NATIONAL EDUCATIONAL ASSOCIATION

JOURNAL

OF

PROCEEDINGS AND ADDRESSES

OF THE

38

THIRTY-EIGHTH ANNUAL MEETING

HELD AT

LOS ANGELES, CALIFORNIA

JULY 11-14, 1899

1899

Published by the Association
EXCERPTED CONTENTS

Special Report of Committee on College Entrance Requirements
pp. 652-677

Report of the Committee of the Chicago Section of the American Mathematical Society
pp. 764-768
secure college graduates for seventh- and eighth-year work. He commended the system of units presented in the report as the basis of college admission.

President William H. Black of Missouri Valley College commended the report, especially for the careful distinction drawn between the principle of election, as defined in the report, and specialization, as ordinarily understood. Specialization, so-called, is one of the hobbies which we are in danger of overdoing. He commended the remark of President Baker that the schools should train men and women rather than professional men and women. Boys and girls in the high school are not then choosing professions.

President David Starr Jordan of Stanford University, California, said that colleges have done much mischief by putting requirements upon the secondary schools as to what they should teach. Secondary schools should give the pupils work upon which the world can build; the universities desire work upon which they can build. These demands are identical. The schools should teach what they can teach best; the only thing that the colleges should insist upon is thoroughness. President Jordan related the experiences of the Stanford University faculty in trying to decide on a basis of admission to the university. After much trouble the "Stanford system" was brought about. According to this system, any twelve units admit a student, the only thing being demanded from all being training in English composition, and there being a further restriction that any science units offered must represent work actually performed in the laboratory for not less than a year. Even the English requirements he thought unnecessary, believing that the high schools would insist upon that anyway. The speaker expressed himself as not being able to find anything in the report with which he could disagree.

Mr. Seely, of Texas, continued the discussion of the report, speaking of the burdens of high schools in trying to connect with the varying requirements of colleges, and recommending this effort to unite them.

Dr. A. F. Nightingale closed the discussion. He regretted that more opposition had not been developed in the discussion; and gave fuller explanation of points in the report concerning which fault had been found.

REPORT OF THE COMMITTEE ON COLLEGE-ENTRANCE REQUIREMENTS

NATIONAL EDUCATIONAL ASSOCIATION

LOS ANGELES, CAL., JULY 13, 1899.

To the Department of Secondary Education and the Department of Higher Education of the National Educational Association:

The committee appointed by your honorable bodies in July, 1895, to study the question of college-entrance requirements has the honor to submit the following report.

A. F. Nightingale, Chairman.
William H. Smiley, Secretary.
George B. Aiton.
J. Remsen Bishop.
John T. Buchanan.
Paul H. Hanus.
Burke A. Hinsdale.
Ray Greene Huling.
Edmund J. James.
William Carey Jones.
James E. Russell.
Charles H. Thurber.
PART I

To the Department of Secondary Education and the Department of Higher Education of the National Educational Association:

The committee appointed by your honorable bodies to study the question of college-entrance requirements, for the purpose of harmonizing the relations between the secondary schools and the colleges, to the end that the former may do their legitimate work, as the schools of the people, and at the same time furnish an adequate preparation to their pupils for more advanced study in the academic colleges and technical schools of the country, submits the following report:

HISTORICAL SKETCH

At the meeting of the Department of Secondary Education of the National Educational Association at Denver, in 1895, a paper was read by Professor William Carey Jones, of the University of California, on the subject, "What Action Ought to be Taken by Universities and Secondary Schools to Promote the Introduction of the Programs Recommended by the Committee of Ten?" Discussion of this paper led to the motion for the appointment of a committee to report a plan of action on the basis of Professor Jones' paper.

The committee presented the following report:

WHEREAS, The most pressing need for higher education in this country is a better understanding between the secondary schools and the colleges and universities in regard to requirements for admission; therefore

Resolved, That the Department of Secondary Education appoint a committee of five, of which the present president shall be one, and request the appointment of a similar committee by the Department of Higher Education, the two to compose a committee of conference, whose duty it shall be to report at the next annual meeting a plan for the accomplishment of this end, so urgently demanded by the interests of higher education.

This resolution was unanimously adopted, and the result communicated to the Department of Higher Education, from which the following reply was presently received:

Secretary Thurber.

DEAR SIR: The Department of Higher Education has arranged to have a committee appointed to co-operate with the Committee on Secondary Education in regard to requirements for admission into colleges and universities.

Very truly,

Joseph Swain,

Secretary.

The president of the Department of Secondary Education announced the appointment of the following committee in accordance with the above action: William Carey Jones, Berkeley, Cal.; A. F. Nightingale, Chicago

President James H. Baker of the University of Colorado made the following nominations to represent the Department of Higher Education: Nicholas Murray Butler (an original member of the committee, who has been unable to participate in its deliberations), New York city; B. A. Hinsdale, Ann Arbor, Mich.; James E. Russell, Boulder, Colo.; John T. Buchanan, Kansas City, Mo., and Paul H. Hanus, Cambridge, Mass.

Early in January, 1896, at the suggestion of Professor C. H. Thurber, the committee proceeded to organize by correspondence, each member sending his vote to William H. Smiley, of the Denver High School.

This action resulted in the election of Dr. A. F. Nightingale, superintendent of the Chicago high schools, as chairman, and Mr. William H. Smiley, principal of the Denver High School, District No. 1, as secretary.

As no appropriation had been made for the prosecution of the work by the committee, no general conference was held this year, but members of the committee as individuals, yet acting in their official capacity, sent out circulars, collected opinions, gathered statistics, and requested the various educational associations of the country to enter upon a discussion of questions correlated with the general subject of college-entrance requirements.

The chairman also invited the four associations which were maintained for the purpose of furthering the interests of secondary and college education to appoint each a committee of three to co-operate with the national committee in its investigation of all matters pertinent to the general subject of inquiry.


The national committee, altho no general conference had been held, presented its first unofficial preliminary report at the meeting of the National Educational Association at Buffalo, July, 1896. This consisted of one hundred and fifty pages of printed matter, which was published in the June number of the School Review, thru the courtesy of the University of Chicago and of Professor Charles H. Thurber, editor and member of the committee.

The report was devoted largely to a tabular statement of entrance requirements to sixty-seven representative colleges and universities of the
United States, with a résumé and critique of the requirements in the different subjects, by members of the committee and others who were deeply interested in these tables.

This June, 1896, number of the School Review is a very valuable document, since it presents for the first time since 1879, in a compact form, in parallel columns, the requirements for admission to the A.B., Ph.B., and B.S. courses of the leading colleges and technological schools of the country. These requirements deserve careful study, and the more they are studied, the more conflicting, incongruous, and unsatisfactory will they appear, and the keener will be the appreciation of the absolute necessity of radical reforms, and the reasonableness of the suggestions in the reports to follow. In the same volume appears a semi-official report of the chairman, from which we extract the following:

There is no educational subject before the American people requiring more serious attention, demanding a calmer discussion, greater wisdom, a keener appreciation of the trend of present civilization, and a loftier spirit of altruism than that which relates to an American system of education which shall be consistent with psychic law from the kindergarten to the graduate school of the university.

The kindergarten has not as yet become an integral part of the public-school system, but its claims are being rapidly recognized. The common-school curriculum, both urban and rural, is in a plastic state, awaiting the touch of inspired artists. The colleges are much at variance as to what constitutes a liberal education in these closing years of a century which began with scarcely any difference of educational opinion; while the secondary schools, awaiting, on the one hand, the abridgment and enrichment of the common-school curriculum, and, on the other, a more uniform expression of opinion on the part of the colleges as to their functions, are suffering from their inability to supply the deficiencies of the former or to satisfy the demands of the latter.

It is generally admitted that, until secondary education commences, children should have much the same training; yet even in the lowest grades individual direction should not be lost sight of, as the mind very early gives evidence of a divine implanting which must not be ignored. Throughout the course of secondary instruction, surely, there must be no Procrustean bed which every pupil by some process of dwarfing or stretching must be made to fit, but natural endowments, as soon as discovered, should have full scope, within certain limitations. College courses ought to be so adjusted that every pupil at the end of a secondary course recognized as excellent, both in the quality and quantity of its work, may find the doors of every college swing wide to receive him into an atmosphere of deeper research and higher culture along the lines of his mental aptitudes. We do not mean that secondary programs should be purely elective, but that they should be eminently elastic, and that this elasticity, based upon psychological laws, should be recognized by the colleges. There is no identity of form, either in mind or matter, in the natural or the spiritual, and since power, power to adapt one's self to the sphere for which nature designed him, is the end of education, every student should find in the college and university the means by which that power may be secured.

The universal recognition of this oneness of education would bring about harmonious relations between the secondary schools and the colleges. A careful study of the requirements of admission in the School Review for June, 1896, seems to indicate a wide divergence of opinion, which we believe does not really exist. The discussions of recent

* Dr. A. F. Nightingale, chairman of this committee, prepared a similar volume, which was published by D. Appleton & Co., in 1879.
years, the admirable report of the Committee of Ten, and the agitation it has provoked, the deliberations of the various associations formed to bring about unity in diversity, all point to a wise and happy solution of this vexed problem.

The results of the conferences held at Columbia College are encouraging in the extreme (Educational Review, May, 1896). It is the most advanced step in the right direction which has yet been taken.

These conferences took on a local color, but the unanimity of their conclusions presages the feasibility of national unity on this same matter.

The secondary schools are the schools of the people, and the people have demanded, and in still more effectual ways will demand, that their courses must be practical, beneficial, disciplinary. The sciences no longer knock at the doors for admission. They have been admitted, and a larger and still larger place will be provided for them.

Physiography, biology, physics, chemistry, in all their elementary principles, and in their relations to man, whose duty and privilege it is to conquer nature and to make it subservient to his advancement and happiness, are no longer to remain in the category of informational studies, and suffer the opprobrium of being contrasted with the humane and the literary as the sole dispensers of intellectual culture. The sciences, as they are beginning to be taught in our best schools, add to the wealth of mind as well as to the stock of facts, and the colleges must recognize them as full equivalents for other work which they have hitherto demanded to the exclusion of science.

In pleading for uniformity in college-entrance requirements, there are a few vital facts which cannot be ignored: First, the triple function of the public high school, viz., to equip pupils for the business of life, to give a proper training to those who will teach in the common schools, and to prepare for college. Secondly, a majority of our young people who go to college come to a decision late in their secondary course. Thirdly, every young man or woman who has successfully devoted at least four years to earnest study in a well-equipped secondary school should be admitted to any college in the country, whether such a pupil has devoted a greater part of his time to Latin, Greek, and mathematics, or to Latin, modern languages, and mathematics, or to Latin, mathematics, and the sciences, or to any other combination of studies which has developed his power and been in harmony with his intellectual aptitudes. To this end, secondary programs of study should be thoroly elastic and with varied electives, suited to the talents of the individual child; a college program should be still more elastic and with a larger number of electives. Every person will then find opportunities for the development of that power which will enable him with confidence to attack the problems of life which he wishes to help to solve.

The public high school can become a link in the golden chain of our American system of education only when the colleges begin where the best high schools leave off; otherwise the gap between the common school and the college must be filled by the private schools, patronized by the children of the rich, and the sons and daughters of the great middle class must be de-privèed of the benefits of a higher education because, forsooth, they have failed to fulfill some specific requirement of the college they would otherwise enter. I have faith, however, that these conflicting requirements will be harmonized, their incongruities removed, so that we may in the near future have a unified system of education, from the kindergarten to the graduate school of the university which will give to every child, without let or hindrance, the right of way for such an education as will best develop the power with which, in a plastic state, he has been endowed by the Infinite Architect.

A conference of the committee with members of the committee of co-operation and others interested was held at Buffalo on Tuesday, July 7, 1896.
In the absence of Chairman Nightingale, who spent the summer abroad, Mr. W. H. Smiley presided. A committee, consisting of Dr. James E. Russell, Dr. Melvil Dewey, and Professor Elmer E. Brown, was appointed to draft a plan of work for the general committee for the year 1896–97.

This committee presented the following at the conference held on Wednesday evening, July 8, Dr. B. A. Hinsdale acting as chairman of the meeting:

**Plan of Work for 1896–97**

It is within the province of the committee, according to the resolution passed at the Denver meeting, to investigate existing college-entrance requirements and to report on ways and means of securing such uniformity in extent and method as will be conducive to the best interests, both of higher and of secondary education. The first step in investigation of existing requirements has been taken; in our opinion the program of the ensuing year should be chiefly as follows:

1. The committee should invite the active co-operation of associations already organized for the study of such problems; it should appoint representative subcommittees of specialists interested in the various subjects; it should ascertain the views of individual institutions—secondary schools, colleges, and universities—all with a view to the ultimate determination of what should constitute a normal requirement in each of the subjects set for the admission to college.

2. To this end it is recommended that the requirements be considered in the following groups: English, classical languages, modern languages, history, mathematics, and sciences.

3. Within the several groups special attention should be given to what should constitute a year's work in each subject (e.g., first-year French; second-year French, physics, chemistry, etc.); or, as may be preferable in some groups, what should constitute the "elementary" and what the "advanced" requirements, and, in general, the constitution of entire courses of study in the separate subjects.

4. It is recommended that a schedule of options or equivalents within the various groups, or between separate groups, be prepared.

5. The committee should make special effort to secure a more satisfactory method of admission to college. The views of the associations, subcommittees, and institutions (above referred to) should be sought as to the best pedagogical means of testing the work done in preparation for college.

6. All partial reports should be submitted to the committee as early as possible, that a tentative report may be prepared for discussion at the next annual meeting of the National Educational Association.

7. The Departments of Higher and Secondary Education and of Science should be requested to make this subject a special order in their program for the meeting of 1897.

8. It is evident that the work outlined cannot be done without the expenditure of a considerable sum of money. This committee should urge upon the Departments of Higher Education, of Secondary Education, and of Science the necessity of petitioning the Board of Directors of the National Educational Association for an appropriation, to be made at as early a day as practicable, sufficient to complete the work.

General discussion of the report, as it was read seriatim, followed, and it was finally adopted as reported by the committee. At the joint meeting of the two departments on the following day it received the unanimous approval of the large body of representatives of secondary and higher education in attendance.
Professor West, of Princeton College, and Professor Kelsey, of the University of Michigan, expressed the opinion that the American Philological Association would be willing to co-operate with the joint committee by presenting at a later stage classical programs prepared by the association. The members of the committee accepted gratefully and unanimously this suggested help, and on motion of the secretary an invitation was extended to the Philological Association, by unanimous vote of the two departments, to prepare a report on Greek and Latin. The invitation was accepted by the Philological Association, which proceeded to make an investigation of remarkable thoroughness and efficiency. The report of its committee (Professor Thomas Day Seymour, of Yale University, chairman) is presented in Part II of this report. The co-operation of the Science Department of the National Educational Association, tendered thru its president, Professor Bessey, was also gladly accepted. The reports of several committees appointed by this department also appear in Part II.

In the autumn of 1896 Chairman Nightingale sent a request to the American Historical Association to appoint a committee to prepare a report on the scope and place of history in the secondary schools, with model courses of study for the same. A committee of seven was appointed, with Professor A. C. McLaughlin, of the University of Michigan, as chairman. Its most excellent report is presented herewith in Part II. Professor C. H. Thurber attended the meeting of the eastern branch of the Modern Language Association of America at Cleveland in December, and the chairman of the committee met with the western branch at St. Louis at the same time. As a result, a committee of twelve was appointed by this association, with Professor Calvin Thomas, of Columbia University, as chairman, to prepare a report on German and French, with model courses of study for secondary schools. Its very exhaustive report is also to be found in Part II.

