AN ADDRESS ON MEDICINE AND MEDICAL ORGANISATION IN JAPAN.

Delivered, by request, to the Medical Faculty of Tokio.

By ERNEST HART.

(From a Shorthand Report in the "Japan Mail," April 9th.)

The Character and Contrasts of Japan.—The Imperial Japanese University and its Professors.—The Museums and Hospitals.—Praise and Criticism.—Suggested Subjects for Study by Japanese Physicians from their Special Field of Observation.—Medical Organisation; Proposals to form Associations such as the British Medical and the Medical Sickness and Provident Associations: Outlines of Organisation.

GENTLEMEN,—I will ask you first to allow me to say a word or two of prefatory introduction, expressing to you my impressions on one or two points of what I have seen during the short time that I have had the privilege of being in your beautiful country. First of all, I must express my pleasure at meeting so many of the heads of the medical profession in the Far East. Let me offer my heartfelt acknowledgments of your kind reception. It is always a delight to find oneself in an assembly of medical colleagues. There we exchange mutual impressions: we make and renew friendships; we add to knowledge; we find new inspiration in the fresh thoughts and original observations of men of learning and experience, and we strengthen the impulses to self-devotion and higher effort, which are the accepted aims of our profession throughout the world. Those are the main objects for which we have established the periodical meetings of the British Medical Association, and we find that the organisation of a great association with branches, properly administered, tends to promote unity, affection, respect, and the growth of knowledge in each part of the empire and throughout the whole profession. But before describing to you that organisation, let me say a few words special to this occasion. I feel this to be an occasion of peculiar interest. This beautiful Land of the Rising Sun saw the early dawn of a civilisation stretching far back into the records of time. It possessed and enjoyed an intellectual culture, an art culture, of a very abstract, metaphysical, and refined kind, in past ages when many European countries such as my own were rude, barbarous, and uncultivated. Your records, and still more your preserved monuments of art, such as the mural paintings of the Temple of Horuiji, dating a thousand years back; the spiritual religious paintings of Kanaoka, dating 800 years ago; your vigorous statues; the exquisite lac, and the elaborate embroideries of the Royal Treasury at Nara, all testify to an advanced art in Japan, as do the writings of the priests to a highly-developed system of thought and philosophy at a time when in Britain and in Gaul all was yet primitive and undeveloped. As centuries passed on your peculiar arts and your refined philosophies underwent some new developments, but were untouched by the innovations of the then rapidly progressing nations of Europe. From the fifteenth down to the eighteenth century your feudal system maintained peace, and favoured the growth of a series of art products and conceptions which compare with those of a corresponding period of time in Italy; but it was at the cost of an isolation which shut you off from modern thought in the West, and which helped to crystallise existing knowledge in Japan, but to arrest progress. Forty years ago the barriers fell, and with the restoration of the Imperial power of the Mikado came the entrance of Japan into the comity of nations of the West. She has taken her place in the great councils of the world, never, we may hope and believe, to derogate or depart from it.

Chief among the rapid and enormous changes that have occurred within these few decades has been the rapidity with which you have acquired and assimilated European science, social organisations, and law, and have applied technical and industrial procedures. Since I have been here His Imperial Majesty the Emperor has launched an ironclad ship of war

