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# The Development of Health Services in Tropical Countries.\*

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Can the under-developed countries achieve our standards of health in measureable time? If they did so, the advantages would be immense to them, to us and to the world as a whole, bringing nearer the possibility that the world might work in union for material and for cultural advancement. It is agreed, I think, that this could only be possible when all countries have at least comparable economic standards and are no longer divided into the "haves" and the "have nots". To attain this, there must be general development covering many wide fields, but in many countries health is the essential barrier to this general development, which is not possible without substantial improvements in health conditions. It is not by accident that the least developed parts of the world are those in which the health problems are the greatest, and particularly those in which the transmission of malaria is most intense—such as Africa and certain parts of South-East Asia.

My subject is health and "under-developed" countries—in this context meaning without hygienic or medical advance. It is, however, impossible to discuss this type of development without reference to others, and it is worth enquiring how far removed we are ourselves from the under-developed state of health. The sanitary revolution, of which we are now enjoying the fruits, is little more than a century old. Our earliest truly objective knowledge of health conditions in Europe dates back only to William Farr's Life Tables published in 1859, which showed for England and Wales a state of health and expectation of life or death such as would now be typical of any of the under-developed countries under discussion. Progress during this century has really been remarkably slow and should be technically capable of achievement in any other country in perhaps a quarter of the time, because others can learn from the experience and vast accumulation of knowledge which have come to us. The initial advances of a century ago, throughout Europe as a whole, were made on first principles only without the enlightenment of any rudiments of scientific knowledge. They were taken 10 to 20 years before Pasteur made his first brilliant demonstrations of the bacterial nature of disease, 30 to 40 years before Koch identified the organism responsible for tuberculosis, 60 to 70 years before Ehrlich laid the first foundations of chemotherapy which has now revolutionised all fields of treatment, and about a century before Fleming and his revolution of penicillin and the antibiotics generally. Progress was by empirical steps, and it is only during the last quarter of a century that it has become firmly founded on scientific knowledge and has progressively accelerated.

It is true that this revolution in health started on the foundation of considerable development of other forms and was made by people of well advanced and old-standing cultures. Faraday was making his first studies of the nature of electricity. At the same time educational and administrative systems, though inadequate by present-day standards, had been brought within their own particular scope to quite high standards of perfection. The economic structure of the European countries was well formed; they all had

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\* Text of a Lecture given at the Swiss Tropical Institute, Basle, on May 5th, 1963.

some degree of industrial structure on which further development could be built.

Some countries which are under-developed in respect to health, enjoy now a background comparable with that which we enjoyed a century ago, and this is particularly the case where ancient civilizations still survive, as in parts of India, Indonesia and Ceylon. Others, however, are less fortunate. Some, indeed, and particularly several in Equatorial Africa, lack the educational, administrative, economic and industrial structures which served as the structure of our own health development. This is a grave drawback. Health development requires a background of education and administrative structure, and it does itself produce strains and stresses in the economic and social pattern of a country which can only be taken up if it has a reasonable and stable economic, cultural and industrial background.

It may seem odd to talk of the economic strains and stresses introduced by health development, but they are very real. One's first impressions on seeing a community in a medically primitive state may not be one of drastic prevalence of killing disease, though chronic infections may be relatively common. Indeed, such a community is typically living in a reasonable state of biological balance with its surroundings, but a biological balance determined by the laws of nature, which have no particular regard for human feelings though they operate in such a way that the community has a high chance of survival, the processes of infection, malnutrition and death breaking the community up into small groups which are of such a size that the transmission, and even the maintenance, of some infections is limited, and the local food resources are enough for their support. It is in this condition that we find many communities and, once they have been reduced to it, they live in a state of equilibrium which seems natural to them; children are born, half or more of them die, and this is accepted as an inevitable happening; those that survive gain an immunity to many of the local infections. Life carries on equably on a pattern of repeated child-birth and repeated infant and child mortality, the total community remaining more or less unchanged except for an occasional dramatic epidemic happening, and reasonably adjusted to its resources. The aim of all public health is to alter this pattern to one which follows man-made, or perhaps heaven-sent, laws that every individual born into the community should have the maximum possible chance of survival and full enjoyment of development and growth, without impediment of defect or disease until his natural span is ended, and we have in our own countries achieved a degree of success at which all but 3 or 4% of the children born survive to adult life, and some 70 or 80% achieve old age. The decrease in child deaths has been met by a decrease in the size of the family, which has enabled us ultimately to settle into a reasonable state of equilibrium again. In these conditions there is good prospect of the survival of both the individual and community. However, the change from the first of these conditions to the second inevitably disturbs the state of balance and equilibrium until the new balance is ultimately attained, and stresses are inevitable too. A substantial increase in population is certain; movement follows from rural areas to towns in search of employment; towns therefore increase in size at unprecedented rates and often with appalling results; rapid industrial development can take up this increasing urban population but, if it is lacking, social and economic distress can follow; the migrant people become separated from their roots and normal cultural patterns and may flounder helplessly for some time before they develop new cultural patterns suitable to their new mode of life. If we seek justification of this statement that the improvement of health is associated with severe stresses of this type, all we have to do is look at the

