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SURGICAL TEACHING IN AMERICA*

BY

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The following personal impressions are the result of a unique opportunity offered to me in October, 1946, of taking over a professorial chair in surgery at Harvard University for a period of three weeks. The chair was that of the late Elliott Cutler and his hospital the Peter Bent Brigham ("P.B.B.)."

The Medical Faculty of Harvard in some ways resembles that of the University of London in that teaching is carried out both at the Central Harvard Medical School, where the "first and second year" subjects of anatomy and physiology are taught (i.e., our premedical sciences are not in America included in the medical curriculum), and, for the purely clinical subjects, at a series of hospitals in Boston, of which the Massachusetts General, the City, and the Infants', together with the P.B.B., are the chief. At all these various hospitals professorial chairs have been established, as is the case with the London teaching hospitals, but a very noticeable point of difference is the much closer relation between the staffs of the various hospitals. It is the accepted custom, if not the duty, of the staff of any one of the group to attend various meetings at the others at certain intervals. I therefore, during my stay in Boston, had the invaluable opportunity of meeting the staffs of the other allied hospitals—of seeing their work, both clinical and operative, and of discussing educational problems with them.

At my own wish, while in Boston I lived in the hospital and thus got opportunities of meeting and talking to the resident staff and senior students which I otherwise could not have obtained. The P.B.B. is not a large hospital—some 350 beds only—but its staff, both resident and honorary, is out of all proportion according to our standards.

Staff Work at the "P.B.B."

Despite their numbers the accommodation and facilities provided for the staff would make the mouths of any English counterpart water profusely. With the exception of the professors, they are all part-time, but many of them have consulting-rooms in the hospital buildings and the use of hospital facilities, both clerical and clinical. The majority are subsidized either by the University or by the hospital itself for the non-private work done in the hospital. So far so good, but with the arrangement of staff work one

finds it more difficult to be in agreement. This is done by a system of "assignment," which means that each member of the staff is labelled with a specialty and all routine admissions are channelled to an assigned surgeon. Thus although each of these assigned surgeons is in fact a general surgeon he gets no routine admissions except in his specialty apart from (a) private patients and (b) emergencies, the majority of which latter class are in fact dealt with by the resident surgical officers. These assignments are additional to the accepted specialties such as orthopaedic, thoracic, neurological, and plastic surgery. As examples one may quote "colon and rectum," "oesophagus," "stomach," "thyroid," "septic hands," "hypertension," "pancreas," "peripheral vascular disease," and even "blood transfusion" and "peritoneoscopy."

Superspecialization

This scheme brings up the whole question of superspecialization, a trend which has become steadily and increasingly more obvious in America over the last twenty years. Logically one must admit that if the patient with the right disease gets into the hands of the right superspecialist he can reasonably expect something out of the ordinary in the way of special treatment, with correspondingly better relative results. But even in America this is still a large "if," and the successful achievement of it demands a very high degree of skill in sorting and initial diagnosis. Such skill can surely be acquired only by one whose training and experience have given him sufficient breadth of vision to view the whole surgical field in perspective—i.e., the exact antithesis of the superspecialist, who, while working more and more efficiently at the bottom of his groove, gets so deep into it that he ultimately has difficulty in seeing anything at all over the edges.

In a teaching school, where after all one is chiefly responsible for making doctors and only to a much smaller extent specialists, the tendency seems even more dangerous. Taken to its ultimate conclusion it would call for the training of a special teacher whose only duty would be the integration into a composite whole of the limited spheres of a series of small specialties. There is nothing to prevent a general surgeon having and developing a particular field of interest, but he must remain a practising general surgeon so long as he accepts responsibility for teaching students to be doctors, by which is implied persons capable of dealing with individual people, not individual diseases. Medicine is surely still a profession with a scientific basis. When it becomes a science with a professional basis, then there may be some justification for an assignment system of allocating work. Let us admit we are living in the age of specialization, but let us watch carefully, particularly as

* Extracts from a paper delivered to the Harveian Society (December, 1947) and the Northern Counties Medical Society (January, 1948).

teachers of students, lest what we gain on the swings our patients lose on the roundabouts.

