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I. Inaugural address. <i>Allan G. Brodie, D.D.S., Ph.D. (University of Illinois)</i>	717
II. Index of participants and sequence numerals for corresponding abstracts	723
III. First Session, Section IA, Evening, June 18; abstracts 1-12	724
IV. First Session, Section IB, Evening, June 18; abstracts 13-22	727
V. Second Session, Section IIA, Morning, June 19; abstracts 23-33	730
VI. Third Session, Section IIIA, Afternoon, June 19; abstracts 34-45	734
VII. Fourth Session, Section IVA, Evening, June 19; abstracts 46-56	738
VIII. Fifth Session, Section VA, Morning, June 20; abstracts 57-68	741
IX. Fifth Session, Section VB, Morning, June 20; abstracts 69-81	746
X. Materials Group, abstracts of papers presented at Sections IIB and IIIB, June 19; abstracts 82-104	750
XI. Papers read by title, abstracts 105-163	754
XII. Executive proceedings and registers of newly elected officers and members	773

I. INAUGURAL ADDRESS: OUR COMMON FIELD OF RESEARCH

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It has become customary in this society for the incoming president to make some sort of inaugural address and for a number of years it was accepted practice for the address to concern itself with the president's own field of research. Fortunately this tradition has been broken several times and you will therefore be spared the pain of following the intricacies of the growth of the facial skeleton, a field that, judging from the proceedings of this and other of our meetings, holds little interest for any except a few misguided individuals. I have elected rather to talk on something about which I know far less but which does concern all of us and should concern us more deeply. I refer to dental education.

When, some four years ago, I was asked to assume a deanship and was weak enough to accept, I entered a field that had vaguely irritated me for a number of years. I had been very critical of the job that was being done by dental schools in general and, of course, of our own in particular. As a teacher of graduate students for a decade and a half, I had had students from most of the better dental schools in this country and had found little difference among them. They were carefully selected, yet they all showed the same deplorable lack of knowledge of everything other than technical procedures. One could wonder at a system in which they were exposed to so much and retained so little. At the graduate level most of them performed satisfactorily. They demonstrated keen interest and the ability to work hard. All of them developed a very critical attitude toward the dental training they had received and they repeatedly asked

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why that training had not given them the background that they now found so necessary. I finally realized that my own experience, which I had considered to be peculiar to me, was a rather universal one.

When I was finally forced to grapple with this problem as an administrator, I found myself spending hours instead of minutes considering its many ramifications and arriving at conclusions that were quite at variance with some of my most cherished precepts. The fundamental problems of the question seemed to lie far remote from the field of dentistry and to involve factors to which we pay little or no attention. Owing to a lack of scientific method that might yield objection data, the experimenter in this field is forced to rely quite largely on his own experience and reactions and those of his intimates. In addition to this, there are a few pretty well-established psychological precepts that prove helpful, and the lessons of history are of course always at hand. Since the problem is one of education it can be examined in the light of general educational patterns.

An educational system designed for the genius requires little planning. He will survive the worst that can be done to him. Education for large groups, however, implies variation in capacities and it becomes necessary to think of factors and objectives basic enough to embrace all. Our primary and secondary school system is much the same wherever found because of a general recognition of this fact. There is inherent in it a recognition of the gradual maturing of the mental processes which in turn depends on changing physiological stages. During adolescence there is an awakening that is normally characterized by the beginning of concept formation and a dawning sense of responsibility.

In the high schools and the colleges of liberal arts and sciences as well as in the grammar schools, there are somewhat generally accepted curricular patterns. In the colleges, the curriculum embraces a limited number of subjects and the areas are separated quite widely, affording a mental change of pace. Since the areas are large there is the necessity of teaching principles rather than details, and finally, but quite as important, there is free time for discussion and assimilation. Likewise, throughout the period of elementary, secondary, and college education, the modern concept that good teaching utilizes and nourishes the curiosity of the student determines the approach.

Professional education offers a striking contrast. Whereas general education attempts to take the responses of the student into account, professional education pays all its attention to the subject rather than to the individual studying the subject. If the general principles here enumerated can be accepted as correct from the psychological point of view, professional education ignores all of them.

Medical education is constantly held before dentistry as a model to be emulated, and the great contributions made by medical scientists are offered as proof of the correctness of its educational system. A critical appraisal of certain other factors, however, lead one to question whether this is a justified assumption. Let us look at some of these factors for a moment.

