

SEX-INSTRUCTION AS THE CORE OF A
HIGH SCHOOL BIOLOGY COURSE

by

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I. THE PROBLEM OF SEX-INSTRUCTION

Some one has suggested that there can be no permanent solution to any important problem in a changing environment. It is obvious that many problems do not "stay answered." Often, in the past, problems that had been "settled forever" have risen again within only a few years for another solution, to be subjected once more to a round of argument and debate. In fact, problems, even problems of vital import, are not "settled" but are merely "tabled" indefinitely. Life is, therefore, always in the experimental stage in regard to some problem or other. A notable example of a "life-experiment" is found in connection with the problem of sex-instruction in the schools to-day.

The problem of sex-instruction in the high school, the phase with which this thesis deals, involves three questions or sub-problems, as follows: (1) Shall such instruction be given? Obviously, if the correct answer to this question were negative, the second and third inquiries would not arise and there would be no place for this thesis. Believing, however, that the correct answer has already been found to be in the affirmative, the two remaining sub-problems, the ones involved in this thesis, are: (2) What facts concerning sex shall be taught in the high school? (3) How shall these facts be best presented?

There are, however, still extant some arguments against giving sex-instruction to youth in the high school, or at any

stage in the schools, that it might be well to review. Those adhering to the negative view assert that such instruction is attended with grave dangers. For example, it is said that the beginning of such instruction to be of value in preventing mistakes must be given to the children at such an early age that they are too immature to understand what it is about and will, therefore, gain erroneous impressions. In replying one must at least admit that the facts to be presented must be adapted to the age and development of the child. Another danger, according to some, is due to the previous false notions of sex and wrong attitudes due to unwholesome sources of information. This is really an argument favoring sex-instruction, for it has been shown that even late instruction from approved sources is beneficial. "Better late than never." It has also been advanced that sex-instruction will set children to thinking about personal conditions and functions which ought to be avoided, and thus establish a neurosis. It will, indeed, require much tact and skill on the part of the teacher to deal successfully with the nervous and supersensitive child. There is need for caution. Again, it has been pointed out that there is the danger of the unfortunate reaction of parents and community due to false ideas. This is a powerful argument in favor of giving the instruction that the parents of the future may be free from such erroneous notions. Finally, there is the danger of the teacher's lack of preparation for this delicate task. The only answer is that there can be and must be adequate preparation on the part of the teacher, for this important task of training both the parents

and teacher's of the future.

On the other hand, there are several positive arguments favoring the giving of sex-instruction in the schools. A profound ignorance concerning sex, one of the most vital of subjects, prevails not only among the untrained, but even among those who have been through the schools. Ignorance is the prolific source of error in any field. It is claimed by those who favor sex-instruction, that enlightenment in these matters will reduce error to a minimum. In other fields there is no resistance to enlightenment. Why should there be in this particular field? Instruction from wholesome sources, even when coming late, has proved to be helpful as will be seen from certain studies, discussed later. The restless energy of "flaming youth" as revealed by an impetuous attitude toward mystery and adventure needs direction and control. It is believed that wholesome knowledges will aid in this respect. Parents and teachers alike have evaded the question,--there has been a "conspiracy of silence" in matters of sex. There is much evidence that this method has not been successful. The prevalence of venereal diseases demands attention. According to records 50% of all young men become infected. This is doubtless due to ignorance and false attitudes. There is a crying need for enlightenment.

From the above it would seem that the weight of argument is in favor of sex-instruction in the schools. There should be wholesome instruction in matters pertaining to sex. That this is the concensus of expert thought is shown later in dealing with the

evolution of opinion. But one does not need to be an expert to discern that it has not paid to thus leave youth to drift in ignorance of the physical and biological laws involved in their very being and in the existence of the race, to see that all is not right with the world in matters of sex, that there has been error somewhere. It is obvious to every thoughtful mind that the "silent treatment" experiment has failed. Sub-problem (1) has, therefore, been definitely answered affirmatively.

But even before sub-problem (1) has been solved to the complete satisfaction of all, a new experiment or project is well under way. A program of sex-instruction, though still in the experimental stage, has been formulated and is being "tried out" in various schools over the country. The new problem is: "What facts concerning sex shall be taught in the high school?" The new hypothesis is that a thorough education in the biologic and sociologic facts concerning sex will remedy or even prevent many of the errors and ills pertaining thereto. In the light of that hypothesis this thesis offers the course of study included herein. It deals with the human organism as to its past, present and future. A good slogan and one in keeping with the spirit of this study is that old dictum of one of the wise men of Greece: "Know thyself." That the youth may be the better enabled to take an inventory of himself he must learn his place in nature. Hence in this program he is to be given a somewhat detailed knowledge of the plant and animal kingdoms and as clear a concept as possible of himself as the climax of a long process of evolution. Teachers of biology have long been derelict to duty and have in the past permitted children to

pass through grades and high school without making any serious study of the tremendous mass of evidence upon which this fundamental generalization is based, this fact of evolution which is one of the foundation stones for any adequate study of sex and

ERRATUM:

Line 8, between the words "inheritance" and "If" insert the sentence: If Nature and Time have "loaded the dice" unfavorably for him, he is to be apprised of it that he may the more successfully cope with the handicap.

virtue of which he is an important living link between the past and the future of the race. An attempt is to be made to answer the question as to how he can best adapt himself in these matters to the society in the midst of which he is to live and work.

And then, what is perhaps of the greatest importance of all, he is to be taught that a share of the responsibility for the highest welfare of the society of the future devolves upon him, that his attitudes, choices and endeavors are important factors in the progress of the race. For, as a thoughtful modern writer has pointed out with much reason on his side, eugenical truth is probably the highest truth to which it is possible for the human species to attain.

Concerning sub-problem (3), the problem of the method involved in teaching such a biology course as herein advocated to children of the high school, suffice it to say that it is

pass through grades and high school without making any serious study of the tremendous mass of evidence upon which this fundamental generalization is based, this fact of evolution which is one of the foundation stones for any adequate study of sex and sex phenomena. We must now make up for this deficiency in past instruction, fearlessly face the facts, trust and teach the truth. The youth must be informed as to what assets and liabilities are his because of his inheritance. If Nature and Time have dealt very leniently with him, he is to learn of that also, that he may the more intelligently cooperate with them for his own highest possible good and that of his posterity.

In the study of sex, the youth is to receive instruction further, as to the structures and functions of his own body, by virtue of which he is an important living link between the past and the future of the race. An attempt is to be made to answer the question as to how he can best adapt himself in these matters to the society in the midst of which he is to live and work.

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basically, the problem involved in teaching any high school science. It is the problem of teaching so as to yield such desirable outcomes as valuable knowledge, skill in meeting and solving worth-while problems, and a wholesome attitude toward the subject involved and toward life. It must be taught so as to "appetize the intelligence," intellectualize the emotions and rationalize the behavior of the individual. It has been the experience of the writer during twenty-four years of teaching in high school and college, that the "laboratory method" is preeminently the method to be preferred in teaching the sciences. It is the method advocated in this thesis. Firsthand contacts with biological materials are to be secured as far as is practicable, generalizations are to be made and these are later to be applied in the solution of the practical problems that arise in daily affairs.

With reference to sex-instruction there is the additional problem of presenting the biological material in such a way as to form a natural approach to the subject of sex, and arouse a healthy interest in the subject free from the morbid curiosity that becomes the precursor of neuroses. Direct observation of sex-phenomena in lower forms of plant and animal life, the use of biologic terms, the formation of biologic concepts and generalizations that the pupil will later find are just as fundamental in his own life as in the life of the earthworm or other forms studied,--these are natural steps in the approach to the direct study of sex and sex-phenomena in human life, and form a logical foundation upon which to build a rational sex-hygiene.

Finally, whatever the material used or the method of instruction employed, the work must be planned and executed in such a way that the pupil is led to think adequately for himself, to correctly evaluate the meaning and importance of his own emotions, and to willingly assume responsibility for his own deeds. The incentive to right action must not be some external factor or combination of factors, but must come from within. It is not enough that one be "a good citizen" though that is much. The key-note of modern education as sounded by leading educators to-day, is that, in whatsoever field it may invade, it must produce a thoughtful, self-controlled and self-reliant citizenry.

II. EVOLUTION OF OPINION

Few subjects, perhaps, have undergone so complete a reversal of opinion during the course of only a few years' evolution as has the subject of sex instruction. This change has been from a flat, outspoken denial that young people should be given any explanation whatsoever in matters pertaining to sex, to the belief that the subject should be fully and frankly discussed with them, not only by the parent in the privacy of the home, but in the schoolroom with the youth in the midst of his fellows; and that the instruction should include not merely a few hygienic rules given casually and with an assumed air of disinterestedness on the part of the parent or instructor, but that there should be an intelligent, thorough and purposive presentation of the biological foundation upon which is to be built a somewhat detailed course of direct sex instruction. To the end that this evolution may be made clear the following excerpts from outstanding pronouncements upon the subject are given herewith.

Walter M. Gallichan¹, tells us as follows:

"Fifty years ago (1871) sexual conduct when taught at all, was inculcated by moral maxims alone. Parents counselled chastity and left the rest to 'natural instinct' without suspecting that instinct is not a guide to social behavior. The primary aim was the preservation of "innocence" in the

¹Walter M. Gallichan, A Textbook of Sex Education (Boston: Small, Maynard & Co., 1921), Preface

young by a compulsory ignorance. In my youth we were told that the wonders of reproduction were improper subjects of inquiry. Our eager, normal curiosity was hushed but not stifled. The mysteries grew enormously, and occupied the mind with futile bewilderment and speculation. Enlightenment was entirely banned in the home. We learned the sacred truths at haphazard, casually, furtively, and in the process we drank from poisoned wells and our souls sickened."

That such a policy as above outlined obtained not only among parents but among professionally trained men as well is shown by the following quotations from a famous medical doctor, as late as 1894. Dr. Alexander J. C. Skene, M. D.², Professor of Gynecology in the Long Island College Hospital of Brooklyn, New York, speaking of the mental education of girls at puberty, said:

"To teach anatomy and physiology to young girls is baneful.

