MEMORY OF THE WORLD REGISTER

János Bolyai: Appendix, scientiam spatii absolute veram exhibens. Maros-Vásárhelyini, 1832
(Hungary)

Ref N° 2008-52

János Bolyai: Appendix, scientiam spatii absolute veram exhibens. Maros-Vásárhelyini, 1832. - The absolutely true science of space: the discovery of absolute and (hyperbolic) non-Euclidean geometries

The author's copy with his autographic notes

PART A - ESSENTIAL INFORMATION

1 SUMMARY

The nominated document, Appendix, is the primary document of the epoch-making discovery of János Bolyai, a turning point in geometric research. For over two thousand years many of the best mathematicians tried to prove Euclid’s parallel postulate (or axiom). János Bolyai created entirely new settings for the problem by inventing absolute (or neutral) geometry that is independent of parallelism. He also showed that no proof was possible and, by assuming all the axioms for absolute geometry and replacing the axiom of parallelism by its negation, we obtain another geometry of equal right to the Euclidean. Appendix presents the new geometry in a clear and flawless way. This discovery stimulated not only the creation of new space concepts vital for modern physics but, by the dissemination of the axiomatic method, the evolution of modern mathematical thinking. The nominated copy of Appendix once belonged to the author, János Bolyai, and contains autographic notes, manuscript title pages and figures by him and by his father, Farkas Bolyai. This copy is therefore unique and irreplaceable.

2 DETAILS OF THE NOMINATOR

2.1 Name
Library of the Hungarian Academy of Sciences

2.2 Relationship to the documentary heritage nominated
owner and custodian

2.3 Contact person
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3 IDENTITY AND DESCRIPTION OF THE DOCUMENTARY HERITAGE

3.1 Name and identification of the item being nominated
János Bolyai: Appendix, scientiam spatii absolute veram exhibens. Maros-Vásárhelyini, 1832
The author's copy with his autographic notes
Library of the Hungarian Academy of Sciences
Shelfmark: 545.091
3.2 Description of the document

Description and inventory ... or similar access information

Library of the Hungarian Academy of Sciences
Shelfmark: 545.091

Bibliographic description


Description of the publication and its contents

János Bolyai's work appeared as an appendix to his father's, Farkas Bolyai's monumental two-volume book Tentamen (Maros Vásárhelyini, 1832, 1833), which summarized the mathematical knowledge of the time. Appendix appeared in the first volume in 1832 but was also published as a preprint in 1831. (The imprimatur of Tentamen – on the versos of the volumes' title pages – is dated October 12, 1829.)

Appendix was written in Latin, in a concise, elegant and rigorous style. The text is divided into 43 sections (§ 1 through § 43). Though this is the only subdivision of the book, two major parts may be distinguished in its contents. The first part is about absolute geometry, the second one is about non-Euclidean (hyperbolic) geometry. Five main topics are treated: 1. the concept and properties of parallelism; 2. the horocycle and the horosphere; 3. trigonometry; 4. applications of the methods of mathematical analysis; 5. geometrical constructions.

Provenance of the copy

The Library of the Hungarian Academy of Sciences bought this copy of Appendix from architect Ferenc Schmidt (1827-1901) or heirs in 1901, according to item 206/1901 in the Library's accession book. (Schmidt authored the biography of Farkas and János Bolyai, thus making them more widely known. It was published in Archiv der Mathematik und Physik in 1868 in German, and was translated into French, Italian, etc.) The copy was placed in what was called the Bolyai cabinet as item A.3. Its present shelfmark is 545.091 in the Bolyai collection.

Physical description

Appendix, as it was issued as part of Tentamen, consists of 15 leaves, forming gatherings with signatures [1] A-C4 D2, and is accompanied by a folded sheet of figures. The latter is signed Steph. Vizi sc. Pages are numbered 4-26 from leaf 3 verso through leaf 14 verso. Leaf 1 recto (fol. 1a) is the title page, its verso (fol. 1b) is blank; fol. 2a: Explicatio signorum, fol. 2b blank; fol. 3a: § 1 ...; ends fol. 14b (= p. 26): ... quod tamen occasioni // magis idoneae reservatur.; fol. 15a: Errata; ends fol. 15b: ... lege sectio.

