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GEORG HERMANN VALENTIN (1848-1926)

Since the last Congress of Mathematicians in 1924, when an International Committee on Bibliography was appointed, Georg Valentin the greatest of mathematical bibliographers has died. It seems fitting, therefore, that a member of the International Committee should briefly survey his life and accomplishment (1).

Georg Hermann Valentin spent his whole life in Berlin. Born there on December 9, 1848, he received his early education at the Friederich-Werder Gymnasium, and during 1869-79 was a student of mathematics at the University, under Kummer, Kronecker, and Weierstrass. He became a doctor of philosophy in 1879, his dissertation under Weierstrass dealing with the problem of the transformation of algebraic equations in two variables into the normal form.

He began his long connection with the Royal State Library as an Assistant in 1874; promoted to be Kustos in 1884, he became Bibliothekar in 1893, Oberbibliothekar in 1894, and was a Direktor from 1908 to 1920, when he retired on pension. Under circumstances to be referred to later, he was granted a room in the State Library for his Bibliography of Mathematics over which he was wont after his retirement to work for eight or ten hours a day. He died on 24 November 1926, a few days before his seventy eighth birthday, and in the forty second year of labor on his Bibliography. He left behind a widow and five daughters (2). Valentin was married in 1880 to Kate, daughter of the late August Hirsch, Professor of medicine at the University of Berlin.

Valentin's publications were comparatively few: a complete list of them is given at the close of this paper. His first publication was in 1875, the eleventh revised edition of S. Sachs's "Auflösungen der in Meier Hirsch's Sammlung von Beispielen etc., enthaltenen Gleichungen und Aufgaben"; the thirteenth edition, (1) Valentin's Bibliography was the subject of a communication by the late lamented Eneström to the "first" International Mathematical Congress of Mathematicians at Zürich in 1897 (Bibliotheca Math., s. 2, vol. 11, 1897, p. 65-72). Valentin's three published communications in this connection are listed below.

(2) Hedvig Beck, Berlin; Else Valentin, Munich; Ruth Lienan, Berlin; Dora Koster, Hamburg; Dr. med. Irmgard Valentin, Berlin.
in 1892, contained an original 40 page appendix. His second publication was the Latin dissertation, already referred to.

Nineteen articles and notes from his pen appeared between 1885 and 1914, and dealt almost wholly with bibliographic questions. Three of these articles, in *Bibliotheca Mathematica*, describe the status of his Bibliography in the years 1885, 1900, and 1911. Of ten other notes or articles in this periodical, the longest is the one which gives a bibliography of «Die Frauen in den exakten Wissenschaften». His identification of the position of Euler's house in Berlin during the years 1744-66, as on the south side of Behrenstrasse, in the position now occupied by number 21, was first announced in the *Jahresbericht der deutschen Mathematiker-Vereinigung*, for 1906. An extensive account of «Euler in Berlin» appeared, in the following year, in the twenty fifth Abhandlung zur *Geschichte der Mathematik*.

Valentin wrote also sixteen reviews of which six were published, 1881-1890, in the *Deutsche Literaturzeitung*. Seven other reviews were in *Zentralblatt für Bibliothekswesen*, 1905-1912, and dealt entirely with bibliographic works, two of which, however, were non-mathematical bibliographies, by Paul Hirsch, of German and French military history. The longest review, of Wölfing's *Mathematischer Bücherschatz*, appeared in *Zeitschrift f. Mathematik und Physik* and showed up the defects of this work with relentless thoroughness.

All of Valentin's writings display great clarity of presentation and statement; geniality and graces of literary expression will be sought for in vain. But Valentin's great contribution to Mathematics was in connection with the preparation of his marvellous manuscript General Bibliography of Mathematics from the dawn of printing to 1900, on which he worked incessantly from 1884 to the time of his death. References may here be found to about 200000 titles recorded on slips of paper of uniform size about 10×12 cm. (On some slips as many as a score or more of titles or editions are sometimes recorded). These are assembled in 76 specially made wooden boxes, each about 27½ cm. long., 56 for pure and 20 for applied mathematics.

With few exceptions Valentin designed that his Bibliography should list every separate mathematical publication, all academy or periodical articles of a purely mathematical nature, as well as similar kinds of material in the fields of theoretical physics, theoretical astronomy, theoretical actuarial science, technology, etc. Mathematical literature of the elementary schools is omitted, for the most part; no elementary arithmetics of the 19th century are listed. Problems proposed for solution in numerous Dutch, English, French, German and other periodicals are not catalogued.