history of Europe—and particularly the more densely populated parts of Europe during the nineteenth century—to realise that the revolution in health which then occurred was a source of very considerable strain on the political, economic and social patterns of the continent, though happily they are now largely overcome.

This is now written into our experience, from which others can profit, and there is no reason why their histories should follow a similar pattern if they take proper advantage of the knowledge of ours. However, this does mean that development of health cannot go alone; it is both originally dependent on educational and administrative development and it can only be sustained on a basis not only of good government, but of economic and social development, the foundations for which are as important to our subject as are those for health itself.

These facts present formidable difficulties and I do not put them forward as possible objections to the development of health, but as a statement of the difficulties which will be encountered and which, in my experience, are well understood in most of the countries concerned. There is something on the other side of the balance sheet. Perhaps the most important point is that the man who is sometimes described as "primitive" is very often only a person living in primitive and poverty-stricken surroundings, having all the characteristics of intellect and integrity that one could ask in more advanced circumstances. Indeed, I have a very high respect for many of the individuals I have met in primitive surroundings and have been very impressed by the balanced way in which they can consider and discuss their circumstances and the possible means of escape from them. Nor are all tropical countries essentially economically poor, many having potential sources of wealth which could be developed without excessive difficulty. It is easy to have one's attention distracted by the behaviour of an occasional unwise ruler or by an occasional breakdown in administration from the great mass of solid work which is in fact the basic picture in most of the under-developed countries at the present time. Nor is it wise to exaggerate the deficiencies of the educational background. There are, it is true, vast areas in which education is virtually unknown, but if we talk in terms of numbers of people rather than in size of countries, there are vast numbers amongst whom education is as widely spread as it was in my country a century-and-a-half ago. Notably, education in West Africa goes back to the beginning of the nineteenth century. Schools have, for a long time, been part of the general pattern in large populated areas, and the tradition of university education, mainly overseas it is true, goes back to the last century also.

Probably the most important point is that what would once have been regarded as an insuperable difficulty in health development in the tropics, the prevalence of malaria and other parasitic insect-borne diseases, no longer constitutes a technical barrier to progress. True, they still make an important contribution to the general picture of ill health, but the means by which almost all of them can be controlled, prevented, or even totally eradicated, are now well understood, and in saying this I should pay a particular tribute to the name of J. R. Geigy, of Basle, who first realised the insecticidal properties of DDT, which has since proved to be of incalculable value to the health of mankind.

The same can be said of almost all the other diseases by which the populations of the under-developed countries are affected. Though the list of them is formidable, it contains the names of few which we have not the technical knowledge to prevent or cure—and indeed some, which only a few years ago would have been deemed important, are disappearing. There are the overall

