Vol. XVIII January—March 1943 No. 1

The Indian Geographical Journal

Formerly

THE JOURNAL OF THE MADRAS GEOGRAPHICAL ASSOCIATION.

PUBLISHED QUARTERLY.

EDITOR

George Kuriyan, B.A., B.Sc.

The Sudden demise of Mr. N. Subrahmanyam and the difficulty of Securing paper have mainly been responsible for the inordinate delay in the publication of this number which it is earnestly requested may be condoned.

EDITOR.

Wellclose, Cathedral P.O., Madras.

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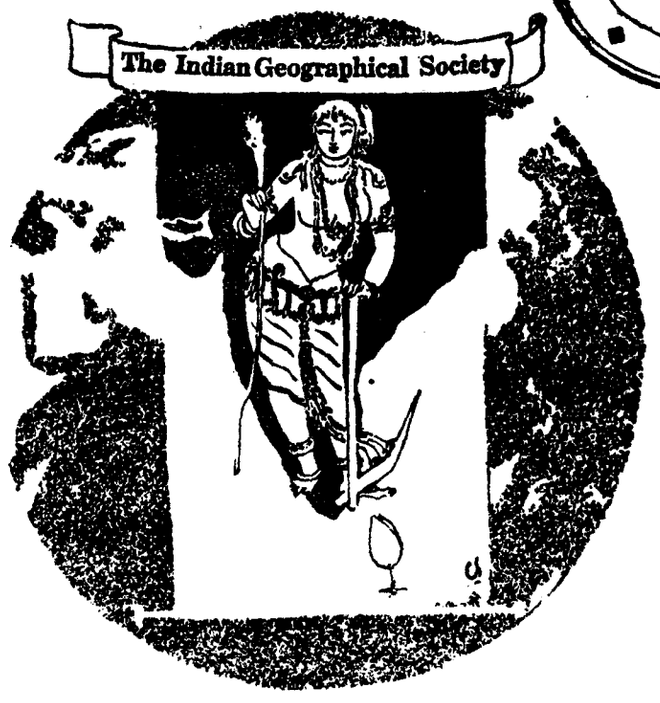

THE INDIAN GEOGRAPHICAL SOCIETY,

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THE LATE N. SUBRAHMANYAM

The Late N. Subrahmanyam, M.A., L.T., F.R.G.S.

A SKETCH

BY

DR. C. RAMAMURTI, B.A., B.S.SC., M.B.B.S.

I. Birth and Formative Years.

The late N. Subrahmanyam was born in the town of Polur, (Polur Taluk, North Arcot District), his mother's maternal uncle's place, on 14th January 1885. He came of Appayya Dikshita family which has produced in these four centuries a long line of celebrated Sanskrit scholars.

His father Arunachala Dikshitar (d. 1918) was an Additional Translator to the High Court, Madras, for thirty years. His services were engaged where high accuracy was required as in Privy Council Cases, thanks to his mastery of Tamil, Telugu, Sanskrit and Law English.

Mrs. Balakucham, his mother, died when he was scarcely five years old; but her mother, Mrs. Lakshmi, a sweet flower of ancient Hindu womanhood, lived long enough to shed upon him her benignant influence.

Many a trait of his, observed in later life—his successful leadership of excursion parties and his drive, his wander-lust and impulse to travel far and wide to geographise his knowledge and

concretise his Geography with tours all over India, Great Britain and the Continent, at his own cost—all these were derived from his maternal grandfather, C. Sivarama Aiyar (d. 1905), a man of strong will and decision of character, great drive and physical endurance, who did the pilgrimage from near Arcot to Benares on foot twice and would lead pilgrims of undisciplined relations without a mishap on the way in the eighties and nineties of last century when railway communications and means of transport were still primitive and circuitous.

Apropos, it may be mentioned that N. Subrahmanyam planned to write an Historical Geography of South India and for that purpose gathered materials and made tours to most places to trace on the ground the several routes and the scenes of battle and realise the geographical factors behind. But he sacrificed his own research opportunities, precarious as they were, in order to create full and substantial research opportunities for others at large.

From those grand-parents, five generations have come up, many of whom have made their mark in public life and service; by this widening circle of relations he was received with esteem; and he kept up affectionate contacts with them.

When it came to choice of profession, he chose Education under the shining example of his maternal uncle (and my father) C. Chandrasekhara Sastri, B.A., a profound Sanskrit and English Scholar; who dedicated himself to Education and who, in his brief years (d. 1887, 32 years old)—'one crowded hour of glorious life' —under the patronage of the Maharajahs, Vizaya Rama Gajapathi Ras and Ananda Gajapathi Ras raised the High school at Vizianagaram to a Graduate College and became its first Principal and also the first Indian Principal of any College in South India up to that time.

No sketch of the late N. Subrahmanyam's character can omit the personality of his virtual Guru who moulded it and who was far and away the greatest factor in his mental and moral make-up. He was the late C. Chandrasekhara Iyer (d. 1915) of Royapuram, Madras; son to the erudite C. Krishnaswami Iyer, (d. 1883) cousin to that illustrious namesake Sastri, just mentioned, cousin to Sir C. V. Kumaraswami Sastri (d. 1934) and grandson to the celebrated C. Ranganatha Sastri (d. 1881) who was the first to re-

ceive education of the modern type. He was thus suckled in a great tradition of scholars and gentlemen. Prof. K. B. Ramanathan once described them as the Tondiarpet and Royapuram Circles with high cultural traditions making a happy blend of the East and the West; and of the Old and the New. He had a brilliant intellect, keen wit and playful humour; was simple as a child and sincere; was easily the master of two literatures, Sanskrit and English; and abreast of modern thought. He set us, boys, at ease in his company, encouraged us to be free in mind, to assess values; to speak with open heart; served us with the cream of Literature and Scientific Thought and with a store of instructive anecdotes. To talk with him was liberal education and to be with him was to be, as it were, in a true residential university. From him N. Subrahmanyam derived his social ease, catholicity, resilient and open mind and his capacity to meet situations and mix in societies.

He learnt Rapid Reading and Fluency in English, of his cousin H. H. The Puri Sankaracharya, and had his schooling up to V Form in Muthialpet High School, Madras. He passed his Matriculation and F. A. (corresponding to the modern Inter.) examinations in first class and graduated from Pachaiappa's College, Madras (taking a high second class) with History and Economics. His undergraduate studies included the Elements of Physics, Chemistry, Physiology, Elementary and Advanced Mathematics of Inter. Standard. This grounding helped him vastly in his self-study of Modern Geography. He carried all the Sanskrit prizes and scholarships and got the English Essay Prize open to all the classes of the College.

Some teachers left a deep impression upon him. The erudite Prof. Ramanathan infected him with zeal for Co-operation and the Teachers' Guild. There was the shrewd and sagacious Professor K. Ramanujachari who commanded respect and compelled the attention of every single member of the class, whatever the subject he taught. He was master of clear exposition and incisive analysis. Better teacher there was none to be mindful of the weak and put them into the fold. His methods of teaching were not lost upon N. Subrahmanyam or other fellow-pupils who like him took to Education—C. S. Srinivasachari, T. K. Duraiswamy Iyer, A. Venkatraman etc. He was stirred by the boundless enthusiasm of Prof. Drew lecturing on Tennyson or Greek History, which in

his day he emulated and followed. The greatest influence at College, however, flowed from Mr. Yates, the Principal, who taught his pupils not to cram but to think, to look beyond the Lecture Room and Examination Hall to Cultural Aspects. In his frequent 'At Homes' to which we were invitees he made us feel at ease and taught us to admire Art and Music and gave us glimpses of English life. The friendship struck up then grew with years and has been sundered now only, with the death of the pupil.

II. Government Service.

Immediately after graduation, Mr. Yates appointed N. Subrahmanyam, teacher in the High School, had him undergo training at Teachers' College, Rajahmundry, and drafted him into Subordinate Educational Service, when he himself became an Inspector of Schools. He took his M. A. Degree in History some fifteen years after, while he was teacher, to qualify for College lecturership.

A man entering Government service at the lower rungs of the official ladder gets the chance, if he is diligent, of disciplining himself for all drudgery; and has the opportunity, if he has a waking eye, of looking abroad and gaining experience in many posts and at many places. The Government has created a certain number of posts and selects a certain personnel to fill them, who are expected to fit themselves into several of them; and the exigencies of service require a man to be rolled from one to another, irrespective of other considerations. That is in the order of things here. But a rolling lecturer can at least gather much knowledge and N. Subrahmanyam turned them all to advantage. He was ever a thorough and indefatigable worker and he was all the better, for serving at Rajahmundry; Mangalore; Villupuram; Madrasa-I-Azam; Presidency College and Saidapet. He had to lecture on History of several countries and on different periods of History; on Theory and Practice and History of Education; and on Geography both in substance and methods of teaching. As early as 1906, he learnt through Mr. Yates of the leaven of Modern Geography fermenting then in Britain; even while he was only History lecturer, his interest in Geography was keen; he cultivated it albeit under adverse conditions; got the modern outlook from the start and became geographer

of first rank by dint of self-study. Off and on he was acting Lecturer in Geography and was appointed to the Chair at Saidapet permanently in 1926, which he filled with distinction till he retired from Government service in 1940.

