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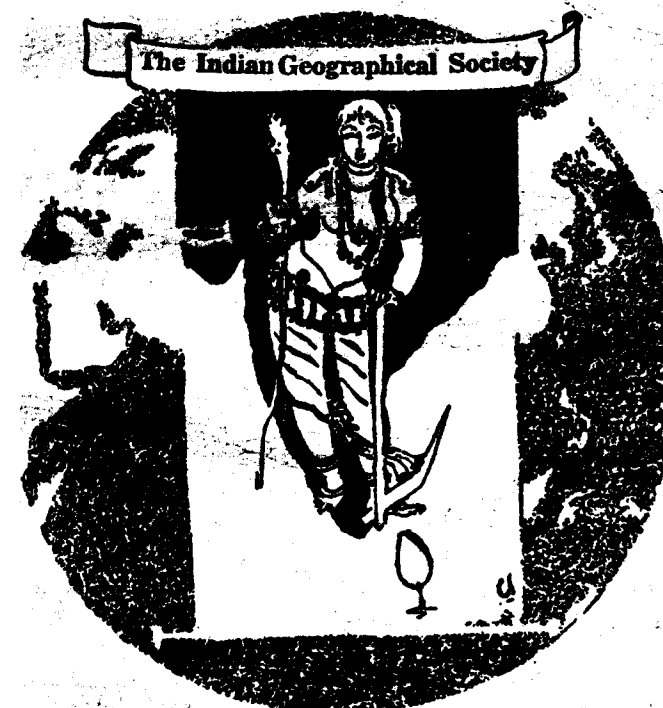
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Foundations of College Geography

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Vol. III: Asia (In Press)	

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The Editor takes no responsibility for the views expressed in the Journal. Authors alone are responsible for their respective statements.

Geographical Factors and Music

BY

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A comparative study of the music of different countries shows that geographical factors have to a certain extent played some part in imparting the particular trait to the country's music. While countries occupying the lower rungs of the ladder in the scale of human civilisation have to their credit only folk music and folk dance, civilised countries have in addition, developed art music and art dance.

A study of the music of different countries, made from the following points of view, will reveal interesting details:—

- (1) The quality of the music of the country—whether martial, serious, light, frivolous, erotic or pathetic.
- (2) If the people generally speaking, are artistic in their temperament and outlook; if they are a musical race and if they are instinctively musical.
- (3) The place given to music in the scheme of national life.
- (4) Places which are at present active seats of music and places which were seats of music in the near past and remote past.
- (5) The number of composers and musicians that the country has produced.
- (6) The status enjoyed by musicians and composers in society.

- (7) The number of opera-houses, concert halls, open-air theatres, musical conservatories and academies that the country has.
- (8) The types of concerts preferred by the people generally in that country.
- (9) Materials used in the manufacture of their musical instruments.

The political and economic conditions of the people of a country are truly mirrored in their national music. In countries which are situated in the midst of powerful and aggressive neighbours and which have in consequence been subject to continuous wars, we seldom come across a vigorous type of music. In countries more fortunately situated, we see a gaiety and vigour in their music.

In the continents of Asia and Europe, it will be found that the countries along the centre have a glorious musical heritage. Germany and Italy have to their credit a very large number of composers who have shed lustre on European music. So is the case with India. Indians are perhaps the oldest musical peoples to inhabit this globe. The Vedic hymns constitute the earliest hymnal music of humanity. Music has been given an honoured place in the scheme of life of the nation in India.

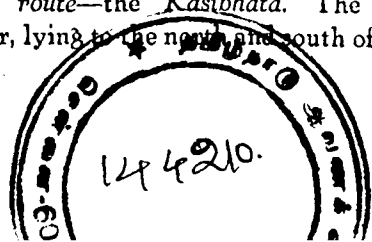
Seats of Music

Musically advanced countries have developed a number of seats of music. Eminent composers and men who specialised in the technique of playing particular instruments lived in those seats. They attracted to their places the best musical brains of the country.

Seats of music can be classified into those which owe their origin to:—

1. Historical factors.
2. Geographical factors.

Rulers who were interested in music and Rulers who were themselves scholars and performers, patronised a number of musicians in their courts and such places became important seats of music in course of time. Munich and Vienna in Europe and Delhi (during the reign of the Moghal Emperors and until the time of Aurangzeb), Rampur, Baroda, Bobbili, Vijianagar, Karvetnagar, Venkatachiri, Tanjore, Pudukottai, Ramnad, Sivaanga, Ettiyapuram, Udayarpalayam, Mysore and Travancore in India may be cited as instances. The city of Madras stands as an instance of a seat of music which not being the capital of a State with a record for musical patronage, nevertheless grew in musical importance on account of its geographical situation and political importance. Madras lay on the hoary Benares—Rameswaram route—the *Kasibhata*. The shrines at Tiruvottiyur and Tiruvanmiyur, lying to the north and south of Madras were invariably visited



by streams of pilgrims who came to the South. Eminent musicians and composers took up their residence in Madras from the 18th century onwards. They had opportunities of meeting the musical luminaries who came to the south in the course of their pilgrimage. This capital and seaport town on the Coromandel coast attracted to it also men of commercial enterprise. Some of them amassed immense wealth by trading with the East India Company. Lovers of music like Manali Muthukrishna Mudaliyar and Venkatakrishna Mudaliyar, Pachiappa Mudaliyar and Kovur Sundara Mudaliyar lived in Madras during the 18th and 19th centuries, and lavished patronage on a number of musicians.

Places which were centrally situated and which had a favourable climate, bounteous rainfall, wealth of agricultural produce and facilities for leading a care-free life also became seats of music. Such places provided opportunities for quiet thinking and for the best musical minds of the country to come into contact with each other. Desert regions, mountainous tracts, barren places and regions subject to extremes of heat and cold never became seats of music. Places lying in the corner of a country continued to preserve the old characteristics of their music. They were not influenced much by the new movements in music which originated elsewhere. For the same reason, any new movement in music that originated in such corner places never made their influence felt beyond the districts on their borders. Travancore and portions of Malabar offer interesting study in this connection. The scale of the *Nanduni* used in Malabar temples and instruments like the *Villadi vadyam* and *Vina kunju* deserve notice.

People in colder countries are generally fond of listening to music of a heavy character. In Malabar people listen to with perfect composure, the Chenda (drum) even when it is played continuously for half an hour or more. But in Tamilnad, people would prefer to listen to the music of the *Naagasvaram* and *Tavil* only from a distance.

Musical Instruments.

The types of resonant wood used in the manufacture of musical instruments are those which are locally available. Maple and Pine are used in the manufacture of violins in Europe. Cocos wood is used for making European flutes whereas the bamboo is used for the purpose in India. Bone-flutes were made use of in Europe in ancient times. The bamboo flute gives a delightful tone and it stands as the best example of a nature-made instrument. Unlike the European flute, the Indian flute has no detachable parts. One can perform on the flute, music ranging from the simplest folk melody down to the highest type of art music. The conch is extensively used in the music of the temple rituals. There are conches which give a bright tone and conches which give a pathetic tone. The former are used in temples and in martial music and the latter in funeral processions. Every warrior in the

past had a conch of his own and he used it on the battlefield. The *Panchajanya* of Krishna and the *Devadatta* of Arjuna may be cited as examples.

Jackwood is largely used in the manufacture of the *Vina*, *Tambura*, *Gotuvadyam*, *Mridanangam* and *Kanjira* in South India. Sometimes blackwood is used for making *vinas*. Redwood is occasionally used for the shell of the *mridanangam*. *Vizianagaram*, *Bobbili*, *Tanjore*, *Trivandrum*, *Mysore* and *Miraj* are noted for the manufacture of musical instruments in South India. In the *Rudravina*, *Sitar*, *Kinnari* and North Indian *Tamburas*, gourds are used as resonators. The gourds are trained in their growth to the required shape. The snake-charmer's pipe consists of a bottle-gourd and two pipes. Into the bulbous end of the gourd are introduced the two pipes, one serving as the drone-pipe and the other as the tune-pipe. The skin of calf, sheep, buffalo and monitor lizard (*varanus*) are used in drums. Silver, bronze, brass, copper and iron are the metals used in the manufacture of musical instruments. With the exception of the Key-board type of instrument and instruments with a fixed tone system (both of which were useless for playing art music of the melodic type), all other types of instruments have developed in India. There are as many as 500 varieties of musical instruments in India, the largest that can be claimed by any single country in the world. The significant factors which localised the manufacture of musical instruments were the proximity of the requisite raw-materials and the availability of local talent to examine and pass them as concert-worthy.

Jalatarangam is an old instrument and is referred to as the *udaka-vadyam* (water instrument). Playing on this instrument is included among the *chatush-shashti kalas* (64 arts). It is certain that prior to the advent of the Chinese porcelain cups, metallic cups of varying sonorousness must have been used.

The bamboo stem is used in the *tuntina*, *kinnari* and *ektar*. Blackwood is used in the manufacture of *Naḡasvaram*, *Ottu*, *Mukhavina* and *Chipla* (castanets). The mouthpiece of the *Naḡasvaram* consists of the leaf of a marshy plant and this functions as a double reed. The *Naḡasvaram* is the Indian Oboe.