The war, with its large number of young medical men in the various Services, led to an underlining of the values of specialization from both the prestige and the financial angles that was only natural under the circumstances. But it has led in these post-war years, with their large and increasing influx of prospective medical students and ultimately therefore doctors, to a warped perspective on the relative importance of general practice as compared with specialization. And this applies equally to both countries. It is exceptional among recently qualified applicants for resident appointments to find one in twenty who expresses the ultimate intention of being a doctor. And there is one other aspect of this question that merits consideration. As the numbers of medical students (and budding specialists) have rapidly risen the number of teachers has only very slowly followed suit, and thanks to the contingencies of the war years a considerable proportion of the new increment of teachers have had very little experience of teaching at all—far less the teaching of embryonic specialists. The teaching of specialists I consider to be one of the more important duties of the staff of a teaching hospital, but I feel that it is essential at this particular stage that those prospective specialists should be well and carefully chosen, that they should be limited in numbers at any one teaching institution, and that they should be meticulously and specifically trained to maintain a breadth of vision and a wide perspective even inside their chosen specialty. Only so can the profession remain a profession and yet not lag behind in service to its patients. The more far-thinking teachers in America are only too well aware of the problems raised by this tendency to over-specialization—and here, I feel, is at any rate one sphere in which British opinion and example can help.

The Resident Staff

To return to our hospital—a few words about the resident staff. This consists of a resident surgeon, a number of assistant resident surgeons, and the interns (or house-surgeons). Apart from these regular appointments there are in most American hospitals a variable number of so-called "Fellows," the number varying with the endowments of the hospital or university concerned. These Fellows, appointed annually with possible extensions, rank in seniority immediately under the resident surgeon, but do come into the direct line of administrative control. They are of the status of our registrars, and are attached to specific clinics, usually for specific research. In the P.B.B., for instance, there were four Fellows, one in charge of the Laboratory of Clinical Research (of which more anon), one attached to the surgeon-in-chief for clinical research, one (by a special bequest) attached to the Department of Urology, and one a Travelling Fellow. This last appointment surely has much to commend it and is one which we in this country might well emulate to a greater extent than is at present the case. The Travelling Fellow will have done approximately four years' postgraduate work as intern and assistant surgical officer, and he will return from his wanderings—wanderings which, guided by his chief and reasonably financed by his school or university, will last at least a year—qualified either to become a resident surgeon or a junior member of the full staff at his own or another hospital. In this connexion I was particularly impressed during my visit with the responsibility felt and accepted by the senior staff of a hospital in getting their senior residents in a suitable appointment.

The resident surgeon's appointment only rarely finds its counterpart in this country. In America it is often an indefinite appointment as regards length of service, though naturally its holder is a very eligible candidate for a staff appointment at his own or another hospital. He really has junior staff status without actually being on the staff, and he has very considerable responsibilities, both clinical and administrative. In the P.B.B. he was an approved "instructor" of the Harvard Medical School and was responsible

for the education not only of the clinical clerks but also of all the resident staff. He also gave surgical lectures to the nursing staff. He had charge of beds and arranged operating lists for the various visiting surgeons and acted as their locum in their absence; he either did or delegated all emergency surgery, and he saw all surgical discharges from the hospital.

The assistant resident surgeons correspond fairly closely to our registrars—but they are resident. Normally there are four, but, as in our hospitals at present, there were three extra ex-Service ones when I was at the P.B.B. The appointment is for 16 months and is divided into four periods of four months—the first spent as senior resident in the out-patient (or "outdoor") department and the private wards, while the holder is also responsible for the medical care of resident staff, nursing staff, and students; the second in a special department, both in-patient and out-patient; the third with the surgeon-in-chief, when he arranges clinical teaching of students; and the fourth in the general wards, when he becomes second-in-command to the resident surgeon, actually does student clinical teaching, and runs the follow-up department. During all these appointments he is responsible for case records, for keeping contact with general practitioners, and for pre- and post-operative orders, and he is the chief assistant at operations.