III. Geographical Association.

By this time a very potent influence began to exert its full force upon him and shape him for his life-work of Modern Geography, inspiring him with high standards and ideals, helping him break through his shyness and diffidence, and setting him on the ways and means. It came from another fellow-disciple of the late C. C. Iyer of Royapuram, the versatile Mr. M. Subramaniam, B.A., B.L., (his mother's cousin) a man of deep and wide scholarship and of varied experience in affairs and organizations and modern movements here. Their talents were complementary, both idealists, the one a hard original thinker, the other a splendid organizer and a notable man of action.

Both were now in Madras. Long before, he had persuaded N. Subrahmanyam when he was still hesitant (1916) to choose Modern Geography for his province in preference to History in which he was long a Lecturer, or Sanskrit in which he was a College Prizeman. The former now awakened the latter to the importance of Modern Geography in Modern life and Modern Education; pointed out how it lay a virgin field here in South India where the labourers were few, where to labour was worth a man's ambition, and how a geographical movement generated here would travel far afield and shed its beneficent influence everywhere.

Their combination was very fruitful and happy in results. Together they evolved the idea of a Geographical Association on a working plan which found ready support and response among a few kindred minds like Miss J. M. Gerrard (1926). The story of the Madras Geographical Association (now the Indian Geographical Society) has been told by Mr. M. Subramaniam, one of the founders, in his Presidential Address at Rishi Valley (Journal of Madras Geographical Association, Vol. XVI. P. 220; Para. 7 to 24).

Regarding N. Subrahmanyam's camel-load of burdens and activities, one may quote from it: "By his devoted work, by his obstinate refusal to be side-tracked under personal bickerings,

by his perseverant energy and persistence in season and out of season, by his indefatigable lecturing tours, besides the normal duties of his office (the chair at Saidapet College) the Secretary, Mr. N. Subrahmanyam, has kept the objects (of the Association) steadily in view and has been fortunate in his colleagues who have accorded him their hearty co-operation."

And he had the satisfaction also of carrying out a cherished object of his—to erect a platform where can meet ladies and gentlemen, European and Indian, irrespective of caste, creed, colour, race, or sex, whoever, in short, takes an interest in Geography.

His work for Modern Geography was, indeed, astonishing in its value and variety, in its volume and range. Not only the normal duties of a Secretary but the organising, maintaining, or running, and providing for the last detail, in all the spheres of that activity—Provincial Geographical Conferences, Summer Schools with intensive courses done in short time, Refresher courses for teachers repeated at different centres, memorials and interviews, for pressing Geography on the highly-placed, finding persons to lecture and arranging for meetings, taking out excursion parties under his ever-watchful leadership, preparing syllabuses and regulations for discussion; besides writing elementary text-books and making geographical tours on his own account. And his zest for work never flagged, nor his zeal.

The success has been great. This other extract from the same may be read with interest:—

"**Ideals and achievements:**—We may now compare the work done by the Association with the objects it set itself at the outset. They are (a) to promote and diffuse geographical knowledge; (b) to secure for Geography its proper place in Schools; Colleges and Universities; (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 standpoints.

"The Madras Geographical Association can look back with legitimate pride on the work it has accomplished. Sixteen years, and every year crowded with activities and crowned with success!

"It found Modern Geography nowhere in South India (or India for that matter) and has raised it here to its rightful place. It has successfully educated the educators and educated the people at large. It has been endeavouring to make the public cultivate "a geographical mind" as Mr. Sabhesan put it and to "geographise education" as Dr. Cousins suggested. Most gratifying of all; the work done by the Association has been hailed as unique in India and first-rate on its merits by veteran British Geographers. By its exertions it has earned for Madras the fame of being 'the cradle of Modern Geography in India' (Dr. S. P. Chatterji of Calcutta University). And its example is spreading."

IV. The Dedicated Life.

Upon the founding of the Association, he consecrated his life to Modern Geography. Even in his last mortal hours while in agonising struggles with death, his thoughts lay with the Indian Geographical Society and for its future. His eager earnest emotional nature found its mission of life and it transfigured him into a Zealot and Enthusiast. He lived, moved and had his being in Geography. He thrust the importance of Geography upon all and sundry, whoever he came across, unmindful of derision, ridicule or boredom. He lost no opportunity of spreading geography whenever and wherever an occasion was found or made. Accepting invitations, he would travel at his own cost near and far and seize the occasion of any meetings, school or college societies, Teachers' Guild, Primary or Secondary School Teachers' gatherings, Indian Science Congress, All-India Educational Conference. It may be as stop-gap or a specially arranged course; he would accept it all. No call too high, none too low, none for which he would not make time. Geography Subrahmanyam was a sobriquet that clung to him and he received with smiles the epithet of 'Enemy of Geography' conferred by some candid friends of his. It gave him pleasure that his name was associated with geography even in such arresting manner.

A prophet is not honoured in his own country; and it is a tribute to his earnest and hard work that even in Madras also he succeeded in carrying with him a good part of Madras opinion. It took years of spade-work to build up a reputation there second to none and it was too firmly set for his detractors to injure it, so long as he was alive.

Outside the dust and heat of Madras, his work and worth were seen in true light and correct perspective. His influence extended in ever-widening circles; from Travancore to Kashmir, he spread the gospel of Modern Geography with missionary Zeal and found his reward in the quickened life that followed in the places he visited which stand out in bold relief against the life where his influence did not reach. At Lahore, for example, he made a strong plea for the establishment of a Punjab Geographical Society; he was delighted beyond measure when two years later he received a letter from its Secretary that it was his exhortation and the reconciliation he effected there between rivals that led to the formation of that society with a record of work already (1941) to its credit. In Indore, only three weeks before his death (Jany. 1943), he captivated the men of light and leading and shaped their attitude to Modern Geography, interesting them in the Indian Geographical Society.

Above all his other services, there stands his inauguration of the Modern Geographical Movement in India and his advancement of it by and through his dedicated life as leader, path-finder and road-builder. To have inspired and led a great educative and educational movement, which is also a part of the creative evolution at work in India, is his enduring fame and entitles him to rank with the great educationists of India of our times.

Recognition came slowly but surely. At the Silver Jubilee Session of the Indian Science Congress (Calcutta, 1938) Dr. H. J. Fleure F.R.S., the *doyen* of British Geographers, in proposing his name for Presidentship of the Geography Section at the next session at Lahore (1939) declared that his work was meritorious and that he had done everything a man could do for Geography in India. Similar tributes of recognition came from other eminent British Geographers such as Professors Fawcett, Ogilvie and Dudley Stamp. Recognition coming from such quarters, from men whose names are so well-known in the world of Geography, gave him the proudest moments of his life.

His Lahore Address (1939) on the Geographical Personality of India also met with appreciation at their hands. Prof. Fawcett, among others, wrote that he read over again that "brilliant" address, which seemed rather like notes of Human Geography and desired its expansion.

V. Last Years.

After retirement with pension from Government service on completing 55 years of age (Jan. 1940), his hands were as full of work as ever. He gave to Geography all the hours thus released from official duties.

He had now a more crowded programme of work for the Association than ever before and gave himself no rest. Nor could he spare time for the books he had been contemplating to write and for which he had taken copious notes for long years—Historical Geography of South India, Tour in Europe, Teaching of Geography, etc. He laid them all aside—absorbed in the greater task of creating full opportunities for the men to come.

In 1941 the old Madras Geographical Journal was renamed the Indian Geographical Journal. From now on, his ambition was to re-create the Madras Geographical Association into an India-wide body and to it he gave his time and thoughts. He had the strong support of men like Mr. Rowland Bowen of N.W.F. Province who gave the first stimulus, and from Lahore to Dharwar he received encouraging approval. He was able to carry his colleagues with him and he got transformed the old Association into the Indian Geographical Society with a constitution like that of the Royal Geographical Society of London. He intended it to be much more than a change of name. He travelled at his own cost to Kashmir, Baroda, Bombay and Indore and persuaded several to interest themselves in the Society. The last three years (1940-42) were devoted to this work. It is pathetic reading to note this in a letter addressed to him (dated 7-3-43 and received here on 2-4-43) which Mr. Yates wrote, "I can't tell you how delighted I was to hear from you again with your family news and news of your dream fulfilled—an All India Geographical Society".

