but I should like to enter a plea for the recognition of opportunity for reasonable treatment of the gifted student commensurate with his exceptional powers; and one of the conditions for achievement is leisure and the privilege of working at your own pace.

To the now traditional practice of allowing excess registration in proportion to quality of credit should be added the proviso that an excess schedule must include an honor course each year, and general health and social orientation should be taken into account. If this is done, the student may combine the saving of time with the winning of distinction—a type of distinction which has real value. A flexible scale of excess registration may then safely have such range that the very gifted student could complete the college course in three years if he so desired.

Comradeship. The first and greatest need of the gifted student is comradeship or fellowship in the late adolescent pursuit of his ideal if it be the search for truth. Each of us who has had any degree of success in original work can look back to little incidents where a teacher or a more advanced fellow student conveyed the sentiment; you are good enough to be in my company; see with me this vision; share with me this harvest; let us seek truth first hand; I want you to fall in love with my problem; over the mountain top there is light. This can not be achieved through any formal academic procedure. Probably less than one fourth of the college teachers in the United States are capable of participating in this privilege, and yet the principle needs to be urged upon the academic community in order that those who have this interest at heart may not trust the machinery to do what it can not do; may not underestimate the great significance of little things in this direction, or may not in the interest of modesty or academic courtesy hesitate to exercise this privilege. It is a personal affair and must therefore take the course of natural, personal values, privileges, and rewards, given freely for the love of it, living for it as a father lives for his son.

For this reason, formal academic privileges and procedures can not be prescribed or even enumerated. Comradeship must be personal and warm, involving privilege. But the outward organizations must not be ignored. Invitation to the home; participation in small groups, clubs, and societies; the enjoyment of special laboratory and library privileges; the exemption from hampering formalities; the encouragement of rewards of all kinds; the stimulation of competition; the organization of rigorous academic wrangling and criticism; the participation in the reading of manuscripts, the conduct of experiments, scientific expeditions, and learned societies. These things are all of very great value to the student who has been taken into comradeship for research as a neophyte. They come to him because he has been admitted to comradeship and in return he gives his best.

He needs counsel to curb his enthusiasms, to acquire fundamental habits and knowledge, to lay good foundations through training in the fundamentals, to fit himself into the social body in which he lives, to care for his health and manners, to seek reasonable outlet for his ingenuity, to keep from being a hermit or a prig, to keep in the humble attitude of a master who is not puffed up over his achievement.

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WHAT SHALL BE TAUGHT IN THE FIRST YEAR OF COLLEGE CHEMISTRY?[1]

THERE is much uncertainty among college chemists as to the proper treatment of freshmen, some of whom had chemistry in high school, while some did not. With a class not exceeding one hundred and a somewhat limited teaching staff, there is no better method than to put them all in the same class with the same text. No apology need be offered for such a procedure. In such small classes the teacher can keep in close touch with the individual student and vary the program to suit individual possibilities. This is especially easy in the laboratory drill where the experiments may be

[1] Paper presented at the Pittsburgh meeting of the American Chemical Society.

selected to fit the student's preparation and ability.

In larger institutions, it is more satisfactory to group those with no previous training in a separate class. It is to be hoped they had high school physics as a scientific foundation. General chemistry for such a class should be just what the name implies—a general treatment including traditional descriptive chemistry, physical, industrial, organic, analytical and something of the historical development. Above all, even above the accumulation of facts, this course should give training in real scientific thinking.

This seems like a large undertaking, but it merely means that we take the student up on a high mountain and show him the promised land. The fact that the majority of this class will never study any more chemistry is added reason for a proper breadth of treatment.

The problem is more difficult for students who may possibly feel satisfied with their knowledge of high school chemistry. They enter college to be stimulated and it is fatal to let them feel that college general chemistry has but little in the way of novelty for them. Hence I counsel against a mere hasty review for one semester by way of transition to some advanced course. Such "rush" courses are deadly, dull and unsatisfactory to teacher and pupil. Nothing short of a full year of rather stiff general chemistry will serve the needs of this class and it can be taught with all the freshness needed to whet jaded intellectual appetites.

The high school course was good discipline. It furnished much useful information and inspired the student with a liking for chemistry. It is no reflection on high school teaching to insist that under no circumstances shall a year of college general chemistry be omitted. The explanation is found in the immaturity of the student, the high school environment and the lack of time given to the course.