A second preliminary report of the committee was presented at the meeting of the National Educational Association at Milwaukee, July, 1897, which was printed by courtesy and without expense to the committee in the June, 1897, number of the School Review. We quote the following from the report presented by the chairman at that time:

The committee, sensible of its responsibilities, and sensitive that no means were provided for their proper discharge, has labored, with a zeal fed by its intense interest in the problem, to make a commendable advancement along all lines. Every educational association in the country dealing in any respect with secondary-school and college work has given this question a prominent place upon its program. Educational papers and magazines have abounded with articles on this subject. The secular press has not been remiss in its instruction to the public, and never in the centuries of our educational history has there been a tithe of the interest awakened that now exists in bringing about that harmony which ought to, and eventually must, prevail between elementary, secondary, and higher education in this republic of free schools, of free opinions, and of universal suffrage.
There must be the closest affiliation between the secondary schools and the colleges. This can be brought about only by the adoption of a plan that shall be consistent with what the secondary schools can do, and what the colleges must have. It is not, however, a question of compromise or of expediency; it is rather one of psychology, or, to use a rational term, of common-sense and justice. All omens point to a successful issue. One after another the old idols are broken. The giants that stood in the path and said to every student, “Let him who enters here” leave all behind but Latin, Greek, and mathematics, are growing limp and lifeless. Requirements for admission are being leveled up; wide options are to be allowed; the element of value in preparation is to be a time element; Harvard, Cornell, Vassar, University of Michigan, University of Chicago, and Leland Stanford, Jr., are unfurling their banners of freedom. There is already a path blazed thru the thicket and jungle of conservatism and tradition, and before the twentieth century dawns in its glory there will be a broad highway thru which a pupil may walk unfettered, amid attractive associations, from the kindergarten to a degree at the end of the postgraduate course of the university, and still will the people of the future be able to say, “There were giants in those days.”

At a meeting of the committee at the Pfister Hotel it was decided to request from the joint departments the privilege of adding four members to the committee. The privilege was granted, and the balloting resulted in the choice of Professor H. B. Fine, of Princeton University, and Dr. Edmund J. James, of the University of Chicago, to represent the Department of Higher Education, and of George B. Aiton, inspector of high schools, state of Minnesota, and Ray Greene Huling, of the English High School, Cambridge, Mass., to represent the secondary schools. These gentlemen accepted, and have since acted with the committee. At this conference it was also decided to ask the National Educational Association for an appropriation to enable the committee to finish its work, which had thus far been prosecuted at individual and private expense. A subcommittee was appointed for the purpose, and the directors voted to appropriate $500, provided the funds of the association would permit.

Another year passed, and it was learned only at the meeting at Washington, July, 1898, that the money had been voted. During the winter the chairman requested the American Mathematical Association to prepare a report on the subjects in which it was especially interested. The request was too late for the general association, but the Chicago branch was empowered to appoint a committee to study the matter and to report. Professor J. W. A. Young, of the University of Chicago, was chairman. He labored with commendable zeal, sent out circulars, called several conferences, and two or three drafts of a report were prepared, and one, which we print in Part II, was presented.

"And, lastly, public sentiment among those who have the schools in charge must devise some way by which all grades of schools, from the kindergarten to the college, shall be so correlated that there shall be a straight and open pathway from the lowest to the highest — with no hurdles to jump over and no hoops to jump through — along which free-acting children may be led by teachers acting freely within the necessary limits of relativity." (George H. Martin, in his Evolution of the Massachusetts Public-School System, D. Appleton & Co.; p. 276.)
Efforts were put forth, in the meantime, to secure the elaborate reports which had been promised by the eminent committees of the different associations which were co-operating with the national committee, and when it seemed probable that all these reports would be ready, the chairman called a conference of the general committee in Chicago for April 13, 14, and 15 of the present year.

Thru the courtesy of Dr. William R. Harper, who welcomed the committee in a brief address, and thru the generous kindness of the Quadrangle Club, every facility in the way of rooms and entertainment was provided at the University of Chicago. The first session was held at the Haskell Museum, where the chairman presented a general outline of the work to be done. All other meetings — and there were three sessions a day for three days — were held at the Quadrangle Club. Subcommittees were appointed on the several subjects of study, and their reports were discussed and amended, or approved and passed. All resolutions were presented and debated in general session. To aid the Committee on Science and English, Dr. John M. Coulter, head of the department of botany, Dr. Alexander Smith, professor of chemistry, of the University of Chicago, and Mr. Charles W. French, principal of the Hyde Park High School, were invited to meet with the subcommittees. Their counsels were highly appreciated and of great value. Ten of the national committee and two of the advisory committee were present at all the sessions. Letters were received from the four absentees of the general committee, giving special and satisfactory reasons for their forced absence. Excellent letters, containing many valuable suggestions, were received from Professor Albert Bushnell Hart, Dr. John Tetlow, Dr. Melvil Dewey, Principal W. H. Bartholomew, Professor William P. Trent, Professor Edward H. Griffin, Dr. James H. Canfield, and Mr. Wilson Farrand. The reports that follow, both that of the regularly appointed Committee on College-Entrance Requirements and those of the special committees appointed by the eminent associations organized for the purpose of advancing the interests of higher education along special lines, are the result of four years of thought, study, and investigation. They contain not only the opinions of the scores of distinguished educators whose names are appended to the special reports, but they also embody the conclusions of conferences, institutes, and conventions, which have zealously studied this question since the meeting of the National Educational Association at Denver in July, 1895. They are submitted, therefore, with confidence that they must in a large degree meet with the approval of the better class of colleges and secondary schools of the country.

ENGLISH

The committee presents first the proposition that the study of the English language and its literature is inferior in importance to no study
in the curriculum. It offers all, or nearly all, the opportunities for mental training afforded by the study of any language, and introduces the pupil to the literature of his own tongue, which must always be the chief source of his own thought, inspirations, ideals, and aesthetic enjoyment, and must also be the vehicle of his communication with his fellow-men. Hence this study should be placed in a position at least not inferior to that allotted other languages.

The course of study in English should include two elements: the study of English literature, and the cultivation of the art of expression; to the end of securing, respectively, sympathetic and comprehensive appreciation of the writings of great thinkers, and the power to use language in a clear, logical, convincing, and agreeable manner. Such study, for the accomplishment of both of these aims, should include the reading of many works of literature carefully selected, the study of the principles of composition and literary style, and abundant practice in production, in obedience to the principles studied under the inspiration of the pleasurable reading of good books.

The subjects selected should be in themselves dignified and elevating, taken from the higher or spiritual environment of the pupil, as found actually in his school work, and from the environment of his common life.

The study of the principles of composition should include the following subjects: a study of words as to their origin and meaning; a study of the structure of the sentence and of the larger units of discourse—in other words, concrete logic; a study of the principles of effective literary composition, as illustrated in the various divisions of literature; and also a study of the aesthetics of literature.

These need not in all cases be taken up formally as grammar and rhetoric. Usually it is better that they be studied in connection with literature and composition; but they should not be neglected. A pupil completing a course in English, or any specific portion of such a course, should be able to appreciate literature that falls within the possibilities of his comprehension, and to express logically, and in good style, such thoughts as he is capable of expressing at all. This should be the test.

Furthermore, the committee recommends that the two departments, literature and composition, be pursued side by side throughout the entire secondary-school course, and that they be so related throughout that one shall, in so far as possible, supplement and strengthen the other.

We desire to express approval of the following principles:

1. That there should be no difference between the regular courses and the college-preparatory courses in English in secondary schools;
2. That the college requirements in English should be distributed throughout the four years.

In accordance with the above, we recommend the following suggestive outline of a course of study in English, the main points of which are in
accordance with the paper presented by Mr. W. F. Webster, of Minneapolis, and thoroly discussed at the Washington meeting of the Secondary Department of the National Educational Association:

FIRST YEAR — FIRST HALF

LITERATURE — NARRATION.

Narratives in both prose and verse, some brief, some of greater length, selected from such authors as Scott, Poe, Tennyson, Lowell, Whittier, Browning, Stevenson, and Kipling, representing various qualities of style, which qualities should be clearly pointed out to the pupils. The selections should be well within the comprehension of the pupils. The following plan of study is suggested:

1. Meaning of the author.
   a) Outline of story.
   b) Incidents in the lives of characters.
   c) Central idea and purpose of the story.

   a) Does the interest center in the incidents or in the characters?
   b) Is there a climax?
   c) Do all the parts converge to this point? (unity).
   d) Are the parts arranged in a sequence? (coherence).
   e) Is the interest sustained?

   It is suggested that here special attention be given to the movement of any selected passage (verbs).

COMPOSITION — NARRATION. To give spontaneity.

1. Incidents. (It is better that at this stage of study pupils compose tales without regard to plot.)
   a) Selection of material (unity).
   b) Arrangement of material (sequence, coherence).
   c) Proportion in treatment (mass, emphasis).

2. External form of composition.
   Heading, margins, indentations of paragraphs.

   Review of principles. (Attention should here be called especially to the sentence as the unit of thought. Attention should also be given to inflection of pronouns and verbs, agreement of verbs and pronouns.)
   Concord.
   Punctuation.
   Capitalization.

4. Figures of speech, based on likeness.
   Simile.
   Metaphor.
   Personification.

FIRST YEAR — SECOND HALF

LITERATURE — DESCRIPTION.

Examples of description.

Examples illustrative of various styles of descriptive literature, in both prose and verse, should be selected from such authors as Hawthorne, Lowell, Gray, Goldsmith, Poe, Blackmore, Burroughs, and Kipling. Some of the books should be studied in class,
others assigned for home reading. In some cases it is well to study in class portions of a
work of considerable length and require that the remaining portion be read at home.

The same general plan of study as that suggested for the first half of the year should
be followed.
1. Meaning of the author.
   a) Does he retain his point of view? (unity).
   b) Does he arrange details in order? (coherence).
   c) Are they treated in right proportion? (emphasis).
   a) Words that produce pictures.
   b) General words or specific words.

(It is well here to introduce a somewhat thorough study of words, as to origin and meaning,
and of the analysis of words into their various elements.)

COMPOSITION - DESCRIPTION.

Aim, accurate expression. Subjects to be individual rather than general. They
should be such objects as the pupil has seen, or is able to reproduce from imagination,
concerning which it is possible for him to find adequate expression.

Treatment. The selection of details should be decided by the purpose of description.
A point of view should be secured and held (unity).
Details should be arranged with some plan (coherence).
Arrangement and proportion of details should effect a purpose (mass, unity).
Technical subjects — paragraph structure.

Having secured in the previous half-year a clear conception of the sentence and its
arrangement, the combining of sentences in paragraphs can now be properly considered.

This consideration should include not merely the construction of paragraphs, but
such arrangement of the sentences within them as shall secure cleanness and proper
emphasis.

Words. Continuation of the analysis of words and of the study of their history.
Selection of words which give pictures (rhetorical figures). Specific words and general
terms compared. Nouns, adjectives, verbs. A review of etymology regarding them.

SECOND YEAR — FIRST HALF

LITERATURE — EXPOSITION. Lyrical poetry.

Attention should be given to the study of those authors who have not merely told
stories well and described objects well, but have expressed ideas in such a way as to make
them convincing. Many selections of lyrical poetry also can be properly studied. Poems
should be selected that are not too difficult of comprehension, that have an easy, flowing
movement, and that are pleasing because of the freedom of their rhythmical qualities, as
well as for the beauty of the thought. The following points may profitably be consid-
ered, under the headings already indicated:
1. Meaning of the author. Indicate the main thesis and subordinate propositions, their
   proper dependence and their relative importance (especially for exposition).
   a) Does he stick to his point? (unity).
   b) Does he pass from the known to the unknown? (coherence).
   c) Does he arrange the material to get the highest effect? (emphasis).
3. Style of the author. His use of connectives, conjunctions, relatives, adverbs, and phrases.
   a) How does he obtain clearness?
   b) Are his figures of speech and comparisons effective?
Composition—Exposition. To encourage logical thinking and adequate expression.

Terms. Definitions.

Propositions.
1. Clear statement of proposition (key sentence).
2. Discussion as limited by the above.
   a) What shall be included? (unity).
   b) What shall be excluded? (unity).
   c) In what order? (coherence).
   d) In what proportion? (emphasis, mass).

Second Year—Second Half

Literature—Exposition (continued). Poetry.

Suggestions made for the first half year should be here followed.

Composition—Exposition.

Paragraph structure.
Study of paragraphs introduced the preceding year should be here followed with much practice.

A further study of connectives, and methods of transition.

Clauses.

Sentences. Periodic, loose, balanced.

To make pupils think a whole sentence before writing, insist on many periodic sentences. Compare the effect of long and short sentences.

Study of argumentation.

Third Year—First Half

Literature. Introduction of character study, as exemplified in the novel. Poetry.

Novels, representing the different classes of fiction, for study both in school and at home. It is best to select novels not too long, and those that have abundance of incident.

Meaning of author.

Method of author.

Is the interest centered in plot or in the characters? Do the details work toward a climax? (unity).

Are the parts arranged in the best order? (coherence).

Style of author. As exemplified in his power to picture, to phrase, to draw characters, to arouse emotions.

The principles already studied should be continually reviewed as occasion occurs. Attention, however, may now be drawn to some of the refinements of composition. Continually increasing attention should be given to the best word for the place in every instance. Pupils should now be led to express themselves, not only with accuracy, but with some degree of elegance. It is well to call attention to the fact that the best authors use the simplest language, and that for English-speaking people words of Anglo-Saxon origin are commonly best. Care should also be given now to the arrangement of words, with the special view to securing force, smoothness, and elegance. Subjects of composition should be drawn to a considerable extent from the literature studied. It is also well to draw upon the other subjects of the curriculum for suitable topics, particularly history and science. Stories, episodes, conversations upon various topics, descriptions of scenes, character sketches, are good topics. It is also well that occasionally outlines of compositions upon the various subjects be prepared by the students.
THIRD YEAR — SECOND HALF

LITERATURE — DRAMA.

It is suggested that the literature of this half-year be the drama, with special reference to Shakespeare. Attention should be given to the grammatical construction, especially to the difference between the plot and a narrative poem. In this connection it might be well to read some such critical studies of poetry as may be found in the works of Matthew Arnold and James Russell Lowell.

COMPOSITION.

Composition work of this half-year may very properly be largely studies of characters of the drama, and the critical treatment of the various plays studied, from the student’s point of view. This last phrase is important; the student should not merely read the plays, but should study them, and should give expression, not to the teacher’s nor the critic’s view, but to his own.

FOURTH YEAR

During this year literature should be studied with due attention to the history of its development. It is well to select for study some works which will test to the full the student’s mature power. Pupils should now learn to meet new difficulties, both in thought and vocabulary.

The technical work of this year, to take the place of the grammar and rhetoric suggested for the earlier years, should be based largely upon the study of the history of the English language.

COMPOSITION.

The composition work of this year should be varied in topic and style. Some compositions of considerable length should be required. These should be upon subjects that will employ the student’s most mature thought. Considerable time should be spent in their preparation, and they should be examined and criticised step by step by the teacher. At the end of the course in English each student should be required to submit a final essay or thesis upon some literary subject, to show to a degree his appreciation of the work done, and to illustrate as fully as possible his power of expression.

The committee recommends that four periods per week for four years be allotted to the work in English, and that at least one-half of this time be devoted to the department of literature.

The committee recommends that a suggestive list of books, graded and classified, be offered, not less than thirty for each year, from which list selections shall be made by the various schools, not less than five books of average length, or a total of 1,000 pages, covering both class work and home reading, to be required for each school year.

LIST OF BOOKS

The following list, as the committee states, is simply suggestive. Principles and preferences, local and literary, will always govern in the choice of books which teachers will urge their pupils to read and which they will prefer for class study. The main purpose is to inculcate a taste for the best reading in the young people of today, to help them to form the reading habit, and to guide them into the way of a critical study of authors. We believe there should be in our secondary schools, and in the requirements for college in English, no hard and fast rule as to just what books
should be read or studied. Uniformity may be excellent, but equivalents should be accepted. The list below contains all that the joint conference recommends both for general reading and for careful study. Many more are given. They are graded and may be readily classified. They are submitted, not as the best list, for there is no such, but as a collection of good books worthy to be read, worthy to be studied, and among which we believe a sufficient number may be found which will interest, instruct, and entertain the pupils of every secondary school.

