SCIENCE

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PRINCIPLES OF CURRICULUM MAKING[1]

THE favorite indoor sport of medical educators is curriculum making. As a game it ranks with jig-sawed pictures and "pigs in clover." It is not yet entirely clear whether this game should be played according to Hoyle or Marquis of Queensbury rules. The scores are published in our annual bulletins. Unfortunately no clear method of recording results has been devised. It is therefore hard to make comparisons, and no national champion has ever been declared. An expert can usually figure out the championship for any particular school. But the results would be much clearer if printed in some such form as this:

Professor Smith, Champion.... 964 hours.
Professor Jones, Runner-up... 807 hours.
Professor Brown, Booby prize. 24 hours.

It is evident that this game has interesting possibilities. Its serious discussion on this occasion may not be without value. Several of the schools of this Association have recently revised their curricula. Others are engaged just now in this work. These efforts are made necessary by a variety of conditions. In general it may be stated that dissatisfaction with the educational results obtained with existing courses of study is the principal cause of the desire for change. Furthermore, the new conditions brought about by increased entrance requirements make a readjustment of teaching desirable and perhaps imperative.

We Americans approach such a problem

[1] Presidential address at the meeting of the Association of American Medical Colleges, February 25, 1914.

with characteristic thoroughness. We are constitution makers by right of heredity. Our mechanical genius asserts itself. Our instinct is for standardization. We cut all our cogs to the same bevel. A rigid alignment of moving parts is insisted on. We are fond of link-belt machinery. We take advantage of gravity for feeding and screening. The machine runs well. The only trouble is that we forget the insignificant detail that we are making men instead of grinding corn.

A curriculum, gentlemen of the Association, is an important matter. Not so important as good individual teaching, it is true. Not so important, perhaps, as proper material equipment. Not so important as high ideals and a cooperative spirit among teachers. Nevertheless, curriculum making is a serious business. Are there no principles which may guide us in such an undertaking?

FORMER METHODS

The simplest way to form a curriculum is to have each professor state how much time he wants. This is doubtless the way the curriculum was made which every one was laughing at a few years ago and which required 230 hours of electro-therapeutics. The principle involved was "All cards have the same value. Every hand is a winner."

This method reaches its limit when the added demands of all the instructors make a larger sum of hours than the students can endure. As soon as this happened the usual procedure in the past was to place an arbitrary limit on total time requirements. Then each professor began to fight for as large a share of this time as he was able to obtain. This was probably the way in which a certain curriculum was produced containing 1,300 hours of anatomy. The principle was "Jack-high and a pistol take the pot."

These simple methods and elemental principles may have been adequate in ruder, simpler conditions. The best time-getter was often the best teacher. At least he was a strong personality. No standards existed. No state boards had formulated embarrassing exactions. The student considered one school as good as another; or, most likely, he believed the particular school he was attending to be the only good school. He was concerned with a certain square of parchment to be obtained after so many years and for the payment of so many dollars. He was not expected to think and succeeded in meeting all expectations.

THE FREE ELECTIVE SYSTEM

The opposite of these primitive methods of curriculum-making is the free elective plan. This has never been tried out in medical education. But Harvard College had a long experience with a program in which very little restriction was placed upon the students' choice of teachers and subjects. Many western universities gave equal or greater liberty to their students. It could almost be said that there was no curriculum. The principle was "American plan hotel. Everything on the table. You pay your money, and you take your choice."

The results were excellent for serious students of good judgment. But many men are not serious, and not all serious men have good judgment. A goodly proportion of men were found to be selecting their courses so as to fit in well with midnight suppers and late breakfasts and afternoon teas, or with more questionable employments. The snap course was the college man's blessing. Men were graduated whose education was an imitation veneer on a pasteboard background. As a

consequence all the colleges, I believe, have had to limit the freedom of election in a marked degree. The group system by which the student is compelled to do a considerable part of his work in one department or group of allied departments has been widely adopted. The principle is "A thorough training in a definite direction."