"What a mistaken idea to direct children's attention to the structure of their bodies and to the functions of organs! Of course, all should as early as possible know how important--and why--a clean person, good and pure air, the relations between rest and sleep, exercise and how to take it, and should, above all, be taught how to obtain these and also the necessities of life. A full knowledge of hygiene, so far as it is related to one's requirements of life and health and to one's relations to the world around, should be included in the education of every girl. It is only when investigation is carried beyond this by

²Dr. Alexander J. C. Skene, Medical Gynecology (New York: D. Appleton & Co., 1895), p. 33, 34.

directing the attention to the personal anatomy and physiology, that the mind is liable to become perverted. A little learning in anatomy and physiology is truly a dangerous thing. The heart will not do its duty more faithfully nor will the stomach digest food better, because the one who possesses them knows all about their structure and functions. On the contrary, either of these organs may be greatly disturbed by thinking about them-----

"To study the structures and functions of one's own body is a kind of vivisection which is nearly always followed by bad results-----This road to ruin is, alas! often opened by the physician himself, who lays too much stress on every trivial symptom, and talks too much in the presence of the girl-----

"Next to the doctor in the order of mischief-makers----- is the intelligent mother who has had lessons in physiology. Such a one usually injures her own children and those of her neighbors who come within reach of her amateur teaching of the laws of life-----How much wiser it would be to have a child obey the laws of health because its parents directed it to do so! -----At first it is absurd to 'appeal ever to their reason'."

Let us turn at once to a recent statement, that of the Archbishop of Canterbury³ at a meeting of the London Diocesan Council for Rescue Work held at the Mansion House, April 4, 1930:

"I would rather have all the risks which come from free discussion of sex than the great risks we run by a conspiracy

³Helena Wright, The Sex Factor in Marriage (New York: The Vanguard Press, 1930), Preface.

of silence.....I notice how silence has given place to complete and free discussion. In my judgment this is a great improvement. In the old days silence drove one of the necessarily natural instincts within. Nowadays people recognize sex as one of the great fundamental questions of society, and all thoughtful Christians and citizens ought to take their part in discussing the great problems with which it deals..... We want to liberate the sex impulse from the impression that it is always to be surrounded by negative warnings and restraints, and to place it among the great creative and formative things."

Even a more recent expression occurs in Mary Ware Dennett's⁴ "The Sex Education of Children" published in 1931:

"One of the first great steps which the rank and file of parents and teachers are taking or are getting ready to take, is to give honest, factual information about sex, as fast as children's natural curiosity makes them want it.....The old disgrace of omitting the sex-organs from school physiologies is being corrected....."

".....Sex facts are part of sex education, and an imperatively necessary part....."

".....(The facts of) sex should be taught with the same directness and freedom from emotion with which one teaches geography."

Between these two extremes of opinion and practice there are sixty years of evolution. It is not our purpose to trace step

⁴Mary Ware Dennett, The Sex Education of Children (New York: The Vanguard Press, 1931), pp. 43,44,142.

by step this change of thought in regard to the teaching of sex matters to young people. It does seem desirable, however, to state some of the opinions, expert or otherwise, that have been expressed in order that we may learn what is the concensus of thought on this important subject.

Havelock Ellis⁵, writing in 1900, says: "I regard sex as the central problem of life.....the question stands before the coming generations as the chief problem for solution. Sex lies at the root of life, and we can never learn to reverence life until we know how to understand sex....."

"For the most part, sexual instruction, as at present understood, is purely negative, a mere string of thou-shalt-nots....."

"We need education from the earliest years in all those matters of sex which all need to know, and such education must not be mere instruction but a slow training of emotions and ideas in the face of the real facts of life. We need sound economic conditions and wholesome surroundings, so that none needs be forced on downward paths. We need to cultivate the sense of responsibility and the power of self-control.....Along these lines we may hope to make it easier for both sexes alike to attain the power of self-protection amid the inevitable risks of life."

Royal S. Copeland⁶ in an introduction to Elizabeth Hamilton Muncie's "Four Epochs of Life", 1910, says: "It is a lamentable fact that ignorance is permitted to abound regarding the most

⁵Havelock Ellis, Studies in the Psychology of Sex (Philadelphia: F. A. Davis Co., 1922), Vol. I, p vi; Vol. VI, p. 517.

⁶Elizabeth Hamilton Muncie, Four Epochs of Life (Brooklyn; N. Y.: Published by the Author, 1910) p. V.

important facts of life. A certain prudishness wrongly called modesty has prevented the discussion of the problems of creation." The author⁷, herself, hopes that her book shall "have a part in arousing public opinion to the point of demanding sex teaching in our schools, by legislative enactment, if need be....."

Edward Carpenter⁸, in the prefatory note to his "Love's Coming of Age, a Series of Papers on the Relations of the Sexes," writes in 1911:

"When I first wrote this book some fifteen years ago, it was refused in succession by five or six well-known London publishers; and ultimately I had to print it at my own expense. Such was the taboo then prevailing on matters of sex. To-day, however, the book is translated into many European languages, and in Germany has reached its fourteenth or fifteenth edition. And to-day people are beginning to see that a decent and straightforward discussion of sex-questions is not only permissible, but is quite necessary, if ever we are to have a better order in this department of human life."

The late Edward Bok⁹, in a foreword to Mrs. Woodallen Chapman's "How Shall I Tell My Child?" says in 1912: "The majority of parents have felt that a child must be 'told nothing'

⁷Same as number 6, p. XIV.

⁸Edward Carpenter, Love's Coming-of-Age (New York & London: Mitchell Kennerly, 1911), Prefatory note, p. 5.

⁹Mrs. Woodallen Chapman, How Shall I Tell My Child? (London & Edinburgh: Fleming H. Revell Co., 1912), p. 7.

about itself, and for years a deplorable policy of silence has held sway until we are now beginning to realize how unwise it has been and how children have been allowed to go out into the world with their eyes closed, resulting all too often in their own sorrow and to the lasting after-regret of the parents.

"This point of view has changed marvellously during the last five years, and the order of the day is now distinctly towards the wise enlightenment of the child."

Mrs. Woodallen Chapmen¹⁰ in the book above cited writes:

"They (the children) must develop, must step out into the world. It is our duty to give them a protection which they can take with them wherever they go....."

"Surely nothing better can be found for this purpose than a right understanding of the truth....."

"It is because there has been no definite instruction along these lines that human beings have for so many generations followed their impulses in these matters instead of living a life of self-control."

That the subject is not yet wholly free from the old taboo is indicated by the caution of Ralph W. Pringle¹¹ in "Adolescence and High-School Problems," 1922. In chapter eighteen, dealing with 'Sex Education', he points out that "The subject....."

¹⁰Same as number 9, pp. 13, 16.

¹¹Ralph W. Pringle, Adolescence and High School Problems (Boston, New York, Chicago: D. C. Heath & Co., 1922), pp. 317, 318, 319, 320-1.

is both difficult and delicate--difficult because it deals with matters concerning which there is at present considerable difference of opinion, and delicate because the propagation of wrong ideas in this field involves consequences momentous in their bearing on both individual and social life. In fact the whole movement of sex education has been seriously questioned.....

"There are grave dangers involved in teaching young people all the facts they need to guide them safely through the strong and choppy currents of adolescence.....

"The dangers and difficulties incident to sex instruction are not likely to appear if the emphasis is continually placed on the natural, positive, health-producing, soul-inspiring life-processes involved in the maturing of sex; that is, fixing and maintaining the proper viewpoint will do much toward insuring success; for nearly all the troubles and dangers incident to sex development are due to false perspectives.....

"Very important, also, to the success of the instruction in matters of sex is the method of approach; it is vital that the subject, as well as all the important facts involved, should be given its true scientific setting.....The scientific approach and setting for all constructive sex education are naturally supplied by the biological sciences..... a complete course in biology logically includes a study of reproduction."

The conclusions of Dr. Herman N. Bundesen¹², M. D., former

¹²Dr. Herman N. Bundesen, Everybody's Problem (Chicago: Chicago School of Sanitary Instruction, 1924, a pamphlet), pp. 27, 28, 31.

Commissioner of Health in Chicago, as given in a bulletin addressed to parents in 1924, contrasts strongly with those of Dr. Skene quoted earlier:

"A campaign of Education will break down the conspiracy of silence sponsored by prudery and the public will most surely respond as soon as the facts are known.....

"Expose the facts to the cleansing light of universal knowledge.....

"Teach the fundamental facts of life to very young children in such a manner that unhealthy curiosity and morbid imaginings are prevented.

"Give special instruction to your children as they enter their teens, in the nature and the widespread existence of venereal diseases and their consequences. This part of training should be supplemental, of course, to the moral teaching of earlier years upon which character is built.....

"Mere laws cannot create morality; force does not create righteousness. These qualities come from within, from the soul and from the enlightened mind."

A Health Circular issued by the Indiana State Board of Health¹³, of which the author and date are not given, treats the subject as follows:

"Young men are taught in school the physiology of the brain, heart, lungs, stomach, and other vital organs. Why should such instruction cease when it comes to the most important function

¹³Indiana State Board of Health, Hygiene vs. The Sexual Plagues, (Indianapolis: Ind. St. Bd. of Health), p. 4.

of the body,--that of reproduction on which depends the perpetuation of the species? The health of the reproductive organs also has an important effect on the other organs of the individual. Is it not social stupidity to insist on the education of young men in arithmetic, geography, grammar, and in other branches which fit them for business life, and at the same time deny them proper knowledge of a function, the impairment of which constitutes a most destructive assault upon their physical and mental capacity, and unfits them for success?.....

"If the subject is too 'delicate' for you to discuss in your home life, if your 'moral susceptibilities' will not permit you to establish such a confidential relation with your son, why not dispose of the matter in a sensible way and turn the problem over to the school educators? They stand ready and willing to give such instruction as soon as you say the word. Since a young man must learn of his sex nature sometime, which is better for him--the wholesome and noble truths of science and morality, or misleading, degrading street or 'curbstone' information that to-day often constitutes his sole knowledge?..... Ignorance is always a curse and knowledge a blessing."

In 1924, Conigsby Dawson¹⁴ believed that the day of silence was past: "I shouldn't call it a loss of delicacy. I should call it a loss of prudishness. The lid is off false reticences. I hope it stays off. We shall be a much honester world."

¹⁴Wm. Leland Stowell, M. D., Sex for Parents and Teachers (New York: Macmillan Co., 1924), Conigsby Dawson quoted.

Winifred Richmond¹⁵ in 1925 suggested that "The time to begin sex instruction is when the child first asks questions, and whatever the manner of its presentation she is entitled to the truth and not to fairy tales.....harm.....results from false and ignorant attitudes toward sex.....in the majority of cases adolescence is too late."

Albert E. Wiggam¹⁶ in 1927 offers his opinion that "Eugenical truth is the highest truth men will ever know."