From this it will be gathered that the role of the intern (house-surgeon) is perhaps relatively less important than with us, but nevertheless his training is carefully graded and his responsibilities steadily expanded. His appointment is for 28 months—the first four at his own hospital, the next twelve at the Infants' Hospital, and the final year again at his own hospital. This training is aimed at teaching a young doctor surgical practice in contradistinction to the assistant surgical officer posts, which are essentially for those who intend to specialize in surgery.

The intern at first is but a glorified clinical clerk. He does the routine laboratory work of his wards and the dressings; he removes plasters and does transfusions, lumbar punctures, catheterizations, and takes instruments at operations. On his return from the Children's Hospital—this appointment being considered of great importance to the potential general practitioner—he returns to more senior status at his own hospital. Part of the final year is spent in the out-patient department, part with various special departments, and part in the wards. During this time he gives anaesthetics (usually under the supervision of a nurse-anaesthetist!), assists at operations, and does minor surgery, cystoscopies, etc. He supervises the clinical clerks' activities and the case records, interviews relatives daily, is responsible for the "dangerously ill" list and for post-mortem examinations, and assists the resident surgeon with emergency work. As will be seen, this provides a very exhaustive training, and it is at the end of this period that the resident goes either to general practice well versed in surgical principles and the technique of minor procedures, or to specialization in surgery well founded on its practical essentials. These are much more ambitious appointments than we make in this country, but for those that obtain them the training is excellent. One has to balance against this the fact that a hospital of similar size in this country would give (admittedly less thorough) resident teaching to probably twice the number of men, and it seems to me that while such a post is ideal for the potential surgeon it is perhaps a little elaborate for the future general practitioner.

Final-year Students

And so to the last group of "residents," the final (fourth)-year students, who act as clinical clerks. I am sure the fact that they are residing is of great importance and offers an

example we should strive to follow whenever circumstances permit. These students are by courtesy called "Doctor" in the wards for the patients' benefit, they are supplied with white coats—the real resident staff being attired by the hospital in full white uniforms—and it is impressed upon them that they act as subsidiary house officers and have a definite responsibility both to the patients and to the hospital. It is also laid down that, like any other member of the house staff, they have no stated hours for work. There are at least two of them on duty every Saturday, Sunday, and public holiday. They have free access to their particular wards at all times. Ordinarily they are assigned one case per day only, by the senior intern or assistant resident surgeon, and this case they "work up"—the result being duly corrected by their resident. They attend all examinations (clinical, radiological, biochemical, etc.) of their own patients *only*, and act as second assistant if these are operated upon. They do *not* attend operating sessions as a routine. Special stress was laid upon the linkage of clinical and laboratory findings (and upon operative and post-mortem results). They were taught to differentiate between "taking" a case and "presenting" a case—and they were specifically forbidden to have any contact with patients' relatives. One of their rules particularly caught my attention: "Clinical clerks should address all members of the staff, whether doctor or nurse, with proper regard for his or her status and duties;" and in my dealings with them I thought this rule was both intelligently and sympathetically interpreted, and raised some slightly uncomfortable feelings in my mind when I thought of our somewhat casual medical student of to-day. No institution can run really efficiently without a certain amount of discipline, but there is no reason why this should in any way mar an otherwise happy atmosphere. It may be old-fashioned, but I find myself rather longingly looking back to the days when a chief was a chief and his residents and dressers treated him with corresponding respect. Probably the fault lies as much with us as with the students, but it was a little startling to have better what I may call "ward manners" brought up to one's consciousness in an American hospital.

Of these young Americans I wrote at the time in my diary: "Keen, very theoretical, and a little stereotyped, politely argumentative but intelligent, receptive, and enthusiastic"—a description which I still think is reasonably fair.