Of course the curriculum of a professional school is a group curriculum by the nature of things. The question is whether it shall be fixed and inflexible or variable and elastic.

GENERAL PURPOSES

Now it is evident that if we are to make any serious effort to find guidance in our own experiments in curriculum-building, we should begin by determining as well as possible what we are trying to do. It is easy to say that our first business is to make doctors—to make good doctors. But a "good doctor" is hard to know and harder still to define. I have discussed this matter before[2] and will only recapitulate my conclusions here.

A good doctor is a keen observer. We must train the powers of observation in our students. We may say that there is a technique of observing, and that we must teach this technique.

A good doctor is a trained experimenter. That is, he combines control of conditions with observation. We must train our students in experimental methods in the laboratory and at the bedside. This is technical training.

A good doctor is a skilled technician also in another and narrower sense of the word. He knows how to do certain things connected with the practise of his profession, things requiring accuracy of hand, ear and eye. He has attained a skilful adjustment of certain senso-motor reactions not provided by nor required in the ordinary experiences of life, but essential in medical practise. Such adjustment is attained only by repetition under direction; that is, by development of habit. We must train our students in the technique of their profession.

A good doctor is a man of judgment. He must be able to draw correct conclusions from observations and experiments. He must be able to synthetize isolated elemental facts into a unified compound. We express this idea when we say he must be able to think. And here is the greatest stumbling block. No one has discovered a royal road to thought. It almost seems as if it is in a man or it isn't. And yet thinking is really a kind of technique. It consists in making valuable associations. If you have on hand the proper thought-stuff and can make the right combinations of it —why, you think. Given a particular sensory stimulus, the resulting impulses presumably go bounding from part to part of the cerebral cortex instead of coming out immediately to the muscles. How these impulses travel depends on how the cerebrum is constructed and which paths have been made easy. Thought in this sense is involuntary response; it is reflex, it is habit.

A large part of our teaching is devoted to giving students what we consider valuable thought-stuff—facts, we call it. We also give them numerous examples of thinking—ready-made combinations of facts, or so-called conclusions. This is well. It ought to help them in the same way that seeing a blacksmith forge out a tool should help one to make that tool, or in the same way that seeing a surgical operation should help the student to do it. But when it comes to making new thoughts, the only

[2] *American Medical Association Bulletin*, January 15, 1911; also "Medical Research and Education," Science Press (1913), p. 375.

way is by practise and repetition and habit. We can help another man's thinking chiefly in the same way that we can help his drawing or his chemical analysis or his physical examination, by stimulating his interest, by showing him where he fails and by teaching him to criticize his own work, as he would any other technical achievement.

Finally, the good doctor is a man of character, which means again, I suspect, only that he has on hand certain kinds of brain-stuff, makes certain kinds of associations of it and reacts in certain ways to these associations. Here again example and criticism are the basis of teaching. A good doctor is skilled in the technique of right behavior. He makes mistakes in ethics no more than in counting blood corpuscles.

You will all see that I have used the word "technique" in a broad way. Probably I have stretched it too far. But for to-day we will let it stand and will ask ourselves what principles should guide us in attempting to make this kind of technicians out of the young men who come to us as students.

Putting the matter in another way, our purpose is to train scientific physicians. By a scientific physician I mean one who is imbued with the principles of science and trained in particular scientific methods. I do not mean that he should necessarily be an original investigator. I do mean that he should approach his work in the spirit of an investigator.

Our commonest stumbling block in considering a problem in curriculum making or in teaching is the unfortunate belief that we must turn out our graduates as fully trained doctors. "There is so much that they need to know," we say. This idea leads us to overcrowd the curriculum and deprive it of elasticity and virility. Our aim should be not to turn out a finished doctor, but a man who will continue to work and learn as long as he lives—a man who will consider that his student life has just begun on the day when he takes his diploma. Our aim should be not to produce a walking encyclopedia, but to inculcate the scientific spirit. What principles are likely to be of service in this work?

