

The singularities of  $B_{mm}$ , as functions of the parameters (let us call them  $\beta_1, \dots, \beta_n$ ) are found by varying  $\beta_1, \dots, \beta_n$  in  $F$ , and finding under what conditions the contours of integration can not be deformed so as to escape passing through a singularity. By a very beautiful discussion the general problem is set up, and the details are worked out in some of the simpler cases.

In conclusion, we may inquire to what class of readers these volumes will most appeal. They certainly can not be digested by American students who are just starting work in the lines to which they are devoted. While Poincaré begins at first principles and works out the results in rather complete detail, the giant strides of the master cross too wide a field of mathematics to be within the grasp of beginners in graduate work. The mathematics would all be readily intelligible to the mature mathematician, but those who were not already somewhat familiar with the subject matter would very often find themselves at a loss to know why the numerous particular artifices were employed. For one having an interest in, and knowledge of, celestial mechanics, this work will be a great source of information and inspiration. In these respects it is surpassed only by the incomparable *Méthodes nouvelles*, which will, I believe, indirectly revolutionize celestial mechanics even in all its practical details.

F. R. MOULTON.

*Die Tätigkeit der Unterrichtskommission der Gesellschaft Deutscher Naturforscher und Ärzte.* Gesamtbericht, herausgegeben von A. GUTZMER. Leipzig, 1908, large 8°, pp. xii + 322.

In a stately volume there is laid before us the complete report of the Commission appointed in 1904 by the Society of German natural scientists and physicians to examine and report upon various proposed reforms in the teaching of mathematics and the natural sciences in Germany. The present report contains reprints of the proceedings in Cassel (1903), and in Breslau (1904), which led to the formation of the Commission, and of the proposals submitted by the Commission in Meran (1905), Stuttgart (1906), and Dresden (1907).

The central questions relative to the teaching of mathematics were taken up in the proposals of 1905, which have already been discussed in the BULLETIN\* and the later reports deal

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\* Vol. 12 (1906), pp. 347-352.

with matters of smaller general interest or importance. The proposals of 1906 have been reviewed in the *BULLETIN*;\* those of 1907, so far as mathematics is concerned, deal mainly with the scientific preparation of candidates for appointment as teachers. An interesting explanatory address by Professor F. Klein introduces this part of the report, which among many things of a local character contains others of a far wider range of interest. Its spirit cannot be laid before American readers more concisely and effectively than by citing a few characteristic recommendations of wider applicability, whose basic principles, translated if need be into our terminology, deserve as thoughtful consideration in America as in Germany.

It will be recalled that the preparation of the prospective teacher of mathematics in Prussia consists of two parts, the scientific preparation, attained in a minimum of three years of university study (beginning with analytic geometry and the calculus), and the pedagogic preparation acquired by two years of training in a secondary school. Only the scientific preparation is considered in the report, which points out (pages 270, 273) that when once the function concept has been made the center of the mathematics of the schools, as recommended by the Commission in 1905, the introductory university work will be a natural outgrowth and continuation of the secondary work and not separated from it by a marked gap as has hitherto too generally been the case.

It is recommended that the university student should from first to last not only hear lectures but also be constantly employed in active work himself, ranging from the treatment of small problems to independent investigations, reporting thereon before his fellows in seminars. The professors should have assistants in conducting this work (in the schools of technology in Prussia it is already customary to appoint one assistant per 30 students) and suitable libraries and working-rooms are also indispensable.

“The commission also recommends emphatically that at the end of the general studies in pure mathematics a course be given organizing the entire mathematical material according to its essential interrelations and as far as possible presenting the import of the higher branches for the different stages of school mathematics. For, in fact, experience teaches that without such a course of study, the majority of the students do not dis-

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\* Vol. 13 (1907), pp. 304-305.

cover the inner bond that connects the various parts of mathematical science, and thus the prospective teacher loses what should be for him the real gist of his mathematical studies. To avoid misunderstanding, we add expressly that this course presupposes matured hearers, and should not be brought down to the level of those preparing to teach mathematics as a minor subject only."

The commission also proposes the following tentative scheme of general professional studies for prospective teachers of mathematics and physics. A common program is proposed for the minimum period of three years, specialization in one direction or the other being contemplated in case the student remains at the university longer than three years, as many do. The courses are presumably of four hours each weekly, supplemented throughout by exercises and seminars as recommended above. Little stress is laid upon the order of the courses, which must be varied to correspond with the courses offered by universities that are not able to offer all the courses of the outline each year.

Half Year.	Professional Studies.			General Studies.
First.	Calculus I.	Plane Analytics.	Experimental Physics I.	
Second.	Calculus II.	Descriptive Geometry (with projective geometry).	Experimental Physics II.	
Third.	Differential Equations.	Elementary Mechanics with graphic and numerical methods.	Introduction to Chemistry.	
Fourth.	Algebra with Theory of Numbers.	Curves and Surfaces.	Higher Mechanics.	History of Philosophy and Pedagogy. Logic.
Fifth.	Theory of Functions.	Geodesy with Probabilities.	Theoretic Physics I.	
Sixth.	Synoptic Course.	Astronomy with Geophysics.	Theoretic Physics II.	Psychology.

The report closes with a bibliography (pages 309-322) of 290 titles of publications appearing in the years 1900-07, inclusive, relative to the field of the commission's labors and classified as shown in the table on the next page.

Referring again to the earlier review in the BULLETIN of the important general proposals of the commission, it may be said in closing that this complete report presents in convenient

	General.	Mathe- matics.	Physics.	Chemistry, Geology, Biology.	Totals.
Books.....	11	16	5	6	38
Articles :					
Secondary Schools....	61	79	14	40	194
Universities.....	14	28	7	9	58
Totals .....	86	123	26	55	290

form for permanent preservation and use the record of the entire activity of the commission, an activity which will not lose its significance for many years to come, and whose record will long remain a pedagogic document of the first importance.

J. W. A. YOUNG.

#### NOTES.

ALL the papers read at the joint meetings of mathematicians and engineers, held at Chicago in December, 1907, have been published in *Science*, and reprinted in the form of a 56-page pamphlet, for the use of the joint committee of fifteen, of which Professor E. V. HUNTINGTON is chairman, and which is to present its report, on the teaching of mathematics in colleges of engineering, at the summer meeting, 1909, of the Society for the promotion of engineering education. A limited number of these reprints are available for distribution among members of the AMERICAN MATHEMATICAL SOCIETY, on application to the Secretary of the Chicago Section, Professor H. E. SLAUGHT, 58th Street and Ellis Avenue, Chicago, Ill. They may be had in the order of application while they last.

THE opening (January) number of volume 10 of the *Transactions of the American Mathematical Society* contains the following papers: "Zur Differentialgeometrie der analytischen Curven," by E. STUDY; "The central of a group," by G. A. MILLER; "The hypergeometric functions of  $n$  variables," by J. I. HUTCHINSON; "Surfaces derived from the cubic variety having nine double points in four dimensional space," by V. SNYDER; "On a certain class of isothermic surfaces," by A. E. YOUNG; "A geometrical application of binary syzygies," by A. E. LANDRY; "Definite forms in a finite field," by L. E. DICKSON.