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Kennedy (A. L.) *Ed. A. M. Linn. Soc. Med. D.*
with the author's regards

PRACTICAL CHEMISTRY,

A BRANCH OF

MEDICAL EDUCATION :

CONSIDERED IN A BRIEF LETTER TO HIS CLASS,

BY

✓
ALFRED L. KENNEDY, M. D.,

LECTURER IN THE PHILADELPHIA SCHOOL OF CHEMISTRY, EX-PROFESSOR
OF CHEMISTRY IN THE PHILADELPHIA COLLEGE OF MEDICINE, LATE
VICE PRESIDENT OF THE PARISIAN MEDICAL SOCIETY, ETC.

PHILADELPHIA :

B. MIFFLIN, PRINTER, 63 WALNUT STREET,
1852.

PHARMACEUTICAL CHEMISTRY

BY DR. J. H. COOPER

MEDICAL PHARMACOLOGY

[Faint, illegible text, likely bleed-through from the reverse side of the page]

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PRACTICAL CHEMISTRY

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CONSIDERED IN A BRIEF LETTER TO HIS CLASS

ALFRED A. KENNEDY, M.D.

LECTURE AT THE THIRDS SEMESTER OF CHEMISTRY, UNIVERSITY OF TORONTO
OF CHEMISTRY IN THE FACULTY OF MEDICINE, 1891
THE UNIVERSITY OF TORONTO, 1891

WILLIAM B. EYRE
D. Street, Toronto

1891

The aid of the Medical Press is invoked in favor of improved
Medical Education. Editors will please feel at perfect liberty
to copy any or all of the 'Letters'. They are especially referred
to the table page 5 & to the three methods of instruction page 7 & 8
seq.

LETTER.

LABORATORY, OFF TENTH ST. BELOW MARKET, }
Philadelphia, April 28th, 1852. }

GENTLEMEN :

The brief period devoted to Medical Study in our country, compels those on whom devolve the responsibilities of teachers, to confine themselves during the term, strictly to their didactic duty. Little time is afforded for the presentation and advocacy of those reasons, which create a preference for one or another classification or method of instruction. This is especially true of the practical and demonstrative courses upon which you have been in attendance; and hence, now that you have retired, some to the enjoyments of home, others to new and untried paths of labor, is the written word presented in continuation of the oral lesson. It is also deemed just, that you should possess, in tangible and permanent form, a brief statement of those causes, which have confirmed your correspondent in the views which led to the establishment of this Laboratory in 1849, then, for aught he knows to the contrary, the only institution in the United States, in which Medical Chemistry was taught practically and simultaneously to classes of students.

Moreover, the great and growing number of those who aspire to enter the medical profession, the glaring disparity existing between the curriculae of American and of European colleges, and a patriotic and professional pride in the elevation of the standard of education in the United States to an equality with the best abroad, have all tended to render the character, length, and proportion, of Medical Collegiate instruction most advantageous to the student; a theme of deep and exciting interest and controversy amongst us. In this discussion, whether conducted in County Societies or our National Association, no invidious distinctions have been drawn between the seven important accredited divisions of medical knowledge. This of itself is sufficient to deter

your correspondent from presenting here, the special claims which chemistry has upon the medical man at this era of the science—of the manner in which it is tending to render more exact and rational our notions of respiration, digestion, assimilation and other phenomena of life—if its revelations of the nature of abnormal retained or excreted bodies, both solid and fluid—and of its Pharmaceutical and Toxicological relations. Rather should medicine be regarded as a whole, so well-proportioned, that no abstraction of one part is possible, without destroying the harmony and stability of those remaining.

The science we profess naturally arranges itself under two heads—one, the study of Disease; the other, the study of Medical Natural History—including man as a part of creation, and the substances which act upon his organism. There are two sciences which claim the attention of students of either of the above divisions. These are Anatomy and Chemistry. The former by assent, ancient and honorable, regarded as the basis. The latter making such rapid advances, and so revealing the mysterious conditions of health, of disease, and of cure, as to be now worthy of a position equally responsible.

In Anatomy, despite well prepared lectures, and the aid afforded by the exhibition of plates, models, diagrams and dissections on the dead subject; all, it is notorious, will not suffice. The scalpel must be in the hand of the student, and he himself must carefully separate the tissues, display the muscles, and lay bare the deep-seated apparatus of life. Now Anatomy is a science, the acquisition of which depends mainly upon observation. Chemistry requires both observation and experiment. The appearances of a reagent, of a solution, and of the result of the combination, are acquired by the same mental process by which one obtains a knowledge of Anatomy—of the form, consistence and positions of the vessels of the human body. The forms, hues, manner of deposition and consistence of precipitates and sublimates, are various and multiplied, and their study alone requires the closest scrutiny. Superadd to this the many precautions to be taken in forming them, in the art of testing generally, and the weighty consequences which in pathological and especially medico-legal questions result from fallacy. Now a knowledge, neither of the appearances presented in the test tube, nor of the manner of producing these appearances, can be gained without repeated practice. This practice the present college courses, admirable illustrated and powerfully enforced though they be, cannot bestow. In Europe, where such courses are generally provided with more extensive and costly apparatus than with us, the idea of this sufficiency has been abandoned; and even at institu-

tions where Anatomy necessarily engages much of the attention, in addition to the duties of the chemical chair, the class is taught practically by a "Demonstrator of Chemistry." The following examples may be cited :