complete and equipped according to the latest requirements of the terrible science of war, built in your own dockyards and by your artisans, and efficiently manned by native seamen, and this is only the latest of a series so built; and I have the high authority of Captain Ingles, R.N., for saying that it would be difficult to discover any point of inferiority to a high European standard, whether in ships or in men. The telegraphs and telephones which traverse this vast and ancient city of Tokio in which I am speaking, the railways, the tramcars, the electric lighting, testify to an eagerness for modern study, a power of rapid assimilation, and an executive facility which is without precedent in Asiatic history, and in respect to the rapidity and completeness of the transformation has certainly no parallel in the history of the world. This is a country and a city of strange contrasts—none more striking than on the day last week when I passed from the tombs and the memorial shrines of the Tokugawa Shoguns to the Imperial University. On one hand, at Shiba, were the gorgeous and silent shrines, resplendent with lac and gilding and colour, but fading and ill cared for, the forest of colossal lanterns whose light has departed for ever, and despoiled by the vigilant hand of the furtive robber of some of their most valuable accessories. There was the majestic seated image of Iyeyasu, who moulded the feudal system with so strong a hand and such far-seeing despotic will. All was eloquent of a day which has but just passed away, but which was vitally continuous with the Japanese civilisation of centuries ago, and which reflected with precision the elaborate art, the regal splendour, but the arrested knowledge, the distorted philosophies and the suppressed individuality of bygone days. Thence I came to the University buildings, themselves seated in the broad-acre park of the castle enclosure, till lately occupied by the great Daimyo, the Prince of Kaga. A modern building, strictly English in its utilitarian ugliness, with a board room which might have been in Cheapside, and with an organisation compiled of types selected in England and in Germany—it is a true university, with its colleges of law, medicine, engineering, literature, and science, each with its full staff of professors, and equipped with laboratories, libraries, workshops, hospitals, and museums. In the Faculty of Medicine I found a staff of fifty-five professors and assistant professors, many of whom have followed their studies for several years in the great centres of medical knowledge in Europe, and some of whom have graduated with high distinction in foreign universities. The arrangements for five years' preliminary study in languages and in physical science, and for a four years' compulsory professional curriculum of strictly professional education, were of the most approved standard, and are more than we have yet been able to enforce in Great Britain. The teaching combined the best features of the English and German systems. The practical laboratory teaching in such departments as those of Professor Osawa in physiology, of Professor Yeshikyō Koganei in anatomy and histology, of Professor Miura in pathology, Professor Takahashi in pharmacology, etc., was, I found, up to the latest scientific knowledge and on the best practical methods; the system is well planned and efficiently carried out. The work which I saw being done, much of the physical and microscopical researches by the Japanese students of Japanese professors, would be a credit to any students of to-day in any university, and reflect the highest honour on both professors and students. You have favoured me with a series of monographs and published articles and pamphlets containing the results of original research in the most important departments of medicine and the allied sciences; these I shall study, and I shall hope to communicate some information derived from them to the medical profession in England. Many of them are, however, known and esteemed by the best scientific men in Europe. The specimens which have been put aside for me of new active principles derived from Japanese drugs by Professor Takahashi I propose to hand to Professor Fraser of the University of Edinburgh, whose name and researches in kindred subjects are, I find, familiar to you. Your hospitals, with all their departments for medicine, surgery, gynaecology, and ophthalmology, have greatly interested me. Finally, I shall be able to report to my colleagues at home that Japan has raised herself as it were by one leap from the deep valleys of the old Asiatic medical superstitions to the upper level of advanced medical

science and practice, and that by no superficial methods, but by thorough-going, sound, and real study, and good work.

Let me say a word or two by way of passing observation and suggestion grounded on our British experience. We have not always found that merely university teaching suffices to turn out students well armed to cope with the daily requirements and constantly varying exigencies of practice. We are studying now how to avoid too encyclopædic and minute detail of study for the ordinary student and for the general medical practitioner. You may likely find that something less elaborate may be needed for the mass of practitioners, and that a difference may usefully be made in the field of study and limits of examination for those who are graduating for professorships and consulting practice, and for those whose life will be passed in ministering to the daily needs of the poor and of the general population. Not all are called upon to be familiar with histological refinements or to practise chemical research. Deductive knowledge too exclusively pursued becomes a snare, and theory is often insufficient if practical skill and resource have not been developed.

I may venture also to express a hope that the Government liberality which has been so wisely and generously exercised may be extended further. The museums will soon—nay, indeed, do now—require more space and better fittings; and the University Hospital has not yet been supplied with all that is needed to satisfy a severe critic in its buildings or its fittings. Your training system of nurses is, according to European ideas, good; but to secure a high class of women the salaries appear to be inadequate. Bathing is so great and so important a part of your domestic institutions that I was a little surprised not to see more complete and better bathing arrangements in your hospitals. They do not compare with those in European hospitals at present; and I may also venture to add that, whereas in Japanese homes nothing is more striking and delightful to the European eye than the extreme cleanliness and neatness which become in themselves a beauty, I have not always observed the same cleanliness and neatness in the hospitals; nor have I seen that custom of making the hospital ward more beautiful, giving it colour, introducing pictures and flowers, and adding newspapers, which we in England have come to regard as a valuable addition to the equipment, and which is supplied by the liberality of kind patrons, and, in the case of pictures, by the artists themselves. Let me add, as I am speaking among medical men and for medical ears, that I observed that in those hospitals that I have seen which were under thoroughly medical control the administration was better than in those which were administered by laymen or by lay directors.