It was the last scene of all when in the midst of these labours and activities, on his return from Indore and Trivandrum, the curtain dropped on him with tragical suddenness. (Jan. 29, 1943.) Dr. Heron said how deeply he felt the loss of a man who was a Geographer every inch of him, who learnt Geography and taught Geography, and in short, was Geography itself." Other feeling tributes are still coming in, from far and wide showing the appreciation as well as the extent of his service to Geography.

VI. General and Personal Traits.

Idealist as he was, he would look to the practical side of things. He was always at his best in the many committees and other bodies such as those of the University, Teachers' Guild, Co-operative Societies, etc. He came to them after full preparation, knowing every inch of the ground. Keen on the promotion of business he would reconcile the diametrically opposed, bridge yawning gulfs and seek the *via media*. He kept an open mind and was ready to change the position he took up, when convinced by the discussion. He stood on no false prestige (all prestige is false, he said with his Guru C. C. Iyer).

As lecturer, he was genial, whether at school or college or elsewhere. He was a good speaker, speaking with steady eloquence, holding the attention of every member of the audience in the manner of his teacher Prof. Ramanujachariar; and would also step beyond the syllabus to inspire them with the great things of the subject. Crammers, too, found it a pleasure to listen to him and follow with the head, as aptly described by one of his pupils.

With his colleagues, he mixed on terms of mutual respect and with his students he was very popular. Long after they passed from under his authority having left school and college, they used to keep up with him and seek counsel on personal matters as well. He helped them with wise and helpful advice—not only students but colleagues, friends and others. He was eager to do his bit and help forward the deserving.

As excursion-leader, he was all eyes and ears, arranging and planning everything in advance, and selecting and explaining the things to observe, with a view to their geographical importance. He would keep careful watch over the flock, rallying them with his whistle, keeping to the time-table and bringing them back home in safety. He was the poor man's friend, cutting costs to the bone. It was a personal triumph to him to have led with great success a geographical party of about thirty persons over a thousand miles doing geography in Mysore for ten days at a cost per head of about Rs. 35 only, all inclusive.

Though after 1926, he lived for an idea, so to say, and was Geography-mad, as it were, his enthusiasm (unlike Prof. Drew's) was tempered with saving common-sense and a shrewd understanding of the situation. The Royapuram training had inured him to humour even at his own expense.

A remarkable feature of him was his excellent business habits and financial integrity. These were his characteristics even as a boy and they stood him in good stead when in later life, he had much miscellany of work to get through. He lived through life an upright man.

He was a voracious reader and industrious, and ready with tongue and pen. His intellect was served by a strong memory for words and places and things. He could easily pick up old familiar faces after long years of separation. He would gladly learn and gladly teach, take immense pains to master a new situation. For example, he used to conform to the exacting conditions of Mr. M. Subramaniam and take lessons, all the first three years of the Association, until he knew the ropes perfectly at last. He was ever handsome in his acknowledgements, as when at last year's Annual Meeting of the Association he introduced Mr. M. Subramaniam as the brains, himself the hand, in those early years. He gave every one his due and that generously.

He was simple in life and manners, was plain living, without sides; unostentatious and unpretentious. Genial in company, he was social and sociable, and kindly.

He wore his heart on his sleeve, though daws might peck at it. He would share his thoughts and feelings, his hopes and fears with all, making no secret of them. And his emotional nature was sensitive to carping criticism and back-biting. He felt keenly the injustice of aspersions and insinuations, took offence and was prone to sally out and fight, keeping himself, however, ever ready to forget and forgive.

A College-friend, Mr. P. C. Chetty, B.A., dropping in by chance, found him busy at his desk and wrote: "My friend, whose enthusiasm is of an infectious quality, is the founder of a Geographical Association, the first of its kind in India. Though he has now passed the age of superannuation at which men unlearn such subjects, my friend is never tired of increasing his stock of knowledge which has now assumed colossal proportions. He is certainly a credit to his *alma mater*' (*Free-lance Writer*, Ap.-July 1942 p. 13).

A normal day before his retirement from his Chair at Saidapet (say October 1938) would find him rise at 3 a.m., take brisk walks in his garden and settle down to work at 4 a.m. First, the college work; next, reading up new books to keep abreast of Geography and Literature. Typing and proofs for the Press. Maps. Correspondence. 9 to 10 a.m. Breakfast and to the College. 10 a.m. to 4 p.m. at College: usual lectures on Geography-teaching and special ones on Rousseau and Pestalozzi; and attending to administrative matters. Home again by 5 p.m. and 5 to 9 p.m. carrying on with work left unfinished in the morning. 9 to 9-30 p.m. dinner, and so to bed by 9-45 p.m. On Saturdays and Sundays and holidays he overtook arrears whether left over or due to going on tours. An hour's nap after the morning meal was the only luxury he indulged in after retirement (Jan. 1940). This full time-table was diversified by visitors who were welcome at any time without previous appointment, by social functions and by meetings which he seldom missed; by going out and arranging for lectures. The calls of house-keeping would come in now and then; and very often the ruffled children would demand his attention as they cut in with disputes to compose. His amusements were the morning walks; tours and travels; social functions; and motoring for business. He cultivated a taste for music late in life; and he would have it on the radio as an undertone while he was busy at work. All his leisure he gave to work and his work gave him pleasure. The more his work, the greater his pleasure.

It used to be a wonder to us how he could manage time for so much out-turn. He got the best out of time by his using it carefully and doing things once-for-all; helped by his business habits, he found time for all things.

He was a warm friend, a good companion and mixer. The picture his last years' students carry of him is of the loving father lecturing with his last child seated by his side.

In person, he was of middle height and medium build; fair of complexion; with a big round head and full speaking eyes, the eager face easily expressive of his mind, now lit up by joys and hopes, now darkened by griefs and fears.

He married twice. The first wife was Mrs. Rukmini (daughter to C. Srinivasa Iyer, C. C. Iyer's brother); she was genial and

cheery, endowed with robust common-sense. She relieved him of house-keeping, took lessons herself and helped him with typing notes for his lectures. When she died (1924) without surviving issue, he married again; his second wife was Mrs. Annapurni (daughter to M. Swaminathan now in war service in Sudan), who excelled in house-keeping. She died in 1937, leaving two boys and two girls, all of tender years.

It has been a melancholy thing to think of him as dead; I almost feel his warm genial presence even as I write. He was my cousin, my father's sister's son. We have known each other for the last 54 years. We grew for years together and have shared griefs and joys together and he would look up to me for comfort and sympathy, opinion and understanding until death has closed his beaming eyes at last. Such was N. Subrahmanyam as I knew him and I pay with tears the tribute to his memory.

Rev. Swami Pranavananda

(Of the Holy Kailas and Manasarovar),
A Sketch of his Life and Work.
By

The Late N. Subrahmanyam

Rev. Swami Pranavananda hails from Godavari District in Andhra Desha and is aged 46 now. His house-hold name was Kanakadandi Venkata Somayajulu. He graduated from the D.A.V. College, Lahore in the year 1919. After six or seven years' service to the Motherland he had an internal urge for search after the Absolute Truth. So he entered the Holy Order in the year 1926 at the age of 30. He was initiated into the Holy Order by the Great Acharya Dr. Swami Jnānānanda Giri.

Dr. Jnānānanda Giri, after attaining Realization, took to scientific Research with the aid of his intuitional knowledge. He took his degree of Doctorate in Science from Charles University of Prague, Czechoslovakia. He had been thrice to the Continent of Europe and stayed in different Universities of Germany, Austria and Czecho-Slovakia for three years doing research work in Spectroscopy of X-Radiations, Isotopes, Astro-physics, Atomic Physics and allied subjects. He has been carrying on research work in George Holt Physics Laboratory, Liverpool for the last three years. It is from this great Swami-Scientist that our Rev. Swami Pranavananda derived his inspiration for search after Truth and for things scientific.

Shree Swamiji has extensively travelled in the Himalayas for well-nigh 16 years in connection with his Spiritual *Sadhana*. During this period he has had occasion to study the Geography and topography of several regions therein.He lived in Gangotri for full one year (1934-35), even after the temple-gates were closed for winter and visited Goumukh, the glacial source of the Ganges, several times.

The Swami visited Kailas and Manasarovar for the first time in the year 1928 via Kashmir-Srinagar, Ladakh, and Gartok. Since then he has been visiting Kailas-Manasarovar region every year mainly for his Spiritual practices; and he usually lives there for about six months in the year, but carries on research work also in different branches of science, such as Geography, Geology, Botany, Zoology, etc., as a hobby during his leisure hours. He visited this region by various routes in different seasons of the year.

