and *Kumbakonam*. This city is situated in the middle of a fairly fertile stretch of country; and "possibly part of its expansion is due to a growing tendency amongst the larger land-holders to forsake their villages for the greater convenience and comfort of life in a town." G. T. Boag (1921). It was the regional capital of the lower Palar basin through the ages, known as Pallavanad or Tondaimandalam; but after the rise of Madras it had to take a subordinate place as its satellite. Hence, unlike *Kumbakonam*, it has not grown into a great educational centre, despite its cultural traditions. It has, however, a flourishing handloom industry.

Tuticorin is the second port in Tamilnad, coming next after Madras. Its growth has been unrivalled and phenomenal in the last 60 years, from 10,565 in 1871 to 60,395 in 1931—an increase of 471·7 per cent. Before 1861, *Tuticorin* was an insignificant port, even less important than *Kulasekharapatnam* or *Kayalpatnam*; but the export of cotton from its hinterland during the American Civil War and after set it on its path of prosperity in which it has since continued to progress steadily as the outlet of the cotton lands of *Madura* and *Tinnevely* Districts. The port is also a terminus of the South Indian Railway. The 35 per cent decennial increase of the last census (1931) is attributed partly to some adjacent areas having been brought within the municipal limits during the decade, partly to the general increase of population within the district, and partly also to the fact that since the provision of good drinking water the town is becoming a seaside residential resort for the Nadar merchants of the cotton lands behind it.

Cuddalore (59,057) and *Vellore* (57,265) bring up the rear in the list of cities of Class II in Tamilnad. The headquarters of South Arcot and North Arcot districts respectively, these two cities have been running an almost even race with their individual vicissitudes showing an increase of 46·6 per cent and 51·6 per cent respectively in 60 years.

Cuddalore is an important trade centre, which had suffered a 10 per cent decrease of population in 1921 census due to trade de-

pression and to the epidemic of influenza in 1918. The provision of railway communication westwards through the interior of the district to Salem has helped somewhat in the increase of its trade, as is evidenced by the decennial increase of 16.9 per cent for the city as against the 5.4 per cent increase for the district as a whole.

The growth of *Vellore* was rather slow; and the town became a 'city' under Class II with just over 50,000 persons only at the census of 1921. Since the famine of 1877-78 a very large trade in grain has developed in the town; but its disadvantage of being 4 miles from the railway (M.S.M.) has been made up for by the construction of the S.I.R. line. A historic town at the crossing of two important natural routes—one north-to-south and the other east-to-west, *Vellore* saw its trade steadily increase in the succeeding years; and recently it has become a big centre of bus traffic.

Summary and Conclusion.

From the foregoing discussion and examination the following conclusions may be formulated:—

- (1) That the cities of Tamilnad (with a population of over 50,000) are found to be evenly spread out over almost all the districts of it without being unduly bunched together in any area.
- (2) That the cities of Class I (what may be called lakh cities) are also distributed evenly as regional centres in the historic divisions of Tamilnad—Tondaimandalam, Cholanad, North Pandyanad, South Pandyanad and Kongunad.
- (3) That Madura, Tuticorin, Coimbatore and Tinnevely-Palamcottah have shown remarkable rise in the 60 years from 1871 to 1931.
- (4) That Coimbatore, with power from Pykara, has grown to be the Manchester of South India, and bids fair not only to show itself as a lakh city in the next census but also to outstrip Salem.
- (5) That Tanjore, Conjeeveram and Kumbakonam have reached the limit of their expansion, any may not show any marked increase of population unless new factors arise to influence them.
- (6) That Cuddalore and Vellore have remained the last two cities in rank, owing to the absence of any great industry in them but depending mainly on trade as collecting and distributing centres for the surrounding country.
- (7) That Madras had a fairly good increase of population only in the last census (1931), while its net increase was nothing remarkable for a metropolis of a large province.

Before concluding, it may be of interest to guess and forecast which of the towns of Class III in Tamilnad are likely to get into the rank of cities of Class II at the next census in 1941. It is very probable that *Negapatam* (48,527 in 1931) which held that position all along, but lost it at the last census as a result of the transfer of the S.I.R. Workshop to Golden Rock, may easily recover that place, being very near the limit. *Dindigul* (43,617 in 1931) which has been growing rapidly in trade after the construction of the railway to Palni and Pollachi, may also enter the rank of Class II. But no other town of Class III holds out such a promise. The Census of the present year should show how far the prognostications made in this paper would prove true.

Finally, it has to be stated that the growth and decline of cities and towns are not mere statistical phenomena; the cause and effect of every factor, political and economical, that affect the phenomena should be studied, and these change with each epoch. In the case of several towns, it may be pointed out, that the conditions of growth are often provided by governments that choose them as capitals and headquarters.

Moreover, mere growth of towns in population may not in itself be a matter of congratulation, unless public conscience is also worked up to the necessary limit, as they are often allowed to grow haphazard without sanitation being properly cared for, the vested interests of capitalists being sometimes arrayed in opposition.

APPENDIX A
Table showing the Growth of the Cities of Tamilnad from 1871 to 1931

No.	Name of the City.	Census of 1871.	Census of 1931.	Census of 1921.	Census of 1911.	Census of 1901.	Census of 1891.	Census of 1881.
1	Madras	397,552	647,230	526,911	518,660	509,346	452,518	405,848
2	Madura	51,987	182,018	138,894	134,130	105,984	87,428	73,807
3	Trichinopoly	76,530	142,843	120,422	123,512	104,721	90,609	84,449
4	Tinnevelly- Palamcottah	38,989	109,068	100,426	89,714	80,014	43,454	41,285
5	Salem	50,012	102,179	52,244	59,153	70,621	67,710	50,667
6	Coimbatore	35,310	95,198	65,788	47,007	53,080	46,383	38,067
7	Tanjore	52,175	66,829	59,913	60,341	57,870	54,390	54,745
8	Conjeevaram	37,327	65,258	61,376	53,864	46,164	42,548	37,275
9	Kumbakonam	44,444	62,317	60,700	64,647	59,673	54,307	50,098
10	Tuticorin	10,565	60,395	44,522	40,185	28,048	25,107	16,281
11	Cuddalore	40,290	59,057	50,527	56,574	52,216	47,355	43,545
12	Vellore	38,022	57,265	50,210	49,746	43,537	44,925	37,491
13	Tinnevelly	21,044	57,078	53,783	44,805	40,469	24,768	23,321
14	Palamcottah	17,945	51,990	46,643	44,909	39,545	18,686	17,964

APPENDIX B
Table Showing the relative rank and decennial variation of population in Tamilnad from 1881 to 1931

No.	Name of the City.	Census of 1931		Census of 1921		Census of 1911		Census of 1901		Census of 1891		Census of 1881	
		Rank	Variation	Rank	Variation	Rank	Variation	Rank	Variation	Rank	Variation	Rank	Variation
62'8	1 Madras	I	+22'8	I	+1'6	I	+1'8	I	+12'6	I	+11'5	I	+2'1
25'2	2 Madura	II	+31	II	+2'8	II	+26'6	II	+21'2	III	+18'5	III	+42'0
86'6	3 Trichinopoly	III	+18'6	III	-2'5	III	+17'9	III	+15'6	II	+7'3	II	+10'3
179'7	4 Tinnevelly Palamcottah	IV	+8'7	IV	+11'9	IV	+12'1	IV	+84'1	X	+5'3	VIII	+5'9
104'3	5 Salem	V	+95'6	IX	-11'7	VII	-16'2	V	+4'3	IV	+33'6	V	+1'3
169'6	6 Coimbatore	VI	+44'7	V	+9'3	XI	-11'4	VIII	+14'4	VIII	+19'0	IX	+10'4
28'2	7 Tanjore	VII	+11'6	VIII	-0'7	VI	+4'3	VII	+6'4	V	-0'6	IV	+4'9
74'8	8 Conjeevaram	VIII	+6'3	VI	+13'9	IX	+16'7	X	+8'5	XI	+14'2	XI	+0'1
40'2	9 Kumbakonam	IX	+2'7	VII	-6'1	V	+8'3	VI	+9'9	VI	+8'4	VI	+12'7
471'7	10 Tuticorin	X	+35'7	XII	+10'7	XII	+43'3	XII	+11'7	XII	+54'2	XII	+54'1
46'6	11 Cuddalore	XI	+16'9	X	-10'7	VIII	+8'3	IX	+10'3	VII	+8'7	VII	+8'1
51'6	12 Vellore	XII	+14'1	XI	+0'9	X	+14'3	XI	-3'1	IX	+19'8	X	-1'4
171'2	13 Tinnevelly	XIII	+6'1	IX	+4'3	XII	+10'8	XII	+62'6	XIII	+6'7	XII	+10'5
189'7	14 Palamcottah	XIV	+11'5	XIII	+3'8	XIII	+13'6	XIII	+111'1	XIV	+4'0	XII	+0'2

Modern Methods in Teaching: the Variety of Interest that Geography Can Give*

By

MISS J. M. GERRARD, M.A.

