E.—NERVE CASES.

Arsenobillon Argentum or Silver Salvarsan.

	Day of Treatment.	Gram Intravenously.	KI Grains.
1st course ...	1	0.15	—
	4	0.15	—
	8	0.15	—
	11	0.5	—
	18	0.20	—
	22	0.20	—
	25	0.20	—
	27	0.20	—
	32	0.25	—
	36	0.25	—
	39	0.25	—
	43	0.25	—
	44-50	—	v t.d.s.
	51-57	—	x t.d.s.
	58-64	—	xv t.d.s.
2nd course ...	85-148 Repeat 1-64. 149-203 Rest.		
3rd course ...	204-267 Repeat 1-64. 268-250 Rest.		
4th course ...	351-413 Repeat 1-64. 414-511 Rest.		
5th course ...	512-575 Repeat 1-64.		

influenced the course for the better and has certainly had a profound effect on the serum and fluid reactions. It shows also the extraordinary amount of arsenobenzol which some patients may receive without apparent ill effect.

This patient came under my care in June, 1921. He had then been in a private asylum for eight months, with typical signs of general paresis. The history of syphilis dated to about thirty years previously. He was grandiose, had slight tremor of tongue and lips, Argyll Robertson pupil, and slight Rombergism. The blood-serum reaction and the cerebro-spinal fluid reactions were strongly positive. The cerebro-spinal fluid contained 250 cells per cubic millimetre, and the globulin content was marked. He had recently received seven injections of "914," and this treatment had then been abandoned as no improvement had resulted. I was asked to do anything which offered the slightest hope of cure, regardless of risk. I stipulated that treatment should not be abandoned unless no improvement had followed at least twenty arsenobenzol injections. I decided to combine injections with spinal drainage. The treatment and progress were as follows:

From July 3rd to July 31st, 1921, I gave 1.5 gram silver salvarsan in seven intravenous, and 0.6 gram sulfarsenol in two intramuscular injections, and drew off 140 c.cm. of cerebro-spinal fluid by three punctures. The patient then refused all further treatment, and showed generally no improvement; if anything he seemed slightly worse than when treatment commenced. During August and September he improved sufficiently to cause his wife to press for his removal to his home, where the further treatment has been carried out. Treatment was resumed on October 1st, 1921, when he was fairly quiet, though delusional on certain matters, such as religion, and grandiose on money matters. The cerebro-spinal fluid gave a strongly positive Wassermann reaction, but the cells numbered only 6 per cubic millimetre.

From October 1st to November 26th, 1921, I gave him 3.2 grams of silver salvarsan in seven injections, ranging from 0.3 to 0.6 gram, and drew off 275 c.cm. cerebro-spinal fluid by seven punctures. Under this treatment he improved very considerably, shedding much of the general parietic mental outlook and behaviour. The Wassermann reaction of his spinal fluid became weaker, giving a reaction only in a dilution of 1 in 2.5 and higher concentrations, and the cells numbered 2 per cubic millimetre. Lange's gold test, however, gave a strongly marked parietic curve. Treatment was suspended from November 26th, 1921, to February 18th, 1922, and it was interesting to observe how he relapsed gradually during the last month of this interval, becoming more and more general parietic, until at last he was quite as bad as on his first return home. I decided to push the treatment far more intensively, and from February 18th to April 4th, 1922, I gave 8.55 grams silver salvarsan in ten injections, ranging from 0.6 to 1.25 gram, and drew off 220 c.cm. spinal fluid by six punctures. The injections were well tolerated, mainly, I think, because they were given in 7 per cent. glucose, and 2 oz. glucose were administered by the mouth one hour before each injection.

The clinical improvement under this treatment has been most marked, and he is now more nearly normal than he has been since he was certified as insane about a year ago. He can criticize a book as intelligently as before his illness commenced and write a sensible letter with no omissions. His balance, formerly very unsteady, is now firm and he walked fifteen miles a few weeks ago. His conversation is generally rational and his memory good, but he is still rather delusional on religion and Christian Science. The improvement in his house manners is particularly marked. He is normally very considerate for others, but in the relapse preceding the last course of treatment he became definitely coarser in his general behaviour; after the treatment was resumed his normal refinement of behaviour gradually returned. His fluid now contains 1.3 cells per cubic millimetre, gives only a partial Wassermann reaction

with one whole volume, and the gold-sol reaction is definitely weaker. The blood-serum reaction is now negative.