The Swami spent a whole year in 1936-37 as an inmate of the Thugolho Monastery, on the Southern shore of the Holy Lake Manasarovar, a rare privilege, never before accorded to a non-Buddhist Monk, as we learn from Mr. Paul Brunton's book, 'A Hermit in the Himalayas'. The minimum temperature during his stay in winter was—18°F, i.e. 50°F below freezing point. During his stay at Manasarovar the Swami recorded how the Manas and Rakshas lakes froze in the beginning of winter, what changes ensued after freezing, and how the lakes thawed in spring. Thus he made a comparative study of the characteristic features of the sister lakes. When the Rāvan Hrad was frozen in winter he went over the lake on frozen ice and made a rough survey of the two islands in it. He is the first non-Tibetan to land on these two islands. Rev. Swami Pranavananda's competency for the task is unique. He has the simplicity and bravery, the fortitude and endurance of the best *Sanyasis;* he has the inquisitiveness and fidelity to truth of the scientist; he is not dogmatic; he is keenly observant; records his observations carefully; and gathers them up with a view to making them available to people at large. Up till now the Swami has completed 15 circum-ambulations of the Mount Kailas and 17 of the pre-historic Lake Manas.

Our Swamiji is very well-known in the Kailas-Manasarovar region and other parts of Western Tibet and is loved very much by officials, monks and people in general, since he renders medical aid free of cost to the rich and the poor alike. He is known there as "Indian Lama Guru." With the aid of the Governor of Purang-Taklakot and the Viceroys of Gartok, (Western Tibet) he visited the real sources of the four Great Rivers of the Holy Kailas and Manasarovar, namely, the Brahmaputra, the Indus, the Sutlej, and the Karnali. As a result of his several explorations and Geographi-

cal researches the Swami has exploded the findings of Dr. Sven Hedin, the famous Swedish explorer, regarding the sources of the four rivers of the Holy Kailas and Manasarovar, and has fixed the sources of these rivers from different criterea, namely tradition, length, quantity of water, and glaciers, after actually visiting all those places. This has evoked great sensation among the Himalayan Geographers all the world over, since this very valuable contribution of the Swami has reopened a question supposed to have been settled by Dr. Sven Hedin as far back as 1908. The Swami's findings have been accepted by the Royal Geographical Society, London and the Survey of India which has incorporated them in their recent maps of 1941. Though he does not profess to have the technical knowledge of a trained Geographer, the results he has achieved and the spirit of minute observation and searching enquiry displayed in his work are really commendable. One cannot but be convinced by the remarkably logical and lucid arguments with which the findings of Dr. Sven Hedin are challenged and disproved. He has exhibited to the world how Indians do not lag behind others in the spirit of adventure and exploration. The Swami is the first of the living Indian explorers, and has vindicated by his researches the Indian's claim to original work of the kind. We trust that his work would inspire many Indian youths to undertake travels of adventure and exploration "The Daily Telegraph" of London writes of him as "the distinguished Indian Sanyasi explorer and Scientist."

Some of the papers of the Swami have been published in the Journal of the Royal Geographical Society, London, Calcutta Geographical Review, The Indian Geographical Journal, and several leading Newspapers of India. He contributes papers to the Indian Science Congress also. Two of his lectures delivered at the Calcutta University have been published by the University in a book-form, entitled "Exploration in Tibet", which elicited the appreciation of several eminent Geographers like Dr. Lonstaff. It will not be out of place here to make a note that, "in appreciation of the very valuable contribution the Swami has made to the Geographical knowledge of the Kailas region, the Surveyor-General of India has been pleased to publish, free of cost, about Rs. 600 worth of maps for his University publication." He has also written the book "Pilgrim's Companion to the Holy Kailas and Manasarovar," a review of which was published in Vol. XVII, No. 1 of this journal.

Besides these two books the Swami has written an exhaustive work in Hindi, "Kailas-Manasarovar," in four parts, which, when printed, would cover about 450 demi pages; and the book is illustrated with 150 Photos, all taken by himself, and 7 maps specially prepared by him. The Manuscripts will be given to the press as soon as paper becomes available. The Swami has written an elaborate commentary of over 1,000 pages on Shrimad Bhagavad Gita, which is awaiting publication. He has also written a few pamphlets on spiritual subjects.

Before concluding his trips to Kailas region, Rev. Swami Pranavananda wants to sink his lead in the Manas lakes and definitely locate the thermal springs situated in their bed. For this purpose, he bought from Calcutta, a four-seater, up-to-date galvanized steel boat weighing 5½ railway maunds, with sailing equipment and air-tight chambers and took it to Almora in June last. For want of funds and cooly-transport he could not take it to Manasarovar this year. But he is making arrangements to despatch the boat from Almora to Garbyang (the last village on the Indian Frontier), before the end of March next. Thence the boat will be despatched to the Holy Lake, early next summer, as soon as the Lipu Lekh pass becomes cleared from snow. We understand that the boat would cost about Rs. 1,200 by the time it would reach Manasarovar. If some donor is forth-coming, the swami wants to take a small out-board motor and petrol, which would cost about Rs. 600, since it can be fitted to his boat converting it into a fine motor-boat. With the help of the sailing boat the Swami wants to reach the centre of the Lake, which is considered inaccessible by Tibetans and which has not been reached by any one hitherto. This will indeed be a unique incident in the history of the Sacred Lake. After the exploration work is completed, the Swami has no intention of bringing the boat back to India, but wants to hand it over to the Darma Seva-Sangha, for the benefit of future pilgrims and tourists.

It may be mentioned that there is no lotus or lily in Manasarovar. So for the last few years, the Swami has been making experiments to culture lotus, lily, and *singhāda* (water chestnut) in the Manas lakes. It is yet to be seen how far he would be successful in his experiments; but all the same it is a novel idea, worthy of praise and worth the trouble. The Swami, being a

Vaidya himself, has discovered a wonderful aphrodisiac drug in the Manas region, which, it is said, is not to be found in other parts of the Himalayas. We understand that the drug is being sent to Col. Chopra of Calcutta for analysis and confirmation of the properties attributed to it. A description of the drug is given in his book "Exploration in Tibet" on page 31.

The Swami has been carrying on research on musk-deer for the last eight years or so, which he hopes to complete by the end of 1943, after a systematic Histological and Cytological study of the animal by bringing a live animal to a laboratory in the plains. It may be remembered that the Swami has read a paper on "Musk and Musk-deer" (though not concluded), in the Medical and Veterinary section of the Science Congress held in Baroda, and in the Benares Hindu University, and Lahore Ayurvedic conference. Every year he does some exploration or research work in some branch or other in his own humble way. It is really a matter of pity that such a brilliant explorer and Scientist like our Swami could not get any pecuniary help from any University or Society. Yet the Swami, unmindful of any help does his work for its sake, in the spirit of a true *Karma Yogi,* unmindful of the fruits thereof. Now and then the Swami brings with him some fossils, specimens of rocks, plants, and flowers, as well as Geographical notes and presents them to some one interested in them.

In last October, the Swami did a close and complete circumambulation of the Rāvan Hrad (Rākshas Tal), for which he had been planning for the last six or seven years. He ascertained the actual circumference of the lake and the number of islands in it; traced the source of the Sutlej by examining the so-called, "Old bed of the Sutlej"; noted the flow of the water in the Ganga Chhu from July to October; and collected a few Geological specimens of rocks. He had also reached the perpendicular wall of the southern base of the Kailas peak for the third time; and crossed all alone, for the second time, the Khando Sanglam La, a pass with deceptive crevices on the eastern side of the Mount, which was neither known to, nor crossed by, any non-Tibetan up till now. He crossed the pass for the first time in July 1941.

Our Swami is not only a full-fledged Spiritual *Sadhaka,* explorer, and a scientist but also a bit of a Historian. He has collected a good deal of material regarding the Kashmiri General

Zoravar Singh, who was killed in an engagement with the Tibetans in the Manasarovar region in 1841, and whose death centenary was celebrated at Taklakot by the Darma Seva-Sangha, in which the Swami delivered a learned speech. We learn from one of his friends, Mr. Paul Brunton that he is a great *Yogi* and is well up both in *Hatha* and *Rajayoga* and that he carried on a systematic research in the famous *Khechari Mudra.* To avoid wastage and dissipation of valuable curios, the Swami has decided to open a small "Kailas-Manasarovar Museum" either in the Calcutta or Benares Hindu University, wherever he might get a good response. He wants to present all his exhibits so far lying with him and other articles which he would bring from time to time in future. He has already opened, on 22nd December 1942, a "Kailas-Manasarovar Museum" in Almora, in the Iswari Bhawan, under the Patronage of Rais Shri Pandit Lakshmi Chandra Joshi M.A., LL.B., Advocate High Court, Hony. Asst. Collector Almora. For the time being he kept all his collection including paintings in this museum. We wish it every success.