**FIRST YEAR**

1. *Snow Bound* - Whittier  
2*.* *Tales of Shakespeare* - Lamb  
4. *Tanglewood Tales* - Hawthorne  
5*.* *Jungle Book, No. 1* - Kipling  
6*.* *Jungle Book, No. 2* - Kipling  
7. *Betty Alden* - Austen  
8. *Sharp Eyes* - Burroughs  
9*.* *Autobiography of Franklin* - Franklin  
10*.* *Tom Brown at Rugby* - Hughes  
11. *Story of a Bad Boy* - Aldrich  
12*.* *Nicholas Nickleby* - Dickens  
13. *Two Years before the Mast* - Dana  
14*.* *Bunker Hill Speeches* - Webster  
15*.* *Sketch Book* - Irving  
16*.* *Washington's Rules of Conduct, Farewell Address, and Lincoln's Inaugural and Gettysburg Speech*  
17*.* *Man Without a Country* - Hale  
18. *Hans Brinker* - Dodge  
19. *Ivanhoe*  
20*.* *Quentin Durward* - Scott  
21*.* *Tales of a Wayside Inn* - Longfellow  
22. *The Story of the Indian* - Grinnell  
23. *Tales of New England* - Jewett  
24. *Being a Boy* - Warner  
25*.* *Merchant of Venice*  
27*.* *Life of Washington* - Irving-Fiske  
28. *Crude* - De Amicis  
29. *Back of the North Wind* - McDonald  
30. *Macaulay's or Chesterfield's Letters*

**SECOND YEAR**

4. *Lyrics and Sonnets* ("Cry of the Children") - Mrs. Browning  
5*.* *The Lake Poets, Wordsworth, Coleridge, Southey*  
6. *Julius Caesar* - Shakespeare  
7. *Translations from the Iliad (Books I, VI, XXII, XXIV)* - Pope  
8. *Last of the Mohicans*  
9*.* *Tales of a Traveller* - Irving  
10. *The War of Independence* - Fiske  
11. *Young Folk's Plutarch* - Kaufmann  
12*.* *Apology of Socrates* - Plato  
14. *Brave Little Holland* - Griffith  
15. *Julius Caesar* - Froude  
16. *Little People of Asia* - Olive T. Miller  
17*.* *Bulfinch's Mythology* - Hale  
18*.* *Twice Told Tales* - Hawthorne  
19. *John Halifax* - Mulóch  
20*.* *Kenilworth* - Scott  
21*.* *Tale of Two Cities* - Dickens  
22. *Rab and his Friends* - Dr. John Brown  
23. *The Private Life of the Romans* - Preston and Dodge  
24. *Hero Tales from American History* - Roosevelt and Lodge  
25. *Girls and Women* - Chester  
26. *Shakespeare the Boy* - Rolfe  
27. *Innocents Abroad* - Mark Twain  
28. *Rudder Grange Stories* - Stockton  
29. *The Hootier Schoolmaster* - Eggleston  
30. *Ranch Life and the Hunting Trail* - Roosevelt

**THIRD YEAR**

1*.* *Richard II.* - Shakespeare  
2*.* *Twelfth Night* - Shakespeare  
3. *Macbeth* - Shakespeare  
4*.* *Legends of the Alhambra* - Irving

---

*In the list of home reading books suggested by the joint conference on English, April, 1899.

1 College requirements for general reading and composition work, as recommended by the joint conference on English.

2 College requirements for careful study, as recommended by the joint conference on English.
FOURTH YEAR

1* Hamlet - - - Shakespeare
2 Sir Roger de Coverley Papers in the Spectator* - - - Addison

FOREIGN LANGUAGES AND LITERATURES

The committee recommends that the courses of study prepared by the committees of the American Philological Association and of the Modern Language Association of America, as printed in Part II, be adopted, with the suggestion that the word “selections” be placed after “Sallust’s Cato-line” in the tables on pp. 701, 702.

HISTORY, CIVICS, AND ECONOMICS

The committee recommends that our colleges and universities should accept as a unit for admission a year’s work in economics, including under this head a course in elementary political economy, supplemented by

* In the list of home reading books suggested by the joint conference on English, April, 1899.

† College requirements for general reading and composition work, as recommended by the joint conference on English.

‡ College requirements for careful study, as recommended by the joint conference on English.
adequate instruction in commercial geography and industrial history. It
approves the courses of history recommended by the committee of the
American Historical Association, with the following proviso, namely:
that it is highly desirable that one year of United States history and
civil government should be furnished by the secondary schools, and be
accepted as a requirement for admission by all colleges and universities.
It will be noted in the report of the American Historical Association that
it is possible to omit the course in United States history. The committee
desires to reaffirm "the principles of college requirements" as given in
the report of the committee of the American Historical Association, if
it understands correctly the statement in regard thereto. In order to
avoid misapprehension, however, the committee feels that it is important
to make its understanding of these principles explicit.

As to the meaning of the first principle as formulated there appears
no uncertainty, and we approve of it heartily, viz.:

1. That the fundamental scope and purpose of the secondary schools should be
regarded.

But the formulation of the second principle, especially when taken in
connection with a note thereto, seems open to misconception. The
principle is stated as follows:

2. That such elasticity be allowed that schools may fit for college and adapt them-
selves to local environments and local needs.

The note is as follows:

It does not seem wise, etc. (p. 757).

The aim of the Committee on College-Entrance Requirements is to
set forth such a series of interchangeable units of substantially the same
value as will meet with acceptance everywhere. Local conditions and
traditions may give rise to differing groups of college-entrance require-
ments, but within these groups the several units should have the same
value.

That is to say, one unit of history taught in one place should equal
one unit of history taught in another place, even tho the subject-
matter of the instruction varies.

Such an arrangement will tend to secure greater flexibility of the cur-
riculum, and, at the same time, to preserve all legitimate claims of varia-
tion growing out of differences of environment, as well as to break down
such claims as are not real.

MATHEMATICS

The committee begs to submit the following report on mathematics.
It will be found that our recommendations are in the main in agreement
with those of the mathematical conference of the Committee of Ten and
with those contained in the appended report of the committee appointed
by the Chicago Section of the American Mathematical Society. These
reports contain many suggestions relative to the teaching of mathematics in which we heartily concur, but which we have not thought it necessary to repeat.

I. We recommend that the course in arithmetic required of all students be limited, roughly speaking, to the following topics: the four fundamental operations for integers, and common and decimal fractions; the most important weights and measures; percentage and its application to simple interest; and that it be completed in the sixth grade. An admirable statement of the reasons for this recommendation is to be found in the report of the mathematical conference of the Committee of Ten, and they need not be repeated here. The recommendation involves the omission of commercial arithmetic from the prescribed course in mathematics. If it be deemed necessary, an elective course in this subject may be offered at some convenient time during the high-school period, and in connection with it a course in bookkeeping.

We concur with both committees in urging that the instruction in arithmetic be enlivened by numerous applications to problems which are of immediate interest to the pupil, or can be made so by simple explanations—notably problems of elementary mensuration and physics.

The most important practical end to be secured by the study of arithmetic is skill in accurate reckoning with integers and common and decimal fractions. That the pupil may not lose this skill, after having once acquired it, we deem it indispensable that he be given frequent practice in numerical reckoning throughout the school course. Algebra, metrical geometry, and the physical sciences afford abundant opportunities.

II. We suggest the following arrangement of the course in mathematics from the seventh to the twelfth grades inclusive, assuming the length of the recitation period to be at least forty-five minutes:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Course Description</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seventh grade</td>
<td>Concrete geometry and introductory algebra</td>
<td>4</td>
</tr>
<tr>
<td>Eighth grade</td>
<td>Introductory demonstrative geometry and algebra</td>
<td>4</td>
</tr>
<tr>
<td>Ninth and tenth grades</td>
<td>Algebra and plane geometry</td>
<td>4</td>
</tr>
<tr>
<td>Eleventh grade</td>
<td>Solid geometry and plane trigonometry</td>
<td>4</td>
</tr>
<tr>
<td>Twelfth grade</td>
<td>Advanced algebra and mathematical reviews</td>
<td>4</td>
</tr>
</tbody>
</table>

1. The algebra of the seventh and eighth grades should, at the outset, be mere literal arithmetic. But we are of the opinion that, by limiting the working material to very simple polynomials and fractional expressions, and to equations of the first degree with numerical coefficients, the four fundamental operations for rational algebraic expressions, simple factorizing, and the solution of equations of the first degree in one and two unknown quantities may be taught effectively in the course of these two grades.

Young students enjoy reckoning, and elementary algebraic reckoning will interest them far more than the complexities of commercial arithmetic.
The principles of the subject must, of course, be presented concretely, and unnecessary generalizations should be carefully avoided. Simple problems which can be solved by aid of equations of the first degree should be introduced as early as possible. The sooner the pupil appreciates the power of algebraic methods, the sooner will the subject attract him.

2. Concrete geometry may be taught with advantage earlier than the seventh grade. But even in that case we deem it wise to devote half the time given to mathematics in the seventh grade to this subject.

3. The amount of demonstrative geometry which should be given in the eighth grade will depend somewhat upon the knowledge of concrete geometry which the pupil has by that time acquired. In any event, we should question the wisdom of undertaking any systematic study of a textbook of demonstrative geometry in this grade. An important object of the instruction should be to awaken an interest in the demonstrative process, and that may be best accomplished by confining the pupil's attention to the propositions which his concrete work has taught him to appreciate, and which admit of easy demonstration. The theorems which relate to the congruence of triangles, parallel lines, the angle-sum of the triangle, parallelograms, and some of the simpler and more useful properties of the circle, and many of the problems of construction, belong to this category; the propositions which necessitate the consideration of incommensurables do not.

4. We recommend that the time allotted to mathematics in the ninth and tenth grades be divided equally between algebra and plane geometry; and that the course in algebra include: (a) a more systematic and comprehensive study of the topics treated in the introductory course of the seventh and eighth grades, with a thorough drill in factoring, highest common factor, least common multiple, and complex fractions; (b) radicals and fractional exponents, and quadratic equations in one and two unknown quantities; (c) ratio and proportion, the progressions, the elementary treatment of permutations and combinations, the binomial theorem for positive integral exponents, and the use of logarithms.

There is time enough in this course for the topics (c), and they seem to us to belong here rather than in the advanced algebra of the twelfth grade, because of their elementary character and general interest. The acquisition, thus early, of a practical acquaintance with logarithms in particular would be of great advantage to the pupil in his work in metrical geometry and physical science. The slight theoretical knowledge of logarithms which it requires is easily within his reach; for the theorems relating to the logarithm of a product, a quotient, a power, and a root are mere restatements of theorems regarding exponents with which he is already familiar, and it is certain to interest him, for it appeals, as few other topics in algebra can, to the utilitarian instinct which is so strong in young students.
5. By "advanced algebra" we mean the remaining topics which are to be found in an ordinary text-book of "college algebra," viz.: the elementary treatment of infinite series, undetermined coefficients, the binomial theorem for fractional and negative exponents, the theory of logarithms, determinants, and the elements of the theory of equations.

III. In solid geometry, plane trigonometry, and advanced algebra the schools should insist upon the same amount of work and aim at the same standard of scholarship as the best American colleges require in their courses in these subjects.

IV. When a student who is preparing for college does not intend to offer advanced algebra, he should defer some or all of the mathematics of the eleventh grade until the last year of his school course, or be given opportunity for mathematical reviews in that year.

V. We recommend that the several mathematical subjects count toward satisfying the requirements for admission to college, as follows:

\[
\begin{align*}
(a) & \text{ Elementary algebra, as defined in II, 4} & \text{1\frac{1}{2} units} \\
(\beta) & \text{ Advanced algebra} & \text{1\frac{1}{2} unit} \\
(\gamma) & \text{ Plane geometry} & \text{1 unit} \\
(\delta) & \text{ Solid geometry} & \text{1 unit} \\
(\epsilon) & \text{ Plane trigonometry} & \text{1 unit}
\end{align*}
\]

**SCIENCES**

We recommend that "nature study" of the kind described in an appended report, Part II, be made an integral part of the school work preceding the high-school period.

We recommend the following arrangement of courses in natural and physical science in the high-school period itself:

First year - - - - - - - - - - - Physical geography
Second year - - Biology: botany and zoölogy, or botany, or zoölogy
Third year - - - - - - - - - - - - Physics
Fourth year - - - - - - - - - - - - Chemistry

and that the time allowance for each of these courses be at least four periods a week throughout the year.

This allowance seems necessary to entitle these subjects to recognition (as one unit each) in a list of college-entrance requirements.

So far as the reports in our possession have enabled us to do so, we have indicated in some detail what the character of these courses in science should be. Unfortunately, this has been impossible in the case of physics and zoölogy,\(^1\) and we recommend that the Committee on Physics and Zoölogy appointed by the Natural Science Section of the National Educational Association be again requested to supply detailed descriptions of suitable school courses in these sciences.

\(^1\) The report on zoölogy is inserted in Part II, but came too late for inspection by the committee.
The committee also makes the following general recommendations: In our opinion it is important that the last two grades that now precede the high-school course should be incorporated in it, and, wherever practicable, the instruction in those two grades should be given under the supervision of the high-school teacher.

This recommendation really means a six-years' high-school course of study, and therefore that the qualifications of the teachers of the seventh and eighth grades shall not be inferior to those of the teachers in the remaining high-school grades.

PHYSICAL GEOGEOGRAPHY

The committee approves the report of the Subcommittee on Physical Geography appointed under the auspices of the National Educational Association, appended to this report; and it accordingly recommends:

1. That this committee adopt the definition of physical geography given in the report of the Subcommittee on Physical Geography appended to this report, namely, "the physical environment of man;" and that its principal themes are, the earth as a globe, the atmosphere, the ocean, and the lands, all appropriately limited in scope and difficulty by the time at the disposal of the course and the capacity of high-school pupils, and all taught "with the motive and the special point of view defined above;" and that "the distribution of organisms should not be taught with reference to zoological and botanical classifications, but in exposition of the organic environment of man, and as itself controlled by physiographic and other influences."

2. That in public high schools and other secondary schools physical geography be taught in a course occupying not less than four periods a week during one school year; and that this course should be placed in the ninth grade (first high-school year, in the present organization of most public schools).

3. That the course in physical geography should include a large amount of field and laboratory work; and lectures, discussions, and textbook study should, so far as practicable, be related to such work. Notebooks should not be an end in themselves; they should be kept in such a way as to emphasize the spirit and method of scientific work.

4. That the course in physical geography outlined in the foregoing propositions, when satisfactorily completed, count as one unit toward satisfying the requirements for admission to college.

BIOLOGY

The course in biology in the second year of the school course may consist either of a half year of botany and a half year of zoology, or of a whole year in either science.
BOTANY

1. That in public high schools and in preparatory schools botany be taught in a course occupying not less than one-half year, and preferably one year, with at least four exercises a week.

2. That this course in botany include a large amount of individual laboratory work, supplemented by as much field work as possible, done by the pupil under the careful direction of a competent instructor, and recorded by the pupil in the form of careful drawings and descriptions in a permanent notebook.

3. That such laboratory work, including the keeping of the notebook, occupy approximately one-half of the whole botany assignment, double periods of time being given to each laboratory exercise.

4. That the course also include instruction by text-book, informal lectures, and frequent quizzes, elucidating and enforcing the laboratory work, or dealing with matter not touched upon in that work, to the end that the pupil may gain a comprehensive and connected view of biological principles, as exemplified by plants, rather than merely a knowledge of a few disconnected facts.

5. That a pupil who has successfully completed such a course in botany as that here described may offer it for one-half or one unit of work in satisfaction of the requirements for admission to college.

6. That for entering students who have thus satisfied a definite requirement in botany, and who continue the subject in college, there be provided a suitable sequel to the school course in continuation of the study; such students being in no case placed in the same class with beginners.

