# Opusculus

The Euler Society Newsletter

Summer 2010 Volume 2, Issue 1


**Hot off the press (or at least the foundry floor).**

The first of the Society's Leonhard Euler Medals have been produced at the Berkshire Fine Arts Foundry in Pittsfield, Massachuesetts. In the coming years, the medal will be the Society's primary honorary award for individuals who make a significant contribution to the understanding of Euler's works, life, and times.

## The Omnipresent Savant

By Dominic Klyve

### Opera Omnia Anglicae Reddit

One of the most exciting parts of my work with the Euler Archive is the opportunity to see so many new translations of Euler's works into English. As I write this, the Euler Archive provides archived or linked versions of 133 of Euler's papers, and I know of four more that should appear soon. We have passed the 15% threshold, and I would like to take this milestone as an opportunity to reflect on the ongoing work of translating Euler into English, and to make an informed conjecture on when we might expect to see all of Euler's works in English – the expected date of an "Opera Omnia Anglice Reddit" (very literally "All works Englishly returned").

I need to begin this essay with a confession. I have only limited data on the number of translations that have existed at any point in the past. The Euler Archive has not been as careful as we should have been in recording and (ironically) archiving this information. We do, however, have several documents we've written which give the number of translations at a moment in time, and I have used that data to put together the following graph (see next page). The lack of a data table is intentional – the data is a bit fuzzy, and no more accuracy is possible than that which can be inferred from the graph.

Before the year 2000, roughly ten or twenty of Euler's papers had ever been rendered in English. The real work began as people began to look ahead toward Euler's tercentenary. I remember in particular a link on Ed Sandifer's web page called the "Euler Project", to which he, Stacy Langton, and Homer White (and possibly others – this was some years ago) had contributed. In 2003, the Euler Archive began to appear, and soon after that, we

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## *Opusculus* and the Internet

By Erik Tou

As many of you are no doubt aware, the ubiquity of the Internet in modern culture has had a profound impact on academic scholarship. As with most new developments, it is a two-edged sword: while resources such as MathSciNet and JSTOR make it easier to obtain copies of important papers, web sites such as Wikipedia and Dictionary.com often tempt students to circumvent the more reliable routes of academic inquiry.

The purpose of this article is *not* to offer an opinion on the use of Internet sources in one's research endeavors. Rather, I wish to bring to your attention some of the more useful features that will appear in the electronic version of *Opusculus*. (For those of you reading this at the Euler 2010 Conference, you can find the electronic version on the Euler Society web site: www.eulersociety.org.)

With the sheer number of reputable resources available on the Internet, it has become simple to include hyperlinks to the various books, articles, and other sources mentioned in this newsletter. Do you want to know more about a popular new book? Click the link to find it! Do you know that a new electronic version of E530 is now available? Click the link!

This new endeavor makes the *Opusculus* more useful to Euler scholars, but it also fits into the broader evolution of academic research in the Internet age. Enjoy this new feature!

## The Euler Line

Dispatches from the world of Euler scholarship

1. Jordan Bell has published a paper on Euler's work with pentagonal numbers. The article, "A summary of Euler's work on the pentagonal number theorem" appears in *Archive for History of the Exact Sciences*, Vol. 64 (2010), pp. 301–373. A copy of the article, for those without electronic access to the journal, is available at Bell's University of Toronto web site:

http://individual.utoronto.ca/jordanbell/

2. A review of *Euler at 300: An Appreciation*, the tercentenary text edited by Rob Bradley, Larry D'Antonio, and Ed Sandifer, appears in *SIAM Review*, Vol. 51, No. 1, pp. 218-220.

3. A review of Dieter Suisky's recent book, *Euler as Physicist*, appears in the journal *Isis*, Vol. 101, No. 2, pp. 432-433.

4. A paper by J. Brüning, "Leonhard Euler in Berlin" appeared in the journal *Uspekhi Matematicheskikh Nauk* Vol. 63, 3(381) (2008), pp. 169-190. This paper examines Euler's Berlin years, with a primary focus on his scientific works. [Note: this article is in Russian.] The first page of this article may be downloaded for free from the journal's web site on http://www.mathnet.ru/.

