

Journal of the Madras
Geographical Association
VII: No. 1. April 1936.



32.
Uganda
17669

The Journal of The Madras Geographical Association

PUBLISHED QUARTERLY.

Volume 11

APRIL, 1936

No. 1

CONTENTS.

	PAGE
EARTHQUAKES AND SEISMIC ACTIVITY IN INDIA—By Mr. M. Vivekananda, B.Sc.	1
THE STUDY OF SOILS—By Mr. B. M. Thirunarayanan, B.A., (Hons.) London	17
HUMAN GEOGRAPHY OF THE AMARAVATHI BASIN—By Mr. C. S. Subbaratnam, B.A., L.T., Dip. Geo.	27
POPULATION AND ITS DISTRIBUTION—By Mr. George Kuriyan, B.Sc., (London)	42
PRESIDENTIAL ADDRESS OF—Mrs. P. S. Sundara Raj	47
THE HISTORICAL GEOGRAPHY OF INDO-CHINA—By Prof. V. Ranga- charya, M.A.,	54
NEWS AND NOTES	60
REVIEWS	65
BOOKS AND JOURNALS RECEIVED	67
SOME IMPORTANT PAPERS PUBLISHED IN PREVIOUS NUMBERS	68

THE MADRAS GEOGRAPHICAL ASSOCIATION,

Gopalapuram,

Cathedral P.O.,

Madras.

THE MADRAS GEOGRAPHICAL ASSOCIATION, MADRAS.

THE WORKING COUNCIL

For 1935-36.

EX-OFFICIO MEMBERS.

President.

Miss Irene H. Lowe, M.Sc., F.R.G.S.,
Inspectress of Schools, Coimbatore.

Vice-Presidents.

1. Miss E. D. Birdseye, B.Sc.,
Principal, Wesleyan Mission Girls' High School, Royapettah, Madras.
2. M.R.Ry. Rao Bahadur R. Krishna Rao Bhonsle, B.A.,
3. Miss J. M. Gerrard, M.A.,
Principal, Lady Willingdon Training College, Madras.

Secretary.

Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S.,
Lecturer in Geography, Teachers' College, Saidapet.

Treasurer.

Mr. G. Narayanaswami M.A., L.T., DIP. IN GEO.,
Geography Master, Teachers' College, Saidapet.

OTHER MEMBERS.

1. Mr. George Kuriyan, B.Sc. (LOND.),
Lecturer in Geography, University of Madras.
2. Mr. B. M. Thirunarayanan, B.A., (HONS.),
3. Miss A. Devadasen, M.A., L.T., DIP. IN GEO.,
Geography Mistress, Lady Willingdon Training College, Madras.
4. Mr. Rao Saheb C. M. Ramachandra Chettiar, B.A., B.L.,
President, District Educational Council, Coimbatore.

All communications and remittances should be addressed to—
The Secretary,

The Madras Geographical Association,
Gopalapuram, Cathedral Post, Madras.

The Journal of The Madras Geographical Association

Vol. 11

April, 1936

No. 1.

Earthquakes and Seismic Activity in India

By

MR. M. VIVEKANANDA B.Sc.,

We have heard of, or sometimes seen the disastrous effects of Thunder, Lightning, Volcano, Deluge or Typhoon. But Earthquakes are the most dreadful of all the natural phenomena, because of their stupendous effect, colossal magnitude of destruction, and their unheraldic sudden occurrence. However, geologically they are insignificant when compared to the great crustal and mountain building movements. But the destruction wrought by earthquakes on life and property is inestimably great. To quote a few instances, in September 1923, 100,000 lives were lost as a result of the Tokyo Earthquake besides huge loss of property. In another earthquake the city of Caracas with 10,000 of its inhabitants was destroyed in about half-a-minute. One-and-a half million people perished on account of the Chinese shocks between the 11th and 12th centuries. Mallet has estimated that at least 13,000,000 lives were lost during the course of 4,000 years. Such is the appalling destructive power of earthquakes over which man has no control and which is still as great as ever. In fact, this power is greater than what it was formerly, for man has aggregated millions of his kind and has housed himself in death-traps and has thus paved the way for Nature's demonstration of the fact that she brooks no control of her forces by him.

WHAT IS AN EARTHQUAKE?

An earthquake as the name implies simply means the quaking or shaking of the earth. As sound is merely the elastic vibration of the air, so some define earthquake as merely the elastic vibration of the earth-mass. This may be effected by some disturbance in the earth, say the sudden subsidence or slipping down of a huge

rock or the falling down of the roof of a subterranean cavity, causing slight tremors or severe shocks in the surrounding soil and superficial mass. The same can be illustrated artificially by the explosion of a dynamite. In fact two curious earthquakes have been produced naturally and artificially. One known as the Turk-
 estan Earthquake of 18th February, 1911, was finally traced to an enormous landslide in Pamirs—a fall of over 500,000,000,000 tons of rock slipping 1,500 to 2,000 ft. The other was the result of the explosion in Badische Analin and Sodafabrik at Oppau in Bavaria on the 21st September, 1921, of 4,500 tons of the double salt, ammonium nitrate and ammonium sulphate. Both produced weak earthquakes but the tremors of the former have been received in Canada, whereas the latter was not noticed beyond 30 miles. But the term "Earthquake" is generally restricted to some natural subterranean concussion or to a sudden subsidence or slipping of the rocks under accumulated strain, ranging from slight tremors to disastrous shocks by which houses are levelled, rocks dislocated, landslips precipitated and human lives destroyed.

ORIGIN OF THE ELASTIC WAVES

Every phenomenon has got its own cause and effect. In the case of earthquakes particularly, we must have a clear conception of these two factors. Because what appears to be the cause may be the result or what appears to be the result may be the very cause. For instance, the landslide just described in the case of the Turk-
 estan Earthquake was the cause of the earthquake, while such landslides are generally the accompaniments or in other words the result of earthquakes. Buildings in ruins, fissures, huge cavities and sand-vents accompanying an earthquake do not constitute an earthquake, nor do they give any adequate clue as to its origin. These are only the results, or the eternal manifestation of an earthquake which can be seen on the surface, while the origin and root cause lies at some depth below the soil and so this is a matter of inference. Before we enter deep into its origin we must bear in mind that the present state of our earth with its elevations and depressions has not been brought about all of a sudden, but is the work of ages and is subject to continual change which is brought about mainly by two processes to which the term "tectonic processes" may be applied. They are (1) Folding and crumpling of the rocks (which keeps them in a state of strain), (2) fracturing and subsequent displacement (by which strain is released). Of the two, fracturing is sudden, coming as a relief to prolonged strain. This fracturing leads to fault slipping by which friction is generated. This consequently sets up a series of elastic waves of either com-

pression or distortion or both. These become more or less complicated according as the media through which they pass is heterogeneous or homogeneous. Eventually when they emerge out of the surface they impart motion to the soil and superficial rocks whose vibrations produce the sensible earthquake. These are called waves by analogy. Being propagated in virtue of the elasticity of the material through which they pass, these are called elastic waves.

AUTOGRAPH OF AN EARTHQUAKE

Some preserve with great esteem the autographs of great men as a token of their visit and greatness. No less valuable and instructive is the autograph of an earthquake to a seismologist, except the difference that the latter is received at a distance, say several hundreds of miles off. In fact the greater this distance the better the stroke received. The nearer the receiver, the more the vehemence with which the earthquake sends forth its stroke and the greater the chance of the destruction of the receiver. Such was the case in the recent earthquakes when the seismographs (the recording instruments) at places near the epicentre were thrown out and got out of order, while those at distant places recorded perfectly well. Astrologers read the character of a man from his horoscope, so do the seismologists, the character of an earthquake from its autograph, technically speaking the seismogram.

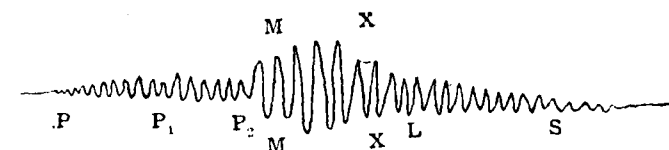
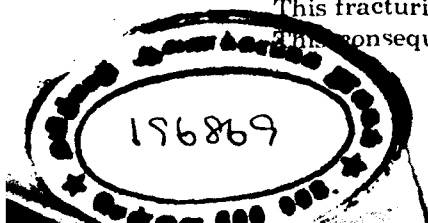


Fig. represents the seismogram (autograph) of an earthquake. P and P₁ are the first preliminary tremors recorded when the seat of origin is several hundred miles from the recording station. These are caused by compressional or longitudinal waves travelling at the rate of 6.75 miles per second (375 miles per minute). P₁ and P₂ is the second preliminary tremor representing a transverse wave motion travelling at a slower rate. MX represents the main shock (when maximum intensity of the shock is reached). LS represents the later phases (subsiding stages).



Ugm 244, v 26 m 6
 ~36.1.1

LOCATION OF THE FOCUS

As the time interval between the two preliminary tremors is proportional to the distance traversed, the distance between the seat of the shock and the seismograph can be calculated. By computing such distances from at least three separate stations a common intersecting point can be arrived at and that gives the locus of the earthquake.

THE NATURE OF THE WAVES AND THE MESSAGE
THEY BRING ABOUT THE INTERIOR OF THE EARTH

The study of the seismic waves is the most complex and yet the most useful part of the subject. The complexity arises because of the fact that the waves pass through highly heterogeneous media, namely the earth's shell, which consists of several different layers of solid rocks, soils, alluvia, shaly strata, etc., with different densities. According to the undulatory theory whenever a vibration reaches a bounding surface it undergoes reflection. When it reaches a medium of different density it is refracted. Thus it becomes still more complex. Putting aside the possibility of complication arising from reflection and refraction, three main types of waves have been distinguished.

The first wave to reach an instrument is the fastest of the three waves and is known as the Primary or P. (Push) waves. They are short waves of a to-and-fro motion and are transmitted through the fluids and solids, and they gain in velocity as they pass a denser medium. Some of these waves travel as fast as 6.75 miles per second (375 miles per minute). They could thus traverse the diameter of the earth in about 20 minutes. The next rapid wave is the Secondary or S. (Shake) waves. These are distortional waves with vibration transverse to the direction of propagation. The third type is the ground or (Raleigh) waves which travel along the earth's surface, like the waves of the sea with a rotary movement. These waves though slowest in speed cause the greatest damage.

As to the message they bring about the interior of the earth, some important geological deductions have been drawn from a study of the velocity and the propagation of these seismic waves, which otherwise would have been inaccessible.

(1) They have revealed the condition of the interior of the earth to be 1.5 times as rigid as steel.

(2) As the velocity increases with the density of the material they traverse, and since they take an arcuate course, the presence

at the centre of the earth of a core composed dominantly of metals (iron, nickel and many others) has been revealed.

WHY EARTHQUAKES ARE SO DISASTROUS

The popular conception of the extent to which the ground moves to and fro or up and down during an earthquake is a great exaggeration of the truth. Measurements taken from delicate instruments reveal the fact that the range of horizontal motion is exceedingly small; only a fraction of a millimeter in the case of a slight shock and seldom exceeds 3 or 4 m.m. When the motion exceeds 10 m.m., it is dangerous. It is estimated that the range of movement, even as small as $\frac{3}{4}$ inch, will destroy a city; $\frac{3}{8}$ inch is a severe shock and $\frac{3}{16}$ inch is enough to shatter the chimneys. In a severe earthquake at Tokyo in Japan, on the 20th June 1894, the range of movement indicated by the instrument was as much as 63 m.m., i.e., 2½ inches. The vertical motion also appears to be small. Why so small a movement causes so much damage is not difficult to answer. The appalling destruction is not due so much to the range of movement as to the great velocity of the movement; the other factors that contribute to the severe destruction being (1) the loftiness of the buildings, (2) the poor construction, (3) the poor foundation such as loose alluvium or made ground, (4) waves passing obliquely 30° or 50° to the surface. Observations show that tall buildings are subject to severe shaking. During the Tokyo earthquake, 110 out of 240 chimneys that were over 45 ft. were completely destroyed. Low structures are generally little damaged. But the construction goes a great way in determining the fate of the building. Dr. A. M. Heron observed that heavy roofed mud buildings although only single storied had generally collapsed in the Baluchistan earthquake of 1909. In the recent Bihar earthquake of 1934 the scene of the greatest damage was at Monghyr and is attributed to the loose alluvium on which the houses are built. The greatest damage wrought by earthquakes occur when the wave reaches the surface at an angle of 30° to 50° and not directly over the epicentrum as in that place the movement is only up and down. Besides the damage due to earth vibration, fires accompanying earthquakes bring great catastrophe, as do the Tsunamis (sea waves) that are produced so commonly by submarine earthquakes. Most of the Japanese earthquakes are followed by fires and the most deplorable fact is that the conflagration becomes uncontrollable as the water mains get severed up during the earthquake. The Tsunamis on the other hand may even rise to 60 or 70 ft. high and thus might inundate the coastal regions. Such was

the case in the great Lisbon earthquake when the waves rose up to 60 ft. and caused much damage. These secondary results are in the main responsible for the prodigious loss of life and property.

SHALLOW DEPTH OF THE FOCUS NOT EXCEEDING 20 MILES

With all their stupendous surface effects sometimes shaking an area of one to two million square miles, the one remarkable feature of earthquakes is their seat of origin at a comparatively small depth below the surface. The nature of elastic waves consequent upon fracture leads us to the conclusion that the depth of origin is within the limits of the solid outer crust. That the depth of focus seldom exceeds 10 miles is the opinion of many seismologists. That it never exceeds 30 geographical miles is perhaps an undisputed fact, though the advocates of the volcanic theory favour a deep-seated origin. According to their theory earthquakes are due to the direct transmission of elastic wave motion from the sub-crustal region. The low depth origin is further based upon the fact that there is invariably a well designed area of maximum intensity followed by regions of diminishing intensity as the distance from the central area increases. Another important feature of the seat of origin is, strictly speaking, not a point but is of considerable length. This is because the original impulse or the elastic waves consequent upon fracture start simultaneously from a linear fracture. This is the reason why the epicentral tract or zone is somewhat longer and oval with the longer axis almost parallel to the seat of origin. Another notable feature is that this longer axis is in many cases found to lie approximately parallel to the great mountain chains. So it is that the places most strongly affected in the Bihar Earthquake of 1934 and the longer axis of its epicentral zone are roughly parallel to the general configuration of the Himalayan chain having a north-west—south-east trend.

THE ORIGIN AND CAUSE OF EARTHQUAKES

Various causes have been attributed to earthquakes according to the nature of the shock, the locality and other circumstances. But it is finally traced to two principal causes: (1) The development of strain; (2) the release of strain. Accordingly earthquakes may be broadly classified into two classes: (1) The Volcanic earthquakes and (2) the Tectonic earthquakes. Of course, minor earthquakes are caused by (1) the falling of the roof of a subterranean cavity, (2) the sudden snap of deep-seated rocks subject to prolonged strain, (3) steam by its evolution and condensation in

the ground beneath and (4) by the tidal waves set up in the liquid interior of the earth by the attractive influence of the sun and moon.

Taking at first the Volcanic earthquake, their origin or cause is traced to the activity of Volcanoes. Some old advocates of the Volcanic theory held the view that the earth's interior was composed of molten matter and that volcanic action was the chief geotectonic agency. Humboldt regarded volcanism as being the reaction between the hot interior and the cold exterior and considered volcanoes as safety valves.

Whatever be the kinetic cause, there is reason to believe that so long as the crater of a volcano continued to steam freely and to discharge regularly puffs of dust and lapilli, there is little danger of any 'quakes being produced in the vicinity. Once the crater turns out of action, this cessation of activity necessarily means accumulation of strain underneath. This sudden development of strain when it is too great is manifested in the form of an earthquake or many 'quakes which though come unheralded yet act as forerunners of a worse-approaching calamity resulting in a great volcanic action. Such in fact was the case with cities that suffered repeated destruction at the base of Mount Etna and the severe 'quake of Hawii preceding the great eruption of 1868. (But a great number of shocks follow an eruption owing to re-adjustment within the lavas and the surrounding rocks beneath the surface). The cause, therefore, of those earthquakes preceding or following a Volcano, occurring in the close vicinity of a volcanic region is volcanic in its nature. These earthquakes are no doubt very severe in intensity though local in surface extent and this is a characteristic feature of most volcanic earthquakes. So it was held by former scientists that earthquakes were related to volcanoes. But no relationship, however, has been found existing between earthquakes and volcanoes. On the other hand the contrary was proved. For instance, in Japan, which is at once a typical volcanic and seismic region it has been determined that earthquakes were more numerous in the non-volcanic region than in the volcanic region. Further some volcanic regions are singularly free from earthquakes.

The majority of earthquakes have a tectonic origin, the ultimate cause being, to put it briefly, the relief of strain whatever be the source of strain. The great mountain chains which are in close proximity with the earthquake zone or belt have much to do with the cause of earthquakes. In fact the great majority of tectonic earthquakes are directly or indirectly connected with the mountain-

building movements. Three such movements have taken place from the earliest times. They are (1) the Caledonian movement (Silurian); (2) the Hercynian (Permocarboniferous); and (3) Alpine (Tertiary).

The Caledonian system can be traced in Wales, Scotland, Scandinavia, Siberia, Africa, Australia and South America. The Hercynian movements account for many of the mountains of Great Britain, Germany, the Urals, and the Appalachians. The Alpine system includes most of the present great ranges from the Pyrenees to the Himalayas, the Rockies and the Andes. These Tertiary formations are therefore of recent birth and geologically young and the production of earthquakes close to these regions might perhaps be taken as echoes of the dynamic forces concerned in their formation. This is well illustrated in the present marked seismic cataclysm in India which is, here, practically confined to one such Tertiary formation, namely, the Himalayas and their extensions. Himalayas are of recent birth and, therefore, geologically young, still growing in altitude as a result of which the recent Bihar Earthquake, as some hold, was given birth to.

It is true that great mountain systems such as the Himalayas are elevated at intervals with long intermediate stages of quiescence. It is equally true that earthquakes are in many cases, the inevitable accompaniments of such growth. But what are the evidences to show that mountains do grow in altitude? Are the mountains higher than what they were before? Why should they grow at all? These are questions the answers of which seem relevant for a better understanding of the course. It is no doubt an indisputable fact that young mountains of recent birth such as the Himalayas do grow in altitude. But the growth, as are all geological actions, is so slow and man's life so brief that it may not be perceptible. The occurrence of earthquakes is perhaps the only perceptible evidence. There are, however, other evidences. For instance, that the mountains are really growing in height is very well illustrated by L. R. Wager from a study of the Arun River. This rises on the Tibetan Plateau at a height of 22,000 feet, flows east for some distance and then turns south to cut through the Himalayan mass between Everest (29,000 ft.) and Kangchenjinga (27,600 ft.) forming an enormous gorge. He points out that this was originally continuous and for the river to cross it at its present height, it would have had to flow up-hill. But the course, he suggests, could have been formed if the original height was only 16,000 feet (4.9 K.M.) i.e., the present height of the southern part

of Tibet. Within the main mass the volume above and below this level are nearly equal. Wager therefore infers that lightening of the crust due to denudation has led to a general uplift of the Himalayas which were originally merely the southern edge of the Plateau, 11,000 or 12,000 ft. high. Further, Wager's study of the sediments laid down by the river, in its upper course confirms the view that mountains were rising after the river took its present course. Why mountains grow or how they maintain their height in spite of denudation may perhaps be explained by the principle of Isostatic conservation. This may be briefly stated as the flow of the earth-mass from the areas which have been receiving great loads of sediments, towards the areas which have been denuded to supply them. The rivers coming down from the mountains naturally remove a lot of material from the upper portions and deposit them in the sea. Strictly speaking this denudation is far less in the actual summit than on the lower slopes and valleys. However the removal of the surface rocks requires an inflow below to restore isostasy and this raises the whole region. So for this reason also the Himalayas are still growing in altitude. How far this tends to the production of an earthquake is not far to seek. Consequent upon the rising movement some instability may be caused at the foot and that is enough to produce an earthquake, or some original fracture might be accelerated to action, thus producing the so-called elastic waves whose exit at the surface, as has been explained already, might produce an earthquake. Such was exactly the cause of the recent Bihar Earthquake of 1934. Since a detailed account of the cause has already been published by the authorities concerned, it is not desirable to repeat the same. But the more important general factors that might have conspired in the production of the earthquake may briefly be stated: (1) In the first place the regions more strongly shaken lie in the seismic belt passing through India and this practically covers the northern border of the Peninsula. (2) The abrupt border which the Himalayas present to the plains of India shows the greatest amount of plication, fracture and thrust. It is true that places in and near this abrupt border are more unstable than those, for example, in Tibet on the gentler slope. But so far as the Bihar Earthquake was concerned those who were in charge of the field-work attributed the cause, not to any visible fracture or thrust, but to the movement along thrust plane at an unknown depth hidden under the alluvium. (3) The occurrence of one or two fractures below the Gangetic alluvium between Motahari and Purnea seems quite probable. (4) The probability of a zone of tension along the northern edge of the

Peninsula induced by the accumulating weight of the deposits in the Gangetic Valley and this must have added some cumulative strain. (5) The area roughly bounded on the north by the Himalayan foot-hills, on the south by the Ganges River and stretching from Meerut to beyond Darjeeling is according to Dr. J. De Groaff-Hunter, C.I.E., a zone of excessive underloading in the earth's crust. The area of underload is flanked both on the north and on the south by regions of overload. These regions of great loading anomaly must cause very great stress differences in the earth's crust which supports them. The region of underload and the amount of underloading are, according to Dr. H. Jeffrey's estimation, sufficient to cause fracture in the lithosphere. (6) The loose alluvial soil offers a suitable media for the amplification of the earthwaves and for their complexity. Thus it might have amplified the intensity of the shock though it cannot by itself form a cause.

