

THE ANALYST.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

THE monthly meeting of the Society was held on Wednesday evening, November 7, in the Chemical Society's Rooms, Burlington House. The President, Mr. B. J. Bevan, occupied the chair.

The minutes of the previous meeting were read and confirmed,

Certificates of proposal for election to membership in favour of the following candidates were read for the first time : Mr. Henry William G, Annable, chemist to the Tungsten and Base Metals Co., Ltd., Queen's Boad, Battersea, S.W. ; Mr. Bernard Cracroft Aston, chief chemist to the New Zealand Department of Agriculture, Wellington, New Zealand ; Mr. James William Brisbane, A.I.G., assistant to Mr. Bayinond Boss, F.I.G., Public Analyst's Laboratory, Burnley ; Mr. Thomas Cockburn, 148, Woodstock Avenue, Shawlands, Glasgow, chief assistant to Mr. F. W. Harris, F.LC. ; Mr. Archibald Prideaux Davson, A, E.G. So. (London), 39, Blandford Square, N.W., assistant to Mr. B. Bodmer, 3?.LC, ; Mr. David Agnew Griffith, "The Houghlands," Kelsall, Chester, chemist to the Biver Plate Fresh Meat Co. ; and Mr. Vincent Herbert Kirkharo, B.Sc. (London), A.I.G., agricultural analyst in the County Technical Laboratories, Chelrnsford.

Messrs. W. Dickson and G-. W. Monier- Williams were elected members of the Society.

A paper on " The Analyst and the Medical Man " was read by Dr, F. Gowland Hopkins, M.A., M.B., D.Sc., F.B.S,



THE ANALYST AND THE MEDICAL MAN.

BY F. GOWLAND HOPKINS, M.A., M.B., D.Sc., F.R.S.

(Head at the Meeting, November 7, 1906.)

IN venturing to address you this evening, I am deeply impressed with the sense that the excuse for my intrusion is a small one. Seldom, I imagine, has this learned Society welcomed a visitor less obviously entitled to occupy its time, So fully do I realize this that I must ask you at the outset to listen, to a few words of explanation, tho personal aspects oi: which you will kindly excuse.

My appearance here primarily takes origin from the circumstance that I am, at the moment, Examiner in Pharmacology and Therapeutics at the Institute of

Chemistry, happy in occupying the position of such distinguished predecessors as Sir Thomas Stevenson and Dr. Arthur Luff.

Now it is an open secret that the officials of the Institute, and the great majority of professional chemists interested in its examinations, were far from welcoming the imposition of this particular test. It was prescribed by an all-powerful Government Department, and accepted by the Institute as a pill is swallowed by a disbelieving patient. Convinced of the utility of the examination, but believing that some modifications in its details had become desirable, I was allowed to approach the Council of the Institute with some suggestions towards such modifications; and though I did not dare ask for all I should have liked, and though my eloquence was not equal to obtaining quite all that I did ask for, yet it was felt by my good friend the honoured Registrar of the Institute that the views I ventured to lay before the Council might perhaps interest a wider audience, and, at his suggestion, your president and your senior secretary, Mr. Chapman, offered me, on your behalf, the indulgence of a hearing. The flattery of this invitation committed me to the effort of addressing you. But consideration made it evident that anything I might have to say about the examination referred to could not be made to occupy your time with advantage for more than a few minutes, and I felt I must expand this narrow text into something wider, which should more or less naturally arise from it. I came to the conclusion that the only real qualifications I had for coming before you were those possessed by an individual who, having been trained for your own profession, and having acquired some knowledge of its aims and claims, sought later a training in the profession of medicine, and so gained similar knowledge with regard to it. I am, of course, very far from standing alone in this experience; but, unlike many who, with the same doubled training, have practised one or other of these professions with distinction, and, still more unlike those who have contrived to practise both, it has been my fate never at any time to practise either. Even so my case is doubtless not unique, but if anything worth saying can be said about the relations of these two professions, the circumstances, at any rate, give me a claim to speak without prejudice. With no other endowment than what I have indicated, I venture, for lack of other text, to say a few words on the relations, present and future, between the analyst and the medical man.

There is no need, I think, to repeat the indisputable statement that the doctor and the analyst share between them—not forgetting the work of the sanitary engineer—almost the entire burden of the maintenance of public health. It would be but repeating the obvious, moreover, to say that these two professions, having such common aims, should possess full sympathy and mutual understanding. But although we may believe that the sympathy is always present, yet the understanding is not quite always complete, and the lack of it has, now and again—we rejoice to know, not often—led to some friction at points of contact. When such small differences arise it must be admitted that the medical profession has this great advantage over yours—that its claims and its merits are so much more easily understood by the general public. This, should a need for judgment arise, somewhat unfairly strengthens the hands of the one disputant. It must, unfortunately, be recognised that, even now, after all the years during which the Public Analyst has served the community,

the layman has a most imperfect knowledge of what his work entails. The services of the engineer are understood, those of the doctor are appreciated, but the skill expended in the analytical laboratory is understood and appreciated but little. This, to you, is again a commonplace ; but I believe I am justified in adding to it the really regrettable statement that even the average medical man is not greatly different from the man in the street in this respect. He has at one time known a little chemistry, but he possesses no standard to measure what is required of the skilled analyst. It should be understood that I speak of average cases only.

I am going to take the risk of making a bold generalisation here which I must justify afterwards. I believe that, of those professional men who in any sense apply science to practical affairs, the average doctor is among the least scientific, while the professional chemist is among the most scientific. I hope I am not making this statement gratuitously, and I am certainly not urging the contrast to ingratiate myself here, or to cast a slur upon the medical profession. There are many in the latter who are using high scientific knowledge, and applying it in the most difficult of all regions, the treatment of disease ; but nowadays the medical man, with a real scientific bent, tends to cleave off from the profession, as a pathologist or physiologist. It is even the fashion, once more, for distinguished medical teachers to urge upon their students that the art rather than the science of their calling is the important thing ; - and we must all, indeed, recognise that in practical medicine, skilled and wise empiricism, based upon experience, is a much better endowment than ill-digested science. The progress of medicine depends upon science, but its practice does not demand scientific interests, properly so called, on the part of the practitioner. You must not, I think, expect that your work will be understood, or fully appreciated, by the doctor merely because he has passed through the medical curriculum,

But, you will be inclined to say here, the predilections of the doctor as a clinician are of small importance to the analyst, save when the latter as one of the general public is sick and under his hands. The analyst, in the exercise of his own profession, has little to do with the practising doctor; it is with the specialized medical officer of health that his duties bring him more or less into direct contact. This is true, and though it will prove the chief burden of my paper to urge that in the future the professional chemist and the clinician will be in closer contact, the present attitude of the Medical Officer of Health towards the Public Analyst claims first attention.

