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From Pusa to . . . ?

THE disastrous earthquake of last January brought with it a chain of problems not the least important of which is the future location of the Imperial Institute of Agricultural Research now situated at Pusa in Bihar. The buildings of the Institute were badly damaged by the earthquake, so, on the recommendation of their experts, the Government decided to abandon them and construct new ones in the neighbourhood of Delhi. This decision, which would involve far heavier expenditure than repair to the old buildings, has now met with considerable opposition. The controversy has indeed assumed such serious proportions that not a day passes without some communication to the press—an important interview, resolution passed at a public meeting or proceedings of a lively discussion at a council of legislatures. Although the social, the economical and the political aspects of the question are now being hotly debated, yet very little is heard regarding the technical considerations which prompted such a decision. In fact, the scientific opinion of the country has hardly expressed itself on this highly important question. It is our present object, therefore, to view the position mainly from the scientific standpoint and to consider the possible influence of the proposed transfer on the progress of agricultural science in the country.

It is argued by those in favour of the transfer that Pusa being in the heart of a region frequently subject to earthquakes, more shocks might follow in the future and the entire building might soon collapse causing considerable loss of life and property. This danger can be eliminated by transferring the Institute to Delhi. Furthermore, the transfer will remove certain disabilities from which the Institute suffered in the past. The soil conditions in the neighbourhood of Delhi will be more representative of the Indo-Gangetic plain than the naturally rich tracts of Pusa. The Institute will also be more accessible and bring the officers into better contact with legislators, agriculturists, industrialists and others visiting Delhi from time to time.

Among those who are opposed to the transfer, (1) a large number are definitely in favour of retaining the Institute at Pusa itself after strengthening the buildings in such a manner as to withstand future

shocks; (2) some are for distributing the activities between different centres; and (3) others are for shifting the Institute to the neighbourhood of a centre of scientific learning like Allahabad, Bangalore, Bombay or Calcutta. The first group of opponents point out that, in recent years, a number of building materials have been discovered which can withstand earthquake shocks. Such materials can be used for repairing and reinforcing the buildings at Pusa. They also hold that Pusa has always been accessible to those who are interested and that the soil conditions at Pusa are not greatly different from those prevalent elsewhere. The second group argue that India is a vast agricultural country with varying soil and climatic conditions, so that no single institute situated anywhere can adequately meet the needs of the whole country. They plead therefore for a number of research institutions distributed throughout the country. The last group agree that Pusa is not suitable but point out that Delhi is also unsuitable. The scientific workers require isolation and peace rather than the crowded and disturbed atmosphere of a political centre. They favour, therefore, the transference of the Institute to the proximity of a centre of learning where a scientific atmosphere would prevail, where there is likely to be the least disturbance at work and minimum interference from those in power. There is something to be said for each point of view, so all the facts should be taken into consideration before arriving at a decision.

Before taking up a discussion of the various technical points at issue, it would be of some assistance if we could define, in a general way, the objects of the Institute, and the type of facilities that are required for carrying them out. It is true that for a long time, the Pusa Institute, with its various sections and sub-sections distributed in the different provinces of the country, was the only centre of agricultural research. Problems of not only All-India character but also those of provincial interest had therefore to be investigated by the Institute. Post-graduate training in agricultural science had to be imparted and the staff of the newly created provincial agricultural departments trained in methods of research. Today, the conditions have greatly altered. Most of the provincial departments have been adequately organised and are in charge of competent men who could deal

with all the local problems. Many of the Universities, as also research institutes, have organised post-graduate training in different branches of agricultural science so that the need for special courses of the type that was in vogue in the past has also greatly disappeared. Even problems of all-India character which the provincial departments cannot adequately handle are fast diminishing, so the Institute is now largely free to devote itself to problems of fundamental interest. In view of the importance of this type of work and the misconception that generally prevails regarding the utility of fundamental research, we wish to deal with it at some length.