Geography is a subject that develops in one something of the insatiable curiosity of the *Elephant's child*, and because it touches life at so many points it carries one along on a never-ending quest of discovery. Let me give you a personal experience as an illustration; it was in connection with the recent presidential election in the United States. Now I could never understand the difference in American politics between a Republican and a Democrat, nor remember (when I wanted to) which was represented by whom—until I noticed there seemed to be something geographical in the grouping of the votes—just why for example was the South expected to vote Democrat and the East Republican? Here was a problem to be solved and after diving into several volumes of the *Encyclopaedia Britannica*—I emerged with the answer, and, moreover, with a more or less well defined outline in my mind of the significance of these terms, and an enriched background of the geography and history of the United States. This I think is one of the attractions of the subject, it gives side-lights on so many things and is always opening up vistas to the mind.

The joy and satisfaction that derives from discovery depends upon the extent to which it is a personal quest; in other words the search for information and for facts must be made part of the individual's experience. Geography is a subject, like Nature Study, that provides splendid opportunities for personal discovery, even in school. Let me give an example. Most children are interested in ships and the sea, and they find absorbing all sorts of details which the grown-up person may think unimportant but which for them are necessary steps in enriching their background of ideas. One school conceived the brilliant idea of "adopting a ship," of tracking its movements through the shipping news in the daily newspaper and charting its voyages upon school maps. The

children wrote letters to the officers and crew and asked questions about things that puzzled them, and you may be sure their questions required a knowledge of details far beyond the experience of the poor geography teacher. And, as it happened, the officers and the crew played their part with zest. They wrote living descriptions of the places they visited, they explained the technicalities and hazards of navigations, they even sent specimens of cargoes, where this was possible, for the school geographical museum. Now the voyages of a tramp steamer cover the great trade routes of the world, and in this way the children learned about places, about commodities that form the basis of world trade; they learned moreover first-hand about trade-winds and monsoons, and how to find latitudes and longitudes (or to use the dramatic nautical expression how to "shoot the sun"). Thus the children were led along many paths to knowledge and many new activities were started—for example some boys were stirred to such enthusiasm that they began to draw up meteorological graphs of their own, from the current weather reports. This experiment proved so fruitful as a centre of interest that other schools followed suit and within a year or two a Ship Adoption Society was started and by the end of the year 1937, the officers and men of over 500 ships in the British Merchant Service were teaching Geography to 250,000 boys and girls of all grades. Other countries have since adopted the idea—and, in passing it is not without interest to note that Germany was the only one to make the adoption by decree and not voluntary, thus losing the educational value of the method. It is true that India has not, as yet, a mercantile service of her own to draw upon but she has equal claims on the British Mercantile Service that transports her cargoes to the uttermost ends of the earth, and there is no reason why we should not develop the scheme in this country.

There is too a realism about geography that makes a very great appeal to children at all stages. They are naturally interested in matters that belong to the life of the community. "Teacher is talking about things that we hear of outside school" they say taken by surprise and the lesson suddenly comes alive. I once read an interesting account of the reactions of pupils in an experiment which set out to bring actuality into the school. The aim was to learn about the work and life of the people who served the community. And so the local postman and the fireman and the milkman and sewerer and many others came to school and talked with the children and then the class was taken to visit the scene of their work. The children of course were thrilled—imagined

*Courtesy of A.I.R., Madras: A broadcast talk to teachers given on 11-1-1941.

their faces as the fireman walked into their class room in his shining brass helmet carrying his spanner and his axe! They bombarded him with questions—it was surprising to see how penetrating their questions were, what a valuable amount of information they gained, what a wealth of experience they were deriving from these personal contacts. Not only were they mentally stimulated but these contacts awoke their sympathy and aroused their social consciousness. Why not carry this idea into the upper school and invite into the class room workers in various departments that serve our City!

Like Nature Study, Geography should vary in garb according to the locality—its urban expression is necessarily different from its rural expression. In other words, the Geography course should be coloured by the environment—although at the same time it must look beyond it—for here is to be found the real measure and illumination of conditions elsewhere. And the experiences children get from this *direct study of the concrete* play an important part in stimulating their imagination and enriching their store of ideas. It is here that the most worth-while projects can be developed which, carried out through the method of group work, provide opportunity for a variety of geographical activities. Take for example a project of local agriculture—this would include a study of the present distribution of cultivation in relation to water supply, the products and the methods, rotations, times and implements associated with the various activities of the cultivator. The material collected would be presented in the form of written descriptions, drawings and plans, with an investigation into the past, making maps of the vestiges of old fields, wells and ditches and grazing ground, particulars of old implements now passing out of use, old sayings, the local names for crops, growing times and details of festivals associated with the local agriculture. Other projects could be developed out of the bazaar, and local industries etc. A more ambitious study of the home area is the regional survey, a fascinating method that brings out the real unity underlying geography, nature study and history.

Then there is the appeal to the imagination and sense of adventure in stories of discovery and exploration. Unfortunately however there is little material here appropriate for the pupils in Indian schools, not only because of the language difficulty but because the heroes and the background of such stories are not Indian. Presently there will arise I hope an Indian Ballantyne and we shall have thrilling stories about the true adventures and

perilous journeys of Pundit Kintap and the other Indian explorers, whose courage and endurance and resource are worthy to be enshrined in epics.

There is no time to talk about the special appeal that Geography can have for the practical child, and the backward child and the scientifically minded child, nor of the appeal that maps can have for all. But certainly Geography gives scope for an infinite variety of approaches if we but have the courage to step off the beaten track for one lesson out of every three. The words of Sir J. Arthur Thompson are equally applicable to the Geography teacher as to the Botany teacher. "All roads" he said, "lead to Rome and what we wish to develop is not so much knowledge as a lively interest, a scientific way of looking at things and some joyful appreciation besides."

A Historic Meeting Ground : Satyamangalam

By

S. THIRUMALACHARIAR, M.A., L.T.,
Board High School, Dharapuram.

The District of Coimbatore is unique in the history of the Tamils of South India, since it commands the key to the central boundary line that separated the three great Tamil Kingdoms and Mysore. It was the bone of contention among the neighbouring belligerent kingdoms and more than once it has suffered terribly at the hands of the conquering invaders. It came under the sway of the Cheras in the early Christian era and it has been, though with some uncertainty, held that Karur was their Capital. The District has been designated as Kongunadu or Kangayanadu, whose limits went up to the trijunctional point, on the banks of the river Karaipottanar, a river entering the Cauvery at about eleven miles east of Karur. Almost all the Tamil poets agree as regards the limits of the kingdom and Auvai (ஓளவை) has cited the following regarding the boundary of the kingdom. “வடக்குத்தலம் பழநி, வாழ்கிழக்குச் செங்கோடு, குடதிசைக்குக் கோழிக் கூடாகும், கடற்கரையினோரம் அது தெற்காகும் ஓரெண்பதிங் காதம் சேரநாட்டெல்லை எனச் செப்பு” One has to infer from this that the present District of Coimbatore and Salem came under the sway of the Cheras.

