search less critical is unworthy of the name. It follows, therefore, that a research must often wait, and wait indefinitely for the collection of the necessary data to round it out, and bring forth a just conclusion. A so-called conclusion to an incomplete research, hedged with the adjective "tentative" is no conclusion at all; it carries no responsibility. The time element therefore is an important feature in original research, and the time may be indefinitely prolonged. In medical diagnosis the problem is to determine the state of affairs in a given patient. The particular methods of obtaining the data are those peculiar to medical investigation. When obtained these data are often insufficient to afford a positive basis for any conclusion. Occasionally, conditions are such that time may be spent waiting for additional data, but much more frequently the decision must be made at once, for action is demanded, and that action is determined by the decision as to the meaning of the data. Frequently, it is quite impossible to obtain a sufficiency of data, because original research in correlated branches of knowledge has not yet formulated laws governing the conditions. But nevertheless a conclusion must be made, for action is necessary. The time element is here important also but the time must be short, or life may be the forfeit. It follows from this, therefore, that the tentative conclusion is common in diagnosis, and unlike the tentative conclusion in research, it is one involving great responsibility. Inasmuch then as tentative conclusions must be made in diagnosis, and as it is essential that those diagnoses be as accurate as possible, great care must be exercised in the methods of thought used in reaching these conclusions. To this end we have recourse to the Logic of Medicine, which has become the logic of medicine, precisely because experience has shown that it is the most potent in reaching the truth under such circumstances. The "medical mode of thought" therefore ought to be inculcated throughout the whole of the medical student's career. When the diagnosis is made, it must then be compared with the data of therapy, in order that a second conclusion may be reached, and this second conclusion is the one which formulates the specific action to be taken, and in making it, psychic and social factors must be considered as well as the purely medical, and here again the "medical mode of thought," the trained professional judgment, comes into action.

So far as research work trains observation it is good, but powers of observation can be trained equally well on pulse and tongue, facies and feces, as with the aid of balances and microtomes; so far as research work trains the judgment, it trains it in a bad direction for the young medical man. It tends to establish modes of thought which hamper rather than help him at the bedside. For anybody to do research work on problems formulated by some one else is largely child's play and hardly rises above the dignity of ordinary clerical work, while at the same time it tends to inculcate a sense of personal importance which is so far from the truth that it can not but be detrimental to its victim. The clinic is the field for medical thought and action. Resting upon its basic sciences, which are for its purposes tributary and subordinate, medicine has a systematized knowledge of its own, extensive in scope, highly complex, difficult to acquire, and requiring the best efforts of the best intelligences for its highest use. The systematized, truly medical knowledge may be designated by the word clinicism, which is the true science of medicine. The time for the medical man to undertake research work is when his experience has become

sufficiently ripe for him to formulate his own problems; then his research work will have some life in it; his problems should be clinical problems, and certainly there are enough of them to satisfy the most varied tastes. The importance of inculcating the medical mode of thought and training professional judgment, is, in my opinion, so great that I would have them meet the student at every turn in his medical college career, from the very day of his entrance, and to this end I would have the teachers of the so-called scientific branches of the curriculum associated, as far as possible, with clinical work, and urge them to put themselves in constant touch with clinical men, that they may impress upon the student the professional bearings of their tributary work. The medical course is short enough now; it is difficult to find time to present all that should be presented to the student, and there is certainly no time to let him stray after strange gods. It is the business of the medical student to receive medical knowledge and to be trained in its use; he is under no obligations to add to the sum total of medical or any other knowledge. To-day an overwhelmingly large percentage of the physicians of the country devote their whole time to the application of medical knowledge to individual patients. It is right that they should. It is what the community expects of them. It will continue to be so in the future. With the few physicians who do research work, it is a side issue, and their real work is this same application of medical knowledge to individual patients. Such medical students as wish to engage in research work should limit themselves to it, and not hamper themselves with practice and they will find that their medical brethren will welcome every contribution of knowledge which they send out. If legislation should be for the benefit of the greatest number, so ought education, and to this end the medical college should keep its prime duty ever before it. It is the function of the physician to practice medicine; it is, therefore, the duty of the medical college to train him for that work. Let us make physicians rather than scientists.

