

D.O. No.120/39

Statistical Laboratory,
Presidency College,
Calcutta.

8th February, 1939.
11th

My dear Jenkins,

I thank you for your D.O. No.116 of the 18th January 1939 regarding arrangements for my work in statistics. I am glad to have this opportunity of putting down my ideas in writing. As you said that there was no special urgency, I have taken my time in doing so. I shall first consider the points raised during our conversation on the 16th January 1939.

Question of a separate Statistical Department in Bengal.

2. Your first question is "whether the establishment of a separate Statistical Department of Government is justified, and if so, whether I shall be prepared, assuming the conditions satisfactory, to abandon physics and take up statistical work".

3. Everything depends on what is meant by a Statistical Department. Up till now in most countries of the world the work of statistical departments has been concerned almost exclusively with the descriptive side of statistics, that is, the compilation, tabulation, and publication of official statistics relating mainly to population, finance, trade and commerce, and other topics of economic importance. In recent years great advances have been made in another direction, namely the analytic side of statistics which is based on the mathematical theory of probability and the purpose of which is to supply an adequate technique for collecting the primary data in such a way that valid inferences may be drawn from them; and secondly to extract the whole of the relevant information contained in the data in the most efficient way.

4. The descriptive side is thus concerned with the day to day use of statistics in administration, while the analytic side is concerned primarily with the interpretation of data and the improvement of technique or the methodology of the subject. The aims and functions of these two aspects of statistics are therefore quite distinct. The contrast is something like that between clinical medicine as practised by the general physician and fundamental research in medicine. Both are important, and a close liaison between the two aspects is of course as essential in statistics as in medicine; and yet a functional specialization is necessary for progress.

5. On the administrative side, the contrast may also be characterised as that between routine work and special work. In the routine work the administrator requires the help of the statistician in compiling and tabulating primary statistics for periodical reports or in deciding questions of immediate administrative arrangements. Commercial intelligence and economic policy, agriculture, industry, medicine and public health, education etc have all their own special needs. It is therefore desirable that each department should have attached to it a small section for the routine statistical work of the department. These statistical sections should be built up gradually by adopting a policy of appointing trained statisticians and computers as necessity arises in the various departments of Government. So far as this routine statistics is concerned, I am therefore doubtful whether the establishment of a separate statistical department in Bengal is either necessary, possible, or desirable in the immediate future.

The need of a permanent organization for Analytic Statistics.

6. On the analytic side, a good deal of work is being done in Bengal in the Statistical Laboratory; and earmarked grants are being at present sanctioned from time to time for this purpose. This procedure is wasteful and uneconomical; and the experience of the last five years has clearly shown the need of a more permanent organization for research and advanced technical work in statistics in Bengal. In "A Scheme for a Statistical Organization in Bengal" which I submitted for consideration by the Government of Bengal in September 1938 I have discussed this question in considerable detail.

Functions of the proposed organization.

7. In this note I have pointed out the type of work which the proposed organization should undertake :-

(1) It would co-ordinate the statistical work in the different departments of Government by devising improved methods and by setting up necessary standard specifications for the collection and tabulation of primary statistics. The technical advisory work would be centralized in this plan, but the

actual work of compiling routine statistics would remain departmental, and the primary data would continue to be kept in the different departments as at present.

(ii) It would prepare and examine all schemes of special enquiries and surveys and help in organizing them. Its primary function would be the improvement of technique; and as soon as suitable methods are devised the work would be handed over to the Government departments or other local authorities concerned.

(iii) It would give necessary training in statistics to Government officers, and where necessary supply trained workers for departmental work.

(iv) It would undertake the systematic analysis of data already available or being collected in the different Government departments; and would explore the most promising lines of advance in statistical studies relating to all aspects of national welfare such as fluctuations in price of staple crops and commodities; relation between wholesale and retail prices; cost of living indices; standard yield of crops and crop forecasts; fluctuations and changes in inter-provincial trade; study of rainfall, flood and irrigation problems; review of financial statistics; vital statistics and epidemics; birth and death rates; maternity and infant mortality; progress of education; intelligence and vocational tests; statistics relating to crime and administration of justice; accident, strike, and other labour statistics etc.

8. The use of modern mathematical tools is essential in this connexion; and, as the analytic methods are unified in character, it would be clearly more economical and more efficient to get this work done by a central staff of trained statisticians rather than by sectional workers attached to different departments. I should like to stress here the fact that the organization I have in mind would not ordinarily undertake statistical work of a routine type. Its primary function would be the improvement of technique and the coordination and technical guidance of the statistical work, rather than the actual carrying out of such work, in the different departments of Government.

An Institute of Statistics.

9. I am convinced that there is an urgent need in India for an organization of the kind described above. If by a "Statistical Department" is meant this, then I have no doubt that its establishment would be fully justified. In fact, about a year ago in March 1938, at the instance of the Government of India, this very question was considered in detail by Dr. T. E. Gregory, Economic Adviser to the Government of India. As a result of personal discussions and correspondence with Dr. Gregory, I prepared a scheme for the establishment of an All-India Institute of Statistics; and I believe a report on the subject was actually submitted by Dr. Gregory to the Government of India. Unfortunately, however, the sudden deterioration in the financial situation of the Government of India stopped further progress.

10. The question of academic connexions were also fully discussed; and Dr. Gregory and I were both agreed as to the importance of maintaining what may be called the academic character and University affiliations of the proposed Institute on the lines of the Biometric Laboratory or the London School of Economics in London. In case the Government of Bengal are pleased to consider the establishment of such an Institute of Statistics I shall be only too glad to supply detailed schemes for this purpose.

My work in Analytic Statistics.

11. I am chiefly interested in the analytic side of statistics. Although I have helped to the best of my ability work on the applied side, I have done so strictly in conformity with the principle that my task is concerned primarily with the development of efficient technical methods. ^{Once} ~~One~~ such methods were devised and standardized, I have invariably handed over the work to the administrative department concerned.