The teaching of the final-year clinical student interested me enormously. There are no set lectures for him as such—and in fact in America there is no doubt the routine clinical lecture has passed out of the sphere of practical politics as a medium for clinical teaching. All his tuition is given either at the bedside or at special lecture-demonstrations. There is a clinical teaching round daily, the weekly programme being:—Monday, fractures and orthopaedics (alternate weeks); Tuesday, general surgery; Wednesday, special surgery (neurological, thoracic, E.N.T., plastic, and dental); Thursday, genito-urinary surgery; Friday, general surgery.

Under this last heading are included all those special assignments mentioned earlier in this paper. In this connexion it is worthy of note that the general surgical wards contain a complete mixture of cases—including gynaecological. This mixing of cases in the surgical wards is quite deliberate in many hospitals—to achieve (a) a wide experience for the student, and (b) an opportunity for the visiting staff to meet and mix. While nobody could deny these advantages, the drawbacks are equally obvious. Apart from these daily clinical rounds, the student follows the assistant resident surgeon on his daily "disposal round," when he sees and gives instructions to all hospital dis-

charges, and every Sunday morning the resident surgeon gives a brief clinical session.

Surgical Research Laboratory

At this point I should like to mention a facility possessed by every large teaching hospital in America, and woefully conspicuous by its absence in this country—the Surgical Research Laboratory. This has two prime functions—research and teaching. The laboratory is under the charge of a director (responsible to the surgeon-in-chief), who is often a Fellow of the hospital as previously described, and who usually has one or more qualified assistants working with him and an adequate number of skilled technicians. It is thanks to the existence of these laboratories (and the American's rather more rational view on vivisection) that so much more new experimental work appears to, and in fact does, come from American hospitals than from our own. The stimulating effect of such an institution in a teaching hospital is very definite. On the teaching side I found its activities equally advantageous. In a student's second year—i.e., Final Anatomy year—he attends the laboratory twice a week for two hours, and by demonstrations on dogs, by excellent enlarged photographs, by films, and by demonstration of instruments is taught the rudiments of operative surgery and the value of surgical anatomy. One should point out that in this year the student is also studying pathology—in fact, the American medical student's course, he having completed his pre-medical basic sciences before being enrolled as "Medical," consists of two years of anatomy, physiology, and pathology, and two years of clinical work. The first two years are done at the Central Harvard Medical School, the latter two at any one of the associated teaching hospitals. In his final (clinical) year the student again comes to the surgical research laboratory—and this time, for one session of three hours each week, himself performs on anaesthetized dogs simple surgical exposures and operations.

There was yet one more excellent link-up between clinical and preclinical years that I discovered at P.B.B. Once a fortnight the surgeon-in-chief of the hospital gives a lecture-demonstration—followed, if possible, by a demonstration operation—to the second-year anatomy students. Although this was held on a Saturday morning it was attended by more than 150 students, and appeared to be a most popular feature. As an example, the particular Saturday morning for which I was responsible involved a simple discussion of the applied anatomy of the biliary system followed by a demonstration of two cases of jaundice and one of palpable gall-bladder, followed by the easiest cholecystectomy it has ever been my fortune to do. This demonstration operation can be watched, by such students as wish to stay, from a glassed-in gallery through opera-glasses.

From the above description it will be seen that the clinical student's tuition is essentially personal, practical, and at the bedside—all three very important considerations. Any further tuition he derives from purely voluntary attendance at any of various so-called "Staff Conferences" that occur at regular intervals. Many of these are such excellent institutions—well worthy of emulation in our hospitals—that I intend to describe them in detail.

