SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

FRIDAY, JULY 17, 1908

CONTENTS

The American Association for the Advancement of Science:—
Section D—Mechanical Science and Engineering: PROFESSOR WM. T. MAGRUDER .. 65

Present Condition of Mathematical Instruction for Engineers in American Colleges: PROFESSOR EDGAR J. TOWNSEND 69

International Fisheries Congress 79

The American Chemical Society 81

Scientific Notes and News 82

University and Educational News 85

Discussion and Correspondence:—
The Mendelian Inheritance of Mutations: O. F. COOK. *Biotypes of Corn:* DR. W. J. SPILLMAN 86

Quotations:—
The College Grindstone 88

Scientific Books:—
Young's Text-book of Physical Chemistry: PROFESSOR GILBERT N. LEWIS. *Abbott's Behind the Scenes with the Mediums:* J. J. 89

A Unique Collection of Peridotite: DR. PHILIP F. SCHNEIDER 92

Special Articles:—
The Effect of an Angle in a Conductor on Spark Discharge: PROFESSOR FRANCIS E. NIPHER. *Dinichthys Intermedius Newberry from the Huron Shale:* PROFESSOR E. B. BRANSON 93

Societies and Academies:—
The Society for Experimental Biology and Medicine: DR. WILLIAM J. GIES. *The Geological Society of Washington:* RALPH ARNOLD. *The American Institute of Chemical Engineers:* DAVID WILBUR HORN 94

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y., or during the present summer to Wood's Hole, Mass.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION D—MECHANICAL SCIENCE AND ENGINEERING

THE meeting of the section for organization was held in Cobb Hall of the University of Chicago on December 30 and 31, 1907, and January 1, 1908. The vice-president of the section, Olin H. Landreth, professor of civil engineering, Union University, acted as chairman of the section. Dr. George F. Swain, professor of civil engineering, Massachusetts Institute of Technology, was elected councilor. Mr. George W. Bissell, dean of engineering, and professor of mechanical engineering, Michigan Agricultural College, was elected a member of the general committee. Mr. Arthur H. Blanchard, associate professor of civil engineering, Brown University, was elected member of the sectional committee for five years. The secretary was elected press-secretary for the meeting.

At the meeting of the general committee on January 2, 1908, on the recommendation of the sectional committee, Dr. George F. Swain, professor of civil engineering, Massachusetts Institute of Technology, was elected vice-president and chairman of the section for the ensuing year; and Mr. George W. Bissell, dean of engineering and professor of mechanical engineering, Michigan Agricultural College, was elected secretary for the next five years.

The first paper on the program was one by Arthur H. Blanchard, associate professor of civil engineering, Brown University, and was descriptive of the "Experi-

ments with Tar and Oil on the Highways of Rhode Island." It divided highways into three classes, interstate trunk lines and popular routes of travel, highways connecting towns which are only a few miles apart and secondary streets of towns, and third, feeders leading to towns and highways of the two preceding classes and those connecting towns which are many miles apart.

The objects of the experiments with tar and oil have been to reduce to a minimum the amount of dust raised by motor-cars, preserve the surface of the road, and to increase its life. The total cost per square yard of tar-macadam on the Post Road between New York and Boston, and in the Town of Charlestown, in 1906 and 1907, was $0.1624. The amount of tar used per square yard was 1.15 gallons. It was found that the different samples of tar and oil used had compositions which were decidedly different.

Judging from the results of the experiments so far made, it is evident that additional experimental work should be done (1) to determine the relation of the composition of tar to the efficiency of a tar-macadam road and tar-painting; (2) to compare the efficiencies of tar-macadam roads constructed by the mixing and penetration methods; (3) to determine the economic value of scarifying, reshaping and reconstructing the surface of old macadam roads by the addition of tar by the penetration method; (4) to discover methods of increasing the bond between the tar-matrix and the surface of the old material of the road; (5) to determine the efficiencies of the various machines on the market for spreading tar and for making the roads; and (6) the efficiencies of the roads treated with the various oils on the market, and in different ways. The author firmly believes that more stress should be laid on the economic construction of more permanent macadam roads and that less attention should be paid to the various surface palliatives. The paper was published in the *Engineering Record* for February 8, 1908.

The subject of the "Pressure-Temperature Diagram of the Properties of Superheated Steam" was discussed and illustrated by Henry T. Eddy, professor of mathematics and mechanics, University of Minnesota. He showed that for purposes of both instruction and use the "P–T" diagram offered certain advantages over the "P–V" diagram which is usually used, and more especially in showing the variations in the specific heat of superheated steam.

A paper descriptive of "An Instrument for Investigating the Circulation of Water in Water-tube Boilers" was read by Frank C. Wagner, professor of experimental engineering, Rose Polytechnic Institute, and was discussed at some length by those present who had made similar experiments.