[*Note on Correction, June 11th, 1922.*—This patient is now normal in behaviour under all conditions, except in regard to the healing powers of Christian Science, in which he is definitely more optimistic than the average adherent of that faith.]

Of course, remissions occur in general paralysis of the insane without treatment, as everyone knows, but in this case it is difficult to attribute the second improvement, dating from the commencement of the last course and proceeding steadily to the end of it, to any other cause than the huge doses of silver salvarsan administered. The case is incomplete, but has proceeded far enough to show that colossal doses of silver salvarsan do affect adversely the deeply buried spirochaemes in general paresis, and that is my excuse for relating it at such a comparatively early stage.

THE PLACE OF OPHTHALMOLOGY IN THE UNDER-GRADUATE MEDICAL CURRICULUM.*

BY

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"In education, most time is to be bestowed on that which is of the greatest consequence in the ordinary course and occurrences of the life the young man is designed for."

LOCKE.

WHAT part of ophthalmology shall be taught in the undergraduate medical course? How much time shall be devoted to the subject? These are important questions; for in seeking to determine the place of ophthalmology in the undergraduate medical curriculum one is faced at the outset, not only with the problem of what to do with the specialties in general, but also with the whole problem of undergraduate medical teaching.

A great deal of time and thought has been advantageously devoted in recent years to the subject of post-graduate ophthalmic studies, but apparently very little by comparison has been given to undergraduate work. The reason probably is that the post-graduate studies present a circumscribed field that falls largely to teachers in the specialties for solution, while undergraduate studies in any one subject are but a single factor in a much larger problem, in which workers in all the branches of medicine are interested.

It seems a duty for ophthalmologists to take part in the widespread deliberations that are shaping the policies of all medical schools; especially so as some of the proposals that have been made in regard to the disposition of special studies are obviously founded upon a misconception of values and of the primary purpose of undergraduate medical education.

Before beginning the study of the problem we must set clearly before ourselves exactly what we wish to accomplish in undergraduate teaching. We still touch hands with those for whom it was possible in their college years to gain a fairly comprehensive grasp of the whole range of the medical knowledge of the time; but the phenomenal development of medicine during the last few decades has made this less and less attainable. Students are now forced to confine themselves to phases of the old major subjects, to subjects of recent development, and even, again, to ramifications of them. We have, in a word, witnessed an extraordinary development of specialization. The problem of undergraduate work is to-day, therefore, much more complex. Men aim not at one goal, but aspire to varied fields of endeavour.

As a starting point we must classify students in accordance with what they have in view. This is not a difficult matter, for quite simply our students fall into three groups: Those who are destined to be general practitioners; those who will be clinical specialists; and those who will specialize in research, teaching, and public health.

The specific business of the general practitioner is to treat sick individuals—in other words, to grapple with distinctive medical problems. Some of these problems are of little or no moment; others are of vital importance; and many of them are clearly beyond the scope of the general practitioner. It is obvious that in order to see clearly what are the requirements of the general practitioner in the way of instruction and training, we must set forth his problems and make some kind of classification in accordance with their relative values.

Clearly, the only standard of classification one can adopt

* Read before the American Ophthalmological Society, Washington, May 2nd, 1922.

in this field is the bearing problems have upon the preservation of life and of function. On this basis medical disorders can be instantly separated into those that menace life and those that do not. Disorders that do not menace life can be subdivided into disorders which threaten complete and permanent disablement and those which do not. The first subdivision (disorders which threaten complete and permanent disablement) includes two sets of conditions: those which call for immediate recognition and immediate and effective interference, and those which do not. The second subdivision (disorders that do not menace life) embraces three classes: those which involve temporary disability but tend always of themselves to recover; those which do not involve temporary disability but cause discomfort in varying degree and lower efficiency; and those falling in the field of congenital deformities and cosmetics.

Although this classification is not intended for more than a suggestion, it yet suffices to throw into relief the relative importance of the disorders by which the general practitioner may be faced. But the classification covers the whole range of the problems of medicine and surgery; and since no man can at this day hope to master the entire subject, it must be determined which part of it the general practitioner can reasonably be expected to manage.