12. The answer to the second part of your first question can be now given without ambiguity. In case an Institute of the type visualized by me is established, and in case the conditions of the appointment, nature of work, facilities for research, academic freedom and affiliations etc are all satisfactory, I should be glad to consider seriously the question of taking up statistical work on a whole-time basis. On the other hand, if the scope of the statistical department is confined mainly or even largely to the

administrative and descriptive side, or in case facilities for fundamental research are not adequate or the terms of appointment are not satisfactory, I should be extremely reluctant to sever my present academic connexions.

Preference for academic connexions.

13. I should like to make my position quite clear. I am convinced that a strong school of statistical research is essential for the future progress of India. I feel that the greatest service which I can render to my country would be to help in building up such a school. This is why I am anxious to retain my academic affiliations and academic freedom; and also why I have always been and am still reluctant to take up work of a purely administrative nature. I may mention here that in 1921 or 1922 (after I had finished certain researches at the Meteorological office in Simla the results of which were subsequently published by Government in the form of two memoirs) I received a definite and formal offer from the Government of India to go over to the Meteorological Department with a guaranteed salary of Rs.250 over and above the I.E.S. scale of pay and with the practical certainty of my succeeding to the office of the Director General of Observatories in due course. After careful consideration I was unable to accept this offer because I felt that, although the Meteorological department was a purely scientific one and the terms of appointment were satisfactory, I would have there less opportunity of fulfilling my desire of building up a research school of statistics. As you are aware, I have also always expressed my reluctance to take up purely administrative posts in the Education Department itself. I may perhaps recall here, although there was nothing in writing, that about a year ago I was asked by Sir Girja Shankar Bajpai and the Hon'ble Sir Jagdish Prasad of the Education Department and also independently by the Hon'ble Sir James Grigg, the Finance Member of the Government of India, whether I should like to go over to the Central Government in case a statistical post were to be created for this purpose. I expressed my reluctance to do so on the ground that this might interfere with what I consider to be my real aim in life.

14. I hope I shall not be misunderstood. I am naturally anxious to take advantage of any opportunity which may offer itself for advancing the cause of statistical studies in India. I feel however that such opportunities will occur, so far as I am concerned, more frequently in what may be broadly

characterised as academic and research spheres of activities rather than in purely administrative posts of the usual type. I may perhaps be permitted to state that I do not think I am lacking in administrative ability. What I want to emphasize, however, is the fact that I consider my scientific work to be of greater importance than my administrative activities.

Need of early decision

15. Whatever may be the decision of the Government of Bengal in regard to the question of establishing an Institute of Statistics, it is clear that such a decision cannot be reached immediately as the question will require a good deal of careful consideration from various points of view of which finance is not the least important. In the meantime, the question of statistical work in connexion with various schemes of Government of Bengal is pressing and requires to be settled without further delay. For example, I started work on the Jute Census Scheme nearly two years ago; and have been engaged on it without any interruption for more than ten months. A Crop Census Scheme for the 1939 season has been already sanctioned by Government the detailed programme of which was settled at a meeting of the Special Jute Census Committee held on the 6th February 1939. As you are aware, it has been proposed that I should continue to act as the Statistical Adviser in the present Scheme. It will be obviously neither fair to myself nor to the Scheme itself to leave the question of my continuous participation in it and my responsibilities in this connexion uncertain and undefined. In this ~~xxx~~ situation, and pending decision of the bigger question raised by you, namely, the establishment of a separate Statistical Department or Institute of Statistics, I submit most respectfully that it is necessary and desirable that the question of a part-time post of Statistical Adviser for technical co-ordination of official statistical work should be settled without delay.

Question of part-time service in Statistics.

16. This brings us to your second question, namely, "whether I consider the arrangement of part-time service to Physics and part-time service to Statistics (a) is satisfactory; and (b) will continue satisfactorily with the growing demands that are being made for my services in Statistics." Three different interests require to be considered in this connexion, namely, (a) Government work; (b) the Presidency College; and (c) my own interests.

Part-time arrangement convenient and economical.

17. I have discussed this question in considerable detail with Mr. Bottomley on several occasions, and also in my D.O. No.DJ/25 of the 14th May 1939, and D.O. No.554 of the 10th September 1938 in which I pointed out that so far as the actual work was concerned a part-time arrangement would be both convenient and economical. Let us consider, for example, the Jute Census work. As at present contemplated, I shall prepare the design and plans for the random sample survey, set up necessary statistical controls, and arrange for a systematic statistical analysis of the material collected by the field staff (which will work under the general supervision of the Director of Land Records). I shall, of course, have to maintain a close touch with the field work and make such modifications in the sampling programme as may become necessary owing to unforeseen difficulties and breakdowns. All these mean a good deal of difficult and responsible work no doubt; but, as far as I can see, there is still not enough of it to justify a whole-time post for me. For the present I am confident that I shall be able to do the work in addition to my duties in the Presidency College. To place me on deputation for the jute work is therefore unnecessary.

18. Let me also refer briefly to financial considerations. In case I am placed on deputation for statistical work I presume I shall have to be given my usual salary plus a suitable duty allowance. At the same ^{time} an additional appointment will have to be made in the senior scale of the Bengal Educational Service in the Presidency College; so that the total cost to Government in this plan will be greater. Placing me on deputation for the statistical work is therefore not only unnecessary, but will be also uneconomical.

19. I should like to emphasize here the fact that the statistical work will not suffer in any way by a part-time arrangement. As I have already pointed out, my work will be primarily concerned with the technical aspects of the projects. In research the output cannot be measured by the number of hours of daily attendance at the office. When a new idea occurs, or fresh material becomes available, one has to work under very heavy pressure for hours, days or weeks at a stretch. I am merely stating it as a fact that I myself have worked in the Statistical Laboratory until midnight on occasions, and have not ceased working even on returning home. On the

other hand, when the field or experimental work is proceeding without any hitch and the statistical analysis is going on smoothly, there are gaps during which there may be little direct work in hand. Such breaks are of course not wasted; this is the time when one gets an opportunity of studying and brooding over allied problems and projects. This being the case, once I take up a research problem, I can assure you that Government will be getting exactly the same service from me whether I am working on it on a whole-time or on a part-time basis, and I may be permitted to add, whether I am drawing any allowance for the work or I am doing it in a purely honorary capacity.

Precedent for part-time arrangement.