plagues of most tropical countries, prominent amongst which I would place malaria, intestinal parasitism and leprosy, but if we cast our minds back we will realise that these are not essentially "tropical" diseases. Europe has known malaria as far north as England and as the predominant disease of the Pontine Marshes of Italy, in Greece and Yugoslavia; hookworm disease, the commonest and perhaps most important form of intestinal parasitism, was one of the plagues of the constructors of the San Gothard Tunnel; and leprosy was, until recently, widely prevalent in Scandinavia and Iceland. What has happened to them in these countries can be made to happen to them in the tropics. Then there are recurrent epidemic diseases; one thinks of smallpox, cholera—now prevalent in Indonesia, plague and cerebrospinal meningitis, together with yellow fever which has now virtually disappeared. One should perhaps also think of influenza, to remind us that our power over the epidemic diseases is by no means complete and no guarantee can be given against their recrudescence in any country, though the scale of happening of those which are typically tropical in prevalence is very much smaller than it was 50 or even 20 years ago. Again we should remember that, except for yellow fever, these have no essentially tropical characteristic. Europe has known smallpox only too well; the transmission of cholera was worked out in London during one of a series of devastating epidemics, and both your country and mine has in the past suffered from plague as severely as any tropical country. Then in every country or every locality there is usually one disease which is of more than usual importance, and perhaps dominates the health characteristics of the area—just as goitre and rickets have had extreme importance in our own countries. One thinks of river blindness in large parts of Africa, a disease attributable to a worm carried by a small, black, biting fly prevalent along the course of many rivers in Africa and causing blindness in a large proportion of the sufferers, so that one may find as many as 5 or even 10 out of every 100 people have lost their sight; or sleeping sickness, which is recently and fortunately on the decline, but which dominated large parts of Eastern and Central Africa; or elephantiasis, a gravely crippling and humiliating disease in very many tropical areas. But there are no insuperable problems in the prevention of these. Apart from these dominating and often dramatic conditions, the foundations of ill health in tropical countries are very much the same in temperate or any others. They lie in nutritional defect, ignorance of the methods of care for children and the handicapped, infections of the alimentary tract, pneumonia and in the dramatic risks of life such as occur in child-bearing. A programme of health development which dealt with the exotic, dramatic and the mosquito-borne diseases could never be successful unless it took full account of these conditions, which affect the people of every country in the world and constitute a major source of loss of life and health.

Many solutions have been sought for these problems. For a long time emphasis has been placed on mass campaigns intended to reduce or even eradicate some of the major conditions. This type of activity did not originate with the World Health Organization and is much older, one of the pioneers being the Rockefeller Foundation which, nearly 50 years ago, started its mass campaigns against hookworm disease and later against yellow fever, achieving a success in the latter which was as brilliant as its failure with hookworm was disappointing. The World Health Organization based much of its earlier work on mass campaigns of this type, directed against the spirochaetal diseases, trachoma and malaria, the latter now having developed into its vast malaria eradication scheme for the world. Other approaches have been through the development of widespread dispensary systems with some form of treatment

mechanism scattered throughout a country, but unfortunately usually failing completely in its objectives due to inadequate training, equipment and supervision of the staff employed. Some have advocated and practised the establishment of hospitals providing at least a nucleus of good-standard treatment, available to those who could reach them, and, though perhaps the proportion reached is small, many of them have undoubtedly established a nucleus of quality which, apart from doing direct good in its locality, has been of immense educational value. Others have advocated and put into operation sanitation schemes with the wide provision of latrines and other elementary sanitary facilities, and perhaps one of the most significant of these programmes is the World Health Organization's present programme for the improvement of water supplies for rural areas through the world. And lastly there has been the approach of research carried out largely at first by individual or private enterprise, and now being successively taken over by governmental and other organisations, and which has in fact a truly astonishing record of success, unravelling one by one the formidable problem of the ideology and transmission of most of these diseases, and ultimately providing mechanisms for their prevention or cure. Tropical research has, of course, gained immensely from the research carried out in and for temperate countries, but it can say that its establishment as a recognizable discipline is in no way dependent on subordination to such temperate activities, tropical research having itself been the pioneer originator of research mechanisms from which the temperate countries have profited equally.

These individual approaches have had their brilliant and lasting successes as well as their failures. Africa is a cleaner and better place for the campaigns that have been waged against the once universal and truly disgusting disease, yaws. There are towns and other places, such as Freetown in Sierra Leone, which have been islets of relative health due to the control of malaria for many years. There are hospital centres of immeasurable value in most tropical countries and, greatest benefit of all, malaria eradication advances until now, only eight years after its start, over 300 million people have seen it completed and a further nearly 700 million draw such advantage from its progress that most of them probably regard it as already eradicated, although the technician would not think it safe to discontinue his efforts for some years.