7. The standpoint of the entire course should be that of plants as living things and at work, details of the structure being entirely subordinated. Observation should be directed to the most obvious facts, those which form a fitting background for subsequent study, and which easily enter into the subsequent experience of those who do not study further. Professional terminology and difficult and expensive apparatus should be avoided as much as possible. Constant and accurate drawing should be insisted upon as the only means of securing and recording definite observation. Great care should be taken not to overload the student with details or to demand too exhaustive a study of single forms. Clearness and variety are essentials in such work.

ZOÖLOGY

The committee presents no special report on zoology, but refers to the report on this subject made by the committee appointed by the Department of Science. This report is printed in Part II, and will be found to be in essential harmony with the report on botany.
PHYSICS

Your committee suggests that an effective working basis for a secondary-school course in physics would be attained by planning such a course substantially in accordance with the following propositions:

1. That in public high schools and schools preparatory for college physics be taught in a course occupying not less than one year of daily exercises, more than this amount of time to be taken for the work if it is begun earlier than the next to the last year of the school course.

2. That this course of physics include a large amount of laboratory work, mainly quantitative, done by the pupils under the careful direction of a competent instructor and recorded by the pupil in a notebook.

3. That such laboratory work, including the keeping of a notebook and the working out of results from laboratory observations, occupy approximately one-half of the whole time given to physics by the pupil.

4. That the course also include instruction by text-book and lecture, with qualitative experiments by the instructor, elucidating and enforcing the laboratory work, or dealing with matters not touched upon in that work, to the end that the pupil may gain not merely empirical knowledge, but, so far as this may be practicable, a comprehensive and connected view of the most important facts and laws in elementary physics.

5. That college-admission requirements be so framed that a pupil who has successfully followed out such a course of physics as that here described may offer it toward satisfying such requirements.

CHEMISTRY

Your committee approves the report of the majority of the Committee on Chemistry of the Natural Science Department of the National Educational Association, appended to this report, and it accordingly recommends:

1. That in the public high schools and in preparatory schools chemistry be taught in a course occupying not less than an assignment of four exercises a week for a year; more than this amount of time to be taken for the work if it is begun earlier than the third year of the school course.

2. That this course in chemistry include a large amount of individual laboratory work, including some quantitative exercises, done by the pupil under the careful direction of a competent instructor and recorded by the pupil in a notebook.

3. That this laboratory work, including the keeping of the notebook and the working out of the results from laboratory observations,
occupy approximately one-half of the whole chemistry assignment; double periods of time being given to each laboratory exercise.

4. That the course also include instruction by text-book, demonstration, with qualitative and quantitative experiments by the instructor, and frequent quizzes, elucidating and enforcing the laboratory work, or dealing with matters not touched upon in that work, to the end that the pupil may gain, not merely empirical knowledge, but, so far as this may be practicable, a comprehensive and connected view of the most important facts and principles in elementary chemistry.

5. That a pupil who has successfully followed out such a course of chemistry as that here described may offer it for one unit of work in satisfaction of the requirements for admission to college.

6. The subject-matter should include the chemistry of both metals and non-metals. More detailed study should be confined to a restricted list of elements and compounds—say twelve of each—other substances being drawn upon for broadening the course, when required for illustration of principles or for classifying facts.

Attention should be given to the atmosphere, manufacturing processes, and familiar substances.

The treatment.—The selection should be rational, such facts being preferred as can be classified or as lead most directly to principles.

The theoretical matter, including the theory of solutions, equilibrium, etc., should include all that can help in co-ordinating and elucidating the facts.

The presentation should be inductive, as far as possible. The principles and theories should not be stated as dogmas, but should follow the facts and supply the explanation for which a need has already been felt.

Symbols and equations should not be introduced until after quantitative experiments, and then in the character of abbreviated expressions of the results of quantitative work. Such experiments should, therefore, appear fairly early in the course.

Formal qualitative analysis should not form a part of a one-year course.

The laboratory work must be intelligent, and every effort must be made to avoid the mechanical tendency to which it is liable.

RESOLUTIONS

The following resolutions adopted by the committee serve to put in concrete form the leading principles that guided the committee itself in its consideration of the special reports, and which in its judgment are to be considered as first principles in the adjustment of relations between secondary and higher schools. These resolutions, embodying such principles, are what the committee offers in lieu of any ideal program or curriculum. The resolutions that follow are to be considered as covering, not every principle that the committee might wish to see recognized,
but only those which could be discussed and agreed to in the limited time at the committee’s disposal.

I. Resolved, That the principle of election be recognized in secondary schools.

In this resolution the committee merely indorses a practice, already very common in secondary schools. The tendency toward wide option in college-entrance requirements is too obvious to be ignored. The student is no longer limited to a single group of prescribed subjects, which alone secure admission to college study. Not only are many different courses offered by most colleges, but there is increasing latitude of choice in entrance requirements for each of these courses, and it seems probable that this latitude will continue to increase. The committee would agree, for instance, where one year of history is required, that the particular subject in history should not be specified, but that either one of the four typical year’s courses recommended by the historical committee should be accepted. In modern languages an option between French and German now generally exists. In science, while the disposition is now to make physics a required subject where only one science subject is offered, yet the committee indorses the tendency to allow election among the other sciences, and, aside from physics, to specify the requirement by amount rather than by subject. At the same time free and unrestricted election is not suggested, but, on the contrary, an election made after the most careful consideration of the matter by the pupil, the teacher, and, if possible, the parents. The administration of such an elective system makes extensive demands upon the insight, tact, and time of the principal, who will, in most cases, be the adviser from the teacher’s standpoint. The work of the principal under a properly administered elective system must inevitably be greatly increased by much personal consultation with students and study of the nature and capacity of individual students. The administration of the secondary school at present makes large demands upon the principal along lines that were practically unknown to his work but a short time ago. The principals, the committee believes, are ready to accept these new duties, and to discharge them with fidelity and skill, but it ought to be recognized that in order to do so they must be relieved of mere routine functions. The personal direction of individual students is the most delicate and responsible part of the principal’s work, requiring the highest intellectual and moral qualities. It is the duty of school boards to see to it that principals possessing these qualities should be relieved of so much of the drudgery of administration as will give them opportunity to perform properly this highest work.

II. Resolved, That the requirements for admission to technical schools should be as extended and thorough as the requirements for admission to college.

If students are admitted to technical schools with lower entrance requirements than those set by the colleges and universities, three consequences follow: (1) that the students enter on the technical studies at
an earlier age; (2) that they have less general culture than is provided by a high-school course; (3) that they leave the high school before the completion of that course. It seems to the committee that the foundation of general culture provided by the full high-school course is none too much for students whose after-studies are to be almost exclusively technical, and yet who, in their professional careers, will be called upon to fill positions where not only technical knowledge, but also general education, and especially the ability to write with ease and precision, will be important elements in their success. Nor does it seem to the committee desirable that students should be admitted to technical studies at an earlier age than that at which they are admitted to the studies of the college course. Technical training is essentially professional training. If a student is able to enter a technical school a year earlier than he can enter a college, and complete his technical studies in four years, he is ready to enter on his professional work at a date three years beyond the time when he would have left the secondary school after completing its full course. The student who chooses the profession of law or medicine, for example, who seeks the best preparation for his career, completes the high-school course, adds to it a four-years' course in college, and to that at least a three-years' course of professional study. He, therefore, enters upon his professional work with six years' more training than the technical student has. There seems to be no valid reason for this very great difference between the best preparation for the so-called learned professions and corresponding preparation for the technical professions.

The difficulties of the secondary schools in fitting students for college are now, and have in the past been, very great, on account of the different specifications from institutions which require theoretically the same amount of preparation. The technical school introduces an additional complication into the problem, and one of very serious import, in that its requirement is not only different in amount from that of the colleges, but also different as to specification. The tendency of this requirement is to develop a special class of schools, such as separate manual-training schools and elementary technological schools, whose function is to prepare students for the higher technical schools. This differentiation, however, does not seem to be in accord with the fundamental principles and ideals of the American educational system. Such a differentiation in secondary schools necessarily limits the field of their usefulness to those students who can reach the specialized institution. Such specialized institutions are apt to be remote and difficult of access, whereas the high school is almost everywhere accessible.

The condition to be desired is that in which a four-years' high-school course shall prepare the student for advanced study along the lines of his choice, whether literary or technical. It is believed by the committee
that it is the general purpose of the technical schools to advance their requirements as rapidly as possible to meet the standard outlined above. There can be no question that the lower and differing requirements for technical schools are becoming a disturbing factor of considerable importance in secondary-school work; nor is it doubtful that this factor would be removed if the requirements for admission both for colleges and for technical schools were made substantially equivalent. It is, of course, not suggested that they should be identical in subject; nowhere does the committee assume that such identity of requirement is desirable.

III. Resolved, That the teachers in the secondary schools should be college graduates, or have the equivalent of a college education.

The time is past when a superficial knowledge of a variety of subjects, coupled with a knack for giving instruction and some administrative ability, can be considered sufficient qualifications for teaching in our high schools. In many departments of study work is now being done in these schools as advanced as that done in the first year of the college course. And there is no better reason in the school than in the college for intrusting this work to the care of teachers who lack adequate special training for it.

Of course, it is not proposed that able teachers already connected with our schools should be displaced because of the lack of a college education, nor implied that young men fresh from our universities are qualified for the administrative responsibilities of the high-school principal. The most responsible positions in high-school work will naturally be intrusted to those alone who have been tested in less responsible positions—in the departmental work of the school. Our proposition is mainly concerned with the appointment of teachers to do this departmental work.

Our colleges and universities are now turning out each year numbers of young men and women of liberal training who are eager to teach subjects which they have been pursuing with enthusiastic devotion and distinguished success. Many of them have personal qualities which should fit them admirably for teaching. Surely, it is reasonable to urge that the best teachers for our high schools may be chosen from among them. Not only have they the requisite special knowledge, but they have given evidence that they possess the love of learning, lacking which the teacher is likely sooner or later to lose enthusiasm for his work and become a drudge.

Fortunately, the policy of recruiting the high-school teachers from college graduates already prevails in many of our great cities, and there is little doubt that the practice will soon become general. It will react most happily on the higher education of our people by enlarging the field of work open to college men and women, and will be a potent influence in elevating our secondary schools to a position as dignified as that now held by the secondary schools of France and Germany.
IV. Resolved, That we favor a unified six-year high-school course of study beginning with the seventh grade.

The most necessary and far-reaching reforms in secondary education must begin in the seventh and eighth grades of our schools. Educators agree that these grades must be enriched by eliminating non-essentials and adding new subjects formerly taught only in the high school. These reforms require the highest pedagogic knowledge and the most efficient supervision. In our opinion these problems can be solved most quickly and surely by making the seventh and eighth grades parts of the high school, under the immediate direction of the high-school principal. Recent attempts to teach Latin and German in these grades have not met with the success to which they are entitled, on account of the lack of qualified teachers and competent supervision. The improvements in the mathematical schedules in the grades have not been given a chance to show their value, because the teachers have lacked the technical training and the breadth of view absolutely essential to good teaching in the introductory courses of algebra and geometry. Science study is now acknowledged to have a place in the grades, yet slow progress has been made in producing educational results, largely because the grade teacher has been poorly prepared to teach the subject, and the leading scientists of the country, in their efforts to circumvent this obstacle, have failed to agree on a suitable course of study for the grades.

The proper adjustment of these studies in a unified high-school course would add much to the effectiveness and solidarity of secondary education. The seventh grade, rather than the ninth, is the natural turning-point in the pupil's life, as the age of adolescence demands new methods and wiser direction. Six elementary grades and six high-school, or secondary, grades form symmetrical units. The transition from the elementary to the secondary period may be made natural and easy by changing gradually from the one-teacher regimen to the system of special teachers, thus avoiding the violent shock now commonly felt on entering the high school. The seventh-grade pupils, if thought necessary, could still be taught and given individual attention by one teacher in all but one or two subjects which require the services of specialists. The personality of the teacher and her intelligent direction of the individual student should be insisted on and made more effective than at present. Under the system proposed an inefficient teacher in the seventh or eighth grade would do less harm in blasting bright intellects and in turning able students away from higher study. The inspiration afforded by a well-equipped high-school principal and by a special teacher in language, science, or mathematics would do much to retain desirable students in the high school, thus raising the educational standard of American citizenship. Statistics show that the number of students leaving school at the end of the sixth grade is comparatively small,
while the number is very large at the end of the eighth grade. By the proposed change, the students in the seventh and eighth grades would gradually gain the inspiration of the high-school life, and the desire to go farther in the languages and sciences which they have already begun under favorable conditions. The result would doubtless be a more closely articulated system, with a larger percentage of high-school graduates.

From an administrative point of view, the six high-school grades should eventually be in one building. As far as statistics are accessible on this point, the experiment of placing these grades in the high-school building has been successful, resulting in better scholarship and a greater percentage in the number of students entering the ninth grade. The gradual change to this system would probably lead to the establishment of a larger number of less expensive high schools, thus placing the "people's college" nearer their homes without additional expense to the taxpayer, but with a saving in money and strength to students attending the high school.

V. Resolved, That in the interpretation of the recommendations of this committee concerning the subjects to be included in the secondary-school program and the requirements for admission to college, for which credit should be given, it is distinctly understood that all secondary schools will not offer opportunities for the pursuit of all these subjects, and that the colleges will select those only which they deem wise and appropriate.

The very large secondary schools containing six hundred or more pupils are, perhaps, the only ones which can offer all the studies which the committee enumerates as legitimately belonging to a four-years' secondary program. No pupils in these schools can pursue them all, for no study should occupy less than one year, and no pupil should carry more than four regular studies which occur four periods a week. The larger the school, the more elective can be the curriculum, without any considerable extra expense. The smaller schools must content themselves with more rigid programs, but the welfare of the individual pupil should be the first consideration, consistent with the limitations of public funds. Every secondary school worthy the name can offer one, and in most cases two, foreign languages, two years at least of mathematics beyond arithmetic, one or two sciences, one or two years of history, of which one should always be American history with civics, and a full course in English. More languages, more sciences, more mathematics should be added as numbers and funds warrant. The colleges should be ver explicit in regard to constants, and equally so in regard to electives and equivalents, and all requirements should be so elastic that a pupil will not find himself, after a good four-years' preparatory course of study, debarred from entering the college of his choice.

VI. Resolved, That, while the committee recognizes as suitable for recommendation by the colleges for admission the several studies enumerated in this report, and while it also
recognizes the principle of large liberty to the students in secondary schools, it does not believe in unlimited election, but especially emphasizes the importance of a certain number of constants in all secondary schools and in all requirements for admission to college.

Resolved, That the committee recommends that the number of constants be recognized in the following proportion, namely: four units in foreign languages (no language accepted in less than two units), two units in mathematics, two in English, one in history, and one in science.

The recognition of elective courses in secondary schools is no longer a controversial subject; all educators acknowledge educational values, but these educational values are relative rather than fixed, and depend not so much upon the subject-matter of the study and its intrinsic power to train and develop and strengthen mental fiber as upon the skill of the teacher who is to elucidate, illuminate, and make attractive such study, and upon the innate endowments, the heredity, and the acquired talents of the student. It is believed, therefore, that there should be no absolutely fixed and inelastic requirements for admission to college, except so far as they may be within correlated groups. If, for instance, a college permits a modern language to be substituted for Greek, and the pupil presents in addition a year of mediaeval and modern history in place of a year in ancient history, the former should be regarded as a full equivalent for the latter. The same may be said of science. If a pupil finds it more to his taste to pursue the study of biology, or even botany, a year in the place of physics or of chemistry, he should not be embarrassed by the refusal on the part of the college to accept the substitute.