20. Neither do I myself desire to be seconded whole-time for this purpose. I have a good deal of work of importance in hand both on research and applied sides with which I should not like to lose touch. I should therefore definitely prefer a part-time arrangement for which there is an excellent precedent. As you are aware, for a long time the professor of physics in the Presidency College used to work as Meteorologist in charge of the Alipore Observatory; and I myself held the post of part-time Meteorologist from 1922 to 1926 for which I used to draw a special allowance with free quarters. A similar part-time arrangement with an allowance for statistical work appears to me to be suitable and appropriate in the present case. (I may mention here in passing that the part-time arrangement at the Meteorological office was discontinued, not because of any inconvenience to College work, but because it was found necessary to post a whole-time Meteorologist with two Assistant Meteorologists in Calcutta to cope with the increasing volume of meteorological work.)

College Interests.

21. I shall now consider the question of part-time service from the point of view of the Presidency College. I may begin by saying that a part-time arrangement for meteorological work worked satisfactorily for, I believe, nearly half a century; I do not see any reason why a part-time arrangement for statistics should not work equally well in future.

Administrative Work.

22. Let us however examine the position in detail. My work as the Senior Professor of Physics may be conveniently considered under four heads :-

- (i) Work of a routine type;
- (ii) Superior administration;
- (iii) Teaching work; and
- (iv) Research.

I have already explained to Mr. Bottomley that I could be easily relieved of work of a purely routine type such as invigilation duty at College examinations, which is done by even such junior officers as instrument keepers of our department and from which I used to be exempted for a long time. This view was accepted in Government Order No.1934-Edn dated 22nd April 1938. I do not see any difficulty in allowing the same arrangement to be continued in future. In fact in my D.O. letter of the 10th September 1938 addressed to Mr. Bottomley I said :-

"I am also carrying on the ordinary administrative work in the Physics Department. To be quite frank, it is only the invigilation duty and one or two routine matters of a similar nature from which I would really like to be exempted. Otherwise, once it is clearly understood in the College that my statistical work is being done with Government approval, there will be no difficulty in my carrying on even the purely routine part of the administrative work as necessary assistance from within the Physics Department will be readily available."

23. I may be permitted to observe that in superior administration, ability and a sense of responsibility is of far greater importance than the mere number of hours of routine work. Judged by this standard, and by my efforts to improve the condition of the physics department, I respectfully submit that its administration can compare favourably with that of any other department in the College. In my humble opinion, my work in the meteorological office or in connexion with the Statistical Laboratory and Statistical Institute shows that I have initiative, powers of organization, and administrative ability of a superior type. The interests of the physics department on the administrative side has not suffered, and is not likely to suffer, therefore, by my continuance as the Head of the Department.

Teaching Work.

24. As regards teaching, it will be seen from the following table of percentages based, not on the nominal, but ^{on} the actual number of lectures delivered that during the last three years I have given practically all the lectures in the three senior classes, namely, 4th Year Honours and 5th and 6th Year M.Sc. classes taken together. It will be also seen that I have given nearly one-fifth of the total lectures delivered (except in 1935-36 when I officiated as Principal on two or three occasions) which is more than my share of the work among six lecturers.

Percentage of Lectures actually delivered by P. C. Mahalanobis as percentage of total lectures delivered.

Year	Post-graduate.	4th Year Honours.	Post-graduate & 4th Years Honours.	All lectures
1935-36	50	42	47	16
1936-37	55	43	51	19
1937-38	55	45	50	18
Average	54	43	49	18

25. I may take this opportunity of stating that this year also I have been doing my full share of lecture work, and have not been and never asked to be relieved of any portion of this work. In fact I may respectfully state that I have always done and am still doing more teaching work than any of my predecessors during the last thirty years. I venture to claim that my reputation as a successful teacher is as high as that of any other teacher in the physics department of the Presidency College or of the University College of Science. I also submit that on account of my mathematical training and equipment I am in a more advantageous position to deliver advanced lectures in theoretical physics than most of my colleagues. In fact during the last 15 years or more I have been actually lecturing in the post-graduate classes on the more mathematical parts of the subject, such as the theory of the electromagnetic field, electron theory, statistical mechanics and thermodynamics, or the theory of relativity.

Research in relation to teaching.

26. During our conversation on the 16th January last you were pleased to refer to the question of research work; and I am glad to avail myself of the present opportunity to clear up certain misapprehensions in this connexion. I am, of course, in entire agreement with the view that advanced teaching cannot reach its highest level unless the teacher is inspired with the spirit of research. This does not, however mean that a teacher should give lectures only on such topics in which he is conducting original investigations. This is usually neither possible nor necessary. As you are aware, not only in India but elsewhere, it is quite common for professors to give lectures ~~on~~ ~~totally~~ ~~different~~ ~~subjects~~ on totally different subjects. I claim and I shall show presently that my own researches have intimate points of contact with physics. I respectfully submit, however, that even if it were not so, the very fact that I am doing sustained work in research is quite sufficient to enable me to carry on my teaching duties with success and distinction.

Statistics and Physics.

27. I should like to emphasize at this stage the close connexion between statistics and physics. As you are aware, the introduction of the principle of uncertainty has changed the entire logical structure of theoretical physics. Until recently classical mechanics of the deterministic type dominated scientific thought. But the idea of a complete determination of a system by an observation of its state was based on a too superficial view. We ^{now} know that classical mechanics is a special case of quantum mechanics, and hence the foundations of theoretical physics have to be established on a purely statistical basis.

28. I may in this connexion mention the emergence of the significant term "Statistical Physics", which is the name adopted by Landau and Lifshitz as the title of their new book a translation of which by Schoenberg of Cambridge was published by the Oxford University Press in 1938. During the revision of the physics syllabus for the M.Sc. examination of the Calcutta University four or five months ago, it was unanimously decided that a special paper on "Statistical Physics" should be introduced as soon as the revised syllabus comes into effect, and I was asked to prepare the detailed s

scheme comes into effect, and I was asked to prepare the detailed syllabus for it.