So far we have seen that instability is caused on account of the growth of mountains in altitude. Let us now discuss whether any such instability is caused in the ocean-beds where sediments accumulate. The overloading of the sediments must naturally cause some cumulative strain. Whether it is so or not this much we can say: The great mountains on land form the lofty anticlines and the steep depressions in the ocean form the deep synclines. As the mountains grow in altitude, the deep synclines sink deeper still as more and more sediments accumulate. The sinking of the ocean-bed must necessarily cause a state of strain which is released now and then, generating the so-called sub-oceanic 'quakes. Sometimes the elevation on land and the sinking of the ocean-bed may both conspire to produce enormous strain, especially in the case of vigorously growing young mountainous region, forming deeply shelving continental borders.

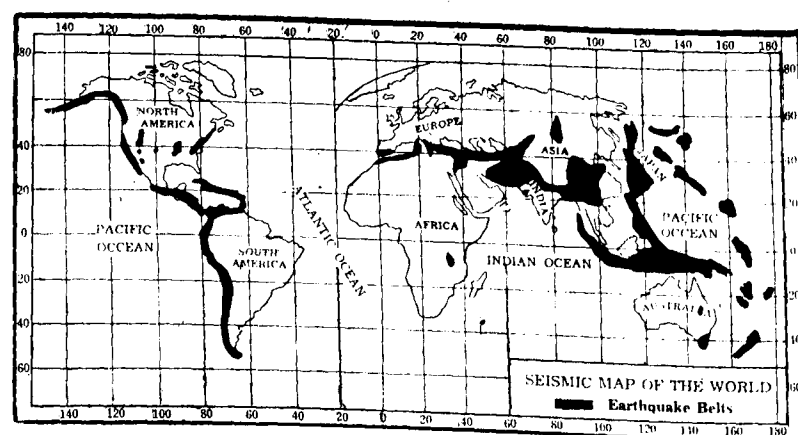
This is well illustrated in Japan, a typical seismic region where earthquakes are numerous and frequent. They are a group of islands arranged in a festoon, convex towards the east and south-east. On the west lies the sea of Japan into which the ocean-bed slopes gradually while on the eastern side, to which our attention is particularly drawn, the ocean-bed shelves rapidly downwards into the well-known basin called the Tuscarola Deep, the depth of which is about 4,655 fathoms. It is from this steeply-submerged eastern continental border that a great majority of the earthquakes in Japan, originate. No doubt earthquakes do occur on the gently-sloping western side, but they are few when compared to those on the eastern side and also less in intensity. Compared to the Himalayas, Japan with its mountains is considered as a young and vigorous

structure, in a less advanced stage of growth. Hence some far-sighted geologists point out that the frequent occurrence of innumerable earthquakes in that district may be taken as indices of steps in the process, which in far-distant geological ages yet to come, will culminate in a great mountain range overlooking the Pacific.

We have just discussed one aspect of the tectonic 'quakes. Coming to the other aspect—the forces that have elevated the mountain ranges and depressed its borders below the level of the sea were also responsible for the great deformations to which the rocks had been subjected. In some places they have been tilted, bent and compressed. At other places they have been broken through by fractures causing great displacements. All these deformations involve the exercise of great forces. We know that for every action there is an equal and opposite reaction. Whether it is here equal or not this much is evident, that the natural rigidity and cohesion of the rock act as the opposing or resistant force. When this resistance is small, the deformation may go on gradually. As it becomes greater the strain accumulates. But when it goes beyond the limit, the resistance is suddenly overcome with an earthquake as the result.

Let us see how far this holds good in the case of the recent Quetta Earthquake. The mountains of Baluchistan form the western extension of the Himalayas and are therefore regarded as young. Moreover the oldest rocks in Baluchistan are of carboniferous age and the mountains round Quetta are of comparatively recent birth, if not still in the process of formation. Secondly, there is a sharp bend in the general north and south alignment of the mountains thus forming a re-entrant angle in the regions of Quetta and Sibi. The Bolan Pass situated between Sibi and Quetta marks the biggest end of this re-entrant and it is in this area that the rocks are most highly disturbed. The re-entrant angle with its apex near Quetta indicates a condition of special strain. It is no wonder, therefore, that Quetta becomes noted for its seismic susceptibility by virtue of its position and poor foundation!

A careful scrutiny of the history of the earthquakes that have occurred in Baluchistan in the past 83 years from 1852 to 1935 reveals one characteristic feature, i.e., the epicentres of a great majority of these earthquakes are found to lie in and around this re-entrant angle and this confirms W. D. West's view that that place indicates a condition of special strain which is now and then released with earthquakes as the only perceptible evidence.



DISTRIBUTION OF EARTHQUAKES

No place either terrestrial or sub-oceanic is exempt from earthquakes. There are, however, two well-defined belts or tracts as indicated in Fig. along which earthquakes are more frequent and numerous. One is known as the circum-Pacific belt which follows the western coast of North and South America, the Aleutian Islands and the island groups along the eastern coast of Asia. The other belt includes the Mediterranean, the Alps, the Caucasus, the Himalayas and continues into the East Indies. That there exists a close relationship between geography and geology is borne by the fact that the seismic belts connecting unstable regions almost coincides with the mountainous and volcanic regions. There is of course a strong evidence to the belief that there is no relationship between earthquakes and volcanoes; yet, they seem to agree in a common cause in the distribution of the lithosphere.

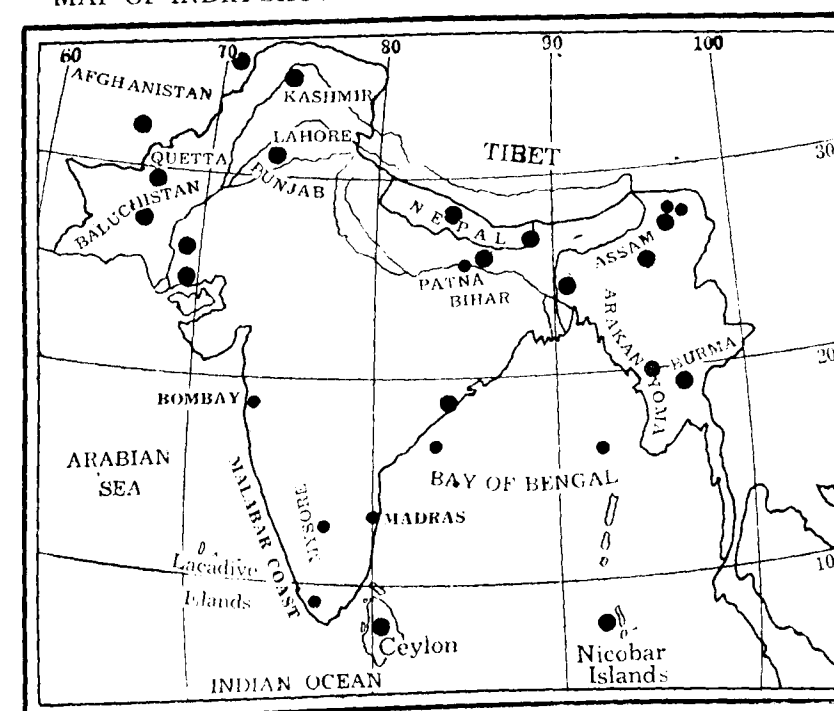
Instability being the main cause that is taken into consideration in the distribution of earthquakes, there are various factors that contribute to it and that explains the above coincidence. They are (1) young mountain chains, (2) the short and steep flank of a chain, (3) deep declivities especially if they border young mountain ranges and (4) sharp deflection in the general alignment of mountains. These are zones of weakness in the earth's crust where strain is released at intervals causing earthquakes.

SEISMIC ACTIVITY IN INDIA

In Japan hardly a day passes without the record of an earthquake. In India it is not so. But she is at present passing through a period of marked seismic activity. What little we can gather from the history of the Indian Earthquakes leads us to believe

that the seismic activity is practically confined to the whole of the northern border of the Peninsula extending from Baluchistan on the west to Assam, Arakan and Burma on the east. The earthquake belt passing through India practically covers these regions. Though the places situated in and near this belt are the most unstable and highly susceptible to earthquakes, it does not follow from this that other places are immune to earthquakes.

MAP OF INDIA SHOWING CHIEF SEISMIC REGIONS



Starting from the west, we have Baluchistan. Much has been said regarding its instability and the cause of earthquakes there. The next seismic region close by is Afghanistan. The mountains of Afghanistan have also suffered great disturbances in the past, and according to Count F. De Montessus de Ballore's account, we learn that earthquakes were many and frequent all along the Kabul Valley, and so it is regarded as unstable. In north-western Himalayas, Kashmir is said to be the most unstable and the instability is attributed to the great deflection of the Himalayan fold where they have been twisted and even crushed. These naturally indicate the probability of great dislocation owing to the change in direction. There have been a certain number of shocks in the Punjab, due, it is inferred, to the dislocations of the Salt Range.

There are also records of a severe shock in September 1803, and another in 1831, with its epicentre near Derabund, when the eastern side of the Sulaiman Range was violently shaken. The Punjab is, however, considered as rather stable. The whole of Nepal is highly unstable. Mention is made of a severe earthquake which occurred in August 1833 and was felt all over the centre and east of Northern India especially Nepal. The shock seems to have extended over the same area as that of the Bihar Earthquake of 1934. Katmandu and Monghyr which suffered most in the Bihar Earthquake of 1934 were also the theatres of a similar catastrophe in the past. Compared to these areas, Tibet on the northern slope of the Himalayas is more stable and less susceptible to earthquakes, by virtue of its position on the gentler sloping side unlike the abrupt southern border. The next seismic region and the most typical in India is Assam. The Assam Earthquake of June 12, 1897, the after-shocks of which continued for nearly a year, is considered one of the greatest ever recorded. It has thus earned an international fame and the earthquake is ranked among the great earthquakes such as the Lisbon and the Californian earthquakes of 1755 and 1903, respectively. R. D. Oldham has suggested in his report that Assam being a vast thrust plane, the earthquake might have originated from a general movement of the peneplain under a strain of compression. Whatever might be the cause, Assam is the most unstable part in India.

Arakan and Burma are also noted for their seismic susceptibility. The mountain chain of Arakan, Upper Burma and south-eastern Tibet are much folded and this folding strain, it is inferred, may be the cause of earthquakes in these regions.

Coming to the Peninsular India, it will be a relieving feature to South Indians to note that it is the most stable and least susceptible to earthquakes, in the whole of the Indian Empire. It is a triangular piece of land with its base running from the mouth of the Ganges to that of the Indus and with its apex at Cape Comorin. Apart from the evidences in the seismic records, there are certain geological evidences that contribute to its stability. These are (1) the almost complete absence of recent foldings, (2) the regularity with which the lavas of the Deccan trap have been deposited, (3) the long period during which dry land conditions have prevailed and (4) the almost complete prevalence of ancient archæan rocks of which it is formed.

It is however not entirely free from earthquakes and some shocks here and there have been recorded in the past. Some shocks

are reported to have been felt on the eastern side of the Vellakonda Range, which is somewhat steeper. Some are reported to have been felt along the Malabar Coast particularly in Travancore. It is on this coast at Quilon that marine pliocene strata have been deposited; and from this, M. De Ballore suggests that the Indian Peninsula was cut off from Africa at this epoch and then received its actual outline. The few slight shocks that are felt there now and then perhaps indicate the survival of the once dynamic forces which dismantled the old Gondwana Continent. Shocks have been felt in various other places, too, in Madras, Salem, Ongole and Nellore. Nearly six shocks seem to have visited Madras in the past, some accompanied by severe cyclone and heavy sea-waves. M. De Ballore suggests that shocks felt at Madras might have proceeded from the Nellore Ghats. But there are no evidences of true epicentres regarding the shocks felt at various places. Though there is no continuous record or data to work upon, it is evident that there have been no severe earthquakes in the whole Peninsula as can be compared to those felt in Northern India, both in magnitude and frequency. Hence the Peninsula deserves to be called the safest part in India.

CEYLON

The Island is formed of archæan rocks especially at the southern part, an indication that it once formed geologically part of the stable peninsula. The occurrence of a few shocks, may, however, be attributed to the central high mountainous region and the steep slope on the southern side.

BAY OF BENGAL AND INDIAN OCEAN

Some submarine shocks have occurred in the past in the Bay of Bengal, the most important of which occurred on 31st December, 1881 and shook an immense area. Some have been felt in the Indian Ocean. As a result of one such shock in February 1865, it is reported that one of the Maldivé Islands disappeared.

When will India be free is perhaps a question which everybody looks forward to with some eagerness for an answer. No definite answer is possible. Since the release of strain is the main cause of earthquakes, a long period of quiescence is likely to follow at places where the strain has been once released. Such places may be regarded, if not the safest, at least safer than those places where the strain has not been released. The old North-east Indian Earthquakes of 1833, 1843, and 1869, the great Assam Earthquake of 1897, the Kangra Earthquake of 1905, the Baluchistan Quakes of

1909 and 1931, the Bihar 'Quake of 1934 and the recent Quetta 'Quake, 1935, not only reveal this truth but show that earthquakes were and will be a regular feature which will continue perhaps till the Himalayas cease to grow and thus become too old to cause any instability at its foot. If earthquakes are to be a regular feature, is there any possibility of averting the same? To this also we must say "No". The rich and fertile resources of the Indo-Gangetic alluvial plain has lured many thousand inhabitants, and as Dr. L. L. Fermor has pointed out some of the richest cities in the East have been built on this geologically unstable region, little dreaming that their opulence and magnificence rest on a powder magazine within a few miles of their foundation. Unless man resorts to the most primitive method of living there is no possibility of minimising, much less averting this danger. Man may reach the most inaccessible heights and pass from one peak to another with a triumphant look upon Nature. Still earthquake is a challenge to show that the mysterious workings of nature are yet to be unravelled by man. Such are man's limitations and helplessness in spite of his divine inventions.

The Study of Soils

By

MR. B. M. THIRUNARAYANAN, B.A., (HONS.) LONDON.

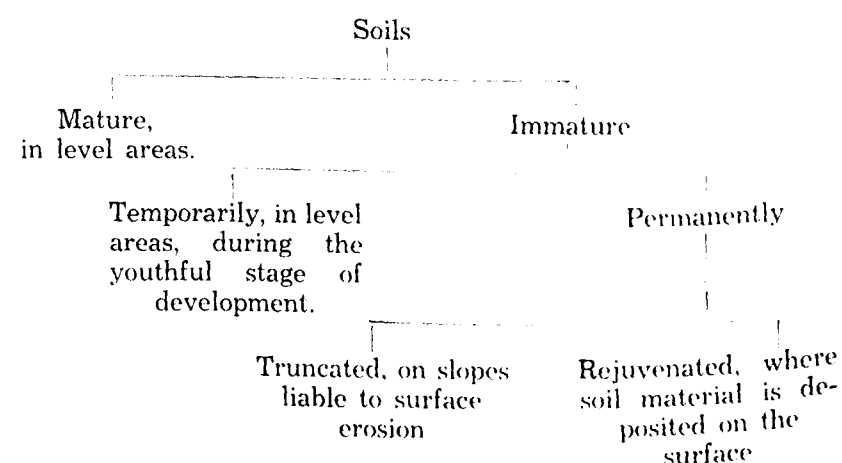
Soil science, or Pedology, is a quite young branch of knowledge, which owes its origin and development largely to Russian soil scientists, who laid its foundations in the course of their investigations of the soils of the Russian territories during the last fifty years. It was the prominent feature of the *tschernosem* or black earth soils of Russia, their occurrence under widely different circumstances, and the facilities for comparative study over a large area which mainly directed the Russians along the right lines and led them to discover and enunciate the general principles of soil formation. American and other European pedologists have, especially after the last war, followed up in their own countries the work of the Russians. Much progress has thus been made, and soil science has been definitely established as a distinct field of study.

In the past, soils had been studied chiefly by geologists and by students of agriculture, and their investigations had been confined mostly to studying the soil in relation to the underlying rocks or to the crops raised on it. The independent study of soils for their own sake had to await the coming of the pedologist, and his discovery of the complexity and the significance of the pedogenic or soil-forming processes. To him the soil ceased to be merely the weathered surface-layer of the earth's crust reflecting in general the character of the rocks from which it was formed, or just the surface layer of the earth on which plants grow. It is "the layers of material lying on the surface of the earth, or near it, which have been changed by natural processes under the influence of water, air, and living and dead organic matter." (Dokutschajeff, 1886). "It is the product remaining in situ, including all the material down to the depths reached or affected by the weathering processes." "Weathering includes the whole of the complicated physico-chemical changes which take place in every kind of the formation on the earth's surface, exposed to the influence of the atmospheric forces on the one hand, and to the life processes and products on the other." (*Glinka : The Great Soil Groups of the World.*)

Soils are developed from soil material consisting of geological deposits of various kinds, under the influence of external forces

18 JOURNAL OF THE MADRAS GEOGRAPHICAL ASSN.

acting on it through the soil-forming processes. The course of development of soils is marked by progressive changes in them, and it has been suggested that the successive stages could be described as those of infancy, youth, maturity and old age. Maturity of development is possible only where, as already indicated, the soil-forming materials have remained undisturbed throughout the several stages of development; in other words, only where the land-surface is sufficiently smooth and level, and not liable either to denudation or to deposition. Where the surface soil is being removed by erosion the soil remains immature through the continuous removal of its upper part, and such soils are known as immature, truncated soils. On the other hand, where fresh material is constantly deposited, the soils are being continuously rejuvenated. On this basis, soils may be classified as follows:—

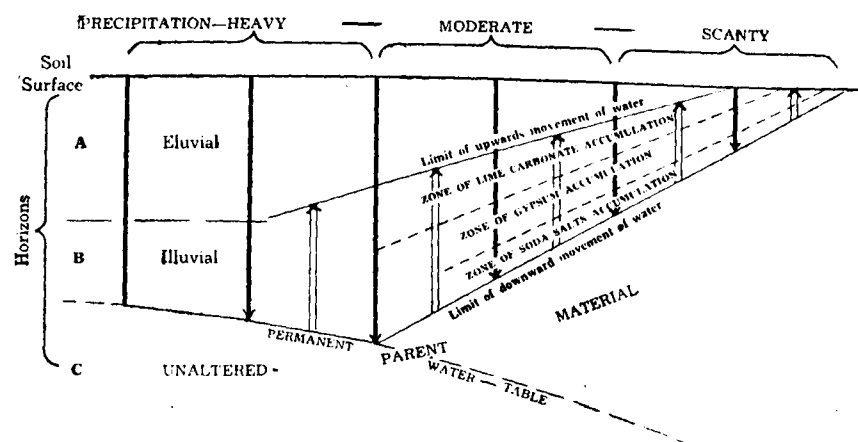


Mature soils are those which have reached a stage of development marked by the geological features being practically absent, and by the great predominance of features acquired during development, which reflect the nature of the soil-forming processes at work; for instance, certain sub-soil characteristics, such as the formation of concretions and hardpans. On the other hand, the characteristics of embryo or skeleton soils, since they are nothing more than freshly accumulated and little-changed geological material, will depend entirely on geological processes. It should also be noted that though the external soil-forming forces are of great importance, they have not produced everywhere the same results. The chemical composition and physical character of the parent rocks affect the development of the soil-types that could naturally evolve under the influence of the external factors.