It is no small surprise that a Swami, who repaired to the Himalayas chiefly for Spiritual practices, besides being inspired by the mystic grandeur of the holy places, could still find leisure and inclination to study the Aesthetics, Geography, etc., of the same and also render a faithful and minute account of the whole, for the benefit of Humanity. We fully wish and hope that Shree Swamiji will continue to enlighten the outside world on the many other Himalayan problems awaiting solution and combine scientific pursuit with Spiritual *Sadhana,* as in fact like our ancient Rishis, he had striven to do so far with such wonderful results. Mr. D. N. Wadia, (formerly), of the Geological Survey of India and President of the Indian Science Congress of Baroda writes in "Current Science" thus: "Sincere thanks and congratulations of all Geographers and of Indian Naturalists in particular are due to the Rev. Swami Pranavananda for publishing results of valuable explorations conducted by him during his various pilgrimages in the region of Mount Kailas and Manasarovar in Western Tibet."

As a mark of appreciation and recognition of his wonderful achievements, explorations, and other scientific researches, the INDIAN GEOGRAPHICAL SOCIETY *has elected His Holiness Rev. Shree* 108, *Swami Pranavanandaji Maharaj of the Holy Kailas and Manasarovar as an Honorary Life Member of the Society.*

The River Danube Between 1918 and 1938

By

V. N. Srinivasa Rao, M.A., (Madras), M.A., (Oxon.)

Unlike the other rivers of Europe, the Danube flows in the wrong direction. It rises as a dribblet in the Black Forest, north of Switzerland. It wends its way along South-Eastern Europe, and after passing through several countries flows into the Black Sea. The Black Sea is quite different from the North Sea into which the river Rhine flows and the Mediterranean into which the river Rhone flows. The North Sea and the Mediterranean are very important from the point of view of commerce. The Black Sea, on the other hand, is situated in the least developed part of Europe.

But, still, does this only fact that the Danube flows into an unimportant Sea explain fully the reason why it—the second of the rivers of Europe—remains an unimportant river?

Undoubtedly, the river, apart from its ill-luck in its direction of flow, suffers to a great extent because of other factors. The Danube differs from many of the rivers of Europe in that it flows through too many countries.

If we consider the Europe of 1938 and compare that Europe with the Europe of 1914, we find a distinct difference between the Danube of the one date and the Danube of the other.

In point of fact, in the Europe of 1914 there existed the Empire of Austria-Hungary; and the Danube of that day had to pass only through South Germany, Austria-Hungary, and Rumania. The river, of course, formed the northern boundaries of the old States Servia and Bulgaria. After the last War (1914—1918), the territorial changes effected in the Danubian countries by the Peace Treaties made the Danube flow through the separate Kingdom of Austria, the separate Kingdom of Hungary, and the new States of Czechoslovakia and Yugoslavia, in addition to its former course through Southern Germany and Rumania. As before, the river remained the northern boundary of the State of Bulgaria.

From the foregoing para one point clearly emerges. The countries through which the Danube had to flow increased in number; and this, coupled with the fact that the Danube, by nature, flows the wrong way, made the prosperity of the Danube a precarious affair.

It may be asked why it became more difficult for the Danube to be prosperous after it was made to pass through more countries.

To answer this question we must look into the life of those nations through which the Danube flowed between 1919 and 1938. It is a matter of common knowledge that the victorious Allies after the last war declared that a victory had been won for the principle of self-determination; and, it is also a matter of common knowledge that the Austro-Hungarian Empire of the Habsburgs was broken into a number of States known in post-war history as the Succession States. The newly created Succession States, however, worked the doctrine of self-determination to death, both in the political and in the economic field and poor Danube had to suffer in consequence.

Even previous to the emergence of the Succession States, the Danube had a number of local variations in name. But, after the Succession States came into existence each State officially christened the Danube in its own way and that very fact gives us an idea of the mind of the new nations. Donau, Duna, Dunarea, Dunav,—all these are the same old Danube. Political and international suspicions "made the river even less useful than formerly" as mentioned by Valkenburg and Huntington in their standard work, "Europe".

No doubt the Danube is not free from difficulties of navigation. The Iron Gates, as any student of European Geography knows, is one of the most difficult spots for the navigator of the Danube. Anyone who would like to learn something about the thrills of shooting through the Iron Gates in an open boat should read the experience of Bernard Newman as narrated in his illustrated travel book "The Blue Danube (Black Forest to Black Sea). Now, thanks to the efforts of engineers, even the Iron Gates is without perils—a canal has been constructed around the rapids, and traction locomotives aid the boats when they attempt "to go upstream against the swift current".

Then, again, there is the difficulty of navigation in the Black Sea delta where water-logged forests and swamps are eternal hindrances. But, even there, the difficulties have been, to a large extent, overcome.

During the twenty years after 1919 the Danube with its 'wide bed and stable water supply' disappointed those who expected a spectacle of massed masts floating on it. There was not a trace of East to West traffic in grain or West to East traffic in manufactures. One reason for lack of sign of business was, no doubt, the fact that the country through which the river flowed and the Sea into which it fell were far removed from the main currents of European life. But there is also another explanation.

The valley of the Danube was in the middle ages the entrance to Europe for the hordes of Eastern conquering tribes. Many a tide of Asiatic Invaders, "from the Schythians and Sarmatians to the Magyars and the Osmanli Turks," smashed itself against the Carpathians and the mountains of Transylvania. The stand of Europe against the invading Asiatics was a fierce and heroic stand lasting several centuries; but in the Danubian region, though the *de jure* victory was for the Europeans the *de facto* victory was for the Asiatics because every invading horde, though turned back, left behind in the Danubian Basin small groups of Asiatics. And these little groups grew into bigger ones with the march of Time. Thus became complicated the politics of the Danubian region. Separatism became the accepted political principle of South-Eastern Europe; and, after the Austro-Hungarian Empire was split up, feelings of jealousy and feelings of hatred were markedly noticeable in the mutual relations of the newly created States. Jealousy and hatred meant commercial stagnation; and the Danubian region was allowed to remain a veritable waste despite its richness. Each country, unwilling to co-operate with the others, tried to live by itself. To give one instance, formerly, the confluence of the rivers Danube and Tisa used to be within the territorial limits of Hungary when it was part of the old Austro-Hungarian Empire. But, by the Peace Treaties of 1918-19 the spot where the Danube and the Tisa unite was shifted beyond the limits of the new Kingdom of Hungary; and, further, the canals between the rivers, which used to lie within Hungary before 1914, were shifted beyond Hungarian

territorial reach. And, Hungary was too poor to connect the two rivers by a new canal passing wholly through Hungary. Also each country, due to the working of Autarchy, erected high tariff walls. We have the high authority of Ellsworth Huntington supporting the formation of a Danube Economic Union as the real solution for the problems of the artificial Danubian States.

It is not in any way suggested that the river Danube, as a commercial highway, is equal to rivers like the Rhine. Geographically, the Danube is badly placed, running as it does through perhaps the most backward part of Europe. But, none the less, it is possible to make a much better commercial use of the river. Commercial geographers must focus the attention of the world on the potentialities of this most unfortunate of European waterways.

Economic Holding in Panjab

By

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Economic holding has been defined by Keatinge as one which allows a man to support himself and his family in reasonable comfort after paying his necessary expenses.[1] It is, however, difficult to fix accurately the size of such a holding, for any large area in the province, as it depends upon a number of factors, the most important being the adequacy of water-supply. The economic holding, or the family farm, as we may call it, varies from area to area, from village to village. In the same district of Ferozepur the average holding is eight acres in the riverain country of the Sutlej, and 92 on the borders of Bikaner. This is because in the one there is plenty of water, while in the other everything depends upon a precarious rainfall, which average only twelve inches a year and sometimes not more than three or four. The decisive factor is water, and in greater or less degree this is everywhere the case in the Panjab, for nothing can be done without it. But once it is available other factors come into play—fertility of soil, system of farming, supply of capital, accessibility o markets, habits and customs of the people and last, but certainly not least, local standard of living.

A certain area may constitute an economic holding, if situate close to a large market and intensively cultivated with the hel of much manure, which would prove well below the economi limit if situated in the Salt Range or the middle of the Sind-Saga Doab. Proximity to a market may be as important as fertility an even more important if facilities for transport are not susceptibl of improvement. Fertility is now-a-days largely a matter of ir telligence, industry and correct application of capital. Similarly given area may provide an adequate living if irrigated from a we

1. Keatinge: Rural Economy in Bombay and Deccan, p. 52.

under the cultivator's control, while it might prove inadequate if irrigated from a canal working on a rotation. For it is not only the amount of water available, but also its availability at the time best suited to the requirements of the particular plant that determines the use to which the land can most profitably be put.

