# MATH 181 NOTES: JANUARY 12, 2022

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One way to study the history of mathematics is to study the biographies of individuals who practiced mathematics. Everyone can appreciate why this is a worthy endeavor. A number of mathematicians led fascinating lives that are the subject of movies and popular novels: John Nash proving groundbreaking theorems and then becoming crippled by mental illness and then overcoming it; Srinivasa Ramanujan rising from obscurity in India and impressing the greatest British mathematicians with his mathematical work only to tragically fall ill and die at the age of thirty-two; Evariste Galois scrambling to complete his new theory of equations (Galois theory) before dying in a duel. Even mathematicians who led less dramatic lives attract interest. Some mathematical results are so surprising, so transformative that one can hardly imagine a person capable of proving them. Biography also has a large impact on participation in mathematics. Elite European men have traditionally been the focus, sometimes creating a perception that others have little or no place in the field. No less a figure than Thomas Jefferson pointed to the absence Black people in mathematics as evidence of their alleged inferiority, writing in "Notes on the State of Virginia" that "one could scarcely be found capable of tracing and comprehending the [geometric] investigations of [the Greek mathematician] Euclid."

How can we learn about individuals? In the case of John Nash, it is easy: we can watch the movie *A Beautiful Mind*, and we can learn more by reading the biography that it is based on. Nash's life story has generated an exceptional amount of interest from Hollywood, but other figures are the subjects of documentaries and biographies that you can find in the library. From the comfort of your own home, you can read Wikipedia articles about many mathematicians. But this just kicks the can down the road: How did the author of Nash's biography research him? And it also limits us. We'd like to learn about people who are not yet the subject of film, movies, and TV.

In some cases, we will have to give up learning about the individual. For ancient historical subjects like ancient Mesopotamia, Egypt, etc, the information simply isn't there. Even with major public figures like king, we often know nothing more than their name, the rough period during which they lived, and maybe a handful of achievements (laws passed, battles won, etc). Often times, we can't even figure out the name of the individual who produced an important piece of math. Even famous names are sometimes obscure. Consider the Greek mathematician Euclid. He's known for being the author of important mathematical texts including *Elements*. We can date those texts to around 300 BC, and he is called "Euclid of Alexandria," so he presumably lived in the city of Alexandria (now part of modern Egypt), but that's about all we know beyond his mathematics writing. He is described in some other texts, but they were written hundreds of years after Euclid died, and people debate whether the information they contain is correct. Things are even worse for Pythagoras. We don't even know if he actually did any mathematics. No writing by Pythagoras himself exists, and everything written about him was produced

many years later by people who never met him. A number of scholars have argued that he did not do any mathematics, and the stories of his mathematical achievements should be viewed as akin to the stories of Hercules slaying a nine-headed Hydra or Perseus defeating Medusa.

How to research a mathematician?

In this lecture, I want to take a look at a historical figure who lies somewhere between John Nash and Pythagoras: Thomas E. Hart. Known professionally as T. E. Hart, he was one of the first Americans to receive a PhD in mathematics. His dissertation was one of the first pieces of theoretical math research produced by an American. Understanding his life is one way to learn about the origins of math research in America. How can we learn more about him?

Hart is not (yet?) the subject of a Wikipedia article, but you can find a few references to him by poking around the university libraries. The 1965 book *Southern Scholars in Goethe's Germany* by John T. Krumpelmann has a 2-page biography, and there are a few sentences about him in the 1890 book *The Teaching and History of Mathematics in the United States* by Florian Cajori. This isn't a lot to go on. The most recent book is almost sixty years old, and it was written by a Germanic Studies professor (Hart earned his PhD in Germany), so the treatment of mathematicians is superficial. It does give us something to go on. Cajori's book does not include a bibliography or a list of citations, but Krumpelmann's does.

The sources that Krumpelmann are displayed in Figures 1 and 2. He used records from Heidelberg University (in Germany) and the Citadel as well as general histories of Furman University and the University of South Carolina as well as the town he was from (Hartsville). What are some more records that we could look for:

(1) University records like course catalogues, directories, course notes, etc. Most universities libraries have a complete course catalogues, etc. Records like course notes are harder to come by. Sometimes, a professor or one of their students donates their papers to the library, but this is unusual.
(2) The mathematical writing that Hart published. The only such document appears to be his dissertation. In general, you have to contact the university to get a copy of a dissertation, but in this case, we are lucky, and it is on Google Books.
(3) The textbooks that Hart read as a student and assigned as a professor. The book titles are usually listed in course catalogues, and for the time/place in question (19th century America), many textbooks are on Google Books, and if not, we could check the university library.
(4) Government records like the US census. Thanks to public interest in family history, these records are easy to get access to. The Santa Cruz library (and many other public libraries) provide access to online databases like Ancestry.com.
(5) Newspaper records. Math professors rarely make front page news, but sometimes they print birth and wedding announcements as well as information about university events. Like government records, accessing old newspapers is much easier than it was a few decades ago. Many newspapers are digitized, and you can get access at a library.