ENTRANCE REQUIREMENTS

Of course the first principle is that we start with good material. We depend upon certain "entrance requirements" to supply this material. We can not stop to consider these requirements to-day, except to remark their mechanical character. A sieve is a good instrument for separating different sizes of coal. It is a bad instrument for separating pebbles from diamonds. The best formulated entrance requirements will supply good material only when supplemented by personal consideration of the individual case. Often you can only tell the diamond by seeing whether it will scratch glass. My sentiment is that it is better to try out ten pebbles which will fail rather than risk throwing one diamond into the dump.

PRINCIPLE OF INDIVIDUAL DIFFERENCES

Having selected our students, we must recognize the inequality among them. No two freshmen are alike. No two seniors are alike. No two graduates are alike. No two old doctors are alike. We are all "born short" in one place, "born long" in another, to use William Hawley Smith's[3]

[3] "All the Children of All the People," Macmillan, 1912. Mr. Smith discusses also the similarities of children. Of course the principle of similarities is basic in any system of education. The trouble in medical education is that we have assumed not only similarity but even *equality* among students. This address is a protest against the prevailing rigid curricula and emphasizes therefore the differences of students, to the present disregard of their similarities. The latter

expressive metaphor. The recognition of the principle of inequality is a most important step in curriculum making. Everything else really rests upon it. If we had a magic yard-stick by which to measure each man's powers and lay out the curriculum adapted to develop those powers, it would be our duty to do so. Education would then become truly individualistic. Since we can not accomplish this ideal, we must do our best to approach it. We know that no body of men is able to lay out a perfect curriculum for medical students taken in the average or *en masse;* witness the severe criticism which may be laid against the A. M. A. model, founded though it was on two years' work by a committee of a hundred medical educators. Recognizing the principle of inequality of men, how much less can any faculty work out a fixed curriculum adapted to the student considered as an individual. To my mind the argument leads inevitably to the elastic curriculum. An elastic curriculum is not an elective curriculum, although the elective principle should find recognition in it.

PRINCIPLE OF RELATIVE VALUES

We have said that our aim is to develop technicians and that for this we must furnish facts on which the thing to be done, whether of hand or brain, is founded. In furnishing these facts, the important principle of relative values must receive emphasis. It is a fact that the stomach secretes a certain per cent. of hydrochloric acid. It is a fact that the lachrymal glands secrete a certain per cent. of sodium chloride. The former fact is much more valuable to a physician than the latter. It is valuable practically. Many other facts not immediately valuable in treating patients are valuable practically as thought-stuff. Facts are like medicines; some are for external and some for internal use. But the differences among facts as regards usefulness are as great as the differences among medicines. We should do our best from the multiplicity of facts to supply those most likely to be valuable to our students. Now the pie-maker is not a good judge of the value of pie as an article of diet, nor is the specialist in all respects in the best position to evaluate relatively his line of facts. The physiologist should have the help of the internist, the aurist, the oculist and the neurologist in determining what facts of physiology should be taught and the time to be devoted to this teaching. The principle applies equally to all the other teachers and their branches of knowledge.

PRINCIPLE OF MINIMUM REQUIREMENT

This leads to the principle of minimum requirement. Take anatomy, for example. We will all admit that certain facts of structure of the body form an indispensable part of a medical man's equipment. A knowledge of these facts must be demanded from every student. This minimum is hard to set—impossible, indeed, in a strict sense. Still, for practical purposes it must be set. In my judgment the minimum in nearly every subject is much less than schools have ordinarily required. They have required as much as possible, not as little as possible. In my opinion an effort should be made in each department to ascertain the minimum. This should be taught intensively. The merely desirable,

principle will take care of itself in any group curriculum, for as Professor Jackson has said: "Our medical students represent a selected group whose physical and mental characters are, broadly speaking, quite similar. This is tacitly assumed in making fixed requirements for the greater part of the curriculum. Yet the individual differences are undoubtedly of tremendous importance, and have hitherto been largely overlooked in medical education."

the questionable and the specialistic material should go into elective courses.