Again, a holding of five acres in a compact block, irrigated from a well, in a district like Jullundur, may be ample for the support of a cultivator of skill and enterprise, but may be completely uneconomic if scattered in ten or twelve different places, irrigated from several wells in each of which the cultivator owns only a fractional share or right.[2]

Again, the economic holding varies with the system of farming. Let us take the case of *market-gardening* first. A market gardener in this province is generally an *Arain* or *Saini,* except in the north where, as likely as not, he is *Maliar.* The Arain is seen at his best round Amritsar, Sialkot and Jullundur, and the Maliar on the banks of the Indus in the fertile strip of country known as *Chhachh.* In the intensiveness of its cultivation the Chhachh recalls the country round the Bay of Naples, where the market gardener can live on 1¼ to 2½ acres. In the Chhachh he can live on 1 to 1¼ acres, and many live on less. A family consisting of an old man, a grown-up son, two women, three small children, a buffalo and a donkey were recently discovered living on less than half an acre, by growing tobacco and vegetables sold in Cambellpur and Rawalpindi, the latter thirty or forty miles away. In another village a Maliar was found supporting his wife and four small children on three-quarters of an acre, though half of everything produced, vegetables, maize and tobacco, had to be given to the landlord.[3] Both cases are possible because snuff-tobacco, a most valuable crop, is grown and irrigation is by wells. Round the larger towns in the Central Panjab, where irrigation is mainly by well but snuff tobacco is unknown, two acres are normally required, though the Arain round Sialkot can manage on one. It may be said, therefore, that in the Panjab, the market-gardener can live on one or two acres and prosper on three. In this there is no marked difference between the Panjab and the West. The main

2. Fazilka, Assessment Report, 1914.
3. Attock Assessment Report, 1925 p. 19.

difference lies in the fact that in the West the market-gardener plays a much more important part. In Belgium, for example, over two per cent of the cultivated area is devoted to garden produce against less than one per cent in the Panjab, and in addition nearly ten per cent is under potatoes.

In *arable farming,* we must distinguish between two types, firstly, the more or less *intensive* type based upon holdings of a few acres and upon an assured water-supply, derived from canal or well; and secondly, the *extensive* type based upon larger holdings and a more or less capricious rainfall. A good example of it is the Tallagang Tahsil (Dist. Attock) in the north with an average rainfall of 21 inches. In this area it is estimated that a family of four can just live on fourteen acres, but only if a certain number of livestock-cattle, camels or goats-are bred for the market. In the Ambala Tahsil, which has a rainfall of 32 inches, it was found that a man could with difficulty support a wife, five children and three dependents on 25 acres.[4] This family is, of course, much larger than the ordinary family, which in the Panjab average four to five. On the *Barani* tracts of Rohtak, with a rainfall of only 20 inches the Zamindar reckons to keep a pair of plough cattle for 20 to 30 acres,[5] which suggests that he cannot comfortably live on less. In Montgomery, where only 10 to 15 inches of rain can be expected in a year and (outside the colony) cultivation depends largely upon the precarious supply from the inundation canals, it is reckoned that 40 to 50 acres are required to support a family in reasonable comfort. In the Tahsil of Susa (Hissar) nearby, where cultivation depends almost entirely upon an average rainfall of 12 inches, a still larger holding is required.

Where the water-supply is assured, the amount of land required varies with the intensiveness of the farming, in which irrigation from well and proximity to town are important factors. This is greatest in Jullundur, where well irrigation prevails and profitable crops like sugar-cane, cotton and wheat can be grown. At the last settlement of the district (1914-16) the normal holding was five acres, which at first sight suggests that this is enough for an ordinary family to live on. This, however, is almost cer-

4. Assessment Report 1918, pp. 8-9.
5. Rohtak Assessment Report, 1909 p. 11.

tainly not the case, for about two thirds of the owners are in debt, many have land in the canal colonies, and not a few emigrate.[6] For the humbler castes with their very simple standard of living five or six acres may possibly suffice, of which, indeed, we have an example in a Mehton of Nawashahr, who was found to have brought up a family of five sons and two daughters without getting into debt, on five and a half acres of irrigated land. He grew sugar-cane, cotton, wheat, maize, chillies, gram, barley, vegetables and fodder crops.[7] Owing to the large number of Arains in Jullundur, vegetables play a more important part in this district than in most, and the more this is the case, the smaller the area required for the family farm. Recently in the Arain village of Tehong, three miles from Phillaur, it was found that more than half the cultivators (226 out of 438) were living on 2½ acres or less. This apparently they were able to do, as each holding had about an acre under vegetables.

Though the normal holding in Jullundur is only five acres and Arains, by cultivating vegetables and accepting a low standard of living, live on less, the lowest estimate for the old districts of Central Panjab, where irrigation is by well or by well and canal combined, is seven acres. But the people there agree that if a family is to live comfortably, the minimum will be ten to fifteen acres, according to the nature of cultivation. This agrees with the results of a survey recently carried out in a village near Lahore. The land is canal irrigated and under wheat, rice, cotton and fodder. No vegetables are grown, but a good deal of stock is carried, as Lahore provides a first-rate market for milk, which nearly every one sells. It also gives abundant opportunities for carting, which is done for four months in the year. Enquiry shows that under these very advantageous conditions, ten acres will support a family of five (including three children) provided there is no debt, which is not usually the case. Thanks to the carting, there will also be enough work, though the actual field labour takes only 180 days. But if no milk could be sold in Lahore and no carting done, it is estimated that fifteen acres would be required instead.

6. Darling: The Punjab Peasant in Prosperity and debt, 1932 p. 44.
7. Assessment Report, 1916, p. 14.

The Canal Colonies require separate consideration, as their conditions are peculiarly favourable. Holdings are substantial and also compact, crops are safe and debt light. The fields are regular in shape, divided into squares or rectangles by means of canal distributaries. On the other hand, irrigation is by canal, which is less productive than irrigation by well, and the standard of living is higher than anywhere else. For Lyallpur, the lowest estimate given is 13½ acres, or half a square, and for Montgomery, where less water is available and cropping consequently less intense, it is twenty acres. Recently exact farm accounts have been obtained for a number of farms in both areas. The result in the case of eighteen Lyallpur farm shows an average net income of Rs. 49-6 per acre. A farm of 13½ acres, therefore would produce about Rs. 667 a year. On this income the ordinary cultivator elsewhere would probably consider himself affluent, but then he is nearly always in debt, and his standard of living is low. The last point is important, and it may be emphasised that the figures taken from the Assessment Reports are based on the very modest standard of the past, while the colony figures postulate the higher standard desired for the future and already partially realised in Lyallpur. The difference is well illustrated by the Kot Adu Tahsil of Muzaffargarh, a district in which the standard of living is lower than in any part of the province. Here it is said that five cropped acres will maintain a family.[8]

The Lyallpur Enquiry brings out three points which, though generally accepted in theory, are not always accepted in practice. The first is that the modern system of farming is more remunerative than the old. One of the estates, for which accounts were kept, consisted of 88 acres divided into three farms, which were given out to tenants on the Batai system. The land was of average quality, but was cultivated on modern lines. Seed was carefully selected, up-to-date implements used, and expert supervision applied. The result was a net income of Rs. 87 per acre as against only Rs. 59 for three other estates totalling 184 acres. The second point illustrates the value of substituting fruit and vegetables for ordinary crops. A tenant who did this obtained Rs. 1,085 by the sale of oranges and onions from land which would otherwise have

8. Assessment Report, 1924, p. 10.

brought in only about Rs. 200.[9] The last point is that intensive farming provides not only more cash but, what in this case is equally valuable, more work. It was found that the cultivation of an acre provided from 17 to 20 days work in the year, but that in one case it gives 22 days. This was because the tenant in question put twice as much land under sugar-cane as usual. For the eighteen farms examined, the average was 170 days work in the year,[10] which, it may be noted, is well within the estimate already given for the Panjab as a whole. As the average area of these 18 farms is almost exactly 13 acres, or slightly less than half a square, it would seem that though half a square may give a family enough to live on, it will not give enough to do. It is one of the problems of the family farm that it is difficult to combine both.[11]

9. Stewart, some aspects of better cultivation in Lyallpur Distt. 1926, pp. 32-34.
10. Stewart, op. cit., p. 4.
11. Agr. J. I. Vol. XXIII, pp. 16-27.

Changes in Level in the S. E. Coast of Madras

By

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The mean level of the sea which is the most general plane of reference from which both heights of lands and depths of the sea are measured may ordinarily be taken as constant with respect to the bordering lands but this does not hold good when longer periods are taken into consideration. There are recorded in the rocks of the earth's, crust evidences of oscillations in the relative level of land and water, due either to deep seated causes and world wide in their effect, or of small magnitude and more local in character. It is with the latter class of movements that the following paper is concerned.

The east coast of India of which the region under consideration forms a part. had been broadly defined at a very early stage in the history of the earth and since then there have been only minor changes in the coast line. The short bit of the coast between Cape Comorin and Rameswaram island reveals by a variety of evidences that there has been an advance of land on the sea—a fact which has been recorded in the geology, geomorphology and history of the region.

Physically the region is simple in character with a succession of features arranged roughly parallel to the coast and coinciding generally with the outcrops of different geological formations.