But History is a record of the rise and fall of kingdoms. And so, in the tenth century A.D. there was a Chola revival under Aditya and Parantaka and consequently the District passed into the hands of the Chola rulers. In an Inscription on the western wall of the Uthra Vira Ragava Perumal Temple, within the fort at Dharapuram, it is recorded that, during the reign of a Kongu Chola by name Tribuvana Chakravartin Vira Rajendra, a gift of a stretch of land for rice offerings to the Goddess Perun Karunai Selviyar had been made. This inscription is registered as number 148 by the Archaeological department. This proves beyond doubt that the Kongu Cholas held sway for a considerable period over the District. There seems also to be much truth in the recent historical finding that the District next passed on to the hands of the Pandyas, as is borne out in other inscriptions recorded as 151 and 152, (to be found in the

south Prakara of the same temple) to the effect, that, during the reign of the Kongu Pandya, Vira Pandya Deva, a gift of certain ceiling stone beams and pillars to the Pillayar Temple had been made.

During the 15th Century the Vijayanagar monarchs held the mastery over the south and with their decline, the Naiks of Madura became masters of the District in the Sixteenth Century. Two inscriptions, registered as Numbers 145 and 149, mention one Vira Pratapa Sadasiva Deva Maharaya as the ruler of Kongunadu during the last quarter of the 15th Century (Saka Era). But the 17th Century was a critical period in the annals of the District when there were a series of incursions, ending in numerous battles, by the Mysore rulers, which ultimately terminated in the District forming part of Mysore territory. But the District saw no quiet or rest, since a series of bitter fightings ensued between Hyder and the British. In the last war with Tippu, when the brave ruler died, the whole of the District was ceded to the British.

It is not so much the history of the District as the remnants of the forts and buildings constructed by the various rulers, in some of the outlying localities of the District that demand our attention. Being of easy approach from Mysore through the Gazelhetty, the Hassanur and Talamalai passes, the District has an entrance in Satyamangalam, a place on the bank of the river Bhavani, and a former head-quarters of the taluk. It is a commercial gateway from Coimbatore to Mysore. Through that locality numerous hordes of Mysore troops poured in, into the District, under Tippu. They passed through the Gazelhetty Pass though now it has been abandoned in favour of Hassanur Pass. A bridge on the river Bhavani is at the entrance to the town. The same river serves as the southern moat to a very big fort, with rampart walls, of clay and granite, surrounding it. There lived a branch of Tirumal Naik's family, in all probability a son-in-law of his, who was entrusted with the arduous task of guarding the northern entrance into the District, with special instructions to see that the Mysore incursions were effectively checked. The fort had moats surrounding it, and to this day we can see an inlet from the river into the eastern moat, to provide for an easy filling up of the moats with water from the river. The forts and moats are now in ruins though the southern wall, with the prickly pears richly grown, are to be seen to this day. The temple at the centre of the fort underwent the ravages of time and the deity has been removed to the western corner of the village and to differentiate it from the main temple

of the village, this temple is called Kottai Perumal Temple. The Arsenal is there in ruins in the south-east corner of the fort.

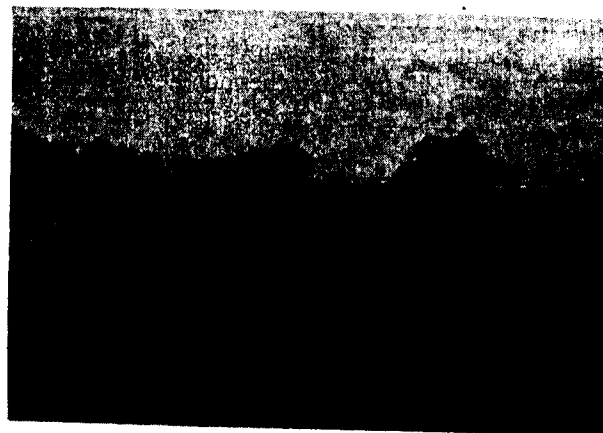
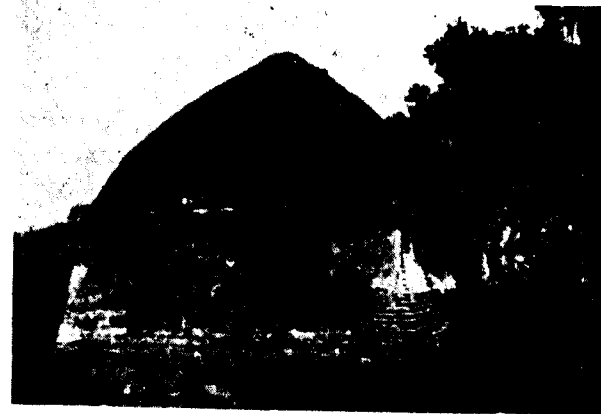
The area seems to have been once populous, as is evidenced from the fact that it was once the headquarters of the Taluk and as it commands, even now, the entrance into the District from Mysore. The lingayats abound in the locality and that is a clear proof of the frequent intercourse between Satyamangalam and Mysore. It has been held that the great Vaishnavite Scholar Sri Vedanta Desika passed through Satyamangalam at a time, when, Sri Rangam was seeing its bad days under Malik Kafur. The Central Vaishnavite Temple, built in the Hoysala Style, beats hollow a perfect Vaishnavite temple in the number of granite and bronze images of Gods and Alwars, set up in it. Hence, we are not far wrong if we conclude that it ought to have been once a Vaishnavite centre. Similarly, Jain Temples seem to have abounded at the vicinity of the locality. Vijayamangalam, in the Erode to Podanur Railway line, boasts of a Jain temple, with rich endowments and in fact all Jain importations into the District should have passed through Satyamangalam (the land of Vishnu's Satya or prosperity). The very History of Kongunadu, (Kongu Mandala Satakam) was written by a Jain and we know that the contribution of the Jains to the Tamil literature is immense. During a talk with Mr. Suri Iyer, the only surviving Jain at Vijayamangalam, I became aware that the book was written by his great grand-father.

From the Naik, the place passed on to the hands of the Mysore generals in 1657. But in the frequent wars with Hyder and Tippu, the sway over Satyamangalam was changing hands often. In 1790, Colonel Floyd occupied it and Danaikencotta, a place about 10 miles to the south-west of it, after a hard-contested battle. Under Lord Wellesly, it passed into the hands of the British and from the 19th Century it continues to be under their control. It is a mountainous area, with a population educationally backward, though recently in 1932, the Coimbatore District Board has started a High School there. For attractive sylvan scenery, Satyamangalam affords the greatest scope.



Kottai Perumal Temple.

The Arsenal in Ruins.



Bhavani Bridge.

The Sunkesula Project

KURNOOL DISTRICT

By

SRI K. NEELAKANTA RAO, B.A. B.ED.

Description of the Place.

Sunkesula, a small village in Kurnool Taluk of Kurnool District, lies 18 miles N-W of Kurnool town. It is a small and tiny village with no special economic or historical importance and the project alone has made its name noteworthy. The area near and around Sunkesula is saline, so that the salt from the earth is manufactured locally in salt beds for home consumption.

The site on which the Anicut is constructed is rocky. The Tungabhadra, on which the anicut stands, is the southern boundary of the Nizam's dominions and its width is about 4,000 feet from north to south, as the crow flies.

Importance of the Project.

The people of Kurnool particularly, are very proud of this Project, though it is small, because they eat the rice produced under it and drink the sweet water supplied by it, nay they breathe its cool, fresh, morning and evening air while strolling on its bund.

Rainfall.

In tropical countries, such as ours, not less than 40" of rainfall is necessary for the germination of seed and successful crops, as much of the moisture is taken away in the shape of evaporation. But, to its great misfortune the Kurnool district lies in the rain-shadow area of the Western Ghats where the monsoon is very uncertain. Bellary District gets an annual rainfall of 17" and Kurnool district 26". These districts are neither the recipients of the South-West Monsoons, nor of the North-East and therefore the rainfall is extremely low.