Maddur on the Bangalore-Mysore line was once famous for the manufacture of metallic strings. With the import of the foreign cheap strings, this industry received a setback. The war has however given a fillip to the manufacture of *guts* in India. Violin *guts* (D and A strings) are now being successfully manufactured in *Vizianagaram*. Metallic strings with twisted coils around them are made in the South.

India is the home of the earliest bowed instrument known to musical history. The hemispherical coconut shell was taken and covered with a

skin. A bamboo stem was fixed in its side. A bridge was placed over the belly and over it two strings were made to pass. The ends of the strings were tied to the two pegs on the top of the stem and to the attachment on the coconut shell. A crude bow of horse hair was used to play the instrument.

The head-pieces of some of the Indian musical instruments are carved into the shape of some animal or bird. For example,

1. The head-piece of the *Vina* is carved into the head of a *Yali* (a weird animal).
2. The head-piece of the *Kinnari* is carved into the head of a *Kite*.
3. The head-piece of the *Taus* is carved into the head of a *Peacock*.
4. The head-piece of the *Svarabat* is carved into the head of a *Parrot*.

There are also snake-shaped horns and horns with a tiger's or lion's head. The *Gomukha* mentioned in the *Ramayana* and *Mahabharata* as a wind instrument used in martial music, resembled the mouth of a cow. *Gosringa* was made of cow's horn and this is also mentioned in these two epics.

Climatic Effects.

Flutists in cold countries have to come to the concert hall at least 15 minutes ahead of the time scheduled for the commencement of a concert and be playing something in order that the warmth imparted to their instruments might restore their normal responsive character. In fact, in a concert hall in Europe, prior to the coming in of the conductor all the performers on instruments will be playing something or other in quick tempo, either for the above purpose or for getting into form. On the other hand in hot countries, there is the danger of perspiration which causes not a little annoyance to instrumentalists. As far as the flutist is concerned the sweat on the lower lip makes the embouchure of the flute get sunk in the lip to a greater extent than usual, with the result that the pitch of the fundamental note gets slightly altered. He is therefore obliged to adjust each time and play cautiously.

In cold countries musicians are able to carry on their practices during day time but in hot countries, practices are mostly done in nights and mornings. Relatively speaking, European musicians are able to practice for longer hours than Indian musicians. Fatigue is a thing that is rarely felt in cold countries. In the case of professional performers in India, the pitch of the voice gradually decreases with advancing age. Climatic conditions are again responsible for professional performers in Europe being enabled to pursue their career for a longer number of years than their brethren in the line, in hot countries.

The fretting of the Vina will be a problem in cold countries. The fretting is done in India by the repairer sitting in the sun with the Vina in front. Due to the heat, the waxy ledge slightly gets soft and while in that condition the frets are placed at the correct positions. In cold countries, although the sun may be shining brightly, still the temperature is so low that the fretting of the Vina cannot be done in the manner indicated here.

Dance dramas (Yakshaganas) are performed in open air in India but this will not be possible in cold countries. There are open-air theatres in places like Salzburg in Austria but such theatres are used only for a brief period during the summer. The folk music festivals of India are held in open air and during off seasons, so that the peasants may be enabled to fully participate in them.

The Musical Conservatories of Europe are housed in colossal buildings with double-walled sound-proof chambers. During a lecture-hour, the door will be closed and even though a piano class may be going on in the next room, still no one will get even a faint idea of that class. But in India it is futile to construct such buildings, because of the problem of ventilation. The doors of lecture-rooms here have to be kept wide open.

It is doubtful if women in tropical countries can reach the high notes of the sopranos of Europe. Let it be remembered that the highest notes reached by sopranos there, approximate to the tara sthayi kakali nishada and the atitara sthayi shadja of the normal pitch of women's voices in India.

If data from different countries could be collected concerning the following :—

1. The age at which the voice breaks in the case of boys ;
2. The period taken for the adult voice to set in and,
3. The behaviour of the voice during the period of transition,

we may be able to conclude whether climatic conditions have anything to do with these physiological changes. The voices of girls also break sometimes and if data relating to this item also can be got, we can evolve some useful generalisations.

Miscellaneous.

In all the countries of the Orient it is the melodic system of music that prevails. The harmonical system had its birth in Europe a few centuries ago and has spread to America and countries which did not possess a developed system of music. Indian music stands as the perfection of the melodic system. Even now Indian music is the one system that uses quarter-tones. Scholars and musicians in India do not merely talk about quarter tones but use them in their music.

In the matter of the geographical distribution of musical scales, it may be interesting to note that the scale of Sankarabharana, (Bilaval of Hindustani music and the Major diatonic scale of Europe) is the most widely distributed. Next in rank comes the penta-tonic scale, Mohana (CDEGA^c). Besides Indian music this scale is found in Chinese music, Scotch music and Celtic music. The scale of Simhendramadhyama (57th melakarta, taking the notes CDE (flat), F (sharp), G, A (flat) and B) is found in the music of the Hungarians and Gypsies in Europe. The scale of Suddha saveri (Durga of Hindustani music) CDEFGA^c is found in the music of Indonesia and the Far Eastern Archipelago.

The murchanas or the derivative scales of the primordial scale of Indian music (sa grama), have their parallels in the ancient Greek and Ecclesiastical modes and in the modes of the Arabs.

The seasons and times of the day or night mentioned as the most appropriate for singing particular ragas are of special interest. Some ragas can be sung at all times, while there are others which are intended for being sung before sunrise or after sunrise, during midday or afternoon, evening or night. There is no questioning the fact that the ragas sung during their allotted times sound best, but the time-theory of ragas generally speaking may be said to be amenable. The Indian calendar recognises six seasons of approximately two months each in a year and the six primary ragas : Sri, Vasanta, Bhairava, Panchama, Megha and Nattananarayana were allotted to these seasons. The shadrutus or the six seasons are : Vasanta, Grishma, Varsha, Sara, Hemanta and Sisira.

The musical stone pillars adorning the temples at Hampi, Madura, Tinnevely and Suchindram are the pride of South India. The like of them is not to be seen in other countries. These pillars are made of resonant granite. These stones perhaps have iron in their composition. Wherever such stones were available, the temple architects made the fullest use of them. Both a musical and a rhythmical accompaniment were provided by these pillars. They were played upon with two thin sticks. There is a resonant boulder on the Chandra giri Hill slopes. Steps of resonant stones are found in the balipitam at the entrance to the temple at Darasuram, near Kumbakonam. In the temple at Krishnapuram in Tinnevely District, there are whole images of such resonant stones.

Musical Maps.

Musical maps of India can be prepared on the following topics :—

1. Showing the seats of music—Present seats and Past seats. The relative density of each seat as shown by the number of scholars, musicians and composers that adorned those places, can be depicted with appropriate signs.

2. Showing the birth-places of famous composers and musicians ; also places which contain the samadhis or tombs of eminent musicians and composers.

3. Showing the places connected with the biographies of eminent composers.

4. Showing the places noted for music festivals and for the performance of dance dramas and folk dances.

5. Showing places which contain sculptures and paintings of interest from the point of view of musical iconography.

6. Showing places noted for the manufacture of musical instruments.

The names of some ragas in medieval and modern music suggest a provincial origin. Kambhoji (from Camboja), Saurashtra. Malavi (from Malwa), Gujjari, Dravida Gujjari and Maharashtra Gujjari, Surati, Multani, Andhri, Turushka Todi, Nepala Guda, Sindhubhairavi, Sindhukannada and Kalinga may be cited as examples.

The Physiography of the Jumna

BY

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The Jumna¹ has its source among the springs at the foot of the Jumnotri peaks of the Himalayas, which rise to an elevation of nearly 21,000 feet. During its first southerly course of about 100 miles, it is joined by the Tons, Giri, Ahsan and other minor streams. The river pierces the Siwaliks 88 miles from its source at Paonta, and leaves the hills 8 miles below at Khara. Thereafter it takes a general southerly course.

At Tajawala where the Jumna debouches from the hills, it is dammed by a weir, which diverts the stream through a regulator into the western branch of the river which itself serves the purpose of canal for the first 13 miles of the Western Jumna Canal. At this point it is joined by the Somb and Pathrala torrents and a dam at Dadpur across the combined streams directs the Western Jumna Canal into the excavated channel.

It is a large river at Faizabad, where it discharges the huge volume of water drawn from the mid and outer-Himalayas, lying between 77° and 79° E. longitude, and gives off the Western and the Eastern Jumna Canals. Thereafter it runs south-west. The Western Jumna canal is led to the Boli Nadi which it meets below the village of Urjani and for about two miles, both run conjointly in the same channel. After they are joined by the Somb Nadi below Hariwa, the Canal is taken westwards and the Nadi falls in the Jumna below Mandawali (Gujar). Further south the Jumna receives the Budhi Jumna above Sadullahpur Kalan.

From Sherghadh Tapu, in Karnal, the river takes a more southerly turn and is met by a small river, the Saindli Nadi, near Dhakwala in Muzaffarnagar. Below Manglaura it divides itself into two branches, the main river running along the Muzaffarnagar—Karnal boundary and the other running more to the west into the interior of Karnal. They both meet at Budhanpur. A little farther, it again divides itself into two branches, one proceeding south and the other running north-east to Balhera Kalri in Muzaffarnagar, wherefrom it curves southeast and both join again at Barana. Thereafter it runs south for about 40 miles and then swings south-east.