Staff Conferences

First the "Grand Rounds," one surgical and one medical weekly, which are in fact clinical demonstrations of interesting selected cases or groups of cases actually in the hospital. Such cases are carefully worked up by the resident staff, who present them with all available clinical, radiological, and pathological data as succinctly as possible, leaving the

member of the staff responsible for the case to add any remarks he thinks fit or to draw possible deductions. Thus in an hour or so one sees a wealth of varied clinical material, questions are welcomed, mistakes freely admitted, and constructive suggestions for diagnosis or treatment put forward. Such "grand rounds" are attended by all the visiting staff who can make themselves available, by visitors from other hospital staffs, from other centres and from abroad, and by the resident staff and senior students of the hospital concerned. They enable the whole staff to keep in touch with the activities of each individual section of it, and they are held in a delightfully friendly and stimulating atmosphere.

Which last remark can apply with even more force to the universal and popular meetings known as "Clinico-Pathological Conferences." These "C.P.C.s" have a wide appeal not only to the staff of the hospital concerned but also to those of associated hospitals, visitors, resident staff, and students. They were said to have been initiated by Richard Cabot, of the Massachusetts General Hospital, but are now routine weekly institutions in most of the bigger American hospitals—and, one is glad to say, an increasing number of British hospitals. Briefly, a case that has terminated fatally is chosen (usually by the resident surgeon and the pathologist) from the records, in which clinical and post-mortem data are well described. The former are worked up into a clinical story, which is typed out and circulated to all concerned anything up to a week before the actual C.P.C., to allow of time for such study of the case as these notes make possible. An "introducer" is selected, who may be a member of the staff of the hospital concerned, of another associated hospital, or a visitor, and he analyses the case before the assembled multitude, asking such questions from his colleagues as he thinks may help his deductions, and finally giving his provisional diagnosis. On this he himself can be interrogated by any member of the audience, after which the clinical students' and the residents' diagnoses are given. The pathologist then rises, demonstrates the post-mortem specimens, and shows sections of the morbid tissue—thereby, as ever, having the last word and providing the correct answer. These C.P.C.s are carried out in the most friendly spirit, mutual criticism is common, much valuable information is aired, and no greater success can attend the ultimate dénouement than for the "introducer" and most of his staff colleagues to be entirely wrong in their clinical diagnosis—particularly if the students' answer is correct!

Another weekly conference at the P.B.B. was the "X-ray Conference," when the radiologist produced a series of films to illustrate some particular morbid condition. These again lead to a free and open clinical discussion which is usually as instructive as it is stimulating. Once a week, too, the surgeon-in-chief and the pathologist combine in a "Surgical-Pathological Conference," in which specimens from current cases are discussed with their relevant clinical background and details of operative procedure and the necessary deductions drawn and morals pointed. Thus residents and students come to know of any interesting case which may have occurred on any firm in the hospital during the week. And twice a month a tea is held in the surgical research laboratory, after which a brief description is given of current research work—the subject then being thrown open to discussion.

Two other weekly staff conferences at the P.B.B. are worthy of note, though their clientele is limited. One is the Medico-Surgical Meeting, at which the staff discuss mutual problems of diagnosis and treatment, and the other the Surgical Staff Seminar, when the surgeon-in-chief meets his resident staff to talk over any problems, clinical or administrative, that may have arisen in the surgical service.

Salient Points of the American Method

Summarized briefly, the chief points that would seem to arise from the above description of clinical teaching in an American hospital are:

Advantages.—(i) A closer liaison between the individual members of the staff of any one hospital, and, if possible, between the staffs of groups of hospitals. The prospective regionalization of hospitals may well bring this conception more into the field of practical politics in this country. (ii) The closer link between clinical services on the one hand and pathological, radiological, physiological, and anatomical departments on the other. It is only fair to say that present indications suggest a very definite move in this direction here, but there is yet much scope for development. And much the same may be said of (iii) The preference for clinical demonstrations of various types in lieu of the routine systematic course of lectures. (iv) The institution of properly organized, staffed, and equipped research laboratories for the use both of undergraduates and of post-graduates. (v) The development of postgraduate instruction during the "resident" period involving a reorientation of ideas concerning the house-surgeon and R.S.O. One feels at the moment that here he is primarily and often essentially simply only a servant of the hospital and a useful adjunct to a firm. He is nevertheless, and in a particularly formative period, a potential specialist or at best all-round doctor, and deserves individual attention and tuition.