Secondary schools, therefore, should be allowed to arrange their programs in accordance with local environment, the demands of their constituency, and the tastes of their pupils; and when the work in any study is well done and a sufficient amount of it has been acquired, and this work is consistent with that done along other lines, it should be accepted by the college. The committee believes there should be constants in every secondary school. It is difficult, however, to fix these to the satisfaction of all. The committee would, therefore, have the constants in the foregoing resolution regarded as suggestive rather than unalterable. Few colleges, few committees, few boards of education will dissent from the proposition that every pupil should have at least one year of history, one year of some science taught by laboratory methods, and two years of English, including composition and literature; some will argue that there are those who cannot master geometry, and yet, if one has the scholarship which will warrant the expenditure of four years in college, he will have the ability to assimilate algebra and geometry to the extent of two full years of work. The question of foreign languages is a mooted one, and yet most intelligent people will agree that one foreign language—and that, too, pursued four years—or two, each followed two years, is valuable, if for
no other purpose than to give the pupil an enlarged and a more appreciative idea of our incomparable English. These constants are submitted, therefore, as important for every secondary school.

VII. Resolved, That the colleges will aid the secondary schools by allowing credit toward a degree for work done in secondary schools, beyond the amount required for entrance, when equal in amount and thoroughness to work done in the same subjects in college.

In many, and perhaps most, colleges the plan suggested in the above resolution is already in effect. Such recognition of school work by the colleges will tend to raise the estimation in which the school is held by the community. It will also directly assist the school in its natural effort to induce students to continue their studies in college, for if a student has, on finishing the school course, already one-third or a half year or more of work to his credit that may be counted toward a college degree, this fact constitutes a great incentive for going on with college work. Furthermore, it frequently happens that a student at the end of the last school year has one or two subjects to complete in order to finish the school course. This may happen for a variety of reasons, among which change of school and ill-health are most common. Should the student wish to go to college, two courses are open—either to enter college with conditions, or to remain an additional year in school so as to complete the course. But if the second alternative is adopted, the student, while making up deficiencies, can and should carry one or two additional studies, in order that the year's work may be complete. If these studies cannot be counted for college credit, there is temptation on the part of the student to do light work, and to take only the subjects required, with a tendency to acquire indolent habits of study. If the additional subjects above those required for completing the school course are accepted by the college toward a degree, a strong incentive is offered the student to do the best work possible, and the danger of falling into indolent habits is avoided. This college credit, furthermore, puts into the hands of the school principal one of his strongest arguments for inducing the pupil to remain an additional year at school, so that he may not enter college with conditions. It seems to the committee that there can be no question that the mutual interests of both school and college will be best subserved by making the class of conditioned students as small as possible.

VIII. Resolved, That for students who have met a definite requirement in any science, and who continue the subject in college, it seems to us desirable that there be provided a suitable sequel to the school course in continuation of the study; such students being in no case placed in the same class with beginners.

It seems to be a somewhat common practice among colleges to accept a subject for entrance, but not to give it credit after the student has been admitted. This is illustrated specifically by the case in which physics is
accepted as an entrance requirement, but not required of all students. Student A comes to college and presents a year's good work in physics, done in a high school or academy, as one of his entrance subjects. Student B has no physics, but presents something else, which is accepted as an entrance equivalent. In college, however, both A and B take precisely the same course in physics, one having had a year's work, with laboratory experiments, the other not having studied the subject at all. This practice is justified by the colleges on two grounds: (1) that the year's work in the high school really, after all, amounts to nothing, and (2) that it is impossible to make two different classes. The latter argument may be disregarded. In some cases it doubtless is true that the teaching force of the college does not permit the organization of two separate classes, and there is no argument with necessity. But the other argument, that the year's work in the high school is not of any value to the college, is refuted by the college itself, in two ways: (1) by accepting this year's work as of full value for entrance to the university, and (2) by allowing university credit for exactly the same sort of work in other subjects, as, for example, in Latin, French, or German. The student who offers French or German for admission to college is not put into the same college classes in either of those subjects with students who have not presented them for entrance, but is always put in an advanced class, and remains there until he has shown his unfitness. The practice of combining in the same college class students who have had previous high-school instruction and those who have not is most common in the sciences, and while physics has been specified above, all of the sciences that are accepted as entrance requirements share equally in this practice. The effect cannot be otherwise than disastrous upon science teaching in the high school, for if a student goes to college with a year's course in science and finds that work totally disregarded by the college authorities, he can but infer that the school work is without value. He is likely to send the report back to the school, and other students will be deterred from taking the course in science, knowing that they will have to do the work over again when they go to college later. The effect on the student himself who, having had a year's work in science, is required to go again over the same ground, to a large extent, alongside of students who have no previous knowledge of the subject, is most unfortunate. Experience totally disproves the argument that such work is in the nature of a thoro review and is, therefore, beneficial to the student. On the contrary, it is distasteful and tiresome. The student is likely to rely upon his previous knowledge and slight the work as much as possible. It frequently happens, therefore, that the student with the entrance equipment attains no better rank in his class than his fellow who entered without previous knowledge. This does not show, as has been supposed, that the high school is of no value, but it conclusively proves that such repetition is destructive of interest and
calculated to foster careless habits of work. The adjustment of college work to a wide range of elective entrance requirements certainly presents many difficulties, but it seems to the committee that, when the colleges have taken the step of offering this wide range of electives, they cannot well stop there, but are bound, so far as possible, to adjust the college work so that the students may not have to repeat in any branch work that has already been done, and presumably, by the college's own recognition of it, well done, in secondary schools.

IX. Resolved, That we approve of encouraging gifted students to complete the preparatory course in less time than is required by most students.

In this resolution the committee desires to approve a principle, rather than to recommend a definite plan for the application of that principle. Gifted students should be allowed special opportunities quite as much in grades below the secondary school as in the secondary school itself, and it seems probable, indeed, that the saving of time may be expected most advantageously in the lower grades. The subject of the grading of pupils below the secondary school is, however, not in the province of this committee.

In laying out a course of study the average student must be the basis of reckoning, but in the schematization of educational work there is constant danger that the interest of the individual student may not be sufficiently considered. There are students who must take more than the allotted time in which to complete the preparatory course, while there are others who can easily finish the course in less than the schedule time. This can be done, too, without overpressure and consequent injury to health. It is a truism that some students acquire much more readily and easily than others. Modern educators do not accept the doctrine of Helvetius, that all men are by birth endowed with the same natural capacities. Instead of cramping and confining the more gifted students, it is the duty of the secondary school to discover them and to furnish them every opportunity for progress in their work. There are difficulties of administration, caused chiefly by the time schedule, which sometimes cannot be overcome; but it seems to the committee that students have a right to expect that the school officers will use their best efforts to overcome these obstacles, and, so far as is consistent with good administration, offer to the students full opportunity for progress according to their individual capacities.

X. Resolved, That in general we recognize in schools the admissibility of a second year in advanced work in the same subject, instead of a second year in a related subject; for example, two years in biology, instead of one year in biology and one year in chemistry, where local conditions favor such an arrangement.

Sound pedagogical reasons might be advanced in favor of the general proposition that two years' work in one scientific subject is better
than one year's work in each of two scientific subjects. This principle is, indeed, generally held in regard to language studies. But in adopting the above resolution the committee was influenced mainly by other considerations. In the smaller schools it is not usually possible to have more than one teacher for science. It can hardly be expected that a teacher will be equally able in physics, chemistry, botany, zoölogy, physiography, and the other sciences that enter into the course. With the general trend toward the adoption of departmental work in the schools and the gradual introduction of university-trained specialists into the corps of teachers, there are more and more teachers who are especially capable and well trained in one special branch of scientific study. Where a school possesses such a teacher, better results in scientific training may, and probably will, be obtained by permitting specialization in the field of the teacher's particular interest. Again, in not all schools is it possible to have a number of scientific laboratories. A school may be able to equip one laboratory adequately, but would find it quite impracticable to equip two or three. Since laboratory work is now regarded as an indispensable part of scientific instruction, two years in one science with full laboratory facilities might properly be regarded as better than one year's work in the same science with laboratory facilities plus a second year's work in a different science with laboratory facilities either very inadequate or totally lacking. Where a laboratory is equipped for one year's work in science, the additional expense for equipping it for a second year's work in the same science is inconsiderable as compared with the expense of equipping another laboratory for a different science. For these reasons, mainly, it seems to the committee wise to recognize the substantial equivalence of two years' work in one science for a year's work in each of two different sciences. Some schools would be able to provide a year's work in one science and two years' work in one other science—a total of three years in science. The committee believes that the aim to be attained is a certain amount of scientific training of the proper and adequate sort, but that, so far as combination of subjects to make up this total is concerned, local conditions may properly be a determining factor.

The committee is not to be understood as recommending, as a rule, a second year of study in the same subject, but only that such an arrangement is admissible or desirable under certain conditions.

XI. Resolved, That it is desirable that colleges should accept, in addition to the year of United States history and civil government already recommended, at least one-half year of intensive study of some period of history, especially of the United States.

To recommend collegiate recognition of the "intensive study" of history in the secondary schools is only to ask the same recognition for history that is already accorded to other subjects. "Advanced requirements"
in languages, mathematics, and science have long been recognized; no one is likely to assert that an advanced requirement in history is less desirable than such a requirement in other subjects. But the chief reason for this recommendation is, of course, the belief that the secondary school will gain a valuable extension of its course of study—an important source of culture for the best students in history, in particular, but also for all interested pupils.

The elementary course in history gives many glimpses of unexplored fields of knowledge that invite further inspection, and suggests many problems of social development that can be dealt with only incidentally at the time. Intensive study of history permits single pupils, or, at least, groups of pupils, to explore some of these fields, and to attack some of these suggested problems. To gratify the interest in historical study thus aroused is to promote the instinct of true scholarship, and hence afford an admirable preparation for college work.

In a word, intensive study in history affords pupils an opportunity to pursue a favorite subject beyond the usual elementary course in history with which they must otherwise be content. It is, accordingly, a valuable stimulus and a satisfaction to both teachers and pupils. But unless this intensive study can be recognized in college-admission requirements, few schools will be able to provide it.

XII. Resolved, That we recommend that any piece of work comprehended within the studies included in this report that has covered at least one year of four periods a week in a well-equipped secondary school, under competent instruction, should be considered worthy to count toward admission to college.

It is the opinion of the committee that a larger option ought to be allowed to high-school pupils in selecting the subjects which they desire to offer for admission to college than is accorded at present. It is felt that the adoption of this policy of permitting larger options lies in the interest of the colleges, and of college education, as well as of the high schools and of high-school education.

The acceptance of this larger option will make it possible for many high schools to prepare properly for college which cannot do so at present, and thus the number of possible college students may be considerably increased.

Many high schools find it impossible to offer one or another of the subjects required for admission to college at present, while they do offer instruction in subjects which there seems to be no adequate reason for excluding from the category of accepted branches.

It will thus become possible for many high schools to undertake the work of preparation for college without seriously impairing that other and perhaps more necessary, work involved in answering the demands of the public for instruction in the specific subjects which the local public insists upon. This will, moreover, permit the individual high school
pupil a range of choice among the subjects which he may desire to offer, which will be only a legitimate recognition of the elective principle in the sphere of secondary education.

It will be noted that the recommendation of the committee in favor of a wider option in subjects is connected with this positive condition that such a subject must be pursued long enough to guarantee serious work, and that the high school must have adequate facilities for teaching the subject, and competent instructors to handle it.

It is felt that the acceptance of the proposed wider range of options, combined with the insistence upon such a method of treatment, upon such amount of time, and upon such facilities for teaching as will secure good educational results from a disciplinary and cultural point of view, will have a pronounced influence in persuading high schools to adopt the principle of selecting a few subjects in which they can give adequate training, rather than the patchwork system of selecting very many subjects and giving only slight attention to each one, which prevails in so many of our American high schools. And it is believed that this will be a very valuable educational result, which might well compensate for any slightly injurious effects which might possibly flow from allowing this wider option.

There is a general argument in favor of this plan which applies to the elective system in general, so far as it can be properly employed, namely, that the pupils themselves will take a greater interest in their work, will conceive a more earnest desire to attend the college and university, knowing that they have an opportunity to pursue there the studies which have interested and benefited them in the high school. It is believed that the limitation of this recommendation to studies included in this report makes the above recommendation an exceedingly conservative one, and one in which all college and high-school men can unite.

This proposition does not involve of itself, necessarily, the idea that all subjects are of equal cultural or disciplinary value, or even that the subjects here proposed are of equal or similar value. The acceptance of this recommendation does not, therefore, hold the committee to the espousal of any such doctrine, or the association, if it accepts the report and recommendation of this committee. It does involve, however, the proposition that, even tho there may be a difference in the disciplinary or cultural value of these subjects pursued under the conditions indicated, yet the advantages to our educational system of the adoption of this principle will be so great as far to outweigh any incidental disadvantage which may accrue from accepting as of equal value for college purposes the more or less unequal values represented by these studies.

It is certainly a further argument for the wisdom of this recommendation that it is directly in the line of all present movements in the educational field. All the leading associations of college and secondary
teachers in the United States have recently expressed views similar to these incorporated in the recommendation. It would seem, therefore, as if the conditions in different portions of the country were so similar that we have here to do with a principle which is applicable to all sections of the United States.

XIII. Resolved, That it is desirable that our colleges and universities should accept as a unit for admission a year's work in economics, including under this head a course in elementary political economy, supplemented by adequate instruction in commercial geography and industrial history.

The present recommendation is really included in the preceding one, and we need not, therefore, spend very much time upon it.

It is worth noting, however, that this is an additional recommendation to those contained in the various reports by the Committees on History and Civics, which from time to time have appeared of late in connection with our educational associations. It is the opinion of the committee that the subject of political economy, which is now taught in one form or another in very many of our high schools, is entitled by its importance, and by its disciplinary and cultural value, to a position in the programs of all high schools, and that, when it is a part of such a program, and is conducted during the entire year, in a school with proper facilities, and with properly qualified teachers, it deserves the same recognition as other subjects pursued under similar conditions.

It will be noted that the committee recommends that some attention be given to commercial geography and industrial history in connection with the work in elementary political economy, and that these three subjects be taken as one.

This recommendation is made because the committee feels that such a subject as this may easily become merely formal in the actual instruction in the schools, and that it should receive a concrete treatment, which will be assured to a certain extent by linking it with the practical subjects having such an intimate relation to it as commercial geography and industrial history.

It appears to the committee that in a country like the United States, where all citizens are called upon to take sides in the discussion and decision of important economic questions, it is exceedingly desirable that the elements of economics should be included in the program of high schools for the sake of the pupils who may not go to college. And, following the general line of the recommendations of this report, it is urged that, when the subject is so taught as to secure adequate results for those who do not go to college, it will also be so taught as to entitle the pupil who pursues it to the privilege of offering it as one of his requirements for admission to college.

XIV. Resolved, That we recommend an increase in the school day in secondary schools, to permit a larger amount of study in school under supervision.
In presenting this resolution the committee is aware that there is a great divergence of custom in the length of the day in secondary schools, the number and length of recitation periods, the noon intermissions, and the time devoted sacredly to study within the schoolhouse. A few have two sessions, following the rule governing the elementary schools; some are from 8 A.M. to 1 P.M., and many from 9 A.M. to 2 P.M., with one-half hour at noon for a light lunch.

We appreciate the almost unanimous and perhaps enlightened opposition on the part of teachers to the proposition for a longer school day. The committee believes, however, that it is a subject for intelligent discussion, and that the weight of argument favors a longer day. The committee does not trace its convictions on this matter to the fact that the German secondary schools are one-half longer in session than our schools, and no hardship seems to result.

There is no disposition to imitate European methods because they are European, but we believe it is easily demonstrable that it is in the class recitation and under the inspiration and instruction of the teacher, and not in the study hours at home, that the pupil acquires the bulk of his scholastic knowledge.

A very large majority of the pupils who attend our secondary schools are of the middle class, a very respectable minority are of the poorer class, and only a small fraction are from the homes of the rich.

In the cities and large towns the school buildings offer better conveniences for study than the homes; pupils of immature age do not know how to study, and need the guidance and direction of an intelligent and interested teacher; lessons should be learned largely in school in the quietness of rooms thoroly equipped for that purpose, in the midst of reference-books, maps, charts, pictures, and all of the paraphernalia incident to study; recitation periods should not be less than fifty minutes, instead of forty, as prevails in too many schools; there must be time for drawing, physical culture, vocal music, and laboratory practice.