The important part played by atmospheric or climatic forces in soil development is achieved in the presence of moisture in the soil, and through their influence on the amount of soil-moisture and its movements within the soil layers. The moisture content of the soil is derived from two sources, viz., (a) atmospheric moisture, received as precipitation, which is generally the more important source of supply, and (b) underground supplies of water. The amount of moisture present in various soils is dependent not only on the quantity of the precipitation, but also on the temperature and the humidity of the atmosphere, the relief of the land, the character of the parent rock, and the plant cover. Of the precipitation received at the surface of the soil, only a portion soaks into it, the rest being lost through evaporation and surface run-off. The water which sinks into the soil tends to move downwards, and when sufficiently large in amount, reaches the water-table and becomes part of the ground-water supply. During the dry intervals between periods of precipitation, the surface layer of the soil generally loses moisture through evaporation, and this tends to draw upwards the moisture from the lower soil layers, thus setting up an ascending movement of moisture in the soil. In the course of such movements within the soil, various constituents of the soil are carried by the water in solution and in suspension, impoverishing those layers from which such materials are removed, and enriching others in which they are deposited. The layer or zone of impoverishment is designated the A or "eluvial" horizon, and the zone of enrichment the B or "illuvial" horizon. Below this is the C horizon, comprising layers of parent material, unaltered because it is either beyond reach of the soil forming processes, or protected from them by being permanently saturated. All these horizons are distinguished by characteristic features and differences whose significance is brought out by a careful study of the entire soil profile and a comparison of its component parts with one another. Thus, for example, the surface A horizon is usually dark coloured, because of the presence of organic matter, and the soil becomes lighter, deeper down; both A and B horizons will show characteristic differences in chemical composition when compared with the C horizon; or the A horizon may show a bleached or "podsolised" layer, as in the soils of the coniferous forest regions of Eurasia, which is due to the reduction, by organic acids, of the brown or reddish iron compounds which usually give the soil much of its colour.

Soil development is also greatly influenced by temperature conditions. The temperature determines the rate of evaporation of

moisture from the soil, and in this way influences all other related processes, such as the upward movement of moisture, the processes of salt crystallisation, the rate of decay of organic matter,



NOTE:—(1) With decreasing precipitation, the range of movement of water also decreases, and correspondingly also the depth of the soil. (2) The order of occurrence of the lime, gypsum and saline horizons in the illuvial zone suggests that the deposition of these salts by the soil solution is in their order of solubility, the less soluble salts being deposited earlier, while the more soluble ones are carried farther, to deeper levels. (3) With decreasing precipitation and range of movement of moisture, the accumulation of secondary minerals becomes more concentrated.

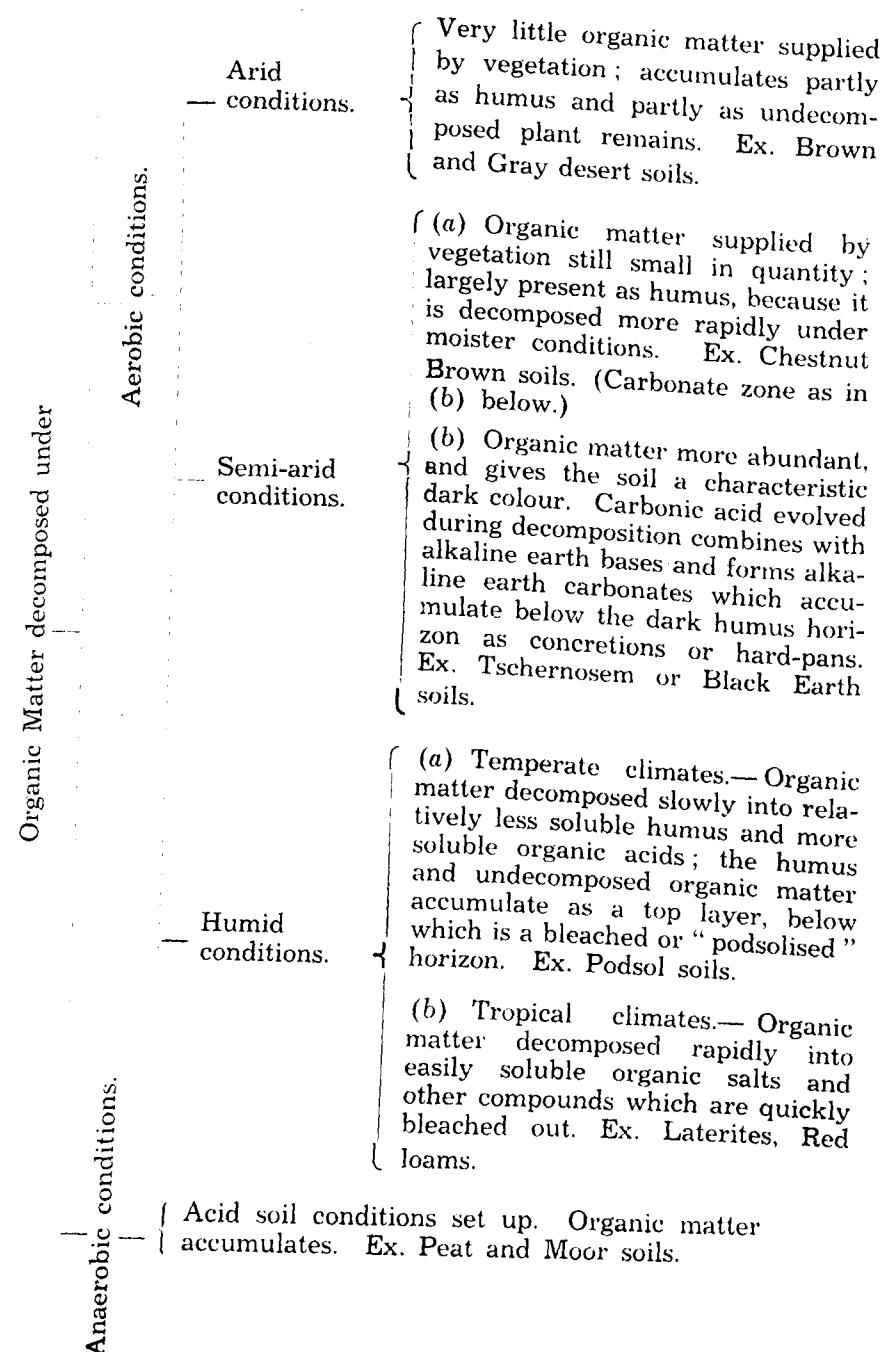
and, in general, the energy of the pedogenic processes. "In comparison with those of the temperate zones, tropical conditions are extreme conditions. In hot climates temperatures are higher by 10° — 20° C., and all chemical reactions proceed at from twice to four times the speed usual in temperate climates." In cold and temperate climates the feeble activity of climatic agencies is for a considerable part of the year still further restricted by the winter months, whereas, in the tropics there is no winter to interrupt the course of soil forming processes. "By reason of the 10° — 20° C., increase in mean temperature (to say nothing of the maximum temperature) together with rainfall which can be very heavy, all chemical processes occur with increased intensity in the soils of the hot zones. If one bears in mind that there is no interruption by winter, one will hardly err in estimating that over the whole year and in relation to temperate climates the intensity of weathering in the tropics is increased at least tenfold." (Vageler: Introduction to Tropical Soils.)

The aeration of the soil has also a potent influence on soil formation. The degree of aeration of any soil is determined by its

texture and structure in the first place, and secondly by its moisture content. The total space occupied by the soil is shared between its solid, liquid, and gaseous contents; but whereas the solid portion of any particular soil remains more or less constant in amount, the water and air within the soil fluctuate very much, competing with each other for the available space. Thus an increase in the moisture contained in a soil would diminish its aeration. The aeration of the soil determines very largely the rate of oxidation of the mineral as well as organic constituents of soils. The depth of aeration is usually shown by the reddish or brownish colour of the soil, the brighter shades indicating greater intensity of oxidation of the iron compounds present in the soil-forming materials.

Climatic influences have, besides the direct influences noted already, an equally powerful indirect influence on soil development through the natural vegetation. The plant cover of any soil is the source of its content of organic matter. The amount of organic matter present in any soil is, however, dependent on the rate of decomposition of the organic matter, as well as on the rate at which it is supplied by the plant cover. Decomposition is most rapid when air, water, and heat are abundantly present, and least rapid when one or more of these are markedly deficient. This is why, even though the tropical and sub-tropical rain-forest has the greatest yearly production of organic matter, approaching, on a cautious estimate, one hundred tons per acre, from which, in temperate climates, there would result a layer of humus many yards thick, as a rule, even where growth is most vigorous, the layer of litter or humus reaches only an inch or two (Vageler, op. cit.).

The following table shows in a comparative manner the decomposition of organic matter in the soil under different conditions:



"Climate impresses itself on the soil even as it does on the plant cover."* This is, indeed, doubly demonstrated by the vertical arrangement of soil types which has been observed in the Caucasus and elsewhere, and by the correspondence of climatic and soil belts in Russia and the U. S. A. Further, the soil is not merely the product of climatic forces acting through soil-forming processes on the materials of the earth's surface. It represents, even as the natural vegetation of a region does, a delicate adjustment to its environment, and every change in that environment will necessitate and eventually result in a readjustment of the soil characteristics as well. The soil should therefore be regarded no longer as inert matter, but as something capable of, and, in fact, always, adjusting itself to its environment. This is, indeed, the main discovery of the soil scientists and the basis of soil science.

The important role of climate in the development of soils provides a convenient basis for the comparison and classification of the soils of all parts of the world. The climatic classification has, further, the great value of enabling soils to be classified at the same time on a genetic basis. Many such classifications have been proposed in the past, which are all inevitably provisional in character, because soil science itself is still in its youth, and also since information of the kind required is still very incomplete for soils of many parts of the world.

Classification of soils, according to Glinka. ("The Great Soil Groups of the World.")

I. *Endodynamomorphic Soils*, i.e., soils whose development and characteristics reveal the preponderance of the influence of internal conditions, viz., the character of the parent rock.

(a) *Rendzinas*; (b) *Various skeleton soils*. These are chiefly immature soils, which may occur in any climatic region, and within any belt or zone of mature soils.

II. *Ektodynamomorphic Soils*, i.e., soils whose development and character show the preponderance of external influences, viz., climate and vegetation. They are grouped into six classes, as shown below, on the basis of the relative amounts of moisture that reach the surface horizons in various parts of the earth during the operation of the soil-forming processes.

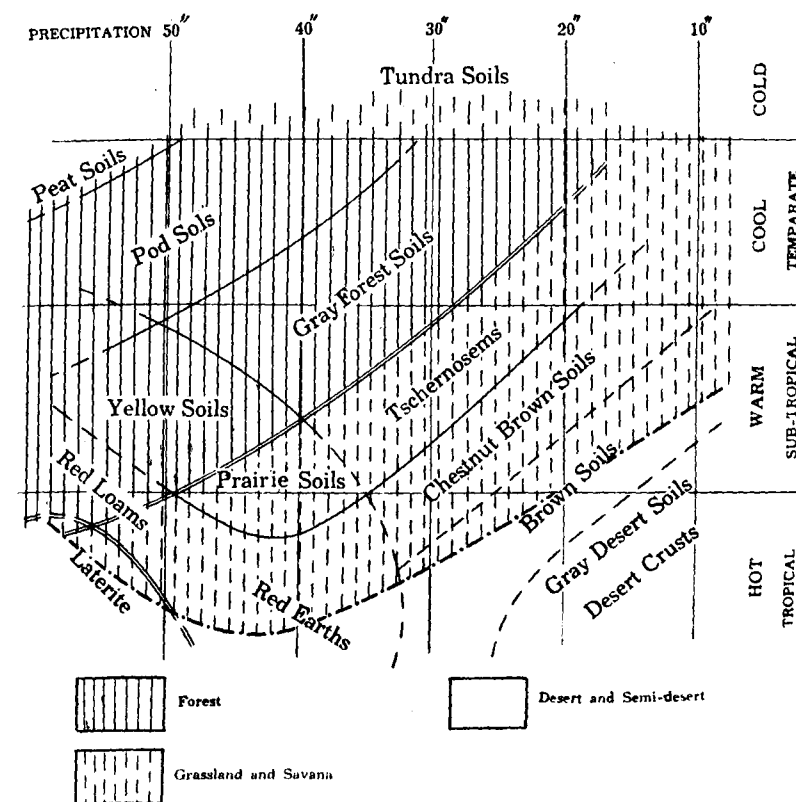
* "Wie in der Pflanzendecke, so prägt sich das Klima auch in der Bodengestalt aus." W. Köppen: Grundriss der Klimakunde.

Conditions of moisture under which soils are developed.	Soil Types or Groups.	Indian Representatives.
1. Optimum moisture.	(a) Laterite. (b) Terra Rossa. (c) Yellow soils.	Indian laterites.
2. Average moisture.	(a) Podsol soils. (b) Gray forest soils. (c) Degraded Tschernosem.	In the Himalayas. Do. Forested western parts of Dekkan.
3. Moderate moisture.	Tschernosem.	Dekkan black-cotton soil or Regur.
4. Insufficient moisture.	GROUP A :— (a) Chestnut-coloured soils. (b) Brown soils. (c) Gray soils. (d) Red soils. GROUP B :— (a) Brown crusts. (b) Lime crusts. (c) Gypsum crusts.	In Hyderabad State, and on the Indo-Gangetic plain. Do. In Hyderabad State, and on the Indo-Gangetic plain and in the Thar desert. In the Peninsula (Teri sands of Tinnevely district ?) In the Peninsula and Thar Desert ? In the Peninsula. Do.
5. Excessive moisture.	GROUP A :— Moor soils (Peat & Muck soils.) GROUP B :— (a) Mountain Meadow soils. (b) Peat soils of dry Tundras and Mountain Peaks.	Peat bogs of Nilgiris. ? ?
6. Temporarily excessive moisture.	(a) Solonety soils. (b) Solonschak soils. (c) Transition forms of (a). (d) Transition forms of (b).	In the Indo-Gangetic plain; Reh, Usar, Kallar.

The first four classes have been developed under the influence of atmospheric moisture. The last two classes occur in areas of negative relief which have received their moisture not only directly from the atmosphere, but also in the form of seepage from surrounding higher lying areas and from the ground water of the immediately underlying layers. In the first four classes of soils the soil horizons have developed normally and typically, i.e., under the influence of downward percolating moisture. In the last two classes, which are developed under the influence of ascending moisture, the "Glei" horizon is often present.

In distinguishing the six grades of moisture, Glinka did not specify definite amounts in each case, but made only general comparative statements. Such definite information has, to some extent, become available subsequently, and is utilised in the following

Climatic, Vegetational and Inter-relationships of Soils.



NOTE :—(1) Relatively less reliable portions of boundaries shown as broken lines.

(2) Temperature conditions are shown only in a general comparative fashion, and the dividing lines do not correspond to any specific temperatures.

ing diagram, based on data available in the works of Glinka, Marbut, Robinson and Vageler. (See references at end.)

In conclusion, it should be noted that all that has been said above refers particularly to natural or virgin soils and not to those under cultivation. Cultivation involves interference with and modification of the soil as well as of its environment. It means, firstly, the replacement of the natural by a cultivated plant cover. Irrigation or drainage would alter the moisture conditions of the soil, modifying to that extent, the influence of climate. The surface layers of the soil are broken up by tillage, and its structure, aeration, etc., are modified thereby. The very great practical importance of studying the effects of cultivation on the soil cannot be over-emphasised. It is shown only too well by the costly mistakes which have been made in many parts of the world and realised only too late, through the adverse conditions that have resulted, such as the rapid loss of fertility of tropical red soils under improper management, the destruction of extensive areas of productive land through soil erosion, and the ruin of other large areas by the accumulation of alkaline incrustations in the soil because of irrigation without adequate sub-soil drainage.

This brief and simple account of soil-formation has been prepared primarily from the geographical point of view, and is based on the works cited below, which are very much more detailed and sometimes rather technical, and not addressed to the geographer, primarily.

1. K. D. Glinka : The Great Soil Groups of the World.
2. Shanty and Marbut : The Vegetation and Soils of Africa.
3. Robinson : Soils, their Origin, Constitution and Classification (2nd Ed. 1936).
4. P. Vageler : Introduction to Tropical Soils (1933).
5. Comber : Scientific Study of the Soil.

Human Geography of the Amaravathi Basin

By

MR. C. S. SUBBARATNAM, B.A., L.T., DIP. GEO.,

INTRODUCTION.

The Amaravathi is one of the important tributaries of the Cauvery in South India. It rises in the Anamalais 10° N.Lat. and 77° E.Long. and runs for nearly 140 miles in the plain country before it joins the Cauvery near Kattalai, the present name of the place being Mayanur. The plain country through which the river flows comprises of Udamalpet and Dharampuram Taluks of Coimbatore District, a part of Palani and Dindigul Taluks of the Madura District, and Karur and its neighbourhood of the Trichinopoly District. From the peak of the Palani Hills, the Plain country looks like a Basin.

OUR METHOD OF STUDY.

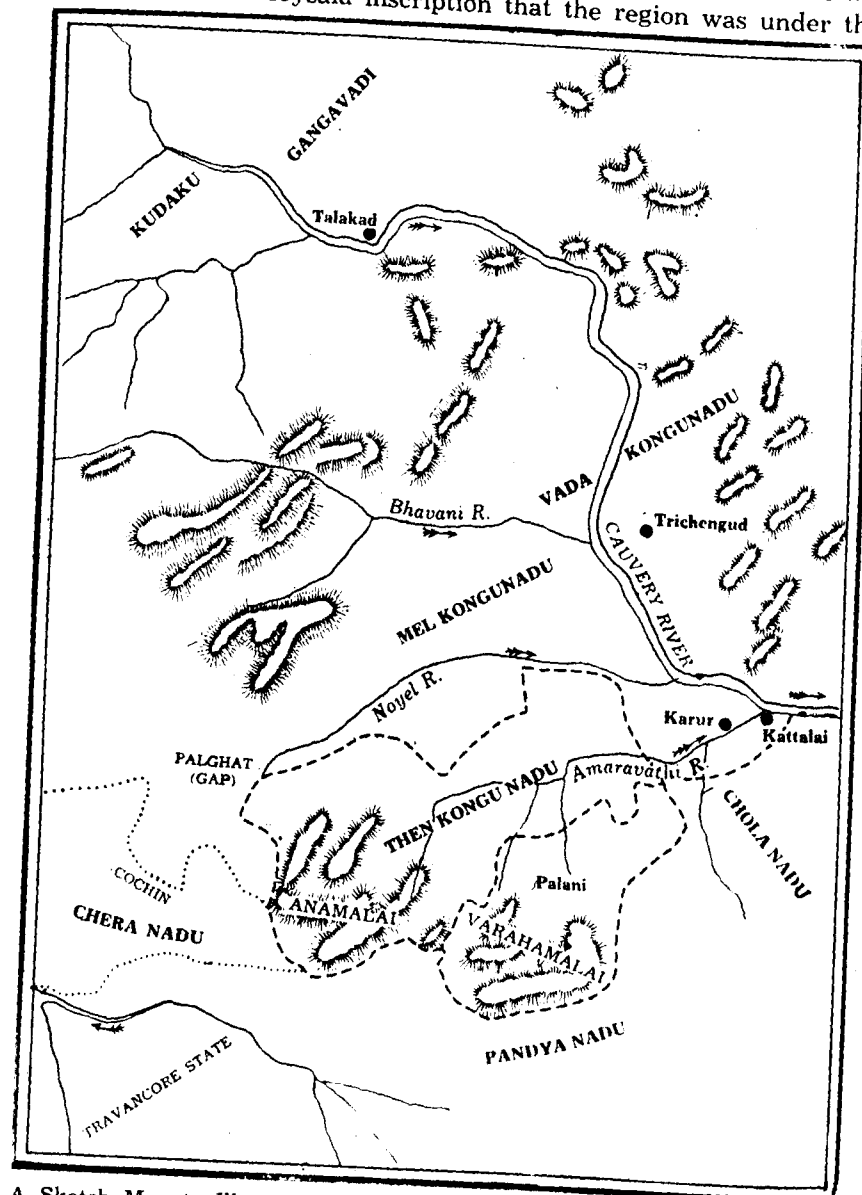
The Region through which the Amaravathi flows forms a hydrographic Unit. It comprises of portions of three administrative districts. But the general dry climate of the Region makes it eminently a pastoral area. Our method of study of this region is first to understand the past history of this region, and then to analyse its physical features, its soil and climatic conditions as determining factors for its productive power and then to trace the influence of these on the human factor as reflected by the distribution of population.