The history of the development of scientific agriculture, as also any other branch of applied science, shows that the most important discoveries are made not by those working on fields or in factories but by pure scientists who plod in the seclusion of laboratories and pot-culture houses for the mere sake of small additions to knowledge. Those engaged on field work or factory operations are largely concerned with the immediate problems of their work and cannot find either the leisure or the opportunity to think out new ideas and to investigate their possibilities. On the other hand, the pure scientist has very few such worries and has often the freedom to think boldly and the facility to work out his ideas irrespective of cost or considerations of immediate return. Most of his researches may be of purely academic interest, but a single accidental finding with a new idea for its background may lead to the most far-reaching developments and thus make up thousand-fold for all the failures in the past. Such is the value and significance of fundamental research conducted by right men in the right environment; such is the right spirit in which agricultural research is being carried out at Rothamsted and other leading experimental stations of the World; and such should be the ideal before those in charge of the destinies of the Imperial Institute of Agricultural Research. Administrative routine and commercial enterprises should be reduced to the minimum and the research workers given ample freedom and facilities to devote themselves to fundamental research.

Let us now proceed to critically examine the various suggestions that have been made and to determine how far they would help towards the attainment of the ideal before

us. Taking first the suggestion that a number of research institutes should be created, we should agree that it would be quite useful to have them, though not for the purpose intended by some of the proposers. There is ample scope for several lines of fundamental research but there is no need to duplicate the advisory work now conducted by the provincial agricultural departments. As for the proposed distribution of work between different provincial centres, it is highly undesirable. The different sections should be together at one place so that the workers may have opportunities for meeting each other and discussing problems of common interest.

Assuming that, at least for some time to come, there will be only one Imperial Institute of Agricultural Research, we shall next consider the type of facilities required for conducting fundamental work of a high order. Firstly, the Institute should be situated in a healthy locality which enjoys a salubrious climate. From this point of view there is not much to choose between Pusa and Delhi. Both the places are as good or as bad as most other places on the Indo-Gangetic plain. If a better climate is sought, the claims of Dehra Dun, Poona or Bangalore will come for consideration. Secondly, the buildings should be safe and there should be no fear of danger to life and property. An unsound building in an area susceptible to frequent earthquake shocks has an adverse effect on the morale of the workers though there may be no real danger for several decades to come. Before condemning the present buildings at Pusa, however, every effort should be made to strengthen them. Reinforced concrete is suggested as a suitable material for safeguarding the buildings against future shocks and it is for the experts concerned to conduct some rigorous tests with that and other materials before pronouncing the buildings to be beyond the stage of repair. Thirdly, there should be ample laboratory and library facilities. These are now being liberally provided by the Imperial Institute and will continue to be available irrespective of location. Fourthly, there should be a proper scientific atmosphere both in and around the place. This is of the greatest importance if work of high order is to be turned out. The scientific atmosphere of a place is partly due to tradition and partly to the example of some of the senior workers. Even a small band of enthusiasts with proper

scientific outlook can infuse new spirit into a place and impart new traditions. Equally important is the scientific atmosphere around a place. There should be in the neighbourhood a number of research institutions devoted to other branches of science so that specialists in different fields will have opportunities to meet each other and discuss problems of common interest. Contact with workers in other fields widens one's outlook and facilitates better understanding of scientific problems. It infuses a spirit of comradeship and leads on to co-operative undertakings in which specialists in different lines join together in the investigation of problems of common interest. It even promotes a spirit of healthy rivalry which is highly desirable and helps to draw the best out of the workers. It is indeed this apparently vague, but nevertheless real, scientific atmosphere which is the secret of the success of most of the leading scientific institutions of the World. Judged from this point of view, both Pusa and Delhi will stand condemned. Pusa itself is isolated and the nearest centre of learning is Patna, a good distance away, on the other side of the river. Calcutta is still farther away and a long and expensive journey has to be undertaken to reach it. Benares and Lucknow are also a long way off. Coming to Delhi, it is undoubtedly a great political centre. Members of legislature and other leading citizens of the country visit the place from time to time. Meetings of the Advisory Board and the scientific committees of the Imperial Council of Agricultural Research are also being held there at least once a year. In spite of these associations, Delhi has yet to build up a scientific atmosphere. The Colleges in Delhi have, unfortunately, very few facilities for scientific research, so naturally much should not be expected from the University. Among the other centres of learning, Agra is some distance away; Lahore and Allahabad are farther still so that Delhi may also be regarded as isolated from the scientific point of view. If a transfer is decided on and if the value of proper scientific environment is taken into consideration, the Institute should be removed not to Delhi but to the neighbourhood of Allahabad, Bangalore, Bombay, Calcutta, or Lahore any one of which would be found more suitable.