The committee, therefore, recommends that the secondary-school buildings be open for pupils from 8 A.M. until 4 P.M., and that all who find it more convenient and attractive be encouraged to occupy the rooms for reading and study, and that as many teachers as are necessary remain to assist these pupils in the prosecution of their work.

The practice in some schools of having two sessions a day, with a long intermission at noon, is to be deplored. The committee especially disapproves of the plan recommended by some with a view to economy, but which we think false economy, of having two sessions with different sets of pupils for morning and afternoon, whether taught by the same or different teachers at each session. This method will require all study, all preparation of lessons, to be done at home, without the conveniences, the equipment, the inspiration of the school itself. It will destroy, in a large
measure, the real function of the secondary school; it will lessen the interest of the pupils, and limit the influence of the teachers; it will separate children of the same families in the different years of the school; it will make the instruction less potent and the discipline more difficult; it will in every way tend to destroy the school as the real laboratory and workshop of the pupil.

NATIONAL UNITS, OR NORMS

The vocabulary of pedagogy is not as yet clearly differentiated in all of its branches, a fact which accounts for no little confusion in educational discussions. The words "curriculum" and "course of study," for example, are used synonymously to apply either to the entire range of subjects pursued in a school, to the schematic arrangement of those subjects for an individual student, or to the quantum of any given subject, as mathematics or history. So we have the expressions, "high-school course of study," "high-school curriculum," "high-school course," the "Greek course" and the "course in Greek" (which may designate either a special schematic arrangement for the whole work of a pupil taking Greek, or specific work in Greek itself), "Latin course" and "course in Latin," etc., thru all the subjects. It is difficult to avoid the confusion which this inaccurate use of language makes almost inevitable.

The committee, for itself, adopts a definite terminology which will be used during this discussion. Three distinct terms seem to be needed: (1) program of studies, which includes all of the studies offered in a given school; (2) curriculum, which means the group of studies schematically arranged for any pupil or set of pupils; (3) course of study, which means the quantity, quality, and method of the work in any given subject of instruction.

Thus the program of studies includes the curriculum, and may, indeed, furnish the material for the construction of an indefinite number of curriculums. The course of study is the unit, or element, from which both the program and the curriculum are constructed.

With the construction of a curriculum, or of several curriculums, this committee has not dealt. A very large number of such schematic plans are already in print. It is difficult to decide, upon general principles, why one is better than another, and still more difficult to formulate a new one which shall be better than any other; nor does it seem to the committee necessary or desirable that such a work should be undertaken. Individual differences of opinion among principals and teachers, as well as the influence of local conditions and surroundings, have always been reflected in school curriculums, and it seems necessary that they always should be. Absolute uniformity in our secondary education thruout the country, or thruout any considerable section of it, is so improbable that it is a waste of time to discuss the question as to whether it be desirable or not. The
committee believes it is not desirable, but it is also of the opinion that uniformity is possible, practicable, and desirable in certain features of secondary work, and that, therefore, the proper course to pursue is one that will leave sufficient scope for individuality, in the field where individuality rightly has most play. The committee aims to secure uniformity in that part of the field in which uniformity is most desirable. Using the terminology outlined in the above paragraph, there seems to be no need for uniformity in curriculums, and no possibility of it, but there does seem to be a great need for uniformity in courses of study, and no insurmountable obstacles to the securing of such uniformity are discoverable. The course of study is the unit out of which curriculums and programs are framed. It is with this unit that the work of the committee has been chiefly concerned.

Acting on these lines, the committee has devoted its chief energies, thru several years, to securing the formulation of satisfactory courses of study which should serve as units, or norms, worthy of national acceptance. The process of formulating these units has been outlined in the preceding sections of the report. The work, on the whole, represents the consensus of opinion of a very large body of the ablest experts in the country. The committee was obliged to rely upon the free co-operation of bodies of specialists for the work of laying out courses in the several subjects. Under such circumstances it was inevitable that there should be some differences in the thoroughness and enthusiasm with which the work was performed. Had the committee been able to call together special bodies of scholars and schoolmen to represent each subject taught in secondary schools, a more complete and symmetrical report might have been presented. On the other hand, it would have been impossible for the committee, with the amply financial resources, to have secured such expert work as is represented in some of the special reports submitted, notably those on Greek and Latin, modern languages, and history. On the whole, therefore, it was, perhaps, fortunate that the method of work pursued by the committee was forced upon it by circumstances. Each body of specialists was invited to outline an ideal and also a practical course of study in the special study it represented. These courses are printed, each under its appropriate head, in the department of special reports.

These courses of study constitute so many national norms, or units, out of which any school may make up as rich a program of studies as its means and facilities permit; a program, moreover, which may be made to yield several curriculums, or, possibly, almost as many curriculums as there are students, each curriculum perhaps being better than the others, from an individual point of view.

In so far as the courses of study representing national units, or norms, may be adopted by the schools and colleges, great simplification will
result in the subject of college-entrance requirements, the subject specifically referred to this committee. Hitherto there has existed the widest confusion in this matter, a confusion that has been more emphatic in some studies than in others, no doubt, and yet it has pertained to all of them. It has been owing largely to this confusion that the colleges have been unwilling to abandon entrance examinations. For instance, elementary German as prescribed for an entrance requirement meant nothing unless the ground covered were outlined with some minuteness in the college catalog; for what might constitute elementary German in one school might be a course of three periods a week for a year, in another five periods a week for a year, in another four periods a week for two years; in one school it might be pursued by the conversational or natural method, and in another by the grammatical method. The same, of course, is true of French. In history there has existed a great amount of confusion. There has also been lacking a general consensus of opinion as to what constituted proper work in science for entrance requirements to college. In the older studies, mathematics and the ancient classics, there has been less confusion, as they have had a longer time to crystallize into definite form; but the report on classics by the American Philological Association represents a very distinct and important advance in the organization of classical education in this country.

The fundamental problem in this connection, in the minds of the committee at least, is to formulate courses of study in each of the several subjects of the curriculum which shall be substantially equal in value, the measure of value being both quantity and quality of work done. This idea has been kept firmly in mind by all the special committees, as is evinced by the fact that the courses of study outlined by these committees make no great or unusual demands upon the schools, and are evidently, at a first glance, in a general way, substantially equivalent. If schools and colleges were able, generally, to accept these courses, the statement of entrance requirements would be extremely simple and perfectly intelligible. That such a general acceptance of these courses may not unreasonably be anticipated is shown from the experience with the English requirements for college entrance, which have within a few years, without any external pressure and authority, become practically uniform throughout the country, simply by reason of the formulation by a reputable body of experts of a definite course of work. It is not to be expected, nor is it desired, that all colleges should make the same entrance requirements, nor is it to be expected that all schools will have the same program of studies. What is to be desired, and what the committee hopes may become true, is that the colleges will state their entrance requirements in terms of national units, or norms, and that the schools will build up their program of studies out of the units furnished by these separate courses of study. A college may recognize more or fewer of these units, but
where it recognizes a subject at all, it is to be hoped that it will recognize it in the shape of the national unit. So, probably, very few schools will be able or desire to offer all of the units, but out of the total number of units outlined any school should be able to build up a satisfactory program from which all necessary curriculums could be extracted.

Notwithstanding the care with which these courses of study representing different units, or norms, have been formulated, it cannot be expected that they will meet with universal acceptance. In many matters of detail they are bound to be criticized; but the committee earnestly expresses the hope that where individual preferences differ in minor details from the statements made in the special reports and the principles outlined in the report of the committee as a whole, these individual preferences will be subordinated for the sake of the general good. The reports of the committees represent a large consensus of expert opinion, and as such should be entitled to weight and consideration. They are entitled also to the advantage of the doubt, where any individual questions as to whether the views expressed are sound on a given point. The opinion is held by good thinkers that we are living in an age of excessive individualism. It is certainly true that the educational system of the country has suffered, and still suffers, from the great opportunity afforded by our system for the play of individual idiosyncrasies. It is quite true, on the other hand, that education, as a whole, has gained vastly from the freedom offered to individual initiative; but on certain measures of national bearing the time has come to subordinate some personal preferences in order to reach an agreement which shall make for the public good. Such an agreement does not mean the abandonment or sacrifice of a principle, but it may involve the non-insistence on carrying the principle into immediate practice. In the curriculums large and, it would seem, ample scope is still left for the play of individuality. The committee distinctly refrains from entering upon the task of constructing curriculums to be imposed, for the sake of uniformity, upon the schools of the country. Such uniformity is not needed; but uniformity in courses of study which shall lead to the establishment of national units, or norms, does seem to be of so great importance that both colleges and, secondary schools may fairly be expected to yield, to a large extent, individual opinions which interfere with its establishment. While the committee is unanimous in this opinion, it feels that the opinion would still be of little value but for the fact that in the course of four years' work upon this problem it has become convinced that there is a widespread sentiment among thoughtful educators of the country which demands such action. In formulating these courses of study, these units, or norms, and presenting them to the public, the committee does not, therefore, feel that it is leading the way into a new and untried field, making suggestions which may come
to fruition in after-years, but that it is formulating, crystallizing, putting into definite shape beliefs and sentiments that have already taken hold upon the educational public. Legislation is largely the official recognition of existing facts or sentiments. The committee in this work feels that it is acting more in a legislative than in a pioneer capacity.

RESOLUTIONS OF THANKS

Resolved, That the conference desires to express its hearty thanks to all who have contributed to the success of the meeting; to President Harper for his cordial welcome and interest in the prosecution of its work; to the university for opening wide its doors and extending all its privileges; to Dr. William Gardner Hale for his special hospitality; to many other professors of the university for generous entertainment; and especially to the officers and members of the Quadrangle Club for the free use of their rooms and many other courtesies that have facilitated the work of the conference, and contributed greatly to the pleasure of its individual members; and to the Chicago press for the unusual pains taken to give full and impartial reports of its proceedings.

Resolved, That the hearty thanks of the committee are due, and are hereby extended, to the American Philological Association, the Modern Language Association of America, the American Historical Association, the western branch of the American Mathematical Association, and the Natural Science Department of the National Educational Association, for the great interest they have taken in our work, for the valuable services they have rendered in furnishing reports and other manuscript material for our use in preparing our report. Also to Professor Alexander Smith and Dr. John M. Coulter, of the University of Chicago, and Mr. Charles W. French, of the Hyde Park High School, of Chicago, for assistance similar in kind, and for the information and counsel they have so kindly furnished the committee since our session began.

Resolved, That the committee heartily appreciates the sustained interest of its chairman, and realizes that what measure of success it has attained is largely due to his indefatigable labors toward securing material from experts for the consideration of the committee.

RESOLUTIONS DEFINING DUTIES OF EDITORIAL COMMITTEE AND APPOINTING SAME

Resolved, That the chairman, Mr. Nightingale, together with Professors James and Thurber, be constituted a committee to prepare for publication the final report of the joint committee, and to carry it thru the press.

Resolved, That this committee of three has permission and authority to call upon the individual members of the joint committee for such facts and views as in their judgment may be necessary in preparing the report.

Resolved, That the report, when in type, be sent to all members of the general committee, in proof sheets, for their suggestions and criticisms, with the understanding that the committee of three shall be the final authority as to the admissibility of such suggestions and criticisms into the report as finally published.

Resolved, That when in the opinion of this committee of three such suggestions and criticisms cannot be properly admitted into the report, their authors shall have liberty to express them in dissenting special reports over their names.

Resolved, That it is not desirable that such dissenting reports shall be insisted upon except in the cases of serious divergency of views, of which the authors themselves shall be the sole judges.

It will be seen, by reference to the resolutions constituting and instructing the editorial committee of three, that the general committee
thought it desirable to avoid, as far as possible, divergent views and dissenting opinions in the final report, and to secure the largest possible consensus of opinion consistent with the truth. This instruction has been carried out in its spirit. While the names of all the committee are signed to the report, and there are no dissenting reports, it is not to be supposed that the members of the committee all indorse every view and opinion that the report contains.

CONCLUSION

Upon several subjects of great importance this report is silent, much to the regret of the committee. These omissions and deficiencies must be regarded as due to the conditions under which the committee has worked, and not at all to any feeling on the part of the committee that these subjects are of relatively small importance. That courses of study have not been prepared in geology, astronomy, and physiology—subjects which play an important part in secondary courses, and which are, to some extent at least, recognized for entrance to college—is perhaps the most important omission. The committee is bound to state, in justification of its own action, that, in accepting the proffered aid of the Department of Science of the National Educational Association, it depended upon the department for detailed reports upon courses of study in the several sciences taught in secondary schools, in the same way that it depended upon the Philological, the Historical, and the Modern Language Associations for detailed reports in their several branches of instruction. These reports were not forthcoming on the subjects of astronomy, geology, and physiology. In the three-days' session held by the committee it was quite impracticable to secure any reports that would have weight and value. The detailed consideration of these subjects is, therefore, reluctantly omitted from this report. But the committee would call attention to the fact that the general principles laid down in the report as a whole apply quite as thoroly to the branches just enumerated as to all the others for which detailed courses of study have been submitted. It might be helpful to the schools if carefully planned courses of study in astronomy, geology, and physiology could be presented in this document, but the general principles upon which such courses should be constructed and administered, in order that they may be received for college entrance, have been fully elucidated in connection with the other subjects of instruction and in the general resolutions adopted by the committee. So far, therefore, as the specific work of this committee is concerned in determining the principles to be followed in adjusting secondary courses to meet college-entrance requirements, and vice versa, it cannot be held that any subject has been slighted, for the fundamental work of the committee has been a formulation of principles that are equally applicable to all subjects of instruction.
Since the work of the committee is concerned in large part with the courses of study in secondary schools, it would, no doubt, have been desirable that the subject of commercial instruction should have been taken into consideration. What relation commercial studies shall have to other studies in the program, and whether any commercial studies, such as history of industries, history of commerce, and commercial geography, should be recognized for admission to college, are questions that will soon have immediate practical importance. The whole subject of commercial education in secondary schools seems to the committee one deserving of special study—one, indeed, for the consideration of which a special committee might well be appointed. Nor is the committee unmindful of the fact that it has not carried out that part of its self-adopted program of work which committed it to an investigation of the best methods of admission to college, whether by examination or by some form of certification. This question, however, seems not so fundamental as those to which the committee has advocated its labors. Still it would, no doubt, be desirable to have an adequate study made of this matter in all of its phases and bearings. The time and resources at the disposal of the committee, however, were not adequate for accomplishing more than is herewith presented.

When it is remembered that the investigations carried on by the committee itself and those carried on at its suggestion, the results of which are herewith presented, have all been completed under a single appropriation, from the National Educational Association, of $500—an appropriation, moreover, which did not become available until the present year—it will be obvious at once that the committee has been favored by the generous and self-sacrificing assistance of many collaborators. A large number of educators, including those whose names are signed to the various special reports, and many others as well, have given generously of time, and also of money, to further the work of this committee. The cordial and enthusiastic support accorded to this investigation from the outset has been an unfailing source of inspiration to the members of the committee themselves, and a sure sign of the importance ascribed to the relations of high schools and colleges as a factor in the development of our higher education. The officers of the National Educational Association have given their cordial support to the work of the committee at every stage of its progress. The committee now submits its report, with the most cordial appreciation of the generous aid it has thus far received, with a conviction of the importance of the subject discussed, that has grown more intense with every additional day of labor given to the report, and with no feeling that the work intrusted to the committee has been finally and forever accomplished, but in the hope that an important contribution has been made to the adjustment of the vexed relations between secondary and higher education, and with confident expectation
that the report thus submitted will receive the careful study and, so far as may be justified, the approval and adoption of those who direct the higher education of this country.

A. F. Nightingale, Chairman,
Superintendent of High Schools, Chicago, Ill.

W. H. Smiley, Secretary,
Principal of High School, District No. 1, Denver, Colo.

George B. Aiton,
State Inspector of High Schools, Minneapolis, Minn.