1. HISTORICAL BACKGROUND.

The main interest of the Amaravathi Basin lies in the fact that it was once the seat of Kongu civilisation of the ancient Tamils. In the days of the Silappathikaram this region was ruled by the kings known as Kosar and later on Retti dynasty ruled it perhaps with Karur as the Capital. Then Ganga dynasty annexed this territory with their own called Gangavadi, and ruled this land from their capital Talakad. During the days of the Chola ascendancy, although this territory lost its independence, it resumed its separate existence under the semi-independent Viceroys known as 'Kongu Cholas' by the historians. Another version says that the Kongu

* A summary of the lecture delivered under the auspices of the Geographical Association, Coimbatore Branch.

Nadu was more or less under the sway of the Chera Kings on the one side and Ganga Kings on the other. It is not proved with the evidence of the Hoysala inscription that the region was under the



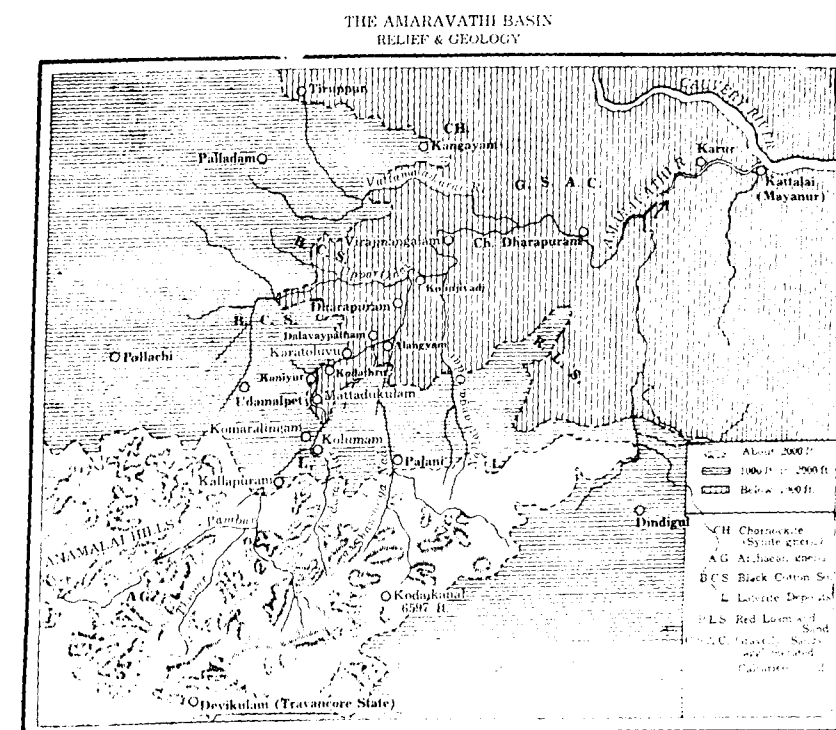
A Sketch Map to Illustrate Historic Background of The Amaravathi Basin. But it is a fact that this region was long retained under the suzerain power of the Pandyas. Later on, it served as a 'bone of contention' between the Vijayanagar governors and the growing power of Mysore. In 1559 A.D. under Viswanatha's Viceroyalty, here existed a kind of Feudalism, the relic of

which is the Pattagar of this region. During the days of Chikka Devaraya in 1704 A.D. the region was brought under the rule of Mysore, and later on, in the war between the Mysore Sultan and the English, this region was 'a scene of incessant marches and counter-marches' and finally in 1799 it was acquired by the East India Company.

In Tamil Literature this region is referred to as 'Konganam' and according to their regional classification this comprises of Mullai with an admixture of Kurinji where the Anamalais and the Palanis rise aloft to the sky. Mullai is the region where the milk and milk products are abundant and wool and cotton weaving developed in the New Stone Age, and where millets and dry crops are raised. These conditions continue to this day as of old.

2. PHYSICAL FEATURES.

Relief and Structure.—The general topography of the region shows the continuation of the Western Ghats in the west and the south as Anamalais and Palani Hills, the average elevation of which is above 4000 ft. The rocks are composed of archaean gneisses buried to a considerable extent under surface alluvium. In certain places at the lower heights of Anamalais, we find laterite deposits



which in these places owe their origin to sub-aerial decomposition *in situ* of the rocks due to warm, humid, monsoonic climate. Between the laterite cap and the under-lying rocks may be noted a transitional lythomarge rock usually called the bole. The plain country stretches more or less from the foot of the hill towards the north and north-east. The relief map shows that Udamalpet is 1297 ft. above sea level, and Dharapuram 997 ft. and Karur 497 ft. The valley forms a meandering course for the Amaravathi to flow through, meandering more between Dharapuram and Karur than between Kallapuram and Dharapuram. The uniform level of the plain is sparingly broken at irregular intervals by small bands of numbers of charnockite rocks, by one small band of syenite gneiss near Kangayam, and by upstanding crags and ridges of crystalline schists.

Soil conditions.—The soil of this region is neither fine nor sufficiently deep over vast areas; but it is not so barren as extreme dryness of the several parts of the region makes it appear. The red sand and gravel are good for dry cereal cultivation, but there are considerable areas of red and black loams which yield a variety of good crops with fair rain and efficient cultivation. Under dry cultivation which is little expensive black cotton soil yields bounteous harvest, while the red loam under garden cultivation and the black loam under river irrigation are remarkably productive. Dharapuram and Karur are covered almost entirely with thin gravelly, sandy or agglomerated calcareous soil, but Udamalpet consists more than 1/6 of the cultivable area of black cotton soil, in contrast to Pollachi which contains red loam.

General Drainage conditions.—Thenar and Pambar are the two hill streams of the Anamalais that supply water to the Amaravathi; and Kudarayar, Shanmuga Nadi, Nallathanga Odai, Nanganji, Kodavanar, Vadamalai Karai and Varatu Karai are some of its important tributaries that join the river in the plain country. Except the Shanmuga Nadi all the others are no bigger than jungle streams, and they carry water only during rainy seasons, and during the rest of the months these streams are practically dry.

When they are in flood the flow of the stream is too rapid to be of any use for irrigation. Kudarayar, Shanmuga Nadi, Kodavanar etc., drain the northern slope of the Palani Hills; and Vadamalai Karai, etc., drain the surface of the northern region of the basin, the average elevation of which is about 1000 ft. The Amaravathi alone is the perennial stream of this region. Even this for a few months in summer contains little water near Karur.

3. CLIMATE OF THE REGION.

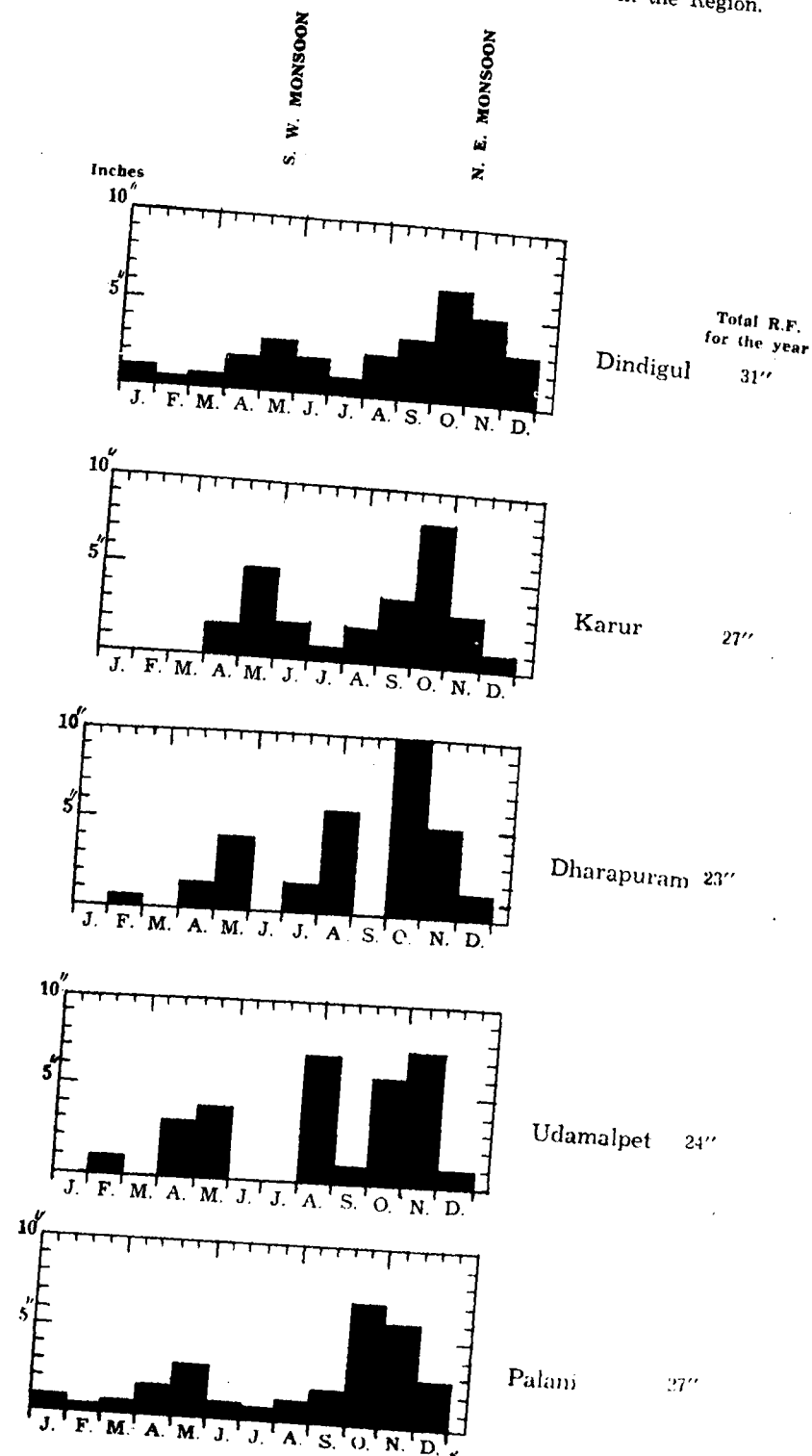
According to the rainfall and temperature conditions there are four well-marked seasons in this region. 1. Cool dry season comprising of January, February and part of March when there is very little rainfall in the form of light showers. 2. Hot dry season comprising of last half of March, April and May when in addition to little rain there will be thunder-storm and the river is nearly dry. 3. June, July and August when S. W. Monsoon breaks and with it comes flood in the river. 4. October, November and December when N. E. Monsoon breaks and the whole region receives its annual rainfall.

The climate of this region is by itself not propitious to agriculture, and it is one of the driest regions except along the banks of the Amaravathi. The mean annual rainfall of this region is about 25 inches only, though the precipitation on the Anamalais is more than 50", for the Amaravathi Basin is in the leeward side of the Western Ghats. The heat of the region is generally modified by the cool air currents from the west coast through the Palghat gap. The dryness of the region is to a certain extent modified during the time of the S. W. Monsoon when moisture laden air rushes over the plain and increases the humidity. The mean annual temperature based upon the record of 25 years ending 1925 is 79.6° F. The hottest months are from March to May with a mean temperature of 85° F.

The large area of dry crops in this region depends solely on the S. W. Monsoon (Khar crops). The rain from January to March is of no use to the agriculturists. The summer rain benefits but slightly the crops under wells, tanks and channels. This region shares in the rains of N. E. Monsoon to the extent of about 12" on an average, facilitating the cultivation of *Paruvam* Crop. At times due to abnormal rainfall on the Ghats west of Udamalpet unexpected flood comes in the Amaravathi, which cause damage to a number of channels in the Udamalpet Taluk. Generally there is much uncertainty as to the possible amount and distribution of rainfall and the region is liable to long drought, and to frequent cycles of deficient rainfall.

The prevailing winds are from north, north-east and east from January, and they continue into March when southerly winds begin to blow and become still more frequent in April. In May the direction becomes more westerly and the south and south-west are the prevailing quarters until September when the wind backs round to south and later on to north-East. By November the N. E.

Rainfall Graph for Important Stations in the Region.



Monsoon is thoroughly set in and continues throughout December. The southerly wind blowing into this region through the Palghat gap blows with the greatest mean velocity of $6\frac{1}{2}$ miles per hour, throughout the whole period of the S. W. Monsoon. During June and July the winds blowing persistently in great volume are notorious for their great violence. The N. E. Monsoon winds are much lighter, the mean velocity being about a mile and a half per hour. The climate of Udamalpet between mid-March and mid-May is cool and pleasant, of Dharapuram hot and not oppressive, and Karur hot and oppressive.

4. THE FORESTS OF THE REGION.

The total area of the region is about 2954.5 sq. miles out of which 381.83 sq. miles is Reserve forest. In Udamalpet Taluk the forest area is about 199 sq. miles, i.e., 35% of cultivable area of the region. Palani comes next with 7.84% and Dindigul is next with 2.1% and Dharapuram with 1%, while in Karur area of the region there is no reserve forest.

The low hills of the region contain for the most part deciduous type of trees. On the Anamalais and Palanis the forests become more and more evergreen and after a few thousand feet on the hills we enter the tropical rain forests. On the Palanis one will be familiar with rolling downs covered with short grass, intermingled with well-known *Sholas* which occupy so many of the moist depressions on the plateau. The Forest Officers tell us that these *Sholas* serve as moderating agents on the hills. In winter time it has been noticed by them that there is marked rise in temperature as soon as one enters the *Sholas*. The important type of plantation trees on these high hills is mostly teak. In some portions of these hills there is a combination of agriculture and forestry due to interesting developments of comparatively recent years in Madras Forests. Some of the most backward hill tribes have for generations been in the habit of cutting down and burning the forests and sowing food grains in the area. Their habit is to use the same place for one or two years and then cut down a fresh bit of the forests and repeat the operation. Needless to say, this is extremely destructive and is forbidden as per Forest Code. However, the Department has devised a means of utilising the form of rough agriculture to profitable ends. In an area on which the Department desires to raise a Teak Plantation, they first fell and remove all saleable trees and then hand over the area to the Jungle Tribes who cut down the balance of the trees, burn them and raise a crop of food-grains usually Ragi or paddy. At the same time as

they are preparing the ground for their cereal crop the Department plant teak stumps, usually at an espacement of 6 ft. and these grow up with cereal crops. The Hill-men weed their cereal crop and look after the teak trees with the result that after the cereal crop has been harvested the Department will have a teak plantation on the area. In the Anamalais the Tea plantations are important. The labour to work on the plantations is recruited from the plains, mostly from Pollachi and Udamalpet. There are several estates on the hills, many of them financed by European capital. It is an interesting fact to know how the Anamalais Rope Way Co., projected in 1926, by several planting companies working on the Anamalais, is now able to have easy transport of plantation produce and other articles from the estates to the Railway station at Pollachi. The bottom station of the Rope Way is near Vannan Thorai Bridge at the foot of the Anamalais Ghat Road and the top terminal station, is on Iyerpadi Estate. The total length of Rope Way is $9\frac{1}{2}$ miles. The system is a mono-cable one. The erection of Rope Way involved many other subsidiary work such as dams across two rivers, a hydro-electric power station, Bangalows, staff quarters, etc. The work was completed in June 1928. It is worth while going on an excursion to these Tea estates on the Anamalais.

5. IRRIGATION.

Irrigation has played an important part in the development of agriculture in this region. Nearly 44,000 acres are irrigated by the Amaravathi. In Udamalpet Taluk there is a number of channels such as Kalavaram Channel, Ramakulam Anicut Channel, Kumaringam Channel, etc., which feed nearly 11,000 acres. In Dharapuram Taluk about 11,000 are under paddy cultivation. Among the tributaries of the Amaravathi, Shanmuga Nadi irrigates about 13,000 acres and Nallathanga and Nanganji about 7,000 acres. Once there was a system of Kudimaramath, i.e., a system of customary labour volunteered by the ryots to construct a temporary dam or 'Korambus' which is now almost defunct owing to the great difficulty caused by the absentee landlordism and the prevalence of factions among the ryots. Now the usual practice is to collect the contribution in cash from the ryots and the Government through the minor irrigation overseers carry on this work. The irrigation under Komaralingam Raja Vaikkal is the best in the region since it is remodelled and resluiced by P. W. D. in 1910. In Karur and its neighbourhood the Amaravathi irrigates about 2400 acres; and Pallapalayam Anicut is the only permanent dam across the Amaravathi in this region. The silt in this region is plentiful and very rich. About 90% of the irrigated area in this region is under well

and tank irrigation. The highest number of wells is found in Dindigal and Dharapuram Taluks, but the efficient wells are in Palani Taluk. There are also cultivable lands of *manamvari* type, where farming directly depends on the rain.

6. CROPS.

One is struck with the great diversity of crops raised in this region. Some of the most important are paddy, cholam, cambu, ragi, varagu, samai, almost all condiments and spices, sugarcane, groundnut, tobacco and other narcotic drugs, fodder crops, fruits, vegetables, etc. Out of 2.4 M. acres of land in this region about 50% of the land alone is under crops. About .6 M. current fallow, .1 M. cultivable waste, .3 M. not available for cultivation; and according to 1931 Census the total population of the area is 1.34 M. Hence per capita holding of land is about an acre. Hence more than productivity of land it is 'the man behind the plough' that is a very important factor in determining the wealth of the region.

Name of the crop.	In thousand acres.
Paddy	.. 100.
Cholam and cumbu	.. 200 & 300.
Ragi	.. 60
Cotton (chief money crop)	.. 129.
Groundnut	.. 58.
Chillies	.. 7.
Tobacco	.. 25.
Sugarcane	.. 5.
Oil-seeds.	.. 45.

In this region there is scope for the growing of fruits; and the total acreage of orchards is 14,000.

Live-stock:—Next in importance to crop is live-stock rearing, which has been the chief characteristic of this region. Kangayam is well-known for its breed of cattle. There are two varieties of Kongu cattle, a large and small one; the larger variety is to be found in Karur and Aravakurichi, and the smaller is numerous in Kangayam and Dharapuram. The lighter soils which are usually shallow with uncertain rainfall but sufficient to retain enough moisture for the growth of a kind of grass called 'Kollukattai Grass', the botanical name being 'Pennisetum cenchroides', are the most favoured condition for breeding and rearing. The red loam full of kankar gravel, known as 'Odai jelli' is excellent for the formation of bone and sweetness of pasture. Among the breeders in

this region the Pattagar of Palaikottai is the largest breeder; and in his herd may be seen the breed in its purest form. There is not another land-lord in the whole of India who pays so much attention or carries out breeding on such systematic lines as the Pattagar of Palaikottai, and the Amaravathi Basin is justly proud of the development of animal husbandry on indigenous lines.