Before 1934, the Jumna flowed more to the west² in Muzaffarnagar, passing by Mustafaabad, Dhakwala, Manglaura, Bindauli, Yusufpur—

1. It is the Yamuna of Sanskrit, the Diamouna of Pliny and Jobares of Arrian.
2. See the old bed marked in Topographical Map No. 53 G/2, 2nd Edn.

Jalalpur and Balhera Kalri. At that time the junction with the Saindli was effected at Mustafaabad.

Below its junction with the Saindli, the Jumna takes a more easterly turn and divides itself into two streams again at Tanda in Meerut. The principal current follows the Karnal-Meerut boundary while the minor one drifts some distance east in Meerut. The two currents meet after an independent course of about 2 miles. Ten miles below Delhi, it gives off the Agra Canal from its western bank at Okhla and runs south-east for 25 miles to Muazzamabad in Gurgaon, when it again resumes a southerly course. From Dadsia, in Gurgaon, the tendency to meander becomes very much pronounced.

The meandering tendency of the river in loopshaped folds clearly indicates that it has reached its base-level of erosion. This has checked the vertical corrasion and increased the lateral corrasion with the result that the river is now working sideways instead of downwards.

The meanders also indicate that there the angle of declivity of the river is low and the general surface of the country more level and the ground more soft. By this process, while the course has been greatly lengthened, the velocity has been proportionately diminished.

Below Gurgaon it forms the boundary between Gurgaon and Aligarh. It then enters into Muttra and, crossing it, turns east till the borders of Agra are reached. Throughout its course in this district where it receives the Banaganja, and also in Etawah, it winds in a remarkable manner, its bed lying deep between high banks which are furrowed by steep ravines. Just before Jalaun is reached the great river Chambal joins it, and the Jumna then separates the three districts of Cawnpore, Fatehpur and Allahabad from Jalaun, Hamirpur and Banda. In Cawnpore District, the Senehar and in Fatehpur the Non and Rind bring their contribution into it. Near Hamirpur the Betwa, and in Banda District the Ken flow into it. It finally falls into the Ganges below Allahabad, 860 miles from its source. The clear blue waters of the Jumna can be distinguished from the yellow silt-charged Gangetic stream far below their confluence.

The tributaries received by the Jumna from Paonta to Fatehabad in Agra are insignificant. Hence its volume is almost entirely determined by the drainage of about 5,000 square miles of its mountain region. The sources of the water supply, therefore, are the melting snows of the mountain tops in the catchment area and the annual precipitation, 90 percent of which comes in the rainy season of the south west monsoon. The amount of rainfall can be roughly gauged from the intensity of precipitation at the following points of the catchment area.

Mussoorie	... 27°55"
Chakrata	... 79°97"
Jağadhri	... 36°32"
Karnal	... 30°55"
Panipat	... 22°91"
Delhi	... 26°84"

The breadth of the water surface in the dry season varies from about 2,600 feet at Okhla and 1,500 feet at Kalpi to 2,200 at Allahabad. In July and August, however, it swells considerably and in places becomes miles wide with a maximum depth of about 25 feet. During winter its normal depth at Delhi is about 4 feet and the river is then just sufficient to maintain the supply of the three canals which draw from it and is also fordable at many places. In May the melting of the snow within the catchment area causes a considerable rise.

The river has a tendency to flood and the floods vary considerably both in time and volume. From the end of July to the end of September the level of the river may rise by about 10 feet at Paonta.

The highest flood recorded was that of 28th September, 1924, when the level of the river rose by 18 feet at Paonta. Previous to this the maximum gauge at Paonta was 38°5' feet (*i. e.*, 13°5' feet above the average level) recorded on 14th August 1903. The average discharge in floods at Okhla is about 41,000 cusecs but this dwindles down to less than 200 in the dry season.

The Jumna drains a total area of about 118,000 square miles. The variability of time and volume in its floods is primarily due to the position, size and shape of the catchment, being such that all the precipitation drains off in as short a time as possible. A fair amount of rainfall in the region follows a rush of water to the main stream from all directions. This increases the flow abnormally for some time and accounts for the pulsating nature of the Jumna floods.

The highest level between the Jumna and the Sutlej throughout from the Siwalik to Delhi occurs along the right bank of the former and no drainage enters the Jumna from the west in all this part of its course. That it should run on the watershed itself is a proof positive that it has made the ground it flows upon, when it was a depositing stream. By periodical overflow it gradually raised its banks and at the same time its bed and so today it runs on a board ridge of its own construction.

Groundnut in Madras.

BY

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The original home of the groundnut plant is believed to be Brazil. The Bengali name Chinibadam suggests that it came into Eastern India through China, possibly Western India got it through Africa. Though an exotic, groundnut has adapted itself so well to the Indian soil and climate that it occupies the first place amongst the oil seeds of India in production and trade.

Botanically called *arachis hypogaea*, the plant has a tap root of about half a foot in length with a few branches and several fibrils. The trunk is hardly an inch high, from which are given off ten to fifteen branches. Secondary branches are common but tertiary branches are rare. The roots are studded with clusters of tubercles for the assimilation of atmospheric nitrogen. An interesting feature of the plant is that it appears to sleep between sunset and sunrise, because the leaves which are horizontal during the day close up vertically by their upper surfaces at night. The explanation given is "Fluctuations in the intensity of light cause curvatures of the mobile parts of plants. The folding up caused by the dark is associated with an increase in the rigidity of the part and therefore, with an increase in its turgidity. The amount of water in the plant increases during the night in consequence of the diminished transpiration from the leaves..... The contractile organs also thus become charged with water, especially on their underside, and therefore gradually assume a more erect position" ¹.

After about three weeks of sowing, the plant begins to flower. Then supervenes a state of rapid flowering but the flowers wither away rapidly after fertilisation but the stalks elongate and bury themselves up into the soil for about three inches where the ovary develops into a pod.

From the early imported stock, there had gradually developed certain races of the plant, collectively called the indigenous variety ². As at present cultivated there are four main varieties of groundnut, though they may be called by different names in commerce and in different parts. They are (1) the Coromandel, (2) the Bold (3) the Peanut and (4) the Red Natal. The former two belong to the trailing type and the latter to the erect, or

bunch type. The Coromandel, popular in Madras, has a small size, an irregular constriction in the middle, a thick shell, a thick oval shaped kernel and an oil content higher than that of Bombay Bold. It is a descendant of the Mozambique or Mauritius seeds. The Bold, popular in Bombay, was derived from the Big Japan and has a large kernel. The Peanuts imported recently from America has smaller pods, thinner shells and a rose coloured round kernel, with the highest oil content. The Red Natal is a progeny of the small Japan and is unique for its deep red tests and low oil content. Besides these there are several minor varieties resulting from local adaptations of the plant.

In Madras the Coromandel variety covers 80 per cent of the area while the Peanut and Red Natal covers only 10 and 2 per cent respectively. The Bold accounting for 27 per cent in Bombay, is absent in Madras.

Climatic and Edaphic Requirements of the Plant

The groundnut plant cannot stand frost and is essentially a tropical plant as is indicated by its distribution at the present. It can withstand high temperatures, provided there is enough moisture at the root.

As for rainfall, the plant requires a minimum of 40" unless the deficiency is made up by irrigation. The upward limit is as high as 70", but in general, the higher the rainfall the better must be the drainage. The soil must be free. Hence groundnut is found to do well in rice tracts of moderate rainfall and high temperature. Groundnut does not require a high absolute minimum but a measure 30 or 40" which must be distributed properly to suit the differing needs of the plant during the different stages of its growth. In fact, it can grow any where, provided the soil is suitable and the rainfall is between 30 and 50" per annum, so distributed that there is a light rainfall in the early stages, a heavier fall later and none at all at the time of ripening and harvesting.

At the time of germination the soil must be moist but not wet with rain or irrigation. Otherwise mould would set in. But even heavy rains after four or five days of germination will do no harm. During the first two or three months of growth very little rain is required, especially for the Mauritius (Coromandel) variety, though at the time of first putting out leaves timely irrigation may be required. In general, the plant can withstand considerable drought and will respond to water supply up to a late stage. That is, any harm done by an insufficient rain during the earlier months can be repaired by irrigation as is done for the summer crops in Madras.³

1. Madras Agricultural Department Bulletin No. 37.
2. Commercial Products of India—Watt.

3. Imperial Economic Committee—Oil seeds—Groundnut.

During the period of active growth i.e., in the latter half of the plant's life, enough moisture is required and hence in Madras sowing is so arranged that the crop receives the full benefit of rains during the last two or three months of its growth. Possibly it is the satisfaction of this requirement of good rain in a limited period that has made groundnut a crop of monsoon lands. Maximum rain is required at the time of flowering, but during ripening and harvest, rains should cease.

Any departure from this ideal seasonal distribution of rain will damage the crop. Rain at the time of sowing will cause mould in the seed, while drought will prevent seeding. Drought during the flowering period will starve the plant and make it wither away. On the other hand, too much rain will cause excessive foliage and immature or empty pods. Any extended rain at harvest will render the pods liable to sprout and make harvesting difficult and costly. Frost at any stage will kill the plant.

