



## Euler as a Teacher – Part 1

January 2010

What would it have been like to be a student of Leonhard Euler? Until we invent time machines, it will be impossible to answer this question. Still, it is almost impossible not to ask it anyway.

By all accounts, Euler was regarded as an excellent teacher. His eulogists all mention that he was a kind and pious man, a great genius and wonderful teacher. There are stories that students from abroad, particularly from France and Russia, studying in Berlin would rent rooms in Euler's house and that they would talk about science and mathematics at meal times. Accounts of the last day of Euler's life, in September 1783, include the detail that he spent part of that day teaching mathematics to his grandson.

Despite these flowery tributes, we have very few accounts beyond the snippets cited above of Euler actually in the act of teaching.

When Peter the Great founded his Academy of Sciences in St. Petersburg, he intended it to be a comprehensive scholarly institution, doing the latest in scientific research, educating the youth of Russia and promoting the sciences among the general public. Euler supposedly had responsibilities in all three points of this academic mission, but he seems to have left few footprints outside his work in basic research.

The archives of the Academy [SPA 1886, pp. 222-224] reprint a catalog that tells us that in 1732, Euler would teach physics on Monday and Tuesday mornings, and on Saturdays he "will confirm its truth by experiments." His course seems to be the only one in the catalog (which is only two pages long) that tells us that he will be using a textbook. "In this matter, he will follow the esteemed s'Gravesand's book *Physices Elementa Mathematica*."

In 1734, he taught his Course in Mathematics from 2:00 to 3:00 in the afternoon. The catalog [SPA 1886, pp. 554-555] does not tell us which days that course met, nor does it mention a textbook.

These were the only catalogs I could find from Euler's time in St. Petersburg. I found nothing to describe the outcomes of these courses. They apparently didn't do student evaluations, nor did deans or directors observe and evaluate the quality of teaching. Indeed, I came across a contract for a French teacher named Comble. It says

Comble is engaged for six consecutive years, and he promises not only to acquit himself faithfully to his duties in the capacity of teacher of the language, but also to all other functions which the directors of the Academy find appropriate to charge to him. If after the term of six years has expired, he no longer wishes to continue in his service, he is obligated to declare that in writing a year in advance, and he will be accorded his departure without any difficulty.

The contract says nothing at all about the quality of his work, and has no provisions by which he might be fired, though perhaps he could lose his job if he did not "acquit himself faithfully."

Euler's classes in the Academy's Gymnasium could not have been very large. The archives give us the number of students admitted each year for the years 1726 to 1738. Students generally aged between 10 and 19 years old when they were admitted, though I came across one student, the son of one of the Academy's typesetters, who was only five and a half years old. Most were sons of military families, though there were occasional sons of merchants, and one was the son of an attendant to a princess. Education was for the upper middle class, and was only for boys.

New students at the Academy's Gymnasium, by year

1726	112	1732	21
1727	57	1733	46
1728	28	1734	34
1729	74	1735	23
1730	14	1736	22
1731	28	1737	16
		1738	12

I find occasional announcements of public lectures in St. Petersburg, intended to promote the sciences among the general public, following the dictates of Peter the Great. Lectures concerned then-popular subjects. One described the dissection of an elephant. Another addressed the delicate question of whether it was possible to tell if the earth moved around the sun. The question was delicate because the Orthodox Church already had a strong opinion on the subject. I can find no mention that Euler ever gave any of these lectures, though in on January 31, 1732, he "responded on behalf of the Academy" when Gmelin gave a lecture "On the origin and progress of Chemistry." It is not clear what Euler's responsibilities were here.

Euler was well respected as a textbook author as well. [Katz 2007] He wrote a series of textbooks that extended from elementary arithmetic (the *Rechenkunst* of 1738 and 1740), through algebra, precalculus and differential and integral calculus. Moreover, we could consider the *Methodus inveniendi* as a textbook on the calculus of variations and his *Letters to a German Princess* as a textbook on science and natural philosophy.

We know something about Euler's own education. In his autobiography,<sup>1</sup> he tells us that he believed that he had the best of all possible educations at the feet of Johann Bernoulli. His Bernoulli lessons from are also recounted in the Fuss eulogy [Fuss]:

---

<sup>1</sup> "My father's life as dictated to me by him. Recorded [by J. A. Euler] in St. Petersburg on the 1<sup>st</sup> of December 1767." [Fellmann 2007, p. 5-7]

It did not take long before he was noticed by Johann Bernoulli, the greatest of the living geometers. He soon distinguished himself from his fellow students and since Bernoulli was not able to provide all that his young mathematician asked of him, he told him to bring all the problems that he encountered when studying and every Saturday he would help him work through them. This instilled an excellent process; but only one that can succeed with an extremely talented genius which Mr. Euler possessed. He was destined to exceed his teacher who at the time was unsurpassed in mathematics.

Little is known about Euler's teaching activities during his Berlin period (1741-1766). One of the few facts about this period comes from a footnote in the Fuss eulogy, from which it appears that Euler made some effort to recreate his own education with Russian students

(6) Euler opened his home to students that the Academy sent to Berlin to study mathematics. Mssrs Kotelnikov and Rumovsky spent a number of years in this situation and enjoyed the teachings of their incomparable master.

In an upcoming column, we'll consider Euler as a teacher during his second St. Petersburg period.

#### References:

- [DSB] Youshkevitch, A. P., Leonhard Euler, in *Dictionary of Scientific Biography*, ed. C. G. Gillespie, IV.467-484, Scribner, 1972.
- [Fuss 1862] Fuss, Nicolaus, Eulogy of Leonhard Euler, English translation by John S. D. Glaus on MacTutor at [http://www.gap-system.org/~history/Extras/Euler\\_Fuss\\_Eulogy.html](http://www.gap-system.org/~history/Extras/Euler_Fuss_Eulogy.html)
- [Fellmann 2007] Fellman, Emil A., Leonhard Euler, Birkhäuser, 2007.
- [Katz 2007] Katz, Victor J., Euler's Analysis Textbooks, in *Leonhard Euler: Life, Work and Legacy*, ed. Robert E. Bradley, C. Edward Sandifer, Elsevier, 2007.
- [SPA 1885] Imperial Academy of Sciences, St. Petersburg, *Materialli dla Istorii Imperatorskoi Akademia Nauk, Volume One (1716-1730)*, St. Petersburg Imperial Academy Press, 1885.
- [SPA 1886] Imperial Academy of Sciences, St. Petersburg, *Materialli dla Istorii Imperatorskoi Akademia Nauk, Volume Two (1731-1735)*, St. Petersburg Imperial Academy Press, 1886.

Ed Sandifer ([SandiferE@wcsu.edu](mailto:SandiferE@wcsu.edu)) is Professor of Mathematics at Western Connecticut State University in Danbury, CT. He is an avid marathon runner, with 37 Boston Marathons on his shoes, and he is Secretary of The Euler Society ([www.EulerSociety.org](http://www.EulerSociety.org)). His first book, *The Early Mathematics of Leonhard Euler*, was published by the MAA in December 2006, as part of the celebrations of Euler's tercentennial in 2007. The MAA published a collection of forty *How Euler Did It* columns in June 2007.

---

*How Euler Did It* is updated each month.  
Copyright ©2009 Ed Sandifer