Disadvantages.—(i) Too much reliance on accessory methods of diagnosis, to the detriment of appreciating the value of simple clinical signs. (ii) As a corollary, the tendency to train the student to treat diseases rather than patients. (iii) The tendency to "spoon-feed" the student and even the immediate post-graduate, so that as a doctor able and willing to accept responsibility he matures relatively late. This lack of practical initiative in the medical student of to-day is by no means peculiar to America, but one feels that there it is the result of a definite system, here perhaps the result of the present and immediate post-war conditions of life.

If I have made it clear by these few words that I do most earnestly believe that there are lessons to be learnt on both sides to the benefit of each, and ultimately the profession as a whole, then I have not entirely failed in my task.

Reverting to more mundane affairs, may I mention one or two points in hospital life over there which particularly struck me. Like all other visitors one cannot help being impressed with the excellence of the clerical and record facilities. Personally, as visiting surgeon-in-chief I acquired the services of two secretaries, whose all-round efficiency was equalled only by their very delightful personalities.

And this was indicative of the service throughout the hospital—a service greatly assisted by the presence of a number of dictaphones in various key situations; for example, in the theatres and out-patient consulting-rooms. I was envious, too, of the surgical artist permanently attached to the hospital staff and of the easy facilities for photographing clinical and pathological material. In this connexion, incidentally, routine frozen sections are made of material removed at operation, and the report on them is delivered to the surgeon in the briefest possible time.

Of other amenities in the P.B.B. let me mention just two more: the "Brigham Shop," where both staff and patients can purchase on the spot the little necessities of life, as well as more expensive articles for the special occasion; and the "Cafeteria," where excellent meals are dispensed with minimum staff all day (and apparently all night), and where staff, residents, and students mix freely and on a delightfully friendly basis.

Surgical Experiences at the P.B.B.

Turning now to the more definitely surgical side of my experiences, perhaps a word or two at first of the operating

room (not theatre) may not be out of place. In American hospitals generally the bulk of the routine operating is done in the morning, and 8 a.m. is not considered an early start. At the P.B.B. only emergencies were done after lunch-time, except in very particular circumstances. All anaesthetics were given by nurses—or by residents and students under tuition from nurses; and let it be said that these nurses were using all modern methods (except spinal), and to my personal knowledge gave excellent service. Nevertheless one cannot help feeling that anaesthesia presents an interestingly obvious hiatus in American specialization. That determined efforts are being made to close this gap became very evident during the war while American forces were in this country, and there is no doubt that much of the stimulus for the movement came from the Americans' very definite appreciation—and even envy—of our anaesthetic service. Even so, anaesthesia and to a lesser extent plastic surgery remain in the States the two orphans of the specialist family.

One had no dearth of assistants while operating—an R.S.O. or an intern (or sometimes both), two students (one for retracting and the other for instruments), and a nurse responsible for swabs, packs, sutures, and drainage material, were always "washed" up. For washing up, liquid soap was supplied on tap, and the subsequent skin detergent was kept in elbow-deep containers. Operating towels in this particular hospital were a delicate shade of duck-egg blue and were used in profusion. In fact, I thought there was a tendency to obscure the actual site of operation with a plethora of towels and packs. A sucker and diathermy are routine preparation for every operation, and I was a little startled on my first night to see both used in the treatment of a simple subcutaneous abscess. One soon gets used to asking for "snaps" instead of artery forceps and "ties" for ligatures. Generally speaking, silk is being far more widely used than catgut as ligature and suture material. In this connexion my use of a continuous skin suture was looked upon as something quite unique. An interesting peculiarity of this hospital was the use of silver foil as an immediate dressing to the wound. All in all, theatre technique showed only differences in detail from methods in use in this country but it was in all respects meticulously accurate. The facilities and the service made actual operating a pleasure, even despite the absence of one's accustomed tools.