I observed with great pleasure the part which women are beginning to take in administering hospitals here; and I saw with admiration how greatly the munificence of Her Majesty the Empress of Japan has contributed to set an example which ought to be fruitful, not only amongst the ladies of Japan but also among the men, for with us the hospitals, as you know, are mainly supported by private and voluntary contributions, and it is to private and voluntary contributions that the whole of the great hospital system of London, which forms one of its greatest glories, is due. It was formerly the custom here for men of wealth and for nobles to devote large sums to keeping up shrines, memorial temples, and tombs. That time is to some extent passing away, and if, following the example of the Empress, they should contribute largely out of their means to the foundation and the maintenance of hospitals and universities, they would be doing that which in Europe has been customary now for some centuries, and has greatly contributed to the public welfare.

Pardon these few words of friendly criticism where there is so much to admire. There are many things on which we may look to you for valuable contributions to our further knowledge. Among them, if I may be allowed to enumerate, there are the etiology and communicability of leprosy, which some among you find strong reasons to doubt, and the question of its prevention and treatment; the pathology and prevention of what we call beri-beri and you call *kakke*, as to which your specially appointed committee is conducting researches for the result of which we are looking with much interest. Your experience will be very valuable to us as to

the influence of prolonged lactation (over from one year to three years according to Japanese custom), first, on the health and longevity of the mother; secondly, on the diminution of infant mortality, which is, I believe, very small in Japan; and, thirdly, its influence on the rate of increase of population (for that purpose we should require to have careful statistics of the average number in a family), and whether there is any other cause than prolonged lactation which increases or diminishes the number of children in one family. The habit of prolonged lactation does not exist in Europe, and its influence would be very important for us to know.

Then we should like to know something exactly and scientifically of that remarkable experience of yours of the comparative immunity of your people from scarlet fever, and of the alleged rarity of its spread. I am informed by experienced physicians here that this, which is with us the most contagious disease by personal contact, is here hardly to be considered contagious from person to person. We want specific details as to the variations of the disease, its incubation, and its results upon the kidneys, in fact, an accurate record clinically and scientifically in order to determine whether it is specifically identical, or whether it differs in any way from the scarlet fever which we know.

Then it would be very interesting to us to have from some of your experienced surgeons complete information as to a curious form of what we know as senile gangrene, occurring here apparently among adults of middle age otherwise seemingly in ordinary physical condition, such as some of the cases Dr. Takagi pointed out to me in going round his wards. Then you would communicate to us observations which would be important as to the influence of those very hot baths which your population are in the habit of taking, a habit which is contrary to European experience, and as to which we have little information on the precise difference of the physiological effect of a bath at 95° F., and one at 105° to 120°. Baths at 120° are unknown to us in Europe, and information as to the influence on health and disease would be most welcome. I am told by Dr. Baelz that the treatment of infantile pneumonia by very hot baths at 105° is with him very successful. This would be at once a field for interesting information if it were communicated by you to our physicians. There are other points, such as the hæmorrhages in typhoid fever, which with us are of the worst possible prognosis; they mean most commonly a very serious case, and inspire the gravest fears. I am told that here, on the contrary, hæmorrhages in typhoid fever are common, and are comparatively benign. That also points to a difference of type, on which comparison and information would be very valuable to us. Massage or shampooing is with us a comparatively recent introduction; with you it is an ancient and long practised art. What have you to tell us of the value of massage in medical cases, and of its real value—not in the hands of the uneducated *amma* but in the hands of the educated physician, carefully and methodically carried out as we are beginning to carry it out in Europe? These are among the subjects on which we should be pleased to offer you the hospitality of our medical periodicals, and as to which we should be glad to receive communications at the meetings of our British Medical Association.

Speaking as the Editor of the BRITISH MEDICAL JOURNAL, which is the journal of the Association, and speaking also as one of its members holding an official position, I may say we should heartily welcome everything which would bring the members of the Japanese profession into more frequent and more direct communication with the British medical profession, and which would allow us an opportunity of seeing them from time to time at our meetings, and reading their communications in our pages. The British are very sympathetic towards the Japanese, and we have the vanity to speak of you as the English of the East, which, knowing that we have not as bad an opinion of ourselves as we might have, you will understand is in our minds an unforced and voluntary compliment. Now if you are disposed to think of following one precedent which we have in England in our Medical Association, I shall briefly summarise some of its features, and I shall place in the hands of your seniors here all the documents and papers which may be necessary to give you such detailed information as you may subsequently require. The British Medical Association owes its origin to an eminent provincial phy-