The prime factor in the success of any human endeavor is the quality of personnel engaged in it. Here medicine can claim great success because it attracts some of our brightest and most altruistically-minded young people. The reason for this is not too hard to find.

The past forty years have witnessed the rise of a number of social heroes. The banker was one of the first and he was followed by the civil engineer. During World War I the aviator came in for a term of worship but he was eclipsed quite completely by the chemist and by the physicist so that his infinitely greater contribution to destruction during World War II was accepted as routine.

Slowly over these years, however, a new hero was being built up by those king makers, the press and the radio. He was the "Man in White." He held

death at bay, he fought microbes and hunger, he sat all night by dying children after driving miles through blizzards. And he never expected a fee! As a result of this propaganda, the doctor is the hero of modern society and it is a very human trait to wish to be a hero.

But society has not stopped here. It has lavished on this hero hundreds of millions of dollars in the form of hospitals, medical schools, research institutions, and endowments and this unbeatable combination of man power and money has only accelerated the trend.

Actually, these benefits have accrued to medicine through the labors of relatively few men, principally laboratory scientists not engaged in practice at all, but so thoroughly has the public come to identify this research with the medical field that the title doctor strikes awe. Is it any wonder that the M.D. degree is the most coveted of all degrees today and the one for which the young aspirant will go through torture? It is the passport to the heights of social leadership and respectability.

But the question remains whether it is the course of instruction in medicine that has led to all these benefits. Given good students under the pressure of intense competition, and almost any system of education will show some desirable results. It would be interesting however to know the percentage of success among average medical graduates, that is, how many can be considered well trained for the scientific practice of medicine.

The medical curriculum is the result of the experience of physicians through the ages. This experience began with curiosity about the world and man, and led to empiricism—but the curiosity and the empiricism were pretty well blunted by seven hundred years of reliance on authority and dialectics. And even though the nineteenth century saw the introduction into medicine of the scientific method, there is ample evidence that the tendency to rely upon authority and tradition is not entirely dead. For the past fifty years or more medical education has been pretty well frozen in the Johns Hopkins pattern which lays great emphasis on the study of the basic sciences and insists that these fields be covered before any contact with patients is allowed.

Dentistry, viewing the popularity of medicine and assuming that it could be credited to medicine's course of training, adopted the same course for its own. This was only logical, particularly so when it was more economical to teach the two groups of students together than to set up separate training courses for each. But the differences that existed in the two fields in the matters of discipline and motivation were not sensed. As indicated before, the reason the system seems to work for medicine is the competition-induced discipline. The system was applied to dentistry with an air of "take this, damn you, it will make a man of you." And this is the face of a falling index and at a time when the voice of authority was being challenged as never before.

The problem that is posed seems to be a determination of whether our objectives can be gained or at least more closely approached by a study that includes some slight regard for the reactions of our guinea pig—the dental student.

Society, and even the dental profession at large, look at dentistry in a different light from that of the dental educator and research man and it is the attitude of society that the average dental student brings to college with him. He expects dental laboratory and clinical work as soon as he arrives and he finds that he must forego these for another two years while he studies more books. True he spends some time at the laboratory bench but this is broken into repeatedly by the flunking courses in basic science. By the time he gets to his junior year he is a thoroughly frustrated individual with a feeling that he hasn't really learned his basic work and with no confidence in his technical abilities. He has become, in spite of himself, the world's best "Artful Dodger" and has picked up along the way a completely developed inferiority complex that he never loses.

Some four years ago we started an examination of this system in an effort to find out if possible where its weakness lay and to arrive at an explanation of the differences that were asserted to exist between medical and dental students. I believe you will be interested in some of the things we discovered.

First of all, we found that the average dental student was two years younger than the average medical student and therefore that much less mature. Second, he had been accepted with lower scholastic averages. Then we compared the work load of the two groups for the first two years and we received a real shock. We found that although the two groups were carrying practically the same load of premedical science the dental students were forced to devote all of their other time to the mastery of technics, while the medical students had this time completely free for study. In other words, we were expecting a younger student and one with lower preprofessional grades to carry a significantly heavier load and perform as well. It did not make sense. Our first step toward reform was to attempt to set our own dental house in order.

Since time immemorial technics had been taught by departments, the denture department teaching denture technic, the crown and bridge department, crown and bridge technic, and so forth. Each department head was requested to submit the answers to three questions: 1. What do you expect of a student when he goes into the clinic at the beginning of the junior year? 2. What phases of this preparation are the responsibility of your department? 3. How and what do you teach to attain your objectives? All this material was brought to the first meeting of the clinical departments and then began a six-month series of meetings devoted to a study of the purely dental phases of the curriculum.