Margaret Sanger¹⁷ in 1927 states that ".....ignorance of sex is one of the strongest forces that send young girls and young boys into unclean living....."

"This together with the knowledge of the rapidly increasing spread of venereal diseases and the realization of their subtle nature has awakened us to the need of a saner and healthier attitude on the sex subject, and to the importance of sex education for boys and girls.

"This need has shown itself so clearly that the question no longer seems to be, 'Is there a need of instruction?' but, 'Who shall instruct?' 'Shall the mother or teacher instruct?' 'When shall such instruction be given?' 'In childhood, or in puberty?'the mother is the logical person to teach the child as soon as questions arise....."

¹⁵Winifred Richmond, The Adolescent Girl, (New York: Macmillan Co., 1925), pp. 186, 193.

¹⁶Albert E. Wiggam, The Next Age of Man (Indianapolis: Bobbs-Merrill Co., 1927), Introduction.

¹⁷Margaret Sanger, What Every Boy and Girl Should Know (New York: Brentano's, 1927), p. 17-19.

"If the mother can impress the child with the beauty and wonder and sacredness of the sex functions, she has taught it the first lesson, and the teacher can elaborate on these teachings as the child advances. All schools should teach anatomy of the sex organs and their physiology, instead of treating the human body in the neuter gender as has been done up to this timeIt is right to give the facts as science has found them."

Reasons for a belief in sex education are given by Sherwood Eddy¹⁸ in 1928:

"We are confronted with two alternatives: either we must continue an evasive silence concerning sex or we must adopt a sane policy of sex education. Among the reasons for a belief in sex education, which seem to be reinforced by experience, might be mentioned the following:

1. Widespread ignorance concerning the subject of sex has resulted in disastrous consequences for many.....
2. Unwholesome sources of information seem to be a practical certainty for all uninstructed youth, however shielded they may be.....
3. Habits, early formed, affect health and character.....
4. The dangers from wide prevalence of venereal diseases and of commercial prostitution, the numbers of unmarried mothers and illegitimate children, the prevalence of illicit relations between the unmarried, the number of criminal abortions annually

¹⁸Sherwood Eddy, Sex and Youth (Garden City, N. Y. , Doubleday, Doran & Co., 1928), Foreword, p. V, VI, pp. 33-38.

performed in this country, all indicate that youth should not be left to drift in ignorance amid these dangers....."

Speaking of his own experience as a boy, Mr. Eddy says:

"During all these formative years no parent, no teacher, no pastor, no doctor, and no older friends gave us the information which we needed. Our education was left to delinquent boys, and they did not neglect it".....He further states: "It is our conviction that information and instruction should be given appropriate to the need of each age and condition, in the home, the school, the college, before and after marriage, and for parents in the training of their children. Sex instruction is a main part of education throughout the whole of life." And in the foreword he says: "The subject can no longer be ignored by anyone dealing with students.....The subject has too long been neglected and left under a taboo of silence with serious results.....there is need to-day, not of the old appeal to fear, not of ignorance, silence or superstition, but of scientific information applied by rational intelligence."

Dr. G. Stanley Hall¹⁹ also relates his boyhood experience: "My entire youth, from six to eighteen, was made miserable from lack of knowledge that anyone who knew anything of the nature of puberty might have given. This long sense of defect, dread of operation, shame and worry has left an indelible mark."

In an attempt to learn whether sex instruction should be

¹⁹G. Stanley Hall, Life and Confessions of a Psychologist (Quoted in Wm. Gallichan, Seel) pp. 5, 6.

provided for the young, Dr. M. J. Exner²⁰ submitted a questionnaire to college men. From the study of 948 answers to this questionnaire he found that 91.5% received their first permanent impressions from unwholesome sources, while only 4% had received their first sex information from parents. Seventy-nine per cent stated that their early sex information was harmful while only 8.8% declared it to be beneficial. Ninety per cent of 751 men said that the influence of later sex information received from authoritative sources was beneficial, and only 1.2% claimed that it was harmful.

Among other conclusions Dr. Exner draws the following:

1. Practically all children gather sex information at an early age and the interpretation they put upon it is a powerful factor in influencing their attitudes and character throughout life.
2. Under the policy of silence and neglect the sex information often comes to the children from questionable sources and in an atmosphere that gives a "morbid twist and a vicious direction to the sex instinct."
3. Such results can in large measure be forestalled and prevented only by proper, timely and progressive education from wholesome sources.
4. "Sex education in home, school, college, church, etc., is entirely feasible, and it is not so extremely delicate and difficult a matter as many have feared it to be.....The

²⁰Dr. M. J. Exner, Problems and Principles of Sex Education (New York: Association Press, 1915).

danger of unfortunate results, while real, is very largely exaggerated. With reasonably sane and wise procedure good results will follow."

5. Sex education "should become a natural and consistent part of the general life training and educational program of the home, school, church, college and university."

Edgar F. Van Buskirk and Edna J. Van Buskirk²¹ in 1920-21 sent over one thousand questionnaires concerning sex instruction mostly to educators. Of these, 298 were filled out and returned. In addition 200 letters in lieu of questionnaires were received. Almost all of the letters were from educators who are strongly in favor of a conservative school program of sex education. Only 6 expressed disapproval or doubt regarding the advisability of using such methods of procedure as are presupposed by the questionnaire, provided that adequately prepared teachers are available.

Of the questionnaires returned 185 were sent by men and 113 by women, most of whom were educators, altho there are included 36 doctors and 6 nurses. The answers are from people living in 35 states and one from the Philippine Islands. Summaries follow:

In 122 high schools sex instruction was given. In 95 of these it was given as a part of a standard course and in 27 as a special course.

In 36 out of 94 high schools, it was given as a part of the biology course.

In 16 high schools out of 68 it had thus been given as a part

²¹ Edgar F. and Edna J. Van Buskirk, Report of a Questionnaire Upon Sex Education (Cincinnati: Cincinnati Social Hygiene Society, 1922)

of the biology course for 10 years; in 22 schools for 5-10 years; in 21 schools for 2-5 years, and in 4 schools for 2 years or less, while 5 schools were unclassified.

Twenty educators had been giving this instruction in sex for less than one year, while 5 had been giving it for 30 years or more. Forty years was the longest period cited.

The total number of pupils in high school courses receiving such instruction was 146, 981.

The content of the courses of study included such topics as reproduction in lower forms of life, elementary facts of human reproductive organs, changes at puberty, effects of "self-abuse," venereal diseases, dress and manners, the home and family life, moral standards and conduct, plant and animal breeding, prenatal care, care of the baby, and eugenics.

In high school, other topics of discussion were: chivalry, infant welfare work, heredity, environment, parasitism, public hygiene, development of self-control, exercise and recreation as aids to moral living, internal secretions, prostitution, physical condition, mental hygiene, and sex as a means of evolving a perfect human mechanism.

Of 253 answers concerning the reaction of the pupils, 245 returned the verdict, "favorable."

In regard to the reaction of parents, 105 out of 125 were entirely favorable with 20 not entirely favorable.

As to method, the number of times each of the following answers was checked is given below:

Informal talk or lecture method,	252
Individual conference,	156
Recitations,	126

Pamphlets,	136
Exhibits,	2
Films,	7
Charts,	1
Slides, pictures or exhibits,	2

Concerning specific instances of the reaction of pupils, supervisory officials, parents, and general public, 64 reported they could give specific instances, and 7 reported they could not give such instances. One high school teacher in a large city said, "In 9 years of work we have never yet had one objection from a parent."

In 1920 a study of the status of sex education in the 3- and 4-year high schools of the United States was made by the U. S. Public Health Service and the U. S. Bureau of Education²². Subsequent to that study there was so much evidence of increased activity along that line of instruction in schools that it seemed wise to extend the study "for the purpose of making available to all high schools the best of educational experience in sex education, setting forth the progress that has been made in presenting the facts as an integral part of certain curriculum subjects, and noting the extent to which there is conscious guidance of the sex-social attitudes and conduct of high-school pupils."

Accordingly, in March, 1927, a questionnaire was sent by the U. S. Public Health Service and U. S. Bureau of Education to the 16,937 principals of Senior high schools of the United States inquiring as to the content of certain health, science and other courses. Of these, 5,745 or 34% were returned.

²²Lida J. Usilton and Newell W. Edson, Status of Sex Education in the Senior High Schools of the United States in 1927 (Washington: United States Government Printing Office, 1928)

There were 4 major sections of the questionnaires:

1. The extent to which certain health and science courses were taught, as biology, zoology, botany, general science, physiology, hygiene, physical education, social studies, psychology, and home economics.

2. The effort that was being made to interpret through such courses those phases of sex education intended to prepare the student more fully for the individual and social problems of life.

3. The type of supplementary methods being used in and out of class-room to help the student understand the control of and to give healthy expressions to emotions.

4. The opinion of the principal as to the need of sex education in the high school to-day.

A summary of the findings almost verbatim are given herewith:

Integrated sex education, i.e., sex education included as an integral part of usual health and science courses, has grown in every part of the United States since 1920.

Returns seem to show that the special lecture method as a means of sex education is losing ground and giving way to the more systematic teaching by the regular classroom instructor.

A greater percentage of large schools were taking advantage of the opportunity to thus integrate sex education with other courses. Eugenics and heredity were the topics most frequently integrated in the regular courses. Reproduction ranked second, and the significance of seminal emissions, menstruation and internal secretions was taught the least of any of the phases of sex education.

Supplemental means, as books, pamphlets and exhibits were used in about one-tenth of the high schools reporting.

Physical examinations were being given to all students in 35% of the schools reporting, and individual conferences, as a result of the findings on examination, were held with the students in 22% of the schools reporting physical examinations.

From one-sixth to one-half the schools reporting were trying to help students to understand and control the emotions, to give them healthy expression, and to guide the relationships between boys and girls. A definite need for sex instruction was indicated by the principals of 67% of the schools reporting. Some stated that the work being undertaken was giving satisfactory results and that appreciation of the work was being expressed by students, school board, parents, or the general public.

