MATHEMATICAL PERSPECTIVES

ABOUT THE COVER:
DO *OPERA OMNIA* HAVE A FUTURE?

GERALD L. ALEXANDERSON AND LEONARD F. KLOSINSKI

Over many years the collected works of prominent mathematicians have been published by major presses around the world. They range from something like the folio *Opera Omnia* of Euler [2],[1] filling over 80 hefty volumes published over many years. At the other extreme, the collected works of Evariste Galois [3] are in a thin 61-page quarto volume published in 1897, well after Galois' death. In recent times, one notes that collected works of mathematicians are still appearing, and one has to wonder why. Anyone wanting access to a specific paper is more likely to go to a computer rather than look up the piece in the author's printed collected works.

First, though, it is worth noting that collected works published on paper in codex volumes vary significantly in form and content. One question has to be answered right off: do the volumes in the "collected works" include the author's books as well as papers in journals? And, are letters included in the volumes? Sometimes yes, sometimes no. Further, how are the contents organized—chronologically? or by field? Those questions are answered fairly easily in some cases where the author has worked on problems in a fairly narrow range.

In George Pólya's *Collected Papers* [7] published by MIT Press not long after Pólya's death, there are four large quarto volumes, the first containing his papers on singularities of analytic functions, the second on the location of zeros, the third on analysis, and the fourth, an omnibus volume on probability, combinatorics, and the teaching and learning of mathematics. There are extensive comments by specialists in the various fields, and the whole effort is a significant contribution to scholarship. Would such an effort be likely to appear today?

---

[1]Euler's papers and books were so large in number and so valuable, the Swedish mathematician Gustaf Eneström devoted much of his life to assembling Euler's bibliography that listed his publications with descriptive detail over 388 pages in two volumes of the *Jahresbericht der Deutsches Mathematker Vereinigung*, issued by Teubner in 1910 and 1913.
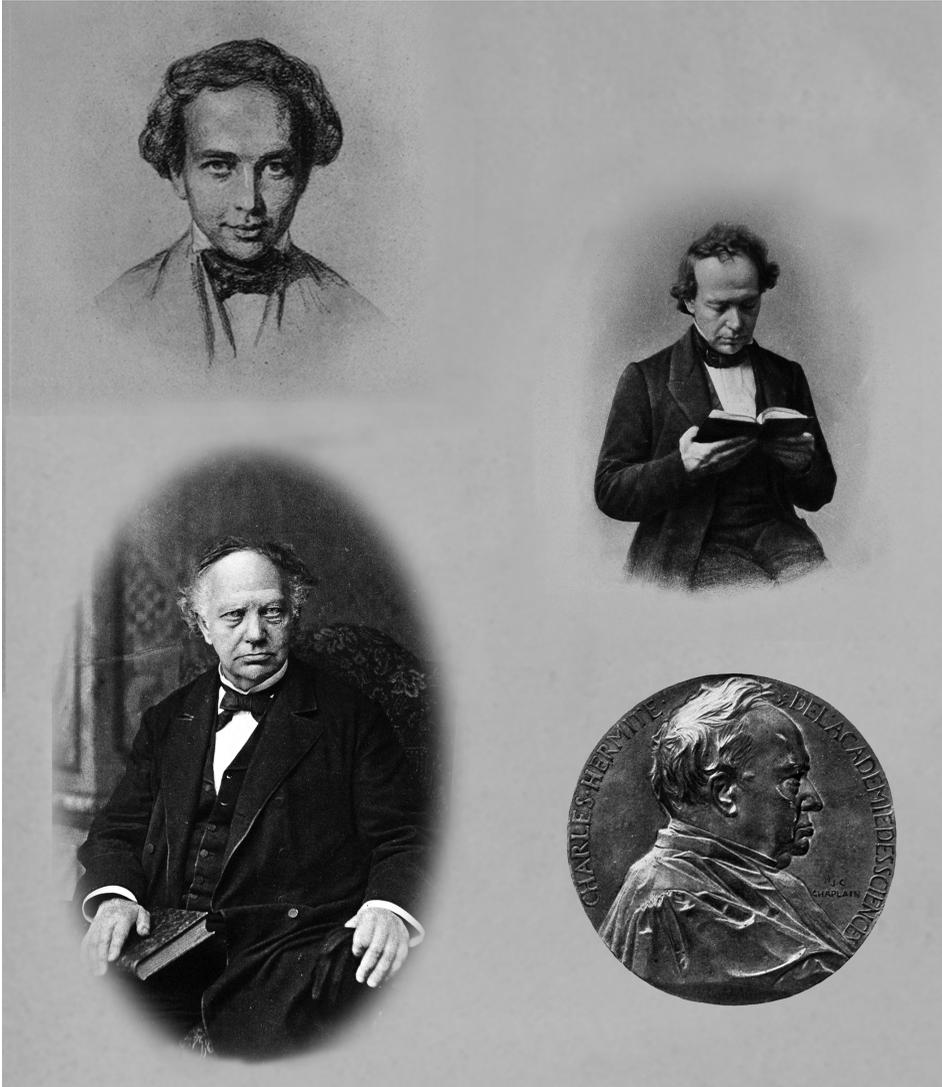
FIGURE 1. CLEAR COPY OF THE COVER. These four portraits of Hermite are the frontispiece portraits of him at the beginning of each of the four volumes of his *Œuvres mathématiques.*