It is interesting to notice that the climatic requirements of groundnut are similar to those of cotton and they differ perhaps only in their soil requirements, the latter preferring black heavy soils.

Soil requirements are not exacting for groundnut cultivation. It can be grown on any soil moderately fertile and not too heavy.⁴ In heavy soils the fine roots of the plant cannot penetrate. Pods will be few and yield low. Nuts are dirty and discoloured and cost of collection is great. The best soil is that which is ash coloured, absorptive and fairly retentive of moisture. The next best is the red sandy soil derived from the decomposition of sandstone, laterite, etc. Grey loam and alluvium are only of third rate value. Clay and salt-ridden soils are unsuitable. So are low-lying wet lands likely to be water logged. "In short, groundnut requires a sandy loam, light and porous with plenty of lime, with free subsoil drainage and a liberal supply of water."⁵ The crop thrives best on well drained open soils when the rainfall is well distributed.⁶

Cultivation of Groundnut in the Province of Madras

The Province of Madras has the distinction of being the biggest producer of groundnut not only among the Provinces of India but also among the countries of the world. It has over 3.6 millions of acres producing 1.65 million tons of nuts.

When it was first introduced into Madras is not definitely known, though Buchanan refers to it in his tours in 1800 as found in Mysore. Records in South Arcot take us back only to 1850, by which time the crop

4. Simkins—Agricultural Geography of the Deccan.

5. Watt—Commercial Products of India.

6. Howard—Crop Production in India.

had become commercially important. In a few decades its cultivation extended in the southern districts and immediately after it was introduced in the Northern Ceded Districts, its cultivation spread like wild fire, in a few years, in the beginning of this century. The climatic suitability of the Province explains its rapid extension and present popularity. No part of the Province is liable to frost and temperature is sufficiently high for the plant. Except on the West Coast, rainfall is moderate throughout the Province and by properly arranging preparation of land and sowing, to monsoon rains, the peasant makes the crop benefit by the rains as they come. It combines well with the other crops of the tract - with rice on the coastal zone and with millets in the interior. In the matter of soil, excluding the coastal alluvial tracts and the black soil patches in the Ceded Districts and in some Southern Districts, the Province is well suited with a predominance of light red soils which respond well to manuring and irrigation. These red soils possess enough of phosphates and potash which groundnut requires.

Seasons of Cultivation

Groundnut is a *Kharif* crop. Since it requires little moisture during the early stages of its growth but plenty of it in the last two or three months, sowing begins under the hot weather rains of April and May, but active growth of the plant depends on the monsoon rains in the period June to September. When the rainfall occurs from the retreating monsoon, as on the Coromandel coast, sowing is delayed till July or August, so that the crop gets the full benefit of the rains from October to December. But taking the Province as a whole, the cultivation of groundnut is found to be dependent on the South West monsoon. Sowings generally take place between May and August and harvests come in between November and January. The general preference of this S.W. monsoon is understandable, because it is the most dependable and is nicely distributed in time to suit the biological requirements of the plant.

Preparation of Land

Generally four ploughings will be sufficient unless the soil is heavy, or cultivation is begun late. Where groundnut is repeated on the same land, the good stirring given to the soil at the time of the harvest very much aids the next cultivation. Where a previous crop of something else had been taken, it may be too late in the season to plough the land more than four times and yet catch the monsoon which will be fast drawing to a close. For instance, where Ragi has preceded, a single ploughing is considered sufficient. The importance of thorough preparation of the soil for groundnut cultivation cannot be exaggerated, because otherwise rank growth of weeds under the influence of the monsoon rains will suffocate the groundnut plant, and also weeding will not be possible, as it might damage the fibrils.

Manuring is done best before the last ploughing and cross ploughing. But there is no unanimity of opinion as to its necessity or quantity. Groundnut is often cultivated without manure. As a leguminous plant it can fix atmospheric nitrogen but "opinions differ as to the effect of groundnut on the nitrogen supply. On the black soil, it is held to increase the fertility; on sandy soils manuring is considered necessary for a full crop." But experiments at *Palur* and in America show that unless the soil is poor, groundnut does not respond to manuring". Any how, in Madras the Red soil does not lack the chief requirements of the groundnut plant, namely phosphates and potash, so that on these lands additions of lime or phosphatic manures have little effect on yield.

But the cultivator always manures his field for this crop. He applies periodically, once in 3 or 4 years, a liberal quantity of tank or channel silt and ploughs it in, at the rate of 10 cart loads per acre. There is a feeling that dung manure predisposes the crop to attacks of *Verpuchi* and hence penning of cattle is discouraged. But there is no objection to the application of well-rotted farm yard manure, if available. But penning of cattle does good to groundnut if there has been a crop of, say, *ragi* immediately following penning and preceding the groundnut. Ashes are considered to be an excellent manure and so freely applied in the districts of South and North Arcot. *Indigo* refuse is sometimes ploughed in. It is to be noted that superior manures are not necessary for groundnut.

Sowing Season

On irrigated land the sowing season commences as early as the middle of May and goes on till the middle of August, but mainly between the middle of June to that of August. Crops sown early, i.e., in July do well and give off more branches and yield better. Those sown late are not so luxuriant in growth and also require 25 per cent more seed.

Sowing Methods

The usual method is to drop the seed in the furrow behind each plough. Women and children are employed to do this. This wasteful method is not adopted in the Ceded Districts where the seed is drilled.

Seed and Seed Rate

The kernels to be sown are as a rule obtained by shelling the nuts by hand, but the shelling is done only four five days before sowing. In some parts the pods are shelled by treading lightly and seed kernels are chosen carefully after removing the damaged kernels. In some cases unshelled nuts are also sown, one-seeded pods being chosen for the purpose. Moisture must be enough in the soil to ensure germination.

The seed rate varies according to the type of nuts grown and the prevalent custom in different areas will depend on the nature of the soil and rainfall. The minimum and maximum seed rates reported in India are 30 lbs and 90 lbs kernel per acre, and the average for Madras is 80 lbs. The percentage of total production that needs to be set apart for sowing works out at 11.3

Generally the rainfed crop requires more seed than the irrigated crop and the red soil more than the black cotton soil. Later sowings require more than early sowings. Bunch variety requires more than the spreading variety. Experiments at Palakuppam have shown that where the crop is sown in July-August, 60 lbs per acre are enough for the spreading variety, but 100 lbs are required for the bunch type. On the black cotton soils of Guntur 40 lbs have been found sufficient for the spreading variety. To a certain extent it is true to say that the higher the seed rate, the greater is the yield.

In Madras most of the seeds sown come from the cultivators' own stock, while in Bombay only 60% comes from this source. The improvident cultivator has to borrow or buy from a neighbouring cultivator or purchase in the market. He has often to pay 25 to 50% of the advance as interest. The Agricultural Department has not yet become a popular source and the quantity of seed distributed by the Department in Madras has been meagre, though it has risen from 1 ton in 1934-35 to 27 tons in 1938-39. A supply of 27 tons per annum out of 120 thousand tons required, is indeed, poor. The resort to the open market for seed is responsible for deterioration in the quality of the groundnut in the Presidency.

Experiments have indicated certain varieties as best suited to certain soils and climatic conditions, as well as to certain trade requirements. For instance the *Coromandel* is the best suited for export while the *Peanut* is good for crushing and the *Bold* for eating. "The desirability of growing different varieties to suit local conditions as well as the nature of demand, and the supreme importance of improving and maintaining the quality of Indian groundnuts, clearly indicate the necessity of centralised control of the production and distribution of seed by agricultural departments".

Germination

Under ordinary circumstances the seed germinates in about a week after it is sown. But if within three days of sowing a heavy rainfall occurs the seed will not germinate.

Hoeing and Weeding

A hand hoe is used to loosen the soil. The number of hoeings required depends on the season, but in general, for the first three months

hoeing should be done as soon as the land is dry after a good rain. This helps to keep the moisture in the ground and enables the pods to penetrate into the soil. Also it keeps down the weeds. For crops sown early, two hoeings at intervals of a month after sowing are enough, but for crops sown very late and for those sown on wet land, three hoeings are necessary as the young crops are liable to be choked by the heavy rains of the North East monsoon. Each hoeing requires about 16 to 20 coolies per acre and so hoeing involves a good deal of labour.

Water requirements of the crop are not exacting but moisture in the soil must be sufficient so that the pods might penetrate properly. In the case of irrigated summer crops, sowings of September or October require no water till January, but then they should have two waterings a week. The interval between waterings depends on the texture of the soil. Watering is done after laying out the field into small beds of six feet square, which receive their supply in succession. So long as the plant looks healthy in the morning it may be taken that it does not require repetition of irrigation. The yield of such irrigated groundnut is double that of the crop dependent on the monsoons.⁷

Harvesting

The crop is ready for harvest after five months. An experienced cultivator knows by sight the readiness of the crop for harvest. When the stalks of the underground pods have dried and the rim of the kernels has turned pink, the crop is ready, though there may be some pods near the ends of the branches still young.