29. On the theoretical side in one of the special lines of research in our Laboratory, namely what R. A. Fisher has called "Mahalanobis's generalized distance in statistics" in his recent paper on "Statistical utilization of multiple measurement" (Ann. Eug. 8(4), 1938, 376-386), I have developed the subject on the basis of a formula which is mathematically identical with the formula for the hyper-dimensional distance in the theory of relativity. I am gratified to find that the subject has attracted the attention of Prof. S. N. Bose who has recently published two long mathematical papers on the moment-coefficients of the generalized distance (Sankhya, 2, 385-396; 5(1937), 105-124) which I believe is his most important scientific contribution since his work on the Bose-Einstein statistics. I may also mention that the subject is being at present discussed at a series of colloquium meetings in the department of mathematics of the Calcutta University.

My work in Meteorology and Geo-physics.

30. On the applied side also I claim that some of my statistical work has important physical bearings. I have published a number of papers on meteorological subjects. Reference has recently been made by Sir Gilbert Walker to my work on the "Seat of Activity in the Upper Air" in 1922 in which by purely statistical methods I had reached the conclusion that a large control in the troposphere was exerted by meteorological conditions at a height of about 4 kilometers, a result which appears to have been recently corroborated by physical methods by Franz Baur in Germany.

31. As you are aware, I have also made a special study of rainfall, flood and irrigation problems. This is not only intimately connected with physics, but actually forms a part of what is now called geo-physics. The subject is of such growing importance that, on the proposal of Prof. M. N. Saha, it has been decided to include it as one of the special papers for the M.Sc. examination; and I have been asked to give a course of lectures on certain portions of the subject. It will not be irrelevant to mention here that last year, in 1938, Prof. M. N. Saha himself selected "River Physics" as the subject for his presidential address to the National Institute of Sciences.

Sustained interest in physics.

32. From the facts mentioned above, the close connexion between physics and my own work in both theoretical and applied statistics will, I think, become quite clear. It will also be realized that there is no cause for apprehending any loss of interest in physics on my part.

The question of accommodation.

33. I shall now discuss some of the points referred to by you on the 16th January. You were pleased to state that there was difference of opinion regarding the question of accommodation for statistical work. I am aware that at one time the Principal (Mr. B. M. Sen) was of opinion that additional rooms in the physics department could not be spared for the jute work. But his objection was based on certain misapprehensions which, I believe, were removed by my note of the 2nd May 1938 a copy of which was forwarded to Mr. Bottomley as enclosure to my D.O. letter No. DJ/23 of the 14th May 1938. I showed in this Note that two rooms could be easily released for statistical work by utilising rooms which were then lying vacant, and without decreasing in any way the total floor area available for the M.Sc. practical classes. The question was then discussed by Mr. Bottomley in Darjeeling on or about the 26th May 1938 in the presence of both Mr. Sen and myself, as a result of which the Principal kindly agreed to have two additional rooms placed at my disposal for the jute work. Formal orders were passed accordingly in D.P.I.'s office letter No. 5631A/OM-167-a-37 of the 8th July, 1938. I respectfully submit that no difficulty therefore exists in regard to accommodation.

Visits to places outside Calcutta.

34. You were pleased to refer to the fact that I have to go out of Calcutta occasionally in connexion with the statistical work of the Government of India or other provinces.

(1) I submit that my position in this matter is not in any way dissimilar to many other professors of senior standing in Calcutta or other Universities in India. So far as the work of the Imperial Council of Agricultural Research is concerned, for example, I may mention in this

connexion the names of such persons as Professors J. N. Mukherjee and S. P. Agharkar of Calcutta, J. C. Ghosh of Dacca, P. Parija of Cuttack, N. R. Dhar of Allahabad, B. Sahni of Lucknow, K. C. Mehta of Agra, L. K. Hyder of Aligarh, S. S. Bhatnagar of Lahore, C. N. Vakil of Bombay and others, none of whom is directly concerned with agriculture, but who attend the meetings of the I.C.A.R. exactly on the same footing as myself.

Journeys are also undertaken from time to time in connexion with various scientific or industrial conferences and meetings of such all-India organizations as the National Institute of Science, Indian Academy of Science etc which are held in rotation in different parts of India. In fact I believe many of colleagues do a good deal more of travelling and committee work outside their respective ~~part~~ provinces than me.

(ii) Apart from work of this nature, a considerable amount of travelling is done by professors of my standing in connexion with examination work in different centres.

(iii) I may point out that Prof. M. N. Saha has been recently elected a member of the National Planning Commission set up by the Congress which I understand is likely to involve a good deal of travelling. Prof. S. K. Mitra has been appointed by the Government of Bengal a Member of the Industrial Committee which is likely to absorb a fair amount of his time. In my humble opinion, what is not detrimental to the normal duties of professors of physics in the Science College should not be considered to be detrimental to my own duties in the Presidency College.

(iv) I also respectfully submit that such occasional absence from Calcutta does not necessarily interfere with the teaching work for two reasons. Firstly, in the post-graduate classes the lectures are given as integral courses which have to be completed irrespective of the fact whether there was any interruption or not. Secondly, it is usually possible by interchange of work and slight modifications in the time-table to arrange matters in such a way that the under-graduate work does not suffer in any way; quite often the actual travelling is done during the slack season, namely from January to April, when there is no pressure of under-graduate work.

(v) Finally, I may be permitted to observe that on every occasion that I have gone out of Calcutta I have done so with the sanction of superior authorities. In future also it will be only with the sanction of the proper authorities that I shall be able to accept similar invitations from outside. If at any time there is any apprehension of the work suffering, Government will easily be able to put a stop to such visits. The mere fact that I receive invitations from outside Calcutta cannot therefore, in my humble opinion, be considered to be a sufficient reason for asking me to give up my present post in the College.

Research in the Presidency College.

35. I have already shown the intimate connexion between physics and my own researches in statistics. Without stressing this point, I may however point out at this stage that research has never been and is not even now considered to be an essential part of the duties of teachers in the Presidency College. (I am leaving out the case of other Government colleges. As you are aware, there are no facilities for serious scientific work in any of them). For example, more than half of the members of the teaching staff holding senior posts (I.E.S., or classes I and II of the B.E.S.) in the Presidency College at present are not actively engaged in research. As regards heads of departments, I find that out of about 24 or 25 different individuals who have held such posts in the Presidency College during the last 10 or 11 years, only about 10 or 12 had shown any sustained interest in research.