In the copy of Appendix (shelfmark 545.091) being nominated, the printed title page (fol. 1) is missing, it is replaced by a handwritten title page in Farkas Bolyai's hand: Appendix Prima // Scientia Spatii absolute vera: // ... // Auctore Johanne Bolyai // de eadem ... // ... Primario Auctoris Filio. – The authenticity is confirmed in Schmidt's hand in red ink: Handschrift Wolfgang Bolyai // Fr Schmidt.

The preceding light blue fly-leaf bears on its recto the title in János Bolyai's hand:
Appendix, // Scientiam Spatii // absolute veram exhibens; // ... // Auctore // Johanne Bolyai de Eadem // ...; while the paste-down, the other half of the same leaf, is filled with his note in German (27 lines):
Anmerkung. // Des Verfassers Schuld könnte es doch offenbar ... bekennen dürfen; both are authenticated by Schmidt in red ink: Handschrift von Johan Bolyai.

Leaf 14 (page 26) is followed in this copy by a loose leaf numbered 27, with three lines of printed text and a rule underneath; its verso is blank. It reads:


The same light blue paper mentioned was used to print the table of figures, pasted in the end of the book. This is preceded by a fold-out of white paper, containing the figures drawn by János Bolyai himself in Indian ink, as well as his corrections (e.g. Fig. 13) and an additional Fig. 23 in pencil (which have been included in the printed figures). There is a note on it in pencil: Original Zeichnung Jo. Bolyai. Bolyai's interlinear and marginal notes in faint pencil are found in the printed text as well. (See Figures 1-3 accompanying the nomination.) The book is covered with bluish grey wrappers.

This copy of Appendix seems to have been compiled from two copies or versions. Namely, a pattern of about 30 pricks is seen on most of the leaves, starting from the lower cover of the wrappers and touching slightly the front cover (including the extra leaf with page 27!). They might have arisen from the disinfection process by penetrating needles for fumigation during the cholera epidemic in Lemberg, where Bolyai stayed at that time. Leaf 14 (pages 25-26), the Errata and the printed fold-out of figures, however, have not been pierced: they must have come from another copy or version of Appendix. Page 27, on the other hand, seems to be part of a variant of the edition, which was shortened in the final version.

Referees

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4 JUSTIFICATION FOR INCLUSION / ASSESSMENT AGAINST CRITERIA

4.1 Authenticity

The copy of Appendix being nominated was purchased from Ferenc Schmidt in 1901 (see 3.2 above). The Library's stamp with the item number of the accession book is seen on the verso of the fly-leaf. The originality of the autographic title pages and manuscript notes has been established by comparing them with letters by Farkas and János Bolyai.

4.2 World significance, uniqueness and irrereplaceability

Appendix is an outstanding document in the history of mathematics and human culture. It presents the solution of a more than two thousand year old problem in connection with parallel lines and the description of János Bolyai's discovery of non-Euclidean and the more general absolute geometries. Non-Euclidean geometry changed our thinking not only about geometry, but mathematics, in general, and paved the way for the creation of the modern physical theories of the twentieth century. This copy of Appendix is unique and irrereplaceable because of the autographic title pages, notes, and emendations by the author and his father, János and Farkas Bolyai (see 3.2 above).

4.3 Assessment against the criteria of (a) time, (c) people, (d) subject and theme, (e) form and style

(a) Time: Appendix presents not only one of the greatest discoveries of the nineteenth century but also that of the history of mathematics. The late American mathematics historian Morris Kline wrote about it that since the ancient Greeks there had never been such a great revolution in mathematics as the discovery of non-Euclidean geometry. Though time was ripe for the discovery, Gauss himself, who, having read Appendix, wrote in his letter to Farkas Bolyai that he had been thinking about parallelism for 30-35 years and attained the same results nearly in the same way as the young Bolyai, did not want to reveal them to the incompetent contemporaries. János also expressed his doubts about being understood in his handwritten Anmerkung to Appendix (see 3.2 above): "... indem selbst sonst
berühmte Mathematiker hinsichtlich dieses Gegenstandes nicht nur ganz befangen und im Dunkeln, sondern Anfangs sogar unempfänglich und gleichgültig sind..."