NECESSITY OF A PRACTICAL KNOWLEDGE OF DIETETICS, HYDROTHERAPY AND PHYSICO-MECHANICAL THERAPEUTICS.

THE NEED OF ESTABLISHING COURSES OF INSTRUCTION IN
THESE SUBJECTS IN OUR MEDICAL SCHOOLS.

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Until very recently the profession has for the most part relied upon the administration of drugs for the alleviation and cure of disease—all other means except surgery being left to the abuse of charlatans and quacks. But it is the sign of the present state of scientific development, that the attention of the thoughtful has been called to the effects that may be obtained by agents not emphasized in books on materia medica, therapeutics, or in the pharmacopeia. The value of general hygienic conditions and of surroundings; the necessity of proper and systematic bodily exercise; the curative power obtained through the placing of the patient's mind in the proper psychological attitude; the importance of the use of a diet suitable to the case and to the individual; the bearing that heat and cold may have upon the bodily functions in general, and especially on the different parts of the human organism when intelligently applied; the efficacy of massage and electrical therapeutics—

all these are now recognized as forming important elements in the alleviation and cure of many pathologic conditions.

Since these means form so vital a part as therapeutic agents, it would seem that the time has come to consider the urgent necessity for the systematic teaching of their principles and the intelligent application of the most important and neglected of them. Broadly speaking, these would appear to be the subjects of dietetics, hydrotherapy, and physico-mechanical therapeutics.

The reasons for viewing these subjects mentioned as so extremely important are, that, in the first subject—dietetics—the question is involved of how life is sustained and nourished, with the laws that govern such a process—a fundamental proposition; in the second subject—hydrotherapy—the consideration is required of how the body and its parts are affected by three of Nature's most common and potent agencies, to whose modification we, and every form of matter, are more or less subject at all times—viz., heat, cold and water—the latter modified in temperature from the normal to one extreme or the other; in the third subject—physico-mechanical—is contained a pointed reference to the broad and universal truth, that the thing which has ceased to use or perform its functions has begun to die, that the exercise of function is one of the most potent factors in maintaining life, and that, if the individual is not able to maintain such exercise of himself, the question of some outward agency may help him to accomplish it, or that such agency may obtain for him in some way the physiologic results of such exercise, is a consideration the importance of which can not be overestimated.

In order to learn whether the necessity for the teaching of dietetics, hydrotherapy and physico-mechanical therapeutics was realized, and whether the need of such instruction was being met, the writer sent letters to the various medical schools and colleges throughout the United States, asking each for its bulletin, catalogue, or yearly announcement. Most of the institutions written to immediately responded. Upon examining the printed curricula of the different schools, it was found that the three subjects above referred to were for the most part given but small space in the general scheme of study, and in not a few institutions were entirely omitted from the course.

To get the voice of competent opinion from medical teachers (after learning the conditions as they were at the schools), the writer prepared a second letter, which he sent to the dean of each institution in the United States. The letter was as follows:

Dear Doctor:—I would like to obtain your opinion of the importance of teaching medical students three subjects now neglected in medical education, viz.: 1, Hydrotherapy; 2, Medical Gymnastics and Massage; 3, Dietetics.

The practical demonstration method of teaching these branches would not seem to burden the student, especially Medical Gymnastics, which would rather be a physical benefit and a mental rest.

Hydrotherapy and other physical methods of treatment seem now to be almost a necessity in the armamenture of modern therapeutics. This branch and Dietetics are left to the nurse or to the caprice of the patient. A thorough and practical knowledge should belong to every physician. The practical and scientific knowledge of these three branches would put a check upon quackery and ignorance.

Kindly answer enclosed questions, and oblige.

Accompanying this letter was a blank on which were printed five questions, as below. Over half of the representatives of the schools written to returned the blanks

originally mailed, with complete answers written upon them. These replies fairly represent the consensus of opinion of the colleges and medical schools of the country, as they came from institutions of different types, both large and small. The questions were:

1. Are you in favor of including the subject hydrotherapy in the curriculum of medical schools?

2. If so, are you in favor of teaching by practical demonstrations in the hospital and dispensary, or by the didactic method?

3. Are you in favor of teaching medical students practical medical gymnastics and massage?

4. Do you consider the study of practical dietetics a necessary part of the student's education? The character and preparation of food, cooking, etc.? The physiology, pathology, and therapeutics of dietetics?