The answers to the three questions revealed all too clearly that each department head expected a fully trained dentist before he had even seen a patient. Further it was quickly discovered that certain technics were being taught with only minor modifications by several departments while other technics were being completely neglected because each department assumed that another was teaching it. The absurdity of many things that were revealed was so apparent that the committee to a man wanted to do something about it. The plan evolved has been gradually put into effect.

Briefly what was done was to examine critically every technical procedure that was considered essential to preclinical training and to classify it according to the basic principles it involved. When this task was completed it was realized that all technical procedures could be placed under one of four headings: (1) the cold fashioning of metals such as filing, sawing, swaging, burnishing, piercing, and graving; (2) the hot fashioning of metals, soldering, and casting; (3) the handling of plastic materials such as plaster and cement which result in crystal formation, and the non-crystalline group such as compound, hydrocolloid, alginate, and acrylic, and (4) the cutting of tooth structure.

A course labelled Basic Technics was laid out and the freshman students were introduced to one technic at a time. Each session was proceeded by a quiz on the material and instruments to be handled and based on a reading assignment in a manual developed by the staff. Beginning with a pure filing exercise and progressing through technics and procedures of increasing difficulty, the class was casting by the vacuum method before the quarter was two-thirds over. They had the upper classmen green with envy. And now we decided on a radical step.

For the remainder of the quarter the class was put into the clinic and, after only two demonstrations, the students began to take the plaster impressions of each other. After trying to teach this difficult technic to juniors and seniors, the results obtained by the freshman amazed us. But more enlightening was their response. They displayed none of the fear that had been so apparent in the upper classes and they thoroughly enjoyed the work.

It is not the intent of this talk to defend a particular course of technical training but rather to indicate certain factors—primarily of a psychological nature—that we had been neglecting. At the beginning of our experiment our chief concern had been to cut down the time devoted to this phase of dental education without losing quality. We believed that this would leave more time for basic science preparation. Since the course had been laid out and conducted by a joint staff composed of men from all departments, we were confident that none would be slighted and that there would be no overlapping of instruction. We underestimated the capacity of the student—if we thought of it at all. At the end of the first year we had reduced by almost twenty per cent the time formerly devoted by the various departments to dental technics and materials and had better utilized the remaining hours. This encouraged us to take another step.

There is probably no greater frustration than that caused by having too much to do and not time enough to do it properly. And when one's efforts have to be directed in a variety of fields the condition is aggravated. This has always been the plight of the dental student, at least at the University of Illinois. Forced to carry an array of science courses, he had his attention further diverted by the demands of a whole battery of technical courses. The combining of the technical courses had eliminated one source of irritation so that the student could concentrate his attention on one course at a time, but it was felt that he was still overloaded. We next turned to the sciences.

A meeting was called of all department heads responsible for the teaching of the medical sciences and the plight of the dental student was carefully explained to them. When they were told that during his first two years a younger student was being required to carry many more clock hours than an older student, they were impressed with the impossibility of a good performance and were anxious to correct the situation. I am sure they expected that the request would be for a lighter load for the dental student but this was not our intention. We merely asked that the load be redistributed in such a way that the dental student would carry only two sciences, at any one time. To this they readily agreed since it would not require any rearrangement of courses on their part, although some of them were frankly skeptical that the plan would work.

This skepticism was based on the fact that we were ignoring a dearly held tenet of most educators; namely, a strict ordering of the sequence of courses. It is apparent that arithmetic has to precede algebra and one could quote other examples of a similar dependence in the exact sciences. This concept has taken complete hold of educators in other fields and each attempts to place theoretical courses in what is called a logical order. The student cannot possibly study a given subject until he has studied the prerequisite courses. But early in our experiment; before the science departments were asked to cooperate, we had been forced to take a chance with the disturbance of sequence. It was necessary to give one class its course in physiology of the nervous system before it had taken neuroanatomy. Much to the surprise of all, this class scored as well as those that had been previously conditioned.