In a vast country like India, no single place can be regarded as being easily accessible from all the provinces. If Delhi is easily accessible from the Punjab, Bombay, Central

India and certain parts of the United Provinces, Pusa may claim to be accessible to Bihar and Orissa, Bengal, Assam, parts of Central Provinces and a large section of the United Provinces. Both the centres may, on the other hand, be regarded as being inaccessible to Madras, Mysore, Hyderabad and South India in general. Thus, the charge of being inaccessible may be levelled against any place in India so that it is not

quite fair to condemn Pusa mainly on that account. The things that really matter are good facilities, right talent and proper scientific atmosphere: if these are ensured, an institute situated even in the most obscure corner of the country can come to the forefront, and attract visitors not only from the whole of India but other parts of the World as well.

V. S.

The Malarial Parasites of the Oriental Monkey, *Silenus irus*.^{*}

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ONE cannot fail to be struck, in any study of the literature on malaria, by the paucity of the experimental evidence in support of many of the theories put forward. This is mainly due to the fact that all attempts to infect any of the common laboratory animals with the *Plasmodia* of human malaria have proved unsuccessful. Although much information has been gathered from the researches into avian malaria, there are many disadvantages and limitations in this work. Moreover, it is sometimes difficult to say exactly to what extent the results obtained are applicable to the human problem.

The discovery of the value of malarial infection in the therapy of certain nervous disorders, has opened up a wide field for gathering invaluable experimental evidence. Even under these more satisfactory conditions, the fact that human infections cannot be allowed to run their natural course, in many instances, restricts the usefulness of this line of investigation.

The monkey is the only one of the mammals commonly used for experimental work, in which the presence of natural malarial infection has been confirmed. The fact that such infections occur in a Primate host, suggests that the investigation and study of these conditions would give results more comparable with human infections than could be obtained with the avian type of disease. That malaria in monkeys might provide very valuable material to the malariologist, has long been borne in mind by workers in India.

Very many attempts made by them to discover such infections in the common

brown monkey of northern India [*Silenus rhesus* (*Macacus rhesus*; *Macaca mulatta*)] have proved unsuccessful. This fact has often been deplored, but more recent evidence would appear to indicate that the absence of natural infection in this species of monkey is a fortunate occurrence, from the point of view of the research worker in India. The absence of such natural malarial infections in *S. rhesus* makes available large numbers of uninfected and susceptible Primates for experimentation. Workers on simian malaria in other countries have been greatly hampered in their investigations by the lack of such types of animal.

Malarial infections of monkeys were first recorded by Koch in East Africa in 1898. Since then many species of *Plasmodium* have been reported from various monkeys in different parts of both the Old and New Worlds. Many of the earlier investigators carried out experimental work with such infections. More recently, extensive researches have been reported by workers in America, Malaya and India. The latter work has confirmed the view that from a study of monkey malaria the solutions of many unsolved problems in human malariology may be obtained.

Research in human malaria has shown that the clinical and pathological manifestations of this disease, as well as its reaction to different therapeutic agents, vary with the species of *Plasmodium* responsible for the infection. It is, therefore, essential that an accurate specific identification should be made of the parasite used in any investigation. It is equally important to ensure that the infection studied is due to one species of *Plasmodium*, and one species only. A failure to obtain these conditions has been responsible for many of the con-

* Sinton, J. A., and Mulligan, H. W., *Rec. Mal. Survey India*, 1932, 1933 A, 3, 357-444; 1933 B, 3, 719-808.