Irrigation in other Parts of the Presidency.

Under these unhappy conditions, irrigation alone, to some extent, can effectively remove the chronic poverty of these districts

Whereas the Tamilnad has 40½ lakhs of acres under irrigation and the Andhras have 26 lakhs, we, the poor and helpless Rayalseemites, have irrigation for 6 lakhs of acres.

But the enterprising spirit of an English Irrigation Company came to our aid under the name of "The Madras Irrigation and Canal Company, Ltd." This company was founded in 1858 just a year after the Great Sepoy Mutiny. This project formed a small part of an enormous scheme to irrigate nearly all the drier parts of Madras, but our project was the only one finished and it cost five times as much as was originally expected.

Origin and short History of the Project.

The canal called the Kurnool-Cuddapah Canal was constructed by a private Irrigation Company. The Company was authorized by an Act of Parliament to raise a capital of one million pounds. Five per cent interest on outlay was guaranteed by the Secretary of State who reserved to himself the right to control the proceedings of the company. But he had to purchase the works after 25 years.

The whole scheme was sponsored and executed by Sir Arthur Cotton. He took up the Sunkesula-Cuddapah section in the year 1863. The site of the Anicut was originally fixed at Kurnool but after work had progressed to some extent, it was found that the site was unsuitable and it had therefore to be abandoned. About 1.1 lakh of rupees was the loss due to this change. It was then moved to its present site and was finally built there. The advantage of the Sunkesula site was the existence of a good rocky foundation, which facilitated the construction of the anicut. The Project was completed by 1870, seven years after its start; but the construction was characterised by lack of proper supervision and by wasteful methods. The anicut breached on a number of occasions (in 1864, 1868 and 1882) and large sums were spent on repairs.

Comparative Study.

The Government took over the project on the 1st of July 1882, on a payment of 3.02 crores. Under this scheme about 72 thousand acres are irrigated. Comparatively, this is a very costly project as will be shown below.

Project	Cost	Area irrigated	Rate per crore Rs.
1. Sukkur	20 crores.	75 lakhs of acres.	33¼ lakhs per crore
2. Mettur	5 „	3 „	60 thousand acres per crore
3. Kannambadi	2½ „	2 „	80 „
4. Proposed Tungabhadra project	11 „	11 „	1 lakh per crore
5. Sunkesula	3 „	72 thousand acres	24 thousand acres per crore.

Thus we see, that of all the projects mentioned here, the Sunkesula project is the most costly, though there is no hydro-electric scheme attached to it. Likewise the proposed Tungabhadra project is likely to exceed its modest estimate of 11 crores.

Measurements.

The Anicut is in two sections with an island in the middle connected by a flood bank 4 furlongs and 28 feet in length. The northern portion of the anicut is 1,064 feet long and the southern 3,294 feet 5 inches. To avoid breaches, in 1886, the crest of the anicut was lowered by 3 feet.

Taluks Irrigated.

The Kurnool-Cuddapah Canal takes off from the Tungabhadra at Sunkesula, and runs through Kurnool, Nandikotkur, Nandyal, Sirvel and Koilkuntla taluks of Kurnool District and through Jammalamadugu, Proddutur and Cuddapah, taluks of Cuddapah District.

Economic Value.

The Canal is 191 miles long and was originally intended to be a combined irrigation and navigation canal. Only the first 75 miles of the canal carry some traffic, the chief articles transported being firewood and stone slabs. Navigation below 75th mile was abandoned as unprofitable.

Partial Failure of the Scheme.

From the beginning the canal did not fulfil expectations. The water in the canal was not fully utilized as it passed through a tract

which combined the disadvantages of black cotton soil and sparse population. The Madras Deccan especially the Central Districts of Kurnool, Cuddapah, Anantapur and Bellary suffer from want of man power. Whereas the Bengal Presidency has a population of 611 per sq. mile, the Deccan plateau has but 168 persons. So it is possible for Bengal to raise rice which requires much human labour, but the Central Districts may not be able to furnish the labour required for wet cultivation under the Tungabhadra project. But this does not mean that we do not want the Tungabhadra project. We do want it not only for irrigation but for generating hydro-electricity which may be supplied at a lower rate than at present.

The other causes for the partial failure of the Sunkesula scheme are (1) Dry holdings are large. (2) Ryots get as much income as they desire from dry crops such as cholan, korra, cotton and ground-nut. (3) Lands give better return with dry crops than with wet; the labour required for dry crops is also less. (4) Ryots are lazy, conservative, easily contented and will not apply labour to bring lands under wet cultivation. (5) Even in a bad year, water is only taken at the last moment. (6) There is optional irrigation; the ryot may irrigate his land or may not. Thus wet cultivation has not made much headway and has been at the same level as it was during the past 30 years.

Extent of Irrigation.

The Canal irrigated 72,624 acres in 1935-36. The crops chiefly grown were paddy, turmeric, cotton, ground-nut and tobacco. This year there was a loss to Government. The remedy suggested was to convert the lands from dry to wet and make the levy compulsory both for dry and wet crops. But to enforce this levy, legislation is necessary.

The ayacut (land irrigable, wet and dry) of the canal is 103,014 acres. Of this, Kurnool District has 53,935 acres and Cuddapah District has 49,079 acres.

Irrigation Season and Practice.

The canal is opened on the 15th of June and actually irrigation begins from the 15th July. It also feeds several tanks, the most important of which lies at Nandyal in Nandyal taluk, Kurnool District.

The garden crops generally raised are plantains and betel leaves in Kurnool and turmeric in Cuddapah; sugar cane is largely grown under the Nandyal tank. The dry crops raised are drilled paddy,

cholan, chillies, garlic, onions, cotton, ground-nut, ragi, korri coriander, gingelly and horse gram.

Sections and Water Supply

Of the 191 miles of length of the canal, the first 94 lie in the Kurnool taluk; the next 42 miles lie in the Nandyal taluk; and the rest in Cuddapah District. The canal supplies drinking water to Kurnool town with a population of 40 thousand and to Nandy with a population of 23 thousand.

Maintenance and Repairs.

The limit for the annual repairs to the canal has been fixed at Rs. 70,000. The amount includes repairs to minor distributaries, wages for work, establishment, tarring, oiling shutters, silt clearance and gravelling.

Conclusion.

In conclusion, it has to be admitted that though the Sunkesul project did not fulfil all its expectations, it has done much to remove unemployment and poverty in the Kurnool district.

Extracts from Periodicals

THE PROJECTION OF INDIA

A NEW APPROACH TO NATIONAL UNITY.

By

M. RUTHNASWAMY, C.I.E.

One—if it is not the only—reason for the dismal deadlock into which all discussion about the future political progress of India has been thrown is the fact that India has not been given the first place in that discussion. The name of India has, no doubt, been taken in such discussion. But when one comes to probe the argument, one finds that by India is meant not India but some favourite *eliche* of the writer or speaker or party that has taken part in the debate. One party means by India, Hindu culture, Hindu Dharma, Hindudom; a second party when it speaks in the name of freedom and progress of India has in its mind Islamic culture and civilisation. A third party stands for India when all that it stands for is its own political and social ideology. The net result of this discussion on the future of India has been the confusion of tongues and the clash of battle. Of the two factors that go to the making of a State, Land and People, the second, the People, has been given undue prominence and weight in current political argument in India. Muslims are arrayed against Hindus, and the interests, the influence, the rights and liberties of either people become the bone of contention. Electorates are required not for particular localities, but for particular communities. Even nationalism speaks only for the people of India. This preoccupation does not prevail in the political field alone—it has entered the domain of culture. At Waltair is founded not the University of Waltair but the Andhra University, at Benares the Hindu University and at Aligarh the Muslim University.