(6) Physical locations associated with Hart. His family is closely tied to the town of Hartsville, South Carolina. Not is the town named after the family, but the family home, Kalmia Plantation, still stands and is now a public garden.

(7) General histories of topics connected to Hart. Information about the history of South Carolina, Germany, the universities Hart studied at, etc can help us contextualize and interpret other records.

(8) Other ideas? As we collect more information, we'll might come up with new ideas of records to look for.

Different sources provide different types of information. Hart's dissertation does not contain any personal information, but it is the main object of mathematical interest. The census records won't contain any interesting mathematics, but they do provide important basic information that helps us flesh out Hart as an individual and can help us find more mathematical records. At the end of the day, to write a history of any mathematician (or mathematical practitioner), we'll want to combine several different types of sources.

What would we like to learn about Hart? Here's some possible goals:

(1) Basic biographical information. Where was he born, where did he live, etc.

(2) What research did he do?

(3) How was Hart educated? South Carolina did not have a public education, and may were illiterate. How did Hart get the education necessary to study at Heidelberg, a international center for mathematics.

(4) What subjects did Hart teach? How did he run his classroom. In general, how did people study math at university in the 19th century? How was it different from studying math today?

(5) What impact did Hart's research have? Did anybody read his dissertation? Build on the results he proved? Was he building on earlier work of other mathematicians? If so, how did he improve on their work?

(6) What does Hart's life tell us about the early development about mathematical research culture? Was he an important figure who trained other researchers? Was his life typical for math researchers in America?

(7) What does Hart's life tell us about the transmission of mathematical knowledge between Germany and America? Hart studied for several years in Germany. Was this unusual? Did he bring new mathematical ideas back to America from Germany? What about teaching techniques? Did he help any German mathematicians move to America? Americans study in Germany?

These questions are just the first ones that I jotted down. Can you think of some additional ones?

Next class I will present a short biography of Hart that can be cobbled together from the available records.

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FIGURE 1.  Krumpelmann's sources on Hart.

C. THOMAS EDWARDS HART

[1] Shumway, "The American Students of the University of Göttingen," *German American Annals*, N.S., vol. 8 (1910), pp. 171-254.  The official registration records show: Ostern-Michaelis, 1859.
T. E. Hart, 160, Ost. 59, Süd Carolina, Am., Philos., Wiederhold, Prinzen-[strasse] 528.
The two succeeding semesters give the identical data.  It is interesting to note that one of the Gibson brothers of Kentucky and Louisiana first registered at Göttingen shortly after Hart: T. Gibson, Louisiana, Rechte, [Registration No. 185] Schepler, 77 Weender[strasse].
[2] Information supplied by Dr. Hans Krabusch of the Department of Archives, Heidelberg University, March 4, 1959.
[3] Druck von B. G. Teubner in Leipzig, [O. J.], iv, 49.  The following data from: "Akten der Phil. Facultät [M.S. Heidelberg Archives] 1865-66, Dekan Zelter, III, 5a, 00. 93"
Thomas Edwards Hart aus Amerika, der seit 1858 in Göttingen ..., hier naturwissenschaftliche Studien gemacht hat ... sich zu Examen in Mathematik als Hauptfach, Chemie u. Physik als Nebenfächer; zugleich überreicht er eine mathemathische Abhandlang (ohne Titel) ... u. vita beilegt.
Herr College Hesse spricht sich in der Anlage für Annahme der Abhandlung u. Zulassung zu Examen aus.  In der Voraussetzung, daß die übrigen Herren Sachverständigen beistimmen, schlage ich Dienstag, d. 13. d. Abends 6 Uhr als Prüfungstermin vor.

Zelter

Heidelberg d. 8. März 1866.
The committee of examiners was: Bähr, Latein; Hesse, Mathematik;

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FIGURE 2.  More of Krumpelmann's sources on Hart.

[Vater] Gutsbesitzer, ev. J. U. [früher] Berlin.
[4] "Tribute to Dr. Thomas E. Hart, offered to the Annual Meeting of the Association of Graduates of the South Carolina Military Academy," July 7, 1892.  "To the Dead of 1891-92."  See note 6, *infra*.
[5] *Ibid.*, p. 30, "Remarks" added by Major J. J. Lucas.  Lest we forget: The examiners were well renumerated from the 240 guldens paid by Hart as his examination fee.  In those days a 53 page paperback did not cost as much to publish as it would today.
[6] J. L. Coker, *Hartsville, Its Early Settlers*, 1911, p. 8.
[7] Robert Norman Daniel, *Furman University, A History*, Furman University, Greenville, S. C., 1951, p. 81.
[8] Green, *History of the University of South Carolina*, p. 92.
[9] *Ibid.*, p. 93 and pp. 453-54.
[10] Coker, *op. cit.*, p. 9f.
[11] Green, *op. cit.*, p. 93.