<i>Medical Boards.</i>	<i>Study of Practical Chemistry prescribed.</i>
Royal College of Surgeons, London,	6 Months,
" " Dublin,	6 " "
" " Edinburgh,	3 " "
University of Edinburgh,	3 " "
" Aberdeen,	3 " "
Faculty of Physicians & Surgeons, Glasgow,	3 " "
British Army,	6 " "
" Navy,	3 " "
La Faculté de Medicinede Paris,	3 " "

It would appear from a comparison of the above table with the annual announcements of our Colleges, that the best of them are behind some of the inferior institutions of Europe in the teaching of this branch.

The cause of the deficiency amongst us is probably owing, not to a lack of appreciation of the wants of the student, nor of indifference to its supply, but to an apprehension that Practical Chemistry cannot be taught, without monopolizing too many of the hours of attendance already allotted to other subjects. That this apprehension is not well founded, you are living witnesses.

The best schools of Chemistry are unquestionably in Germany.—They are generally large and expensive establishments, supported wholly or in part by government, with extensive ranges of buildings, furnaces and apparatus, involving an enormous outlay ; students enter them for one or more years, during which time leisure is seldom afforded for other studies. No regularly concerted nor uniform course of instruction is ordinarily adopted, but each student works independently of his neighbor, following frequently the bent of his own inclination, and merely calling upon the Principal for advice when a difficulty presents. Many who have studied in these schools have imbibed the notion, that Chemistry can be taught in no other way.—That in asserting the possibility of teaching it with success simultaneously and practically, to a class, we presuppose an equality of mental and manual aptitude, which does not exist—and that consequently the many would be wearied by a repetition rendered necessary by the

wants of those endowed with a less quick perception. These and many other objections would doubtless hold good, as regards the processes, tedious and intricate, of quantitative analysis, especially where atomic weights are to be determined; but they cannot be allowed to obtain against teaching testing, or qualitative analysis—an act, as you know, generally finished before the glass has left the hand of the experimenter—nor against the performance and examination of the processes of Pneumatic Chemistry.

With the quantity of time usually included in the terms of Medical Colleges in America, the whole question of the possibility of teaching Practical Chemistry *at all*, rests upon the possibility of teaching it simultaneously—meaning, of course, by the word simultaneously, the performance of the same process by a class within the same reasonably short space of time.

In order that your correspondent be not accused of speaking unadvisedly on the subject, it may not be improper to state that, from the time of his entrance, as assistant to the Professor, into the Laboratory of "Pennsylvania Medical College," under its original organization in 1839, until his resignation of the Professorship of Chemistry in the "Philadelphia College of Medicine," and establishment of this School of Chemistry in 1849, he had been engaged during each returning season, either directly or indirectly, in teaching Chemistry to Medical Students. He certainly had time enough, during the period of ten years, to know the chemical wants of that class, and held positions favorable to the determination of the exact value of the usual oral instruction, and exhibited illustrations. Since he has ceased his connection with a College, he has proved (and you have witnessed) the possibility and practicability, of effecting the proposed reform in the methods of Germany, by teaching—within a period not exceeding one half the shortest single medical collegiate term, and without serious inroad into hours already appropriated—manipulations, medico-legal-testing, the determination of the purity of medicinal salts, and the reactions of all the important acids and bases, organic and inorganic. During his absence in Europe, he examined the facilities for instruction, and the means employed in the principal Colleges of Great Britain & Ireland, of Germany; and also in "L'Ecole de Medicine," at Paris. At some future time he will have the honor of laying before you, more in extenso, the result of his examination; at present he is unwilling to trespass upon your attention further, than is necessary to the briefest possible elucidation of *three* methods of teaching, believing that such information will prove advantageous by directing many able

minds to the subject, and thus eventually leading to the maturing of what is now evidently in its infancy.