There is no doubt that in the great majority of cases these two coequal and independent officers of a sanitary authority work together harmoniously, but there have been, in the past, sufficient instances of misunderstanding to make it justifiable to take one's courage in hand and say a word about them, though on such a subject it is difficult, perhaps, to do more than give vent to *obiter dicta*, with the risk of being misunderstood,

The Medical Officer of Health is a man whose education has been wide and various, and who has submitted himself to tests of efficiency which are without doubt rigorous. But although, among many other things, he has been taught more chemistry than the less specialized members of his profession, I venture to think that even he does not—at any rate, at the outset of his career—possess enough chemistry

to appraise the high claims of the skilled analyst or to gain the full respect for the latter which comes with knowledge. He does not always recognise, as he should, that the consulting chemist and the analyst belong to a profession in which education is as prolonged, and in which personal ability and skill are as essential, as in his own, I feel that this lack of knowledge on the side of the medical officer is certainly one of the causes leading to misunderstanding. The Public Analyst on his side should not, of course, forget that the Medical Officer of Health is a man of multifarious and responsible duties, whose accomplishments are not to be measured by his knowledge or ignorance of special laboratory problems; he must demand only that these laboratory problems be viewed with a due sense of proportion.

Now we all know that one bone of contention has been the matter of water analyses, which either officer concerned may legally carry out. I believe this is really a somewhat small bone, not really important to the nutrition of either combatant, but it has given rise to some growls. I have in my time taught water analysis to medical students in an official public health course, and if you ask me whether the average man, having finished such a course, and having weathered the examination at the end of it, is equal in practice to examining and reporting *upon* a series of drinking waters, I must certainly answer, No ! The real value of such practical work as he does in class is in enabling him the better to appreciate the significance of analytical data when they come before him- If he subsequently argues to himself, " I have been to the trouble and expense of learning water analysis, and I am stamped by the examiner as efficient : why should my knowledge not add to my guineas?" then, so arguing, he shows himself a man without sense of proportion.

But, remember, there are individual Medical Officers of Health who, owing to special tastes and opportunities, do try subsequently to make themselves efficient in this connection, and it is going much beyond the facts to assert that an intelligent man pre-eminently in touch with practical problems, having carried out routine analyses of a score or so of water samples, is not in a position to claim accuracy for his work so far as it is of this routine kind. You would, if I mistake not, accept the data obtained by your own junior assistants after similar experience.

But the existence of these exceptional cases is beside the mark. To the normal medical officer, even if he be possessed of some skill as a chemist, the chemical laboratory and its pursuits are but an accident, He can enter it only seldom, and if he come into it with a sample in hand it is usually to find standard solutions which time and accident have made unreliable, and apparatus untested for weeks or months. Nine times out of ten, therefore, the analytical effort is a trying one, and if the medical officer spend the time necessary for accuracy in a laboratory which is not strictly a going concern, the enterprise is to him unprofitable. He should realize how much simpler it all is to the professional analyst in constant practice, No one, I venture to assert, has seen more of these things than I have, and I certainly believe that the medical officer who does not refer all the water analyses which might come his way to his chemical colleague is a person neglecting other, and to him more profitable, opportunities.

But into the controversy about water analyses there came some years ago a,

certain *tu quoque* argument, and to the disinterested outsider the position was even a little amusing. The examination of water is only partially complete without a bacteriological study ; and though it must be admitted that our power to dogmatize about the details of contamination has not yet been aided by bacteriology to the extent that was hoped for, yet it is certain that the water expert must be, on special and limited lines at any rate, a bacteriological expert. But in bacteriological study the medical man for the most part preceded the analyst, and " Hands off ! " at first seemed to him as legitimate an expression when uttered on his side of the boundary as when used on the other,

The technique of bacteriology on its cultural and merely diagnostic side is much simpler, more limited, and more empirical than that of analytical chemistry; but the former subject, like the latter, requires something more than a formal knowledge of technique. It is the development of certain special instincts, only given by long contact with the problems, which converts the amateur into the expert, The ordinary training of the medical officer or of the analyst gives in neither case this endowment us regards bacteriology. There is, however, I believe, this fundamental difference between the intrusion of the Public Analyst into bacteriology and that of the medical officer into chemistry : the analyst is first, last, and always a laboratory man, while the medical man is not. The six years of laboratory life which must elapse before the professional chemist is looked upon as fully qualified make the attempt upon new laboratory ventures an easier task for him. This confinement to the laboratory is, on the other hand, the cause of some distinct disadvantages to the analyst. The four walls of his workshop hide him from the gaze of the public ; he triumphs over difficulties in secret, and without appreciation. But he should at least reap the advantage of a recognition, from those who know, of the fact that his constant practical experience at the laboratory bench endows him with fundamental instincts for laboratory work in general, which the occasional visitor to the laboratory can only very exceptionally possess.

Some of you have doubtless been practical bacteriologists for as long a period as any pathologist can claim to have been, but the question is now rather as to how far the student who intends to practise chemistry in the future shall spend time and energy on the study of bacteriological technique. It seems to me highly desirable that a certain proportion among chemical students should be encouraged to take an interest in the subject, because of the enormous amount of purely chemical work to be done in connection with it, and because of its growing importance in subjects quite other than medical ones, These are the students for whom Branch J3 of the Institute's final examination, with its admirable syllabus, is intended.