The Land of India

The preoccupation with this political factor, the People, having led us into such distress and disturbance, we might consider whether the way out might not be to turn our eyes and our hearts to that other factor in the making of India, the Land of India. The

ethnography of India having failed to give us unity and solidarity, one might turn to the geography of India. The Land of India has its own rights and liberties, its own interest and importance. And these have not been given due consideration in recent schemes for the future of India. The unity of India is determined by its definite frontiers, the Himalayas in the north, the Hindukush in the north-west, the seas on the east and the west. No such decisive walls, whether of land or water, divide India up within itself in fragments of independent or self-sufficient States. If India has been divided up in all its history till the other day it is because none of its peoples was able to acquire the political strength to realise its unity. But all the time the Land of India was calling its people to achieve that unity. The long line of its land frontier and the still longer line of its sea frontier require that India shall have the strongest army and navy possible, whatever the traditions of her peoples or their philosophy or their religion may say. The Land of India, worked to exhaustion for centuries, requires rest and the widespread establishment of small or large scale industries and the development of town life away from the village-culture to which some would call her back. Arguments like these the Land of India addresses to her leaders and peoples. It is high time they listened to the voice of the Land of India. It might achieve more for the unity and freedom and progress of the country than what the People of India has. Anyway, it is time we gave it a chance.

What We Require Now

A few years ago, Sir Stephen Tallents, the able Permanent Under-Secretary to the Post Master General, published a brochure entitled *The Projection of England*. "The burden of his argument was that England was not known enough within the empire or in the world, and that it was up to her to make herself better known if she was to survive in the modern competitive world. He called upon England to make use of all modern scientific media to advertise herself to the world. To-day, he says, as the result of scientific discovery, a people is known to its fellows by the impression which it makes upon them through the cable and the printing press, on the air and upon the screen. He advises England that if a nation would be truly known and understood in the world, it must set itself actively to master and employ the new, difficult and swiftly developing modes which science has provided for the projection of national personality." The projection of India is what the people of India require, in order to make them jealous of her

unity, her freedom, her progress. They must know India if they are to live and work and fight for India. What do they know of India now? It is true India is heard on everyone's lips, splashed on every page of the daily newspaper, blazoned forth on every kind of platform. But what do they mean by India? More often than not, the Hindu means by India Hindu Dharma, the Muslim Islamic culture, and the Nationalist or Congressman his party *credo*. What does the average villager know of India except his own village or at the most his own district? Does a villager in Tirunelveli know anything of the hills of the Frontier, or the vale of Kashmir, or the rivers of the Punjab? There are thousands, probably millions, that have not seen the sea and known what it means to the life and liberty of India. The figure of India, its form, its beauty, its hills and its rivers, its flora and its fauna must be made known to the people of India. "If we are to love our country, we must make it lovely," said Burke. But India is already lovely and its loveliness must be made known to her people if they are to love it and do all for it, that love calls forth. India requires to be projected to her people. What India needs now is the exercise of the art of national projection.

A New and Complicated Art

It is a new and complicated art, as Sir Stephen Tallents proves it to be. It demands "an intense study and a continuing apprenticeship"—for it has to present the numerous and complex features of a large and varied country to a numerous and multi-graded community. It has to be a corporate act and therefore requires "concentrated planning and organisation." The modern media of communication of thought and pictures of things to man, the Press, the Cinema, the Radio, have to be studied as a means of publicity and in the reactions of men as individuals and groups to them. This art is to organise the presentation of the facts of India's life—its natural features, its economic and social life, its industrial awakening—in a way that will get them across to people's minds and hearts. The methods of successful salesmanship and publicity have to be studied. The new means of communication—the screen and the air—have to be used on a large scale. The cinema can teach not only the literate but the illiterate, not only the classes but the masses. Two or three small schools of Russian producers, we are told, working at no great cost and producing a mere handful of films, have done more than all the studies of the world to show us what an incomparable instrument of national expression the cinema might be. We want producers in India to let

India reveal herself to her sons and daughters. What a great service to the making of Indian unity can be rendered by documentary films about the geography, the history and the life of India. Radio programmes all over the country must provide for talks, and songs and plays depicting the features of Indian scenery and the still and moving life of India. Tourist and Travel agencies must organise tours of the common folk to all parts of the country. The youth of the country must learn to love India long before they become conscious of their separate communities.

A Corporate Society of National Projection.

All this work would require the formation of a school or society of National Projection. It would be composed of representatives of all the arts that have to do with national projection—of the Press, of the cinema producers, of the All-India Radio as well as of the people. It might be organised on the lines of the British Broadcasting Corporation. Its funds must be drawn from contributions by all Governments in India—for they must be interested in this national projection which will counteract the evils of excessive communalism—and from all those that are interested in extending and developing the idea and the practice of the love of India. This Society of National Projection would not only plan and organise the revelation of India to her people through the Press, the Cinema and the Radio. It would organise a National Exhibition every year or periodically to publish not only the industrial but the artistic, literary, and cultural achievements of India and facilitate tours to this Exhibition from all over the country.

Not merely "India First" but "India" as the only object of the secular study, devotion and loyalty of the people of India is the slogan of national projection. Politics divides us, Religion divides us, Culture divides us. But the land and the love of the land of India may unite us. No political, or communal, or religious or cultural differences can affect our love of the snow tops of the Himalayas, or the rugged hills of the frontiers, or of the valley of Kashmir, or of the great rivers of India, or of the Downs of the Deccan, or the limpid blue of its seas. It may be that while Politics and Culture and Religion divide us, the land of India and the knowledge and love of that land may unite us and the land of India has greatness, and beauty, and appeal enough to achieve even that difficult end.

THE BURMA ROAD

A WONDER OF THE WORLD

Some highly interesting information has been made public concerning one of the greatest civil engineering achievements of modern times, carried out on communal lines by the people of the Republic of China, that is the Burma Road.

This extends from the Burma frontier of China right into the centre of the latter country to the present war time capital of Chungking, a distance of nearly 700 miles. Also the work has been undertaken by an army of over 160,000 peasants, not only men and women, but also children, with supervision by only about 200 engineers, many of whom incidentally have been British and American volunteers, anxious to lend a hand in this gigantic national achievement.

This road crosses some of the most difficult country, including high mountain ranges, and over 300 bridges and more than 6,000 culverts have had to be constructed, whilst the carrying capacity, including the weight of the vehicle, is 5-10 tons, and hundreds of 2-ton motor lorries are operating upon it. By this means material of all kinds can be imported from India and Burma, particularly through Rangoon, and the construction was commenced at the end of 1937 as a result of the wisdom and imagination of the Government of the Chinese Republic, who foresaw that the Japanese naval blockade would cut them off eventually from supplies of munitions, particularly from the United States, and to some extent from Soviet Russia.

The first half of the road from Auting on the Chinese-Burma border to Schaknoan in China, a distance of 350 miles follows what is known as the Old Tribute road, which is essentially a caravan and mule track whose age goes back to the dawn of history. For example it was this track that was followed in the Middle Ages by the famous Venetian traveller, Marco Polo, who in the most extraordinary manner, it may be remembered, travelled over the greater part of the vast Japanese Empire when most of Europe was in complete ignorance that such an Empire even existed. This track, however, had to be completely realigned, re-bridged and rebuilt, and has been constructed of packed stone with rolled gravel or broken stone, with a total width of from 18-24 feet, and an actual travelling surface of at least 10 feet. Needless to state it was almost impossible to get any modern equipment in the way of steam rollers,

and almost the whole of the consolidation has had to be carried out by crude rollers made of stone on the spot, and hauled by mules or gangs of labourers.

Many million cubic yards of material had to be excavated almost entirely by hand, and that such a road, over 700 miles in length, as stated, with hundreds of bridges and culverts should have been constructed in two years almost without any modern appliances and equipment, is almost incredible, and of course was only rendered possible by the patriotism of the vast army of people engaged upon it.

Considerable numbers of motor vehicles have been imported by the Chinese Government, largely from the United States, and not the least remarkable aspect of the achievement is that thousands of Chinese drivers have also had to be trained.

The Burma Road has been described in detail in *Asiatic Review* by Hsiao Ch'ien, who recently also gave a vivid description at a luncheon in London, including particularly the great loss of life through disease, blasting accidents, and drowning experienced by the large army of heroic volunteers who built this road.