J. Remsen Bishop,
Principal, Walnut Hills High School, Cincinnati, O.

John T. Buchanan,
Principal of Boys' High School, New York, N. Y.

Henry B. Fine,
Professor of Mathematics, Princeton University, Princeton, N. J.

Paul H. Hanus,
Professor of the Science and Art of Education, Harvard University, Cambridge, Mass.

Burke A. Hinsdale,
Professor of the Science and Art of Education, University of Michigan, Ann Arbor, Mich.

Ray Greene Huling,
Principal of the English High School, Cambridge, Mass.

Edmund J. James,
Professor of Public Administration, University of Chicago, Chicago, Ill.

William Carey Jones,
Professor of Jurisprudence, University of California, Berkeley, Cal.

James E. Russell,
Dean of the Teachers' College, Columbia University New York, N. Y.

Charles H. Thurber,
Associate Professor of Pedagogy, University of Chicago, Chicago, Ill.
Third year — English history, with reference to the chief events in modern European history (three times per week).

Fourth year — American history and civil government.

First year — Ancient history.
Second year — Mediæval and modern European history.
Third year — American history, with special reference to development of English political principles and English expansion in connection with American colonial history (three times per week).
Fourth year — American history and civil government (three times per week).

ANDREW C. McLAUGHLIN, Chairman,
Professor of American History in the University of Michigan.

HERBERT B. ADAMS,
Professor of American and Institutional History in the Johns Hopkins University.

GEORGE L. FOX,
Principal of the Hopkins Grammar School, New Haven, Conn.

ALBERT BUSHNELL HART,
Professor of History in Harvard University.

CHARLES H. HASKINS,
Professor of European History in the University of Wisconsin.

LUCY M. SALMON,
Professor of History in Vassar College.

H. MORSE STEPHENS,
Professor of Modern European History in Cornell University.

REPORT OF THE COMMITTEE OF THE CHICAGO SECTION OF THE AMERICAN MATHEMATICAL SOCIETY

Dr. A. F. Nightingale, Chairman.

SIR: In compliance with a request from you, the Chicago Section of the American Mathematical Society, at its session in December, 1898, appointed a committee to co-operate with the committee of the National Educational Association of which you are chairman, by preparing for the use of the latter committee a report "on the scope, aim, and place of these studies (mathematics) in the secondary schools and in preparation for college, with model courses in algebra, geometry (plane and solid), and trigonometry, with methods to be used, time to be consumed, etc., etc." This action was afterward approved by the Council of the society.

In order that the various phases of instruction in mathematics might be more fully
represented, it was decided to associate with the members of the American Mathematical Society upon the committee several persons not members of the society, these persons to have equal voice and vote with the members of the society in the proceedings of the committee, but to be designated as associate members of the committee. The associate members are Messrs. Lyon and Schobinger.

The committee held several sessions in December, at which the various problems presenting themselves were discussed, and a subcommittee was appointed to prepare a draft of a report. This was done, and a copy sent to each member of the committee. These drafts were returned with criticisms and amendments, upon the basis of which a second draft was prepared by the subcommittee and a copy sent to each member of the committee. The comments hereupon were discussed by those members of the committee present at the meeting of the Chicago Section of the American Mathematical Society at Evanston, April 1, 1899, and the subcommittee was directed to prepare a third and final draft, which is submitted herewith. Since the report is submitted to you directly, and not to the society, the individuals concurring in the report are alone responsible for its contents.

Very respectfully,

J. W. A. Young,
Chairman.

PRELIMINARY REMARKS

1. Terms used.—The term "secondary school" is used to designate, generically, all schools which have courses fitting for college. The term includes high schools, academies, and private college-preparatory schools. The course of study in the secondary school proper is assumed to cover four years.

The term "the grades" is used to designate the work prior to the secondary school. It is assumed to cover eight years. The work of each of these years is sometimes alluded to as a "grade," the grades being numbered in order from one to eight. The child is assumed to enter the first grade at the age of six years.

2. Scope of report.—In determining the phases of topics to be discussed and the nature of its detailed suggestions, the committee has been governed by the condition of instruction today, rather than the absolute importance in themselves of the topics selected for remark. It was found impracticable to discuss the work in mathematics in the secondary school without giving quite a little consideration to the closely related antecedent work in the grades.

3. Scope of mathematical work.—At its sessions in December the following resolutions were adopted by the committee:

(a) That before the pupils reach the secondary school the work in mathematics should be the same for all.

(b) That in the secondary school the standard course in mathematics should be sufficient to admit to college; that this course should be required of all pupils, and that the instruction in this course should be the same for all pupils.

(c) That the main emphasis should be given to such topics as are useful in later work.
(d) That the best place for a topic in the course of study is where it is most closely related to other topics; that there should be applications of algebra, geometry, and arithmetic to each other, and to various sciences and the practical affairs of life.

CONCERNING METHODS

Various methods of teaching mathematics are in vogue. The good teacher will not tie himself to any one method, but, on occasion, will make use of the good features of every one. The committee recommends no single method above all others, but whatever method may be used, the aim should always be to cultivate independent thinking on the part of the pupil. A method which encourages, or even permits, rote work, or mechanical manipulations, is radically wrong. The value of the study of mathematics cannot be realized, not one of its objects attained, unless the student himself thinks, produces. Not to learn proofs, but to prove, must be his task. This idea should dominate the instruction from the very beginning. The independent work should not be left to the close; not to the closing years, nor to the close of the subject in hand, nor to the close of the chapter, nor even to the close of the first lesson in arithmetic.

GENERAL METHODIC SUGGESTIONS

1. Steps.—The importance of distinguishing the various steps of a process, and of taking them one at a time, can hardly be overemphasized. This is sometimes irksome to the pupil, and the consequent attempts to take several steps at once are responsible for much of some pupils' lack of success in mathematics.

2. Oral work.—In all the subjects of mathematics much stress should be laid on oral solution of many easy and carefully graded exercises. Principles are just as effectually applied in these as in more complicated exercises, and the application is more readily seen.

3. Testing results.—The pupil should be taught to test the accuracy of his results by applying a check whenever this is possible, and before completing any topic he should have acquired sufficient facility in checking his work against errors, to rely with confidence upon the correctness of his own results, independently of corroboration by the teacher or a printed answer. Often a rough estimate of the probable character of the result will enable the pupil to detect a glaring error, without the use of a more detailed check. Written exercises should by no means all have results of a simple form, since pupils are very apt to fall into the habit of thinking that the result must be simple to be correct.

4. Translation.—Mathematics has a language of its own. The teacher must be unwearying in his endeavors to teach his pupils to speak the sentences of the mathematical language with intelligence, and he must be
ever on the alert to check the tendency to use them as meaningless jargon. Here, as in other languages, one who has made some progress shows that he has intelligent control of the language by uttering consistent sentences conveying ideas. Ability to think in the language is one of the ends aimed at, but in the language of mathematics this can be attained only by much translating; the beginner must assure himself that he understands the mathematical sentence, by giving its equivalent in ordinary English; and, what is more difficult, must be able to clothe in mathematical symbols thoughts expressed in English.

5. Different presentations.—In the fundamentals and in the beginning of any subject the committee is decidedly of opinion that one set of definitions and style of presentation should be strictly adhered to. After a time (and still adhering to the one style of treatment adopted) the presentation by the pupils of other proofs which they may have found for the same proposition, or of different methods of attaining the result of some exercise, and the discussion of these in class, is of great value. More may often be gained by proving one proposition in three different ways than by proving three propositions in the same way. This practice should, however, be introduced gradually, great care being taken to avoid confusion; and its use should be much increased as the pupils gain a firm grasp of the subject.

Definitions, tho developed in class as needed, should not be left in an inaccurate form, nor inconsistent with the analogous definitions of later mathematics. Tho in higher mathematics the definitions of the elementary subjects may be generalized, it should not be necessary to overturn them. (E. g., the circle should be defined as a curve, not as a portion of a plane.)

6. Neatness and accuracy.—Papers written in a slovenly manner, slipshod work, half-guessing at results, and artificial juggling with the quantities involved, are far too frequently found. The difficulty can be met only by persistent training, from the very beginning of mathematical instruction, in neatness and accuracy. In particular, the committee suggests the use of numerous short written exercises, in which the pupil is not hurried for time by the amount assigned, and in which the requirement is made that what he hands in must be accurate and neatly arranged.

7. Synopses.—At the close of each chapter or topic a synopsis in schematic form of its definitions, methods, and results should be made. The object of this is to correlate the material and to secure that view of the topic as a whole which is too likely to be obscured by the details of the first study and the working of exercises. This will serve also to bring clearly before the pupils that the solution of exercises is not an end in itself, but is a means of impressing a connected theory.

8. Correlation of work.—The subjects arithmetic, geometry, algebra
should be treated as branches of one whole—mathematics—and each of these subjects freely applied in illustrating and broadening the others.

9. Independent thinking.——Whatever specific method or methods may be used in conducting the instruction, the controlling principle must be that the pupil is to be kept thinking for himself. The learning of proofs, even tho it be done understandably, is not sufficient. Not learning proofs, but proving, should be the pupil’s principal activity in the study of mathematics.

ARITHMETIC

The instruction in arithmetic, except as it would properly come up in connection with geometry, algebra, and trigonometry, thus adding to their interest and usefulness, should be confined to the following topics:

1. The four fundamental processes with integers, all the computations being tested.

2. Factorization of all numbers up to 100, and some above 100, exponents being used. The results not to be derived by rule, but from the multiplication table.

3. Easy work by short rule in L. C. M. and H. C. D.; to be tested by seeing whether the quotients obtained by dividing L. C. M. by the numbers are relatively prime, and whether the numbers divided by the H. C. D. also give relatively prime results.

4. Simple work in denominate numbers, only the measures generally in vogue being used.

5. Simple operations in fractions, geometric, i. e., graphic illustrations being given, and fractions with large terms being, as a rule, avoided. Application of simple fractions to making rough estimates.

Much stress on cancellation; actual multiplication or division being performed by cancellation wherever possible.

6. United States money. The commoner measures of the metric system; the measures being actually constructed, and measurements performed with them. There should also be rough comparison with our own measures.

7. Decimals: the four rules, with especial attention to the correct placing of the decimal point.

8. Simple problems in percentage; the fact being emphasized that “per cent.” means hundredths, or a fraction with 100 for denominator. The pupil should be trained always first to ask himself of what the per cent. is to be taken. This (the determination of the base) is largely a matter of use of language. Making use of “aliquot parts” (where the per cent. can easily be converted into such) connects per cent. with fractions and helps to prevent rote methods.

9. Examples in simple interest where the time and rate are given.

10. The use of the “method of analysis” for the solution of problems
in simple and compound proportion, and in interest, without ever introducing the terminology and machinery usual in proportion.

11. The concrete exemplification of the simpler geometric notions and facts should begin with the beginning of the arithmetic and be carried on in connection with this subject and with drawing during the first six years. By the close of this time the leading facts and theorems of geometry, plane and solid, should have become familiar by means of concrete illustrations and computations (mensuration). The pupil will now, perhaps, himself begin to feel the need of proof rather than illustrations (or will be led to feel it by the teacher), and at the beginning of the seventh year this transition may be made, and the developing of proofs begun carefully, gradually, and as informally as possible. In the seventh year the work in arithmetic may permit the informal beginning (as abbreviations) of literal arithmetic. The committee recommends that all topics not mentioned be omitted from the instruction in arithmetic as such—in some cases to be taken up later (in algebra, geometry, or trigonometry), in others to be omitted altogether.

In all the instruction in arithmetic there should be insistence upon neatness and upon accuracy; much oral work (object: correct thinking) and frequent short oral drills (object: quickness and accuracy); the testing of computations, both by rough estimates and exact tests; avoidance of technical terms and formal rules, save where absolutely necessary and when the need is felt by the pupil; ideas before definitions or rules.

**ALGEBRA**

While not recommending any radical alterations in the subject-matter of algebra, as usually presented in our best schools, the committee desires to emphasize the following points:

---

1. As sufficient exemplification of the method we give the following: If 48 men can do a piece of work in 12 days, working 10 hours a day, in how many days of 8 hours each would 40 men accomplish the same work?

<table>
<thead>
<tr>
<th>Arrangement</th>
<th>Men</th>
<th>Days</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>48</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>?</td>
<td>8</td>
</tr>
</tbody>
</table>

Oral explanation: We seek days, so we begin with days. If 48 men accomplish the work in 12 days, 1 man would have to work 48 times as many days as 48 men, and 40 men \( \frac{48}{40} \) as many as 1 man. That is, working 10 hours per day. To accomplish it by working 1 hour per day, it would take ten times as many days as when working 10 hours per day, and to do it by working 8 hours per day, \( \frac{10}{8} \) as many days as when working 1 hour per day. We have now considered all the data, and, performing the multiplication, we obtain the result.

The written work is by cancellation. Nothing is written down except the arrangement and the following equation:

\[ 12 \cdot \frac{48}{40} \cdot \frac{10}{8} = 18. \]

This method makes compound proportion correspondingly easy, and dispenses entirely with the confusing verbiage of the subject. The work is precisely the same, no matter which of the quantities is unknown.

2. The report of 1896-97 of the Commissioner of Education contains (pp. 457-613) a collation of the entrance requirements of 432 institutions having a course leading to the degree of A.B. Of these institutions, 346 specify arithmetic as an entrance requirement, the others probably regard it as implied in the requirement of algebra. Algebra is required in 412 institutions to the following amounts:
1. The arithmetical side of algebra.—Computations with numbers should be constantly introduced, problems with literal quantities being worked out or verified with numerical data also. The processes of arithmetic, both oral and written, should not be allowed to fall into disuse, but facility therein should rather be increased. At the same time, the pupil should understand the value of algebra in abridging or simplifying computation with numbers, or in proving the correctness of rules of computation, and should understand clearly that the devices of mathematics (especially algebra) have the purpose of enabling us not to compute; and that actual computations are usually not to be made so long as they can be avoided; that cancellation is to be resorted to wherever possible; and that to obtain an expression in factored form, or in any form in which operations are indicated, is a distinct advantage, not to be surrendered by needlessly performing the operations. Some of the topics omitted from arithmetic should be taken up at appropriate places in the work of algebra.

2. The equational side of algebra.—The equation should be made from the very beginning. Very simple problems in words leading to equations can be given at the outset.

3. Algebraic translation.—What has been said as to the value and necessity of translation in general applies with special force to algebra. Here the danger of mechanical, or even haphazard, manipulation of symbols is perhaps the greatest, and it must be especially guarded against by care that the meaning of the symbols, and the reason for the operations, be always clear in the pupil’s mind. This can be done to a large extent by requiring the pupil to give readily and clearly in words the meaning of the formulae and equations. On the other hand, the danger is exaggerated by the use of complicated and long examples, which seem to emphasize operative skill merely, and make that appear as the main object sought. Better many short examples with the principles always

<table>
<thead>
<tr>
<th>To quadratics</th>
<th>37 institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Including quadratics</td>
<td>74</td>
</tr>
<tr>
<td>Amount not specified</td>
<td>201</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>312</strong></td>
</tr>
</tbody>
</table>

The other requirements are as follows:

<table>
<thead>
<tr>
<th>Plane geometry in</th>
<th>294 institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid geometry in</td>
<td>93</td>
</tr>
<tr>
<td>Trigonometry in</td>
<td>4</td>
</tr>
<tr>
<td>Conic sections in</td>
<td>2</td>
</tr>
</tbody>
</table>

Upon looking over the detailed statement of the requirements for each institution, it appears that the better institutions require arithmetic (explicitly or tacitly), algebra including quadratics, and plane geometry. Solid geometry is required by many institutions of high rank, and not required by others of equally high rank. The territorial distribution of the institutions requiring solid geometry is interesting.