I. L'ECOLE DE MEDICINE, *Paris*.—Four years' attendance upon Lectures and Hospitals, and the degrees of Bachelor of Letters and of Bachelor of Sciences, are required by the French regulations before one can attain to the honors of the Doctorate in Medicine. The two series of College courses are delivered during ten months of the year. September and October are vacation. During these and the preceding August, three months in all, Laboratory duty is performed by the students of the *first year*. This duty is rendered obligatory at that time by laws regulating the subjects of the first examination, which takes place in November of the commencement of the second scholastic year. Of the merits of the regimen of the great Parisian School, this is not the place to speak. It has so few points of resemblance with our own, as to be almost incapable of application. In the Laboratory, the classes of say twenty students each, are taught about three hours of the day. The subjects for practice are indicated in advance, by the Demonstrator, and he or his aid remains in the apartment to give advice when required. The method, with slight modification, is the German one, applied to the exigencies of the medical student, and sufficient time is taken to admit of its successful prosecution. Such, however, could not be done under existing regulations in the United States.

II. UNIVERSITY OF EDINBURGH.—After the Medical Schools of Paris and Vienna, that of Edinburgh probably enjoys the highest reputation for thorough and efficient teaching. It may therefore be regarded as a most favorable type of British colleges. Professor Gregory who fills the chair of Chemistry, is known to be one of the chief ornaments of the science which he teaches, and the present condition and wants of which he, by travel, acquirements, and correspondence, understands fully. His laboratory is well arranged and furnished, and the collection, especially of specimens in organic Chemistry is rich and varied. Moreover his classes in practical Chemistry have been successively continued for a number of years and their utility and popularity are acknowledged. His method therefore bespeaks for itself an exalted interest.

To Mr. Kempt the efficient Demonstrator of Chemistry in the University, is confided the special charge of these classes, subject to the superintendence of the Professor. There are generally five classes during the year, each consisting of about twenty students, who thus

devote one hour, on three alternate days or evenings of the week for a period of three months. In teaching, the class is divided between two of the laboratory tables, where each finds himself provided with small apparatus, necessary for the performance of the processes. The demonstrator being so placed as to overlook both tables and to be seen from them, commences by a description of the general characters of the substance which has been selected for the lesson; which for example may be supposed to be *chlorine*. Its general properties, and the methods of generating it are first described. One method, for reasons given, is preferred, and each student finds himself provided with materials for performing it. The generation is commenced simultaneously by the class; they apply heat, collect and transfer the gas, test its bleaching, disinfecting, corroding and distinguishing properties; the appearances being alluded to by the demonstrator and questions asked by the students. The compounds of chlorine with hydrogen and oxygen are generated and examined in the same manner. Should any process be tedious it is commenced before the class assemble, they set others in action and thus study the beginning and the end. Should expensive substances be required, one or two of the manipulators are selected from each table, to perform the experiment, and thus by slight modifications of the plan, which suggest themselves to every physician, the course is conducted. The fee for each student is three guineas, which covers all expenses.

It must be evident to all readers of the above, that to teach practically the nature and reactions of the non-metallic elements alone in the excellent manner of Prof. Gregory, would require nearly the entire period of three months, and such is found to be the case. The bases and metallic poisons, which are certainly of paramount importance to the physician, are of necessity either entirely neglected, or their reactions dismissed hurriedly by the demonstrator. The method however is as applicable to the salts as to the non-metallic substances, and commends itself strongly wherever students have the time to devote to its prosecution. One hour every other evening during six months, or its equivalent in three months would probably render the course all that could be desired.

III. PHILADELPHIA SCHOOL OF CHEMISTRY.

The plan you have pursued at this school differs from that of either of the institutions above mentioned. The laboratory, being arranged with tables after the manner of a dissecting room; with a table opposite to each window, the *piers* containing the tests, reagents, and smaller vessels of glass, allotted to each table respectively. Here the

course of instruction lasts two months, thrice a week, and is given in the evening. Four distinct classes may therefore pursue the study during the winter session of the colleges. You have considered the non-metallic elements, and all the organic and inorganic acids and bases interesting to the physician—a prominence having been given to the study of poisons and of the falsifications of medicines. The instruction of the evening being commenced with a lecture of an hour, in which the experiments are performed by the lecturer in the immediate presence of the class; at the close of the lecture each section of five repairs to its appropriate table, where with apparatus at hand, each of the members repeats, and varies at pleasure, the experiments he has just witnessed. From three-fourths of an hour to an hour and a-half have usually been spent in this exercise, the lecturer being referred to if a difficulty present, and the students retiring when they become satisfied of their proficiency. In this medical qualitative analysis, your progress has been tested once or twice a week by means of unlabelled bottles, containing the substances which have been considered during the preceding lectures, and which you have determined by the use of reagents already known. The number of these unlabelled bottles, accumulating each week at length reaches to fifty or more, which you have been enabled readily to discover and name by the knowledge of testing you have acquired.

A comparison instituted between the methods pursued at Edinburgh and at Philadelphia, shows that while at the former three months are devoted to the study, at the latter two months are so employed; but as the duration of each lesson at the latter is double that at the former, the entire time spent at Edinburgh is to the entire period at Philadelphia as 3 is to 4. Now if as would appear from the nature of the courses, the number of subjects considered at the latter is twice that of the former, the advantage is decidedly with the American Institution.