5. What would you suggest as the most practical method of teaching this branch? Practical demonstration or otherwise?

To the first question, out of 59 answering, 1 replied: "Not as an undergraduate study;" 2 replied: "No;" 39 replied in unqualified terms: "Yes;" and the balance answered that hydrotherapy was already being taught as a branch of general therapeutics, or that they advocated its so being taught, but not as a special subject by itself. In all of these replies, save two, the prime importance of the serious consideration of hydrotherapy is fully recognized.

To the second question, out of the same number of letters received, 3 gave no answer; 1 replied: "No;" 1 advocated the didactic method; 16 advised practical demonstration; and 38 suggested both practical and didactic methods as likely to afford the best results.

To the third question, 1 gave no answer; 1 was undecided, not having given the subject sufficient study; 1 replied: "Yes; not under these names, however, but as a sub-topic of general therapeutics;" 1 answered: "Desirable, but doubtful whether time is sufficient;" 2 said: "To a limited extent;" 46 wrote unqualifiedly, "Yes;" and 7 answered, "No."

To question No. 4, 1 gave no answer; 1, "In a limited way;" 1, "Business of the nurse;" 1, "Not as a separate course;" 1, "Desirable, but can't see how it can be accomplished;" 1, "Questionable whether it can be introduced into four years' curriculum;" 1, "Character and preparation of food, yes; cooking, no;" 3, unqualifiedly, "No;" 49, unqualifiedly, "Yes."

To the fifth question, 16 made no reply; 3 said that dietetics is already sufficiently taught by didactic and practical methods in their institutions; 4 advocated lectures and didactic methods; and 36 preferred practical demonstration in the hospital, coupled with theoretical teaching.

On reviewing and analyzing these various answers, it will be seen that there is an overwhelming majority of those who favor the establishment of some method by which the subjects we are considering may be more carefully and systematically taught; and that the greater number of those who have replied to the questions propounded lay very great stress on the importance of teaching by practical and illustrative methods.

Together with these answers written on the printed slips, and categorically replied to, many letters were received, giving the personal opinion of the writers as teachers and professors. The following are included here, as showing that not only are dietetics, hydrotherapy and physico-mechanical therapeutics not sufficiently

taught, but that there is a genuine and urgent demand on the part of trained medical educators for placing these branches in the curriculum of the schools:

David Streett, Dean of the Baltimore Medical College, Baltimore, Md., says:

... There can be no question about the importance of teaching Hydrotherapy; indeed, such has been done a number of years, its importance in the medical curriculum growing each year; and of Dietetics there are few subjects of more intrinsic importance to the practitioner, as well as to the surgeon. As to Medical Gymnastics and Massage, I think they are less important than Hydrotherapy and Dietetics; still they eminently deserve a place in our medical curriculum, provided there be found time for their teaching. . . . I regret to state, in my judgment sufficient importance has not been attached to the thorough knowledge of these two subjects.

Victor C. Vaughan, Dean of the University of Michigan, favors instruction in these three subjects, and says:

I know I talk three hours a week for three months on this subject, and give them a good grounding in the scientific principles of Dietetics. . . . As to Hydrotherapy, our students get considerable instruction along this line. . . . We also give considerable instruction in Medical Gymnastics and Massage. . . .

One correspondent, Dr. A. F. Jonas, Dean of the Omaha Medical College, and President of the Western Surgical and Gynecological Association, writes:

... I feel that the three subjects mentioned should occupy a first rank in our therapeutics; but, for some unknown reason, they have been neglected by our schools the world over. It is in the use of these particularly that "quackery" has obtained a large part of its capital stock. I am sure that if these subjects will be scientifically taught and properly applied by the profession, we will have added to our armamentarium most important factors for good.

H. G. Brainard, Dean of the College of Medicine, University of Southern California, Los Angeles, says:

... I feel very strongly on the point that some systematic teaching should be given in the medical college in regard to the use of Hydrotherapy, and in regard to Dietetics. I do not feel so sure about the question of Medical Gymnastics and Massage. While I think that a more thorough knowledge of these subjects would be beneficial, it does not seem so imperative as a more thorough knowledge of Hydrotherapy and Dietetics. Though I presume that a thorough knowledge of gymnastic manipulations and massage would drive osteopathy out of the field.