"A Note on the Shearing Stresses in Beams" was presented by Calvin M. Woodward, professor of mathematics and applied mechanics, Washington University, and discussed by several members.

The same author read a paper on "The Problem of Power for Airships," which was discussed very fully by the members.

An elaborate paper on the "Classification and Comparison of Hydraulic Turbines as to Performance at Best Speed," and illustrated with tables was read by Benjamin F. Groat, professor of mechanics and mathematics, University of Minnesota.

The same author presented a valuable paper on the "Efficiency of the Screw." These two papers add much to the respective subjects and should be put into permanent form for future reference, being too long to be abstracted satisfactorily.

In the absence of the authors, the following papers were read by title: "The

Use of Arrow-heads in Alternating-Current Vector-Diagrams," by A. S. Langsdorf, professor of electrical engineering, Washington University; "Segregation in Steel Ingots," by Henry M. Howe, professor of metallurgy, Columbia University.

The other sessions of the meeting were held in Cobb Hall in conjunction with Section A, Mathematics, and the Chicago Section of the American Mathematical Society. For the joint sessions, invitations had been sent to teachers of engineering and of mathematics in the engineering colleges and technical schools of the country, and to professional engineers who, it was thought, might be interested in the subject of an engineering-mathematics symposium. As a result, the attendance was large and representative and included about one hundred persons interested on the mathematical side, and over fifty teaching and practising engineers. Twenty-one privately endowed, and twenty state-supported educational institutions were represented.

The promotion of acquaintance and personal knowledge was an important factor in the success of the meeting, which was in large part due to the labors and foresight of Professor H. E. Slaught, of the department of mathematics of the University of Chicago, and Secretary of the Chicago Section of the American Mathematical Society.

A subscription dinner for engineers and mathematicians and their friends brought about one hundred persons together at Hotel Del Prado on Monday evening, December 30. The speakers at the dinner were introduced by E. B. Van Vleck, professor of mathematics, University of Wisconsin, Chairman of the Chicago Section of the American Mathematical Society. They were Calvin M. Woodward, dean of the School of Engineering and Architecture, Washington University, St. Louis, Mo.; Charles F. Scott, consulting engineer of the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa.; George F. Swain, professor of civil engineering, Massachusetts Institute of Technology, Boston, Mass.; and Edward V. Huntington, assistant professor of mathematics, Harvard University, Cambridge, Mass.

The first session of the engineering-mathematics symposium was held on Monday afternoon, December 30. Professor Van Vleck acted as chairman. Four papers were presented, as follows:

The Present Condition of Mathematical Instruction for Engineers in American Colleges: EDGAR J. TOWNSEND, professor of mathematics, University of Illinois.

The Teaching of Mathematics to Engineering Students in Foreign Countries: ALEXANDER ZIWET, professor of mathematics, University of Michigan.

The Teaching of Mathematics for Engineers: CHARLES F. SCOTT, consulting engineer, Westinghouse Electric and Manufacturing Co.

The Point of View in Teaching Engineering-Mathematics: ROBERT S. WOODWARD, president of the Carnegie Institution of Washington.

The two sessions, held on the morning and afternoon of December 31, were devoted to a symposium on the question: "What is needed in the Teaching of Mathematics to Students of Engineering? (*a*) Range of Subjects; (*b*) Extent in the Various Subjects; (*c*) Methods of Preparation; (*d*) Chief Aims." The speakers represented three phases of the subject, namely: (*a*) From the standpoint of the practising engineer; (*b*) from the standpoint of the professor of engineering; (*c*) from the standpoint of the professor of mathematics in the engineering college.

Professor Landreth and Professor Slaught were the chairmen of the two sessions. The speakers were as follows:

Ralph Modjeski, consulting engineer, Chicago, Ill.; J. A. L. Waddell, consulting bridge engineer, Kansas City, Mo.; Gardner S. Williams, professor of civil, hydraulic, and sanitary engineering, University of Michigan; Arthur N. Talbot, professor of municipal and sanitary engineering, University of Illinois; George F. Swain, professor of civil engineering, Massachusetts Institute of Technology; Charles S. Slichter, consulting engineer, U. S. Reclamation Service, and professor of applied mathematics, University of Wisconsin; Frederick S. Woods, professor of mathematics, Massachusetts Institute of Technology; and Fred W. McNair, president of the Michigan College of Mines.