But as regards the future activity of those who become officers of public sanitary authorities, it is likely that specialization will increase and the bacteriological laboratory will become a unit. I think specialization will here become accentuated, because of the familiar difficulty due to the intrusion of the pathogenic organism. It is, of course, not possible to draw the line sharply between the study of: these and the non-pathogenic groups. The *B. coli communis* is an organism which must always concern the water specialist, and yet its case is one which bridges any gulf between, the pathogenic and the non-pathogenic. But to follow up the study of the pathogenic organisms fully

requires the use of animal experiments, with all their attendant difficulties. The rigour of the license system is likely to increase rather than diminish, and only specialists, working in a comparatively few licensed laboratories, will be able to do useful work. This will lead to the emergence of the bacteriologist as a specialized officer of all sanitary authorities, and since laboratory work is best grouped in accordance with the technique employed in it, rather than in relation to its immediate aims, the specialized laboratory is likely to attract all public bacteriological examinations to its domain. This is my view of the future, and though, for reasons already mentioned, I utterly disagree with Professor Hewlett, for example, when in a presidential address last year he declared that "the present tendency of Public Analysts"—assuming this exists—"to undertake any and every form of bacteriological work is fraught with the greatest danger . . .," yet I believe him to have been right in urging that the bacteriological specialist must emerge in the future. It is highly desirable that the knowledge possessed by any expert should extend beyond the limits of his daily task, and, in fact, that it should be as wide as the shortness of life permits ; but it is equally desirable that in the application of expert knowledge to the public service, specialization should go so far as Society and the State can afford.

If in the future the Public Analyst is to be reminded by other specialists that his business is chemistry, the medical officer will be treated on similar terms, and I have firm faith myself that an increase in the analyst's activities, on purely chemical lines, will leave him well content, as I hope in some sort to show later.

There are, it seems, some grounds of complaint against medical officers in other and, to my mind, more serious connections than those yet dealt with. It has occurred that the Medical Officer of Health of a district has acted as though he were the superior of the Public Analyst, in the sense of possessing a right to deal with the reports of the latter, publishing them as though they emanated from a mere departmental officer under his control. Such a distortion of fair conduct, or anything analogous to it, must be and remain rare, and need not be discussed as though it pertained to the normal. It could arise only from the existence of a complete misunderstanding of the situation. I am sure that every reasonable medical officer of health, recognising that the analyst's appointment is a direct one and coequal with his own, would wholly repudiate such a course. In such a case it would be well to see that the facts came to the knowledge of the medical press, in which, I am sure, it would meet with right and effective comment.

Leaving for the moment any further reference to the difficulties which have arisen between doctor and analyst, let me now proceed to the more satisfactory task of indicating future developments which may tend to bring them together.

In pursuit of this side of my subject, I find that I may logically begin by referring to the Institute examination in pharmacology and therapeutics. "When this was first established by fiat of the Local Government Board, Sir Thomas Stevenson, the first examiner, very wisely established a standard which has since kept the range of the examination within certain narrow limits, The student has been expected to recognise by their naked-eye characteristics the various drugs of the British Pharmacopoeia, and to know roughly the practical uses of the more important drugs, and the doses, medicinal and fatal, of such drugs as are presumably toxic.

Such limitations were very necessary on the first establishment of the subject, and the present view of the Council, which, with certain modifications, should, I think, be respected by all wise examiners, is in favour of the careful avoidance of any demand for knowledge within the proper province of the medical student.

At the moment, however, things have arrived at this pass : Either as a result of the growth of coaching, or because of present organized facilities for handling pharmaceutical preparations, not a single candidate now fails to be well versed in the recognition of drugs. It is most rare to find a single individual who cannot, with the aid of various "tips" and *memoria technica*, recognise with unfailing accuracy every typical drug which he may be shown. His knowledge of doses is equally accurate, for he comes provided with a short list which has been got by heart the night before, and can be again consulted at the eleventh hour. Indeed, on the somewhat rare occasions when it becomes necessary to refer a candidate, it is almost always, in my experience, because of weakness in the associated subject of microscopy, in the practical technique of which I have been surprised to find a chemical candidate inferior to the medical student of similar standing.

Now, as examiner, I certainly did not wish for more opportunities of referring candidates, nor did I desire to increase the amount of work the student has to do. In asking for a somewhat more extended syllabus, I had several considerations in view which I should like to submit to you.

In the first place, I found the candidates come up for this examination with feelings of considerable discomfort. So far as the matter of previous papers set on the lines defined above can guide them, they succeed easily in making themselves letter perfect; but they feel that between the -boards of a text-book of pharmacology and therapeutics there are many things beyond these, and though they understand they are not to be treated as medical students, they yet feel uncertain as to what exactly may be sprung upon them, to their no small distress. In circumstances such as these a syllabus which seems to extend the subject may really limit the amount of reading to be done.

Next, it appeared to me that if a given subject is studied under compulsion, those parts of it which stimulate interest and are of educational value should certainly not be eliminated, and it seems to me that "spotting drugs" and learning doses by heart possess little of either of these qualities.

Again, there seemed to be aspects of pharmacology which really concern the professional chemist as much, if not more than, those hitherto emphasized, I have found, for instance, that candidates who can without hesitation distinguish between caraway and dill, or rattle off a list of doses, did not know that a man taking chloral hydrate excretes a product which, by reducing Fehling's solution, has led to confusion with glycosuria. Yet he might quite conceivably be face to face with the results of this phenomenon in his laboratory, and such matters, as well as many analogous ones, seemed to me to concern him even more than a knowledge of poisonous doses. Moreover, if the fatal dose of a poisonous drug is supposed to be known, there should certainly be the added knowledge of the influence of age, idiosyncrasy, and habituation as modifying such doses.

Questions as to whether a poisonous drug is rapidly eliminated, or whether it is

accumulated in the body, and whether, when it has to be looked for, it will be found unaltered or changed by the extraordinarily interesting processes for which the body may submit it, are of import to the professional chemist; for, though it is to be hoped that investigations concerning criminal toxicology may largely remain in the hands of specialists, yet the help of the professional chemist in ordinary practice may often be sought in non-criminal cases. His help may, indeed, become more important, and at the same time his task somewhat more difficult, with the growing use of complex organic drugs,

It further seemed to me, though I was not allowed by the Council to insert such matters in the syllabus, that a chemical student who is compelled to learn pharmacology at all might well have his attention called to the interesting relationships which exist between the chemical constitution of active substances and their effect upon the body. This knowledge, and the synthetic work based upon it, has certainly proved highly profitable to scientific chemists in Germany.