Research in the physics department.

36. I may now consider the position in the physics department itself. As I told you on the 16th January, Sir J. C. Bose had started work on plant physiology so early as 1899 or 1900; and his last paper in pure physics was published in 1902. Since then practically no original researches in physics were published by any ~~one~~ of my predecessors in the post of the Senior Professor of Physics, neither by Sir J. C. Bose himself nor by any of his four immediate successors, Mr. C. W. Peake, Dr. E. P. Harrison (who had done some work at an earlier date, but not when he was actually holding the post of the head of the department), or Dr. D. B. Meek and Mr. H. C. Banerjee. Sir J. C. Bose of course did continue his work on plant physiology

until 1915 when he retired from the senior professorship, but his work had much less in common with physics than a good deal of my own work in statistics.

Question of vacating my post in physics.

37. I may now consider some of the other issues which were raised during our conversation on the 16th January. You were pleased to mention that, in case I were to vacate the post in physics, it would give an opportunity for developing physical research in the College. As you were pleased to lay considerable stress on this point, I may be permitted to discuss the question ~~in~~ in some detail.

38. On the material side, the important factors in the organization of research are accommodation (about which there is no difficulty), books and journals, workshop facilities, grants for the purchase of instruments and accessories, and research assistants.

(i) As regards books and journals, the present grant of Rs.800 (of which Rs.435 is spent for journals leaving only Rs.365 for the purchase of books) is not adequate. But my vacating the physics post will not make the slightest difference, for the simple reason that no statistical books are purchased out of the physics grant; so that no additional funds will be released by my giving up the physics post.

(ii) In the case of the Workshop, a certain amount of rationing for the different sections of the physics department is, of course, necessary. Two or three years ago I therefore placed the allocation of requisitions from different sections under the direct charge of Prof. C. C. Bhattacharya; and as much time as can be spared without detriment to teaching work is being now utilized for physical research. As regards the Statistical Laboratory, outside mistries are regularly employed for the repair of calculating machines and accessories. The only help taken from the Workshop staff is practically in connexion with adjustment of partitions, fittings etc. My vacating the physics post will not therefore make any appreciable difference in regard to Workshop facilities for research.

(iii) Let us now consider the question of funds. The normal allotment for physics is Rs.7000 per year. Of this amount we spend on an average Rs.1200 (or one-sixth of the total grant) for apparatus for Dr. S. Datta's

Dr. S. Datta's researches. You will easily realize that with about 400 students in the Intermediate and 150 in the B.Sc. stage and two years of postgraduate M.Sc. classes, it is not possible to divert more money for research without serious detriment to teaching work. I should also like to emphasize here that practically no money will be released by my vacating the senior professorship. During the last three years, for example, the total amount of expenditure incurred out of the physics grant for my own work was Rs.116, Rs.96, and Rs.23 respectively, or an average expenditure of about Rs.80 per year. I need hardly mention that this additional amount of eighty rupees per year will not make any appreciable difference in the situation.

(iv) Special grants on a large scale are in fact essential for scientific research. In the case of Sir J. C. Bose, for example, it is worth mentioning that an annual research grant of Rs.2500 was sanctioned so early as, I believe, 1897; this was of course subsequently increased to much higher figures. In my own case also, all my work has been done with the help of special grants (which I succeeded in obtaining simply because my work was found directly useful). If Government desire to encourage physical research in the College, I respectfully submit that the first step should be to sanction a definite and substantial grant for this purpose.

(v) This so far as funds are concerned. Research assistants are also essential; but, as you are aware, in spite of repeated representations during the last fifteen years, no such post has yet been sanctioned for the physics department. Conditions are therefore not favourable for developing physical researches on a large scale in the Presidency College.

(vi) As regards statistical physics, I may also mention here that I have had in mind for a long time certain essentially physical problems in which I believe valuable work can be done from the point of view of statistical theory. I shall be glad indeed to have an opportunity of taking up such work; and I shall be most sincerely grateful to you if you will kindly sanction, even if on a temporary basis, a qualified research assistant with competent knowledge of applied mathematics for work in statistical physics. If this suggestion meets with your approval, I shall be glad to submit definite proposals for your consideration.

39. In case I vacate the post of the Senior Professor of Physics it will be filled either (a) by some one from outside the Government service, or (b) by some one in Government service, with an outsider filling a vacancy in the chair at a lower level. In case some one from within Government service succeeds me in the post of the senior professor he will not get more facilities for research than what is available at present (unless of course more funds and a larger share of the time of the Workshop are diverted for research to the detriment of the teaching work). He will, indeed, be in a worse position in as much as he will have to devote presumably a portion of his present leisure to administrative duties. Vacating my post in physics will not therefore, I submit most respectfully, help in any way in developing physical research in the Presidency College under present conditions.

40. The facts stated above will show that there is no foundation for the impression that my presence in the department is prejudicial to physical research. The attention focussed on my statistical work in connexion with various schemes of national welfare, and perhaps I may be permitted to add, the public recognition and appreciation which it has been fortunate enough in winning, may have created a wrong impression in certain quarters that, as I found time to do all this work, my normal duties in College must have been ~~extremely~~ neglected. The fact of the matter is, however, that I can work hard; and I have always done and am still doing my statistical work after discharging my normal duties in the College to the fullest extent. I also submit that my researches in geo-physics alone can compare favourably with the physical researches of any of my predecessors or any other member of the physics staff of the Presidency College or any other Government college in Bengal during the last 35 years. In fact it appears likely that if I had confined my attention to only geo-physics, or if I had abstained altogether from doing any research work, no complaint would have been raised at all.

A supernumerary post in physics.

41. I may also point out that my vacating the physics post is merely the negative aspect of the question. On the positive side it means bringing in some one from outside either as the Head of the Department or at a lower level. The arrangement must necessarily be of a temporary nature in the

first instance as I presume I shall be allowed to retain a lie~~x~~ on my present post for a reasonable period. This experiment can be easily made by creating a temporary supernumerary post in physics at the desired level without however discontinuing my connexion with the physics department. In case Government are desirous of bringing in an eminent scientist like say Prof. M. N. Saha from outside, I can assure you that I shall not have the slightest hesitation in relinquishing the senior professorship in his favour, retaining simply the post of a professor in the department. If an outsider is brought in at a lower level obviously no such change will become necessary.