The college course must cover again the same ground—and much more. It need not, however, be a dull rehash. The broader general chemistry in college must present more fundamental views. Much more of physical chemistry, more exact quantitative experiments, and a glimpse of the newer developments such as radioactivity, atomic structure and colloids are a proper part of such a course. A very simple but reasonably complete system of qualitative analysis may well be used as the laboratory drill during the second semester. This teaches system, classification and comparison. The student greatly enjoys his quest of the unknown and sees a definite use for a somewhat confusing array of facts he may have accumulated. That majority who never take advanced chemistry have a right to the joys and benefits of qualitative analysis.

During this difficult freshman year the old facts of high school chemistry must be dealt with in an interpretative spirit. When taken behind the scenes, so to speak, the student sees a new meaning in the subject. There is small doubt that unless all that has gone before, more or less loosely held in mind, is worked over into a solid foundation the student is chemically crippled for life. A certain amount of forceful repetition is the essence of good teaching. Even in the second, third and fourth years, we all find it profitable to repeat and expand what was presented in the freshman year of general chemistry. This makes the thorough chemist.

It may be well to mention a number of specific topics to be stressed for the class.

The historical development of the system of molecular and atomic weights is far more convincing to the student than a mere statement of the system as it now is. In fact a little of the historical introduction to many topics interests the class and develops the research attitude of mind. It may seem absolutely ridiculous to talk of research on the part of a freshman, yet clever questioning as the steps of a historical piece of research are discussed will do much in stimulating the student into a research attitude of mind.

Structural formulas appal the class on first sight. Later familiarity breeds, not contempt, but appreciation. The usual confusion of formulas of nitrogen, arsenic, antimony and phosphorus compounds is easily cleared up by

constant use of structural formulas. With such practise the study of two chapters of organic chemistry is not appalling.

A library shelf, easily accessible and especially selected for students of general chemistry, pays goods dividends. Other texts, books on the applications and special advertising pamphlets should fill this shelf. Not all will read but those who do are the ones who take advanced chemistry.

Stress must be placed on equilibrium, early and late, on solutions, on that fascinating chapter about the periodic system, on the hydrocarbons and their derivations and such other topics as appeal strongly to the teacher.

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An informal talk with each student or a written test on entrance will indicate that some who have had high school chemistry will do better in the class with those who had none. Since high schools vary widely in quality of instruction in chemistry (as do colleges also) the mere name of preparatory chemistry should not be accepted without some investigation. Usually the record of the school is sufficient evidence.

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ON THE EXISTENCE OF A HITHERTO UNRECOGNIZED DIETARY FACTOR ESSENTIAL FOR REPRODUCTION[1]

THE fact has been abundantly demonstrated that rats may be reared on a dietary regime consisting of "purified" protein, fat and carbohydrate to which an appropriate salt mixture and adequate doses of the growth vitamines Fat Soluble A and Water Soluble B have been added. We have employed a ration of casein (18), cornstarch (54) and lard (15) to which butterfat (9) and salts (4) are added, the animals receiving separately and daily .4 gram each of dried whole yeast.

Such animals are sterile. They are chiefly so in the first generation and wholly so in the next succeeding one. The sterility of dietary origin yields a highly characteristic picture. Animals suffering from it do not differ so profoundly from normal ones in their ovarian function as they do in placental behavior. Approximately the same number of Graafian follicles mature and rupture per ovulation and the ova are fertilized and implanted. The placentæ are abnormal. They may persist almost throughout gestation but show as early as the second day of their establishment beginning blood extravasations which increase in extent. Resorption invariably overtakes the products of conception.

Natural foodstuffs contain a substance, *X*, which prevents such a sterility or which cures the disorder occasioned by the purified dietary regime. We have thus been able to witness a comparatively sudden restoration of fertility to animals of proven sterility, and whose controls continued sterile, by the administration of fresh green leaves of lettuce. Even the dried leaves of alfalfa appear to possess a similar potency. The proven efficacy of leaves invites inquiry into the certainty of segregation of the new dietary factor from vitamines A and C. As regards A, it is conceivable that amounts of A adequate for normal growth, freedom from eye disease and, indeed, vigorous health might still be inadequate for the reproductive function. Such a conception is apparently strengthened by the reappearance of fertility which we have discovered to take place when the butterfat quota in the above diet is increased so as to constitute 24 per cent. by weight.[2] A sufficient answer to this conception, however, is afforded by our demonstration that in some dietaries reproduction may be unhindered when the A content is lower than in

[1] University of California, aided by the Dairy Division of the Bureau of Animal Industry of the United States Department of Agriculture, the Committee for Research on Sex Problems of the National Research Council and the California Central Creameries. The writers desire also to express their especial thanks to Mr. C. E. Gray, of San Francisco, and Dr. C. W. Larson, of Washington.

[2] Drummond (*Biochem. Jour.*, xiii, 77) has, for instance, reported two generations of animals reared on 20 per cent. butter in this diet.