

**THE BOSTON COLLOQUIUM; LECTURES ON  
MATHEMATICS DELIVERED FROM SEPTEMBER  
2 TO 5, 1903, BEFORE MEMBERS OF THE  
AMERICAN MATHEMATICAL SOCIETY IN  
CONNECTION WITH THE SUMMER MEETING  
HELD AT THE MASSACHUSETTS INSTITUTE OF  
TECHNOLOGY, BOSTON, MASS.**

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The Boston colloquium; lectures on mathematics delivered from September 2 to 5, 1903, before members of the American mathematical society in connection with the summer meeting held at the Massachusetts institute of technology, Boston, Mass. by Edward Burr Van Vleck & Henry Seely White & Frederick S. Woods

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**EDWARD BURR VAN VLECK & HENRY  
SEELY WHITE & FREDERICK S. WOODS**

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Am. Math. Soc., 1905  
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THE BOSTON COLLOQUIUM

# LECTURES ON MATHEMATICS

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IN CONNECTION WITH THE SUMMER MEETING HELD  
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BOSTON, MASS.

BY

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HENRY SEELY WHITE  
FREDERICK SHENSTONE WOODS

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1905

MATH

TO

PROFESSOR JOHN MONROE VAN VLECK, LL.D.

THESE LECTURES ARE AFFECTIONATELY INSCRIBED BY

HIS FORMER PUPILS

HENRY SEELY WHITE

EDWARD BURR VAN VLECK

FREDERICK SHENSTONE WOODS





## PREFACE.

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FOR a number of years the American Mathematical Society has held a Colloquium in connection with its Summer Meeting at intervals of two or three years. In the circular sent out prior to the first Colloquium, in 1896, the purpose and the plan of the undertaking were described as follows:<sup>1</sup> "The objects now attained by the Summer Meeting are two-fold: an opportunity is offered for presenting before discriminating and interested auditors the results of research in special fields, and personal acquaintance and mutual helpfulness are promoted among the members in attendance. These two are the prime objects of such a gathering. It is believed however that a third no less desirable result lies within reach. From the concise, unrelated papers presented at any meeting only few derive substantial benefit. The mind of the hearer is too unprepared, the impression is of too short duration to produce accurate knowledge of either the content or the method. . . . Positive and exact knowledge, scientific knowledge, is rarely increased in these short and stimulating sessions.

"On the other hand, the courses of lectures in our best universities, even with topics changing at intervals of a few weeks, do give exact knowledge and furnish a substantial basis for reading and investigation. . . .

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<sup>1</sup> Cf. *Bull. Am. Math. Soc.*, ser. 2, vol. 3 (1896), p. 49.

“To extend the time of a lecture to two hours, and to multiply this time by three or by six, would be practicable within the limits of one week. An expert lecturer could present, in six two-hour lectures, a moderately extensive chapter in some one branch of mathematics. With some new matter, much that is old could be mingled, including for example digests of recent or too much neglected publications. There would be time for some elementary details as well as for more profound discussions. In short, lectures could be made profitable to all who have a general knowledge of the higher mathematics.”

As a forerunner of the Colloquia here outlined may be mentioned the Evanston Colloquium of 1893, which followed the Congress of Mathematics held in connection with the World's Fair in Chicago, Professor Klein, of Göttingen, being the sole speaker. But whereas that Colloquium covered, in a descriptive manner, a variety of topics,—it comprised twelve lectures,—the Colloquia of the Society have been characterized by close contact with the actual analytical development of the topic treated.

The following Colloquia have been held :

#### I. THE BUFFALO COLLOQUIUM, 1896.

- (a) Professor MAXIME BÔCHER, of Harvard University : “Linear Differential Equations, and Their Applications.”

This Colloquium has not been published, but several papers appeared at about the time of the Colloquium, in which the author dealt with topics treated in the lectures.\*

- (b) Professor JAMES PIERPONT, of Yale University : “Galois's Theory of Equations.”

This Colloquium was published in the *Annals of Mathematics*, ser. 2, vols. 1 and 2 (1900).

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\* Two of these papers were : “Regular Points of Linear Differential Equations of the Second Order”; Harvard University, 1896; “Notes on Some Points in the Theory of Linear Differential Equations,” *Annals of Math.*, vol. 12, 1898.

## II. THE CAMBRIDGE COLLOQUIUM, 1898.

- (a) Professor WILLIAM F. OSGOOD, of Harvard University:  
"Selected Topics in the Theory of Functions."  
This colloquium was published in the *Bulletin of the Amer. Math. Soc.*, ser. 2, vol. 5 (1898), p. 59.
- (b) Professor ARTHUR G. WEBSTER, of Clark University: "The Partial Differential Equations of Wave Propagation."

## III. THE ITHACA COLLOQUIUM, 1901.

- (a) Professor OSCAR BOLZA, of the University of Chicago: "The Simplest Type of Problems in the Calculus of Variations."  
Published in amplified form under the title: *Lectures on the Calculus of Variations*, Chicago, 1904.
- (b) Professor ERNEST W. BROWN, of Haverford College: "Modern Methods of Treating Dynamical Problems, and in Particular the Problem of Three Bodies."

## IV. THE BOSTON COLLOQUIUM, 1903.

- (a) Professor HENRY S. WHITE, of Northwestern University: three lectures on "Linear Systems of Curves on Algebraic Surfaces."
- (b) Professor FREDERICK S. WOODS, of the Massachusetts Institute of Technology: three lectures on "Forms of Non-Euclidean Space."
- (c) Professor EDWARD B. VAN VLECK, of Wesleyan University; six lectures on "Selected Topics in the Theory of Divergent Series and Continued Fractions."

This colloquium is here published in full.

At Commencement, 1903, Professor John Monroe Van Vleck, M.A., LL.D., completed his fiftieth year of service at Wesleyan University, and retired shortly after from the chair of Mathematics