In formulating its minimum a department should bear in mind that not all the teaching of its subject-matter is done by itself. Anatomy is taught—should be and must be taught—by surgery and pathology; physiology, by medicine and pharmacology, and so on.

The sum total of these minima should constitute the required part of the curriculum. Probably they should make up between three fourths and seven eighths of the total. Nobody really knows.

PRINCIPLE OF SEQUENCE

In arranging a curriculum the principle of sequence must be kept in mind. Certain subjects are indispensable prerequisites to another subject. Others are desirable prerequisites. While this is true, it is also undoubted that this principle may be carried too far. The subject-matter of medicine is inextricably woven together. It is not even separable from the great body of general science. Our departments are in a measure artificial and arbitrary divisions. If a man goes into physiology before he has had anatomy, he is handicapped, it is true. But, on the other hand, when he gets to anatomy after physiology, he will carry to that work usable facts and enlarged interest. We may acknowledge that systematic knowledge of disease is valuable before the student can take up clinical work to best advantage, and consequently we make didactic courses prerequisite to clinics. But consider for a moment how much more intelligently the student would approach a systematic lecture course if he had previously seen some sick people. We should not allow too rigid an application of sequence to interfere with larger aims of elasticity and the recognition of individual capability and needs.

PRINCIPLE OF CONCENTRATION

In making a curriculum the principle of concentration deserves consideration. The theory is that the student does better work if he confines himself to one or a few subjects for a given short period of time. He is to concentrate on one thing and get it done. The antagonistic view is that the student gathers more from a subject kept before him for a long time. Under this theory the curriculum may include from six to a dozen subjects running through a semester or a year. Recently I met a freshman in the college of science, literature and the arts of our university who was studying seven subjects. She complained of being harried and overworked. I believe she would do better with the same number of class hours devoted to only three or four subjects. I think we should avoid the multiplicity of subjects in the junior and senior years by concentrating one hour a week lecture courses so as to run a shorter time and more periods a week. On the other hand, I can not bring myself to accept the Harvard plan by which only anatomy is studied the first semester, only physiology the second, and so on. I think Harvard has stuck to this plan more for the benefit of the teachers, who thus escape class work half of each year, than for the benefit of the students. Be that as it may, too much concentration is bad pedagogy; and in as much as it contributes to a rigid curriculum, it is a bad principle of curriculum making. A proper medium is to be sought between concentration to the crystallization point and dilution to tastelessness. At the present time we are more guilty in the latter direction, particularly as regards the rapid shifting of students among clinical instructors. If Dr. A. meets a group of students to-day and does not see them again for six weeks, how is Dr. A. to make his personal-

ity felt in these students' training? Dr. A.'s influence is lost in homeopathic dilution, which we should be ashamed to countenance.

The proper degree of concentration needed to produce best results should be possible of determination by the methods of experimental psychology. I understand that something has been accomplished in this line, particularly as regards memory. It is a common impression that "cramming" does not conduce to permanent acquisition. This conclusion is supported by laboratory tests. On the other hand, experiments prove that a subject referred to only at long intervals is not well remembered. There must be a golden mean between concentration and dilution. For this golden mean we should earnestly strive, and the psychologists should help us to find it.

PRINCIPLE OF ATTENTION AND INTEREST

Taking up more particularly the individual student in curriculum making and teaching, we should take into account the element of interest. A girl can dance all night with the pleasurable expenditure of several foot-tons of energy (no pun intended). Her back aches if she sweeps the floor, though the muscular energy discharged be insignificant. We should avoid a multiplicity of detailed laboratory exercises illustrating the same thing. The humdrum of laboratory repetition kills interest and initiative. Recognition of the principle of interest means an elastic curriculum, for the interest of one student is not the same as the interest of another student.