This brief resume of the evolution of opinion may well be closed with Professor Maurice A. Bigelow's²³ summary of his view on the subject, as given in his "Sex Education":

"There are eight important sex problems of our times that offer reasons or arguments for sex instruction, because ignorance plays a large part in each problem. 1. Many people, especially in youth, need hygienic knowledge concerning sexual processes as they affect personal health. 2. There is an alarming amount of the dangerous social diseases which are distributed chiefly by the sexual promiscuity or immorality of many men. 3. The uncontrolled sexual

²³M. A. Bigelow, Sex Education (New York: Macmillan Co., 1920), pp. 33, 34.

passions of men have led to enormous development of organized and commercial prostitution. 4. There are living to-day tens of thousands of unmarried mothers and illegitimate children, the result of the common sexual irresponsibility of men and the ignorance of women. 5. There is need of more general following of a definite moral standard regarding sexual relationships. 6. There is a prevailing unwholesome attitude of mind concerning all sexual processes. 7. There is very general misunderstanding of sexual life as related to healthy and happy marriage. 8. There is need of eugenic responsibility for sexual actions that concern future generations."

While the statements of opinions, beliefs and findings given above come from a somewhat meager and random sampling of the voluminous literature on the subject, it is believed to be more or less representative of the thought of the country at large. The expressions are from medical doctors, teachers, social workers, government research workers, and writers on sex subjects. It is not difficult to see, as far as these statements go, that the concensus of opinion is in favor of sex instruction in the schools, and that the movement toward such instruction is an accelerated one, constantly gathering in momentum, so that, as one of the authors above quoted says, the question has ceased to be, "Shall such instruction be given?", but is rather, "How shall the work of giving such instruction be best accomplished?"

III. DEFINITIONS AND OBJECTIVES

The above study of the opinions of representative thinkers on the subject of sex instruction, together with such concrete evidences as are brought out by Dr. Exner's²⁴ investigations, studies of the U. S. Bureau of Education and Public Health Service²⁵, findings of the Cincinnati Social Hygiene Society²⁶, and records of juvenile delinquency and crime as manifested in the daily newspapers of the country, leave no doubt that the subject is to-day one of utmost interest and consequence. The demand for such instruction is too great to be disregarded, and, indeed, it is not being disregarded. Teachers of elementary grades, of high schools and colleges, especially in science subjects, have accepted the challenge in the situation and have responded by incorporating such studies into their curricula. The pioneer work in such a "crusade" has already been done. It remains but to extend and intensify the work thus undertaken and to continue the search for better and more efficient methods. It is the purpose of this thesis merely to propose, as one way of treating the subject, the organization and method that the writer has used for a number of years in teaching biology in the ninth grade.

Sex may be defined as a natural dimorphic condition in organic beings, which makes possible the improvement of a species by the introduction and development of favorable variations within its

²⁴Dr. M. J. Exner, op. cit.

²⁵U. S. Bureau of Education and Public Health Service, op. cit.

²⁶Cincinnati Social Hygiene Society, op. cit.

boundaries through the union of two dissimilar special cells called "gametes".

Education, to paraphrase a modern definition given by Lewis M. Terman²⁷, is the purposive "making of changes in Human Nature."

Sex education has been defined, its general aim stated, and its place in the curriculum pointed out by Dr. Maurice A. Bigelow²⁸ as follows: "Sex education, in its largest sense includes all scientific, ethical, social and religious instruction and influences which directly or indirectly may help young people to prepare to solve for themselves the problems of sex that inevitably come in some form into the life of every normal human individual..... If such instruction and influence are to be effective in helping to shape conduct in accordance with normal and wholesome attitudes and ideals about sex and the relationships between the sexes, then it must be made a natural part of the educational program." Mr. E. F. Van Buskirk²⁹ makes a similar statement of the definition and aim as follows: "Sex education includes all that instruction, training and experience which in any way leads to the making of healthier, fuller and happier adjustments of the sex impulse in one's life, first to other phases of individual development, --spiritual, mental and physical--and secondly to the lives of others." He further believes that the study of sex as a phase of biology should help the child to understand that reproduction is

²⁷Edward M. East and others, Biology in Human Affairs (New York: McGraw-Hill Book Co., 1931), p. 95.

²⁸Maurice A. Bigelow, op. cit., p. 1.

²⁹E. F. Van Buskirk, op. cit.,

one of several natural life-activities, give him knowledge of the great laws of nature concerned with the unity and continuity of life, and teach him that reproduction involves the use of a great creative force, the conservation of which calls for certain very definite responsibilities. He adds: "If such study is properly conducted it will possess ethical and emotional as well as intellectual value."

While the writer of this thesis does not presume to attempt any improvement upon these statements he adds his own for the sake of emphasis.

By sex education is meant the inculcation of the known body of biological and sociological facts and principles concerning sex, to the end that the pupil may obtain a definite understanding and an accurate evaluation of his own place and that of others in regard to sex, strongly sense with reference to sex his own responsibility as a member of society, and choose to conduct himself, in matters pertaining to sex, in accordance with those ideals and regulations of society that by long experience have been found to be of the highest value to the race.

The ultimate aim of education according to Terman's definition, already given, is the making of changes in Human Nature, an objective that means much more than the mere making of changes in the behavior of the individual. However, the usual statement of the objectives of education consists in the enumeration of the seven primary ones as suggested by the Committee on the Re-organization of Science³⁰, as follows: health, worthy home-membership, vocation,

³⁰Committee on Reorganization of Science, Bull. #26, (Washington: Government Printing Office, 1920).

citizenship, worthy use of leisure, ethical character-building, and command of the fundamental processes. The first six of these, as named above, are especially applicable to any science. The objectives of science education may be re-stated as below:

1. Knowledges leading to the understanding of the facts and principles concerning self and others and the common environment of all.
2. Adaptability of the individual to life-situations involving problems and the necessity for their satisfactory solution.
3. Skills contributing to the efficient performance of one's reasonable share of the world's work.
4. Intelligent interests and altruistic motives contributing to one's highest success as a citizen of the world.
5. Attitudes due to a correct evaluation of the relative importance of self, a proper appreciation and regard for one's fellow-men, and a wholesome outlook upon life.
6. Ideals of character leading to the formation and practice of such habits of life as contribute to the highest welfare of self and society.

The specific objectives of sex education are either restatements or sub-objectives of those above given and will be stated together with the writer's reasons for adhering to the method of treatment suggested in this thesis.

We are here considering the study of the human body as the "cap-sheaf" of all biological studies since the human being stands at the summit of the evolutionary "climb". One might re-state that the ultimate aim of biological instruction is to teach the human organism how to live to the highest advantage. All other objectives

are but subsidiary and contributory to this aim and every detail of the study would contribute in some measure to one or more of these objectives. And since the dominant theme of all biological studies has been for many years, and still is, evolution, it would seem logical that any sex instruction that might be given should be given in the light of this fundamental principle of the science.

The twin essentials of the Darwinian explanation of evolution are the organic relationship of all living things and their descent from simpler and more generalized forms. Hence the study of the lower animals as well as of plant life gives a background for the proper evaluation of one's own structures and habits. It is of value in understanding the real meaning of sex in one's own life to study the origin of sex and sex impulses in lower forms and the dependence of sex functions upon sex structures. It would seem, therefore, to be a matter of fundamental importance in such studies to devote some time to the evolution of sex and sex phenomena instead of detaching these topics from their biological setting. It is a method of giving the youth of to-day an opportunity to take an inventory of himself, that he may better understand his own life, become able to discriminate between desirable and undesirable capacities in his make-up, and to foster, encourage and develop what desirable traits he may possess, while "nipping in the bud" the undesirable ones.

That this is not a theory hastily invented "out of chaos and Old Night" is attested by the fact that it has been recognized as a sound educational practice by writers of to-day even in other

fields of study. For example, H. G. Wells³¹ in "The Salvaging of Civilization" says: "I can not think of an education as even half done until there has been a fairly sound review of the whole of the known past, from the beginnings of the geological record up to our own time. Until that is done the child has not been placed in the world. He is incapable of understanding his relationship to and his rôle in the scheme of things. He is--whatever else he may have learned--essentially an ignorant person." Lillian Eichler's "Customs of Mankind" is based wholly upon the idea that our modern beliefs and customs have evolved from man's first and uncertain grasp of biological principles.

In such a series of studies as that herein advocated, one is not merely studying the past but the present as well, in as much as the present epitomizes within itself the whole of the past, known and unknown. Such a study of the past should give one a good perspective view of life in which the details of the present will assume a clearer definition. When the youth in his honest attempt to unriddle some of the secrets of his existence thus obtains an inkling of the trend of forces that have brought him to his present high estate, and learns that although such tremendous forces lie behind him, he still is not a mere puppet, but that his own life may be purposive, and that his own intents and purposes may be joined to and correlated with the great forces to which he owes his very existence, it is believed that such knowledge will contribute in some

³¹H. G. Wells, The Salvaging of Civilization, (New York: Macmillan Co., 1921)

measure to a dynamic sense of responsibility, that it will furnish him with a strong incentive to conserve his powers and improve his capacities. It would seem to be a rational faith that such knowledge will equip him with a sound basis for a sane morality and for a safe and sensible philosophy of life.

The tremendous influence of heredity is no longer questioned. Studies in this subject have revealed that much of what goes to make up the sum of life has been brought with the individual from the Past. At the moment of conception "the gate of gifts is closed."³² These "gifts" include, first of all, the body itself--it is a human body because of its inheritance. Sex, stature, posture and complexion; color of hair and eyes; facial contour or angle; facial expression or "looks"; bodily expression, brain-size, voice, endurance and longevity--all of these physical characteristics are gifts from a long line of ancestry. Intelligence; such mental capacities as judgment, imagination, reasoning; mathematical capacity, and artistic talents, say for music, painting or sculpture;--these and many other mental traits are in the original inheritance. By training, many capacities, of which only the merest rudiments must certainly exist in the original, may be brought forth or developed--as gentleness, sympathy, morality, honesty, truthfulness, tolerance, sincerity and patience. It is, indeed, a tremendous inheritance that the individual brings with him into the world. Small wonder is it that Goethe³³ inquired concerning an individual, "What is there left to call originality?" Should the pupil not be informed of such an

³²Jordan & Kellogg, Evolution and Animal Life, (D. Appleton & Co., 1922), pp. 165, 166.

³³Jordan & Kellogg, op. cit. Quoted from Bayard Taylor's translation, p. 163.

inheritance?.