To give a concrete idea of the manner in which our curriculum has been altered I should like to outline it as it has been offered to our freshman class. During the first quarter this class took physiological chemistry and general histology. The latter was for the sole purpose of acquainting the student with the structure of tissues he would be studying in other courses. During the second quarter he continued his chemistry but dropped histology for gross anatomy. During the third quarter, having finished his chemistry, he started physiology and continued anatomy. Both of these courses will continue through the first quarter of the second year and in addition the student will take a course in neuroanatomy. This is the only quarter in which he has three science courses. Although the neuroanatomy is a demonstration course and requires compara-

tively few class hours, it has always been a terrible bugbear for both the medical and dental student. The work in anatomy during this quarter is head and neck, and in physiology the study of the nervous system. Hence the student will be studying neurology from three aspects simultaneously, and we think that this advantage should more than make up for the few additional clock hours and result in better preparation.

With the end of this quarter the student will have finished his year of anatomy but physiology extends for one more quarter during which he will go back to histology, this time to review general histology and to study the dental tissues. Histology extends through two quarters. Bacteriology begins after physiology ends and continues through the first quarter of the junior year. The student will study no pathology until the third year and no oral pathology until the third quarter of that year. During the entire fourth year he will carry a major in oral medicine.

Now for just a moment let us return to a consideration of the purely dental side of the student's training. We left him, you will remember, taking plaster impressions of his classmates at the end of the first quarter of the first year.

Beginning the second quarter the laboratory periods were devoted to an application of some of the technics the student had learned by introducing him to prosthetic procedures in the laboratory. After only a short period of training in such details as mounting casts, preparing base plates, bite-rims, and setting up teeth, he was assigned an edentulous patient and started true clinical work. And again his instructors were amazed because his performance was fully equal to or better than that of former junior students. At the same time, after preliminary lectures and demonstrations, he was back in the clinic cleaning his classmate's teeth, charting his mouth, and beginning to read x-rays. In the laboratory he was applying basic technics to the construction of various types of partial dentures. This completed his freshman year.

I shall not carry the description of his training further except to point out that the student does no cutting of dental tissues until he is a sophomore and he devotes much of this year to it. Toward the end of the year he starts his crown and bridge training which may continue into the junior year if necessary.

The objectives sought in this curriculum might be stated to be: 1. A more gradual development of the student's knowledge and background on the one hand and of his technical skill on the other. 2. A more even distribution of technical, clinical, and theoretical loads over the four years. 3. Better motivation toward learning by giving him early clinical experience. 4. Better-rounded courses through the cooperative efforts of all departments.

If the objection be raised that we have the cart before the horse and that we are being illogical in not giving all the basic science courses before we permit patient management, it should be pointed out that we are attacking this problem in the manner in which man has always solved his problems. He has proceeded from empiricism toward science. Experience first arouses his curiosity and then he tries to satisfy that curiosity. As he grows older he tends to forget this and he says to the young man, "do not do it the way I did it—do it the way I say to do it," never realizing that logic cannot of itself take the place of the motivation of curiosity.

Now since this is above all a scientific society I wish to point out that our experiment—although promising of results at present—is not controlled. In fact, I think it is safe to say that we are dealing with a loaded sample because our postwar classes are more mature and superior in scholarship. They would probably have performed better under the previous curriculum than classes that had gone before. Nevertheless, we think we detect an enthusiasm for dentistry

and even for its preparation that has been lacking in the past and we are confident that the experimenter is going to learn something even if the guinea pig doesn't.

It is time that dentistry learned that it cannot be dependent on medicine indefinitely—even for its examples. There are uneasy stirrings in medical education also and if changes come about, dentistry must be prepared to say something besides, "Me too," as it has so frequently done in the past. Our experience thus far leads us to believe that dental education lends itself to experimentation much more readily than does medical education. We shall be very foolish if, through adherence to a mass of traditions of questionable validity, we miss the opportunity to develop a program more suitable to our own needs.