Interest is the basis of attention and of that self-activity which Dr. Jackson[4] so well discussed before this association two years ago. So important is this element in education that almost any sacrifice is warranted which will attain it. In our sophomore schedule at Minnesota this semester there is provision for six hours of elective work. It has been our custom in the case of conditioned or backward students to compel them to carry the required courses and postpone their electives. The other day a student appeared before the conference committee of the faculty and made a strong plea to be permitted to carry his elective. He said he was interested in that work and would rather postpone one of his regular studies. The committee voted favorably on his request; and in my opinion they acted wisely, for his failure to work with serious effort heretofore has been due to lack of interest. I expect him soon to observe that this elective work in which he is now interested is really tied up with all the rest. I expect to see his interests broaden and all of his work improve.

[4] C. M. Jackson: "On the Improvement of Medical Teaching," SCIENCE, N. S., Vol. XXXV., p. 566 (1912). Also, "Medical Research and Education," Science Press (1913), p. 367.

PRINCIPLE OF RESPONSIBILITY

Closely related is the principle of student responsibility. We are interested in work for which we are responsible. This is especially true if we select the work ourselves. A fixed curriculum deprives the student of all responsibility. He becomes a boarder coming in to meals when the bell rings, not a man laboring for his daily bread. If he may choose his subject or his instructor, his interest and responsibility increase.

Workers in the field of animal psychology tell us that animals carried through a maze never learn how to find their way alone. Let us remember this when tempted to help students over difficulties. Our teaching and our courses of study must be so planned as to encourage initiative and responsibility.

PRINCIPLE OF RESEARCH

The principle of research is very important in curriculum building. I do not advocate research with the idea that we should announce a great discovery every few minutes. I advocate it as supplying the proper atmosphere for teaching. The fixed curriculum segregates a certain portion of knowledge and teaches it as law and gospel. The student is like a red corpuscle confined by the vessel walls to a definite circuit. If the teacher has research interests, he carries them alone. His students can not follow him. The elastic curriculum permits the capable student to put out an occasional pseudopod and make little excursions with his teacher into the unknown. This can not help but react upon both student and teacher; and most important of all, on the spirit of the school. If time and opportunity for research are to be offered even to the exceptional student, it means that the electives can not be confined to the last year, as at Harvard, nor to one semester, as in some other schools. The free time should be scattered through the course, at least beginning with the sophomore year. I sometimes hear that the sophomore does not know enough to select any of his work. I can not agree. The sophomore in most of our medical schools is a junior or senior in the college of arts. He is a university man. He should be responsible. He should be thinking about what he is doing. The nursing bottle should be taken away, and he should choose and masticate his own food. Not many will nibble at research, but the aroma of it may well permeate the whole pantry. It will improve the taste of all the other food.

PRINCIPLE OF SPECIALIZATION

The principle of specialization may be given some attention. While every medical student should have the fundamental training of a general practitioner and while most of the elective courses will naturally be adapted to strengthen the student's general grasp, there is no objection, in my opinion, to a moderate extension of specialistic instruction. There are very few students who would care to move far along a specialty in their undergraduate course, and the dean or students' work committee should have power to prevent an abuse of this principle by limiting election in the specialties when such election would be likely to prejudice a student's general training.