But there is even a stronger motive for such a presentation as is here being proposed--one that results from the nature of the human organism itself. Man has been likened to a machine, a physico-chemical machine, that does what it does because it is what it is and where it is. Behavior, or conduct, according to this view, is dependent upon the postures and actions of the skeletal-muscular system. External and internal stimuli impinge upon the human body and the resulting response is determined by the structures and functions of the body and depends upon it for its existence. According to John Dewey³⁴, "bodily habits do our thinking." Someone has said that Psyche does not regulate Homo, but that the structures of Homo determine the kind of action. Even his choices are not entirely free, if the experimental psychologist³⁵ is to be believed. Bones can withstand only so much strain; muscles can lift only so much weight, nerve fibers function only in accordance with the all-or-none principle. The performance of every tissue, organ and system is limited by the very nature of the structures concerned, and is further limited by the structure and functions of the regulating mechanism. It is said, and upon good authority, that the endocrine glands hold the "biochemic secret" of longevity and the intensity

³⁴John Dewey, Human Nature and Conduct (New York: Holt & Co., 1922), p. 37.

³⁵E. L. Thorndike, The Original Nature of Man (New York: in Educational Psychology, Vol. I, Teachers College, Columbia University, 1913), p. 174.

of life, determine in large measure whether one is active or inert, intelligent or unintelligent, successful or unsuccessful, and are a powerful factor in all of our physical and mental characteristics. The thyroid influences the rate of metabolism and development, the tiny parathyroids regulate the calcium content of the blood--a very important function--, the adrenals furnish us with "nerve" to meet emergencies, the pituitary body is much concerned with our stature, the pineal gland regulates and controls the development of children, and the gonads have to do, obviously, not only with the welfare of the individual, but with a matter of even greater importance,--the perpetuation of the race.

The writer believes that it is to the youth's interest that he learn to what extent he is thus limited and bounded by the external factors of time, place, and surrounding circumstances; and to what extent he may, through his choices, aid in freeing the race to which he belongs from abject bondage to these forces. It is not merely a matter of his own health and happiness but the concern of his posterity as well, for if the future parent be taught, he in turn becomes a factor in the teaching of his children, and the effects are cumulative as the generations pass. Then will Terman's aim of education which reaches beyond the improvement of the individual be realized, for it is in the influencing of the youth in his choices that the teacher becomes a eugenical factor of incalculable importance.

In view of these facts and faiths this thesis proposes not only that sex instruction be given as an integral part of the work in biology, but that it be made the "core" or "heart" of the course

around which all other phases of the biological studies are grouped; and that it be taught in an unobtrusive way as a natural and highly important phase of the evolution of the individual pupil himself and of the race that he represents, to the end that both the individual and the race may be improved.

METHOD AND PROCEDURES

The laboratory (elaboratory) method, that method by means of which the student under guidance "works out" or produces, and improves or refines some result, effect or achievement through his own labor and study, needs no defense. It might well be called the "natural method" of teaching (or learning) because the student comes into direct contact with actual materials and concrete situations much as he does in real life and thus has an opportunity to do some independent thinking and to find out some things for himself. In the teaching of biology the writer has used this method for several years, and has found the work interesting to the pupils (and, therefore, easily motivated), inexpensive when the results of the work are taken into account, and reasonably successful.

Since it is natural that pupils of the ninth grade are more interested in living plants and animals in their native haunts than in dead or preserved specimens from a collection, the field-trip or "exploring expedition" is one of the most effective kinds of the laboratory type of "lesson", if one may still use that obsolescent term. Ideally, there should be a directed or supervised study of living things in the field or woods, along the stream or on the hill, observations made, notes written, discussions begun, photographs taken of habitats and of interesting phases of plant and animal life, and collections of specimens made to be studied later in the laboratory, classified, labelled and added to the school museum.

In lieu of the field-trip, if for any reason such treatment as here suggested is not feasible, the next best thing is the laboratory study of specimens, living or dead, brought in by pupil or teacher, preferably the former. For the study of structures in detail or for experimental work dealing with materials and apparatus the laboratory lesson of the individual type finds its highest value. Usually the pupil is given some guiding suggestions for the study and is then permitted to try out his own mental powers in the solution of problems that may arise as the result of his study. A notebook or record of all the work is kept by the pupil. A newer term for this type of lesson is "Supervised Study". It is a kind of "initiatory degree" in a new subject.

The conference or discussion type of lesson logically follows the laboratory lesson. The aim of the conference is to give the pupils an opportunity to compare their experiences in open discussion. From such a comparison of their findings and conclusions derived from the preceding laboratory study a definite and acceptable conclusion may become the common property of all. In this free-for-all discussion some member of the class may act as leader and the role of the teacher may well be that of advisor or "referee" as well as a representative of "authority".

The demonstration-conference lesson, often erroneously called the "lecture-demonstration", is a form of the laboratory lesson. It, too, has as its aim to provide the pupils with personal experiences, but it differs from the

individual laboratory lesson in that it is a collective study of materials or phenomena, accompanied by a comparison of these experiences, and in that it offers some incentive to quick thinking on the part of the pupil and gives training in extemporaneous expression. In procedure, the attention of the entire class is focused upon the materials or phenomena as exhibited by a "demonstrator", who may be either the teacher or a pupil, and the teacher is again the representative of "authority". This type of lesson has been used by the writer much more frequently and, perhaps, more effectively than the lecture-demonstration.

A fourth type of lesson that is much used in science-teaching and especially in biology is the picture-conference, the aim of which is to provide the pupils with vicarious experience through the medium of pictures, with opportunity for thought and expression. In procedure, pictures, usually in the form of lantern-slides, are exhibited in lieu of actual objects, with free discussion of the same as in previous types.

In the project lesson or series of lessons the aim is to provide the pupils with the experience of applying the understandings derived from previous experiences to the solution of some practical problem connected with the work in hand. As to procedure, some task, (if a self-imposed one, the better), is undertaken by the pupil, who plans the work, invents his own devices in the performance of the same, and carries the task to a successful conclusion,--in fact, it is a bit of elementary "research" work.

The usual reading, review, drill, test and other types of procedure need no discussion in this connection.

A general outline of the study of plants and animals is given below, followed by the detailed study of a one-celled plant and of a one-celled animal, as illustrations of the methods and procedures discussed above.

A. General Outline for the Study of Plants and Animals

I. Field Studies:

1. Habitat
2. Obvious activities, structures and adaptations
3. Photography of significant scenes
4. Collection of specimens

II. Laboratory Studies:

Investigation of life-activities,--experimental if feasible and considered worthwhile.

Self-maintenance processes:

Respiration--circulation

Movements

Food-taking

Digestion--circulation

Growth

Regulation and control

Excretion

Race-maintenance process:

Reproduction

More or less detailed study of external and internal structures, including diagramming and sketching the same.

III. Conference Topics:

Findings of field and laboratory studies and their significances

Phenomena peculiar to particular form being studied:

Unique characters in activities or structures

Biological principles involved in life history

Place in the scale of evolution

Family relationships

Ecological importance

Additional topics suggested by the teacher

IV. Readings:

Assignments from texts and various references after the above studies have been made.

V. Deskwork:

Carefully organized and written record of each of above-mentioned studies.

Carefully organized and written resumé of knowledges obtained from the above studies, as life-history

Special reports and tests

Preservation, labelling and arrangement of collected specimens.

Detailed Study of a One-celled Plant

Pleurococcus or "Wall-Stain"

I. Field Study:

1. With the aid of the teacher find several places in which the "Wall-Stain" grows. Make a list of the different kinds of situations in which it is found. Does it seem to be a very common plant? With reference to water supply what kind of a situation is each of those in your list? Which does it seem to prefer? Give reasons for your answer.

Visit in both dry and damp weather and observe if there be any difference in the appearance of the "Wall-Stain". Account for this.

If found on trees does it seem to prefer one kind of tree more than another? How indicated?

2. Select some one situation in which it is found and describe the character of its growth. Does it present a thin layer and a smooth, even surface, or is it a thick growth with clumps here and there? Is it loosely attached to the substratum, (the surface upon which it grows), or does it adhere tightly?

With reference to the four cardinal points, on which side of the object does it grow best? How do you account for this fact?

With a hand-lens decide whether "Wall-Stain" is a large or a small plant. What means of anchorage has it?

What is its color? Of what significance is this?

3. Make a photograph of the "Wall-Stain" in situ from as close a point of view as your camera will permit. The picture you obtain will need to be tinted with an appropriate water-color to show the position of the "Wall-Stain".
4. Collect several specimens from various situations together with bits of the substrata and take to the laboratory for further study.

II. Laboratory Study:

1. Place specimens obtained on the field-trip in glass jars with covers, moisten and set in a warm but shady place. Observe several times per day to see if they seem to be thriving. Is there any indication of any growth or movement?
2. Make the following experiment to determine whether there is any sign of respiration in the "Wall-Stain".

Place some of the specimens in a dish with a small uncovered watch-glass containing clear lime-water, cover with a bell-jar and set in a warm, light situation, but not in direct sunlight. In a similar manner arrange another dish, watch-glass with lime-water, and bell-jar, but without any "Wall-Stain", and set this beside the first. After twenty-four hours observe the lime-water in the two watch-glasses. Is there any difference? What does this indicate? (Refer to study of respiration in your General Science Notebook of last year).

3. From the color of the "Wall-Stain" what power would you suspect it to have? Verify this by means of the starch test, using some specimens that have been in the light all day and from which the chlorophyll has been removed by alcohol. (Refer to your General Science Notebook). What is your finding in this experiment? What is your conclusion?
4. If you can find this plant growing on an old limestone wall or on white marble scrape some of it off to see if it has affected the surface of the stone in any way. Excretions from plants will, in the course of time, cause a polished stone to have a rough surface.
5. With a hand-lens study the edge of the "Stain" on some substratum, and see if you can determine by what method it increases in area.
6. Scrape off a very small bit of the material, mount in a drop of water on a glass slide, add a cover-glass and study under the low power of the microscope.

Observe the tiny particles, --cells, or clumps of cells, into which it separates. Note the various sizes of the particles.

Study under high power, noting and sketching:

The individual cells either single or associated together in small groups. Are they uniform in size? How account for this? Are they all of the same shape? Account for this character. Describe the cell-contents and the nature of the cell-wall surrounding each cell. Press upon the cover-glass to break

some cell-walls and eject contents so that they can be more readily studied.

Add a droplet of iodine under the cover-glass to stain the contents of the cell, or protoplast, which is composed of protoplasm. Find the separate chlorophyll-bearing bodies or chloroplasts. Identify the nucleus of the cell.

7. Find and sketch cells in all stages of division.

Notice the difference in shape between separate cells and those still attached to others. At the time of beginning division are the cells uniform in size or are they of all sizes? Can you think of any way in which growth and reproduction are related?