—*The Hindu*.

LIFE IN THE ARCTIC

By

ROBERT BENTHAM, B.Sc., F.R.G.S.

Some interesting details regarding the Arctic region and the observations made by him in that part of the world were furnished by Mr. Robert Bentham, B.Sc., F.R.G.S. in an exclusive interview to a representative of *The Hindu*.

Mr. Bentham, who was the Geologist of the Ellesmere Land Arctic Expedition, is now on a short visit to Madras, spending his holidays between periods of military training. He first came to India during the Christmas of 1939 to join the staff of the Burmah-Shell and was doing geological work in Assam before he was called up for military service.

Mr. Bentham told the Representative of *The Hindu* that he was with the Oxford University Ellesmere Land Expedition in 1934-1935. This Expedition was organised by Mr. Edward Shackleton, son of Sir Ernest Shackleton of Antarctic fame, and led by

Dr. Noel Humphreys who was afterwards a member of the 1936 Everest Expedition.

The object of the Expedition was, Mr. Bentham said, to explore the northern part of the Ellesmere Islands, near Greenland. The party left for Ellesmere Land in a Norwegian "sealer", and carried with them provisions to last for about a year. When they reached the Arctic regions in the autumn of 1934, difficult ice conditions made it necessary for them to establish a base camp in Greenland. This they did, and from this camp long sledge journeys were made to various parts of Ellesmere Land by different parties and survey and geological work carried out. The Expedition returned to England in the autumn of 1935, the return journey having been made in a sailing schooner.

In 1936, Mr. Bentham said, he returned to Ellesmere Island to continue the work started in the previous year. This time he went there, on behalf of the World Geographical Society and was engaged both in geological and in survey work. He stayed at the Police Post established by the Royal Canadian Mounted Police at Craig Harbour, on the southernmost tip of the Ellesmere Island. From here he made sledge and boat journeys, sometimes alone and sometimes accompanied by a Policeman or Eskimo, and mapped several hundreds of miles of coastline of this Island. He returned to England from this Expedition in September 1938. From that, till he left for India towards the end of 1939, he was engaged in jotting maps and otherwise putting down into writing the work he had done during the preceding two years.

Relating some of the observations made by him, Mr. Bentham said that one of the features of the Arctic was the long winter nights. He observed at Etah, the Greenland base during the 1934-35 Expedition, that the sun set early in October and was not seen again until the end of February. This was followed by a short period when the sun rose and set daily. From the end of April to the end of August the sun never sets at all. At the Craig Harbour, where he camped during his next trip, he found that the maximum temperature was about 50 degrees, warm enough to bathe in the sun. The coldest periods recorded a temperature of 55 degrees below zero, or 87 degrees of frost.

Speaking generally about the Arctic, Mr. Bentham said that there was very little rain there, most of the precipitation taking the form of snow which fell intermittently throughout the winter and spring. The only source of water was ice, obtained either from glaciers or icebergs. Consequently, he said, it took a long time to

make a cup of tea when travelling. The ice had to be collected, then thawed and finally boiled. He added that he used Primus stove, for this purpose and that in cold weather it often took as long as threequarters of an hour to make enough tea for three people.

Mr. Bentham told our Representative that the other phenomena characteristic of the Arctic included "Sun dogs" and the "Northern lights." The "Sun dogs" he explained, consisted of false suns, seen only in cold weather, appearing above, below and on either side of the real sun. Usually not more than four sun dogs could be seen at a time; but under favourable conditions as many as eight had been observed. "Northern lights" were seen in the nights during the winter. They took often the form similar to a search-light beam. When they were shining well, they appeared like a gigantic fire works display of variegated lights shimmering across the whole sky.

News and Notes

Ourselves.—The Journal of the Madras Geographical Association has completed its 15th volume with the last issue for 1940; and it now emerges under the new title of "*The Indian Geographical Journal*," in response to calls and suggestions from several friends in Northern and Western India. The change is not a mere nominal one, but involves great responsibility; and it has not been lightly undertaken without deep consideration and forethought. With the experience we have gathered these 15 years and with the co-operation and goodwill of competent geographers in India who have so kindly and willingly offered their help and support, we hope to run it successfully as an All-India Journal.

* * * * *

There would have been no need for this change if the proposed *Indian Geographical Federation* had come into being with its own organ. In accordance with the suggestion made by the British Geographers at the Calcutta Session of the Indian Science Congress in January 1938, a Committee was appointed to urge Provinces and States where Geographical Associations or Societies did not exist, to start them, and to bring them together into a federation for several purposes among which the running of an All-India Geographical Journal as its organ was prominently mentioned. But despite earnest and strenuous attempts for more than three years, it was not possible to get new associations started in several States and Provinces for the simple reason that Geographical studies had no proper place in their Universities and Colleges, and very few persons were consequently interested in the subject. Nor was there any enthusiasm or desire among the few existing Associations to come together. Under these circumstances the call came to us as the oldest Geographical Association in India with the longest journalistic record of achievement; and we have responded with the fullest hope of getting support and encouragement from all in our endeavours to serve the cause of Geography in this country.

* * * * *

Our aim and policy shall not be merely provincial; and our appeal and service shall be to the several Universities and Colleges in the whole of India. We shall stand as hitherto for Geographical research as well as for dissemination of geographical knowledge, but in a far wider field.

* * * * *

Geography in the Indian Science Congress.—Meantime, it is most distressing to learn that the Indian Science Congress has decided at its Benares Session in January last to amalgamate its short-lived Geography Section with the Geology Section—a decision which is tantamount to abolishing it—on a chance vote taken at a Meeting of the General Committee in an almost empty house on a cold winter night in the teeth of unanimous opposition of all the Geographers present.

* * * * *

In this connection it may not be out of place to trace the history of this short-lived Section. For over two decades, the Indian Science Congress Association which is considered to be the premier scientific Association in India, had not thought of Geography at all as a subject worthy of any place in it—so low has been the position of Geographical studies in Indian Universities and Colleges. For the Indore Session of the Congress in 1936, the Section of Geology was nominally expanded to include Geography also, under the title of the Section of Geology and Geography, when there were 16 papers contributed on Geology and *none* on Geography. At the Hyderabad Session next year (1937), the Joint Session had 52 papers, of which only three were on Geography.

* * * * *

Then came the Silver Jubilee Session of the Congress at Calcutta in 1938, when window-dressing was required against the visit of the British Geographers; and so, a Section of Geography was temporarily created for that year only. But even under such conditions, the Section had 21 papers contributed, which were all agreed generally to be good. Thanks to the action taken by the British Geographers, who, by means of a resolution in the Section, as well as by a separate memorandum, pleaded for its permanence, the Executive Committee of the Congress decided to retain it permanently. The wisdom of this action was proved by the fact that at the Lahore Session next year (1939), there were again 20 papers for the Geography Section as against 18 papers for the Geology Section at the same time.

* * * * *

Despite all this phenomenal progress, however, at the Madras Session in 1940, a Damocles' sword was hung over the Section in the shape of the proposal to re-amalgamate Geography with Geology; and due to strong opposition, an amendment was carried to consider the question again next year, thus putting off the evil day. At Benares in January this year, the one existing body

in India that could bring all the Geographers together on a common platform was practically annihilated with a year's lease of life at Dacca.

* * * * *

For the Dacca Session of the Congress Geography will accordingly have a separate section for the last time, after which it will be an annexure to Geology. We take this opportunity to congratulate Mr. George Kuriyan, Head of the Department of Geography in the University of Madras, who has been elected President of the Section, and Prof. Nafis Ahmed of Islamia College, Calcutta, who has been elected Recorder of the Section.

* * * * *

The aims and outlook of Geology and Geography are so variant that the votaries of the two subjects cannot be expected to work together usefully in an unequal and unwilling partnership. Nor do the Geologists seem to be happy over this consummation. It is, therefore, to be hoped that the question will be raised again and decided in favour of Geography, restoring it to its proper place with a separate Section of its own.