sician, then Dr., afterwards Sir Charles, Hastings, who founded it some fifty-six years ago. Its declared objects then were, and they have never been departed from, first of all the elevation of the standard of professional knowledge and the improvement of medical education; secondly, the collection of information from all parts of the empire as to local prevalent diseases and the best means of treating diseases according to locality; of studying epidemics, and of considering local conditions so far as they might affect the public health; and, thirdly—and this is amongst its most important and its always most valued objects and results—the cultivation of a sentiment of friendship and unity amongst all the medical men of the empire, and the raising of professional ethics and of conduct towards one another to the highest standard of professional duty and courtesy. The British Medical Association is essentially a representative institution. It is one in which for purposes of association, and of meeting, the members of the profession, however humble in pretension or however great in position, meet for the time on an equal footing. Each must meet the other as a friend and a brother, each making his contribution to knowledge or to the general unity and power of the profession. It is an institution founded in the first instance, as you see, by a provincial practitioner, with the object of extending, not from the centre to the periphery, but from the periphery to the centre, so that every medical man, in however remote a district or colony, may feel himself a member of the whole body, and may have an opportunity of communicating with the centre. The arrangements are such that the whole body of men have the opportunity of periodically meeting at convenient times and places in their own locality, forming there a committee for their own self-government, according to a common and general pattern, and sending from each local centre a representative who comes every three months to form one of a central committee, and to meet his colleagues from the other parts of the kingdom.

Each of these local bodies, which have arranged themselves by a sort of natural growth according to geographical necessities, constitutes what we call a Branch. Each Branch has a set of by-laws, formed with absolute uniformity, but modified to suit the necessities of each locality. Before the Branch can be recognised these by-laws must be approved and accepted by the General Committee. The funds of the Association are supplied by an annual subscription from each member. That subscription includes a small contribution required for carrying on the work of local organisation, and the general expenses of the Central Committee and of their publications. I need not trouble you with the details of its growth, but I will tell you that at present, at the end of fifty years, our position is this. For the annual subscription of £1 ls., or \$6, each member has all the privileges of attending the great general meeting, which takes place every year in a different part of the country by invitation, the medical men and the authorities of each town vieing with each other from year to year in inviting the pleasure and the honour of meeting the Association, and giving to their professional brethren a hearty welcome at this annual gathering. On these occasions not only do the medical men themselves, so far as the resources of their homes permit, invite their medical visitors to stay with them in their houses, but the principal inhabitants of the town take pleasure, at the suggestion of the medical men, and knowing the event is to happen, in extending similar hospitalities to the medical practitioners who assemble. The total number of members of the British Medical Association, all of whom must be British subjects, is about 14,000, so that it has grown to be a great organisation starting from small beginnings. Its Branches have each their local meetings at such times and places as are most convenient to themselves. In some places where there are not many medical practitioners they meet rarely. Where the district is extensive the place of meeting is changed from time to time, and arrangements are made for local meetings at which papers are read, cases are shown, discussions are held, and probably a friendly dinner takes place afterwards. So great is the power of numbers and of union that the influence of the Association is now very considerable, and its funds have grown to a great point. The total income of the Association from subscriptions is £14,500.

The BRITISH MEDICAL JOURNAL, which is supplied to the members for their subscription of a guinea, is a weekly