Dr. E. O. Sisson, Dean of the College of Physicians and Surgeons, Keokuk, Iowa, writes:

I hasten to give affirmative answers to the questions you have propounded, for I believe you have struck the keynote, and that the introduction of such teaching will mark an epoch in medical science.

The only school that I know of that carries out practical instruction in Dietetics is the Medical Department of the Minnesota State University, and the professor of that department told me that it was not compulsory there. They have a very complete laboratory, fitted with gas ranges, and the necessary cooking appliances, and each student prepares his own dishes.

Medical Gymnastics, as you say, would not burden the student, but would rather be a physical benefit, and a mental rest.

Hydrotherapy, although taught to a greater or less extent in most schools, it is very seldom that a practical demonstration is given of it.

I heartily agree with your statement that "a practical and scientific knowledge of these three branches would put a check upon quackery and ignorance."

We are dealing with subjects here, the value of which thinking people must realize sooner or later, and the physician by

an intelligent practice of such will do a great deal towards doing away with the superstition and mystery with which the charlatan has always loved to surround the practice of medicine.

In my lectures on Hygiene to the medical students, I try to impress upon them the value of these subjects, but as my work is necessarily all didactic I fear they fail to take the interest that they should, and therefore they do not realize the importance of the subjects. In my lectures to the nurses, where there is more opportunity for practical demonstration, I believe that more is gained.

I certainly wish you success in your investigation, and hope that your work will be productive of much good.

Dr. S. W. Williston, Dean of the School of Medicine, University of Kansas, says:

I believe that all these subjects should find a place in medical instruction, and, of course, wherever taught, they should be, so far as possible, taught by the laboratory method, that is, by actual doing or seeing done.

Dr. Alfred C. Wood, of the University of Pennsylvania, Philadelphia, writes:

Of course, I appreciate the difficulty of having hours set apart for these subjects in a curriculum already so full; at the same time, in my opinion the necessary readjustment should be made to admit these subjects.

Besides reports from the medical schools the writer has received similar complete reports from many of the editors of our medical journals, and also from the president and other officers of the state medical societies, offering their views and comments as to the importance of more practical instruction in these subjects.

Lack of space prevents the publication of these reports here.

In order intelligently to approach the question we are considering, and that practical suggestions of value may be made, it will be well to review what consideration is generally being given to hydrotherapy, dietetics and physico-mechanical therapeutics, and how they are being taught.

From the replies we have received, it would seem that small part of the attention due these subjects is being paid them. The physiology of dietetics is usually embodied as a part of the lectures under the chair of physiology in the first year of the student's course. In the majority of the colleges the subject is not made plain by any means of actual demonstration; while the therapeutics of dietetics is taught, only incidentally, in connection with the subject of general medicine, usually in the fourth year. The student graduates, with superficial instruction in, or practically ignorant of, the application of dietetics in health or disease. A large number—nay, the larger number of the graduates of our schools—afford examples of the deficiency of knowledge of the composition of foods, the chemical changes taking place in cooking, the digestibility and the absorbability of the various forms of nutriment. And from this it also follows that there is a woeful lack of the understanding of the therapeutics of dietetics, which latter involves the practical application of the facts and laws of this subject in the treatment of different diseases.

The very important subject of hydrotherapy, which comprises the application of water internally and externally, from solid to fluid and vapor—from ice to steam—depending for the result upon the judicious adaptation of its mechanical and thermal influences, is being neglected also. This branch of therapeutics it is customary to teach from the chair of general therapeutics; in most cases, merely by didactic methods. As a result,

the student has neither a definite knowledge of the physiologic action of water, which can only be gained by practical experience, nor the understanding of its intelligent application in diseased conditions. The effect of heat in all its variations of temperature, with such a wide range of therapeutic uses, is of both scientific and clinical importance.

Physico-mechanical therapeutics, which embraces medical gymnastics and massage, with some forms of the application of electricity, is not less important than the other two subjects, and what may be said in regard to the lack of proper training and instruction in these two may apply to the other.