42. I should like to emphasize here the fact that in this plan, so far as College work is concerned, the position will be better than if I vacated my present post, in as much as the services of an experienced teacher like myself will be available in addition to the services of the outside who may be taken in under the proposed scheme. The research position will also be strengthened as the other professors will have more leisure for original investigations in pure physics. The cost to Government presumably will also be same; the only difference being that my salary will continue to be paid from the Education Department instead of from some other department. I may point out that here also I believe there is a good precedent. If I am not mistaken, a supernumerary post in the Indian Educational Service was attached to the physics department for a number of years during the period when Sir J. C. Bose was the Head of the Physics Department. This arrangement worked quite satisfactorily in the past. There is no reason why it should not work equally well in future. In fact the principle of a supernumerary post appears to have been already accepted in Government Order No.5191 Edn. dated 5th September 1938. Owing to the uncertainty regarding the continuance of the Jute Census Scheme, no actual appointment has been made so far; but there can be no doubt that such an additional post will be of great advantage to the College.

Part-time arrangement quite satisfactory.

43. The answer to the first part of your second question is, I think, now clear. A part-time arrangement for statistical work is likely to be quite satisfactory for the present, and will not be in any way prejudicial to the interests of the Physics Department of the Presidency College.

Under existing conditions there will be no improvement in the position in regard to administration, teaching or research by my vacating the physics post; on the contrary, the position may even deteriorate.

Future Possibilities.

44. As regards the second part of your second question, I am of course unable to say whether the part-time arrangement will always continue to be satisfactory in the future. This can only be decided in the light of actual experience. In fact one of the great advantages of the proposed part-time arrangement is its flexibility. If the statistical work expands sufficiently and Government are prepared to provide necessary funds for this purpose, a whole-time arrangement can be made when the need arises. If the plan works smoothly, the part-time arrangement may continue. On the other hand, in case the proposed arrangement proves unsatisfactory it may be discontinued without any difficulty.

Question of vacation duty.

45. I shall now turn to some of the wider issues not directly connected with the Presidency College. You were pleased to refer to the question of my being placed on duty during vacation. I am afraid I do not see what difference this makes.

(i) I may be permitted to state in this connexion that since 1929 I have been engaged in statistical work during both the summer and Pujā vacations; and that a number of advanced workers and computers have always accompanied me to the place where I happened to have spent the vacations. In 1934 during the greater part of the summer vacation I was engaged in preparing my report on Rural Indebtedness for the Government of Bengal; in 1935 I was engaged on work in connexion with agricultural statistics; in 1936 on the work in connexion with the Survey of the Hand-loom Weaving Industry and the Hooghly-Howrah Flushing and Irrigation Scheme; and in 1937 I had already started work on the Jute Census Scheme.

(ii) Since 1934 I have therefore in actual fact done statistical work during the vacations for the Government of Bengal. It was only in May 1938 when I was engaged on the Jute Census Scheme that I almost casually mentioned

this matter to Mr. Bottomley who immediately said that there was no reason why I should not be considered to be on duty during the vacations, and asked me to write to him in this connexion. On my doing so, he was pleased to pass orders placing me on duty.

(iii) I have already mentioned that during the last ten years I have worked hard during all the vacations. I shall have to continue to do so, irrespective of the fact whether I am considered to be on duty or not, as the vacations give me the only opportunity for solid and uninterrupted work.

(iv) I submit, however, that in case I am engaged on Government work, it is only fair that I should be allowed to earn duty leave on this account; and I hope that the present practice started by Mr. Bottomley of placing me on duty for this purpose would be continued to be followed.

Question of Remuneration.

46. You were pleased to mention that difficulties had arisen only because I had asked for a special allowance for my statistical work. May I be permitted to observe that the initiative in this matter was not taken by me? During the last 15 years I have done a great deal of statistical work for the Government of Bengal as well as other Governments, for which I neither received nor asked for any remuneration. It was only during a conversation with Mr. H. Graham in May 1938 (when he was acting as the Secretary to the Agriculture and Industries Department) that this question had arisen. I gathered the impression that instead of my honorary services some kind of allowance, possibly on a whole-time basis, would be considered desirable. At the suggestion of Mr. Graham, I discussed this question, among other relevant matters, in my D.O. No.DJ/23 of the 14th May 1938 addressed to Mr. Bottomley. A little later, I had occasion to explain my position in greater detail in my D.O. No.DJ/173/72.4 of the 5th July, 1938 addressed to Mr. A. P. Cliff (Secretary, Indian Central Jute Committee) a copy of which is enclosed for your information.

47. I should also like to point out with due respect that if it is a fact that no difficulties would have arisen in case there was no question of remuneration, then it is also clear that, so far as the actual work is concerned, College interests are not likely to suffer in any way, a conclusion which I believe I have otherwise succeeded in establishing.

48. As I have already mentioned, I have been doing a good deal of statistical work in my spare time during the last 15 or 20 years, not for the sake of any remuneration, but because I considered the work to be important and worth doing. I can assure you that in future also it is my intention to continue my statistical work irrespective of the fact whether any remuneration is sanctioned or not.

49. I may be permitted to observe, however, that in case the work is done for its own sake, I should naturally like to reserve the fullest discretion regarding the choice of topics. On the other hand, in case Government desire that I should take up such work as they are pleased to assign to me, that is, in case the work to be done by me is to be settled at the discretion of Government and not of my own, then in my humble opinion there is nothing improper in the question of a special remuneration.

50. I may also be permitted to observe that remuneration for such additional work is not lacking in precedence. I have already mentioned the allowance of Rs.300-350-450 plus free quarters for my own part-time work in meteorology. I may give one or two other instances. For example, only recently during my visit to Lahore, I found that Mr. Dunicliff of the I.E.S. is receiving an allowance of Rs.500 per month for his part-time work as Chemical Adviser to the Board of Revenue in addition to his own duties at the Lahore Government College. I understand that Prof. S. S. Bhatnagar of the Punjab University is also drawing a special allowance of Rs.500 for his part-time work in connexion with certain industrial investigations. I hope, therefore, that the proposal of creating a part-time post with a special allowance for statistical work will be given such consideration as it deserves by Government.