* * * * *

It is this gloomy prospect that drove some ardent Geographers to the length of discussing an annual Indian Geographical Conference, like the Economic, Philosophical, Oriental and other Conferences. But the proposal has not so far materialised, though it denotes the strength of the feelings of disappointment and resentment at the decision to close the Section.

* * * * *

It is under these circumstances that a long cherished idea has been put into action,—that our Journal has been changed into an All-India one to provide a common organ and a liason to all workers in the field of Geography in this vast country.

* * * * *

The War and Geography.—The unsatisfactory position and immature development of Geographical studies in most Indian Universities are largely responsible for the general absence of geographic outlook even in the educated Indian, for the improper appreciation here of the part played by Geography in this great world conflagration such as the underlying geographical causes that led to it or the geographical factors at work steering or shaping the course of it. And when the Peace Settlement is made, Geographical considerations will have to enter largely, if that settlement is to be abiding.

* * * * *

Our country has been lucky so far to escape the grave calamities that have befallen so many of the European countries; but even in this country it is interesting to note the rapid reactions and adjustments to the War. The resources of the land are now better taken stock of, better worked up and better utilised; un-exported materials like groundnuts are attempted to be used in new ways within the country itself; and substitutes are being tried for dyes, drugs and other things that are in great demand but cannot be imported. Even heavy industries are coming in, rather slowly though.

* * * *

And amid the war-time clash of internal politics, comes a new suggestion from Prof. M. Ruthnaswamy, C.I.E., as a solvent of the communal, religious, linguistic and other differences, to approach the problem from the Geographical or *Land* point of view rather than from the point of view of the *Peoples*, as all such attempts have unfortunately proved so far abortive on account of the multifarious differences that have loomed so large. This contribution entitled "*The Projection of India*," extracted elsewhere in this issue will be found to be highly interesting and thought-provoking.

* * * *

Bihar's 'Problematic Rivers'.—A study of Bihar's 'problematic' rivers for their control is expected to form an important part of the activities of the Public Works Department, Bihar, during the year.

The Kosi river which has been flooding an area of about a hundred square miles every monsoon, comes first on the list of the rivers to be studied. An enquiry on behalf of the Nepal and Bihar Governments is shortly to be started to investigate the possibilities of training this river which is now threatening Darbhanga district, one of the most densely populated areas in the province.

Gauge and velocity readings are also being taken at Dehri-on-Sone to find out tendencies of sand deposits which have necessitated the remodelling of the headworks of the Sone canals at Dehri-on-Sone.

Estimates are being prepared for repairs to 115 miles of embankments on the left bank of the Gandak. These embankments protect from floods 4,000 square miles of fertile and thickly populated land. The cost of maintenance and repairs has been about Rs. 35,000 annually in the previous years.

* * * *

Mettur Hydro-Electric Scheme.—The scheme utilizes a part of the water let down for irrigation purposes from Mettur reservoir. The dam is 176 ft. high, and impounds a total of 93,500,000,000 cubic feet of water. The peak load at the powerhouse has already risen to about 11,000 kilowatts and is expected to reach 17,000 kilowatts by the end of 1940-41, when the several extensions now under construction begin operation. At Erode the Mettur System is linked with the Pykara net-work and both can work in parallel as and when operating conditions demand. The Scheme supplies power to the districts of Salem, Trichinopoly, Tanjore, South Arcot, North Arcot, Chittoor and Chingleput.

* * * *

Papanasam Falls to be harnessed.—Madras will have a third hydro-electric undertaking in operation by 1942. The scheme is to utilize the fall of about 330 feet in the passage of the Tambraparni river, in the Tinnevely District. By the construction of a masonry dam 176 feet high across the river in the foothills of the Western Ghats above Papanasam, a reservoir of 5,500,000,000 cubic feet capacity is being created. When the scheme is in full operation, a peak power of 28,000 kilowatts is expected to be generated. The scheme covers Tuticorin, Koilpatti, Madura, Tenkasi and Rajapalayam, and will incorporate the existing lines in the area and the system will be linked to Pykara at Madura. Construction is now in progress.

* * * *

Geography at the Calcutta University.—A degree examination in Geography will be held for the first time by the University of Calcutta this year, at which about 50 students, including four women will appear. The course was started in the University two years ago, and it is now proposed to introduce the subject in the post-graduate department.

A Geographical Exhibition was organised at the Darbhanga Hall of the Calcutta University by the Calcutta Geographical Society; and exhibits were sent to it from the Geological Survey of India the Meteorological Survey of India, the Imperial Library and the Geographical Department of the University.

A Map of India during the time of the Emperor Jehangir, drawn by a European draftsman and an old Persian Map of the Grand Trunk Road with a sketch of that part of Calcutta which was inhabited by the English in 1756 were among the large number of exhibits displayed.

* * * *

The 17th All-India Educational Conference will be held at Srinagar (Kashmir) from the September 27-30 during the Dusserah holidays.

* * * * *

The Madras Geographical Association.—The 11th Provincial Geographical Conference, Madras, will be held at the Rishi Valley, Chittoor District on the 15th, 16th and 17th May, 1941—under the Presidency of Mr. M. Subramania Ayyar, when papers on various aspects of the Geography of the District will be read and discussed.

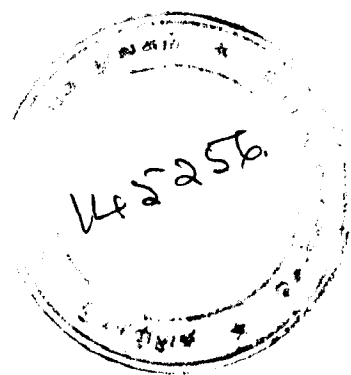
* * * * *

A Summer School of Geography will be conducted by the Association at the Geography Department of the Teachers' College, Saidapet, from 7th April to 6th May 1941 for the benefit of teachers of geography in secondary schools.

* * * * *

Four meetings of the Association were held during the current quarter as follows:—

- 25—1—41: Mr. N. Subrahmanyam gave a talk to teachers on "Geographical Excursions in and around Madras."
- 11—2—41: Mr. Robert Bentham, Geologist of the Oxford University Ellesmere Land Expedition, gave a lecture on "The Northern Hunters."
- 15—2—41: Mr. George Kuriyan read a paper on "Growth of the Population of Madras."
- 8—3—41: Mr. N. Subrahmanyam read a paper on "Regional Distribution and Relative Growth of the Cities of Tamil Nad."



INDIAN GEOGRAPHICAL JOURNAL

Select Contents

The Geographical Journal: October 1940.

Harnessing the Columbia River: The Grand Coulee Dam and its Geographical Setting—By G. B. Barbour.

The Geographical Journal: November 1940.

Desert versus Forest in Eastern Africa—By E. J. Wayland.

The Scottish Geographical Magazine: November 1940.

Ancient Greece and the Healing Art—By Douglas Guthrie.

The Changed Baltic—By J. F. Stewart.

Geography: December 1940.

Bulgaria: A Summary—By S. H. Beaver.

The Burma Road—By P. M. Roxby.

Transhumance in Europe—By E. Estyn Evans.

Mental Factors in Geographical work—By C. L. Heywood.

The Geographical Review: January 1941.

The Nitrate District of Tarapaca, Chile: An Aerial Traverse—By John L. Rich.

The Eastern Outposts of the Magyar—By John B. Appleton.

Chinese Place-Names and the Appreciation of Geographic Realities—By J. E. Spencer.

Climatic Regions of Corea and their Economy—By Shannon McCune.

The Koppen Classification of Climates in North America—By Edward A. Ackerman.

Settlements of the North-Eastern Canadian Arctic—By John Q. Adams.

The Indian Journal of Political Science: January-March 1941.

China's War of Resistance and Japan's Dilemma—By S. Lautenschlager.

India and the Changing Politics of Asia—By Prof. S. V. Puntambekar.

The Karnataka Historical Review: Vol. V—Part II.

Town-Planning in the Vijayanagar Empire. By R. N. Saletore.