7. THE PEOPLE OF THE REGION.

The man behind the plough:—The man behind the plough is the pivot of all agricultural activities. Encomiums have been showered on the skill, industry, patience and prudence of the cultivator of this region particularly on the three important classes who constitute the bulk of the peasant proprietors, the Kongu Vellalas of the Dharapuram area, Vellalas of Karur area, and the Kammas of the Udamalpet, Palani, and Dindigul areas. The defect in the art of agriculture in this area is largely the result of unfavourable climate and soil and want of capital rather than of practical knowledge. A full purse in the hands of Kongu Vellalas will conquer season and soil. His wet-land farming is excellent. In garden lands the ryot is the past master of his art. Unless it be his water lift, it is doubtful if there is anything to teach him. Inspection of his cultivation from fallow to reaping will show that all the minutiae of good cultivation are elaborately attended to. Dry land cultivation is not so elaborate; but the higher classes of lands are thoroughly well-tilled, especially when cotton is grown. Compared with the peasant proprietors of Europe, particularly of France, Switzerland, Saxony and Prussia, the peasant in this region has neither the minute and patient industry of the French nor the agricultural knowledge of the educated peasant of the European countries. The striking feature of the rural economy of this region is want of energy and thrift in dealing with space and time, which has, however, come to be modified by co-operative organisations which now work in the villages.

8. THE VELLALAS AND OTHERS.

The Vellalan is a word derived from 'Velanmai' which means cultivation. This is a caste entirely devoted to agriculture. The Kongu Vellalas are confined to the four centres of concentration of this caste, Kangayam, Pudupalayam, Pudur and Kadyaiyur; and the chief of the land among them is the Pattagar. 'Nattamaikaran' is the recognised head and wiseman. His orders in social matters are regarded as final. The marriages are presided over and celebrated by 'Arumaikaran and Arumaikari'. The Vellalas are simple and in many cases ignorant. Litigation and resort to Law Courts is a great drain on their wealth. Now, for the last few years there

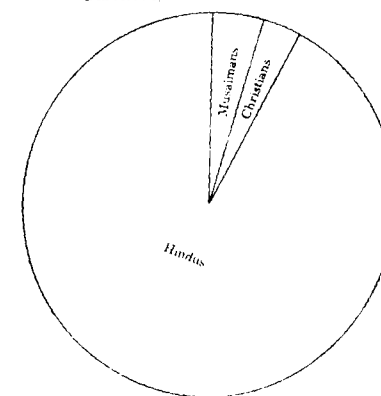
is some change for the better, for they are seriously taking to education.

The trade of the region is mostly carried on by the Arya Vysias or Komuties, although the trade in cotton is entirely in the hands of Kaikolas and Kammas. Arya-Vysias trace their descent to one of the primary castes of the Aryans of Hindustan, and they are religious and ceremonious in their outlook. In this region, the Arya-Vysias form 1500 strong in Karur town. In other parts they are not so concentrated, yet they are the traders of the region. Kaikolas are the hereditary weavers of the region, but now these people have become leading merchants and cotton commission agents.

Kammas, another important class of the people found in this region, trace their original home to Andhra Desa and it is now nearly 4 or 5 centuries since they have come to settle down in this region. Most of them are cultivators of land, and a few of them for the last twenty-five years or so, have turned to industry and commerce. Several of the Mills such as Venkateswara Mills and Dandapani Mills in Udamalpet and a number of ginning factories found in all important towns of this region have come to exist due to their enterprise.

Within the last fifteen years much change has come over the life of the people in this region. Owing to the great impetus given by the concentrated acreage utilised for growing cotton in this region, and the present changing outlook of the Indian Nation, there is a boom in this region for Mill Industry. Mills, nearly 20, started in Coimbatore, Udamalpet, and Tiruppur absorb about 60,000 labourers which in a great measure relieves the too much pressure on land.

DIAGRAM
Showing
DISTRIBUTION OF POPULATION



9. POPULATION.

The total population of this region is nearly 1.34 M out of which 90% are Hindus. Musalmans are only 55,849, and the Christians 43,215. Among the Hindus there are many castes. The depressed classes mostly work on lands; and they are mostly menial servants to the farmers of the region. The other labouring classes of this region are Kollan, Kammalan, Oddan, etc.

10. OCCUPATIONS OF THE PEOPLE

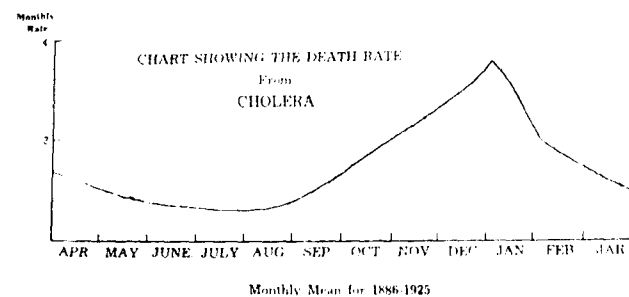
The pastoral and the agricultural classes form about 70% of the total population of the region. Industries form about 9%, and trade about 6%. The rest of the population is distributed variously under the heads of fishing and hunting, transport, public administration, etc. Under each one of these items it is less than 1%. Under the head 'Indefinite' the figure shows more than 9%.

11. INDUSTRIES.

The chief industry of the region is weaving. Handloom weaving is carried on in villages as a cottage industry; the woven cloths are usually intended for local consumption. Generally these products find easy sales in the *shandies*. It is estimated that more than 30,000 handlooms are working in the villages in this area. Kanga-yam is in the centre of palmyra groves. It is believed that a large quantity of palmyra fibres for cordage for ships was formerly supplied from this region. The collection of 'Avaram' bark and of bones is also of importance in this region. There are ginning factories in Karur, Dharapuram, Udamalpet, and two cotton mills in Udamalpet. There is sugar industry in this region on a small scale concentrating round Alangyam in Dharapuram Taluk.

12. PUBLIC HEALTH OF THE REGION.

This region has good report of public health. There are no endemic centres of epidemic diseases. Some of the diseases of this

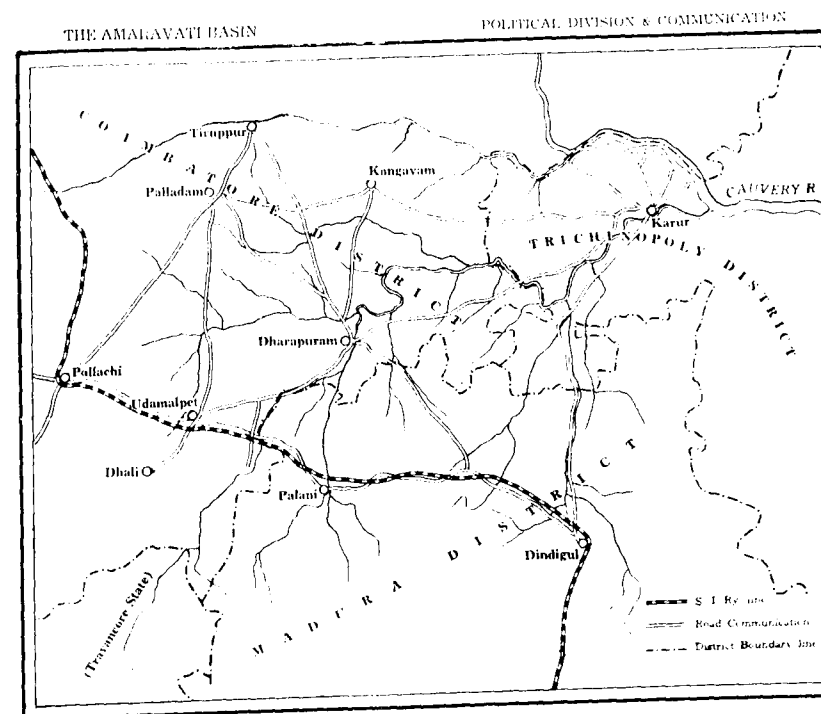


area which cause mortality are cholera, small-pox, plague, fever and

dysentery. Fifteen years ago, Udamalpet area was infected with plague, but now such cases are rare. Cholera prevails in some pilgrim centres like Palani and Dharapuram and the greatest mortality from cholera is during the period covered by the North-East Monsoon. (see graph). Small-pox is more or less prevalent throughout the region. The hot weather seems to exercise some influence on the incidence of these diseases. Fever consists of malaria and occasional epidemic of relapsing nature. Since there is much dry area in this region, the general health conditions of the region are always good.

13. COMMUNICATION

The railway runs in the heart of the region through sufficiently populated areas of agricultural and industrial interest. The name of this Railway is 'Podanur-Dindigul Railway'. It is metre gauge section. Podanur-Pollachi section of this Railway is owned by the Coimbatore District Board. This was opened in 1915, and was fur-



ther extended from Pollachi to Dindigul in 1928. The cost of the line was about 89 lakhs. This serves a fairly populous area in which there are important trading and pilgrim centres, and in future this is sure to open up and develop a prosperous tract of country

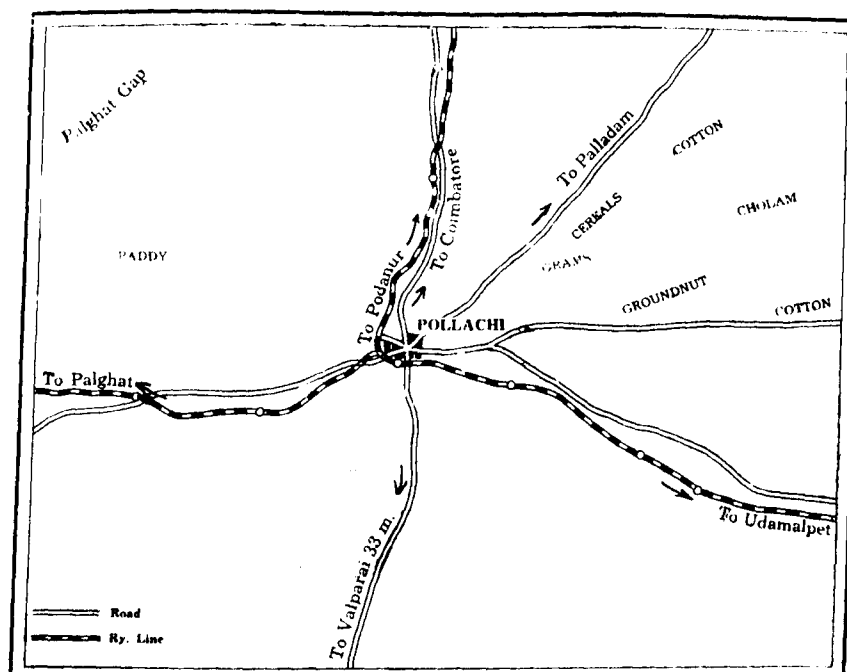
long in need of railway. This shortens the distance from Dindigul, and the South to the West Coast and the Nilgris by a hundred miles. The Pollachi-Palghat section opened for traffic in April 1932 forms a continuation or extension of the Dindigul-Pollachi Railway to the West Coast, and shortens the railway journey to the West Coast from Pollachi by 20 miles.

The examination of the roads in this region presents at first sight a remarkable net-work radiating from the chief towns. All important towns of this region are connected by means of excellent roads, well-maintained by the Local Boards. Dhara-puram is the central place from which roads radiate to all important places of the region including those rural areas along the banks of the Amaravathi, where paddy and sugar-cane are grown.

14. THE MARKETS OF THIS REGION.

The important markets of this region are some of the few important markets of South India. Pollachi market which is not far away from Udamalpet is situated at the mouth of the Palghat gap to com-

- SKETCH MAP OF POLLACHI



mand easy access to Malabar Coast. This is the biggest grain market in this region. This is a nodal centre. The hinterland of Pollachi comprises cotton, cholam, groundnut, paddy, cereal and gram

areas. The chief export of this region is groundnut. The second important market is Tiruppur which is a big cotton market, well-known as 'The Bombay of south India.' Karur is a market for *mandi* merchants. Dindigul is a cattle market.

15. HUMAN SETTLEMENTS.

Along the valley of the Amaravathi are seen many important villages (see phy. map.) prosperous and progressive, the rural economy of which is based upon paddy and sugar-cane. Dhara-puram is in the valley of the Amaravathi. This was the capital of the Virata Desa during the Mahabharata Days, and later on under the rule of the South Indian Kings this developed into a nodal centre, which it continues to be even to-day. It is a Taluk headquarters and a municipal town consisting of nearly 30,000 people. Other municipal towns of this region are Udamalpet, Karur, Palani, and Dindigul. As a Pilgrim centre Palani is famous. Here is a beautiful little hillock dedicated to God Subramanya. Union Motor Service Ltd., Coimbatore, run Bus service in all the roads of this region, hence there is no difficulty of communication between one place and another in this region. Kangayam is in the heart of the pastoral area and is exporting ghee to Madras and other places. Palladam, being a nodal centre, has developed as an entrepot for cotton.

In education this region has not become very much forward, although there are many schools both elementary and secondary. The general literacy of the region is about 14%. It is desirable that education should penetrate into villages and mass literacy should be spread.

Conclusion:—It is interesting and instructive to study the life of man in the Amaravathi Basin, a large dry tract of land which has spread out choice for man to develop agriculture, pastoral industry, and later on cotton industry. The river Amaravathi promotes, 'Unity of Life' in this region. The geographical environment here has reared a simple, hard-working husbandry, which on account of development of communication, and contact with life outside, is now slowly trying to engage itself in textile industry. Simple living and high thinking has ever been the cultural note of this region.

Population and its Distribution*

By

MR. GEORGE KURIYAN, B.Sc., (LONDON)

All accounts of population are obtained from the official census returns and by far the most remarkable fact in the last few generations has been the attempt by various governments in several parts of the world to take census returns. The earliest census ever taken was in Sweden in 1790 and in Great Britain by 1801 the first census was recorded. In India the first census was taken in 1851 and it is therefore clear that there are very few countries in the world which have any accurate returns for the last 100 years. It should also be remembered that there are very large tracts of country like China where no official statistics of population of any kind are available.

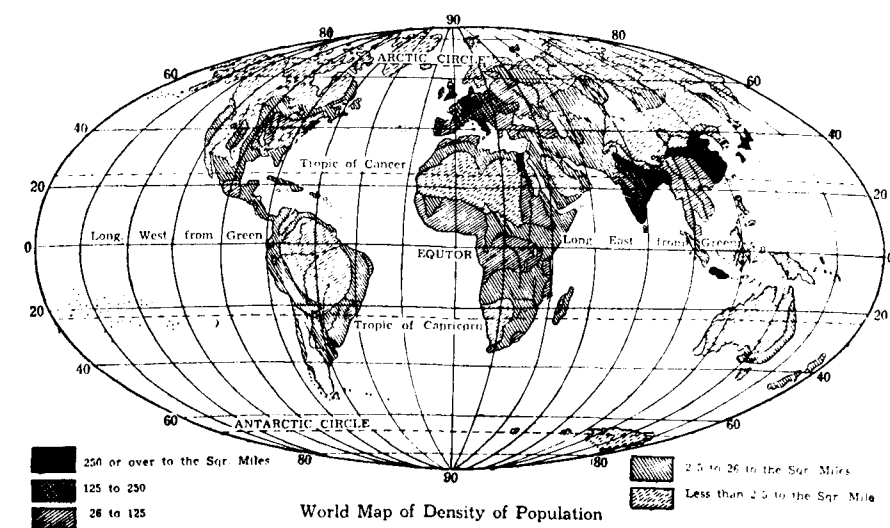
On a compilation of these census returns, it is found that the total population of the world is about 2000 millions. (The error in this figure may be as much as 20%). During the four decades 1881 to 1921 there has been an increase of population at the rate of 1.159% per annum. At this rate of increase the population will double itself in nearly 62 years and if this rate were to continue steadily there will hardly be standing room on the earth after 1000 years. Taking for granted that this rate of increase has been constant and calculating backwards, it is found that today a progeny of 2000 million would result from 2 people who lived in 180 A.D. This is against all known facts of history, the earth was peopled long before 180 A.D. It is therefore clear that there has been a tremendous increase in the rate of growth of population in the near past. The most important reasons for this phenomenal growth of population are :—1. The industrialisation of several parts of the world, 2. The opening up of the grasslands, 3. The utilisation of improved machinery, tools and manure in agriculture.

During the last census decade, however, it is found that the population of Western Europe and the North Eastern parts of North America has been stationary. These highly industrialised regions have shown a fairly rapid and steady decline in birth rate. The modern women of those regions want as few children as possible due perhaps to the high standards of life and the tremendous economic demands made by a child. Thompson in his "Population

*Summary of a Madras University Readership Lecture.

problems" says, "It is clear that industrialised man will no longer submit tamely to the hardships of too numerous a family. It is the manner of life brought about by the industrial revolution which lies at the root of the changes in the population growth which have taken place during the last century and a half. The techniques of contraception as well as the motives leading to their use are also among the consequences flowing from the industrial revolution."

Before the industrial revolution 70 to 80 per cent. of the population had to work for feeding and clothing the entire population. Such conditions exist even to-day in regions like India and China. The use of machinery especially in agriculture has made it possible



for about 20 per cent. of the population to be able to feed and clothe themselves as well as the rest. The other 80 per cent. can therefore be engaged in the production of luxuries and the other necessities of life.

Distribution. The earth has a surface area of 196 million square miles, out of which nearly 140 million square miles are covered with water, the land surface being thus only 56 million square miles in extent. The sea may be a rich food-mine for mankind but its possibilities as a permanent abode for man are negligible. Man is and will be an animal of the land and mankind therefore will have to live on the 56 million square miles of the land surface of the earth.

The whole land surface of the earth, however, is not suited for human settlement, the essential limiting factor

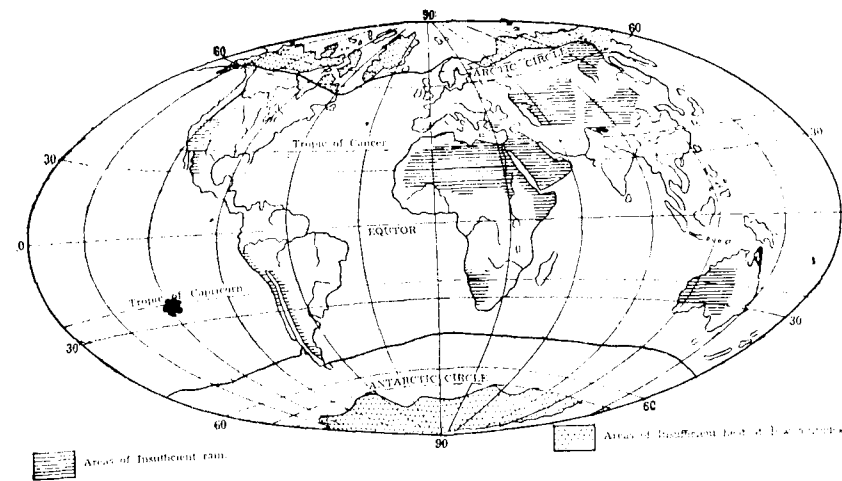
being the cultivability of the region. Temperature, rainfall and relief practically determine the extent of cultivable land. In no part of the earth are the surface temperatures too hot for agriculture, but there are large areas of land where the surface temperatures are too low for agriculture. The two essential temperature ingredients for successful agriculture are: (1) The actual surface temperature must be over 50 degrees F. and (2) there must be a minimum period of about 60 to 90 days of frostlessness. The regions lying polewards of the 50° F. surface isotherm for the warmest month are too cold and they constitute the cold deserts of the world. 30 years ago, 120 days of frostlessness was required for the cultivation of wheat, but to-day science has made such improvements that 90 days of frostlessness is sufficient for the successful cultivation of wheat in Canada. The further possibility of evolving types of wheat which mature in a shorter period than this is remote and little. The ultimate limit for some crops will be 60 days but this actually lies equator-ward of the 50° F. surface isotherm for the warmest month. Thus it is clear that the 50° F. surface isotherm for the warmest month is the effective limit of cultivation. The total area which is too cold to be cultivated is about 10 million square miles.

The total amount of rainfall necessary for agriculture is not constant throughout the world because it is dependent on other factors like evaporation, surface run off, seasonal distribution, etc. In some parts of the world the rainfall is excessive and in others it is insufficient.

Region.	Rainfall excessive if it is more than	Rainfall insufficient if it is less than	Total area with insufficiency of rain
Cool temperate regions	50"	8"	2 M. Sq. Miles.
Warm temperate regions	80"	12"	8 " " "
Hot regions	100"	18"	2.1 " " "
			Total 12.1 M. Sq. Miles.