Question of curtailing my statistical work.

51. You were also pleased to refer to the possibility of Government asking me to curtail my statistical work in case I was unwilling to take up statistics on a whole-time basis. This is a matter which is of such vital importance to me that I hope you will kindly permit me to discuss it in detail.

Government work in statistics.

52. I should like to state here that during the last twenty years I have done my statistical work with the knowledge and the approval of the Government of Bengal. In fact a good deal of the work was taken up at the instance of Government. I have given full particulars in my letter of the 8th January 1937 addressed to the Director of Public Instruction, but I may recapitulate here a few salient facts.

53. As early as 1920 I was asked to go to Simla for two months for special work in meteorological statistics. In 1924 I was appointed a member of the North Bengal Flood Committee, and my report on the subject was published by the Government of Bengal in 1927. I was given study leave in 1927 for advanced work in the Statistical Laboratory of Karl Pearson in London. I have been asked to serve on various Government committees since 1932; and I was appointed a member of the Bengal Board of Economic Enquiry in 1934 and re-nominated in 1936. As already mentioned, since 1934 I have been asked by the Government of Bengal to undertake statistical investigations of various kinds, and since 1935 an annual grant of Rs.2000 is being given for my work in connexion with the Bengal Agriculture Department. In 1934 I was asked to prepare a report on "rural indebtedness", and in 1936 I was asked to undertake the heavy responsibility of organizing the sample survey of the hand-loom weaving industry in Bengal. In April 1938 formal orders were passed by Government giving me special facilities for work in connexion with the Jute Census Scheme; and in July 1938 I was nominated a member of the official Conference on River and Irrigation Problems held in Calcutta.

Repeated administrative review.

54. On the purely administrative side also the question of my statistical work has been repeatedly reviewed during the last ten years by the Education Department.

(1) In 1929 orders were passed posting me as Principal of the Krishnagar College which were however subsequently cancelled on my own representations. In my letter of the 23rd September 1930 to Mr. H. E. Stapleton (then Director of Public Instruction) I said:-

"I consider the work I am doing to be of such importance that I would, if I am given any choice in the matter, unhesitatingly prefer to remain in my present post in the Presidency College, Calcutta, where I have full facilities for my work."

(ii) In 1933 the question of my transfer again arose in connexion with the post of Principal in the Rajshahi College. On this occasion in my letter of the 4th March 1933 I again wrote to Mr. Stapleton :-

"I did not ask for administrative posts in the past. I have no intention of asking for such posts in future. If I am given any choice I shall most gladly give up all claims to administrative posts and to all emoluments and preferments accruing to such posts during the remaining part of my career in case the Government be pleased to permit me to carry on my present work in the Presidency College."

(iii) A little later, in April 1933, the Hon'ble Sir K. Nazimuddin, (then Minister in charge of Education) together with Mr. H. R. Wilkinson, (then Secretary, Education Department) visited the Statistical Laboratory, and looked into my work most carefully. I learnt from Mr. Wilkinson that the visit was primarily in connexion with the question of my transfer from the College. As you are aware, on this occasion also Government were pleased to allow me to continue in my present post mainly, I believe, on account of the importance of my statistical work.

(iv) A little later I was asked by the Hon'ble Minister in charge of Education to prepare a "Scheme for the Organization of Statistical Studies in Bengal" which was submitted for consideration by Government in August 1933.

(v) As you are aware, the question of my statistical work was again very thoroughly discussed last year during the summer of 1938. I had several talks with Mr. Bottomley in this connexion. In September 1938 he told me in the presence of Mr. T. Dow (then Secretary, Education Department) that he had already decided to recommend to Government a scheme for statistical work in the Presidency College. Mr. Bottomley was kind enough to mention in this connexion that he wanted that my connexion with the Presidency College should be maintained.

Question of a change in the situation.

55. It was therefore not unnatural on my part to think that my part-time work in statistics had the full approval of the Education Department. I am therefore surprised and alarmed to learn from you that there is a possibility of Government asking me to curtail my statistical work. You were pleased to mention in this connexion that the situation had changed recently. I think it is pertinent to enquire in what respects? I am not aware of anything

that has happened during the last four months, since my talk with Mr. Bottomley and Mr. Dow in September 1938, which can in any way be considered to have altered the previous position, excepting that Mr. Bottomley is now on leave.

56. I shall, therefore, welcome a clarification of the present position. In case Government have the slightest doubt regarding the desirability of permitting me to remain in the Presidency College I trust no action will be taken without a full enquiry and without giving me proper opportunities for submitting my case in this matter.

Social Relations of Science.

57. I shall now consider the broader aspects of my statistical work. I have already pointed out its contacts with physics, but for purposes of the present discussion I do not wish to emphasize this particular aspect of the matter. I wish to take my stand on the importance of my work from the wider point of view of national welfare.

58. As you are aware, in recent years, there has been a great change in the outlook on the relation between science and society. At one time it was thought that science can and should be pursued in isolation from social considerations. This is no longer the prevailing view. The trend of recent thought has been significantly reflected in the series of editorial and special articles in the "Nature" such as "Science and Social Problems" (139, 1937, p.403); "Science, Industry and Society" (139, 1937, 689-691); "Science in the Service of Man" (141, 1938, 1075); or to the special ~~an~~ symposium on "Social Relations of Science" in which no less than 26 Fellows of the Royal Society including its President and Secretary participated (141, 1938, 723-742). I may in this connexion also refer to the action of the International Council of Scientific Unions in April 1937 in appointing a committee to report on progress in the physical, chemical, and biological sciences with reference to their interconnections and "the practical applications of scientific results in the life of the community" (Nature, April 24, 1937, 697; May 22, 1937, 689), or to the many discussions on "Science and its Social Relations" in recent meetings of the British Association for the Advancement of Science or the Indian Science Congress Association.

59. It is now widely recognized among scientific workers that "knowledge may be pursued for its own sake, but it is not less the function of science to share in the planning for ~~xxxxx~~ future, which the development of social and economic organization makes more and more imperative everyday." In fact it is now generally agreed that science must "serve as faithfully as possible the needs of the people and indeed of humanity."