For the first few years of his work Valentin listed, whenever possible, all titles of independent publications with bibliographic exactness, also the year of publication, the name of the publisher or printer, the number of pages and plates,
and the format. As the work progressed certain abbreviations of titles of publications after 1700 were introduced; the titles of periodical articles are practically never abbreviated.

The assemblage of the material was achieved not only through personal handling of thousands of volumes in the great Staatsbibliothek in Berlin but also through the use of all sorts of bibliographies and by making trips to other libraries. Shortly before his death Valentin told me that he had spent about $10,000 in making his catalogue and I have every reason to believe in the accuracy of this statement. Towards this amount at different times the Prussian Academy of Sciences contributed $2300. Already in 1886 we find in the Academy's records a document of four folio pages in the handwriting of Weierstrass who set forth what Valentin had done and hoped to do in the near future and recommended that the Academy make a grant of 4500 marks to assist him. This was done and in a document dated 8 November 1886, Valentin made the following declaration: «Ich erkläre hiermit dass falls ich durch irgend welche Umstände der Fortführung und Vollendung meiner von der königlichen Akademie der Wissenschaften unterstützten Bibliotheca Mathematica verhindert werden sollte, das gesammte fur die Bibliographie gesammelte Material in dem Besitz der Akademie übergehen soll, und dass ich eine dahin zielende schriftliche Erklärung bei mir so niedergelegt habe, dass meine Familie geeigneten Falls Kenntnis daran nehmen muss».

In 1897 Valentin obtained leave of absence from the Staatsbibliothek and, on the recommendation of Schwarz and Frobenius, the Academy made a further grant of 2500 marks towards the cost of a journey to libraries in Belgium, Denmark, England, France and Sweden. With the same recommendation in 1909 the Academy made a further grant of 1500 marks which assisted Valentin in other journeys, to Rome, Florence, London, Paris, Brussels, Amsterdam, Copenhagen, Lund, Vienna, Pest and Bucharest. Especially in the library of the Academy of the Lincei did Valentin discover a fine collection of Polish and Russian serials, which were of great importance in rounding out his work. While German mathematical literature is probably most completely dealt with in his Bibliography, such journeys made sure that the output of other countries should be well represented, though the literature of Poland and Russia was not as well covered as that of other countries. Such widespread search for material revealed many editions of works which could scarcely be learned of in any other way; for example, Valentin lists more than twenty editions of Lacroix's *Éléments d'Algèbre* and its *Complément*, and Dutch, English, German, Greek, Italian, Polish, Portuguese, and Russian translations. He also lists fifty-three editions of the arithmetics of Adam Ries.

In two respects especially Valentin's Bibliography contributes much of interest: firstly, in references to articles in thousands of volumes of out-of-the-way
serials where the ordinary mathematician would never dream of finding anything of special interest to him; and secondly, in listing thousands of reviews, even in such serials as *Journal des Savants, Acta Eruditorum Lipsiensis, Litterarisches Centralblatt*, and *Athenaeum*, the last of which contains so many of De Morgan's contributions, most of them unsigned.

Until 1910 Valentin's material was arranged, so far as possible, alphabetically according to authors. He then started to rearrange it in the form of a subject catalogue which, it was estimated, would fill six royal octavo volumes of about 700 pages each. Roughly speaking, the material in volume 1 was to consist of works devoted to History, Philosophy, Study and Teaching, Mathematics in general; volumes 2-3, Arithmetic, Algebra, Theory of Numbers, Analysis, Theory of Functions; volume 4, Geometry and Geodesy; volume 5, Mechanics and Ballistics; and volume 6, Applied Mathematics (that is, mathematical physics, theoretical astronomy, technology, etc.). A seventh volume of about 700 pages was planned as an author index for the six volumes. At the time of his death Valentin completed for publication the arrangement of volumes 1-3 only, and the part devoted to Ballistics of volume 5.

I have with me the sixty-page typewritten table of contents for the most extraordinary volume 1. It may be of interest to give some suggestions as to what may here be found.

I (pages 2-5) Serials: Giving headings under which are listed all serials indexed, and abbreviations therefor. These include, for example, headings for the publications of astronomical, engineering, architectural, railway, shipbuilding, electrotechnical and telegraph, mineralogical, botanical, forestry, medical, pedagogical and philological societies and unions; and for insurance, philosophical, theological, historical and other periodicals.

II (p. 6-7) giving headings for Bibliographic Literature of a general nature (bibliographies of special subjects not treated in volume 1 being listed with the subjects in other volumes).