The method of harvesting depends on the nature of the soil and the variety grown. In the bunch type the pods cluster round the root stalk and simply by loosening the soil under each plant, the plant can be pulled up with all the pods in tact. Instead of digging up each plant direct with a *mammutie* which is the common method, sometimes it is attached to a draught pole and worked like a plough. The plants are then pulled out and the pods collected by women and children. A few pods may yet remain in the ground and are brought to the surface by ploughing deeper. No fewer than fifteen men are required to loosen an acre of crop in a day and seventy five pickers are required to collect the produce of an acre.

In the Ceded Districts the practice is to work first in the field a type of big harrow (*pedda Guntaka*) drawn by bullocks and then a small *Guntaka* three or four times. The pods are then hand picked.

7. B. V. N. Naidu estimates the yield of monsoon crops as 1200 lbs. per acre and irrigated crop as 2400 lbs. per acre. See Groundnut—B. V. N. Naidu, page 7

In parts of Trichinopoly District and in some villages in North and South Arcot Districts the fields are said to be flooded and pods collected as they float on the water. But before flooding the land should have been left to dry for 15 days so that the pods will float. The vines also should be removed before flooding. Ploughing and flooding are repeated till all the pods are gathered but the whole work should be done expeditiously, lest the pods should get soaked and sink. After collection, they should be dried quickly to avoid moulds setting in. Obviously this method is practicable only where water is easily available.

The absence of heavy rain at the time of harvest is an important requisite both for successful collection and for maintaining the quality of the nuts. Under heavy rains, the pods, if very dry, will germinate. Hence the danger of germination is not quite so great in the case of irrigated groundnut. Heavy rains may by creating a large demand for labour for other agricultural operations force the groundnut cultivator to pay high wages to secure it.

The conditions of harvesting determine largely the quality of the crop and hence its marketability. The condition of the crop at the time of harvesting, the methods of harvesting and atmospheric conditions have all a bearing on the quality and quantity of the crop. If the crop be harvested too soon before maturity, light and shrivelled nuts are obtained making the outturn low and the quality poor. Since there is a gradual and uniform gain in oil content and reduction in free fatty acids as the seed develops, such premature harvesting naturally yields kernels of poor crushing quality. If on the other hand harvesting is delayed too much, the stalks of the pods get brittle and make lifting difficult and harvesting costly. When the haulms turn yellow and the lower leaves wither away it is said to be just the time for harvesting.

Rotation

Groundnut is predominantly a dry crop and so is grown in rotation with, or mixed with dry crops. Obviously mixed sowing is practicable only with the bunch type and the groundnut crop is harvested before the associated crop.

In South Arcot, on dry land groundnut is generally grown mixed with *cumbu* (spiked millet) or sometimes with *tenai* (Italian millet) or gingelly (sesamum) red gram, hemp or castor seeds. On irrigated land, it is generally sown by itself, though occasionally mixed with ragi.

When sown mixed with *cumbu* on unirrigated land, the latter may be sown a month earlier (in May or June) and groundnut later hoed in. But if the season is well advanced, groundnut is dropped immediately after

cumbu or *tenai* is sown. Where *raji*, is sown on land which has to be irrigated, groundnut is dibbled in during the hoeing of *raji*, or after the harvest of *tenai*, which is a short period crop.

Variations are found as between the different parts of the Province. The ryots in Chingleput, North Arcot and Tanjore prefer to cultivate groundnut alone. Whether groundnut is cultivated alone or mixed, depends on the nature of the season, the extent of land available, the type of groundnut sown and the staying-power of the peasant. Where land is in plenty, specialisation is possible. A needy peasant may be anxious to have a hardier crop associated with groundnut to be sure of at least that, in case of failure of rains. If sowing has been delayed till July, it is usual to grow groundnut alone as the season for sowing *cumbu* has already passed.

Experiments made to ascertain the best system of rotation and mixed cropping show that mixed cultivation of groundnut and *cumbu* is more economical because of larger yield than groundnut-*tenai* combination. The combination with *cumbu* is preferred also because it is a short term crop, harvested earlier.

As a legume, obviously groundnut is best suited for cultivation in rotation with cereals. On irrigated land groundnut thrives best after *cumbu* or *raji*. In the South Arcot District groundnut and *Varaḡu* are supposed to form a good rotation as it leaves the soil in a friable condition. Experiments at Palur show that where cereals and groundnut are sown as pure crops, *tenai* and *raji* form a better rotation with groundnut than *cumbu* because the yield is greater. As between *tenai* and *raji* there is nothing to choose. *Raji* rotating with groundnut and cotton following groundnut yield best. Groundnut after *chulam* is said to be liable to attacks of *Verpuchi*. Groundnut may do well after indigo but not vice versa. Hence it appears that *tenai*-groundnut, *raji*-groundnut, and groundnut-cotton rotations are the best; that mixed cultivation is more economical than rotations and that *cumbu*-groundnut is a better mixture than *tenai*-groundnut.

Where groundnut has been recently introduced there is a tendency to continuous cultivation or only rare rotation. This necessarily makes heavy manuring necessary. The effect is said to be to predispose the crop to disease, to reduce the oil content and to increase the proportion of hollow nuts. The Northern and Southern Zones of groundnut cultivation in the Presidency differ in some important respects in the manner of cultivating this crop. The southern districts of North and South Arcot were the earliest to take to groundnut while the northern Ceded Districts began only in the twentieth century. Yet, in several

respects the latter show superiority in the arts of cultivation. The yield per acre in the Ceded Districts is nearly 750 lbs. whereas in the Southern Districts it is barely 250 lbs. The northern ryot drills the seed so that there is economy in seed, cultivates with bullock power, pulls out the mature crop with about 75 per cent of the pods in tact by a special adaptation of his *ḡuntaka*, dries and stocks the crop with the pods for about 3 or 4 months until he gets leisure and the kernels are dry and then thrashes the crop, winnows out the haulms and secures 75 per cent of the produce at less than 1/6 of the cost of the South Arcot ryot.⁸ This is almost the American system except for the part played by pigs in recovering for themselves the pods deep in the earth. By storing the haulms and pods in tact, the peasant is able to sell at the most opportune moment when stocks in the market are low and obtain a good price, especially because his kernels are free from moisture. Contrast this with the habit of the South Arcot ryot to rush to the market immediately after harvest and to moisten the kernels going to the market.

Yield.

The yield per acre depends to a certain extent on the variety grown in a particular area, but more important are the seasonal and soil factors. The yield has varied notoriously from year to year in different areas according to the vicissitudes of season and differences in the technique of cultivation. In general, the spreading varieties give a larger yield than the bunch types and yield on light soils is better than on heavy ones⁹. Also irrigated land gives double the yield of rain-fed lands.

The average yield per acre in India (902 lbs) is among the lowest in the world, though better than Senegal (765 lbs), South Africa (491 lbs) and the U.S.A. (758 lbs). Spain and Italy yield nearly twice as much as India and even China records 1668 lbs. Mauritius stands foremost with 2230 lbs.

The average yield in Madras (1014 lbs) is above that for India and during the quinquennium 1933-34 to 1937-38 the yield per acre has varied between 877 lbs and 1016 lbs, with an average of 1014 lbs, which does not differ much from the standard yield of the Province (1120 lbs.) Yield in Madras up to 1914-15 has been under 900 lbs per acre, but has increased subsequently with the introduction of improved varieties. Just the contrary happened in Bombay due to change over from irrigated to unirrigated cultivation of the crop.

Among the several districts in Madras the Ceded Districts and the Circars have a higher average yield than the Southern Districts in general and Coastal Districts in particular.

8. Madras Agricultural Journal 1935.

9. Report on the Marketing of groundnut in India.

Pests and Diseases that affect the groundnut plant are numerous. *Verpuchi* is a type of larvae that eats away the tips of the roots and fibrils and thus cause the death of the plant. The attacks occur in isolated patches and hence ravages are seldom extensive. Fresh farm-yard manure is said to predispose the crop to this attack. Groundnut following *cholam* is also found to suffer from this disease.

The red hairy caterpillar which is striped red and black and bristles with hair is a familiar pest in South India. They appear suddenly in large numbers soon after the rain and eat away the leaves of the tender plant. They may affect large tracts of the crop but the plant, if mature enough, can recover from their onslaught, provided repeated attacks do not occur. But in the case of young crops destruction may be so complete as to necessitate resowing. Anyhow, once the crop is affected by these pests, yields are much below the average. As for methods of combating them, hand picking of the moths as they appear is suggested. The pupae of the caterpillar which lurks in the soil can be collected and destroyed. An effective step would be to dig steep trenches across the path of the approaching swarm of caterpillars.

Surul Puchi, known as *Panni novu* in North Arcot and Chingleput attacks the plant as a result of which the leaves curl up and their margins meet. It is a tiny, hair like, dark coloured larvae, scarcely one quarter inch long, settling on the under surface of the leaf. Crops wither away unless heavy rains refresh them. The *puchis* die at the same time in patches and fall off. The destruction of the crop was so extensive and complete at times, that animal sacrifice and sprinkling of the blood were the only remedies that the ryot could think of.