Practical dietetics can not be universally introduced without the free use of hospitals equipped with dietetic kitchens; but in schools where such hospital facilities are at hand, a section of the class could take its turn under a competent instructor, certain hours in the day, during the week, in acquiring the accurate knowledge of the preparation of foods and their proper administration in the cases being treated in the institution. The effects could then be readily appreciated by actual demonstration; and thus another and most important element would be added to the skill of the future practitioner.

No objection, however, can be urged against the illustrative method of teaching hydrotherapy and physico-mechanical therapeutics. Every school is equipped with college dispensaries. All that is needed is to arrange a room, or suite of rooms, equipped with the necessary appliances for the application of water in various forms, and with the different mechanical apparatus to be used. These arrangements may be as elaborate or simple as the school can afford. A separate, or adjoining room may be equipped for placing the patient where he may obtain the benefits of the various forms of physico-mechanical therapeutics. In the customary division of students into sections, for the different dispensary classes, a certain number can readily be allotted to each of the rooms above mentioned, just as they are assigned now to the rooms for instruction in surgery, gynecology, nervous diseases, general medicine, dermatology, etc. The clinical material may come direct, or may be referred from the other departments of the institution. Students will gain more exact knowledge by being called upon to assist the instructor in his daily work; and more patients can be treated when the students are turned into assistants—which is a double gain. This method would not trespass on the time allotted to other work, or unduly press upon the strength of the student; and therefore it would appear to be perfectly feasible. As the value and practicability of the subjects we have been considering become further recognized by the faculties of our medical schools, special elective courses may be established, under trained instructors, in order to give the student theoretical and practical teaching combined. The writer has found in his own experience in teaching that these practical methods are easier for the student. They give him an opportunity to learn more accurately by actual observation and experience, associating the clinical importance of the case with the therapeutic measures used.

It will thus be seen that such observation and experience will help the student to comprehend the pathologic condition of the patient—whether a medical or surgical case, and he is better enabled to grasp the clinical and scientific phenomena presented to his mind. The sig-

nificance of medical teaching will become real, better understood and more easily remembered. The accumulated facts obtained from didactic teaching will also thus be better utilized, and the mind stimulated for further investigation and study.

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THE SEMINAR METHOD IN MEDICAL TEACHING.

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The present is a time of great change in methods, as well as in the principles of pedagogy in our medical schools. The extent of medical science is so great that no individual can expect to be master of the whole field. The duration of the course preparatory to the practice of medicine is now long enough, and the preliminary education is now thorough enough to allow the best methods of study to be used. For a certain part of the medical curriculum there is no plan of teaching which promises so much as the seminar.

In previous publications¹ I have called attention to my own efforts in this direction. It is my purpose here to make another plea for the more general adoption of the seminar, in teaching almost any topic of interest to the student.

In order that we may understand each other, let me say that the seminar is a method in which each member of the class does independent laboratory, clinical or library work on a subtopic of general interest to the class as a whole, this subtopic chosen by the student or assigned by the teacher. The seminar is a meeting of the students and the teacher to hear, question, criticize and discuss the work of individuals. When the seminar meets for the first time the teacher presents the general subject in the form of a lecture, in the course of which the whole topic is outlined and interesting questions are put forward. From these questions and the outline, and from a knowledge of the individual members of the class, the assignments of subtopics are made. A student takes his assignment and studies up the question, and at the next or some subsequent meeting of the seminar, he presents to the class in such a manner as the case requires, the results of his study. This time it may be an analysis and blackboard talk, the next time a carefully-written abstract, then again a microscopic demonstration and written paper, or later and more complete than any of these, a finished thesis. During the presentation the student who has the floor is in the position of the teacher. The teacher for the moment becomes one of the students. At any moment during the presentation questions may be asked or explanation required. At the end criticisms are to be expected. Such exercises, like laboratory investigation, are time-consuming. The student should have not less than one-half his daily study time for a seminar of two hours a week. The seminar class should not exceed 20 students, selected by their interest in a topic or in the teacher. The management of larger classes is limited to unusual teachers and special topics and methods of procedure. In a very limited field I have used the seminar with a class of 150 students.

The seminar presupposes an elective course. In no other way can the student have time for the exhaustive

1. Holmes, Bayard: "The Seminary Method in Teaching Surgery." THE JOURNAL A. M. A., Aug. 8. 1896, et seq.