PRINCIPLE OF UNEQUAL PROGRESS

Finally, regard for the differences and inequalities among students should make us consider their inequality of progress: the principle of unequal velocity, if you will. Some students by physical constitution and mental make-up are calculated to go forward more rapidly than others, who, being built on the "slow and careful" plan, may in the end be just as good doctors. Our arrangement of students into definite classes and a four years' required attendance is the worst possible condition for the extra bright man, whom it tempts to laziness, and for the slow man, whom it pushes beyond his powers. In my opinion students should be received at any time when a workable program can be arranged for them, and graduated at the end of any semester or summer term when they may have completed the requirements. Our extra intern year at Minnesota, as part of the requirement for the degree and consequently of attendance, will, I think, allow us to work this plan without running counter to the four-year rule of the state laws. The class system is a pernicious artificiality in education and should be done away with in professional education, if not more widely. So should the four-months' required vaca-

tion. The doctor-in-practise works eleven months or more. Why should the doctor-in-making work only eight or nine? Some students may need the long vacation for health's sake; others may need it for financial reasons. But some would be better off without the long interruption of their studies. Moreover, important elements of economy argue for the continuous session and a curriculum adapted thereto. Our expensive equipments stand idle one third of the time. Our hospitals and dispensaries go on the year around and are unused for teaching for several months. This would be poor practise in any line of business. For our northern schools, at least, the University of Chicago idea with its four quarters and its liberal curriculum, appeals to me as eminently wise. The next best thing is a strong summer term for which credit[5] is given on the regular course.

Your professors may say that they can not teach the year around. Well and good. They ought not to. While some of the older men should be "on the job" during the summer and may arrange their vacations at some other season, on the whole the summer quarter or term is a good time to give the younger men a chance. Let them conduct courses given at other times by full professors. A repetition of courses, at least in certain subjects, has advantages and is essential if a really elastic curriculum is to be developed.

CURRICULUM MAKING FROM THE SIDE OF THE TEACHER

I have gradually swung this discussion over from the side of the student to that of the teacher. Several principles of curriculum making may be formulated from the side of the faculty.

[5] The distinction between subject credit and time credit is not sufficiently recognized by medical educators. It is only time credit which is restricted by the state medical laws.

THE DEVELOPMENT OF TEACHERS

One of these principles is the development of the teacher. The rigid curriculum works but little for this cause. A professor of principles of surgery, for example, lectures year after year on that subject. For years perhaps the same manuscript is read to the classes. There is no incentive for a younger man to prepare himself. Finally, the old professor drops away, and a new and untried man must take his place. An elastic curriculum with repetition of the course under various instructors means the opportunity for the development of new men all the time. The prepared man is ready for the advanced position.

PRINCIPLE OF COMPETITION

The principle of competition is as important for efficient teaching as for any other trade or business. The rigid curriculum tends to develop a trust in teaching, with the usual bad characteristics of trusts. The elective system by giving the student a choice among several men furnishes each teacher with incentives to bring his work to the highest state of efficiency. The experience of Rush Medical College in this regard has been very instructive.

It might be thought that students would abuse this privilege of electing their instructors and that the easiest teacher would be most popular. That has not been the case. The students can be trusted to go where they get what they consider the best for themselves. Their judgment, on the whole, can be trusted. A general rule requiring approval of electives by the dean or a committee is a sufficient safeguard against the few who might search for "snap" courses.

The elective system tends to make a larger number of men available and useful as instructors and a larger number of hospitals available and usable for clinical in-

struction. So long as every student must appear before every instructor we have the tendency either unduly to reduce the number of instructors or unduly to reduce the time the individual instructor teaches. Either horn of the dilemma is dangerous. To be effective, clinical teaching must approach the ideal of individual teaching. Not how many students an instructor teaches, but how well he instructs a limited number, should be the criterion of his usefulness to a school and of his own sense of satisfaction with his work. As I have said earlier, nothing is worse than a whirlwind program which sends the students in vortices of section instruction so rapidly from teacher to teacher that no one can impress his personality upon the students. The belief that every teacher must teach every student, long since given up in colleges of arts and sciences, is pernicious and inexcusable. If your ideal of teaching is merely to reach as large a number of prospective consultants as possible, stop teaching and buy stock in a patent medicine company.