But despite this record of success, there is an increasing realisation that true health for a community cannot be brought by an approach on individual lines. An unhealthy community may be greatly benefitted by the disappearance of malaria or of yaws, or by the provision of sanitation, but it is not raised by these measures alone to the standards of a healthy community. For this its needs a very much broader approach which will, in some degree and to the best of abilities at the time, take account of all of the needs for health and make the necessary knowledge, facilities and services generally available. Indeed, some of the mass campaigns cannot be truly self-sufficient in themselves in that they depend for their final completion and for their ultimate maintenance in the face of risks of reintroduction of disease on the presence of a widely distributed rural health system. This has recently been recognized by the World Health Organization in the case of malaria eradication, and it has very wisely introduced its system of pre-eradication programmes which amount to the encouragement of the growth of a general health service as a preliminary to malaria eradication in those countries where it was previously primitive or non-existent.

A mechanism must be found which provides for prevention of the epidemic disease, control and ultimately elimination of dominating conditions such as malaria, filariasis and night blindness, for care of the infant and growing

child, for prevention and treatment of the common illnesses of life such as enteritis which cause such a large drain on health, and for rendering help in the ordinary accidents and illnesses, starting with those of which the continuation is a humiliation and an indignity to the community as a whole as well as to the individual, such as obstructed labour and major accidents without prospect of aid, and going progressively until in the end a wide coverage of services exists.

Achievement of this aim will set different demands according to the circumstances of the country. In some countries, India, Pakistan and others, health services are already not unreasonably developed and there are large, though not adequate, numbers of well trained staff available to operate them; and such countries advance by expansion and adaptation of their existing facilities and services. The problems are greatest in those countries which lack the administrative, medical and educational background. The considerable re-orientation of many of our ideas on medical services, in some cases abandoning some of the concepts derived from European medicine, and in the process improving on them by the substitution of others more appropriate, will be necessary, and it is these cases that set the most difficult—and at the same time the most fascinating—problem.

The first re-orientation is to abandon our old concepts of the distinction between curative and preventive services, the first being traditionally regarded as services rendered to the patient for his or her benefit alone, and preventive services being measures carried out on the environment—such as the provision of drains and water supplies. With the advance both of knowledge and of the methods available to us, this distinction should go and should be replaced by a distinction between "personal" and "environmental" services. The personal services are those rendered direct to individuals and they include a great deal that is preventive. The four big causes of death amongst children are malaria, nutritional defects, pneumonia and gastro-intestinal infections, often inter-mingled with each other. Much of the nutritional deficiency is due to ignorance rather than to direct poverty. Some of this can be remedied by the activities of the Agricultural Department in educating parents in the types of crops that should be grown, and part of the remedy lies in the education of the mother in the selection and preparation of foods, and this is entirely a personal service to be shared between Ministries such as that of Community Development and Health.

The traditional concept that gastro-intestinal infections can be prevented by provision of water supplies and drainage systems is applicable to towns and large collections of people but has very little direct application to the rural areas of countries such as we discuss. They can be prevented by sanitation, but the sanitation required is domestic sanitation, care of the house, and care of its immediate surroundings, with development of child management and methods of upbringing, which are every bit as important as provision of facilities.

These alone cannot be effective and the next requirement is that the mother should appreciate the gravity of diarrhoeal diseases in children, the fact that they are curable, and the urgency with which help should be sought; and this again is a personal service, in the form of education. Completion of the management requires that medical services should be accessible, and accessible to a mother with a sick child at the actual time of need, and that these services should provide specific therapy given urgently and continued under supervision until danger has passed. Very much the same requirements apply to pneumonia and to malaria. In fact three of the main causes of death amongst children demand for their adequate handling an educational system which

reaches into the home and the provision of accessible medical services graded to the management of a limited number of infections by specific therapy, and with suitable arrangements to ensure the early provision of treatment and its continuity, thus providing basic prevention of the diseases, curative facilities, and thereby the limitation of sources of infection for others.

It follows that the basic need for public health is accessible medical services operated by trained staff and orientated in the first place to the management of certain defined conditions. And it follows from this that some form of institution must be widely distributed to achieve accessibility, and the number of centres must inevitably be large, particularly in a country such as Tanganyika, in parts of which the population is sparse. Problems of staff immediately arise both as regards numbers and the nature of their training. A review of the availability of staff is almost always disappointing, revealing not only that the number of graduate medical practitioners is wholly inadequate to the needs, and that often the opportunities for medical training are insufficient, but also that the limitations of the ordinary schooling system are such that the number of potential entrants to traditional forms of medical schools is so low that the needs of the country cannot be met through a mechanism such as this for a very long time.