II. INDEX OF PARTICIPANTS, AND SEQUENCE NUMERALS OF CORRESPONDING ABSTRACTS

Agnew, R. G., 105; Angell, R. C., 86; Armstrong, W. D., 4, 7; Arnold, F. A., 40; Asling, C. W., 106, 108; Avery, J. K., 35; Ayers, H. D., 97; Barnes, H., 51; Barr, J. H., 34; Bažant, V., 107; Becks, H., 19, 43, 56, 106, 108, 115; Bernier, J. L., 25, 109; Berry, H. M., 26; Berzinskas, V. J., 123; Best, R. C., 41; Bevelander, G., 39; Bhaskar, S. N., 75, 110; Bibby, B. G., 1; Binford, C., 67; Blayney, J. R., 3; Borovanský, V. I., 111, 112, 113; Boyd, J. D., 42; Boyd, T. M., 8; Bragiff, D. A., 74; Brashear, A. D., 57; Brines, O. A., 20; Brodie, A. G., 63; Brown, A., 88; Bruckner, R. J., 53; Caul, H. J., 90; Chapin, M. E., 114; Cheo, N. H. F., 29; Cheyne, V. D., 42, 79; Cohen, M. M., 14; Collins, D. A., 19, 56, 115; Coolidge, T. B., 30; Costich, E. R., 13; Craddock, F. W., 22; Cressen, J., 83; Crowell, W. S., 95; Dale, P. P., 23, 116; Dam, H., 121; Darley, H. P., 93; Davenport, R., 1; Deakins, M. L., 117; Degni, F., 87; De Jonge, T. E., 130; Dickson, G., 90, 99; Docking, A. R., 104; Dreisinger, F., 70; Edwards, L. F., 17; Emery, E. K., 5; Engel, M. B., 59, 63, 118; Ennever, J., 68; Evans, H. M., 19, 56, 106, 108, 115; Everett, F. G., 80, 81; Falkenheim, M., 5; Fischer, T. C., 101; Fitzhugh, O. G., 129; Fosdick, L. S., 9, 10, 37, 50, 51; Frisbie, H. E., 127; Gardner, D., 2; Gatz, A. T., 60; Glass, R. L., 64; Glasson, G. F., 102; Gilda, J. E., 49; Glavind, J., 121; Glickman, I., 52, 119; Goldberg, H. J. V., 49; Gorlin, R. J., 120; Gottlieb, B., 18; Granados, H., 121; Greep, R. O., 6; Griffiths, N. H. C., 91; Grunewald, A. H., 92; Gurney, B. F., 72, 122, 148; Hahn, W. E., 143, 147; Hampp, E. G., 78; Healy, H. J., 98; Hegre, E. S., 57; Hein, J. W., 70; Hess, W. C., 11; Hill, I. N., 3; Hill, R., 52; Hill, T. J., 36, 65; Hirshfeld, I., 44; Hirschfeld, L., 44; Hodge, H. C., 5; Howell, A. H., 85; Howell, S. R., 55, 123, 124; Hughes, G. A., 15; Hugill, R. A., 125; Hurme, V. O., 126; Hurst, V., 127; Irving, J. T., 128, 129; Jarabak, J. R., 45; Jelinek, O. E., 3; Jensen, A., 43; Johnson, P. L., 39; Karshan, M., 28, 74, 163; Keyes, P. H., 49, 77; Khenkenberg, E., 1; Kitchin, P. C., 17, 68; Kniesner, A. H., 65; Knighton, H. T., 66; Kostečka, F., 131; Kostlan, F., 132; Kostlan, J., 133; Langohr, J. L., 20; Leung, S. W., 47, 151; Levy, B. M., 73; Li, C. H., 106, 108; Liebig, E., 96; Likins, R. C., 40; Lindenbaum, A., 7; Losee, F. L., 11; Ludwick, W. E., 10, 37; Macdonald, J. B., 32; MacDowell, E. C., 75; Maloney, J. H., 80; Manly, R. S., 85, 134; Marshall, M. S., 127; Massler, M., 24, 32, 33; McCauley, H. B., 40; McCay, C. M., 124; McClure, F. J., 48; McRae, H., 154; Mézl, Z., 135, 136; Mitchell, D. F., 71, 137, 138, 151; Morse, A., 6; Moyers, R. E., 58; Muhler, J. C., 8; Muller, R., 88; Nelson, M., 56; Neuwirt, F., 139, 161, 162; Neuwirth, I., 140; Nuckolls, J., 127; Orban, B., 141, 142; Ostrom, C. A., 9; Paffenbarger, G. C., 92, 102; Page, J. C., 143; Parma, Č., 144, 145, 146; Pearlman, S., 41; Phillips, R. W., 98; Pollack, B. R., 147; Pollack, S. L., 147; Rapp, G. W., 54, 114, 122, 148; Restarski, J. S., 149; Richmond, J., 63; Roberts, F., 1; Robinson, H. B. G., 68; Roelstad, G. H., 21; Rynearson, B. E., 20; Savchuck, W., 4; Schlack, C. A., 55, 122, 124; Schoonover, I. C., 90, 92, 101; Schour, I., 29, 33, 60, 61, 62, 75, 110, 129; Schubert, J.,