THE CURRICULUM AND THE DEPARTMENTS

As regards whole departments of instruction as distinguished from individual instructors, certain principles of curriculum making may be mentioned. A proper regard for the "born long" and "born short" demands greater elasticity in departmental procedure than is usually the case in our American schools. There should be better provision for the irregular student. Opportunities for laboratory work should be afforded at other than scheduled hours. Men should be encouraged to work alone or with a minimum of supervision. Let us limber up our laboratory organizations. Let our motto be salvation by individual work rather than salvation by formal creed. "Laboratory" should be synonymous with "Opportunity" not with "Drudgery."

The offering of electives is one important means of liberalizing a department. This system allows the instructor to vary at least a part of his work from year to year. It enables him to teach to the interested few those subjects in which he is immediately interested. It diminishes the temptation to introduce the instructor's fads as part of his required courses. It broadens the interests of a department by giving scope for all its members.

The elective system allows the young instructor who is assisting in a large required course to gain independence and confidence by conducting a small elective course in his special line. This is important.

THE CURRICULUM AND THE SCHOOL AS A WHOLE

Now as regards the school as a whole, certain principles of curriculum making may be formulated. It goes without saying that conditions as regards the quality of instructors, students and material facilities must vary among institutions. They ought not to adopt identical curricula.[6] The American Medical Association and Association of American Medical Colleges have presented models which are very valuable as points of departure. A curriculum committee should consult other schools, but not with the purpose of adopting their curricula unchanged. Each school should work out its curriculum with broad wisdom to suit its own conditions. It would be worse than folly, for example, if small and weak schools should attempt a wholesale adoption of the elective work which I so strongly

[6] While this statement is true, it may also be stated that important advantages would follow a substantial agreement among the schools as to the minimum requirements in each branch. For one thing, migration of students, at present very difficult, would be facilitated.

advocate. It would be folly even for a strong school to push this principle equally in all departments. A curriculum is a road or a race track. Road materials are quite different in central Illinois from those which abound in New England. Bear this crude analogy in mind.

The school revising its curriculum should avoid all possibility of allowing this important function to deteriorate into a contest for teaching time. Such a procedure loses sight of the principles involved and the objects to be sought. Consequently, curriculum revision must be approached with care and carried forward with tact and open-mindedness. Our recent experience at Minnesota is perhaps illuminating. The committee on revision was composed of three men only. These men studied conditions thoroughly and were able to speak with authority concerning conditions in our school and elsewhere. They studied the educational and pedagogical problems involved. This committee did not overwhelm the faculty by bringing in a complete report at one time. It first secured the approval of the faculty for certain general principles such as (*a*) "The necessity of limiting the scheduled work to about thirty hours a week or about 4,000 hours for the course." (*b*) "The necessity of clinic clerkships as a required part of the senior schedule." (*c*) "The desirability of elasticity to meet individual preparation, abilities and needs of students." The individual members of the faculty, recognizing the validity of these educational policies, approached the proposal to decrease their hours in excellent spirit. Consultations of departments with the curriculum committee led to practical unanimity of opinion on details; and when the final report was presented to the faculty, approval was quickly secured.

Gentlemen of the association, you have listened well. Probably you got into the habit when you sat upon the benches as medical students. Probably, like the students of this day, of whom we are dealing, you learned to "let it go in at one ear and out at the other." Is our lamentable ability to hear and forget due to something like interference of sound, some mental process by which the impressions from one ear annihilate those from the other? Or is it rather true that we are only to be jarred from our complacent forgetfulness, our nonchalant do-nothingness, by something unusual? I think the latter, at any rate, is a fact; and I am going to risk the dignity of the presidency and hang the moral of my previous remarks on some lines copied from the back of a seat in the amphitheater of one of our medical schools, where they had been scratched in the varnish by some medical student, departed and forgotten:

> Talk, Talk, Talk,
> Till my ears are split by the din.
> Sit, Sit, Sit,
> Till my pelvis sticks through the skin.
> In clinic and lecture and quiz
> I wear out my pants to the seam,
> Till over the benches I fall asleep
> And wear 'em out in my dream.