Southern India Commerce: January & February 1941.

Paper-making in India.

Southern India Commerce: March 1941.

Economic Resources of Madras Presidency: Groundnuts.

Mathematical Gazette: July 1940.

Correlation of the Teaching of Mathematics and Geography—By J. Fairgrieve.

Reviews

The Complete Geography Series: Asia and Australasia. By Alys Mamour. (Macmillan & Co., Ltd.). Price 4sh.

The book under review is the third of a series of four volumes, designed to provide a complete course in Geography for pupils aged eleven plus. Each of the volumes forms a self-contained complete course, so that they can be used independently also.

The series comprise the World as the Introductory book and three "gores" of the world in order—the Americas, Asia and Australasia, and Europe and Africa. The keynote of the volumes may be summed up in the words Reliability and Readability; but special mention should be made of two of the noteworthy features, namely, the exercises at the end of each chapter and the many short excerpts from travel books and authoritative volumes arranged and inter-woven as part of the text, the list of them being given at the end. In fact, the latter feature is unique and characteristic of the volumes serving to sustain interest, enabling pupils easily to follow and appreciate the facts presented. Other important points in the series are the specially prepared maps, the numerous valuable illustrations from reliable sources, suggestions on geography games, handwork, local study, essays and debates. The treatment of the several countries and regions is balanced and in proper perspective. Naturally Asia occupies three-fourths of the book and Australia the remaining fourth.

A Map Book of Africa and South America: For Juniors and Middle Forms. By A. Ferriday. (Macmillan & Co., Ltd.). Price 1sh. 9d. paper; 2sh limp cloth.

The teaching of Geography has ceased to be the dull bookish thing that it was; and among the factors that contributed to it has been the use of books like the one under review.

This map book of Africa and South America follows the plan of the previous books of the series, reviewed in earlier numbers of the Journal, namely, that of presenting the main geographical features in map form with accompanying text on the opposite page. Being intended for junior and middle forms, the treatment is somewhat simpler and less detailed than in the map books of North America, Asia, Europe and British Isles. Hence, unlike in the

latter books, only one question or exercise is set at the foot of each page of the text because of the shorter time available in the Junior school. On the last page a good number of comparative questions on the two continents are appended.

Philip's Fundamental School Atlas. Edited by George Philip and George Goodall. (George Philip & Son, Ltd., London). Price 3sh. 6d.

This Atlas treats comprehensively the main aspects of Geography:—Relief, by means of form-lines and a layer system of colouring; Climate, including Temperature, Seasonal and Annual Rainfall, Pressure and Winds, all summarised in maps of the Climatic Regions of the World and the Continents, and supplemented by Climatic Graphs of stations chosen to typify each region; Vegetation, showing distribution in its natural form; Human Geography, as reflected in the distribution of Population, Races, Languages and the various Nations of the World; and Economic Geography, showing the broad activities of both civilised and primitive Man in Industry, Agriculture, Pastoral Farming and Forestry, and those regions where Nature makes no response to human endeavour.

Clarity of presentation has been secured by omitting all inessential matter and including only salient facts. Each map deals only with a single subject; and simplicity has been the keynote of all the maps, which include only essential ones, shown in clear and legible type. Economic diagrams and a carefully prepared index are other good features of this useful School Atlas.

125256.
JL
UM2/12691E
1241.16.1

Books and Journals Received

- Asia and Australasia* : By Alys Mamour.
- A Map Book of Africa and South America* : By A. Ferriday.
- Philip's Fundamental School Atlas* : Edited by George Philip & George Goodall.
- Report of the Department of Industries and Commerce, Madras, for the year ending 31st March 1940.*
- The German Colonization of Anaheim, California* : By Hallock F. Raup.
- Land Forms of San Gorgonio Pass, Southern California* : By Richard Joel Russell.
- Toward a Theory of the Morphologic Significance of Turbulence in the Flow of Water in Streams* : By John B. Leighly.
- Marquesan Meteorology* : By John B. Leighly.
- Graphic Studies in Climatology : III. A Graphic Interpolation Device for dating the Extremes of the Annual Temperature Cycle* : By John B. Leighly.
- The Dominican Mission Frontier of Lower California* : By Peveril Meigs.
- The Extremes of the Annual Temperature March with particular reference to California* : By John Leighly.
- The Towns of Medieval Livonia* : By John Leighly.
- San Bernardino, California : Settlement and Growth of a Pass-Site City* : By H. F. Raup.
- The Scottish Geographical Magazine* : November 1940.
- Indian Information* : From December 15 to March 1, 1941.
- Southern India Commerce* : November and December 1940, January, February, and March 1941.
- The Educational Review* : December 1940, January and February 1941.
- Visvabharathi Quarterly* : November 1940-January 1941.
- The South Indian Teacher* : January, February and March 1941.
- The Geographical Journal* : October and November 1940.
- Karnatic Historical Review* : Vol. V, Part II (July 1938), 1940.
- The Indian Journal of Political Science* : January-March 1941.

Indian Co-operative Review : July-September 1940.

Nagarapracharini Patrika : Vol. XLV-No. 2.

Kalaimagal : January, February and March, 1941.

Geographical Review : January 1941, and title-page and index for 1940.

Geography : December 1940.

Brahmavidya : Adyar Library Bulletin : Vol. V-Part 1 : February 1941.

Problemi Fizicheckoi Geografii : Nos. VIII and IX, 1940.

Trudi Geodesy Kartography (Moscow) : Volume 32.

MIDDLE SCHOOL GEOGRAPHIES

Middle School Geographies : By C. Rangunathan,

REVISED EDITION 1941

Book I for form I Tamil & Telugu each As. 10

„ II „ II „ „ As. 12

„ III „ III „ „ As. 12

—:—

**G. SRINIVASACHARI & SONS,
21, NARASINGAPURAM STREET, MOUNT ROAD, MADRAS.**

PHONE : 8303

**JOURNAL OF THE MADRAS GEOGRAPHICAL
ASSOCIATION**

Back numbers of the Journal and reprints of articles from them are given away at specially reduced rates as shown below up to 31st December 1959. Every one of these back issues contains important articles of permanent value; and it is an opportunity for individuals and institutions to complete the series. Non-Journal members can go in for those issues which contain articles in which they are specially interested. The prices given below do not include postage.

Vol.	No.	Rs.	As.	Vol.	No.	Rs.	As.
I	1	0	4				
"	2	0	6				
"	3	0	4				
"	4	0	4				
The whole volume		1	0				
Vol.	No.	Rs.	As.	Vol.	No.	Rs.	As.
II	1	0	6	VII	1	0	6
"	2	0	8	"	2	0	6
"	3	0	4	"	3	1	0
"	4	0	6	"	4	0	6
The whole volume		1	4	The whole volume		2	4
Vol.	No.	Rs.	As.	Vol.	No.	Rs.	As.
III	1	0	5	VIII	1	0	6
"	2	0	6	"	2	0	6
"	3	0	10	"	3	1	0
"	4	0	7	"	4	0	6
The whole volume		1	8	The whole volume		2	0
Vol.	No.	Rs.	As.	Vol.	No.	Rs.	As.
IV	1	0	6	IX	1	0	5
"	2	0	4	"	2	0	6
"	3	0	10	"	3	0	7
"	4	0	4	"	4	1	0
The whole volume		1	4	The whole volume		2	0
Vol.	No.	Rs.	As.	Vol.	No.	Rs.	As.
V	1	0	5	X	1	0	6
"	2-3	1	0	"	2	0	6
"	4	0	5	"	3	0	12
The whole volume		1	8	"	4	0	12
				The whole volume		2	8
Vol.	No.	Rs.	As.	Vol.	No.	Rs.	As.
VI	1	0	5	XI	1	0	6
"	2	0	5	"	2	1	4
"	3-4	1	0	"	3	0	13
The whole volume		1	8	"	4	0	13
				The whole volume		3	8

SPECIAL CONCESSION
For Purchasers of Vols I-XV
at Rs. 30 only