Describe the process of division. What seems to happen to the "daughter-cells" of a cell even before they are completely separated? Is there any hint in this as to the future development of plant bodies? A botanist has said that the "daughter-cells" are "orphans". What did he mean?

III. Conference Topics

Field and laboratory experiences with "Wall-Stain".

Findings and conclusions in these experiences, including:

Occurrence

Nature of habitat

Relation to environment

Activities and structures,--nutritive and reproductive,

as:

Respiration

Photosynthesis

Fission

"Organs" of the cell: protoplast of protoplasm,
nucleus, chloroplast, cell wall.

Prophecy of the colonial plant body

Reproduction

"Immortality" of the one-celled organism

Additional Topics (to be presented by the teacher,
preferably with lantern slides).

Immediate relatives of "Wall-Stain"

Its place in the evolutionary scale

Ecological importance

IV. Readings

E. F. Andrews, Practical Course in Botany. Chicago:
American Book Co., 1911. pp. 300.

Geo. F. Atkinson, Botany for High Schools. Henry Holt
and Co., 1910. pp. 220.

O. W. Caldwell, Plant Morphology. Henry Holt and Co.,
1904. pp. 16-24.

John M. Coulter, A Textbook of Botany. D. Appleton and
co., 1909. pp. 102-104.

John M. Coulter, Elementary Studies in Botany. D. Appleton
and Co., 1913. pp. 12.

Wm. F. Ganong, Textbook of Botany for Colleges. New York:
Macmillan Co., 1930. pp. 299, 417, 563.

George B. Rigg, College Botany. Lea and Febiger, 1930.
pp. 181-182.

V. Deskwork:

Carefully prepared notes on experiences in field and

laboratory, with gleanings from class discussions and readings on the subject of Pleurococcus.

Special report--"The Importance of "Wall-Stain" to a Biology Student."

Test--A true-false or completion test covering all the work on Pleurococcus.

Mounting and labelling small pieces of typical substrata with Pleurococcus attached, to be placed in the school museum.

Detailed Study of a One-celled Animal
Paramoecium or "Slipper Animalcule"

I. Habitat or Culture Study

1. Place a handful of hay or of dead weeds in a jar of pond water or tap water. Cover with a glass plate and set the jar in a warm shaded place for several days. Observe from time to time. Note all the changes in appearance, odor, etc., that seem to have taken place in the contents of the jar. Use hand lens and look for evidences of life in the culture. In what part of the culture does life seem to be most abundant? Account for this.
2. With a pipette take a drop of the scum at the surface and mount on a glass slide. Hold this over a dark background. What can be seen with the eye alone? Use hand lens and observe size, color and movements of the tiny animals which are probably Paramoecia or "Slipper Animalcules". Make sketches to indicate what you have seen.

II. Microscopic Study

1. Place a very thin layer of medicated cotton on a slide and upon this put a drop of water containing Paramoecium. Study first with the low power of microscope. Use cover glass and see that only a few threads of cotton are used. What seems to be their shape? Compare the width and thickness of a specimen with its length. What evidence if any can you find to indicate

which is the anterior and which the posterior end of the animalcule? Is its body flexible or rigid? What do you think is the actual shape of the little animal? If you have some modeling clay at hand make a model to show its shape. How do the animals compare with each other as to size?

2. Make a careful study under low power of the movements of the *Paramecia*. Do they seem to be "going somewhere"? If so, where? If not, how do you account for their movements? By what means does the swimming movement seem to be accomplished? Which end of the body is usually forward in swimming? Do they swim equally well "in reverse"? Do they seem to be able to guide themselves? Can you make out the shape of their path? What happens when they strike some object? Is there a tendency for them to congregate at any particular place in the culture, or in the drop of water under the microscope? How account for this? What effect is produced by placing a drop of dilute salt solution under the cover glass? Try also a weak sugar solution. Explain.
3. Add a small amount of powdered carmine to the water under the cover glass and by applying a piece of blotting paper to the edge extract some of the water from beneath the cover glass. Using low power locate a specimen that is not moving about and turn the high power upon it. What indications of movement? Can you find any structures involved in the movements? Observe

again after a half-hour or more. What is the animalcule doing with the carmine? What structures seem to be concerned with this process? What is done with these "food balls"? Where are they most numerous? Are they all of the same size? Do you find any of them that do not contain carmine? What finally becomes of them? Make sketches.

4. Find two clear spots or contractile vacuoles in the animal. Why so called? Where are they located? Do they appear and disappear regularly? Which of the two acts requires the most time? When do radiating lines surround the vacuole? With what vital processes do you suspect the vacuoles are concerned? Sketch.
5. Why is the Paramecium called a single cell? What organs of the cell found in Wall Stain can you find in Paramecium? How many nuclei does this animal possess? A tiny drop of dilute acetic acid placed under the cover glass will make them more easily seen. Are they of the same size? Where are they located? Try to find a Paramecium that shows a constriction or narrowing near the middle. Sketch. Watch this specimen for some time, say, an hour, sketching at intervals. Explain what happens. What nuclear changes were there? Name the process involved and compare with Wall Stain in this respect.
6. Locate if possible, two Paramecia that are adhering side by side to each other. Sketch. Observe closely for some time and try to determine what changes take place.

Was anything like this noted in your study of Pleurococcus? Would you venture a guess as to the meaning of this process?

III. Conference Topics

Laboratory experiences with Paramecium

Findings and conclusions in these experiences including:

Occurrence

Nature of habitat

Relation to Environment

Activities and Structures--Nutritive and reproductive, as:

Respiration

Movements

Responses

Ingestion

Digestion

Excretion

Reproduction

Asexual--fission

"Immortality"

Sexual--Conjugation

"Rejuvenescence"

Additional topics (to be presented by teacher, preferably with lantern slides:

Immediate relatives of Paramecium

Its place in the Evolutional scale

Ecological importance

IV. Readings

Colton, Buel P. Zoology, Descriptive and Practical.

Boston: D. C. Heath and Co., 1903, pp. 291-294.

Hegner, Rob't. W. College Zoology. New York: Macmillan Co., 1930, pp. 53-63.

Linville and Kelly, Textbook in General Zoology. New York: Ginn and Co., 1906, pp. 286-291.

Jordan, David Starr, Kellog, Vermont L. and Heath, Harold, Animal Studies. New York: D. Appleton and Co., 1903, pp. 26, 27.

Moon, Truman J. Biology for Beginners. New York: Henry Holt and co., 1928, pp. 162-163.

Newman, Horatio Hackett, Outlines of General Zoology. New York: Macmillan Co., 1930, pp. 45, 96; 129-145.

V. Deskwork

Carefully prepared notes on laboratory experiences with gleanings from discussions and readings on the subject of Paramoecium.

Special report: "The Economic Importance of One-celled Animals".

Test covering all work on Paramoecium.

V. BRIEF OUTLINE OF A COURSE OF STUDY IN BIOLOGY

The following Course of Study is offered as the outgrowth of more than twenty years experience in teaching biological subjects in the high school. During the last half of that period the writer has been inclined to give the studies of reproduction more and more emphasis and to render them more and more contributory to the studies of sex and the sex-problems of the human individual so that such studies might now be considered as the "core" of the course. Obviously, the outline is intended to be suggestive only and not exhaustive. There is, therefore, opportunity for the teacher to use her own initiative and originality in working out the details of the subject. It is arranged, too, so that plant and animal studies may be made either alternately or consecutively in emphasizing biological principles.

The writer has given due consideration to the advantages and disadvantages of the two-column, three-column and four-column arrangements of courses of study and has chosen to use the one-column plan. Methods and procedures with detailed illustrative studies are indicated in part IV.

The units of the course are as follows:

- I. An individual plant--Lima Bean
- II. The race of plants--Plant Kingdom
- III. An individual animal--Frog
- IV. The race of animals--Animal Kingdom
- V. Man as an individual (animal)
- VI. Man as the "climax" of evolution
- VII. Man, the individual, as a member of society

Course of Study in Biology

Unit I--An Individual Plant

A. Objectives:

1. To develop in the pupil the concept of a plant as a living, developing, reproducing body--an organism, in the midst of a complex and rigorous environment to which it must adapt itself or die.
2. To yield the pupil knowledge and appreciation of a plant's activities in the struggle for existence and the structures involved in the performance of those activities.

B. Subject Matter

1. Lima Bean

a. Signs of life

Green color

Responses

Growth

Development

Flowering

Fruiting

b. Phases of Development

(1) Undeveloped--Seed

(a) Role in Life History

Dispersal

Tiding over unfavorable conditions

Resumption of growth

(b) Structure

Parts of the seed

Contributions of each part to role

(2) Immature--Seedling

Activities

Establishment of soil and air relations

Transition from dependence to independence

Structure

Parts of the seedling

Contributions of each part to activities

Responses

Stimuli

Gravity

Water

Light

Contributions of each response to activities

(3) Mature plant

(a) Activities as a whole

Self-maintenance

Race-maintenance

(b) Systems of organs

Leaf

Activities

Respiration

Photosynthesis

Transpiration

Structure

Organs and parts of leaf

Lamina

Petiole

Midrib

Veins

Epidermis

Cells--the units of structure
in organisms

Walls

Contents

Protoplast of
protoplasm

Cytoplasm

Nucleus

Chloroplasts

Contributions of parts and
organs to activities

Special adaptations of leaf

Color

Shape

Arrangement

Fall of the leaf

Note: In a similar way study each of the
following systems:

Stem, Root, Flower and Fruit Systems

Unit II--The Race of Plants--Plant Kingdom

A. Objectives:

1. To yield the pupil knowledge and appreciation of the race of plants as to the evolution of nutritive and reproductive structures and functions.

2. To give the pupil a perspective view, with some detailed knowledge, of the great groups of the Plant Kingdom, as to their evolution, morphology, physiology, ecology and taxonomy.

B. Subject Matter

I. Plant Kingdom

1. Evolution of plant body and plant functions

a. A one-celled plant--Pleurococcus

Activities and Structures--nutritive and reproductive (See detailed study of Pleurococcus in Part IV).