Such knowledge as is asked for in the present syllabus can be got from almost any reasonably complete text-book by selecting a few special sections. It is not its bulk, but its suggestiveness, that gives *it* importance.

Note that it has not hitherto been my purpose to discuss the wisdom of the actual institution of a professional examination in pharmacology and therapeutics; but, taking it as an accomplished fact, I have wished to point out that, without taxing the student's time overmuch, and without treating him in any sense as a medical student, he may with great advantage be asked to know something more than the dry bones of the subject,

But I believe further that, just as the establishment of Branch F (biological chemistry) came at an opportune moment, and will help to provide experts whose services will be of great value to the State in the immediate future, so the existence of a section in Branch B capable of giving some slight medical bias to the minds of even a few students will ultimately prove of no small service, both to themselves and to the medical profession. This is my firm faith, and this is why I have wished to see the examination deal with something more than the dead and unstimulating aspects of the subject. I will try to explain why I hold this faith in the value of a medical bias just now.

As many of you will have realized, there has been enormously accentuated progress in physiological chemistry during quite recent years. The new knowledge being gained is living stuff and of real practical importance. Now, progress in physiology rapidly reacts upon pathology, and pathology upon methods of diagnosis. Pathology is striking out some chemical paths of its own, but it has not yet felt the effect of the unloading of chemical facts which physiology is preparing for it. Sooner or later there will be activity on lines unknown to the physician, at present.

If we consider the question of urine analysis alone, it is easy to prognosticate that there will be added to the study of the few constituents which are now troubled about that of a great number of excretives, appearing in small amount, but of great importance as measures of departures from the normal metabolism. The practical urine analyst of the future will have to cover an extensive ground. Even now, with the physician only vaguely aware that the pathological chemistry of the past, which

was too ill developed a subject to be of much use to him, is giving way to something more real—even now there is some awakening to the importance of the laboratory. On the Continent, at any rate, and especially in France, elaborate and very numerous analytical studies are continuously made by professional analysts, from which characteristic curves are constructed, these being supposed to give important indications as to departures from normal health. Though many physicians in France attach much importance to these curves and attribute to them even a prognostic value, I believe myself that much of this work is only pseudo-scientific; it is a little premature and indiscriminating, but it is, at any rate, exceedingly profitable to the analyst, the patient—if not the physician—cheerfully paying satisfactory fees.

In this country the medical profession is, at any rate, beginning to think more seriously of the professional laboratory as an aid to its work. This is evidenced by the astonishing success of certain medical investigation associations run upon business lines. Only part of their work is chemical, however, and as the complexity of the chemical problems grows, the special difficulties of chemical technique will wend the work more and more into the hands of individual experts.

The average medical man, while not yet aware of all that chemistry can do for him, is also, for reasons already indicated, not yet clear as to whom he should turn to for help in those chemical problems which he has, even at the present time, in mind. I have read recent elaborate medical monographs, involving extraordinarily futile chemical investigations, in which the author, himself innocent of chemistry, acknowledges his obligations to the pharmacy which is adjacent to him. Now, it is no reflection upon an honourable calling to suggest that in such a case the doctor ought to have gone elsewhere. One can see that in these conjoint researches it was the good nature of the pharmacist, and no worse motive, which made him consent to the unprofitable partnership. But I believe it is not going too far to say that the rise of chemical pathology to its full importance will call almost for a new profession.

I wish very much to make a point here which, if it seems too remote at present from your practical interests, may be considered as in parentheses. The care of the body in sickness, with all the delicacies of human relationship which it involves, must remain always an entire and carefully guarded prerogative of the physician; but the innate respect of the public, and even of the non-medical scientific public, for the physician's calling has led to a somewhat illogical attitude, and has tended to make sacrosanct not only the calling of the physician, but the scientific material which he deals with. There has been, as it were, an averting of the gaze whenever a region of knowledge is stamped as "medical." Now, I am certain that the progress of Biontilic medicine demands a change here. "While a large part of future scientific medical studies must always be carried out by men who, though medically qualified, have preferred the laboratory to practice, and whose special qualification, therefore, is that they have had personal touch with the problems offered by disease, yet in a middle region these must be joined in their work by men whose primary qualifications are non-medical—men who, saved from the long years of clinical study, are able to bring well-grounded laboratory knowledge and (I may add) a sufficient knowledge of the literature of pathology, which is open to all, to join their medically qualified *confreres* in attacking the huge problems which await solution.

Many of these must be organic chemists, and, to make a distinction which I will urge again later, many of them must be also analysts. If it be felt that these are matters which concern those who aim at pure science, and not the professional chemist, it is yet certain that the amount of valuable analytical work to be done professionally and outside the research laboratory will greatly increase as a result of the tendencies indicated.

My own calling compels me to know well the present position of physiological and pathological chemistry, and I may claim to have had first-hand acquaintance with the large amount of paying work which is even now being done for the medical profession, though not by individual professional analysts. And though I may not stop to prove my point further, I yet reiterate my opinion that there will be in the near future an efficient source of income for many of the students in your laboratories if they are prepared to work on these lines.

While upon the business of prophecy, I am tempted to put another series of prognostications before you, the credibility of which is at the present time, perhaps, more obvious to the physiological chemist than to anybody else. I pass from pathology to an aspect of dietetics. This is a subject in which the medical man is the recognised authority, charged with instruction of the public, but for a scientific knowledge of which he depends largely on the chemical physiologist and the analyst.

Putting on one side the aspect of affairs which especially concerns this Society—the maintenance of purity and freedom from adulteration—and leaving out questions such as digestibility and the like, the chief practical points which have hitherto been considered in relation to the daily rations of mankind are the total energy value requisite for maintenance, the optimum ratio of fats and carbohydrates, and the optimum supply of pi*ofcein. Now, these questions have recently received fresh attention, and experimental work has been done lately yielding, as you know, somewhat startling results, tending at first sight to modify our views concerning maximal, minimal, and optimum dietaries, But I am not going to discuss the work of Atwater or Chittenden, proposing rather to put before you very briefly facts of another sort, less known and seemingly academic. I believe, however, that my theme, which is that of the influence of minimal qualitative variations in dietaries, will one day become recognised as of great practical importance.