(No accurate records are available regarding the extent of areas with excessive rainfall, but these are often small and scattered mountainous tracts.) The above table gives the conditions of

both excessive and insufficient rainfall in the major climatic regions (other than the cold regions already dealt with) and the total area with insufficient rain in each of such regions. There are nearly 12 million square miles of land in which the rainfall is insufficient for agriculture; thus 10 M. sq. miles is too cold and 12 M. sq. miles is too dry, i.e., 22 M. sq. miles or nearly $\frac{2}{5}$ th of the land surface is uncultivable due to climatic factors. The remaining $\frac{3}{5}$ ths therefore



appears to be cultivable, but nearly half of this is uncultivable because either the soils are too infertile or the altitude is too great, or the region has a mountainous topography or it is occupied by forests (practically impossible to be cleared as in the equatorial regions) marshes, houses, roads, etc., i.e., nearly 17 M. sq. miles of the land surface is cultivable or 30 per cent of the land surface is cultivable.

This cultivable land, however, is not evenly distributed, there are actually three large patches: (1) W. Europe including Russia but excluding Norway and Sweden; (2) India, China and Japan and (3) Eastern parts of U. S. A. These are actually the regions of high density of population.

In the Far East in China and Japan approximately in an area of 2 M. sq. miles there are about 500 M. people, in India in about 1 M. Sq. miles there are about 300 M. people, in Europe in about 3 M. sq. miles there are nearly 450 M. people and in N. America in 2 M. sq. miles there are about 100 M. people, i.e., on a total area of about 8 M. sq. miles there are about 1,350 million people; or more than $\frac{2}{3}$ rd the population of the world is concentrated in about $\frac{1}{4}$ th the land surface. This is clearly a very uneven distribution.

It is because of the more favourable conditions for agriculture in the past due to fertility of the land (true even to-day of regions like China and India) and the possibilities for industrial development (true of W. Europe and parts of N. America). Originally the total population of an area depended on the agricultural possibilities of its immediate neighbourhood; but to-day it is dependent only on its capacity to import food.

It may not be out of place to consider something about the maximum population which the earth can support. A. Penck estimates that the world can support 8,000 M. people; Thompson thinks that the earth can support 5,000 M. people based on the present-day European yields of crops, but these figures seem to be too high. In conclusion it may be mentioned that synthetic food has been produced and based on a synthetic food-producing capacity the earth can support a much greater population than any of these estimates, but whether it will be sufficiently cheap and whether it could completely replace the natural food is a matter which time alone can prove.

Presidential Address of Mrs. P. S. Sundara Raj

To the Teachers of the Summer School of Geography, April 1936.

Mr. Chairman and Fellow Teachers,

We are met today to inaugurate yet another Summer School in Geography, and I feel it is a great honour to be asked to deliver the inaugural address. Geography teaching is slowly coming into its own and schools such as these ought to play a very important part in increasing the knowledge and the enthusiasm of teachers of Geography. Much effort has been expended in obtaining a place for Geography in the school curriculum. It is for teachers to show that the effort has been worth while. It is not for the sake of adding one more subject to an over-elaborate time-table, or to give one more text-book to be swallowed by unappreciative school-boys, that the fight has been waged to give Geography a proper place alongside other subjects in school and college, but because it is believed to have values of its own. Therefore to those teachers who managed to survive their own early education without being bothered to learn Geography, and now find themselves called upon to teach it, I would say, "Try first to find what value it might have for you, for only when it is worth while for you to teach it will it seem to be worth while for your pupils to learn it." Of course, those who have had the privilege of Mr. Subrahmanyam's teaching will not have escaped without being thoroughly infected by his enthusiasm, and it is such people who have a great part to play in carrying this infection into any school in which they may find themselves.

One reason why I think Geography has been viewed with suspicion by those who framed our scholastic programmes in the past is that we cannot quite classify it, and in these days of air-tight and water-tight compartments we do like to have everything labelled and put in its proper place. Now the Science teacher we know: we can put him in the laboratory with his little test-tubes and for so many periods a week he teaches what is called "Science", by which we mean generally Chemistry or Physics. And as scientific study progresses, we find it becoming more and more the province of the specialist: very often the more advanced the research the narrower is its scope, so that it becomes almost true to say that the specialist is the person who knows more and more about less and less. But of course the more specialised the

work, the more easily is it labelled, and put away in its appropriate compartment and unfortunately this passion for specialising has invaded our schools and colleges. Education has become the mastering of a series of special subjects, each taught by a specialist teacher, and each neatly arranged in its separate compartment. But school and college should be a preparation for living, as well as being a full and satisfying life in its own sphere. And this I think is where the Geography teacher has an important part to play. The Science teacher looks askance at him because he cannot be put into a pigeon-hole and labelled. The physical side of Geography indeed reaches into the realm of pure Science: these are aspects of geographical study which require the pure specialist. The geographer, for instance, must use the researches of the geologist, but the true geographer is not a specialist; he cannot pitch his tent firmly in the scientific camp, and so he is viewed with suspicion, and perhaps a little contempt, by the scientists.

On the other hand, there is yet another and an older tradition in our schools: the tradition that has come down through many centuries of classical education; the study of language, and from language the study of Philosophy and History. When we come near to the study of great literature, of whatever age or in whatever tongue, we find ourselves studying philosophy and we find ourselves studying life. Here surely the Geography teacher can find fellowship, but the teachers of Philosophy, of History, of Literature are apt to be just as suspicious as their scientific brethren. But the Geography teacher is bound to give some interpretation to the facts which he observes, and so he becomes a philosopher. History also can often be interpreted only through a knowledge of Geography, and so the historian and the geographer find themselves working together. I think therefore that one great value of Geography is that it acts as a bridge between pure Science and the study of the humanities, and in so doing it helps to counteract that tendency to divide up knowledge into compartments with apparently little connection between them.

Geography, properly speaking, is the study of man in his environment. It is therefore vitally concerned with the problems and achievements of every day life. The tendency is more and more to emphasise human as distinct from physical Geography. And here again we must beware lest Geography itself should be cut up into irrelevant sections. Physical and human Geography are not distinct and different subjects, though some teachers and some text-books would appear to think so. It is essential that the

unity of the subject should be preserved. The universe is one, even to the most distant star, and all life, including man himself, is maintained on this one tiny unit in the immeasurable universe only by the interaction of conditions which could very easily be thrown out of poise, or so it seems to us. Therefore, it is for the Geography teacher to study and interpret what we may call the "Pattern" of the universe, and show how man fits himself into this pattern and so is able not merely to survive, but to make himself more and more able to understand the factors that govern his conditions and so to subdue them to his own ends. In so far as the geographer has to observe and gather his facts before he can interpret them, he is following the method of the scientist, but there is one essential difference between the work of the scientist and that of the geographer. The scientist looks for the repetition of the same phenomenon, until the same set of conditions have produced the same result so many times that he feels that given such conditions the results will always be the same, and so he formulates a law. The geographer, on the other hand, has to deal with conditions that do not repeat themselves indefinitely, and so he must evolve a technique of his own. And I think it is just here that the geographer has a great opportunity to give his students a training for living. They can learn to arrange the facts that come to them, not as they are endlessly repeated in a laboratory, but as they come, unexpectedly and changefully, to the men and women who have to find a way of living on this earth.

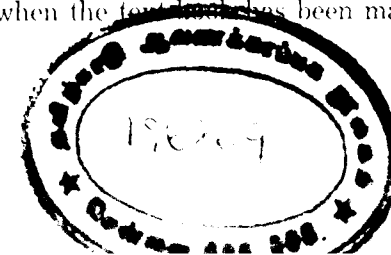
I have spoken so far of the value of Geography as a bridge subject, as it were, linking the researches of the scientist to the study of humanity. But there are other values in Geography that I should like to suggest to you, and this especially in view of the world in which we find ourselves at this moment. What I want to say has been very well expressed by a great geographer, and I cannot do better than repeat the words Sir Halford Mackinder used eleven months ago. He said, "Is not the crisis of today, which penetrates into every human activity and almost every larger thought, essentially geographical in its origin? Mankind has suddenly become world-conscious and has taken fright. The nations have run to their homes and are barricading their doors. They have realised that henceforth they must live in a closed system in which they can do nothing of which the repercussion does not come back to them from the very antipodes. In an age that may become cruel, because imprisoned, their first impulse has been to make sure of their castles of refuge." Every day wireless brings to us the voices of men from the far corners of the world: every day

air-liners start from the world's ports to accomplish in a few days journeys that our grandfathers would have required months to perform. The world hardly realised the changes that were taking place, and it woke to the reality with a tremendous shock. Sir Halford Mackinder's words are a challenge to all teachers of Geography. If the crisis of today is essentially geographical in its origin, these geographers have a very real responsibility in helping to create a new and better world consciousness. To come from the general to the particular, I think that in this country especially the Geography teacher has a great opportunity. No one can help noticing the cleavages occasioned by race, by caste, by religion, in this land. Not only are there broad divisions along the lines I have mentioned but there are innumerable local differences and hostilities. It has always seemed to me, that the Geography teacher, particularly the teacher of little children, can help more than most people in counteracting this tendency to communalism, whatever form it may take, and whatever may have been its causes in the past. For children are gregarious, not exclusive, and their sympathies are easily won. They are interested in people, and if they can be taught in their most impressionable period to look upon the people of other lands, and the people of their own land who are so different from them, with sympathy and knowledge, a great deal of prejudice will melt away. Human Geography, seeking for the causes which make the Eskimo different from the South Indian, the South Sea Islander different from the Scotsman will give a new outlook upon the world, and make for tolerance instead of hostility, for understanding instead of contempt. This is one of the most important lessons mankind has to learn, perhaps I should say has to re-learn, and I think that in a great sub-continent such as India is, if the people are even to be welded into a unity, the teachers of Geography, and I emphasise again the supreme importance of the teachers of the very young, have a not inconsiderable part to play.

I should like to point out another value which I think Geography has as an instrument of training. That is, in the encouragement of initiative. It is fashionable to decry the present system of education and so I will be in the fashion and make my complaint also. It cannot, I think, be denied, that the great multitude of those who annually leave our schools and colleges are singularly devoid of a spirit of adventure. So many of them seem to be anxious to pass from the pupil's desk to the office desk. All through their school life they do as their teachers direct them: every bit of an exercise they do must be adjudged and marked by their teacher. They learn what is in the text-book and reproduce it as faithfully

as they can, and the teacher carefully awards a higher or a lower mark according to whether the text-book is well and faithfully reproduced or not. Set an examination paper in any University with a choice between questions which bear on the prescribed text, and questions which require original thinking or a knowledge of the latest publications and theories on the subject, and see how many students will attempt the latter. Of course the teachers are largely to blame for this. They are as anxious to keep to the well-beaten paths as their students are to follow them. I have myself seen teachers nearly faint with horror at the idea of allowing their pupils to mark even so simple an exercise as a piece of dictation; yet here one would think is a very simple way of training children to judge their own work by a given standard. One has only to think also of the suggestion to keep to the same text-book for five years. In this country teachers seem to stick pretty closely to the same class. How could any teacher teach the same book for five successive years and maintain his own interest and freshness of outlook for that period of time? And if he is not enthusiastic over his teaching, what possibility is there of his pupils being enthusiastic over their learning? Besides there are few text-books that are not out of date within that time.

Now Geography is a subject that I think is specially valuable in developing initiative and training the critical faculty. In the first place, Geography cannot be learned out of a text-book. Even the best text-book needs to be constantly brought up to date. And I suggest the most useful piece of apparatus in the Geography laboratory is the daily newspaper. Here you have the day to day correction of text-book theories and dogmas. Within a very short period of time great changes have been taking place. One has only to think of air-routes, bringing into prominence ports of call for passenger and commercial planes that before were scarcely on the map at all. Or one can mention the extraordinary migration of heavy industry from the North of England to the Thames Valley: or the rapid increase in the use of oil and oil-products with the consequent growth in importance of oil-producing areas and the reduction in the export of coal. Many such examples can be cited. Such changes in the relative importance of parts of the earth's globe are faithfully represented in the daily shipping lists, in the trade reports of various countries, and in other items of news to be found in the newspaper. I suggest that the constant use of such reports will help to disabuse the pupils' minds of the idea, that seems to be often only too firmly fixed, that when the text-book has been mas-



tered the sum of all knowledge has been achieved. It will show them that knowledge is not attained once and for all, but that new facts must constantly be fitted into the existing framework : that the world does not stand still : that their minds must be alert to compare and to correct, to cast off what is obsolete, to assimilate what is new, and to be ready to check even the new fact by subsequent knowledge. Geography is not something that has been settled once for all and therefore I think it does provide a very valuable means of mental training, a training in mental alertness and in the sifting and correlation of the facts that are observed.

But, even with the most comprehensive and accurate of newspapers, Geography cannot be learned in the class-room, and expeditions form another kind of training ground for initiative and mental alertness. They provide another means of amplifying and correcting the statements of the text-book : they provide opportunity for the display of leadership and self-reliance. There is not much of the globe left for the pioneer explorer but there are many regions in which groups of people could do very useful work. The vastness and variety of India makes it a promising and interesting field for regional surveys. Here is an opportunity for young men and women to leave the beaten path of the text-book and do some original work. There probably was never a time when more young men could be seen going out from English Universities into little known regions and doing solid and sincere scientific work. Although the great days of exploration and discovery may be said to have ended, almost every year sees two or three parties going out from Oxford and Cambridge and other English Universities, with simple equipment and a definite field of study. I think if as Geography teaching is really lively and stimulating we ought to see something of the same spirit of adventure, something of the same desire to add to the sum of our knowledge, in the students of our own universities. It is credibly stated that there are still eleven hundred heights in your own Himalayas of more than 20,000 feet not yet climbed. Here is a chance for initiative and adventure ! Yes, the Geography teacher whose students are content to remain in the class-room may be said to have failed entirely in his work as a teacher.

In all that I have been saying, you will have noticed that the emphasis has been laid upon training. I think it cannot be too often or too emphatically repeated that very very little depends upon what a person learns, but everything depends upon how he learns it. Education has been very suitably described as that which remains when we have forgotten all we have ever learnt at school

or college. In Geography, as in other subjects that deal with the living changing world, there is much that we can afford to forget. Many of us have seen the map of the world re-drawn since we went to school : if we were to repeat now in an examination paper the answers which gained us marks in those days, we should fail hopelessly. But the power to see, and still more to interpret what we see, the alertness of mind that will not be content with second hand opinions, the ability to grasp the essential wholeness of the universe, the teacher who can give us these things has enriched us for life. We often talk of an "educated man". There is no such person. The expression is in fact a contradiction in terms. Education is a process that cannot stop, and it only remains for a man to believe that he has been educated for anyone to know that he has never even begun to be educated. Of the study of Geography it can indeed be said that it

" is an arch where through
Gleams that untravelled world whose margin fades
For ever and for ever as we move."

The Historical Geography of Indo-China

(Contd. from p. 274 of Volume X.)

By

PROF. V. RANGACHARYA, M.A.,

UPPER BURMA.

Having studied the historical geography of Arakan and the coast down to Cape Tēmala or Negrais, the latter of which was apparently a corruption of Nāgarēsvara,¹ (Nāgarēs or Nāgarāsi) we shall now turn our attention to Upper Burma. According² to the Burmese chronicles the origin of civilisation and government began in Burma in what we would regard as the later Vēdic age. They tell us that there was an expansion of the Āryans from India across the mountains of the north-east some time about B.C. 850. They say that a chief of the Sākya clans (to which the Buddha belonged) left his native country, migrated with an army of followers to the country of the middle Irāwadi³ (Irāvati), settled there, and built the city of Tagaung the ruins of which still exist. Tagaung or Tagōng has been pronounced to be a variation of Hastināpura, and its foundation has been placed by the interpretation of some scholars at an even earlier date,—about⁴ B.C. 923. That Tagōng is identical with Hastināpura is demonstrated by the fact that a Sanskrit inscription dated Gupta Samvat 108 (A.D. 426) and locally discovered calls it Hastināpura situated in Brahma-dēśa.⁵ The country about Tagaung in Upper Burma (Katha District) must have been named Brahmadēśa after the Brahmarshidēśa in India, and the name Hastināpura must have been given to the Āryan headquarters in Upper Burma on the grounds of analogy in their ancestral home.

To resume the story of the immigration and settlement as given in the *Mahārājavaṃśa*; On the death of the founder of Tagaung in

the 9th century B.C. there was a succession dispute between his two sons Kan Rajagyi and Kan Rayangi, as the result of which the elder brother became an exile, and the younger brother ascended the throne. The exiled chief is said to have become the progenitor of two dynasties, one in the Kubo Valley and the other in Arakan. The younger brother and, after him, thirty-one descendants of his ruled at Tagaung for a space of three centuries till some hostile tribes from the east⁶ put an end to their power (B.C. 550). The timely arrival of a new Sākya prince, 'Daza Rāja' or Dhaja rāja' by name (Dāsarāja?) is said to have saved the old royal line from extinction. Endowed equally with the spirit of romance and conquest, the new adventurer, who had first settled at Manipura, entered into matrimonial relations with the exiled queen of the ill-fated 'Bhinnaka', and, with the popular support, was able to establish a second dynasty with his government at Old Pagān near the ancient city of Tagaung. This event took place in B.C. 523. The name Pagān, which is found in Chām inscription⁷ of A.D. 1207 and in Chinese records under the variants of Bhukām, Bukām or Pukām, seems to have been an alternative for Ari-mardana-pura, and derived⁸ from something like *Bhūkāma*, the delight of the earth.

A succession of sixteen kings are said to have followed Daśa-rāja, when the pressure of hostile tribes, the blindness of the last two chiefs and other misfortunes led to the migration of the royal house further south to Prome or Śrī Kshētra. It is from this Prome or Śrī Kshētra dynasty, the founder of which, Mahā Thambava, is assigned by the Chronicles to B.C. 483, that the later kings of Burma claimed descent. It has been already shown how, according to Gerini's arguments, the new capital was called Mareura in consequence of the probable dynastic connection with Mayūra or Maurya.

Thus, according to the Burmese chronicles the region of Burma proper was colonised and governed by Indian dynasties continuously from the 9th century B.C. It is difficult to say whether

1. It has also been connected with *Nāgadvīpa* and the *Nicobars*. Gerini's considered conclusion is that it was borrowed from the *Nāgarāsa* lake of Nepal, the residence of Karkotaka, in preference to the derivation in *Hobson-Jobson* (p. 623) from *Nāgarāshṭra*.

2. Phayre's *Hist. of Burma*, p. 9.

3. Ptolemy's *Bē-synga* or Elephant-river.

4. Gerini, p. 62.

5. Fuhrer: *Arch. Rep.* 1894; Gerini, p. 471, footnote 2.

6. From the Gandhāra-*ratṭha* (Yünnan) in the land of Sein or Sin. See Gerini, p. 62. But Tagaung or Hastināpura seems to have continued to exist. For an inscription at Pagān in A.D. 610 mentions it though the former was the seat of government. *U. Burma Gazr.*, pt. I, vol. 2, p. 186.

7. Pagān has also been connected with Vugama or Bugamati in Nepal.

8. A Pagān inscription dated in 1242 calls it the most beautiful and pleasant of the kingdoms of the earth.

the expansion of the Aryan power beyond the north-east mountains of India into Burma took place so early as the later Vedic period. The chronicles are defective in certain respects. They seem to be chronologically unreliable. Sir A. Phayre "believed that the general trend of historical events was probably correct, but that they were ante-dated by several centuries. He suggests that the two Kshatriya States of Upper Burma must have been overthrown by the Shān or Thai race when they were driven westward towards the basin of the Irāvati by the Chinese incursions into Yünnan in B.C. 122—109 and A.D. 9, and that it was as the result of this that the capital was shifted to a place much further south. Col. Gerini on the other hand believes that the traditions of the Thai race indicate that the Shāns must have begun their advance towards the west by the middle of the 6th century B.C. He is, in other words, not for going to so late a period as the first century B.C. or A.D., but for an intermediate date.

The other defect in the chronicles is, they ignore ethnology altogether. We know that ethnologically Burma is occupied by three races: the Mon-khmers in the south, of whom a branch called the Talaings played a most important part in history till the 18th century; the Chinese Shāns in the east; and the Tibeto-Burmans in the north, from whom the modern Burmese proper and the Arakanese are generally derived.