journal which has grown now to 120 or 140 pages weekly, constitutes, in fact, a volume in itself, which gives the members information from every part of the world on medical subjects. It supplies, in virtue of its great circulation, an income of £13,000 to £14,000 a year from advertisements; so that the Association is able not only to supply this great mass of literary matter, but also, in virtue of its prosperity, to put aside a sum of £2,000 a year, which it assigns in donations and studentships for scientific research to assist medical men who desire to carry on medical investigations. It is also collecting a valuable library, and it is able to defray the expenses of a Parliamentary Bills Committee, which exercises great influence over the welfare of the nation in respect of sanitary questions and over the welfare of medical men in all public departments. Being so numerous it is in a position to study all sanitary questions, all questions of public law, and all questions of the organisation of army and navy medical officers, and to make representations to Parliament which, coming from such a great body of men—a large proportion of whom are able to influence local members of Parliament—are always listened to with respect. I need not trouble you with the enumeration of the questions—but on points of sanitary law, the health of the people, drainage, water supply, the organisation of the Poor-law medical service, the condition of army and navy medical officers—on all these, as they arise, the Government finds it an advantage to be able to hear from such a highly organised body what their views are, and the medical men find it of great advantage to express, by organised means, to Ministers, to departments, or to Parliament what they think about questions affecting the public welfare. These duties are largely carried out by the Parliamentary Bills Committee, of which I have had the honour for many years to be Chairman, on which every Branch of the Association is represented by one member, so that this Central Committee is always in touch with the local Branches, and, on the other hand, the local Branches are all represented on the Parliamentary Bills Committee. It only remains for me to say that we shall be happy to afford any information or assistance to you if you should at any time think of adopting an organisation of the sort—of course, with such modifications as may be suited to the genius and customs of your nation. We shall be glad to send copies of the BRITISH MEDICAL JOURNAL to your libraries, and otherwise to do that which will show our brotherly feelings towards the faculty in Japan.

A word or two now of a much younger institution, in which I learn that you are much interested, and which has also proved itself to be most useful to medical men. It had long been felt that it was exceedingly desirable that some means should be provided to enable medical men—whose very living depends upon their good health, and whose means of livelihood often cease if their health fails—to provide against sudden calamities of sickness or accident. The merchant or official has in times of illness the income of his business or of his office still going on, even if temporary disablement should overtake him. When the doctor himself falls ill, however, his income often, and sometimes permanently, ceases. In that respect he resembles the artisan or the barrister; he lives by the daily work of his brain just as the artisan lives by the daily work of his hands. How then to provide something which should put the doctor at ease in his mind when times of sickness suddenly overtake him without his having been able to put by money adequate to provide for them? That is a difficult problem, which has more than once engaged the attention of thoughtful men; and which it has always been found very difficult to solve on account of the complexity and costliness of the machinery necessary to control the demands on such a fund, and to carry it out in a thoroughly trustworthy and reliable way on a sound financial basis. An effort of this sort was made in England some years ago and failed by reason of its difficulty. But a few years ago, when the subject was again raised by some of our medical men, it seemed to me that the extensive organisation of the British Medical Association and the wide circulation of the journal which I edit, and our knowledge thus obtained of each other would enable me to make that effort again on a better footing, and possibly with a more successful result. And so about seven years ago, after making the necessary preliminary inquiries and after getting some actuarial bases of the expectation of life of the average medi-

cal man so as to obtain accurate tables, we had a meeting at Liverpool, at which we resolved to found a society for providing an adequate weekly payment to medical men disabled by sickness or by accident, and with some provision for permanent disablement. I will not give you the figures, which would weary you, but I will tell you briefly the result. We based the whole structure upon this: that the society must be absolutely mutual, that is to say, that there should be no aiming at any other profit than the profit to the subscribing medical men themselves; that there should be no shares, no capital, no interest to be paid except to the medical men themselves. We therefore decided that we would not commence until we had a sufficient number of subscribers to this new institution to ensure a sufficiently large average for stability—which our actuary fixed at two hundred medical men. By our general meeting and by making the whole facts and propositions known in the *BRITISH MEDICAL JOURNAL*, we were able to commence with that number. That was little more than six years ago. The whole basis of payment was accurately calculated by the proper authority, whom we call an actuary, and tables were prepared showing what annual sum needed to be paid by each of the 200 medical men, in order to enable every one of them to have a claim for the payment, according to their subscription, of either £2 or £4 weekly when disabled by sickness. The payment varied, therefore, according as they desired to receive £2 or £4, and it varied, of course, according to the age at which a subscriber entered, and, therefore, according to the expectation of sickness. To give you an idea of the kind of payments necessary, I may say that for the higher sum of £4 a week a man, aged 30, would pay about £10 a year. If his illness lasted for six months he would be entitled to the £4 a week for the whole six months; if it went on for more than six months and permanently disabled him—if it were a case such as we often have of a permanently disabling illness or an accident, he would be entitled after the first six months to half that amount—£2 a week for the rest of his life. We have already had three such permanent claimants on the fund in the course of the first six years, who joined in perfect health, and they have been receiving and will receive that sum for the rest of their lives. We find that an average of, I think, 10 per cent., of the members are disabled by sickness or accident each year. Medical men were found to be exceptionally liable to accident. The sick members receive their payments every week on receipt of a certificate from the medical men attending them, showing that they are disabled by illness from attending to their practice, but in no case is any payment made except upon such certificate, which must be renewed every week. Every man who desires to retire after having been a member for twelve months can do so with the approval of the committee, and on doing so receives nearly 75 per cent. of the money which he has paid in, 25 per cent. being forfeited by his retirement, and representing the risk incurred and insured against while a member. The same payment entitles every man, whether sick or well, to a pension of £50 a year from the time of his attaining the age of 65, and by a slight addition to the annual payments his family become entitled to a sum of £200 at his death. That institution has been found to be so useful, that at the end of six years we have over 1,000 members. The result of the actuarial inquiry at the end of the first five years has been to show that we have made a profit, that is to say, the receipts have been in excess of the requirements to the amount of £3,000, which was put in reserve to diminish the future payments of members. We have accumulated to meet future demands £40,000, which is invested, the property of the members, and every year the sphere of usefulness of the Society improves and the number of its members increases.