Physiological chemistry, chiefly owing to the work of Emil Fischer, has recently gained the knowledge that individual proteins, and among them those which contribute to human dietaries, may each bear a special chemical stamp; that a given protein may differ so widely from another protein as to have, quite possibly a different nutritive value. I will illustrate this, first of all, by a somewhat extreme case, A protein, zein, forming no inconsiderable proportion of the total nitrogenous constituents of maize, is entirely deficient in at least one characteristic molecular grouping. It yields on digestion no tryptophane, the product which represents the indol group present in the molecule of most typical proteins.

In mentioning tryptophane, I cannot deny myself a moment's harmless gibe at your expense. The well-known colour reaction which you have used for so many years as a test for formaldehyde in milk is really a reaction due to this indol group

of the casein. Now, as it was a similar colour reaction which led some of us at Cambridge to separate the tryptophane of protein for the first time, I have felt that some of you, being authorities on food-stuffs, ought with proper enterprise to have anticipated us in this not unimportant discovery.

Recently we have fed animals with this indol-free maize protein in such a way that it formed the only supply of protein, though associated with abundant fat and carbohydrate and suitable salts. The diet wholly failed to maintain tissue growth in young animals, which, however, grew at once when their zein was replaced by pure casein. When tryptophane was added to the zein diet, there was still inability to maintain tissue growth, doubtless because the zein has other deficiencies as a protein. But now an interesting fact came to light. The animals which received the missing indol derivative in addition to the zein did not grow, in fact, continued to lose weight daily, and were afterwards in much better health than, and long outlived, those which had the zein alone. These experiments seem to show two important facts : First, that in an extreme case a particular protein may wholly fail to support life, just as is the case with gelatin; and next, that a group in the protein molecule may serve some purpose in the body other than that of forming tissue or supplying energy. The usual discussions about food-stuffs attribute to them these two functions only—repair of the tissues and energy supply. But the body has other and more subtle needs equally urgent, Here, there, or elsewhere in the organs must appear special, indispensable, active substances which the tissues can only make from special precursors in the diet.

The indol grouping in the protein molecule serves some such special purpose, quite distinct from its necessary function in tissue repair. This matter of qualitative differences in proteins may be of no small significance in dietaries. It may account for what I believe is proved by experience—that rice may serve the races which rely upon it as an almost exclusive source of protein, while wheat is only suitable for races that take a much more varied dietary. It may explain many variations in nutritive values which at present we feel and recognise only vaguely. In the future the analyst will be asked to do more than determine the total protein of a food-stuff; he must essay the more difficult task of a discriminative analysis.

But, further, no animal can live upon a mixture of pure protein, fat, and carbohydrate, and even when the necessary inorganic material is carefully supplied the animal still cannot flourish. The animal body is adjusted to live either upon plant tissues or the tissues of other animals, and these contain countless substances other than the proteins, carbohydrates, and fats.

Physiological evolution, I believe, has made some of these well-nigh as essential as are the basal constituents of diet. Lecithin, for instance, has been repeatedly shown to have a marked influence upon nutrition, and this just happens to be something already familiar, and a substance that happens to have been tried. The field is almost unexplored ; only is it certain that there are many minor factors in all diets of which the body takes account.

In diseases such as rickets, and particularly in scurvy, we have had for long years knowledge of a dietetic factor; but though we know how to benefit these conditions empirically, the real errors in the diet are to this day quite obscure. They

are, however, certainly of the kind which comprises these minimal qualitative factors that I am considering.

Scurvy and rickets are conditions so severe that they force themselves upon our attention ; but many other nutritive errors affect the health of individuals to a degree most important to themselves, and some of them depend upon unsuspected dietetic factors.

I can do no more than hint at these matters, but I can assert that later developments of the science of dietetics will deal with factors highly complex and at present unknown.

But am I at present justified in troubling you, as practical men, with such matters—you who are interested in professional chemistry, and not in what is still more or less academic physiology ?

I have been led to do so from two considerations, First, it is abundantly clear that the foundation of future progress in chemical pathology and dietetics on the lines I have been indicating calls for large efforts in purely analytical chemistry—efforts which have been too long delayed. And the delay has arisen from a circumstance of no small interest and importance.

The scientific chemist—unlike his predecessors, the pioneers of sixty or seventy years ago—has long ceased to be much interested in the animal or the plant. Further, the triumph of synthetic work in advancing theory has led the pure chemist away from the especial difficulties of analytical work. His extraordinary developed technique concerns itself only secondarily and imperfectly with analytical studies of the kind still necessary in physiological problems. I mean the endeavours to identify and separate unknown substances, with unknown properties, present in complex mixtures. Only now and again has he made special efforts in this direction, such as that with which Fischer started his work upon proteins. Such work really requires special instincts, and the pure chemist has largely lost them. He is but a poor analyst, as the physiological explorer finds on turning to him for help, I feel that this help, so far as the immediate future is concerned, will have to come from the pupils primarily trained in your own laboratories, where the analytical instinct is developed, Some of your students, it is to be hoped, will have their attention turned in this direction, and to at least a few there may ultimately come opportunities for research; for research, in all callings, even that of the academic teacher, is only to be snatched from leisure. There are the beginnings just now of a renewed interest in biology on the part of all chemists. May the analyst feel this too, It is not only—the manufacturer and the sanitary authority that require his help.

In the second place, I am not afraid to assert that progress in dietetics, no less than in chemical pathology, is about to react largely on professional chemical practice. Fresh problems and new ideas will unfailingly extend the field of professional operations.

All progress of the kind I have been hinting are cannot fail to be of the greatest importance to the doctor; and if I may seem to leave maligned him in previous paragraphs, I know well how ready and able he is to make use of all knowledge that he believes to yield advantage to his patients.

I see abundant reasons for believing that in the near future events will march to the consummation of mutual appreciation and helpfulness, and to the disappearance of all misunderstanding, in the relations between analyst and medical man,

DISCUSSION.