It is evident that the foremost place must be accorded to those disorders that carry with them a menace to life—namely, haemorrhages, suffocations, serious fractures, strangulations, virulent infections, poisonings, and cancerous growths. Scarcely less important are the conditions that lead to complete and permanent disablement, that deprive a man of his active life in society. No one will question the assertion that this state is regarded by mankind as among the great tragedies of life. Under these two headings are what may be called the major problems of medical practice. These problems vary in their degree of urgency, but they demand of the practitioner a knowledge so complete that it will express itself in immediate and fully effective action. Delay and partial recognition mean death and disaster.

On the other hand, it is equally clear that in a field that cannot in any event be fully covered the disorders that do not threaten complete and permanent disablement are those which should receive least consideration. At their head stand those conditions which are either extremely rare or require for their management a training beyond the power of the student to acquire. These belong of necessity to the province of specialization. If we eliminate these, as we reasonably must, we reduce the problems of our second division to a group made up largely of what we may call the minor ailments—that is, disorders which are neither menacing, complex, nor rare, but assume a certain importance because of the frequency with which they occur. In this minor field, then, and in the major field of menacing disorders, lie the problems that fall with reason to the general practitioner.

The segregation of his problems in this way reveals the educational requirements of the general practitioner. A distinctive problem in the field of practice implies in a broad sense a distinctive scholastic task. We are able, through our classification of medical disorders on the basis of what is of most importance, to design an undergraduate curriculum in accordance with the principle of what is of most worth. This principle requires, on the one hand, that the range of problems as determined shall shape the studies underlying their comprehension, and, on the other, that the amount of time and attention given to the mastery of a problem shall be proportionate to its importance as fixed. Major problems must always take precedence over minor problems, to the extent of entire neglect of the latter, if time be limited.

What applies to the design of the curriculum as a whole applies to the individual studies. This answers the question as to what part of the subject shall be taught. The time devoted to a subject is to be determined in accordance with this decision. The place of a subject in the undergraduate medical curriculum—the place of ophthalmology, for example—will be proportionate to the number and character of the problems which fall to it from the whole number as determined. These conclusions lead us to see how illogical is the practice of devoting an equal amount of time to the specialties simply because they are so classified, instead of apportioning time on the basis of relative values. They also dispose of the proposal that the specialties as such should be entirely eliminated from the undergraduate curriculum, to the end that the whole time available may be devoted to the major subjects.

In illustration of what has been said let me indicate the

disorders that must shape the undergraduate course in ophthalmology for general practitioners.

Major Problems.

1. Disorders that menace life: intraocular tumours; malignant growths on and about the eye; wounds and injuries; orbital cellulitis and osteitis from extension or from metastasis. The student should have knowledge of, and be able to distinguish between, the various disorders of which exophthalmos or proptosis is the most striking sign.

2. Disorders that do not menace life but are signals of disorders that menace life: optic neuritis, or "choked disc"; the various types of systemic retinitis and choroiditis; paralyses of the intrinsic and extrinsic muscles of the eye; visual disturbances expressive of disease in the optic tract.

3. Disorders that threaten complete and permanent disablement and call for immediate recognition and immediate and effective interference: the purulent ophthalmias; trachoma; pterygium rarely; phlyctenular conjunctivitis; tuberculous and diphtherial conjunctivitis; ulcer of the cornea; interstitial keratitis; wounds and injuries and burns of the eye, including foreign bodies, or the field of industrial accidents; iridocyclitis; panophthalmitis; sympathetic ophthalmia; glaucoma; optic neuritis, of local origin, or axial; dacryocystitis; myopia.

Minor Problems.

Sties; chalazions; marginal blepharitis; chronic catarrhal conjunctivitis.

It will be noted that, apart from numerous other harmless and rare conditions, one excludes from this list almost the whole series of cataracts and congenital anomalies. Implied, too, is but a limited acquaintance with the subject of muscular anomalies, and the operative field is highly restricted. On the other hand, the work demands a fair mastery of refraction, ophthalmoscopy, and perimetry in the functional examination of the eye.

If we were dealing solely with the ophthalmic course the problem of how to present this work would not be difficult; but in undergraduate teaching we must view the matter from the standpoint, not of one but of all the subjects composing the undergraduate curriculum. Admitting that at the moment, and still more in the future as medicine develops, problems from the field of general practice must fall into the fields of specialization, when we come to include all that bear on general practice we are confronted by what is apparently a task of great magnitude. Nevertheless, this principle of what is of most worth leads us to conclude that at any given time the maximum feasible achievement in the field as outlined shall be the minimum requirement in the way of a curriculum for general practitioners.