From west to east the succession is as follows:—

(i) *The ghats*—the continuation southwards of the plateau of Mysore and likewise made up of highly contorted gneisses and schists (the region has not yet been surveyed in any detail). Like the plateau of Mysore this also is of the nature of an uplifted peneplane, but in contrast with the former it has been much more dissected resulting in the disappearance of much of the initial surface Eastwards the ghats end rather abruptly and descend down almost precipitously to

(ii) a gently undulating lowland with a general slope eastwards towards the gulf of Mannar and down which flow a number of streams, the Tambraparni the Vaippar and the Gundar being the three larger ones among them. Like the ghats this undulating lowland also is floored by the archaean gneisses which have in most cases been planed down—probably by the action of marine erosion. The eroded surface of the gneiss is covered in most cases by a thin veneer of soil while over large areas—especially in the northern half of the Tinnevelli district they are masked by the development of the black cotton soil; yet even here the islands of gneissic rock reveal the nature of the basement.

Lying along the foot of the ghats at a few places are well rounded boulders and pebbles resting on the surface of the gneiss. These boulder beds in the opinion of Mr. R. Bruce Foote that pioneer in South Indian Geology, appear to be due to "surf beating on shoals for not only do many large well rounded pebbles and a few boulders strew the surface, but the surface of the various protuberances of the coarse granular gneiss are worn and rounded in situ."[1] Similar boulder beds have been observed in the northern part of the Carnatic plain where they have been taken to represent unmistakable evidence of the sea having extended upto that point at a particular period. But in the Tinnevelli region, the boulder beds are much fewer in number and much less well developed to form such a definite indication of surf action. This difference in the distribution of boulder beds between the north and the south is probably to be related to the differences between the geology of the two regions—the more widespread distribution of boulders in the northern half goes with the more resistant character of the quartzite pebbles derived from the disintegration of the Cuddappah formation while the granular quartz rock provided a relatively more easily denuded material in the south.

Eastwards the gneisses are unconformably overlaid and concealed under out crops of Cuddalore and laterite facies. The former which are undoubtedly of marine origin consists largely of coarse gritty sandstones calcareous in places and variously mottled in colour but in spite of their natural suitability to their preservation, they contain very few fossils.

1. Mem. Geol. Sur. Ind. Vol. XX, p. 53.

The formations grouped as laterites in this area are not of such great lateral extent as they are in the north, but are cut up into a number of N. E. to S. W. bands by tongues of alluvium and they gradually diminish in width towards the south.

This part of the lowland forming a plain of marine denudation passes off into the coast line proper with sub-recent marine formations overlapping and concealing the denuded gneiss, the Cuddalore or the laterite formation.

From near the cape northwards there are isolated low plateaus rising fairly abruptly from the shore line and in certain cases forming a natural quay along the shore. Calcareous grits or sandstones in nature, they dip gently seawards and show frequent falsebedding. The plateau must originally have been much more extensive by far the greater portion of which has since been removed by denudation. Here and there isolated patches have been left behind which betray by their false bedding and subfossil remains of littoral organisms (near relatives of which inhabit similar zones in the neighbourhood) their shallow water origin; and they testify by their present elevation to the fact that since their formation under the sea they have undergone a considerable amount of elevation. Geologically the formations are definitely recent and if we accept Bishop Caldwell's report of the occurrence of intercalated broken pieces of pottery[2] their recency is much more emphasized.

The coastline itself is low and sandy and generally there is a line of sand dunes along the shore line; behind this there is a line of lagoons elongated parallel to the line of sand dunes and these are locally known as "taruvai." The dunes formed by the sands blown up from the freshly exposed sea floor consequent on emergence will invariably mark off lagons parallel to and inside of them. In course of time the lagoons will get silted up and lagoons in several stages of silting may be noticed along the coast.

The occurrence of undoubtedly marine formations and features of surf action such as beach pebbles in places far removed from the present position of the shore line and at a considerable elevation above the present level of the sea point unmistakably to a process

2. Bishop Caldwel, A political and general history of the Tinnevelly District.

of elevation of the land. This conclusion is strengthened by a study of the geology, of Rameswaram Island, the Pamban Straits and the Toniturai spit.[3] Rameswaram is the western-most in the chain of islands and submerged shoals that extends between Ceylon and the mainland of India as the Adams bridge. On the north side of the island are found a fringing reef and an upraised reef. The latter forms an irregular scarp 3′ to 4′ or sometimes even 5′ along the north shore. The reef could not be traced along the south shore of the island but continues across the straits as far as Pillaimadam to the north of the Toniturai spit and for a good distance along the south shore of the spit, the straits between Pamban and the mainland is nearly bridged over by a reef of coral sandstone showing a system of rectangular joints. This latter makes the reef appear as if it is made up of huge cuboidal blocks of stone forming a flight of steps—stepping stones across the straits—a fact which has been taken full advantage of in the epic story of Ramayana. The calcareous sandstones forming a natural quay wall east of Kilakkarai and that forming the straits are identical in character and further remains of corals have been observed attached in situ at some places on the top of the quay wall. The raised reef at Rameswaram and the sandstone quay wall east of Kilakkarai point unmistakably to an elevation of the coast while the fossil organisms associated with the raised reef have their living representatives in the vicinity, an evidence pointing to the recency of the process. The calcareous sandstone probably formed the base to which corals were attached and the same elevatory processes which uplifted the the upraised reef at Rameswaram must have affected the adjacent mainland too, raising the sea floor sufficiently to expose the underlying base and affecting the straits between the island and the mainland. This fact, coupled with the peculiar appearance of the rocks—the result of the jointing of the calcareous sandstone—may well have formed the basis of the bridge building by Rama. The natural bridge seems to have been in existence until quite recent times and the destruction of this bridge and the separation of the island has been ascribed to a big cataclysm of the XV century.

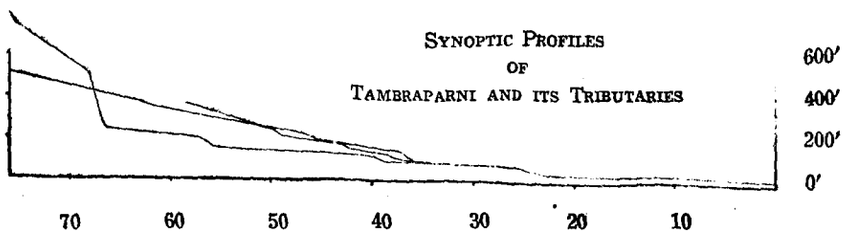
Corroborating this is the occurrence of a marine formation—a thin layer of fine grained grit locally known as 'uppukal' or salt

3 Scottish Geo. Mag. Vol. 6 pp. 257-258.

stone underlaid by fairly stratified sea sand with shells of organisms like Pecten and Ostaea that inhabit waters deeper than 5 fathoms. This formation could be traced up to Korampallam 5 miles inland where it has been met with at about 17′ above sea level. As the marine beds contain organisms whose living representatives are at present found beyond the 5 fathom line we are irresistably led to postulate an elevation of a least 47′ (30′+17′) since these deposits were formed.

Geomorphological evidences.

Stream profiles in recently uplifted regions afford one of the best proofs of the movement. Three important rivers drain the region, the Gundar, the Vaippar and the Tambraparni of which the last is the most important and the one best suited for the purpose. The longitudinal profiles of the Tambraparni and its chief tributary the Chittar reveal that they are not smoothly graded from end to end but that they are divided into a number of reaches each of which begins up stream with a comparatively steep declivity and becomes gradually graded. The One inch maps of the Survey of India are the largest scale maps of the area available and the information available in it is limited from our point of view, but they are just enough for the construction of a rough long profile of the river. The course of the river from the foot of the hills to its mouth is cut up into three 'reaches' each of which begins upstream with a relatively steep gradient and becomes gradually graded down stream. Such a feature in the long profile of a stream—breaks in slope, cannot always be traced to differences in structure or hardness of the underlying formations. When it is developed, as in the present case, in massive igneous rocks it is particularly significant and must evidently be due to successive elevations of the region. Each section of the longitudinal profile will



correspond to a certain stage in the progress of stream work or more precisely to a "definite position of the base level with respect to the

bordering lands subjected to erosion."[4] Each lowering of the base level will start a wave of retrogressive erosion which will work upstream dividing and subdividing at the confluence of tributaries. The breaks of slope are therefore repeated in the course of the tributary streams also. The 'Synoptic' profile of the Tambraparni and its left bank tributary, the Chittar reveals such a harmonious feature.

The successive changes in the base level of erosion will leave its no less evident tell tale marks in the transverse profile of the valleys. Successive elevations of the flood plain will tend to develop a polycyclic valley—the upper parts of which often show gently concave slopes like those of a fully mature or even old valley and these terminate rather suddenly at a shoulder below which the sides steepen again, only to flatten progressively downwards just as if another narrower and less evolved valley had been sunk into it and so on.