At the invitation of the President, the discussion was opened by

Dr. BUCHANAN, of the Local Government Board, who endorsed the remarks of Dr. Hopkins as to the advantages which might be derived from a closer association of the analyst with the medical consultant and the medical practitioner. Dr. Hopkins also saw, as probably they all did, many opportunities for a greater use of the chemist in matters relating to the public health. He might make a few observations on this matter, although it was not, perhaps, the part of the paper on which Dr. Hopkins would wish to lay greatest stress. Some of the considerations to which reference had been made—the lack of appreciation of the work of Public Analysts under present circumstances, the isolation of the analyst as a "laboratory man," and especially the limited use that was at present made of chemistry in relation to public health questions—were, it should be remembered, arguments that were used in support of the suggestion that was very frequently made in the larger municipalities, and was coming more and more to the front, for the appointment of whole-time municipal chemists and analysts. Those authorities said that they would like to put their chemical service on the same footing as other expert services, and to have a chemical officer on the spot, who would not only do formal work under the Sale of Food and Drugs Acts, but would undertake research work and other chemical work for the municipality, and would be able to advise and confer with the executive officers as to the collection of samples, interpretation of analytical results, and so forth. It must be recognised that in some aspects there were advantages in this solution of the question. He was far from saying that it was the right one, even for the larger cities and boroughs, but he thought that one of the legitimate reasons for this proposal was that under such an arrangement better use might be made of chemistry in relation to public health. Assuming, however, that the Public Analyst continued, as now, to occupy a position which in many ways stood apart from that of other municipal expert officers, the question arose, How could his work best be utilized and developed in the interests of the public health? The obvious answer seemed to be, By full and cordial co-operation between the analyst and the medical officer of health who was on the spot. Dr. Hopkins had said that medical men of scientific bent were wont to specialize—in physiology, pathology, and so forth. There was another thing in which they specialised, namely, public health administration, and where the analyst had the opportunity of working with a trained officer of that kind it was of the utmost benefit to both that their mutual relations should be as cordial as possible, and that they should help one another. If he might find just a little fault with this most admirable paper, it was that it seemed to him in the first part to go a little out of the way, not to emphasise the necessity for such co-operation, but to draw attention to small and admittedly trivial points of divergence and difference between Medical Officers of Health and Public Analysts. With regard, for instance, to water analyses, he ventured to say (speaking for the

moment of those not holding combined appointments) that no Medical Officer of Health undertook water analysis willingly. He would much rather leave it to the Public Analyst. But in many cases the position was forced upon him by the local authority, and this was not a grievance against the Medical Officer of Health, but against the local authority. Occasional differences and even stupidities did, of course, occur, as he himself knew, from both sides. For example, there was the Medical Officer of Health who said to himself—say in reference to samples of canned meat—" I will give the Public Analyst no information at all," and straightway stripped the tins of all their labels and sent them to the Public Analyst under mere numbers : whereas, of course, the whole point was to get information and get the views of the Public Analyst, and to let him have every possible help and information. On the other hand, there was the analyst who said, " I am not going to supply the medical officer with any information, or to tell him what my results are for individual milk samples, and, in fact, am not going to send him any reports at all, because it is not laid down in the Sale of Food and Drugs Acts/' Just now, when the assistance which chemistry was able to afford in regard to public health was becoming more and more apparent, and when the medical officer and the Public Analyst were coming more into contact, these points of friction occasionally arose, but he thought they were much more trivial than to the people immediately concerned they sometimes appeared. He thought that Dr. Hopkins quite realized that they were exceptions, and, although they received a good deal of attention momentarily, he did hope that too much stress would not be laid upon them. He believed that Medical Officers of Health and Public Analysts, as a whole, were fully alive to the necessity for " give and take," and that they would not allow friction to arise which would hinder the work which they did for their mutual benefit and that of 'the 'public. He was very glad to have had the opportunity of hearing Dr. Hopkins' observations on the probable development of the work of the analytical chemist in the investigation of proteid food constituents. The paper had in many ways given them a great deal to think about.

Professor R. T. HEWLETT (King's College, London) said that on the whole he was in cordial agreement with Dr. Hopkins' remarks, and any criticism of them that he would have been disposed to make had been admirably put by Dr. Buchanan. With regard to his recent presidential address, which had been referred to, he did not think that Dr. Hopkins' quotation was altogether fair, because the remarks quoted were very much qualified by what followed them. The view which he took was that the analyst was not in a position to deal with pathological problems. It seemed to him that many chemists had no biological training at all, and most had certainly no training in pathology ; and when problems of disease had to be dealt with, as was the case in many of the examinations that had to be made to-day, he thought it distinctly dangerous to the public health that those examinations should be undertaken by anyone who could not view pathological problems in the light afforded by a medical training. He believed that the position had been partly thrust upon the analyst. One instance which he had in mind was that of a very important city which insisted that its recently appointed Public Analyst should undertake examinations for diphtheria, typhoid, tubercle, etc. To his mind, that was wrong. It seemed to him

that in an ideal sanitary administration each department should have its analyst—*i.e.*, that there should be both a chemical analyst and a bacteriological analyst, and for the latter a medical training would probably be desirable. The work of the analysts, with that of the sanitary engineering staff, would be co-ordinated by the Medical Officer of Health. With regard to the examinations of the Institute of Chemistry, there was just one addition that he should like to see made to the excellent syllabus of the examination in biological chemistry. As matters stood at present, candidates could enter for the examination without previous biological training. Such training was essential to the proper taking up of work of that kind, and he thought that the Institute would be well advised to insist upon it,

Mr. HEHNER, said that analysts owed gratitude to Dr. Hopkins for having pointed out directions for research and means by which their professional knowledge could be more useful to physiologists and their medical colleagues. It was singular that, as far as he knew, not a single University chair had been established for the teaching of analytical chemistry in this country; and as one who had always insisted that the analytical chemist, in order to take his proper place amongst chemists, must be a highly-cultured scientific man, he deplored the fact that at the Universities no specific notice had been taken of the claims of analytical chemistry as a science. He thought that the cases referred to by Dr. Hewlett, in which analysts were forced by ignorant local authorities to undertake pathological work, must be very rare; and that if the medical profession, which was generally well represented on local authorities, were so minded, they could easily prevent such undesirable appointments. Analysts did not want to do work outside their function, but if it were forced on them they would in some cases submit, just as Medical Officers of Health had sometimes, perforce, to undertake chemical analytical work against their inclination. The time when every local authority of sufficient magnitude would have a chemical officer as well as a medical officer was beyond doubt approaching. Although its advent might damage some members of the analytical profession as at present constituted, the damage would be insignificant compared with the resulting public benefit. The analyst had a claim to be recognised as an independent officer of public authorities, working, whenever the subject demanded, in conjunction with the medical department, but dealing in a great number of cases with chemical problems quite foreign to medical or public health matters. He (Mr. Hehner) had always been most anxious that the analytical profession should maintain as many points of contact as possible with their medical friends and colleagues, but that under no circumstances should a chemist be considered as an officer working under the Medical Officer of Health, and that in an age which owed at least as much to chemistry as to medicine the chemist was entitled to have the recognition of his independent position. The sooner combined medical and analytical practices were things of the past the better. Only on one point was he inclined to differ from Dr. Hopkins. "While it was quite true that the ignorant public had still a great deal to learn about the useful services which the analytical profession could render, and that many people, instead of going to the chemist direct, still referred questions to the medical man, on which he at best could have but second-hand information, the fact, nevertheless, remained that, in the