"The original home of all these people" says Sir George Grierson, "seems to have been North-western China, between the Upper courses of the Yang-tse-kiang and the Ho-ang-ho, and from here they spread out in all directions. So far as British India is concerned, they followed river-valleys in their migrations down the Chindwin, the Irrawaddy, and the Salween into Burma, down the Brahmaputra into Assam, and up the Brahmaputra into Tibet. From Tibet they occupied the Himalayas and are now found in Nepāl and in other mountainous tracts lying south of the main watershed. Three successive waves of completed migration can be traced. First, there was in pre-historic times, a Mon-Khmer invasion into Further India and Assam. Secondly, there was the first Tibeto-Chinese invasion, that of the Tibeto-Burmans, into the same localities and into Tibet, the period of which is also unknown. Thirdly, there was the second Tibeto-Chinese invasion, that of the Tai branch of the Siamese-Chinese into Eastern Burma, which took place in force about the sixth century A.D. Finally, another Tibeto-Burman invasion, that of the Kachirs, was actually in progress

when it was stopped by the British conquest of Upper Burma. The later invaders drove the first to the sea-board or into the hills overlooking the river-valleys; and thus we find the earliest immigrants to India, the Mon-Khmers, confined at the present day to the coast country of Pegu and a few mountain tracts in Assam and Burma, while the Tais, who found most room for expansion in the direction of Siam, have driven the Mon-Khmers of that country to the sea-coast also." (*Imperial Gazetteer*, chap. VII, pp. 384—5). The languages of Further India, accordingly, fall into the two groups of the Mon-Khmer and Tibeto-Chinese.

During the early colonisations and settlements of Indians in Burma there must have been the Tibeto-Burmans in Middle and Upper Burma and the Mon-Khmers in Lower Burma, Pegu, Cambodia and Tenasserim. The Shān Tais were to come later on. The Chronicle ignores these ethnological factors. It indeed refers to occasional racial irruptions but it does so vaguely. The racial convulsions were between the Tibeto-Burmans of the comparative north and the Mon-Khmer Talaings of the south. The chief Tibeto-Burman tribes were the Pyus, the Kanrans and the Thets. The latter two are believed to have been the ancestors of the Arakanese and the Chins, and it is the first that are believed to be the chief ingredient in the Burmese race. It was the Pyus that had to meet the Shan, Tai and other Chinese tribes. As has been already said, Sir A. Phayre attributes the overthrow of the two Kshatriya kingdoms of Tagaung and Old Pagan in Upper Burma to the Shan-Tai race in the first century B.C. and the beginning of the Christian era, but Col. Gerini places it about the middle of the 6th century B.C.

While in Middle and Upper Burma there were Kshatriya colonisations and settlements from North India many centuries before the Christian era, there were similar movements into the Mon-Khmer land of Lower Burma from South India. As Gerini observes, "a double stream of emigrants from India flowed into Indo-China at a very early period. One, proceeding from the north, advanced overland through Manipur and Burma, and influenced the northern part of Indo-China as far as the Tonkin Gulf and the Chinese borders; the other, coming from the south, reached Indo-China by sea, and its influence extended mainly over the Malay Peninsula, Siām, Kamboja and Southern Assam. Thus it will be seen that Northern Indo-China owes its early civilisation to settlers from Northern India; while its southern portion, including the Malay Peninsula

and Archipelago, is indebted for its ancient development to adventurers and colonists from the Coromandel and Malabar coasts. Once this point, never hitherto cleared up, is well understood, much that is yet incomprehensible and obscure of the early history of Indo-Chinese nations will appear more distinct." (p. 122).

The North Indian colonists of the first three or four centuries before the Christian era left royal dynasties not only in Upper Burma, but Siām, Laos, Yünnan, Tonkin, and South-east Indo-China. This string of petty States from Manipur to Tonkin used Sanskrit or Pāli in their court records or epigraphs, built monuments in the Hindu style, and employed Brāhman priests and advisers for the guidance of the State. Tagaung and Pagan were only States typical of similar state of things throughout the northern parts of the Peninsula. It was from them that the Chinese derived much of their knowledge in different fields. Out of the tangle of racial convulsions and dislocations of the Peninsula the one thing that emerges as a unifying, civilising, assimilative and preservative force in unifying mankind in this part of the world is the Indian culture brought by the organised immigrant Kshatriya aristocracy in the north and the more commercialised culture of the Talaings in the south. To use the expressive language of G. E. Harvey, "The Burmese are a Mongolian race, yet their traditions, instead of harking back to China, refer to India. Their chronicles read as if they were descended from Buddha's clansmen and lived in Upper India. Even their folklore is largely Hindu. Most of their towns have two names, one vernacular and the other classical Indian, just as the Latin Church made it the fashion for every city in Europe to have a Roman name whether the Romans had been there or not. A few of these classical names are due to actual immigration from the original namesake in India; thus Ussa, the old name for Pegu, is the same word as Orissa, and Pegu was colonised from Orissa. The surviving traditions of the Burmese are Indian because their Mongolian traditions died out. The only classes who could read and write and keep traditions alive were their ruling class, the Indian immigrants" (*Hist. of Burma*, p. 6). Mr. Harvey continues: "In Upper Burma these immigrants came overland through Assam; in Lower Burma they came by sea from Madras. In some localities such as Thaton, Prome, Pegu, Rangoon and in many a town in Arakan, Indian immigrants doubtless formed a large proportion of the population; indeed the name *Talaing* is probably derived from Telingana, a region on the Madras coast whence so many of them came. Like good Hindus they built little shrines; and it is probably these shrines that form the original strata of such pagodas as the

Shwemawdaw at Pegu, the Shwedagon at Rangoon, and the Shwezayan at Thaton, all of which may well date back, in some shape or another, to before the Christian era. They brought their clergy with them, just as Chetties and European merchants do now in Rangoon, and with as little result on the people at large. As a rule their religion was a domestic matter, but in the course of centuries they became so numerous as to effect peaceful penetration. Moreover their Hinduism began to⁹ include Buddhist elements after 261 B.C. when Aśoka conquered Kalinga and introduced Buddhism into South India." (*Ibid*, pp. 6—7). Writing, law, industries, and trade were introduced into Burma as much as in Sumatra, Java, Borneo and Tonkin. Prome, Rangoon and Thaton were typical "trading principalities." We know from Burmese chronicles that the dynasty of Prome or Śrī Kshētra ended in A.D. 84 and a new capital was established at new or Lower Pagan in Middle Burma. The date is somewhat different in different authorities, the fall of Prome being placed in 95 A.D. and the foundation of new Pagān in A.D. 108. In any case the new dynasty was very much under the control of the Talaing culture; and it was during this period that a synthesis of North and South Indian cultures took place, though very often there was a rivalry between the two.

(To be Continued.)

9. There are traditions connecting Burma with the Buddha and with Aśoka directly, but the historicity of these is doubtful.

News and Notes

The Association and its Journal have just completed ten years of useful work ; and the present issue opens the eleventh volume. We take this opportunity of thanking the Director of Public Instruction, Madras, and the heads of educational institutions, who have continuously supported the *Journal* and made the recent improvements in it possible. With increased financial support, we intend to carry out further improvements in the coming years.

* * * * *

It is our great joy to welcome the Marquess of Linlithgow as our new Viceroy. With his antecedents and his great qualities of head and heart, we feel sure that no better choice could have been made at this juncture. It is gratifying to recall to our readers that the noble Marquess when he came to India as Chairman of the Royal Commission on Agriculture presided over one of the early meetings of the Associations in the very first year of its existence (22-11-1926), when Mr. R. D. Anstead, the then Director of Agriculture in Madras delivered a lecture on *The Planting Industries of South India*. M.R.Ry. Rao Bahadur H. Narayana Rao, Avl., M.A., the President of the Association then, in requesting the Marquess to take the chair, spoke prophetically as follows : —“The Marquess of Linlithgow felt the charm of India, her infinite fascination, so far as to decline an important office in his party. He would, it is hoped, give India of his best in still more exalted spheres in the years to come.”

And the Marquess himself in the course of his concluding speech said —“In such matters it is the achievement and not the promise that counted. I would, therefore, not take up your time by making any prognostication of the direction in which my recommendations would point or by giving you an undertaking that the Commission would do their best, because, as you are aware, men did not undertake those grave and arduous tasks unless they were fully determined to give all their best. It is true, no doubt, that India's future for many a long day must be based on industry and agriculture. * * * I do not desire that all the industrial conditions prevailing in the West should be introduced in Oriental countries. Nevertheless, we hope that the measurable future will see in this country a more flourishing agriculture, calling upon the industrial enterprise of India to provide it with the machinery and the agricultural implements which it required.” It is now

left to His Excellency to take his share in working for that consummation.

* * * * *

Three meetings of the Association were held during the quarter ending 31-3-'36. In the first of them, Mr. P. Sridhara Rao read a paper on “*The Geological Formations of South India*” on 25-1-'36, under the presidency of Mr. T. N. Muthuswami Iyer, which was published in the last number of the Journal. On 21-2-36, Mr. M. Vivekananda read a paper on “*Earthquakes and Seismic Activity in India*,” under the presidency of Mr. T. Sankara Singh. On 21-3-36 Mr. B. M. Thirunarayanan delivered a lecture on “*The Soils of India*” with Mr. N. Subrahmanyam in the Chair. These two papers are included in this number.

* * * * *

The Coimbatore Branch of the Association held a meeting on 8-2-36 when Mr. C. S. Subburatnam of Peelamedu High School read a paper on the *Human Geography of the Amaravathi Basin* with Mr. Rao Saheb C. M. Ramachandra Chettiar in the Chair. Another meeting was held on 8-4-36 when Mr. M. Narayanaswamy Iyer of St. Michael's High School delivered a lantern lecture entitled “*Round the Cape Comorin in Three Weeks*.” The first paper has been published in this issue ; and the second one will be included in the next number.

* * * * *

Under the auspices of the Association, twenty-five members went on a week-end excursion to Kambakkam Durgam (2,540 feet), about 50 miles from Madras. The party left Madras by one bus and two cars on the afternoon of Saturday the 29th February 1936, visiting *en route* Red Hills tank and the ruins of Sathiavedu fort and its environs. The whole of the next day was spent in the ascent and descent of the Hill, which is an outlier of the Cuddappah formations. The Hills enclose a long valley-trough, fairly well wooded, which appears to have been in former times a region of some strategic importance, as can be seen from the ruined walls and gateways in some places. One of the streams in the Valley, it is said, was a retreat of holy men, and its name *Japala Madugu* (the stream of austerities) is reminiscent of that tradition. Its strategic importance arises from the fact that the eastern coastal route is very much constricted here between these Hills and the Pulicat Lake. The region appears to be quite an interesting one from various points of view ; and it is proposed to re-visit the place next year, making a longer stay and fuller study.

* * * * *

The Tenth Annual Meeting of the Association was held at 5 P.M., on the 30th April 1936 at the Teachers' College, Saidapet, under the Chairmanship of Mr. K. Srinivasaraghavan, M.A. After the reading of the Annual Report the following persons were elected as members of the Working Council for the year 1936-37 :— Miss E. D. Birdseye (*President*), Miss J. M. Gerrard and Mr. Rao Bahadur R. Krishna Rao Bhonsle (*Vice-Presidents*), Mr. N. Subrahmanyam (*Secretary*), Mr. K. Sundaresan (*Treasurer*), and Mr. George Kuriyan, Mr. B. M. Thirunarayanan, Mr. V. K. Sundaram and Mr. Rao Saheb C. M. Ramachandra Chettiar (*other members of the Council*).

After the business meeting was over, Prof. R. Gopalan, M.A., delivered a lecture on "*Some Aspects of Animal Geography*," which was illustrated with the help of the Epidiascope. Mr. N. Subrahmanyam then gave a short talk on "*The Use of Pictures in the Teaching of Geography*," which was also similarly illustrated.

The Sixth Summer School of Geography was opened at the Teachers' College, Saidapet, by Mr. R. M. Statham, M.A., C.I.E., Director of Public Instruction, Madras, on 15-4-36; and Mrs. P. S. Sundara Raj, F.R.G.S., delivered the Inaugural Address in connection with it, which is published in this number of the Journal. 36 teachers joined the course; and it is interesting to note that several of them have come from such distant places as Jamkhadi and Rajkot in the Bombay Presidency, Secunderabad, Bangalore, Berhampore, Mangalore, Cannanore, Nazareth, etc. Another interesting feature of the school this year was that half the number of teachers attending the course were ladies.

Before declaring the Summer School open, Mr. R. M. Statham said in the course of his speech :—"I appreciate very much the work which the Association has been doing; and particularly I may make special mention of the real and valuable propaganda work which the Association has been doing in the Presidency and in all parts of India in favour of Geography. The Association Journal is a very good production. I am happy to note that the work of the Association and its Journal are known even outside India, in Europe and other countries. By taking up the running of the Summer School course, you are serving a very real need indeed. Unfortunately in India there are not many degree courses in Geography; and seeing how the curriculum of schools has been changed, I consider the work of the Association a very great bene-

fit to the Educational Department. I congratulate the Association for working on its own resources without expecting Government Grant." The Summer School was brought to a close on 5th May 1936 with a *Valedictory Address* by Miss J. M. Gerrard; and a full Report of its working will be published in the July number.

The Sixth Geographical Conference will be held at Salem on the 7th, 8th and 9th May, as per programme already published (Vide last page of the Tenth Annual Report for 1935-36). 16 papers have so far been presented on various aspects of the Geography of Salem District; and excursions will be arranged to places of geographic interest in the District such as Hogainakkal Falls, Mettur Dam, Magnesite Works, Yercaud and Kolli Malais. A Report of the Proceedings of the Conference together with all the papers read will be published in the July issue of the Journal.

The Refresher Course in Geography organised by Mr. D. Samuel, M.A., District Educational Officer, Tinnevely, for the benefit of teachers in the District, could not be held in December last, as originally intended. It was now conducted by Mr. T. S. Sundaram Ayyar for a fortnight from 15-4-36. 45 teachers, representing almost all schools in the District, attended the course.

The Director of Public Instruction, Madras, has issued a comprehensive Questionnaire regarding the reorganisation of the S.S.L.C. Scheme to the Heads of High Schools in the Presidency. It is hoped that educationists will give their considered opinion, and the S.I.T.U., whose Conference will be held shortly in Salem in May, will discuss the Questionnaire from all points of view, and express itself and formulate a healthy scheme, giving a right lead in the matter. It is hoped that the Director and the S. S. L. C. Board will settle the question permanently, as the present uncertainty does not tend to efficient and sound education. We hope that in the final solution the importance of Geography will be duly recognised and a proper place assigned to it in the final scheme.

At its Conference held recently at Bhimavaram, the West Godavery Teachers' Guild passed a resolution, requesting the S.S.L.C., Board to give more prominence to Geography by holding a two-hour examination for the subject in the S.S.L.C. Scheme. We heartily support this request, and hope it will be granted, as it will tend to the best interests of the subject and the examinees.

64 JOURNAL OF THE MADRAS GEOGRAPHICAL ASSN.

The University Geography Department, which was hitherto working in a rented hall in the Wesleyan High School, Royapettah, has been shifted to the University's own buildings, just completed near the Senate House. The Diploma classes in Geography will be held from July 1936 onwards, in the new premises. In view of the growing importance of the subject and the need for prospective teachers of Geography to get first of all a grounding in the subject, it is expected that the Diploma class will become fuller and more popular. With growing strength, the University also will be able to provide for the teaching of the alternative subjects in the course such as Historical Geography and Bio-Geography, instead of forcing all students to take up Economic Geography alone.

Reviews

North America. By Thomas Pickles. (J. M. Dent & Sons, London). 1936. Price 2s.

This book is suited for use by pupils of High Schools, who are preparing for the Secondary School-Leaving Certificate and Matriculation examinations. In the choice and presentation of the material, relationships between natural phenomena and human activities have been generally brought out; and the treatment made rational and realistic. Some of the chief historical factors which have influenced the modern development of the areas studied have also been outlined, thereby infusing living interest in the studies. Tables of Statistics have been appended to each chapter; and these can form the basis of exercises framed by the teacher. The volume includes a treatment of Central America and the West Indies also. It is well illustrated with a dozen pictorial plates and 74 useful maps and charts.

A New Geography: Book I (In Tamil for Form I). By Rajamani J. Johnson and B. Clutterbuck. (Macmillan & Co., Madras). 1935. Price Re. 1.

This is a text-book prepared in Tamil for use in Form I in accordance with the recent departmental syllabus in Geography for middle school classes. The first part treating about India is naturally fuller than the latter part dealing with the Southern continents. The volume has been copiously illustrated with sketch-maps, diagrams and pictures. We feel, however, that several unnecessary details, which go to swell the volume to no purpose, and are not of geographic importance, might well have been omitted. The book has apparently been brought out very hastily; and several mistakes have crept in, many of which have been corrected in the list of errata. One of these, not corrected on page 107 is Walajabad (a town in Chingleput District) for Walajah Road in North Arcot District. Again, there is no doubt a difficulty in getting proper technical terms in the mother-tongue. Still the use of the word *படுகை* for *basin* (as in the Orinoco *basin*) seems objectionable, for the word would mean *bed* and not *basin*. The book is on the whole better than the ordinary middle school geography book; and we are sure that the few errors and the unnecessary details would be eliminated in the next edition.

Experimental Geography (Books I, II and III). By A. D. Merri-
man (Thomas Nelson & Sons, Edinburgh). Price 2s.

This is a very useful series of books on Practical Geography, including observational work, covering mathematical and physical geography. As Prof. J. H. Nicholson of Durham University says in his foreword, "The matter is well selected and arranged, the illustrations are distinctly good and to the point, and the exercises are well-designed to maintain interest and to ensure that the principles studied have been understood and can be applied to practical problems." These books may be recommended for use in High Schools where C. Group Geography is taught as well as in Training Schools and Colleges.

The Oxford Advanced Atlas (Fifth Edition). By John Bartholomew.
(Oxford University Press). 1936. Price 10sh. 6d.

The fifth edition of this well-known Atlas has been considerably enlarged and improved to such an extent that even those who already possess copies of the earlier editions will find it to their advantage to go in for this edition. Among the improvements may be noted the following:—The size of the page is increased in width, so that the double-page plates now measure approximately 20"×14¾" instead of 18"×14½" as formerly. An important new projection, termed the *Recentred Sinusoidal*, is used for the World Political and Population maps, so that it has been possible to show all land areas true to scale and with a minimum of distortion, as can clearly be seen by a comparison with Mercator or Mollweide. For Europe a valuable new map of Morphology has been introduced, classifying land forms into their different types, and showing where earlier river systems of the Great Ice Age have played their part. The physical maps of the British Isles show added detail; and a new population map is given along with a general Political and Railway Map. Seismology is an improved plate, while 'Storm Tracks' is an addition to Climatology. Entirely new maps (generally double-page) have been introduced for several important 'regions', notably the Soviet Union, S. W. Asia, the Malay Archipelago and the Atlantic and Pacific Oceans. Altogether a very useful atlas to students of Geography as well as to general readers.

Books and Journals Received

Experimental Geography, Books I, II and III: By Dr. A. D. Merri-
man.
A New Geography (Book I) for Form I: By R. J. Johnson and B.
Clutterbuck.
North America: By Thomas Pickles.
Oxford Advanced Atlas (Fifth Edition): By John Bartholomew.
*Studies of the Morphological Activities of Rivers, as illustrated by
the river Fyris*: By Hjulstrom.
Kalaimagal: February, March and April 1936.
The Geographical Magazine: February, March and April 1936.
The Educational Review: February, March and April 1936.
The South Indian Teacher: February and March 1936.
The Indian Educator: February and March 1936.
The Geographical Journal: February, March and April 1936.
Our Home Magazine: February 1936.
Journal of the Andhra Historical Research Society: April 1936.
Geography: March 1936.
Mitteilungen der Geographischen Gesellschaft in Hamburg. Bd.
XLIV.
Educational India: March and April 1936.
Academy Hayk: Geography (Russia): Bk. 15.
Indian Journal of Economics: January 1936.
Journal of Indian History: December 1935.
Journal of Annamalai University: March, 1936.
The Scottish Geographical Magazine: March, 1936.
Geographical Review (New York): April, 1936.