III (p. 8-14) devoted to headings in connection with the general History of Mathematics. This includes sections on congresses, and the founding of various mathematical organizations in different countries; challenges, claims of priority, and other discussions; biographies, general and individual, lightning calculators; portraits (e.g. under the letters A-C of his Bibliography Valentin refers to nearly 300 portraits).

IV (p. 15-26) Collected works, including correspondence; most of these pages are devoted to listing of headings for works of the ancient Greeks.

V (p. 27-33) Introduction to Mathematics, under which are such special headings as: Mathematics and reality, Mathematics and experience, meaning, importance, relation to other fields such as aesthetics, chemistry, ethics, music, poetry, theology; terminology; esperanto; space; time; number words in 45 different languages.

VI (p. 34) Philosophy of mathematics.

VII (p. 35-40) Study and teaching.
VIII (p. 41-56) Instruments, alphabetical list.
IX (p. 57) Models.
X (p. 58) Encyclopaedias and Treatises.
XI (p. 58-60) Problem-collections, theses, recreations and games, paradoxes.
XII (p. 60) Formulas and formula collections and tables of a general nature.

Such are brief indications of the remarkably rich contents of the proposed volume one.

The question of the publication of Valentin's work has been discussed at various times. In January, 1911, Schwarz and Frobenius reported to the Prussian Academy of Sciences that the cost of publication would likely be 15,000 marks a volume for the first six volumes. This was the sum mentioned in Eneström's article in Bibliotheca Mathematica for that year, when he recommended that the Deutsche Mathematiker Vereinigung should take up the matter vigorously. It would seem as if the Prussian Academy of Sciences was seriously considering the publication of volume 1 when the Great War commenced.

In the spring of 1926 Valentin allowed me to take a large number of his Zetteln to a Hamburg firm which estimated that the cost at that time of printing the complete work of 7 volumes would be $30,000. The editorial expenses would be considerable. In order to take care of these and the possible purchase of the Bibliography with a view to its publication with English subject headings in America it was estimated that fifty thousand dollars was desirable. At its meeting held in Philadelphia in December, 1926, the Trustees of the Mathematical Association of America voted «That it is the sense of the Trustees that the publication of the great Mathematical Bibliography of Georg Valentin covering the period from the beginning of printing to 1900 would be of great value to mathematicians throughout the world, and that such publication in America with English sub-headings would be very desirable if funds therefor can be secured». In visualizing the publication problem the difficulty of securing a competent editor who would be willing to devote five or six years to seeing such a work through the press was probably the chief factor in preventing the Association from following the matter up.

Through the presentation of the matter by Professor Bieberbach, the Prussian Academy of Sciences in November, 1927, and March, 1928, authorized grants amounting to 700 marks to a life long friend of Valentin, namely Professor Schoenflies of the University of Frankfurt that a portion of his expenses might be met while he surveyed the situation with a view to making recommendations. The recommendations he made to the Academy only shortly before his death, last May, were as follows: a) That the Academy publish volume 1 as it stands. b) That a second volume be published to contain that portion of the Bibliography devoted to pure mathematics and that this portion be reduced in size by the elimination of those titles already recorded in Jahrbuch über die Fortschritte der Mathematik.
These recommendations are still to be acted upon by the Academy. They provide for two large volumes without any author index. Anyone interested in mathematical bibliography and history must hope that some way be found to publish Valentin's work as he planned it, without any abridgement. Possibly the members of this section will care to present some resolution in this connection (1). On 1 August 1925, Valentin requested the Prussian Academy to allow his Bibliography to be placed in a room of the Staatsbibliothek where it could be readily at hand for use by officers of the library and inquiring scholars. This permission was granted by the Academy on the understanding that the Bibliography could be called back to its control at any time. There the Bibliography lies at the present time.

With the greatest pleasure do I recall several days of 1926 spent with Valentin working on his Bibliography, his kindliness of spirit, his genial welcome, and his generosity in allowing the use of material he had spent more than half of his long life in collecting. To the man of indomitable perseverance and high idealism, great in his conceptions and achievement, hail, and farewell!

(1) «The members of Section VII of the International Congress of Mathematicians at Bologna desire to place on record their conviction: 1) that the publication of Valentin's General Bibliography of Mathematics would be of very great value to mathematicians throughout the world; and 2) that it is highly desirable for the work to be issued in unabridged form, amplified by an author index, as planned by Doctor Valentin».

BIBLIOGRAPHY

SEPARATE PUBLICATIONS


ARTICLES AND NOTES

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REVIEWS