Now professedly the colleges undertake to cover this field; but we know only too well how far they fall short of meeting the requirements—that there are annually graduated in large numbers men who are quite incapable of overtaking what should reasonably be expected of them in the field of general practice. I shall not now occupy time with an analysis of the causes of this lack of success. Mainly it has been due to failure in recognizing the diversity of aims that has arisen, to efforts that have been made to develop unduly the purely educational aspects of medical studies, as well as to the introduction of "cultural" subjects that are clearly outside the province of a medical curriculum. The consequence of this confusion of ideals has been to graduate men on the one hand with an inadequate knowledge of important problems and of the subject as a whole, and on the other hand with an unnecessary knowledge of minor problems and of things outside the practitioner's field. Because of the insuperable difficulties of the curriculum practical training has been neglected, facts have usurped the place of principles, and knowledge the place of education.

The consciousness of failure is a matter of concern and dissatisfaction to teacher and graduate alike; but behind the faculties and behind the practitioners is a third group whose interest in this matter has been apparently overlooked. In the end, medical education is a trust imposed on the schools and colleges of the country by the public, and one does not need to put one's ear close to the ground to learn that there is discontent with the manner in which practitioners are being trained to deal with the emergencies that arise in the community. From every point of view, therefore, the situation demands redress.

A curriculum designed in accordance with the decisions that have been reached offers a helpful measure for the solution of the difficulties. Taking the practitioner's problems as listed we shall develop courses of study that will cover as nearly as possible, not only the field as a whole, but what the student is expected to know of each individual problem. It is implied that at the beginning of each course the student

shall be given printed notes or a synopsis of the work to be done. Assistance may be had from the different departments; but in the end everything is to be carefully considered and brought into conformity with a prearranged plan. This work ought really to be entrusted to a small group of men, vested with considerable authority; and I suggest that it would be helpful for them to think of the problems, not as belonging to the various fields, but rather to medicine and surgery—to the mother subjects—as indeed they do.

Particularly important is the fact that under a unified direction it would be possible through co-ordination to eliminate completely the wasteful overlapping that now prevails, as well in the primary as in the final subjects. This process should be extended to its logical limit, through subject and problem to phase and element. It ought to be determined at the outset, in every instance, when and by whom a subject of this kind is to be taught. Students should be required to master a problem as defined, once and for all, and having mastered it, pass to something else. On completion the scholastic tasks would be distributed among the various subjects making up the curriculum. It really does not matter who does the teaching, though expediency would probably demand the services of experts in the special fields.

While what I have said applies particularly to the clinical subjects, which must be regarded as the basis for any arrangement of a curriculum, it also holds for the primary subjects; for the function of all primary teaching is to build concepts for the clinical work. The great fundamental principles will be taught as before; but with a classification of problems on the basis of what is of most worth, there will come to the primary teachers a scale of values that will be most helpful, as clearly indicating where emphasis should be laid in their work of preparation. It is not to be expected that all this could immediately be effected. Many difficulties can be foreseen. Adjustments and readjustments would be necessary; but eventually, with not one but many centres participating, there would develop a more or less standardized curriculum, which might be universally adopted.

But the adoption of a minimum medical curriculum implies certain specific obligations. One is, that the student must know everything of the subject as presented. It will not suffice that he recognize but two out of four essential problems, that he know but half of what is expected of him to learn of any one problem. This suggestion demands a very thorough system of examination, under which accurate and continuous records are kept of the work the student has done and the success with which he has done it.

A second and equally important obligation is, that if a specified task is set the student, the subject must be fully and systematically presented to him. With exceptions, of course, clinical instruction in medicine is still largely and generally of a haphazard character and based on chance. By this I mean that in many clinics cases are used for teaching as they appear, without any thought of fitting them into a well-defined curriculum. The practice is largely the outcome of a want of clear conception of the field to be covered. The result is that the students either do not see examples of disorders with which they should be familiar, or that the subject may be presented a quite unnecessary number of times. All clinical teaching should, from the outset, be brought into strict alignment with courses previously defined. This second obligation has also a very important bearing on the existence of a college; for no school is justified in carrying on clinical teaching if the community in which it is situated is not sufficiently large to furnish clinical material of the right kind in adequate amount.