You laugh! But really are not these doggerel verses as pregnant with pity as the "Song of the Shirt"? Are they not as full of meaning for us as were the words of Hood for callous wealth and heedless government in poverty-stricken London?

The plaint of the student we have heard before, delivered in more dignified but less expressive form by speakers on this floor. Our students are overcrowded. They have no time to think. They do not think. Their individual qualities are crushed. They are made to conform to a common mould. The curriculum is largely responsible. We are responsible for the curriculum.

We make the usual specious arguments. The students are poorly prepared. The time of the course is too short. There is so

much to teach. Medicine is going forward so fast.

Let us broaden our conception of medical education by broadening our conception of education itself. Education is primarily the bringing out of something from within, not the forcing of something in from without. It is the discovery of the individual to himself. It is a process of training, not a process of fattening.

If these conceptions of education gain possession of us, we shall approach our teaching and our curriculum making in a corresponding spirit, and some at least of the difficulties and disappointments of our labor will disappear.

E. P. Lyon

Medical School of the
University of Minnesota

INDUSTRIAL FELLOWSHIPS OF THE MELLON INSTITUTE[1]

Since January, 1912, I have made no report to this journal on the progress in the system of industrial fellowships initiated by me at the University of Kansas and since transferred to the University of Pittsburgh.

The working of these fellowships began September 1, 1911, on the university campus at Pittsburgh and in the temporary building erected at a cost of about $10,000. In March, 1913, Mr. Andrew William Mellon and Mr. Richard Beatty Mellon, brothers and citizens of Pittsburgh, impressed by the evident practical value of this system both to learning and to industry, established it on a permanent basis through the gift of over half a millon dollars and consented to allow their family name to be placed upon it as the "Mellon Institute of Industrial Research and School of Specific Industries of the University of Pittsburgh." While working in affiliation with the university and in close sympathetic accord with it, the institute is possessed of its own funds and is under its own management.

[1] This article was written by Dr. Duncan shortly before his death.

The gift of the Messrs. Mellon has been divided for expenditure as follows:

FOR IMMEDIATE EXPENDITURE:

Permanent building	$250,000
Apparatus	60,000
Library	20,000

FOR YEARLY MAINTENANCE FOR FIVE YEARS:

$40,000 per year.

Since September, 1911, the following Fellowships have been established and in operation:

1. BAKING:*[2]

$750 a year for 2 years.
Bonus, maximum cash: $2,000.

Fellow:

Wilber A. Hobbs, B.S. (University of Kansas). (Accepted November 30, 1910.)

2. ABATEMENT OF SMOKE NUISANCE:

$12,000 1st year; $15,000 2d year; $12,000 3d year.
Fellows:

Staff in Charge

R. C. Benner, Ph.D. (University of Wisconsin), chief fellow first and second years.
J. J. O'Connor, Jr., A.B. (University of Pittsburgh), economist and chief fellow third year.
W. W. Strong, Ph.D. (Johns Hopkins), physicist.
A. F. Nesbit, B.S. (Massachusetts Institute of Technology), electrical engineer.
J. A. Beck, LL.B. (University of Pittsburgh), attorney.
E. H. McClelland, Ph.B. (Lafayette), bibliographer.
O. R. McBride, B.S. (Purdue University), engineer.
J. E. W. Wallin, Ph.D. (Yale University), psychologist.
H. H. Kimball, Ph.D. (George Washington University), meteorologist.
A. B. Bellows, B.S. (Massachusetts Institute of Technology), engineer.
J. F. Clevenger, M.S. (Ohio State University), botanist.
C. H. Marcy, bacteriologist.

Advisory Staff

Oskar Klotz, M.D., C.M. (McGill University), senior fellow.

[2] * means that the fellowship has expired.