When this valley in valley structure is repeated at approximately corresponding heights in the tributary streams and appears largely independent of structural control, it suggests some distinctly cyclic interpretation. The construction of a transverse profile, however, requires precise levelling and could therefore not be attempted in this case. The trend and lie of the canals and the position of some important towns like Tinnevelli and Palamcottah vaguely suggest a pattern of the type but this has to be proved by an accurately constructed profile.

Such in brief are the pieces of evidence for an uplift of the land produced by the fall in level of the mean surface of the sea. Besides the effects due to positive changes in level of the land, minor modifications of the shore line are due either to erosion or accretion of land. An advance due to accretion of land is to be found on this coast where Korkai now 5 miles inland has been identified with the ancient Korkai of the Pandyas and the Kolkoi' emporium of Greek geographers. Reputed to be the seat of a valuable pearl fishery and the headquarters of the Pandyas, its site is now 5 miles inland. With the decay of Korkai another and a newer emporium—Kayal (cail) arose during the middle ages, a port which has been described by Marco Polo as a great and noble city and

4. Baulig; The changing Sea level.

one of the premier ports of the east coast. Bishop Caldwell whose researches into the history of the region has thrown a flood of light, has identified Marco Polo's Cail' with the present hamlet of Palayakayal about 2 miles inland. This identity is confirmed by the relics of its ancient greatness which are still to be found, the whole plain for two or three miles north of the village and for a mile or two inland is covered with broken tiles and remants of pottery and China porcelain.

The tamil word 'Kayal' means a back water or a lagoon opening out to sea and in this part of the coast there is a number of these Kayals or backwaters near the mouth of the river and in various stages of silting up. Many may have dried up completely since then and in some salt pans have been established.

Both Korkai and Kayal are situated on the delta of the Tambraparni 5 and 2 miles respectively from the sea but each was originally on the coast. It will appear at first sight remarkable that the sites of two such famous places shoud have been discovered in the same neighbourhood but a consideration of the geology makes it clear why each had to be abandoned in turn. As the silt accumulated near the mouth of the river or as the coast line rose or from both causes Korkai was found at length too far infland for the convenience of the sea borne trade. 'Kayal' rose in its stead on the seashore and rose to still greater dimensions. Progressive recession of the sea due most probaly to the silting of the lagoon. however, threw Kayal also into insignificance. The prevalence of lagoons and marshes add weight to this conjecture.

The islands lying to the east of Tuticorin harbour, the Pandyan, Cronjee and Punnayadi thivu which were reported to have been separated from each other and from the mainland by a shallow channel, are now united together and with the mainland and this is also due to the same processes that led to the abandonment of Korkai and Kayal.

In conclusion it may be said that the physical and geological features point unmistakably to a gradual elevation of the region within recent times while apart from this there has been an advance of land locally due to an accretionary growth, which latter has continued down to historic times and may be still in operation. A more detailed geological survey combined with a study of the charts of the adjacent seas will give very convincing proofs of the deductions ennurated, but which unfortunately could not be attempted.

A Suggested Syllabus in Military Geography and Map Reading in the University Studies

By

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As the U.T.C. cadets are now entitled to offer the subject of Military Geography as an optional subject in many Indian Universities, a syllabus may be suggested to bring this subject in line with other University subjects.

Aim.—The main object in teaching Military Geography and Map reading at the First Year stage should naturally be (a) to enable the Cadet to grasp the importance of the geographical factor from the point of view of war and relations between nations; and (b) to give him a ground-work in tactical training through a systematic course in Map Reading. This has become all the more important with the recent introduction of Certificate 'A' and 'B' courses in the curriculum of the University Training Corps.

Considerations in framing a syllabus.—The following points arise in framing such a syllabus. (i) The course should be based on the assumption that the Cadets have reached a matriculation standard in Geography. This would obviate unnecessary duplication of work and waste of time. (ii) The course should consist of general outlines of the subject with some special reference to India. This would maintain a desirable continuity in the subject from the Matriculation stage and would not impose too great a burden on the Cadets at the cost of the other examination subjects. (iii) Although Map Reading does not strictly form a part of Military Geography, it is included in this course for two reasons; (a) understanding of *local* geographical factors through a systematic interpretation of maps is as necessary as the knowledge of general principles of Military Geography (b); it gives the Cadet a basis frame-work for his tactical training and as such it should help him in his general training especially at the stage of Certificates 'A' and 'M' examinations.

Syllabus:—

Paper I. *Military Geography:—*

A. An outline survey of the world in its political aspects; distribution of races of mankind; distribution of economic resources essential from the point of view of war.

B. Elementary study of frontiers; sea, desert, mountains, forest and swamps. River boundaries; artificial boundaries; their advantages and drawbacks.

C. Elementary study of lines of communication by land, sea and air. Cable routes and wireless.

D. An outline study of the *leading* powers in their geographical setting; economic interdependence of nations in peace; problems of self-sufficiency in war.

E. a. *India*—distribution of essential minerals and raw materials; lines of communications by land, sea and air; industrial areas and their significance; political geography; British Indian Provinces, Indian States, Burma, Ceylon; b. *Problems of defence*—organisation of defence; internal and external security; nature of frontiers, land and sea; strategic points of defence outside India.

F. Imperial relations and security.

Paper II. *Map Reading:—*

A. Use of large scale maps in military operations; different types of maps; a descriptive survey of the large maps of the leading powers.

B. Definitions.

C. Conventional signs; use of Service Protractor.

D. Scale, conversion, setting a map, bearings, grid.

E. Methods of representing relief; advantages and drawbacks, visibility; appreciation of a given area from map.

F. Enlargements and reductions.

Expalanatory Notes.

Military Geography.—A. An outline survey of the world in its political relations should consist (at this stage) of a rapid survey of the world more as a revision of the Matriculation course, but greater emphasis should now be laid on political region; since racial factor, as is obvious, is playing a predominant role in world events, an elementary knowledge of the races of mankind and their distribution is desirable; the same consideration applies to the disribution of raw materials and mineral resources.

B. A critical study of frontiers is naturally one of the most important aspects of Military Geography. Only an outline study however should be expected in this course. Leading examples of different types of frontiers should be given and their advantages and drawbacks should be stressed.

C. The importance of lines of communication by land, sea and air, in war and peace, cannot be overstressed. Cadets should be taught the general principles underlying each type, with special reference to certain leading examples. An exhaustive survey of the communications of the world is not necessary at this stage.

D. An outline study of leading political powers like Great Britain and U.S.A. is desirable from the point of view of international relations. It is to be noted again that at this stage this cannot be anything more than a very general survey.

E. (a) *India.*—Here a detailed knowledge of the country from the point of view of defence and economic self-sufficiency is expected. Cadets will have already studied the general geography of the country at this stage since it forms a part of the Matriculation course in most of our Universities. Emphasis must now be laid on those aspects which demand special notice from the point of view of war. The distribution of minerals and raw materials, and the development of the 'key' industries should receive attention, since economic self-sufficiency now-a-days plays a fundamental role in war. Similarly a study of lines of communications is important, because on them depends the maintenance of law and order in a vast country. These should be studied, in their pattern and distribution, from the point of strategy and ease in moving men and material in times of war. Certain political factors within the country cannot be ignored; Linguistic regions, religions, British Indian Provinces and Indian States, are some of them. The position of Burma and Ceylon has to be studied since they are our immediate neighbours and from the point of defence almost a part of our country. (b) *Problems of Defence;* Problems of defence must naturally receive a detailed consideration; as maintenance of law and order is a vital factor, the problem of internal security is important. This presupposes an outline study of the organisation of the Army in India. The problem of external security entails a critical study of the land frontier on the north and the approaches by sea in the

south. This part of the course should include a reference to all the strategic points of defence outside India, such as Aden, Cape of Good Hope and Singapore.

F. Imperial Relations: This part of the course should consist of a descriptive survey of the British Commonwealth, its defence organisations, and the role of the country in his organisation.

Map Reading.—This part of the syllabus requires very little explanation since most of it consists of practical tests in ability to read a topographical map. In training as well as in examinations the practical side must be stressed. This is possible only by a good deal of field-work during the training period. Examination in this respect should therefore be conducted more to test the ability of Cadets in making use of the map for tactics than to test his knowledge in theoretical aspects of map reading and general cartography. Topographical terms and conventional signs form the bases of map reading. Questions on visibility and gradient are intended to give the cadet an idea of the nature of the ground as represented by contours or any other method of representing relief, on the map. Setting the map, taking bearings, and use of grid, are obviously those aspects on which depends the utility of the map in tactics. A comparative study of scales is useful in getting an idea of distances; R.F. is useful in comparing maps drawn on different scales and systems of measurement, as, for example, the one Inch (or 1:63,360) map of the British Ordance Survey and the 1:50,000 scale French maps drawn on the metric system. Finally a study of enlargement of maps is necessary from the point of view of field-sketching and tactics. A question on appreciation of an area may be usefully asked to test the ability of Cadets to visualise the ground from a study of the maps.

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