Sometimes, weevils attack the plant and green larvae is another enemy, though never a menace. In *Murai-novu* the pest burrows into the plant near its collar and splits the germ open. *Thamarai-novu* causes a characteristic sickly appearance in the plant and the leaves decay from the top to the bottom. A black insect (*Naval puchi*) is said to attack the pods in storage and damage the seed kernels. *Perandai-novu* in which the leaves fold into quadrangular shapes, *agni-roham* which causes brown spots on leaves leading ultimately to their decay, *sembai-roham* in which the leaves turn red, *idi-novu* in which the crop wither in patches are other diseases which the South Indian ryot can distinguish.

Agricultural Research and Groundnut

South Arcot was the District where groundnut was originally cultivated extensively, though as early as 1800 Buchanan found it in Mysore. From 3,000 acres in 1850 in Panruti and Villupuram taluks, ¹⁰ the area rose

10. South Arcot District Gazetteer, p. 225.

fast to 20,000 acres in 1870 and 48,000 in 1882. Unfortunately in the late nineties the acreage declined suddenly from 185,000 to 80,000 due to deterioration of seed, exhaustion of soil and several diseases. Messrs. Parry & Co., Ltd., the principal exporters of groundnut introduced in 1889 a new spreading variety called the Mauritius or the Mozambique and it did well raising the acreage to 133,000 in 1900 and 343,000 in 1902.

Since then, deterioration was again in evidence, the new seed no longer giving the same results as it did originally. The Government sanctioned an experimental farm in Cuddalore Taluk and research was begun at Tindivanam, Nedu Veerapet, Palakuppam, etc., and naturally attempts were made to select the best variety that would stand drought.

An intensive study was begun in 1931 and trials revealed that the Bunch varieties were less resistant than the spreading. Among Bunch varieties the Gudiyattam Bunch and the small Japan, and of the spreading varieties the Virginia Runner (A. H. 7) and local Pondicherry (A.H. 72) were found to be more resistant to drought than others.

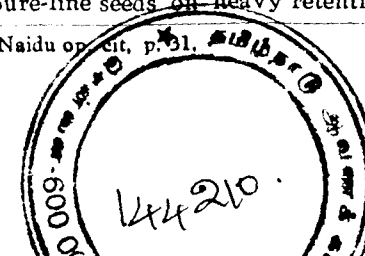
Selection resulted in the choice of A. H. 1581 and 1589 (from Tennessee White and Improved Spanish respectively) as the best of the Bunch type while Saloom (A. H. 25) proved to be the best spreading type. This last was obtained from West Africa in 1930 and is drought resistant.¹¹ It yields 15 to 25 per cent more than the local Coromandel and the kernels have a rose coloured testa. The seed distributed by the Madras Agricultural Department in recent years is mostly of this variety. The variety suits best the conditions of South and North Arcots, Chittoor, Trichinopoly and Guntur. Elsewhere the Mauritius is popular. Experiments in manuring have shown that Potash increases the yield of groundnut but Ammonium Sulphate affects the yield in the absence of basal dressing.

A five year scheme of Research to be conducted in Madras was sanctioned by the Imperial Council of Agricultural Research. This programme includes as chief features the selection, or breeding of varieties possessing high yield, oil content, high shelling percentage and low free fatty acid content; from these to select also drought resistant and disease resistant varieties. The effect of soils, climate, manurial and general management conditions on yield and quality of soil is also to be studied.

The scheme inaugurated in 1937 has established the superiority of the Gudiyattam bunch in shelling per centage, of A. H. 334 in yield as against A. H. 25 itself, and of pure-line seeds on heavy retentive soils and

11. Dr. B. V. NarayanaSwami Naidu op. cit. p. 31.

52.
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needed for cloth manufacture was supplied by the Imperial sobahs of the Indo-Gangetic plains as well as by Malwah and Gujrat. Sind and Malwah cotton was always regarded as of very high quality. We do not find in any Indian or foreign records cotton in the list of foreign imported goods. From the history of the world cotton production development, we find that U.S.A. had not even started cotton cultivation. Egypt and Spain were producing a very limited quantity of cotton and these countries had no surplus quantity of cotton for export. Our requirement of raw cotton was never less than several thousand million tons per year.

Hemp or Tasar :—It was another important cloth weaving material. The whole quantity of Tasar thread was supplied by Orissa and Bihar.

Gold and Silver tissue or thread :—Gold and Silver tissues and wires were manufactured in the Empire. They were never obtained from any foreign country, either of Asia or Europe. These tissues or wires were used with silk and wool threads in the manufacture of fine and costly type of cloths. This industry is still alive in places like Benares.

Dyes and colours :—Dyes and colours used in the Mughal days were generally organic ones. They were obtained by different plants. With the exception of Verman, no other colour or dye was imported.

Blue colour in all its tints was obtained from Indigo which was very widely cultivated and manufactured in different sobahs of the Empire.

Abul Fazl gives a long list of about 36 different colours which were used for dyeing silk and wool in the Empire.

Weaving implements :—Besides the raw material mentioned above, the question of the supply of the weaving implements is also very important. Today in India supply of tools and implements is a very important item in the list of import trade. In the Mughal days the Empire was self-supporting in the requirements of all kinds of tools and implements. Indeed, it goes to the credit of the Mughals that all sorts of tools and implements required for the manufacture of fine and complicated types of fabrics were manufactured by the Empire manufacturers.

Printing and dyeing of cloths and yarn :—With the cloth manufacturing industry, cloth printing work also made a great advance. Calico (printed fabric) was specially in demand by the foreign merchants in millions of yards yearly. The English and the Dutch had developed a large trade of calico goods for the South Eastern countries of Asia. There were other printed cloths of very fine type, available in the Empire market, both for the home consumption as well as for the export trade. In the branch of industry the Empire was entirely self supporting.

The Woollen Textile Industry Branch

Akbar took special care and paid great attention to make improvements and extensions of the industry. The following practical steps were taken by the Emperor to assist the industry :—

(1) New centres in the Punjab and in other Imperial sobahs were opened on the lines of the Kashmir shawl and woollen cloth manufacture.

(2) Skilful weavers and technical experts of woollen cloth dyeing were engaged by the state on very high salaries for the training of India's young workers.

(3) Education was given to the Indian students in the methods of wool spinning, silk spinning, wool and silk dyeing.

(4) Especial State *karkhanas* were opened where the training was given to the qualified and intelligent Indians in the art of weaving woollen cloth of superior quality and of beautiful designs.

The immediate result of these arrangements was that (1) new colours and dyes were prepared for dyeing wool in a large number of colours and shades. Abul Fazl mentioned some 35 kinds of colours which were used for dyeing wool.

(2) Special care was taken to increase the breadth of a piece of woollen cloth. It improved a great deal. There is evidence to prove that the length and breadth of a piece of woollen cloth was so much increased that one piece was sufficient to make a Jama or Qaba i.e., a Sherwani of this age.

(3) Tarhadar or striped pieces of different designs and colours used to come in the empire market in very large numbers.

(4) Indian artisans had so much improved their skill that in a short time "in the Imperial Karkhanas (Factories) of Agra and Delhi high quality cloths, in imitation of the Persian, Turkish and the European designs, were manufactured in large numbers.

Shals * and woollen Cloths :—The royal department of textile industry paid a great attention to the industry of shawls. It was liberally financed and assisted in many ways.

Shal making :—For commercial purposes shawls were divided into four classes :—

1. Toos- Assal-The word was used in Kashmir as a name for a kind of sheep. Its wool also became famous by the same name i.e. Toos. It was considered to be of a very superior quality for its softness, and lustre. The shawls of the toos-wool were incomparable for lightness, warmth and

* Shal • Shawl.

softness. They were sold for very high prices and were presented as Khilat (Darbar present) to great royal officials and visitors by the Emperors.

2. Zardozi, Kalābatun. Kashidah, Kulgha, Bandhum, Chhent, Aliacha and Pech-dar shawls.

The designs of such shawls and woollen stuffs were invented by Akbar himself and by great local and foreign experts. They were considered very costly and beautiful. They soon became very popular and were purchased for very high prices.

3. Trahadar or Safaed Aliacha cloth and shawls were much improved in colours, and designs. It was the cloth woven with twisted woollen thread.

4. Before the time of the Mughal conquest of Kashmir Doomala, puttoo, shawl and felt carpets were made only of one type and of simple designs; under the supervision of the Mughal textile experts the varieties of these cloths were increased and the quality of cloth was much improved.

The fourth class of shawl was called Tarha-dar, Purim-narin, Sarpanch, Lohi, (a kind of blanket) Gosh Painch. Those shawls were generally meant to make head-gears, i.e. pagris. Those shawls were woven with the combination of silk, gold and silver threads.

The shawls called Mayan were made with superior kind of wool and of fine silk. They were very highly valued.

A concise list of some important woollen cloths made in the Empire.

1. Saqlat. 2. Subh-marabah (chequered garam cloth). 3. Mushajjar, 4. Jama-war Puram. 5. Photah (striped variety) Butā. 6. Cheerah Puran garam (pagri shawl). 7. Pohk. 8. Reuh-kar. 9. Anbari. 10. Kakas. 11. Darmah and 12. Sarpéch.

Note.—1. Purz-dar. It was the cloth, the outside of which was like the plush of birds.