(c) People: János Bolyai received his mathematical education from his father, Farkas Bolyai, also a world famous mathematician, professor at the Reformed (Church) College of Marosvásárhely, Transylvania, an outstanding school of long tradition. János first reported about his discovery in a letter written to his father on November 3, 1823, when, as an army engineer, he was assigned to the Directorate of Fortification of Temesvár, Transylvania. At about the same time when Bolyai published his results, the Russian mathematician N. I. Lobachevskii also published similar results, so we attribute the discovery of non-Euclidean geometry to both of them. However, absolute geometry is Bolyai’s sole discovery.

(d) Subject and theme: Appendix contains descriptions of absolute and (hyperbolic) non-Euclidean geometries, ingenious discoveries of János Bolyai.

(e) Form and style: The presentation is elegant, concise and rigorous. Although János Bolyai had never met Gauss, the latter, upon reading János' work, characterized him in a letter as: "Ich halte diesen jungen Geometer v. Bolyai für ein Genie erster Grösse." Other parts of the letter show that Gauss was especially impressed by the mathematical elegance of the work.

4.4 Issues of rarity, integrity, threat and management

Since the document was published in a very small number of copies, only a few exist today. It is also hard to find early translations of it in other languages because they mainly date from the nineteenth century. This copy of Appendix is unique (cf. 4.2) and complete; once it was compiled from two copies (cf. 3.2). The document is stored in a secure and safe room in the Library. For the sake of preservation, its direct study is restricted to very special requests. All parts of the document are being digitalized and will be available for study through the Library's web-site.

5 LEGAL INFORMATION

5.1 (and 5.2) Owner (and custodian) of the documentary heritage

Library of the Hungarian Academy of Sciences
Postal address: P. O. Box 1002, H-1245 Budapest
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URL: http://www.mtak.hu

5.3 Legal status

(a) Category of ownership: public institution.

(b) Accessibility: Physical access is very limited because the document is a unique copy (cf. 3.2). Access in digital form will be possible (see 6.1 below).

(c) Copyright status: The contents of Appendix is not subject to copyright. To reproduce or store in any form the copy or parts of Appendix owned by the Library of the Hungarian Academy of Sciences is not allowed without the prior written permission of the owner.

(d) Responsible administration: Library of the Hungarian Academy of Sciences, the owner of the document.

6 MANAGEMENT PLAN
6.1 The document being nominated, the copy of János Bolyai's *Appendix* will be accessible in digital form through the web-site of the owner: http://www.mtak.hu, Library of the Hungarian Academy of Sciences, Budapest. Thus, the digital form will be available to researchers and to the public. This will facilitate: (a) further studies of the copy; (b) comparisons with other extant copies; (c) identification of possible variants of the edition.

7 CONSULTATION

7.1 Consultation about this nomination

(a) Consultation with the owner of the heritage and (b) with the custodian: The nominator is the owner and the custodian of the documentary heritage at the same time.

This nomination has been initiated by Ms. Anna Oláh, researcher of Bolyai heritage, Pedagogical Foundation Bolyai, E-mail: bolyaikutatas@bolyatestamentum.hu; URL: http://www.bolyatestamentum.hu/

(b) Consultation with the national committee: The Memory of the World National Committee - Hungary was consulted prior to and during preparing this nomination.

PART B - SUBSIDIARY INFORMATION

8 ASSESSMENT OF RISK

8.1 The document is stored in a secure and safe place, in the same way as other valuable documents in the Library.

9 ASSESSMENT OF PRESERVATION

9.1 Both preservation and access will be satisfied by making the digital form of the document available. To store the original document more properly, it is suggested that its library binding from the 1950-60s be removed and a suitable acid-free case be prepared for it.

PART C - LODGEMENT

This nomination is lodged by:

(Name) Prof. Gábor Náray-Szabó, Member of the HAS
Director General, Library of the Hungarian Academy of Sciences

(Signature) ........................................................................................................ (Date) ....................................................................................