Following the presentation of the four formal papers, and of the eight prepared discussions above recorded, a general discussion was held on the entire subject. The following persons took part in this general discussion: Calvin M. Woodward, professor of mathematics and applied mechanics, Washington University; Benjamin F. Groat, professor of mechanics and mathematics, School of Mines, University of Minnesota; Charles S. Howe, president, Case School of Applied Science; Clarence A. Waldo, professor of mathematics, Purdue University; Clarke B. Williams, professor of mathematics, Kalamazoo College; J. Burkitt Webb, late professor of mathematics and mechanics, Stevens Institute; Henry T. Eddy, professor of mathematics and mechanics, College of Engineering, University of Minnesota; Arthur E. Haynes, professor of engineering-mathematics, University of Minnesota; Arthur S. Hathaway, professor of mathematics, Rose Polytechnic Institute; Edward V. Huntington, assistant professor of mathematics, Harvard University; and Donald F. Campbell, professor of mathematics, Armour Institute of Technology.

On motion of Professor Campbell, the chairman was authorized to appoint a committee of three persons, they to increase their number to fifteen, to be chosen from among teachers of mathematics and engineering and from the practising engineers of the country, and this committee of fifteen was authorized by the meeting to take into consideration the whole subject of the mathematical curriculum in the engineering and technical departments of colleges and universities, and to report to the Chicago Section of the American Mathematical Society. On motion of Wm. T. Magruder, ex-secretary of the Society for the Promotion of Engineering Education and professor of mechanical engineering, Ohio State University, the motion was amended that the committee of fifteen shall submit its report to the Society for the Promotion of Engineering Education at its annual meeting in the summer of 1909. The motion as amended was unanimously adopted by those present. It is hoped that at the meeting of the society in 1909, a second engineering-mathematics symposium may be held.

The selection of this important committee was entrusted to Professor Edward V. Huntington, Harvard University, Professor Gardner S. Williams, University of Michigan, and Professor Edgar J. R. Townsend, University of Illinois. They will select the remaining members of the committee, choose a chairman and secretary, and determine the scope of the investigation that they will make.

The papers will be printed in SCIENCE in the next few weeks. They will prove to be interesting reading to those engaged in either mathematical or engineering work and will show the tendencies of the thought of the meeting. The key-note of all the discussions was that we need more sympathy and knowledge of the ideals, aims and work of the other fellow.

The meeting was without doubt the best

attended that the sections have held for many years, the interest never seemed to flag and, while no wonderful contributions were made to scientific knowledge, every one went away feeling either that he had gained much information as to the other man's point of view concerning scientifically instructing engineering students in mathematics and of the wishes and needs of the engineering instructor, or that he appreciated more the quality of work that was now being done by teachers of mathematics in engineering colleges.

WM. T. MAGRUDER,
Secretary, Section D

PRESENT CONDITION OF MATHEMATICAL INSTRUCTION FOR ENGINEERS IN AMERICAN COLLEGES[1]

OUR country has witnessed in recent years a most marvelous industrial expansion and development. Along with this movement has come a rapidly increasing demand for trained men, equipped with all that science can contribute, to direct and carry forward this development of our natural resources and our industrial power. In meeting this demand our technical schools have experienced a remarkable growth, and not a little of the educational thought and activity of the country is being directed toward the problems connected with technical instruction. Well-equipped engineering schools have grown up in the larger centers of population and most of the larger state universities now include strong engineering departments. Mathematics is so fundamental to all of this work, and so large a proportion of the students now receiving mathematical instruction in this country anticipate making use of it later in connection with engineering work, that it has been thought best by the Chicago Section of the American Mathematical Society to invite to a joint discussion of the "Mathematical Training of Engineering Students," representatives from some of the leading engineering schools and some of those consulting engineers whose wide experience has brought them into contact with demands of actual practise.

That we may all know what the actual conditions are with respect to this instruction and consequently have some common basis for our discussion and our conclusions, I have been asked to present a statement of the work in mathematics which is now being given to engineering students.

As the basis of our consideration, I have selected seventeen institutions where engineering work is an important feature. Of these, eight give their attention largely or exclusively to technical work, and the remaining institutions have strong engineering departments; so that the mathematical work given in these institutions may be said to fairly represent the preparation in this subject for engineering students in American institutions.

The three most important factors entering into the consideration of our topic are: the entrance requirements, the requirements for graduation, and the qualifications of the instructional force.

As will be seen from Table I., all of these seventeen institutions require for entrance algebra through quadratics, together with plane and solid geometry. Five of the institutions require plane trigonometry, while at several others it may be counted for entrance if the student so elects. It will be observed that four institutions require elementary algebra through progressions, four require the subject of logarithms, and two, Sheffield and Cornell, require the whole of college algebra.

[1] Opening address before the joint meeting of Sections A and D of the American Association for the Advancement of Science with the Chicago Section of the American Mathematical Society for the discussion of the topic "Mathematical Training for Engineers."