But if, in its application, the principle of most worth brings a more circumscribed, yet equally comprehensive curriculum, it demands, on the other hand, a more thorough practical training. Granting that the most is made of the facilities afforded by the dissecting room, the *post-mortem* room, and operative courses on the cadaver—and it is not—we are bound to admit that attendance on hospital work as now generally practised does not produce satisfying results. Training to be effective must be much more intimate. There is daily evidence of the rapidity with which graduate internes are trained to deal competently with problems that are entirely beyond the scope of the man who leaves college immediately to enter practice. We must strive to secure for our students similar facilities in their undergraduate years. The hospitals at present engaged in teaching could with advantage to the work of the institutions add greatly to the number of internes; but when the limits are reached a great field of opportunity for practical instruction remains.

Arrangements with non-teaching hospitals in college centres, as well as with numerous hospitals in centres which do not support colleges, could undoubtedly be made to share in the practical instruction of students. This means the training of the staffs of these institutions, who would then take rank as extramural teachers. The value of this enlarged opportunity for training to the colleges and to the student is apparent; and the benefit that would accrue to the community, through the raising of the standard of practice in this way, is scarcely to be estimated. The hospitals of the entire country might advantageously be utilized for this purpose. The suggestion implies in a broad and more modern sense a return to the old system of apprenticeship. Just how this idea would work out could not be determined until the curriculum as a whole had been developed. The main difficulty would be in arranging a plan of rotation. The housing problem would only be a matter of subsidizing the institutions to enable them to erect the necessary residences. Maintenance, in any case, would fall on the shoulders of the students.

More seriously to be considered is the objection that the work as outlined would occupy more time than men could afford. There is no reason, however, why theoretical instruction could not be concomitantly and even more advantageously carried on during the period of residence. Then, too, the time necessary to cover the field would be less than would first appear. Careful work in medicine paves the way for accurate diagnostic work in surgery, and the general training in surgical technique and procedure goes a long way to make easy the difficulties of the specialties. The general principles and the technique cover the whole field. Moreover, when one has mastered the major problems the minor problems present no difficulties.

Speaking for ophthalmology, I am satisfied that, to a man who has had a year of active work in general surgery, one could give a satisfactory training in the course as outlined for general practitioners in approximately four months' whole-time work, the necessary instruction in refraction and in ophthalmoscopy included. The ophthalmic operations falling to the general practitioner in accordance with the decisions formulated are few in number, including as they do only enucleation of the eye, exenteration of the orbit, drainage of the orbit, opening of lacrymal abscesses, sties, and Meibomian cysts, removal of foreign bodies from the cornea, cauterization of the cornea, and iridectomy for the relief of glaucoma and for incarcerated iris. The last mentioned is the only one that presents any difficulties, but these could be largely overcome by practice on dead animals' eyes.

But before estimating what, if any, additional period is necessary for practical training, note should be taken of the saving of time that can be effected in various ways for this purpose by the utilization of time that is still largely wasted in attendance on operative clinics, the details of which are entirely indiscernible; by the ruthless exclusion of everything that is obsolete and trivial and irrelevant; but most of all by a rearrangement of the present curriculum as I have suggested, as well as by the introduction of more effective methods of teaching and study that grow out of this work. In the last analysis the argument calls for a matriculation standard that shall be no more than adequate if time demands consideration.

A few final words about undergraduate optional courses and specialization are now required. Under the plan as outlined the scope of the curriculum would be much more sharply defined; and it ought to be possible, in a measure at least, to grade students and to permit the more brilliant among them to proceed to advanced work in optional courses after satisfying the faculties that they had mastered the information of a minimum curriculum.

But specialization in undergraduate years is unthinkable. The interdependence of the various systems of the body being so well established a fact, it is clearly impossible that a man could intelligently practise in any special field without a knowledge of medicine and surgery as a whole. The only guarantee against narrowness of view, the bane of specialization, is a broad theoretical training. On the other hand, a general surgical training is the corrective for meticulous and careless methods in the special operative field.

Finally, from the point of view of public necessity—and that must always be the last court of appeal—it is not to be tolerated that men trained in limited fields of medicine shall be given the right to practise the art as a whole; for there is no guarantee that men so trained will always succeed, or that later they may not wish to establish themselves as general practitioners. The only conclusion is that men must qualify fully as physicians and surgeons before becoming specialists.