<table>
<thead>
<tr>
<th>Division</th>
<th>Total number of institutions</th>
<th>Number requiring solid geometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Atlantic</td>
<td>76</td>
<td>6.6 per cent.</td>
</tr>
<tr>
<td>South Atlantic</td>
<td>62</td>
<td>6.6</td>
</tr>
<tr>
<td>North Central</td>
<td>183</td>
<td>37.1</td>
</tr>
<tr>
<td>South Central</td>
<td>75</td>
<td>10.7</td>
</tr>
<tr>
<td>Western</td>
<td>37</td>
<td>21.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>429</strong></td>
<td><strong>21.5 per cent.</strong></td>
</tr>
</tbody>
</table>
clearly apprehended than a few complicated ones with the principle obscured.

(Skill in manipulating long and intricate algebraic expressions should also be attained, and for this purpose the use of long and hard examples, after the principles and methods of a topic are clearly understood, is indispensable.)

4. Topics to be emphasized.—The following topics require especially careful treatment:

The meaning and use of exponents, positive, negative, and fractional; the handling of the simpler surds; the distinction between identical equations and equations of condition; the character of the roots of the quadratic equation as determined by inspection; the connection between the roots and the coefficients of the quadratic; the solution of equations by factoring; and the making of the algebraic statements for problems given in words.

5. Secondary-school algebra and college algebra.—It should be the aim of the secondary school to avoid taking up any of the topics which are customarily treated in college algebra, but rather to secure as thorough mastery as possible of those topics which the college presupposes. It is recommended that schools which have hitherto taken up topics anticipatory of college algebra devote the time gained by omitting them to a more thorough study of the topics of the previous head.

The progressions, arithmetical and geometric (with applications to interest, simple and compound), and the theory and use of logarithms, might well, so far as the nature and difficulties of the subject are concerned, be included in the secondary-school course, but as they are required for entrance by very few colleges, and are accordingly taken up in connection with college algebra, the committee recommends that they be omitted from the secondary-school course, in the interests of economy of energy, and to avoid duplication of work; until such time at least as, by action on the part of the colleges, these topics (or any of them) are relinquished as parts of college algebra, and made parts of the entrance requirements.

These remarks relate solely to the work in algebra required of all pupils in the secondary school. It is not meant to discourage the offering of more advanced courses in algebra ("college algebra") or in trigonometry to such pupils as may wish to take them. As these pupils will often desire that these advanced courses in the secondary school should be accepted by some college as the equivalent of college work, the scope and character of the work will usually be determined by the requirements of the college in question.

DEMONSTRATIVE GEOMETRY

The instruction in demonstrative geometry should not begin with a mass of definitions and axioms. All definitions should be introduced
when needed, and not earlier; and, as a rule, only after the teacher has, by suitable examples and problems, familiarized the pupil to some extent with the notion in question, and the pupil himself feels the need of some convenient term by which to designate it, or the need of a precise agreement as to the meaning to be given to a term already used vaguely in common parlance.

Care should be taken to select for the early instruction such propositions as are less difficult to understand because less nearly self-evident; those that are more nearly self-evident being reserved for a later stage. Such propositions as, "All straight angles are equal," "All right angles are equal," should be omitted altogether.

Oral proofs (i.e., proofs in which nothing but the figure is placed upon the board) may well be used in geometry. Later even the figure may often be omitted. After the pupil has had some practice of this sort with familiar proofs, he will be able to work out the proofs of simple new propositions, with the figures only before him, and even if no figure, carrying the whole proof in the mind.

Frequent drills in seeing relations in a given figure (angles equal, supplementary; lines parallel, perpendicular; triangles equal, similar; etc., etc.) as a general exercise, without having any specific theorem proposed for proof, are also helpful. The teacher should prepare the figure, at first simple and anticipating coming propositions; later more complicated and unlike any of the figures of the text.

As to subject-matter, the propositions taken up may be divided into two classes: fundamental propositions and exercises. The fundamental propositions together constitute the nucleus or skeleton of the subject, being that minimum which all pupils alike should know. They should be reduced to as small a compass as possible. All other propositions constitute the class we have called exercises. The proofs of the exercises are to be based upon the fundamental propositions. Every course in geometry should invariably include all the fundamental propositions and a large number of exercises; the selection of the latter may vary from year to year. It is not at all implied here that the proofs of the fundamental propositions may not also be obtained as original exercises.

What has been said applies to both plane and solid geometry. A word may be added as to the use of models in solid geometry. While not wishing to undervalue models which are presented to the pupils ready-made, the committee believes that, as a rule, the pupils gain more by constructing their own models, and that this can be done very easily in a sufficient number of theorems. Some pieces of cardboard, darning needles, and thread constitute apparatus sufficient for making models of a large class of propositions. Another large class of models can be cut out of potatoes. A broomstick furnishes all the models needed for the
cylinder. An orange will do fairly well for the sphere, but a small slatted globe in the hand of each pupil is better.

The attempt has been successfully made to teach geometry by interweaving solid and plane geometry from the outset. While the committee is not prepared to commend this, there are advantages to be gained by beginning solid geometry before plane geometry is completed. In the opinion of the committee, the restriction of the study of geometry in many secondary schools to plane geometry is unfortunate, and it is desirable that the school course and the college-entrance requirement in geometry should cover both plane and solid geometry.

The notions and results of modern geometry may be used with advantage, but only so far as they actually simplify or make clearer the topic in hand.

The work in demonstrative geometry should be accompanied by construction and measurement. E.g., in connection with similar triangles, pupils may measure distance of some inaccessible object, simply measuring base line and two angles, and then drawing to scale. Of course, the work is crude, but this form of exercise opens a new window in the child's mind.

In the work in geometry, arithmetic, and also algebra (so far as this subject has been developed), should be frequently applied.

TRIGONOMETRY

Trigonometry is at present usually not required in the school curriculum; to prepare pupils for admission to certain technical schools and colleges, it is sometimes taught in the schools. When thus taught, the subject-matter taken up is determined by the requirements of the institutions in preparation for which it is taught.

There is, however, no intrinsic reason why the elements of plane trigonometry should not be an integral part of the school course in mathematics; it can be developed well in continuation of algebra and plane geometry, and is a fitting sequel to them. The matter should be restricted to that needed for the solution of plane triangles—numerous, but simple applications to the determination of heights and distances should be made.

To avoid duplication of work, the introduction of plane trigonometry into the school course (like that of certain portions of algebra mentioned above) should be an action of school and college jointly.

The trigonometric functions should be defined as ratios, and the whole treatment should be based upon the ratio definitions exclusively.

Before logarithmic tables are introduced, sufficient training should have been given in the solution of problems by means of the natural functions to make the pupils regard these as the real functions; log sin., log cos., etc., appearing merely as tools.
The object of a logarithmic table is to abridge computations. Those tables are accordingly to be preferred which furnish such aids to interpolation that the value sought may be read off quickly with the desired degree of accuracy and without side computations.

**DISTRIBUTION**

**I. IN THE GRADES**

The committee believes that the work in arithmetic outlined by it can be completed in the seventh grade, and that in this grade half the time can be given to demonstrative geometry. In all the preceding grades concrete geometry should be interwoven with arithmetic and with drawing. The transition to demonstrative geometry will thus not be abrupt, but will find the pupil prepared for it. The introduction of demonstrations into the concrete work should be gradual and informal; there should be much demonstration before the machinery and technical terminology of demonstrations are introduced. In the eighth grade demonstrative geometry would continue to occupy half the time, and the other half would be devoted to the beginning of algebra. This should be a natural growth of the arithmetic; the use of letters to stand for numbers may be introduced even earlier in formulating rules; as, "The area of a rectangle is equal to the length times the breadth," $A = LB$. The equation with one unknown quantity may also be introduced informally as occasion may arise. Under favorable circumstances the following ground could perhaps be covered in the grammar grades:

*Geometry.* — Lines, angles, triangles, parallelograms, elements of the circle.

*Algebra.* — The four fundamental operations with positive and negative numbers; simple cases of factoring under multiplication; simple equations with one unknown, and problems leading to such equations.

In the work in these subjects and in their further development in the secondary school, numerical applications of the results should be made continually. These applications should lead to computations sufficiently difficult to keep in practice the facility in computation gained in arithmetic, and to increase it. Stress should be laid on the simplifications in computations which may often be made by the literal notation of algebra.

In suggesting this course of study for the grammar grade, the committee realizes that in many places it would be impracticable to adopt the suggestions at once as a whole. In fact, under some circumstances the committee would not encourage, but would actually discourage, the immediate and complete adoption of its suggestions. On the other hand, in cases where some (perhaps a large part) of the suggestions of the committee are already in force, and where the corps of teachers is prepared to adapt its work to the new plan, there would be no obstacle, but indeed
a distinct gain, in putting the committee's suggestions as a whole into immediate operation. The committee believes that the suggestions made (followed, if need be, gradually) are generally feasible.

The study of demonstrative geometry should in all cases be begun before that of algebra. Geometry is less abstract, less artificial, lends itself less readily to mere mechanical manipulations, and is more easily illustrated by concrete and familiar examples than algebra.

II. In the Secondary School

The great desideratum for the distribution of mathematics in the secondary school is that it should be studied throughout each of the four years of the course. It is not meant by this that more time should be given to mathematics, but that this time should be distributed over the entire secondary-school course. The committee recommends no specific distribution over the four years of the hours now given to mathematics, but simply the general rule that there be work in mathematics required of all throughout the course, and that in no year less than two hours weekly be given to mathematics during the whole year.

If in any school it is altogether impracticable to take up mathematics in each of the four years, the state of affairs is to be deplored. If a year must be left free from mathematics, the committee recommends that it be the second or the first year.

The distribution of the subject-matter over the various years will be influenced by the distribution of the hours. The same general principles would, however, govern in all cases; of these are:

1. The study of geometry should be begun before that of algebra. Reasons for this have already been indicated.

2. When algebra has been begun, the two subjects should be carried on simultaneously in each year of the remainder of the four years. By simultaneously is meant simply in the same year. It is not necessary that the hours of instruction be given to each alternately. The division may even be the first half-year to one (geometry) and the second half-year to the other (algebra), but this arrangement is not to be preferred.

3. The work of the fourth year should include a review of all of the previous work of the course, with the aim to extend, broaden, deepen, and correlate what has already been done.

4. The instruction in mathematics of each class or section of a class should be, as far as practicable, in the hands of the same instructor for at least two years. It is still more important that, instead of trying to plan the assignment of work so that certain teachers do "first-year work," others "second-year work," etc., year after year, the aim should be to plan the assignment so that each teacher habitually teaches all the mathematical subjects, tho not necessarily all in one year.

5. Under no circumstances should an instructor who has not qualified
herself especially to teach mathematics be intrusted with a class in mathematics simply because he may have a vacant hour which must be filled up.

Throughout the course (and especially in the last year) the more the subjects can be interwoven, and made to illustrate and support each other, the better. The teacher should not hesitate to introduce a geometric illustration or a geometric truth into algebra, nor to avail himself in algebra of apt occasions for recalling previous geometric theorems, or developing and discussing new ones. Quite similarly, algebraic proofs and methods should be freely used in geometry, and, as need arises, new algebraic results established. It is quite wrong to teach geometry and algebra (and arithmetic) in the high school as subjects so essentially different that the purity of the one would be impaired by the use of the methods and results of the other.

**PREPARATION OF TEACHERS**

The preparation of teachers for high-school work should include a good college course, with special attention to mathematics, either by electives during the course or by some graduate study. The minimum attainment in mathematics should include analytic geometry, a first course in the calculus, and the elements of the theory of equations (including determinants).

The committee regards it as desirable that the teacher should have paid some attention, under guidance, to the pedagogy of mathematics (problems, means, and methods of instruction; if practicable, seeing actual teaching and discussing it afterward), before beginning his own teaching. Still more important is it that his first teaching should be under the careful supervision of an experienced teacher of mathematics. If possible, his first year or two of service should be explicitly and actually under the direction and guidance of older teachers. Perhaps each beginner may be assigned by his principal to some specific teacher of experience and tact, for supervision and counsel. The relation will be more or less formal, under varying circumstances; but it should always be actual and effective, never merely nominal; it should involve personal consultation, mutual class-room visits, friendly, careful advice.

Much can be accomplished in this way. At present young teachers of no experience, having no pedagogic preparation, are often put into full charge of classes, and receive no assistance, no advice, no encouragement from their more experienced colleagues. They have as model only some recollections of their impressions (as pupils) of the teaching which they received. They profit as best they can by their own experience, and learn from their own mistakes. Some never appreciate their shortcomings or how to remedy them; even for the best it is a devious and painful path to excellence, which might be shortened and eased by the judicious counsel of one who had traversed the path himself.

In institutions where there are several teachers of mathematics it would
be well for them to meet statedly for the discussion of questions of local administration, of pedagogy, of mathematical topics; perhaps the systematic study together of some mathematical subject could be undertaken. (Among the suitable subjects for such study are the following: modern synthetic geometry, analytic geometry, the differential and integral calculus, determinants, the theory of equations, analytic mechanics, the history of mathematics.)

It is very desirable that the teacher be making year by year new acquisitions of mathematical knowledge.

CORRELATION OF WORK

Mathematics is unique in the extent to which it builds on previous work. Hence secondary-school work should be correlated as closely as possible both with grade work and with college work. The division of the work in mathematics into three portions, carried on in different institutions (grades, secondary-school, college) differing in management, methods, and aims, and with teachers differing radically in type of preparation, causes a great waste of teaching energy. Much can be done to diminish this waste by close relations between the teachers of the three divisions, and the comparison of results and adaptation of work to mutual needs. The relationship may be official or unofficial, formal supervision or friendly suggestion; it should, however, never be a mere form, but a cordial co-operation for strengthening and unifying the work in mathematics in grades, secondary schools, and colleges.

LIBRARY

Every secondary school should have for the use of the pupils, and especially of the teachers, a carefully selected library of reference-books in mathematics (standard elementary texts, histories, tables, books of problems and recreations, and advanced mathematical works suited to the needs of the teachers). Measuring instruments should also be provided.

SUMMARY OF PRINCIPAL CONCLUSIONS

The most important of the conclusions which were reached by the committee are the following:

1. To the close of the secondary-school course the required work in mathematics should be the same for all pupils.
2. The formal instruction in arithmetic as such should terminate with the close of the seventh grade.
3. Concrete geometry should be a part of the work in arithmetic and drawing in the first six grades.
4. One-half of the time allotted to mathematics in the seventh grade should be given to the beginning of demonstrative geometry.
5. In the eighth grade the time allotted to mathematics should be divided equally between demonstrative geometry and the beginning of algebra.

6. In the secondary school, work in mathematics should be required of all pupils throughout each of the four years of the course.

7. Wherever, from local conditions, it is necessary to defer the beginning of geometry and algebra to the secondary school, here, likewise, geometry should be begun before algebra.

8. When once begun, the subjects of geometry and algebra should be developed simultaneously, in so far, at least, that both geometry and algebra should be studied in each of the four years of the secondary-school course.

9. The unity of the work in mathematics is emphasized, and the correlation and interapplication of its different parts recommended.

10. The instruction should have as its chief aim the cultivation of independent and correct thinking on the part of the pupil.

11. The importance of thorough preparation for teachers, both in mathematical attainments and in the art of teaching, is emphasized.

J. W. A. Young, Chairman,
Assistant Professor of Mathematical Pedagogy in the University of Chicago.

J. J. Schobinger, Secretary,
Principal of the Harvard School, Chicago.

Ellery W. Davis,
Professor of Mathematics in the University of Nebraska.

Thomas F. Holgate,
Professor of Applied Mathematics in Northwestern University.

L. S. Hulbert,
Collegiate Professor of Mathematics in Johns Hopkins University.

C. W. Lyon, Jr.,
Principal of Grammar School No. 78 (formerly Professor of Mathematics in the Boys' High School), Brooklyn, N. Y.

H. B. Newson,
Associate Professor of Mathematics in Kansas State University.

W. F. Osgood,
Assistant Professor of Mathematics in Harvard University.

James Byrnie Shaw,
Department of Mathematics in Michigan Military Academy.

B. M. Walker,
Professor of Mathematics in the Mississippi Agricultural and Mechanical College.