The advantages of Laboratory instruction to the medical student are in Europe practically recognized and are made a requisite to graduation, and the time has unquestionably arrived when a working laboratory should be found by the side of the dissecting rooms, connected with every Medical College.

It is gratifying to know that the reform has already commenced, and that in the comparatively brief period which has elapsed since

the organization of this school, a Medical college in a sister city,* awake to the vital importance of the measure, has added a working laboratory for practitioners and students, to the former means of instruction. The popularity of this step has, as was predicted, been thus early shown in the increased interest manifested in the study of this difficult branch.

One experiment personally and critically performed, frequently illustrates not only an entire class of reactions, but also a complex theory, the comprehension of which has been long and tediously delayed. The first obstacles scaled, the student views more clearly, the next before him, and flushed with recent victory, presses forward with redoubled zeal and energy to new conquests.

Finally. Your correspondent after a careful and impartial comparison of European colleges with our own, knows no requisite to graduation (save hospital attendance) in which we are so deficient as in that of Chemistry. How much of that ~~difficulty~~ has arisen from a want of practical skill on the part of those who have held the position of chemical professors, it would be out of place here to inquire. Unfortunately, the general ignorance of this science in other walks of life, creates a more absolute reliance upon the physician, and compels a more frequent reference to him. Verily, in no other enlightened land, is so much required of the practitioner, as in ours. Especially in rural districts, is his head supposed to be a treasury of all knowledge, and many and varied are the drafts upon him—be it in the examination of a pustule or a mineral—in tasting a porridge, or testing a medicinal spring—in a case of labor or one of suspected poisoning. Should he not honor his clients drafts at sight, alas, for the reputation of our village Doctor!

Jealousy of innovation, which, properly maintained is the safeguard of Medical teaching, as it is of Medical practice, will demand much proof before any change is determined on. This we must always be prepared to furnish. Jealousy of dictation which is characteristic of our people, actuates also our profession, and however earnestly the introducer of any salutary measure, may advocate it, unless the mass which surround him and who have witnessed his success, second his appeal, it falls unheeded on the public ear. To you then, who have enjoyed and acknowledged the value of laboratory practice, will the profession look for testimony in its favor.

Let us then continue earnestly and respectfully to call the atten-

* New York Medical College.

tion of professors, laity and students, to the exalted position which Chemistry occupies among her sister sciences, and to the imperative necessity of studying it both *theoretically and practically*, if one would grasp and retain its great teachings. In things commercial, American earnest energy is universally acknowledged; but the sneering expression is still not unfrequently heard on the continent of Europe *L'Amérique n'est pas grand chose en rapport avec la science*. Let us prove this destitute of even seeming foundation, by the most thorough cultivation of that, which is emphatically the leading science of the nineteenth century.

Accept gentlemen, the best wishes for your continued happiness and prosperity from your friend and servant,

ALFRED L. KENNEDY, M. D.

PHILADELPHIA SCHOOL OF CHEMISTRY,

Rear of the University, Entrance Boyds' Avenue, upper side of St. Stephen's Church, Tenth St. below Market.

The entire upper floor of the building sixty feet in length, is devoted to the purposes of this Institution.

The Laboratory is well lighted and ventilated, and contains a full assortment of carefully selected, pure chemical tests and re-agents; also apparatus of approved European model and construction, whereby the most delicate analytical processes may be performed, and the student be made acquainted with the best methods.

The Laboratory will be open for instruction throughout the year, the usual summer vacation during July and August excepted. Gentlemen may enter for the year, quarter or month, daily or tri-weekly, during the whole or part of the day—and pursue chemistry, practically in its connection with medicine, agriculture or the arts.

Terms for every day in the week \$20 per month in advance.

The Evening course of Lectures on Analytic Chemistry in connection with Laboratory practice, designed for Students in Medicine or Pharmacy, commence about the 1st of November.

The most approved German and French processes are therein taught and illustrated by Lecture. These are repeated immediately thereafter by the Student himself in the Laboratory. The object of this combined instruction is to furnish the same facilities for the study of Chemistry, that the Dissecting Rooms afford for the prosecution of Anatomy. The class is divided into sections, to each is allotted a table, and an abundant supply of Tests, Reagents, Apparatus, &c.

By this method, students are enabled to acquire a practical familiarity with Manipulations, the Incompatibilities of Medicines, the means of detecting the presence of Poisons, &c.

Tickets for the course (exclusive of breakage) \$10 00.

No charge for Chemical Apparatus, or materials employed.

Apply either at the Laboratory, or at the office of

ALFRED L. KENNEDY, M. D.

No. 238 South Tenth Street.

PHILADELPHIA, April, 1852.