In conclusion may I say that this, my latest visit to America, has left me with two predominant feelings—first, very genuine gratitude to my hosts and colleagues in the States for allowing me to do so much, see so much, and hear so much under such delightful and stimulating conditions; and, secondly, the profound belief that all of us who have the good of the profession at heart should encourage in every possible—and preferably practical—way the development of exchange schemes between our two countries. There are many things to be both learnt and unlearned on either side of the Atlantic.

The governors of the National Corporation for the Care of Old People have appointed a Scottish committee to advise the National Corporation on its activities in Scotland and to make recommendations about grants for old people's homes and other welfare services in Scotland. In addition to the resources made available by the National Corporation it is hoped to attract funds from private gifts or legacies. All such moneys raised in Scotland will be devoted to the welfare of old people in Scotland. The members are Sir Hector Hetherington (chairman), Dr. A. Grieg Anderson, Dr. A. D. Briggs, Dr. R. W. Craig, Miss Grace Drysdale, Prof. Thomas Ferguson, Mr. H. L. F. Frazer. Mr. C. S. Gumley will act as hon. treasurer, and Miss E. V. Lowe has been appointed secretary. The offices will be at 2, St. Andrew Square, Edinburgh, 2. It is hoped to co-opt to the committee in their personal capacities two members from the Department of Health for Scotland and the Scottish Assistance Board.

THE PUBLIC HEALTH LABORATORY SERVICE*

ORIGIN AND DEVELOPMENT OF PUBLIC HEALTH LABORATORIES

BY

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The early work of the public health bacteriologists was carried out partly in special laboratories, such as that established privately in Howland Street by Burdon-Sanderson in 1870, the Brown Institution in the Wandsworth Road, founded the following year, and the British Institute of Preventive Medicine (now the Lister Institute), established in 1891; partly in university laboratories, such as Edgar Crookshank's laboratory in King's College, London, Percy Frankland's laboratory at Dundee, Delépine's laboratory at Owens College, Manchester, and later in laboratories at Durham, Leeds, Sheffield, Cambridge, and Bristol; partly in municipal and county laboratories, such as those that began to be established around 1900 at Liverpool, Cardiff, Wakefield, Derby, and Worcester; partly in laboratories housed in hospitals, such as Klein's laboratory at St. Bartholomew's; and partly in commercial laboratories that had sprung up for the purpose.

Since comparatively few local authorities considered it economically justifiable to establish laboratories of their own for carrying out public health work, an extensive postal system grew up by which specimens were sent to laboratories situated often at considerable distances from their origin. Birmingham University laboratory, for example, examined specimens from Southampton; the Lister Institute from Burton-on-Trent, Northampton, and Exeter; the Clinical Research Laboratory from the East Riding; and Thresh, Beale, and Suckling's laboratory from as far afield as Scotland. This development during the early part of the present century had a profoundly baneful effect. In the first place it brought to an end the close association that had existed from the start between bacteriology and epidemiology. It was clearly impossible for laboratory and field workers to collaborate under these conditions, with the result that both parties suffered unduly. Secondly, it degraded the status of the pathologist, whose business it became merely to turn out results demanded by the medical officer of health or other similar official, and led to the growth of what may be termed "shop pathology." In consequence technicians began to replace qualified pathologists, the work became stereotyped, the background of the laboratory investigations was neither realized nor studied, and research fell into abeyance. Thirdly, it introduced into medicine a regrettable atmosphere of commercialism. University laboratories encouraged the work of the routine laboratory because of the large sums that it provided, and voluntary hospitals took up public health bacteriology as a side-line in order to bolster up their exiguous finances.

Pre-war Position

Before the second world war the position was broadly as follows. Many universities, such as Manchester, Leeds, Birmingham, Sheffield, Durham, and Bristol, maintained routine laboratories for public health work. A few private pathologists had started dual-purpose laboratories which

*The second Milroy Lecture, delivered to the Royal College of Physicians of London on Feb. 12. Lecture I appeared in last week's issue.