2. Chhent-stuffs on which foliage or shapes of different birds and animals were printed in various colours.

3. Cloths named as sarpainch, gosh painch and cheerah were used for pagris (head gear).

Table showing varieties of woollen cloth and the centres of their manufacture.

Manufacturing centres.	Varieties of cloths (woollen).
1. Kashmir.	Shawls of different colours, designs and material. Puttu, felt carpets, lohi, rugs, kolah Kashmiri (caps) Puramgaram, Doomah Taha dar-a variety of striped cloth, and Alaicha.
2. Nagore (Rajputana)	Saqlat. It was a very valuable stuff.
3. Lahore (Punjab)	Saqlat, Soobh-Murabah (check), Mushajjar, Puram garam, chheet, puram garam (Head gear shawl.) Gosh painch, pohk, Darmah, Rewh-kar, Sarpainch, Ambari, Kakas, Takia (Felt pillow). Photah-(striped cloth), Jamawar Puramgaram and gosh-painch.
Sind.	
Agra.	Rugs, blankets and carpets.
Jaunpore.	" " " "
Gujrat.	" " " "
Allahabad ...	" " " "
Allore (Sind) ...	Carpets only.

"The carpet should if possible be 5 yards by 2 yards the flowers and branched work are the best in request, if fair your pictures not so much desired". So writes an English Factor from Agra to his officer in Surat * about the Agra carpets.

Silk Cloth Manufacture

We have many pieces of evidence on record from the European merchants and travellers that the silk-cloth making industry had attained a very high standard of perfection in the Mughal days. They say that the Indian silk cloths were very much liked in the European countries particularly by the ladies. Several thousand pieces of silk cloth were annually exported from India to the different countries of Europe.

Classification of the different types and designs of the silk-cloth manufactured in different parts of the Empire :—

1. Pure silk cloths both plain and coloured.

2. Chheet or flowered and striped cloth of pure silk.
3. Silk and gold thread mixed cloths.
4. Silk dopatas (ladies head gear) with gold and silver thread borders.
5. Transparent silk cloths like Dacca muslin and khassa.
6. Mashroo variety. It was made of the silk and cotton yarn and was meant for those musalmans who on account of religious prohibition did not like the use of pure silk made stuffs.

Table showing various kinds of silk cloth made in the Empire with their manufacturing centres.

Manufacturing centres.	Varieties of cloths.
Bengal	...
1. Burbakabad	... Ganğajali,
2. Sonarğang	... Khassa.
3. Dacca	... Khassa and muslin.
4. Allahabad	... Jhannab (a silk muslin) Murğhael (" ")
Benares,	... Kamkhoab, Velvet, Satin.
Table showing various kinds of silk cloth made in the Empire with their manufacturing centres.	
Jalalabad.	... Qababand, Deryai-bof.
Agra	... Mutabaq, Sherwani, Milak, Zarbaft,
Lalitpore (Jhansi)	... Satin, and Quatifab.
Ahmadabad.	... Velvet, Mashroo, Tass, Muqaish, Mandil, Silk dopata, Mushajjar.
Satipore (Malwah)	... Qabahband, Daryae, Mutubq, Sherwani and Meelak.
Tatbandpore	... Lah, Sar, Tassar, Atlas, Kapoor-noor and Alaicha.

Cotton textile Branch:—Cotton cloth manufacture was also much improved and established. The Empire was entirely self supporting. The supply of the cotton cloth was fully sufficient for all the requirements of the population of the Empire. Besides that, a large quantity was spared to meet the demand of the foreign merchants for foreign exports. Mr. Moreland remarks that "the demand of the European merchants was indeed a great factor in the increase of out-put and in the improvement of textile finish

and designs. The European merchants' demand was mostly for coloured and printed fabrics and this industry had attained a great deal of high standard." Some important centres of cotton cloth manufacture were:—Ahmadabad, Broach, Cambay, Surat, Thatta (Sind) Lahore, Multan, Semana, (Patiala State) Agra, Allahabad, Jabalpur, Zafferwal (Jaunpore) Lucknow, Mau (Azamgarh U. P.) Tantada (Oudh), Patna, Hasilpore (Malwah), Tatbandpore (Malwah), Ujjain, Manda, Burhanpore and Lalitpore (Jhansi Distt).

The whole textile industry was divided into three forms of organisation.

Textile industry system:—1. The Imperial Karkhanas - factories. In these Imperial karkhanas a large number of workers were employed on daily or monthly wages. These karkhanas were Government experimental factories which were placed under the supervision of the honest and experienced supervisors or Daroghas (as they were called) with a large staff of clerks and technical experts on high salaries. The product of these karkhanas was meant firstly to meet the demand of the Darbar and the Emperor's household and the remaining quantity was released monthly or annually for public sale. It was the duty of the chief supervisor of the Imperial karkhanas of Agra, to publish a monthly list of the controlled prices of all sorts of textile goods. This device saved the people from the evils of the black market.

2. The karkhanas run by the private people but subsidised by the State. Thousands of pieces of different types of cloths were purchased by the state from these karkhanas. It was a very valuable state help to the industry.

3. Independent public karkhanas and private shops. In all large cities and towns, several thousand people were engaged in the private karkhanas. Sometimes weavers worked at their houses and sold their cloth to these karkhanadars. The Kotwal of that city was responsible to regulate the rate of wages and the prices of the cloth. The foreign European agencies generally did their business with those private firms.

4. Weaving industry was being carried out in almost all towns and villages as a very important cottage industry. Thousand weavers' families obtained their livelihood in that way. This form of cottage industry is still serving in different parts of India. A weaver privately prepares cloth and sells it daily in the local market, or in a village painth (market).

All these forms mentioned above were so smoothly working that there never was any complaint of labour, or wage dispute. The State was always willing to provide facilities and was responsible for obtaining the necessary supply of raw-material and labour on reasonable rates of wages for all

factory owners. There was no question of capitalist coercion or labour strike. Both were interdependent and co-partners in the industry. A labourer was free to choose to work either in a karkhana or independently in his house.

Estimate of total production of cotton cloth :—It is difficult to make a correct estimate of the total production of cotton cloth in the Empire. The difficulty is much enhanced for the reason that we have no population figures of those days.

On the basis of the official report laid before the committee of the House of Commons on Indian affairs, October 11, 1831, the population of India was estimated upto 140,722,700,

In this report Madras and Bombay population is given as 20,000,000. Therefore the total population of the regions then in the Mughal Empire, had a population of about 120,000,000. We take it for granted that at the death of Shah Jahan when the Empire had enjoyed peace for about a century, the population could not have been less than 120 millions. On this basis we can now calculate the expenditure of cloth in the Empire. In these days of cloth control every individual is entitled to receive 15 yards of cloth yearly. Hence if we estimate the production of cloth for the home consumption in the Mughal days at the rate of 15 yards per head yearly then it comes to 120 millions $\times$ 15 yards = 18,000,000 yards yearly.

This whole quantity was produced by the Empire weavers. To this quantity we should add that produced for foreign exports which was also very large. On the calico cloth alone, Indian weavers had an income of about 4 lakhs of rupees a year. Besides that, there were several other types of cloths of cotton, silk, and of mixed texture, which were sent to other countries of the East and the West for trade. They were also worth several lakhs of rupees yearly.

Note :—If we calculate the price of the cloth consumed in the Empire at the rate of the present day controlled prices, then the total amount comes to 1800 million rupees per year at an average rate of Rs. 1-, per yard for both fine and coarse. Again if we fix 1 : 8 as the ratio of the price between these days and the Mughal times then the total amount comes to 225 million rupees. The following is a general list of different kinds of cloths manufactured in the Empire with their countries of production.

Gujrat :—Zarbaft, Velvet, Tass, Daraibaft, Gold thread and flowered Sherwani, Tafsala imitation, Mandil, Cheerah, Dupatah, Fotah for tahband, Bed sheets, Taja baf, Kharah, Three coloured-Sah Rang, Ambari, Mushjjar, Satin.

Benares :—Benaresi Kamkhoab, Velvet, Satin.

Lahore :—Velvet, Satin.

Laitfapore :—Satin.

Sitapore :—Qababand, Daraibaf, Mutabbaq, Sherwani, Milak.

Tatbandpore :—Lah, Sara, Tassar, Satin for Shirts, Kapoornoor, Aelchah, Khassah, Chautar, Muslin, Tansukah, Sribaf, Gangajal, Bhoiron, Satoo, Doriah, Bhadarshahi, Garbah soti, Shaila (Deccan) Mohargul, Sookhan, Jahannah, Atan, Rasadili, Baftah Bofta.

1. Gangajumni (a) narrow. 2. Gangajumni (b) Broad. 3. Gangajumni (c) napkins.

Mahmudi, Jahoolah, Sarband, Katanchah, Tarban, Chintse, Salathi, Saqlab nagori, Soof murabah, Jamawer, Ahook, Darmak, Patoo, Raiukar, Reeses, Rs. 2, per piece. Samanes, Sohan cloth, stout cloth used as a warpper in cold season, Asmani, Erameess, Maftoon, Qaim khani, Jaffar khani, Jahanjiri, Mercolies, Salimporee, Byramee, Selas, Zafferkhani,

There were other clothes but they have been omitted for the sake of brevity.

Geography in Indian Universities : with the march of time.