Countries in this position, and there are many of them in Africa, face a dilemma. They have the alternatives of waiting endlessly, at least within the span of life of the present and the next generation, for an acceptable level of services, or on the other hand of devising a means of provision of medical services which differs radically from that which they have for the most part adopted in the past. It is clear that, if services are to be accessible to all, they must primarily be rendered through the agency of auxiliaries without a full medical training, and that the education of these auxiliaries must be adapted onto entirely new lines. Experience shows that the auxiliary mechanism can break down unless it operates within an organisation which is especially devised to make use of them, and to ensure that they receive the supervision, general management and continued training which the very name "auxiliary" implies. In many countries the number of graduate medical doctors is inadequate even to provide this necessary supervision, and in any case the training of the ordinary medical officer is not orientated towards this type of activity and he is both educationally and psychologically inappropriate for the purpose. It is therefore necessary to re-orientate our conceptions of the form of medical training which is appropriate for developing countries. There can be no departure from the idea that a full medical training includes a full scientific basis and a wide range of vocational training, but there is considerable room for divergence of opinion about the range of subjects in which both basic and vocational training should be given. The need is for a medical practitioner who has been specifically trained to carry out general practise and all aspects of personal medicine which might fall on the general medical practitioner. There seems to be no need in this context to provide either the scientific foundation or the vocational training which makes the potential specialist in cardiology, surgery, neurology, or the other hosts of specialisms in which the European graduate usually gets his grounding.

It is worth noting in this context that the suitability of the standard forms of medical training has been the subject of much discussion at the 16th World Health Assembly, held in May 1963, where it was agreed that there was a widely felt urgency concerning the many doctors who are being trained, if not badly, then inadequately, to meet the needs of the day, and also that there was a world-wide problem of the low status of preventive medicine in the minds of clinicians and teachers alike. The needs of Africa are that these

defects of training should be remedied and a practitioner should be produced, by a modified training mechanism, who can meet the needs of developing countries and in whose mind preventive medicine does not have any low status. The report of that meeting concludes with the statement that a re-evaluation of medical teaching has to be undertaken and new methods are needed to teach students how to look at health problems from the curative, preventive and social points of view. It is exactly that re-evaluation that is needed.

Fortunately the need for it is being faced in several parts of Africa and perhaps most completely in Tanganyika, where a new curriculum of medical education has been established with the specific objective of turning out a practitioner, fully trained in all the aspects of general practise and, in comparison with the traditional graduate, lacking only some of the basis of subsequent specialisation in more erudite subjects. On the other hand, it is hoped that he will be better trained as a general practitioner and in relation to the needs of a rural community. Here I should make special mention of the work of the Swiss Tropical Institute, which has undertaken a pioneering activity in extending its educational work from Basle to Ifakara in Tanganyika. You probably know as well as I do the mechanism, the transfer of a substantial part of their staff, together with their equipment, to a rural area of Tanganyika for three months in the year, where they now participate in the later training of the predecessor of the practitioner I have described, and will in future take a very important part in the training of the new type of practitioner. Unlike most of you, I have had the opportunity of visiting Ifakara myself and I know how imaginative was the choice of this particular locality and how imaginative, sympathetic and valuable is the training which they can give there. This is an outstanding example of the type of help which European institutions can give in developing the new training mechanisms which are essential for Africa's development.

I have described two grades of staff, the auxiliary and the practitioner, and clearly these must be fitted into an organisation which provides also for hospital treatment, including special mechanisms, and environmental care. I have gone into the possibilities of development of a mechanism in considerable detail, and I am satisfied that it is possible to create one of which the peripheral, and ultimately most important, unit is a village clinic staffed by auxiliaries, a limited number of these clinics being under the supervision of Health Unit operated by practitioners and other staff of comparable training, and a number of these Health Units being grouped into Health Areas at the centre of which there is an administrative mechanism, a supervisory mechanism and a hospital mechanism to which more serious patients can be referred. The essential of such a three-tier system is to ensure adequate contact between the different levels, and it is envisaged that this can be carried out through arrangement of sufficient sessional working visits.