Note: In a similar way study:

b. A colony--Oscillatoria

c. A multicellular plant--Ulothrix

2. Great groups of plants as to their evolution, morphology, physiology, ecology and taxonomy.

a. Thallophytes or Thallus Plants

{1) Classes

(a) Algae

Representatives

Spirogyra

Characteristics

Habitat and Distribution

Behavior or habits

Structures and functions

Relatives

Economic Importance

Characters of the group

Note: In a similar way study each of the following groups and its representatives:

- (b) Fungi--Slime Mold, Water Mold, Bacteria,
Yeast, Lichen, Field Mushroom
 - b. Bryophytes or Moss Plants
 - (1) Classes
 - (a) Liverworts--Marchantia
 - (b) Mosses--Pigeon-wheat
 - c. Pteridophytes or Fern Plants
 - (1) Classes
 - (a) Horsetails--Equisetum
 - (b) Ferns--Wood Fern
 - d. Spermatophytes or Seed Plants
 - (1) Classes
 - (a) Gymnosperms--White Pine
 - (b) Angiosperms--Higher Flowering Plants
 - Dicotyledons--Wild Rose
 - Monocotyledons--Lily
3. General Summary of Plant Kingdom

Unit III--An Individual Animal

A. Objectives:

1. To develop in the pupil the concept of an animal as a living, developing, reproducing body--an organism in the midst of a complex and rigorous environment to which it must adapt itself or die.

2. To yield the pupil knowledge and appreciation of an animal's activities in the struggle for existence and the structures involved in the performance of those activities.

B. Subject Matter

1. Frog

a. Signs of life

Respiration and Circulation

Sensation and control

Movement

Ingestion

Digestion and Circulation

Assimilation

Growth

Regulation and Control

Excretion

Reproduction

b. Phases of development

(1) Undeveloped--Egg

(a) Role in Life History

Dispersal

Conservation during formative period

Tiding over unfavorable conditions

Resumption of growth

(b) Structure

Organs of Embryo

Contribution of each organ to role

(2) Immature--Tadpole

(a) Activities

Establishment of water and air relations

Transition from aquatic to terrestrial

equipment for life

(b) Systems of Organs

Respiratory-Circulatory

Activities

Exchange of gases, O₂ and CO₂

Transportation of gases

Structure

Gross

Organs and parts

Lungs

Air passages

Nostrils and mouth

Pharynx

Larynx

Trachea

Bronchi

Bronchial tubes

Bronchioles

Air Sacs

Minute--a cell, the unit of an

organism

Special Adaptations of Respiratory-

Circulatory System

Note: In same way study each of the following systems:

Nervous, skeletal, muscular, digestive-circulatory, endocrine, excretory and reproductive systems

Unit IV--The Race of Animals--Animal Kingdom

A. Objectives:

1. To yield the pupil knowledge and appreciation of the race of animals as to the evolution of nutritive and reproductive structures and functions.
2. To give the pupil a perspective view with some detailed knowledge of the great groups of the Animal Kingdom, as to their evolution, morphology, physiology, ecology and taxonomy.

B. Subject Matter

I. Animal Kingdom

1. Evolution of Animal Body and Animal Functions

a. A one-celled animal--Paramecium

- (1) Activities and Structures, nutritive and reproductive

(See detailed Study of Paramecium in Part IV).

Note: In a similar way study:

b. A colony--Volvox

c. A multicellular animal--Fresh-water Hydra

2. Great Groups of Animals--Phyla--as to their evolution, morphology, physiology, ecology and taxonomy.

a. Protozoa

(1) Representatives

Paramoecium

Characteristics

Habitat and distribution

Behavior or habits

Structures and functions

Relatives

Economic importance

(2) Characters of the group

Note: In a similar way study remaining phyla and representatives as follows:

- b. Porifera--Grantia
- c. Coelenterata--Fresh-water Hydra
- d. Platyhelminthes--Tapeworm
- e. Nematelminthes--Horse hair snake
- f. Trochelminthes--Rotifer
- g. Molluscoida--Brachiopod
- h. Echinoderma--Starfish
- i. Annelida--Earthworm
- j. Mollusca--Fresh water clam
- k. Arthropoda

(1) Classes:

(a) Crustacea--Crayfish

(b) Myriapoda--Centiped

(c) Insecta--

Orders:

Ephemerida[?]--May Fly

Odonata--Dragon Fly

Orthoptera--Locust, Grasshopper,
 Cricket, Cockroach,
 Walking Stick, Praying
 Mantis

Hemiptera--Squash bug

Lepidoptera--Butterfly

Diptera--House Fly

Coleoptera--May Beetle

Hymenoptera--Honey Bee

(d) Arachnida--Garden Spider

1. Chordata

Subphylum, Vertebrata

Classes:

Pisces--Yellow Perch

Amphibia--Leopard Frog, Common Toad

Reptilia--Pine Lizard, Mud Turtle,

Black Snake, Alligator

Aves--Familiar Groups of Birds and

representatives:

Struthionidae--Ostrich

Pygopodidae--Loon

Longipennidae--Gull

Tubinariae--Albatross

Steganopodidae--Pelican

Anseridae--Goose

Herodionidae--Heron

Paludicolidae--Crane

Limicolidae--Woodcock

Gallinae--Quail

Columbae--Dove

Raptores--Hawk

Psittaci--Parrot

Pici--Woodpecker

Passeres--Perching Birds

Kingbird, Vireo, Crow

Blackbird, Sparrow, Robin

Blue Bird

Mammalia

Orders and representatives:

Monotremata--Duckbill

Marsupialia--Opossum

Edentata--Armadillo

Cetacea--Whale

Ungulata--Horse, Cow

Rodentia--Rat

Carnivora--Dog, Cat

Insectivora--Mole

Chiroptera--Bat

Primates--Monkey, Ape, Man

Unit V--Man as an Individual (Animal)

A. Objectives:

1. To develop in the pupil the concept of man as an animal in the midst of a complex and rigorous environment--an organism living, developing and reproducing in accordance with the same natural laws to which all other

organisms are subject.

2. To yield the pupil knowledge and appreciation of man's activities in the struggle for existence and the structures involved in the performance of those activities.

B. Subject Matter

I. Man--Homo sapiens sapiens

1. Activities

a. Self-Maintenance or Nutrition

Respiration--Circulation

Sensation and control

Movement

Ingestion

Digestion-Circulation

Assimilation

Growth

Regulation and control

Excretion

b. Race-Maintenance or Reproduction

Reproduction

2. Structures

a. Nutritive Systems and Organs

(1) Respiratory--Circulatory

(See Outline under 3 b, Unit III)

Note: In a similar way study each of the following

(2) Nervous, Skeletal, Muscular, Digestive,

Endocrine and Excretory Systems

b. Reproductive System and Organs

Note: See outline under 3 b, Unit III. For the study of reproduction in this unit, the class is divided into two groups according to sex and direct instruction is given to the pupils of each group by a teacher of their own sex. This instruction includes anatomy, physiology and hygiene with the emphasis upon the last named.

Unit VI--Man as the "Climax" of Evolution

A. Objectives:

1. To develop in the pupil the concept of man as the "summit" of the long evolutionary "climb" from a simpler, one-celled form with mere nervous responses to factors in the environment, to the more complex, multicellular form with high mental attainments and the ability to make intelligent and purposive adjustments to the environment.
2. To yield the pupil knowledge and appreciation of the laws of inheritance and of the environment as the factors operative in man's evolution.

B. Subject Matter:

I. Evolution

1. Meaning

2. Types

a. Inorganic

(1) Evidences from

(a) Astronomy--From nebula to sun and planets

(b) Geology--Stages of earth's history

b. Organic

(1) Evidences from

(a) Comparative structures

Resemblances among groups of plants
and animals

Homologies or inherited simi-
larities

Vestiges

(b) Classification

Grouping of plants and animals into
species, genera, families, orders,
classes and phyla

"Family Tree" of plants and animals
from Protista to highest types (a
diagram showing relationships of
plants and animals).

(c) Blood Tests among animals

(d) Embryology

Recapitulation--The Biogenetic Law

(e) Paleontology

How fossils are formed

Representative fossils of the groups
as to discovered remains, restorations,
conclusions:

Plants

Mosses

Ferns

History of coal

Seed plants

Animals

Invertebrates--Protozoans to

Arthropods

Vertebrates

Fishes

Amphibians

Reptiles

Birds

Mammals

Lower Mammals

Primates

Lower Primates,

Pliopithecus

Man

Ape-man

Heidelberg man

Piltdown man

Neandertal man

Rhodesian man

Cro-Magnon man

Evolution of

"Culture"

(f) Geographic distribution

Effects of migration, barriers, iso-
lation

(g) Genetics

3. Factors in Man's evolution:

a. Heredity

(1) Definition--Resemblance based upon kinship

(2) Man's physical inheritance

(a) Body characters

Physical body--a human body

Sex

Posture

Stature

Complexion

Color of hair

Color of eyes

Facial angle or contour

Facial expression--"looks"

Bodily expression

Brain size

Voice

(b) Tendencies

Tendency to health or disease--endurance

Tendency to length of life--longevity

Tendency to resemble parents

Tendency to vary--variation

(3) Man's mental inheritance

(a) Instincts

1' Ego instincts

Safety

Comfort and pleasure

Experience

Power and influence

Admiration and approval

Self-respect

2' Reproductive instincts

Sex

Parental

3' Herd instincts

Gregariousness

Emulation

Cooperation

Altruism

(b) Emotions

(c) Intellect

Capacities

Education

(4) Laws involved in heredity

Probability

Natural Selection

Sex Selection

Mutation

Mendel's Laws:

"Law" of Dominance (not universal)

Law of Segregation

Law of Independent Assortment

b. Environment

(1) Nature of man's environment

(a) Physical

(b) Biological

(2) Man's reactions or adjustments to requirements of environment--the "Struggle for Existence"

- (a) Variations
- (b) Involuntary adjustments or responses
- (c) Conscious and purposive adjustments
 - 1' To physical environment
 - 2' To biological environment
 - To world of plants and lower animals
 - To his fellow man--See Unit VII

Unit VII--The Individual (Man) as a Member of Society

A. Objectives:

1. To develop in the pupil the concept of the individual (man) himself as a member of a group of interdependent fellow-beings--society.
2. To yield the pupil knowledge and appreciation of his social heritage with the advantages it brings to him--rights, privileges, opportunities, and his debt to society for the same.
3. To cause the pupil to feel a deep sense of obligation on his part to repay society for these values received by him.
4. To lead the pupil to choose to fulfil his obligation by so conducting himself that not only will present society

to which he belongs, but, also, the society of the future, be improved through his efforts.