SOME IMPORTANT PAPERS PUBLISHED IN PREVIOUS NUMBERS OF THE JOURNAL

1. *Some Aspects of the Geography of Madras*: By Miss E. D. Birdseye.
2. *The Geographical Evolution of Madras and its Environs*: By Rao Bahadur H. Narayana Rao.
3. *The Flora of Madras and its Environs*: By Mr. M. S. Sabhesan.
4. *The Planting Industries of Southern India*: By Mr. R. D. Anstead.
5. *Rural Geography* (With special reference to South India): By Mr. N. Subrahmanyam.
6. *The Birds of South India: their Distribution and Habits*: By Mr. C. Lakshminarayana.
7. *South Indian Cattle: their Breeds and Distribution*: By Mr. A. Swaminatha Ayyar.
8. *Stages in the Growth of the City of Madras*: By Professor Srinivasa Chari.
9. *Sewage and City Geography*: By Mr. A. Swaminathan.
10. *Rural Life on the West Coast: A Study in Environment*: By A. Appadorai.
11. *The Geographical Data of the Sangam Works*: By Professor V. Rangacharya.
12. *Notes on the Maps of Old Madras preserved in the Madras Record Office*: By Professor C. S. Srinivasa Chari.
13. *The Buckingham Canal: A Survey—Historical, Geographical and Economic*: By Mr. V. K. Sourirajan.
14. *The Geographical Basis of Ancient South Indian Culture*: By Professor P. T. Srinivasa Ayyangar.
15. *Some Results of Recent Upper Air Investigations*: By Dr. K. R. Ramanathan.
16. *Studies in the History of Some Common Commodities*: By Professor V. Rangacharya.
17. *The Comorin Continent*: By Mr. C. P. Gnanamuthu.
18. *The Geographical Distribution of Disease* (With special reference to South India): By Major A. M. V. Hesterlow.
19. *Environments and Economic Activities in the Madras Presidency*: By Mr. K. C. Ramakrishnan.
20. *South Indian Pearl Fisheries*: By Dr. B. Sundara Raj.
21. *Migration of Labour* (With special reference to South India): By Dr. P. S. Loganathan.
22. *Statistical Sources for the Study of the Economic Geography of India*: By Mr. K. C. Ramakrishnan.
23. *The Geography of Kalidasa*: By Mr. C. Sivaramamurthy.
24. *Localisation of Industry in India*: By Dr. P. S. Loganathan.
25. *South India of Venkatanatha's Days*: By Mr. C. Sivaramamurthy.
26. *Economic Geography of the Vizagapatam District*: By Mr. T. Appalanarasayya.
27. *The Geographical Evolution of India*: By Mr. T. N. Muthuswami.
28. *Sugar Industry in India*: By Mr. K. C. Ramakrishnan.

A limited number of back issues of the Journal are available at specially reduced prices. The Conference numbers contain papers on various aspects of the Geography of the following Districts: Coimbatore, Malabar, Madura, Trichinopoly, Anantapur and Salem. They are of permanent value as reference books; and no school or college library in South India can afford to remain without them.

THE TENTH ANNUAL REPORT OF THE MADRAS GEOGRAPHICAL ASSOCIATION, 1935-36

THE WORKING COUNCIL

For 1935-36.

EX-OFFICIO MEMBERS.

President.

Miss Irene H. Lowe, M.Sc., F.R.G.S.,
Inspectress of Schools, Coimbatore.

Vice-Presidents.

1. Miss E. D. Birdseye, B.Sc.,
Principal, Wesleyan Mission Girls' High School, Royapettah, Madras.
2. M.R.Ry. Rao Bahadur R. Krishna Rao Bhonsle, B.A.,
3. Miss J. M. Gerrard, M.A.,
Principal, Lady Willingdon Training College, Madras.

Secretary.

Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S.,
Lecturer in Geography, Teachers' College, Saidapet.

Treasurer.

Mr. G. Narayanaswami M.A., L.T., DIP. IN GEO.,
Geography Master, Teachers' College, Saidapet.

OTHER MEMBERS.

1. Mr. George Kuriyan, B.Sc. (LOND.),
Lecturer in Geography, University of Madras.
2. Mr. B. M. Thirunarayanan, B.A., (HONS.),
3. Miss A. Devadasen, M.A., L.T., DIP. IN GEO.,
Geography Mistress, Lady Willingdon Training College, Madras.
4. Mr. Rao Saheb C. M. Ramachandra Chettiar, B.A., B.L.,
President, District Educational Council, Coimbatore.

THE TENTH ANNUAL REPORT OF THE MADRAS
GEOGRAPHICAL ASSOCIATION, 1935-36.

The Working Council of the Madras Geographical Association has the honour to present the following Report for the year 1935-36:—

Strength.—The strength of the Association at the commencement of the year was 234 as against 290 at the commencement of the previous year. During the year 9 members resigned and 57 members were removed from the list for non-payment of arrears of subscription. 20 new members were enrolled during the year. The strength of the Association on 31-3-36, therefore, stood at 188, including four life members.

The Journal had 160 subscribers during the year as against 172 in the previous year. Of these 82 are official subscribers as against 72 in the previous year; and 78 are member-subscribers as against 100 in the previous year.

Financial position.—The financial position can be seen from Appendix A, which shows that the total subscriptions for the year (including the Journal) amounted to Rs. 1305 as against Rs. 1,600 for the previous year. The Association Fund stood at Rs. 462-13-6 at the beginning of the year and there has been a surplus of Rs. 14-5-5 added during the year, as shown by the Income and Expenditure Account, which brings up the balance of the Fund to Rs. 477-2-11. The total of the Association, Research and Capital Funds at the end of the year amounted to Rs. 783-2-11.

The Working Council.—The Working Council met thrice during the year; and urgent business was transacted by circulation.

A list of the *ordinary meetings* of the Association is given in Appendix B.

The Standing Committee of the Association met five times during the year. In the second meeting, a Questionnaire was prepared regarding the teaching of Geography in the High Schools and Training Schools of the Presidency; and it has been sent to those schools with the permission of the Director of Public Instruction who has ordered the results of the investigation to be communicated to him. In the last three meetings, the scheme of work in Geography for the lower school was discussed; but the work has not been completed.

The Vizagapatam and Coimbatore branches of the Association continued to work satisfactorily during the year. The former organised a successful excursion to Chattikona Falls on the Eastern Ghats; and the latter had some interesting papers read. Of these, *the Noyyal Basin* by Mr. Rao Saheb C. M. Ramachandra Chettiar has been published in Volume X, No. 3 of the Journal of the Association. The paper on the Amaravathi Basin by Mr. C. S. Subburatnam will be published in the issue of April 1936.

The Fifth Summer School of Geography was conducted in the Teachers' College, Saidapet during April 1935, which was attended by 37 teachers (including 3 ladies). A Report of it was published in the issue of the Journal for July 1935. The Working Council feels specially indebted to the following lecturers, who did honorary work in the Summer School:—Messrs. George Kuriyan, B. M. Thirunarayanan, S. Balakrishna Iyer, S. Muthukrishna Iyer, T. Sankara Singh, G. Narayanaswami Iyer and N. Subrahmanyam.

Excursions.—Though there was no major excursion of the Association during the Michaelmas holidays as in the two previous years, there was an interesting excursion in February last to Kambakkam Durgam (2,540 feet) about 50 miles from Madras, in which 25 members (including 3 ladies) participated. A detailed account of it will be published in the Journal for April 1936. The excursion to Chattikona Falls by the members of the Vizagapatam branch has already been noted above.

The proposed *Decennial Celebration* of the Association was decided to be put off to next term, as a result of His Majesty's demise.

In conclusion, the Working Council has to note with regret that there has been no improvement in the set-back noted last year in the strength and financial position of the Association. This was traced partly to the altered position of Geography in the proposed 1934 S. S. L. C. Scheme and partly to the widely prevalent salary cut. It is hoped that with the passing off of these temporary conditions during the coming year, the strength and financial position of the Association will improve.

(By order)

Gopalapuram Cathedral P.O.
Madras, 14th April 1936.

N. SUBRAHMANYAM,
Secretary

APPENDIX A.

THE MADRAS GEOGRAPHICAL ASSOCIATION, MADRAS

Balance Sheet as at 31st March 1936.

Liabilities.		Assets	
	Rs. a. p.		Rs. a. p.
Advance Subscriptions:		Furniture (at cost) ..	120 13 0
Ordinary Mem-ship	27 7 0	Cycle (at cost) ..	45 0 0
The Journal	14 0 0	Books, Maps & Equip-ment (at cost) ..	232 8 6
	41 7 0	Subscriptions Outstanding:	
Liabilities for expenses:		Ordinary Membership:	
Press bill due	222 4 9	for 34-35 Rs. 2.	
Capital Fund:	300 0 0	35-36 " 141.	
Research Fund	6 0 0		143 0 0
Association Fund:		The Journal:—	
Balance as per last Balance sheet	462 13 6	for 33-34 Rs. 10.	
Add surplus since	14 5 5	34-35 " 13.	
	477 2 11	35-36 " 155.	
			178 0 0
		Cash & Other Balances:	
		Cash to be remitted	2 0 0
		Balance of Imprest A/c.	72 0 1
		Balance on S. B. A/c. with Indian Bank Ltd.	253 9 1
Total	1,046 14 8	Total	1,046 14 8

Note:—Articles not included in the above statement and received by the Society in kind will be recorded in a separate inventory.

N. SUBRAHMANYAM,
Secretary.

G. NARAYANASWAMI,
Treasurer.

J. M. GERRARD
Vice-President,

AUDIT REPORT.

Verified the above Balance Sheet as at 31st March 1936 of the Madras Geographical Association, Madras, with the books of account relating thereto. The statement shows a true and correct state of affairs of the Association as on that date according to the books maintained and in the information and explanations furnished.

Madras, 6th April 1936.

G. L. NARASIMHAM, R. A., G. D. A.,
Registered Accountant,
Auditor.

THE MADRAS GEOGRAPHICAL ASSOCIATION, MADRAS

Income and Expenditure Account for the Year Ending 31st March 1936.

Expenditure.		Income.	
	Rs. a. p.		Rs. a. p.
To Journal Expenses ..	684 6 9	By Subscription received	
Stationery	8 14 6	and Outstanding:—	
Expenses of meetings	4 8 0	Ordinary Membership	392 0 0
Conveyance charges	51 9 0	The Journal	913 0 0
Travelling Allowance	53 14 0	Advertisement	32 0 0
Cycle License & Repairs	8 1 0	Sale of copies of Journal	1 3 0
Office rent	180 0 0	V. P. Charges recovered	
Summer School Expenses:		and sundries	2 11 0
Paid Rs. 10 12 0		Interest from Bank	2 6 8
Less Open- ing dues Rs. 8 14 0	1 14 0	Summer School:	
		Fees	370 0 0
Postage	165 0 0	Hostel rent	3 0 0
Excursions	2 0 0		
Telephone & sundries	2 10 6		
Fee to auditor	20 0 0		
Clerk & Peon	87 8 0		
Branch Expenses	3 0 0		
Cost of views, etc.	1 9 6		
Balance c/d.	441 5 5		
Total ..	1,716 4 8	Total ..	1,716 4 8
To Irrecoverable subscrip- tions written off—		By Balance b.d.	
Ordinary Membership	211 0 0		441 5 5
The Journal	216 0 0		
Surplus (to B. sheet)	14 5 5		
Total ..	441 5 5	Total ..	441 5 5

G. L. NARASIMHAM,
Auditor.

G. NARAYANASWAMI,
Treasurer.

N. SUBRAHMANYAM,
Secretary.

THE MADRAS GEOGRAPHICAL ASSOCIATION, MADRAS

Statement of Receipts & Disbursements for the Year Ending 31st March 1936.

Receipts.		Disbursements.	
	Rs. a. p.		Rs. a. p.
Opening Balances :		Expenses :	
Cash to be remitted ..	8 8 0	Journal Expenses ..	562 2 0
Balance of Imprest A/c. ..	2 12 7	Return of "Advance by Secretary for Potage." ..	140 0 0
Balance Indian Bank S. B. A/c. ..	177 3 5	Stationery ..	8 14 6
Receipts :		Expense of meetings ..	4 8 0
Interest from Bank ..	2 6 8	Conveyance ..	51 9 0
Subscriptions :		Travelling allowance ..	53 14 0
Life Membership ..	80 0 0	Cycle License & repair ..	8 1 0
Ordinary Membership ..	332 7 0	Office rent ..	285 0 0
The Journal ..	827 0 0	Summer School :	
Summer School :		Hostel rent ..	3 0 0
Fees ..	370 0 0	Photos, etc. ..	7 12 0
Hostel rent ..	3 0 0	Postage ..	165 0 0
Advertisement ..	32 0 0	Excursions ..	2 0 0
V. P. Charges recovered ..	2 11 0	Telephone & sundries ..	2 10 6
and sundries ..	1 3 0	Fee to auditor ..	20 0 0
Sale of copies of Journal ..	1 3 0	Clerk & Peon ..	122 8 0
		Cost of Cycle ..	45 0 0
		Branch Expenses ..	3 0 0
		Cost of views, maps, etc ..	26 11 6
		Closing Balances :	
		Cash to be remitted ..	2 0 0
		Balance of Imprest A/c. ..	72 0 1
		Balance with Indian Bank S. B. A/c. ..	253 9 1
Total ..	1,839 3 8	Total ..	1,839 3 8

N. SUBRAHMANYAM,
Secretary.

Accounts passed at meeting held on
14-4-36.

J. M. GERRARD
Chairman of E. Committee.

G. NARAYANASWAMI
Treasurer.

Checked and found correct in accordance
with the books.

G. L. NARASIMHAM,
Auditor.

Madras, 6th April 1936.

APPENDIX B.

List of Meetings held in 1935-36.

DATE.	SUBJECT.	LECTURER.	CHAIRMAN.
10- 8-1935	Indian Geography as Key to the Ramayana and the Ramayana as Key to Indian Geography.	Mr. Diwan Bahadur K. S. Ramaswami Sastri.	Prof. V. Rangacharya.
24- 8-1935	Anthropo-Geography of the Dekhan.	Mr. V. R. Ramachandra Dikshitar.	Mr. George Kuriyan.
6-11-1935	The Political Geography of the Italo-Abyssinian Conflict.	Mr. V. Venkataraman.	Mr. Joseph Franco.
14-12-1935	The Tourist Industry in the West.	Mr. N. Subrahmanyam.	Miss E. D. Birdseye.
25- 1-1936	The Geological Formations of South India.	Mr. P. Sridhara Rao.	Mr. T. N. Muthusawmi Ayyar.
21- 2-1936	Earthquake and Seismic Activity in India.	Mr. M. Vivekananda.	Mr. T. Sankar Singh.
21- 3-1936	The Soils of India.	Mr. B. M. Thirunarayanan.	Mr. N. Subrahmanyam.

Longmans' Select List of

TEXT-BOOKS

- SECONDARY SCHOOL GEOGRAPHY. By L. D. Stamp, D.Sc. Re. 1-12.
INDIA AND THE WORLD STUDIES. By L. D. Stamp, D.Sc. As. 15.
PART I, INDIA. English Edition. As. 10.
Tamil Edition. As. 10.
A NEW SERIES OF GEOGRAPHY BOOKS FOR FORMS 1, 2 and 3. By
L. D. Stamp, D.Sc. Based on the latest Departmental Syllabus. In Tamil
and Telugu. Book I, Ready. Other Books will be ready shortly.
GEOGRAPHY OF MADRAS PRESIDENCY. By N. Subrahmanyam, M.A.,
L.T., Malayalam Edition, As. 7. Tamil and Telugu Editions, As. 6 each.

ATLASES

- LONGMANS' SENIOR ATLAS FOR INDIA. Edited by George Philip. Rs. 2.
THE TAJ MAHAL ATLAS of Comparative Geography. Edited by George
Philip. Re. 1-5-6.
LONGMANS' VERNACULAR ATLASES. In Tamil, Telugu and Urdu.
As. 12 each.

BOOKS FOR TEACHERS

- MEMORANDUM ON THE TEACHING OF GEOGRAPHY. Issued by the
Incorporated Association of Assistant Masters in Secondary Schools.
7s. 6d. net.

(IT IS THE GEOGRAPHY TEACHERS' 'VADE MECUM'.)

- GEOGRAPHY IN SCHOOL. By James Fairgrieve, M.A. 7s. 6d. net.
A JUNIOR PRACTICAL GEOGRAPHY. By E. J. Orford; Pupils' Book, limp
Cloth, 1s. 6d. Teachers' Book 3s. 6d.
SENIOR PRACTICAL GEOGRAPHY. By E. J. Orford. Pupils' Book, limp
Cloth, 2s. 2d.
REGIONS OF THE WORLD. In Pictures. By G. J. Cons, M.A. Sixteen
Pictures in each set put in an envelope. 1s. 3d. each set.
SET 1 Northern Africa. SET 2. West and Central Africa.
SET 3. East Africa. SET 4. South Africa.
A SYSTEMATIC REGIONAL GEOGRAPHY. By J. F. Unstead.
Part I. The British Isles, 6s. net.

MAPS AND MAP-MAKING

- MAPOGRAPH Outfit. Easy to get outline maps which can be rolled off
straight into the note-book or in a sheet of paper at the rate of 60 a
minute. No preparation, no mess. Available for all continents and
most of the countries. Particulars on application.

- WALL MAPS in Vernaculars and also in English are available in various
sizes. A special catalogue of Maps and Globes will be sent on request.

LONGMANS, GREEN & CO., LTD.,
36-A, MOUNT ROAD, MADRAS.



THE MADRAS GEOGRAPHICAL ASSOCIATION RULES

1. The name of the Association shall be 'The Madras Geographical Association'.

Objects.

2. The objects of the Association shall be:—
(A) To promote geographical knowledge;
(B) To secure for geography its proper place in the High School, the University and its constituent and affiliated colleges;
(C) To help to improve the methods of teaching geography;
(D) To work for a school of geography being started;
(E) To promote studies about South India from various stand-points.
3. These objects shall be secured by:—
(A) Holding meetings and conferences, and publishing periodicals and occasional bulletins;
(B) Organizing geographical exhibitions and excursions;
(C) Helping in the preparation of geography books in the languages current in the Presidency;
(D) Forming a central library of geographical literature, and collecting maps, charts, plans, models, slides and instruments;
(E) Providing for circulation to members, of books, periodicals and other collections;
(F) And by such other ways as are deemed necessary to effectuate the objects of the Association.

Membership.

4. The membership of the Association shall be open to all those who are interested in the promotion of geographical knowledge or in the teaching of geography.
5. There shall be two classes of members, honorary and ordinary.
6. Honorary members are those who shall be so elected by the council by the majority thereof present at its meeting. They shall be exempt from liability to pay subscription, and shall have all the privileges of ordinary members, except voting.
7. A person shall become an ordinary member upon the proposal by a member, the seconding by another member and approval by the council by the majority thereof present at its meeting. He shall pay an annual subscription of rupees two, payable in one instalment or in two equal half-yearly instalments at his option.
8. Those who pay an amount of hundred rupees in two years become LIFE MEMBERS, and they shall be exempt from payment of any further subscriptions.

36
Vign 211, 11-26-19
11-36-11-1

THE JOURNAL OF The Madras Geographical Association

The Journal is a Quarterly published every April, July, October and January. It contains mainly original papers read before the Association; but, it will also include articles, notes, reviews, etc., useful for the teacher of Geography.

The annual subscription is Rs. 4 for members (excluding the membership subscription of Rs. 2), and for non-members and institutions Rs. 8.

The Journal is a good medium of advertisement for Geographical publications, apparatuses and appliances.

Advertisement Rates.

Full page per insertion	..	Rs. 10
Half page „ „	..	„ 6
Quarter page „ „	..	„ 4

All correspondence to be addressed to the Secretary,

**The Madras Geographical Association,
Gopalapuram, Cathedral Post, Madras.**

THE SOUTH INDIAN TEACHER (Is the Teachers' Journal)

Do you get a Copy of it!

If not write at once,

With the Annual Subscription,

Rs. 3 0 0 only.

**To the Hony. Secy. & Manager,
41, Singarachari Street,
TRIPLICANE, MADRAS.**