Trend of scientific thought in India.

60. I have already mentioned that Prof. M. N. Saha himself in his presidential address to the National Institute of Sciences of India in 1938 deliberately took up as the subject of his discourse not astrophysics but the "problems of Indian rivers". He concluded his address with this significant paragraph :-

"If we desire to fight successfully the scourge of poverty and want from which 90% of our countrymen are suffering, if we wish to remodel our society and renew the springs of our civilization and culture, and lay the foundations of a strong and progressive national life, we must make the fullest use of the power which a knowledge of Nature has give us Towards the realization of this ideal, we must adapt ourselves to the new philosophy of life and train the coming generations for the service of the community in scientific studies and research."

61. I may also draw attention in this connexion to the symposium on "Planning of Power Production in India" presided over by Sir C. V. Raman and held a month ago in Madras in December 1938 under the auspices of the India Academy of Sciences.

Statistics in relation to National Welfare

62. In view of the new orientation in thought, I submit most respectfully that my endeavours to serve the cause of national welfare with the help of statistical science should not be looked upon with disfavour as activities outside the scope of my professorial duties, but should be regarded not only as coming within the proper and normal functions but as fulfilling the new responsibilities of a scientific worker of my standing.

Reputation of the College

63. May I be permitted also to refer briefly to the question of the reputation of the Presidency College which was raised during our conversation on the 16th January 1939. I am gratified to find that my work has had the good fortune of winning recognition not only in high official circles but also in public estimation. I naturally feel honoured at the visit of His Excellency the Most Hon'ble the Marquess of Linlithgow to the Statistical Laboratory about a year ago in December 1937, which I understand was the first Viceregal visit to the College during a period of at least half a century. I feel gratified by the reference made to our work by His Excellency the Right Hon'ble Lord Brabourne, Governor of Bengal, in his speech on the occasion of the opening of the First Session of the Statistical Conference in January 1938 in Calcutta. I feel gratified at the appreciative reference in the speech of His Excellency Sir Henry Duffield Craik, Governor of the Punjab, at the Opening Ceremony of the Statistical Conference at Lahore on the 5th January 1939, from which I beg to submit a few quotations :-

"It is a pleasure and a privilege to welcome you here to-day for the second session of the Indian Statistical Conference. We in the Punjab count ourselves fortunate in your having selected Lahore for your meeting place; fortunate, in the first place, because it gives us an opportunity to express our gratitude to your Secretary, Professor Mahalanobis, for the great services which he has rendered to India. It is largely due to his zeal, foresight, and I may say, private generosity that the foundations of a systematic study of statistics have been laid, and all provinces of India are under a deep obligation to him for this pioneer work, from which, if they are wise, all will be able to derive advantage. We in the Punjab, welcome this opportunity of expressing to him our thanks."

64. I am gratified at the appreciation of my services in connexion with the study of flood problems in Orissa which was conveyed in a formal resolution passed by the Government of Orissa and forwarded to me in your office letter No.4784A of the 8th June, 1938. Requisitions for my services from the Government of India or from other provinces like Bihar or the United Provinces also give me confidence that my work is being found useful in schemes of national welfare.

65. With all humility I submit that the reputation of the Presidency College will be more enhanced by recognizing and claiming as its own the work done in the Statistical Laboratory than by asking me to sever my connexions with the College and the Education Department.

Summary of Conclusions

66. It has been a long letter, and a summary of conclusions may prove convenient for reference. So far as descriptive or purely administrative statistics is concerned, the establishment of a separate statistical department in Bengal is neither possible nor necessary in the immediate future. In the present stage the best policy will be to develop small sections for statistical work in each of the important administrative departments of Government.

67. In my opinion statistics is a means to an end, and its ultimate justification lies in the advancement of human welfare. On the analytic side, the object of all fundamental research must therefore be development of necessary tools for this purpose. On this view, a close touch must necessarily be maintained between the administrative and research sides of statistical work. Specialization of function is however essential for success. In my opinion the desired end can be best secured by the establishment of an Institute of Statistics which, besides conducting fundamental research, will help in the administrative departments concerned by :-

(i) Giving technical guidance and help in connexion with the collection and tabulation of primary statistics now proceeding in different Government departments; (ii) undertaking analysis and interpretation of available data; (iii) giving courses of special training in analytic statistics to administrative officers; and (iv) vetting or preparing statistical schemes, and organizing special enquiries and surveys as required by Government from time to time. In case such an Institute is established, I shall welcome the opportunity of considering seriously the question of taking up statistical work on a whole-time basis.

Part-time post of Statistical Adviser.

68. Pending decision of the question of establishment of an Institute of Statistics, I respectfully submit that in the present situation the most convenient plan would be to create a part-time post for me ~~in~~ as Statistical Adviser for the technical direction and co-ordination of the statistical work of the Government of Bengal.

69. The proposed arrangement would not be prejudicial to the interests of the Presidency College in any way; and yet would be quite adequate for the statistical work of Government for the present. It would avoid large commitments and yet allow for expansion as and when necessity arises. (In a whole-time post, on the other hand, it would be necessary not only to sanction adequate funds but also to guarantee the continuance of the post for a reasonable period.) Reviewing the situation as a whole it is clear that a part-time arrangement would be the most logical, the most economical, and the most flexible method of organizing the technical side of the statistical work of the Government of Bengal in the immediate future.

70. In view of my previous conversations with Mr. Bottomley, I had hoped, when I received your letter asking me to come and see you in connexion with my statistical work, that this would give me an opportunity of discussing the detailed scheme for a part-time post in statistics. However, as you have not asked for my opinion in this matter, I suppose it will not serve any useful purpose to consider this question at the present stage.

71. It has already become a very lengthy letter; and I dare not encroach on your patience any longer by dilating on one or two other points which were also touched during our conversation on the 16th January 1939. However, I shall be obliged if you will kindly let me know in case there is any thing obscure in this letter or if you desire to have any of the points further elucidated.

Yours sincerely,

(Sd) P. C. Mahalanobis

Enclo :

Copy of letter.

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