I B. Subject Matter

I. Man's Social Heritage

1. Definition of Society
2. Evolution of Society
3. Customs of Society

a. Institutions

(1) Home

Beginnings

Evolution of the family

Marriage

By capture

By purchase

By mutual consent

Polygamy and polyandry

Monogamy

Advantages of monogamy

(2) Church

Development of religion

Nature--Worship

Animism and Spiritism

Polytheism

Dualism

Monotheism

(3) School

Origin

Brief History

Activities

Definition of Education

Modern "culture"

Sciences and Arts

(4) Government

Meaning

Need for government

Evolution of government

Clan, or patriarchal form

Tribal government

City-State

Nation

(5) Industry

Age of Primitive man

Old Stone Age

New Stone Age

Age of Metals

Bronze Age

Iron Age

"Machine Age"

"Electric Age"

(6) Public Welfare

Recreation

Sanitation

Public Health

II. Individual's Debt to Society

1. Itemized account

2. Paying the Debt

a. Present payment--Social Behavior

Personal hygiene

Physical

Mental

Vocational Efficiency

Institutional Spirit

Morals--Ethics

Provision for future payment--Eugenics

Definition of Eugenics

Man as a creator

Plant and animal breeding

Artificial Selection

Inbreeding and outbreeding

Possibilities of human improvement

Choice of mates

Jukes and Kallikak families

Edwards and Darwin families

Future marriage laws

Endogamy and exogamy

Education of the future

VI. RESULTS, CONCLUSIONS, SUGGESTIONS

"If the theory of evolution be not universal," says Edward Clodd, "the germs of decay are in it." To this statement we take the liberty to add that, if, on the other hand, it be universal, it becomes in the hands of the student, a master-key of prime importance in unlocking biological situations and in solving biological problems. Indeed, the writer of this thesis has found that some knowledge of the fact of evolution, even though it may often be but an inkling of this great generalization, is always of value to pupils in interpreting the facts and principles of plant and animal life. It serves to stimulate interest and motivate the work to a surprising degree, often transforming a dull and listless attitude into an alert and active one. It thus serves to "appetize the intelligence", clarify the vision and yield a perspective that makes the study significant. It opens the front door not only to biology but to other branches of science as well.

The principle of evolution becomes, therefore, an indispensable tool by means of which the student invades and investigates the various realms of learning, finding out what is already known and later adding his own discoveries to the body of knowledge. It is the working basis of all investigators to-day. Instead of being out of harmony with religious principles it corroborates and explains them. It helps the learners to understand themselves in greater measure in all their relationships and in the appreciation of other objects of nature with which they come in contact, both organic and inorganic. Armed with such a tool they

learn, in the very process of learning, to seek, sift and interpret evidence and to be tolerant of others' findings and opinions in similar endeavors. The writer has repeatedly seen such a mental evolution in ninth grade biology classes.

There can be no adequate presentation or understanding of sex and sex phenomena without the light that evolution throws upon the subject. The writer has found that after a study of elementary biological facts and principles in which they have obtained a more or less comprehensive grasp of the fact of evolution, pupils have shown a readiness to assume a rational attitude toward the subject of sex. They see it as a natural and necessary phase of life and an essential factor in the evolution of the race. When thus presented in scientific spirit they have accepted it in the same way as have been accepted the facts of any other science.

In dealing with about eighthundred high school pupils during the past twelve years, no cases can be pointed out definitely as showing sustained antagonism toward or intolerance of the idea of human evolution. In no instances concerning the subject of evolution has the writer met with any unfavorable response from a parent. If there were such objections on the part of pupils or parents they never came to the teacher's notice. On the other hand, in many cases favorable responses have been received. For example, one young man who contemplated entering the ministry, reported while in college that his work in high school biology had "made him broader-minded." In one instance the teacher found a girl in tears over the apparent conflict of evolution with the instruction

she had received in religious matters. After a quiet talk with her teacher about the subject she went home to ask her father's opinion about it. She was very happy the next morning in telling the teacher that her father said he "guessed that evolution was true". He had also made a humorous remark about it that amused her greatly. Apparently she had no further misgivings concerning the subject. In another instance a girl was worried for a while over the same phase of the subject, later was convinced and became an able proponent of evolution, defending it against one of the boys of the class who still "had his doubts". Both above-mentioned girls are to-day actively engaged in religious work in local churches and both are "evolutionists."

In regard to sex instruction thus taught as an integral part of the biology work no unfavorable response from either pupil or parent has been encountered. On the other hand many favorable instances could be given. One lady, a patron of the school, made a special request to the teacher of biology that this work be given to the class of which her boy was a member. The writer has received letters from parents and from former pupils in which they have commented quite freely upon the subject. A few of these comments are recorded herewith.

One young woman while still in high school wrote: "I want to express my appreciation for.....the things you taught me while in your (biology) class. I can truthfully say that I never enjoyed a class more or got more out of a subject."

The following letter was received from a young man after several years of married life. He and his wife were both students of biology under the instruction of the same teacher. At the time of writing there are two healthy children in the home and theirs is a happy

family:

"So frequently are your Biology classes discussed in our home and the good influence they have wrought on our lives, we feel that we should tell you the regard in which we hold your teachings so that you may feel even more justified in carrying on your good work.

"The comparative illustrations of the fundamental functions of lower animal life with that of our own lives as taught in your biology classes has been the most enlightening part of our education.

"In the light of the knowledge we obtained while students in your classroom, we are better able to understand and control our emotions; also we can appreciate the wonderful gift bestowed upon us by God in giving us a sound and healthy body. From a study of lantern slides presented in your class, we learned of the enormous responsibility placed upon each individual in preserving his own good health for the sake of future generations as well as for his own happiness.

"Frequently I think back a few years when I was one of your students and I can distinctly recall my reactions to your statements in which you first intimated to us that while we were studying the earthworm and other forms of lower animal life, we were studying something that had to do with our own lives. It was quite fascinating to study one's self "Via the earthworm". We were able then and are now to regard all human functions of respiration, reproduction, irritability, etc., in the same scientific manner in which we regarded like functions of the earthworm and other types of animal life.

"This knowledge of biologic functions will have its reward doubled in the future, no doubt, when we can intelligently instruct our children through those transition periods when their bodies and emotions are more fully developed than their knowledge and understanding.

"I can truthfully say that a knowledge of sex life as presented in your biology classes has, for me, made the world a better place in which to live."

The letter below was received by the biology teacher from a patron of the school:

Dear Professor,

To-morrow you are to receive a letter from a grateful "Dad". To-night as I sat at my desk, I began to review the events of the school year that is soon to end. Many experiences, most of them pleasant, crowded in for recognition. Chiefest of all these, however, was the sense of my deep obligations to you for whatreceived during her membership in your Biology class. I have no means of expression at all adequate to convey to you my deep appreciation of what you did for her. Life to her, since she was student of Biology, has been a sacred gift, whether expressed in an earthworm or a human baby.talks to her mother and sisters about babies with the same abandon that she would speak of a bird in its mother's nest. No blush ever appears on her cheek to indicate a break or cleavage in her thinking about life, no intimation that she regards one form of life "nasty" and another clean. For this ideal outcome in my daughter's life, I shall ever be your debtor.

Sincerely and gratefully yours, etc.

A college student, whose practice-teaching had been done in

biology, wrote the following statement:

"As a former practice student in biology, I wish to express my appreciation for the opportunity of both learning and teaching biology in what seems to me to be the biologically correct way.

"The course, which is organized around the vital processes of life, has for its climax the stressing of the process which provides for the life of coming generations, that is, the reproductive phase. By first studying some of the simpler well-known forms of both plant and animal life, it is possible to lead the pupils to an unconscious realization of the importance of sex as a life process. Later, in a more direct way, the pupils build on their general knowledge in understanding the importance of sex matters in their own lives. The attitude of the pupils toward the course was not only favorable but in many cases decidedly enthusiastic.

"It was a pleasure to teach the course under your guidance, and the experience has been increasingly profitable to me as a teacher in the public schools."

The above responses in a few individual cases indicate that in some instances the study of sex and sex phenomena as above outlined has proved to be beneficial. The writer believes that these are not exceptional cases, but that, in the absence of any apparent aberrations either during or after high school life, the inference may be made that the experiences of the rank and file have been similar. After all, "the proof of the pudding is in the eating thereof" and "by their fruits ye shall know them". In the present state of experimental psychology there is no available "ultra stethoscope with which to render a blush audible"; but if

during and after such instruction as is herein advocated, the pupils go happily on their way living, to all appearances, normal lives, should we not feel justified in giving such instruction? Positive instances of good plus the absence of apparent untoward effects would seem to warrant such a procedure. For it appears that thinking does determine one's views of life, and not one's views of life his knowledges. It is a logical saying that "the virtue that is strength contains an intellectual element," for otherwise, morality, instead of being purposive social custom based upon intelligence and reason, becomes a mere blind response to factors of heredity and environment, a definition that no thoughtful person would be willing to accept.

The writer is led to suggest, however, that perhaps it might be well for some future investigator to make a detailed study of the effects of such a course as herein outlined by means of a questionnaire. There might be a "follow-up" study of high school graduates of both sexes in regard to the influences of sex instruction upon their lives after graduation. Such studies have been made for college graduates as in Dr. Exner's studies of 948 men and Dr. Katherin Bennett Davis's study of the sex-life of 2200 women. Would it be feasible, or even desirable, for scientific purposes, for an alumni association of a high school to attempt to secure similar data from its graduates with reference to their domestic affairs? Could such a record be made complete or accurate enough to be reliable and valuable?

In this thesis the writer has tried to emphasize the fact that the problem of sex-instruction in the schools is one of the greatest educational problems the public faces to-day. Many e-

educators have realized for some time the importance of the problem that thus involves the past, present, and future of the individual and of the race. The responsibility for its solution falls heavily upon the teacher, indeed, it is preeminently the biology teacher's task. Why wait for future state-legislatures to pass pro-evolution laws, to require sex-instruction in the schools, to make compulsory a eugenical program? If the biology teacher would not be recreant to duty he must begin now. He must teach as he has never taught before the ascertained facts and firmly-established principles of modern biology, so necessary to the proper understanding of the human organism. The same zeal with which for many years he has fought shy of the teaching in the schools of a sound course dealing with the human body as to its long past history and its present structures and functions, (as if such an illuminating perspective of one's own nature could contaminate the youthful mind), must now be transferred to active participation in teaching these very studies--not "a mere anatomy", but in addition to a substantial study of anatomy, the essentials of the resultant and concomitant physiology that renders anatomy significant. These studies form a logical basis upon which to build the only rational hygiene, the hygiene that insures the individual's "good health" to-day and the highest possible well-being of the race of to-morrow.

VII. APPENDIX

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