BY

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It is indeed a pleasure for us to record the fruit of our appeal through the Monograph "Geographical Education in Indian Universities" to the Universities of India to enhance the cause of Geography as a subject of University education. We congratulate the authorities of the Allahabad and Agra Universities for having started M.A., classes in Geography since July, 1946. It is highly satisfying to see that some of the Universities which have till late been neglecting the subject, have now realised the importance of geographical studies in their future programme of educational planning and expansion.

Allahabad University.—This University, since July 1946, has started Geography in M.A., only. No provision has been made for M.Sc., course. Naturally it would take some time to make provision for research, but we trust that the authorities will do their utmost to develop the Department soon into a research centre. I learn that no addition has been made in the staff and that Dr. R. N. Dubey, M.A., D.Litt., continues to be the Head of the Department. It is good as far as the new Department has to function under Dr. Dubey, but, I wonder, his visualisations are likely to be poorly or insufficiently realised without a good and extended team of professors. I therefore strongly urge the Academic Council to make immediate additions to the staff, which at present consists of only two members including the Head of the Department.

The number of students admitted to the M.A., previous class this year is 25, and the enrolment to the same class is expected to be 25 to 30 next year and the following years.

It may also be mentioned here that the number of students who offered Geography in the Junior B.A., class in 1946 was 72 as compared to 50 in 1944, showing an increase of 50% in two years.

Agra University.—It was reported in my Monograph that Geography had been included in M.A., course of the Agra University, but no affiliated College was recognised for M.A. It is now pleasing to note that St. John's College, Agra, which had been teaching geography upto B.A., classes for a dozen years nearly, has begun M.A., classes in Geog-

raphy since July, 1946. The number of students admitted to this College is 8. A great number of students had to be refused admission on grounds of 'No Vacancy'. But this smallness in number is likely to be compensated by a contingent of private teacher candidates from the United Provinces and Rajputana who are to appear at the first M.A., previous examination of the University in 1947. The strength of the private candidates may be estimated to be not less than 100, judging from the number of candidates from Udaipur alone (seven) who will be taking their examination this year.

Mr. N. M. Ghose, M.A., (Hons.), assisted by two lecturers, is the Head of the Department of Geography at the College. Geography has been included in only M.A., course as in the Allahabad University. It is hoped that the other Colleges affiliated to the University will follow suit in the near future so to make geographical instruction in these classes available to a wider area. The private examination system in the subject, however, in my opinion, has to be discouraged, directly or indirectly. India needs today trained geographers who have a thorough understanding of the aims and methods of geographical research and who have had inspirational education under a regular College staff.

Bombay University.—In my Monograph befitting reference could not be made about the contribution of the Bombay University towards the progress of this science in India under the person of Dr. Maneck B. Pithawalla, D.Sc., B.A., F.G.S., L.C.P., University teacher in Geography for Postgraduate research. The University is fortunate in having a scholar like him. It is expected that the University will recognise his services very soon and start M.A., classes under his chairmanship. Dr. Pithawalla, who happens to be one of the Vice-Presidents of the Society, has been doing pioneer work in the field of geographical research in this country. He has over 50 research papers and seventeen publications to his credit. He was the first Doctor of Science in Geography in India of the Bombay University. He received training in the methods of research at the University of London under Professor E. G. R. Taylor and was awarded the Research Certificate in Geography by the same University. He conducted a regional survey of the Lower Indus Basin. This thesis consisting of 17 papers published in various scientific journals of India, was awarded the Moos Gold Medal, the highest Science award by the University of Bombay in 1942 for the best thesis for the year.

At present some Ph. D. students are working under him for the Ph. D. degree on the following problems :—

1. A regional geography of the Upper Ganges Basin.
2. A geography of Sind during the Arab occupation of the region (711 A.D. to 1200 A.D.).
3. A Geography of Sind with special reference to animal life.
4. Parsee settlements on the West Coast of India.

REVIEWS.

The Progress of Geographical Education in Indian Universities.

Mr. Srivastava has placed all those interested in the progress of geography lastingly in his debt by preparing a very careful and detailed statement showing the present position of geographical studies in Indian Universities. He not only deals in general terms with geography as a University subject, but goes on to indicate the rapid growth in popularity of the subject amongst undergraduate students. He estimates the total strength of students pursuing studies in geography in degree classes at approximately 1,000, with a total teaching staff of 74. He summarises the position by saying, however, "The progress of geographical studies in India has been very poor. We started late and still the onward march is unsatisfactorily slow." As he rightly says, geography was introduced into the Universities of Europe at a relatively late stage compared with many other subjects. It gained an important position in Germany and later in France and although geography has been taught in Oxford since 1887 and in Cambridge since 1888, it was really not until the first World War that the importance of geographical studies became so obvious that Honours Schools were set up in practically all the Universities of the British Isles. As he rightly says, therefore, the position in India is simply that there is a lag of a few decades.

The development to date has been very different in different parts of India. A special mention must be made of the pioneering work of the Department of Geography of the Muslim University at Aligarh, and this University stands in the forefront. Very important progress has been made at Calcutta and there are now important developments at Madras and Bombay and in the Punjab. Details are also given of University work in geography at Agra, Allahabad, Mysore and Patna.

Mr. Srivastava describes the work of the Indian Geographical Society, Calcutta Geographical Society, and mentions the Punjab Geographical Review.

When the Indian Science Congress celebrated its coming-of-age in 1937-38 and about one hundred delegates came from the British Association for the Advancement of Science, the old-established Section E (Geography) of the British Association was naturally represented by a strong contingent of University geographers, including Professor H. J. Fleure, F.R.S., Professor C. B. Fawcett, Professor A. G. Ogilvie, Professor L. Dudley Stamp, Mr. R. H. Kinviß and Professor W. T. Gordon, all of whom are, or were then Heads of Departments of Geography in British Universities. The delegates included others who had contributed to geographical research. The meetings of the special Section of Geography which was established that

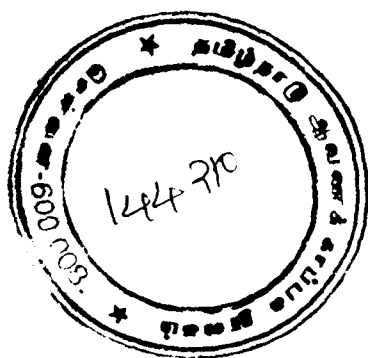
year for the first time were well attended and it is tragic to have to record that the separate Section of Geography of the Indian Science Congress has since been remerged with Geology. It is clear, therefore, that a fresh start must be made and the author of this monograph sets out in some detail proposals for a Central Institute of Geographical Research.

He introduces his proposals by some very wise remarks. He points out that the geography which has been taught in India has very naturally been introduced by those whose training has been in Europe, or elsewhere abroad. As he says, the student has tended to learn more of the geography of other countries and continents than he has of his own country, and that the vast field of research into Indian geography remains unexplored. There is at the present time no adequate account of the geography of India in any language and the regional studies which play such an important part in work in other parts of the world have only recently begun. There is no doubt that the great need in India is for those who have a thorough training in the aims and methods of geographical research to turn their attention to the problems of their own country. He proposes, therefore, a Central Institute of Geographical Research. Rather naturally the University of Aligarh is suggested as a possible centre as being one of the few places in India where advanced geography is taught and where there is a considerable library. From Aligarh there is reasonable access to the Imperial records at Delhi and reasonable communications to most parts of the country.

He goes further and suggests the personnel of the governing body and here there seems a danger in introducing at the outset, too much rigidity. The recent development in Britain whereby the Government has made available a large sum for research in the Social Sciences, some of which is being used to further the objects of such Central Institutes, might well be taken as a model by the Indian Government at a time when there can be few if any more pressing problems than those which fall within the purview of the Social Sciences. Among the Social Sciences, geography takes a fundamental place in its study of the physical environment of man. Surely such an Institute should be under a Director of quite unimpeachable academic status, and well provided with funds to be used for the furtherance of geographical research along the lines that would be done in India, that the allocation of definite regions for primary study to the University Departments which is further suggested has some advantages, but there are many problems of central research which the Institute itself might undertake with the help of Research Fellowships.

Just as the first World War resulted directly in the realisation that the countries of the world knew little about their own background and still less about one another and led therefore to the establishment in Britain, America and elsewhere of many University Departments of Geography, so the second

World War has led to a very real appreciation of the importance of trained geographers and geographical studies. The Intelligence Departments of the Allies were staffed to a very considerable extent by those whose University training had been in geography. The operations of the fighting services depended very largely on geographical information collected for and supplied to them by trained geographers. At the same time, those who were engaged on the work of reconstruction came more and more to rely upon detailed surveys, such as surveys of land use, carried out by teams of geographers. There is a realisation that all physical planning is in essence the determination of the right use of land in the national interest and in accordance with international co-operation, and such surveys involve essentially a geographical training and the representation of the data on series of maps. The greatest difficulty at the present time is a lack of well-trained first-class personnel to carry out the surveys. There is no doubt that the author's plea for a Central Institute and its adequate equipment is well founded, and judging by what is happening in other countries where geographers are finding their rightful place in many spheres of Government and private activity, there is no lack of opportunities for those who look upon their geographical training as leading to other careers than that of the teacher, important as that remains.



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