

The Klein Protokolle

Modern technology makes possible as never before access for everyone to the classics of mathematics. The Clay Mathematics Institute has undertaken several initiatives in cooperation with other institutions to digitize and disseminate significant historical mathematical works. The first project, entirely funded by CMI, was the digitization of the oldest extant copy of Euclid's *Elements*. This is the d'Orville manuscript, dated to 888 AD, when it was copied in Constantinople by Stephen the Clerk for Arethas, later bishop of Caesarea Cappadociae. The manuscript has been in the collection of the Bodleian Library since 1804. The photography, directed by Chet Grycz of Octavo and Richard Ovenden of the Bodleian, took place at Oxford in the fall of 2004. From it resulted a set of 386 digital images, one per spread of the manuscript, each with a resolution of 639 pixels per inch and a file size of 254 megabytes. CMI, the Bodleian Library, and Octavo.com maintain copies of the original images for use by any interested person. Online copies are available at CMI and the non-profit organization Libraries Without Walls.

The next two projects took place in Göttingen with the help of Yuri Tschinkel of the Mathematisches Institut. Bernhard Riemann's 1859 manuscript "On the number of primes below a fixed bound," was photographed in 2005 by the Niedersächsische Staats- und Universitätsbibliothek Göttingen in 2005 with the assistance of Helmut Rolting, curator of manuscripts.

Much greater in scope was the digitization of the Klein *Protokolle* at the Mathematisches Institut in Göttingen — twenty-nine volumes comprising 8600 pages. The work was carried out by Libraries without Walls under the direction of Chet Grycz, again with CMI funding. Ardon Bar Hama, the photographer, used a Leaf Aptus 75 camera with a digital back and was able to complete the job in three days of round-the-clock work at the Mathematisches Institut. The images were captured as high resolution camera Raw DNG files for magnification and close inspection by scholars using a careful non-intrusive

handling procedure developed specifically for rare and delicate bound material.

Eugene Chislenko, CMI Senior Research Assistant on the project, has been facilitating digitization of the Klein *Protokolle* and other historical volumes. He is now editing and annotating the digitized volumes and is engaged in researching the history of mathematics with this material as a primary source.

There is much more of value to be digitized at the Mathematisches Institut, for long the home of many of the world's best-known mathematicians, from Gauss to Hilbert. A complete catalogue of their manuscript holdings was prepared by Jeremy Gray of the Open University in a research project supported by CMI.

The most recent CMI digitization project, *currbibliothek*, is the preservation of portions of Riemann's *Nachlass* at the Staats- und Universitätsbibliothek.



Portrait of Felix Klein, Courtesy Mathematisches Institut Georg-August-Universität, Göttingen.

Websites:

www.claymath.org/library/historical

www.librarieswithoutwalls.org

www.librarieswithoutwalls.org/klein.html

Hier haben somit die folgende
Tafel für unsere vierdimensionalen
regulären Körper:

	N_0	N_1	N_2	N_3
Pentahedroid	5	10	10	5
Oktahedroid	16	32	24	8
Hexadekahedroid	8	24	32	16
Ikosatetrahedroid	24	96	96	24
Hekatonikosihedroid	600	1200	720	120
Hexakosioihedroid	120	720	1200	600

Die Grenzen dieser Körper ge-
nügen einer Gleichung, welche im
Allgemein für irgend einen n -di-
mensionalen Körper die folgende
Gestalt hat-

$$1 - \sum_{k=0}^{k=n} (-1)^k N_k = 0.$$

Dies ist der Eulersche Satz für

59

addire man successive 20, 30, 60,
60, und 60 Tetraeder dazu, so be=
kommt man respective die Figuren
11, 12, 13, 14 und 15.

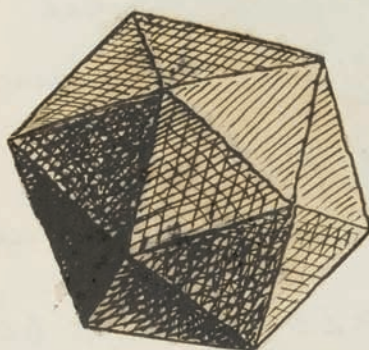


Fig. 10



Fig. 11

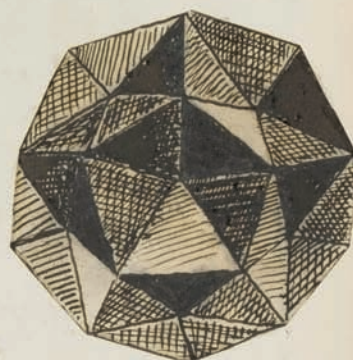


Fig. 12

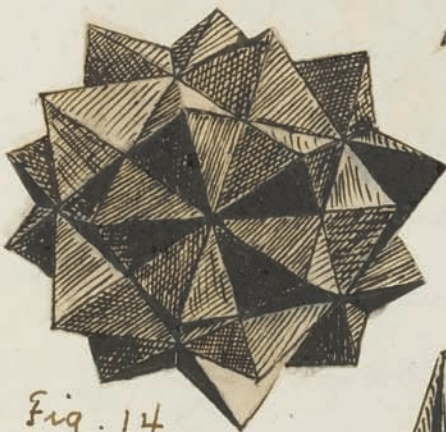


Fig. 14

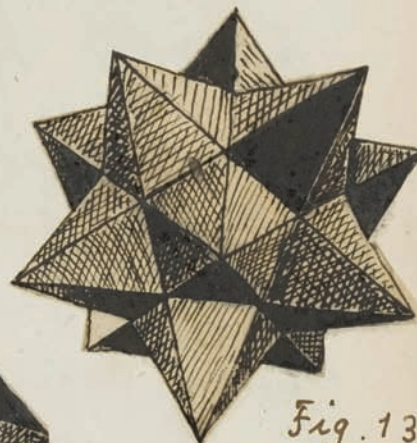


Fig. 13.

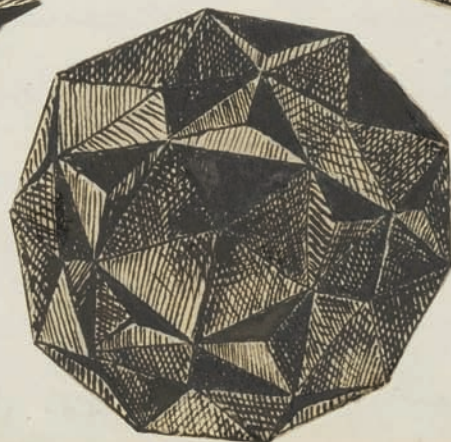


Fig. 15

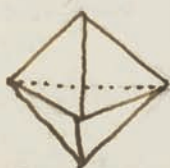


Fig. 16



Fig. 17.