With the picture of an organisation such as this in mind, it is possible to estimate the minimum number of units which would be originally acceptable, and then to calculate the staff required. I have carried out this exercise and I am reasonably satisfied that any country which already has an established school mechanism, even though it is not universal, should be able to undertake training programmes for this purpose and to establish a minimum necessary number of units within a period of 15 or 20 years, and the first requirement of provision of a preventive as well as curative personal service would then be established. The financial implications are, of course, considerable, but they do not appear to be beyond the resources of the type of country which we are discussing. The more difficult problem is the technical resources, and particularly the resources for establishing the training curricula and then staffing

and running the training institutions to an adequate standard. We are often asked how European institutes can best help in the health development of overseas countries, and here is a field of possible assistance, of immense value but not demanding the expenditure of immense sums of money—though it does require a very solid background of technical knowledge and of local knowledge of the countries concerned and of their people. Here is the field in which every medical school and special medical institution can render a practical aid to the developing countries, and it is one in which the schools of tropical medicine are peculiarly well fitted to serve, on account of their accumulated knowledge of tropical conditions and tropical people. Some of them are already active in this field. I have paid tribute to the pioneering work of the Swiss Tropical Institute. My own School and also the Liverpool School of Tropical Medicine are active in this field, and I know from a recent meeting that it is very much in the minds of the authorities of all of the European schools of tropical medicine. They must be the leaders in this form of help, but it need not be confined to them, because teachers are required in every aspect of pre-medical and medical training. What we need and as yet still lack is a method of integrating the activities of the many European universities where a generous system of secondment is possible for such purposes as this. I have paid particular attention to the training of a new type of practitioner, but these principles apply alike to existing types of medical schools which deserve every encouragement possible, and to the training of nurses, health inspectors, technicians of great variety, and other groups of ancillary workers.

In this talk I have concentrated on the development of personal services, but this is not intended to be to the exclusion of mass campaigns for the improvement of the environment, as by malaria control; it is because these mass campaigns must necessarily be built, if they are to be continuously effective, on the background of an existing public health service, which therefore must come first. The place for these campaigns is very real and very important. I would certainly place malaria eradication in the highest position of priority, if we talk in terms of continents. If we talk in terms of smaller areas, there may well be campaigns against other disease which have a greater importance—campaigns, for instance, against river blindness in parts of West and Central Africa; against trachoma in some of the drier countries; or against bilharzia in the countries badly affected by that condition, such as Egypt and China. These campaigns will develop on the original basis of local services, which therefore are to be encouraged in parallel with the personal services. All of these mass campaigns present enormous technical problems and it has perhaps been a fault in the past to regard them, and particularly malaria eradication, as routine processes requiring only the application of already accepted knowledge. Our knowledge is sufficient to start these programmes with confidence that we can continue them and, by adequately developing our resources for research, we can expect to overcome the technical difficulties as they arise, but it is vital to their success that research should continue and should be elaborated before their institution and in parallel with them. My own School undertakes several types of research of this nature, and within my own Department we have particularly concerned ourselves with the scientific basis of malaria eradication. Experience during the last 15 years has shown without any doubt that this concept of malaria eradication is dependent on the parallel execution of research, without which it would be frustrated in many places. Here is another field in which schools of tropical medicine particularly can render valuable help. It would be unwise to recommend excessive specialism in research or to try to restrict research on individual subjects to special institutions, but I feel that real progress in

preventive medicine is to be achieved by individual research groups adopting primary objectives, such as the scientific basis of malaria eradication or of bilharzia control, examining these subjects to see where the scientific basis is inadequate, and setting these subjects as independent research projects which will naturally vary from time to time, particularly as difficulties are elucidated. If we can bring our resources together as the tropical schools of Europe are now happily trying to do, we could develop a rational picture of research with a reasoned balance throughout different institutions, between them covering most of the major problems of health development in tropical areas.

The teaching of the graduate from Europe who intends to go to the tropics, or of the graduate from the tropics who wishes to specialise, has always been and will continue one of our main functions, and it may be expected to develop though the pattern of teaching is changing and will inevitably continue to do so. We must foresee here a gradual change of pattern from an original picture of the basic courses teaching the elements of a subject which, however, become progressively less important as adequate teaching institutions develop in tropical countries themselves, to a progressive replacement of courses in Europe by more advanced ones, the true functions of which will be to teach the future teacher in the tropical countries themselves. This will involve the progressive increase in standards of teaching and, at the same time, a progressively increased standard of specialisation with the development of individual subjects for students, rather than broadly based courses.

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