twenty years during which the profession of chemistry had existed in this country, enormous strides had been made. The position of the chemist at the present time, compared with that before the foundation of the Institute of Chemistry, was incomparably better. The extent to which practising chemists had multiplied, and the fact that they were, as a whole, at least as prosperous as the average medical practitioner, afforded proof of the progress made.

Professor BOSTOCK HILL said that he happened to be a county Medical Officer of Health and a Professor of Hygiene, but he had also been a Public Analyst for over thirty years, and therefore felt that he might perhaps look at this matter from points of view that were not open to some others of the members of the Society. He should like to say how much he appreciated practically all that Dr. Hopkins had said. He thought that if any jealousy existed between the medical man and the analyst it was largely due to two factors: Firstly, the special work of the Public Analyst was largely an inheritance of work that had originally been done—what little of it was done—by members of the medical profession. One could not forget that in the early days much of the work that formed the basis of the modern Public Analyst's work was done by medical men, of whom Hassall, Letheby, and many others, might be mentioned as notable examples. Another factor was, to use Mr. Hehner's words, the profound ignorance, not only of the public, but also of medical men, as to the duties of the analyst, and sometimes, he believed, ignorance on the part of the analyst as to the functions of the medical man. The public had been accustomed to look upon the medical man as almost the symbol of scientific work, and on that account expected him to do things quite outside his province. The Medical Officer of Health, who could be taken as the type of medical man chiefly concerned in this discussion, might be said to be in a state of transition—to be undergoing evolution. When Medical Officers of Health were first appointed their work had practically to be developed by themselves. Now their work was on a fairly firm basis, and was developing on many lines. The same might be said in the case of the Public Analyst, He (the speaker) did not think that there should be the least jealousy between the two. If any had arisen, it was largely through their want of appreciation of each other's work. If the Medical Officer of Health sometimes assumed an attitude of apparent superiority towards the Public Analyst, it was not altogether surprising, when it was remembered that at the present day, whether rightly or not, the Public Analyst was practically a worker in the department of the Medical Officer of Health as far as public health work was concerned. Therefore in deciding, for instance, what samples should be taken, it was only natural under present circumstances that, in the case of a large authority, the Medical Officer of Health should have control, without, of course, in any way interfering as regards the results or conclusions of the chemical work, As one in touch with medical teaching, he felt convinced that, while the Public Analyst might do certain bacteriological work with advantage to himself and to the public, yet any entry of his into work of a pathological kind would be resented by the medical profession, and would not lead to any good. Attempts were certainly made in this direction; and he knew at the present time a Public Analyst who, willy-nilly, had to do all kinds of pathological work that might be sent to him from a very wide area. It was not easy for the analyst to refuse, and such cases could probably only be met by a strong professional

feeling that work appertaining to those sciences comprised in the medical man's work should be kept, at all events, in the medical branch of the profession. He had had some experience of examinations in pharmacology, etc., and he thought that, in the case of the Institute examination in its present form, a man might, given a fair amount of daily time, learn all that was required for the therapeutical part in three or four weeks. That a man should be labelled as having a knowledge of therapeutics after so short a period of necessary work was, he thought, not at all of value to the profession of chemistry.

Mr. F. J. LLOYD said that he ventured to think that it was quite as difficult for the Medical Officer of Health as for the Public Analyst to undertake pathological bacteriological work, and his own view was that in the future such work ought not to be put upon the shoulders of either, but ought all to go to specialists. There was, however, a large quantity of non-pathological bacteriological work that could be done by either the one or the other ; and he agreed with Dr. Hopkins that the man who was always in the laboratory was better able to undertake that work than one who must necessarily leave his laboratory very frequently, and perhaps for long periods. He thought, therefore, that in the education of the analyst non-pathological bacteriology should be given a prominent place, Dr. Hopkins had made some interesting and valuable suggestions as to the need for investigation in certain directions. He (Mr. Lloyd) would like to mention one instance showing how difficult such investigation was. There was abundant evidence that the disease known as " Barlow's disease " resulted from the feeding of children upon boiled milk, and entirely disappeared on reverting to the consumption of fresh milk. Now, the analytical differences between boiled and unboiled milk were very slight indeed, and their investigation would probably require some years of very careful work at great pecuniary expense. Could any analyst dependent for his income on his analytical practice be expected to give the necessary time and money to such a research? He thought not, and therefore agreed with Mr. Hehner that it could not be hoped that such recondite subjects would be fully investigated until the Universities were able to appoint professors charged with the duty of investigating, and of training others to investigate, analytical problems which were far beyond the ordinary routine work of the profession,

Dr. VOELCKER said, that he was hardly in agreement with Dr. Buchanan in thinking that the points touched upon in the first part of the paper were perhaps somewhat trivial. These were the points which really came into prominence when the relations between the medical man and the analyst were discussed, and for a considerable time they had been a cause of agitation. The remedy for them, and for the harm caused by the continual search after cheapness, must, as had been pointed out, be looked for in the better education of the public. In this connection it would be wrong not to take the opportunity of acknowledging the work of the Institute of Chemistry in emphasizing the need for keeping separate these two classes of work, and for urging that the claims of both should be fairly represented. The Institute, urged on by its energetic Registrar (whose presence they were glad to have at that meeting), had been steadily insisting on the importance of this matter, and had made repeated representations on it to the Local Government Board. The tendency was

for a man to rise to what was expected of him, and to try as best he could to do what the public or the local authority thought he ought to be able to do. The result, however, was often unsatisfactory. It might be pointed out that the Institute's examination in branch " E " was framed in accordance with the desire of the Local Government Board. It would, however, be wrong for anybody to take advantage of having passed that examination and say that he was therefore qualified to take up bacteriological and similar work. The chemist could not afford to ignore the help that was to be obtained from bacteriological study, but it was quite another thing to pose as an authority on the subject; at the same time, it was true that the chemist, from his constant work in the laboratory, had better opportunities of learning bacteriological methods and applying them than the medical man had of picking up the details of chemical analysis.