I think my brief account of that Society may perhaps be suggestive and useful to my colleagues here in Japan. Of course all our tables, and regulations, and calculations, and other documents are entirely at your service, if at any time in the future they may be useful to you. In conclusion, gentlemen, I thank you very sincerely for the kind attention you have given to me.

It is stated that the Austro-Hungarian Government intends to appoint lady doctors to the hospitals for Mohammedan women in the occupied provinces of Bosnia and Herzegovina.

REPORTS TO THE SCIENTIFIC GRANTS COMMITTEE OF THE BRITISH MEDICAL ASSOCIATION.

REPORT ON THE PROTEIDS OF MILK.

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THE following experiments were made with cow's milk, and it will be convenient to describe them under the headings of the various proteids which have been described as existing in milk.

I.—CASEIN.

Most writers appear to use this word indiscriminately for the principal proteid in the milk itself, and for the curd which is the result of the action of rennet on milk. It appears important that the two substances should be distinguished by different names; and I would suggest that the proteid pre-existent in milk should be called caseinogen, and the less soluble curd formed by rennet, casein. These two terms convey to the mind the relationship of the two substances to one another, and are moreover framed on the same pattern as the names of other substances, like fibrinogen and fibrin, myosinogen and myosin, which bear similar relationships one to the other. In each of these three cases we have a soluble proteid (-ogen), the precursor of a less soluble one, and the change is in all three instances the result of the action of a ferment.

Casein is obtainable by one process only, namely, by the action of rennet on caseinogen in the presence of certain calcium salts (Hammarssten). Caseinogen, on the other hand, can be obtained from milk by two methods; it can be precipitated either by saturating the milk with neutral salts, like magnesium sulphate or sodium chloride, or by adding a certain amount of acid, preferably acetic acid, to the milk. I have found that by a combination of these two methods, it is possible to obtain very easily a preparation of caseinogen which is perfectly free both from fat and from calcium salts.

Milk is saturated by shaking it vigorously with excess of finely powdered magnesium sulphate crystals; the precipitated caseinogen is on standing carried to the surface of the mixture by the entangled fat globules, and is then collected on a filter. It is washed with a saturated solution of magnesium sulphate, until the washings give no evidence of the presence of albumin. Distilled water is then added to the residue on the filter; the caseinogen, in virtue of the magnesium sulphate still adherent to it, dissolves, and the solution of caseinogen which passes through the filter is collected; the fat is left undissolved on the filter. The solution of caseinogen so obtained is then again saturated with magnesium sulphate and the process repeated. The solution that is obtained in this way does not however clot with rennet, on account of the large amount of salt present, which exercises an inhibitory influence on this as on many other ferment actions. The process of dialysis to get rid of the salt is a very lengthy one, and the following will be found better. Excess of acetic acid is added to the solution; the precipitate of caseinogen so formed is collected, washed with dilute acetic acid, and lastly with distilled water; it is then dissolved in a weak alkali, preferably lime water, and once more precipitated by acetic acid, washed, and redissolved as before. The solution so obtained is an opalescent one, and on the addition of rennet no coagulation occurs; the addition of a few drops of 0.5 per cent. phosphoric acid, however, leads to the formation of the necessary amount of calcium phosphate, and the subsequent addition of rennet produces a firm curd, which soon, especially at 40° C., contracts, squeezing out a clear whey.

Another question, which appears to me to be important to settle, is the place that caseinogen and casein should occupy in the classification of proteids.