The other extreme is, of course, just to reprint the author's papers in the order they appeared. These latter collections may be the first to disappear in the era of the computer. In Polya's case he also wrote quite a few books—I count 22—and those are not in these four volumes that are correctly titled "collected papers". Many sets of volumes are given names like "*opera omnia*", "*Werke*", "*œuvres complètes*", "*opere matematiche*", or the equivalent in some language or other. The titles often do not describe adequately the contents. But "collected works" have consistently continued to appear over the first years of this twenty-first century—notable examples are the works of Heinz Hopf, A. N. Kolmogorov, B. Kostant, Hans Lewy, Stephen Smale, L. N. Carnot, Armand Borel, Jean-Pierre Serre, Donald Knuth, Hellmuth Kneser, among many, many others. The list of firms publishing these is not surprisingly, dominated in numbers by Springer, Birkhäuser, deGruyter, and a few organizations like the American Mathematical Society or presses operated by universities.

We have been somewhat surprised in recent years to find such collections still appearing in advertisements by publishers, listing their recently issued volumes. It appears that "collected works" have not yet been driven from the market by the ease of printing out something with the computer. Of course, those of us who are "collectors" would prefer to see the continued appearance of such collections on paper, partly because the existence of such collections can be either entertaining or could influence scholarship. Here are a few examples. We own the copy of Riemann's *Werke* [8] that was owned by Cayley, with marginal commentary in pencil by Cayley presumably. A historian could well be interested in what Cayley thought of the various publications of Riemann. We also have Dedekind's copies of Lejeune Dirichlet's *Werke* [1], with the signature of the owner on the endpapers of both volumes but no marginal commentary. We can conclude either that Dedekind did not approve of writing in books—generally admirable—or that he found the contents to be without flaw. Or perhaps he never got around to reading them.

We own only the first three volumes of Gauss's *Werke* [4]. These are the copies acquired by Darboux as they were published. The other volumes are missing because Darboux died the same year that volume 3 appeared. The dealer from whom these were acquired noted that at the point Darboux died he stopped collecting.

There are unexpected rewards in going through some volumes of collected papers. Very often they contain some of the best portrait engravings of the author. In the case of Hermite the collected papers [5] are in four volumes. The papers are arranged more or less chronologically and each volume contains an engraved portrait of Hermite thus forming something of a view over time of Hermite's appearance. We can see him age right before our very eyes. It would be interesting even if the subject were not a prominent mathematician—rather a chronicle of the ages of man. Leibniz' *Collection* of 1717 [6] has the signature of a noted scientist Thomas Huxley on the title page. Huxley was no mathematician. But then Leibniz was a mathematician who worked successfully in other disciplines. Did he perchance predict in some way the theory of evolution? Maybe. Browsing through "collected works" can reveal interesting rewards and challenges.

FIGURE 2. The frontispiece and title page of a typical eighteenth century opening of a set of collected papers, in this case the opening of the five-volume set *Œuvres de Blaise Pascal*, la Haye, Detune, 1779.

REFERENCES

[1] Gustav Peter Lejeune Dirichlet, *Werke*, Reiner, Berlin, 1897–1898.

[2] Leonhard Euler, *Commentarii Academie Scientiarum Imperialis Petripolitaniae*, St. Petersburg, 1728–1751.

[3] Evariste Galois, *Œuvres mathématiques, Introduction par Emile Picard*, Gauthier-Villars, Paris, 1897.

[4] Karl Friedrich Gauss, *Werke*, Königlichen Gesellschaft der Wissenschaften, Göttingen, 1863–1902.

[5] Charles Hermite, *Œuvres, ed. par Emile Picard*, 4 vols., Gauthier-Villars, Paris, 1905–1917.

[6] Gottfried Wilhelm, Freiherr von Leibniz, *A Collection of Papers which passed between the late and learned Mr. Leibniz and Dr. (Samuel) Clarke*, Georg Löwe, Leipzig, 1737.

[7] George Pólya, *Collected Papers*, Edited by R. P. Boas and Gian-Carlo Rota, 4 vols., MIT Press, Cambridge, MA, 1974, 1984.

[8] Bernhard Riemann, *Gesammelte mathematische Werke und wissenschaftlicher Nachlass*, Teubner, Leipzig, 1876.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE, SANTA CLARA UNIVERSITY, SANTA CLARA, CALIFORNIA
   Email address: galexanderson@scu.edu

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE, SANTA CLARA UNIVERSITY, SANTA CLARA, CALIFORNIA
   Email address: lklosinski@scu.edu