Mr. FAIBLEY remarked that, while the analytical profession was undoubtedly indebted to the work of medical men in the past, it was equally true that much help had been given to medical science by chemists. Pasteur was a conspicuous instance, and there were many others. With regard to the "clinical research associations" which had been referred to, he thought that the very success of these institutions, where the reports of the work done by various professional men were sent out merely signed by a secretary, must tend to deter young chemists from giving attention to problems of pathological chemistry.

Mr. G. T. KINGZETT said that, although neither a Public Analyst nor a Medical Officer of Health, he had devoted a good deal of attention to public health questions ; and he felt very strongly that all chemical matters should be referred to the chemical officer, and that the medical officer should no more encroach upon the domain of the chemist than the latter should encroach upon the domain of the medical officer. He thought that a good deal of confusion arose in this matter from a misuse of terms. It was most regrettable that the Public Analyst should be so called ; he ought to be styled the Chemical Officer. The subject of chemistry was so wide, and covered such a large range of knowledge, that to call a man a Public Analyst did not adequately describe the position which he ought to occupy in relation to public health. Dr. Hopkins seemed to consider that the acquaintance of medical students with bacteriological work must be more intimate and thorough than that of the chemist. He (Mr. Kingzett) did not think that that was at all the case. He thought that the chemist who followed bacteriological work was much more likely to have an adequate knowledge of it than the ordinary medical student or practitioner. The difference between the effects produced by so-called pathogenic and by non-pathogenic organisms - was all a matter of chemistry, and the chemical knowledge which the medical man obtained from his ordinary course of instruction was absolutely inadequate to enable him to draw any sound conclusions in this branch of work. The work of the medical officer should, if possible, be restricted to matters pertaining to the outbreak and prevention of the spread of disease; and if there must be an officer in a position of control, he should be an " Officer of Health "—not necessarily medical, but at least an expert capable of assimilating the knowledge to be derived from both sources, and of presenting it in a proper and digested form to the municipal authority.

The PRESIDENT (Mr. Bevan) said that he was very glad that Dr. Hopkins had laid

so little stress upon the so-called antagonism between the Medical Officer of Health and the Public Analyst, which he thought was very much overrated. Certainly it had never occurred in his own work, and he thought that a good deal of it was due to petty jealousies that ought not to exist. Although not disposed to go so far as Dr. Hewlett, he agreed with Dr. Hewlett in thinking that Public Analysts had; no right to trench upon the province of bacteriology; but he did consider that they ought all to be acquainted with what might be called the more rudimentary methods of bacteriological examination. He was glad also that so little had been said about dual appointments. He was free to confess, and did so with a full sense of responsibility, that the ideal Public Analyst was a medical man with a great knowledge of chemistry. But men like Sir Thomas Stevenson were very rare, and in these days of specialization were likely to be rarer still, so that it was highly important that the two offices should now be kept distinct.

Dr. HOPKINS, in reply, said that he had felt considerable compunction in reading this paper before the Society, even after it had been written. He had a strong feeling that, while the first half was made up of platitudes and indiscretions, the second consisted of an academic lecture. Still, as regards the points first touched upon, it was, perhaps, difficult to utter other than platitudes, while he was bound to say that he did not wholly regret the second part, for, if anything gave him pleasure, it was to talk academically to practical men, He might have made too much of the points of difference between analysts and medical men, but he had been tempted to try and make a contrast between the present state of things and the Utopia which might exist Although he still did not agree with Dr. Hewlett, he owed him some apology for having concluded his quotation marks a little too soon. Dr. Hewlett had gone on to say that bacteriology in the hands of the Public Analyst would be a very dangerous thing " unless the chemist made himself a biologist or employed in the laboratory those who had had biological experience." That addition to the quotation perhaps made all the difference, but he still thought that there was not the least danger in trusting the Public Analyst with a pathogenic organism, for the reason that he believed a laboratory man to be a safe person. It was quite right, as Dr. Hill had said, to recognise what the medical profession had done in the past, but the time had long gone by when the medical man was the only scientific man available, The question of the Institute examination was, of course, one which he had very much at heart, and, with regard to the views thereon of Dr. Voelcker and Dr. Hill, he should rather like to know whether it was before or after his suggested alterations that they did not think much of it! With regard to the difficulties of entering into research to which Mr. Lloyd had referred, he had felt that the original work that was done in strictly analytical laboratories was, perhaps, in too few hands, The provision of chairs of analytical chemistry at the Universities was, he believed, at any rate as far as Cambridge was concerned, merely a question of money, But research in any event had to be stimulated, and he thought it important that students of analytical chemistry should be encouraged, as part of their advanced work, to make original investigations bearing upon, their special branch of applied science, One would wish that the Institute of Chemistry might ultimately see its way to making some sort of award for the encouragement of research.

THE ANALYST.

The PRESIDENT remarked that, under the research scheme initiated some time ago by the Society's Council, there had been sent to various Universities a great many problems, the investigation of which had been undertaken, under the guidance of their professors, by senior students. He then moved a vote of thanks to Dr. Hopkins, which was heartily carried.



Hopkins 1906

This text was scanned and changed to characters using an Optical Character Recognition program. The program may generate a few errors, but they have been corrected, although few may remain.

This file (version Aug 28, 2008):

http://www.ltdk.helsinki.fi/users/hemila/history/Hopkins_1906.pdf

Harri Hemilä

Department of Public Health

University of Helsinki, Helsinki, Finland

harri.hemila@helsinki.fi

Home: <http://www.ltdk.helsinki.fi/users/hemila>