5. Kurt Møller Pederson's paper, "Leonhard Euler's wave theory of light," appeared in *Perspectives on Science*. Vol. 16, No. 4 (2008), pp. 392–416. In this paper, Pederson explores Euler's wave theory from both a mathematical and an experimental standpoint. The full article is available for download (for those with a subscription) from

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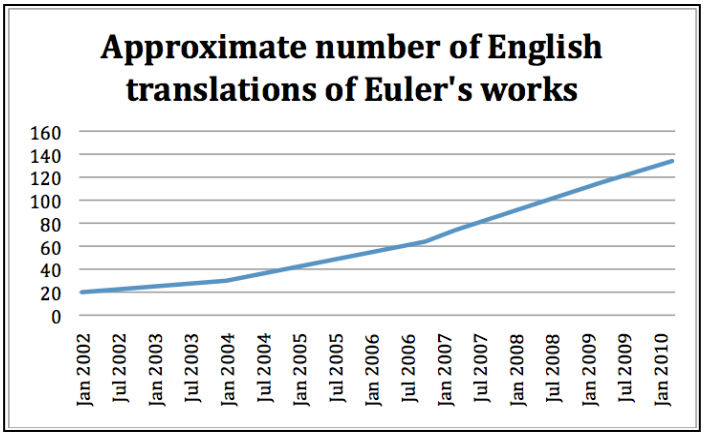


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were able to provide a good home and some publicity for new translations, thus accelerating the translation rate. Now, with the tercentenary over, many people have discovered the personal and professional rewards that come from translating Euler's works, and progress continues.

Over the last three years, we've seen about twenty new translations of Euler works appear each year. At this rate, all of Euler's works will be finished in (866 – 134)/20 = 36 years or so. It's still true that most of these translations come from a small number of people, but that pool, too, is growing.

Only a few years ago I would not have been optimistic about our chances of rendering all of Euler's works into English, for the simple reason that translating Euler's books is a monumental undertaking. Few scholars have the time and energy to devote themselves to a 500- (or 1000!)-page work, a work which would probably have less benefit to their careers than working on many smaller papers. Seeing all of Euler's long works in English, I thought, was an unrealistic hope. Then I learned of Ian Bruce.

Ian Bruce is a retired physics professor, formerly of the University of Adelaide, South Australia. Several years ago he decided to start translating works from the history of mathematics and make them available online. Dusting off his Latin, he quickly grew quite good at the task, and built up a widely regarded website (http://www.17centurymaths.com). Happily for readers of this newsletter, a significant fraction of his attention went to Euler's works. Over the last three or so years, he has translated (by my last count) 22 of Euler's papers, including most of the previously untranslated works with Enestrom numbers below 45. Far more impressive, however, is his work on Euler's books. He has completed both volumes of the *Mechanica* (E15 and E16), along with the *Theoria Motus Corporum Solidorum seu Rigidorum* (E278 – sometimes called Volume 3 of the *Mechanica*.) These three works alone comprise 1500 quarto pages in the Latin original.

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6. An article by Janet Heine Barnett, "Mathematics goes ballistic: Benjamin Robins, Leonhard Euler, and the mathematical education of military engineers," has appeared in the *British Society for the History of Mathematics Bulletin*, Vol. 24, No. 2 (2009), pp. 92–104. This article examines the history of ballistics, including special attention to Euler's *Neue Grundsätze der Artillerie*.

7. González Redondo and Francisco A. Constants' paper, "Units, measures, and dimensionals in Leonhard Euler's mechanics, 1736–1765", appeared in the *Euler Reconsidered* (Roger Baker, ed.) as part of *Tercentenary Essays* (Heber City, UT: Kendrick Press, 2007), pp. 205–231. The authors identify Euler's work on mechanics as a transition between Newton's geometrical mechanics and Fourier's analytical method.

8. Manuel Lopez Pellicer's paper, "Tres insignes ilustrados: Bethencourt, Euler y Jorge Juan" (Three important philosophers of the Enlightenment: Bethencourt, Euler and Jorge Juan) appeared in *Revista de la Academia Canaria de Ciencias* Vol. 19 (1–2) (2007), pp. 129–154. This paper connects Euler's philosophical views with two lesser-known Spanish Enlightenment philosophers.

## A Letter to the Editor

A note from Stacy Langton, University of San Diego, regarding the title of *Opusculus*:

> …if the title is Latin, shouldn't it be 'Opusculum'? Generally, the gender of a diminutive is the same as that of its primitive. Since 'opus' is neuter, 'opusculum' should also be neuter (and therefore end with 'm' rather than with 's'). Alternatively, one could look up 'opusculum' in the dictionary.

As the Euler Society is committed to the pursuit of knowledge (and especially the accurate rendering of language), all readers are invited to join the discussion. If have any questions or comments, please contact the editor at etou@carthage.edu. A consensus on the Latin rendering may well produce a new newsletter title…

to lead the reader through difficult passages. And best of

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Bruce does more than just translate, however. He then goes on to re-typeset the original Latin text. When the original figures are of sufficiently high quality, he inserts them. When they are not, he redrafts them. I find this intriguing. Many of the benefits of having a searchable original text have not been realized, as this is a new tool open to scholars. Even beyond the ease that comes from being able to locate ideas quickly, this opens up Euler to types of quantitative textual analysis to which he has never been submitted. Often Bruce provides helpful annotations to lead the reader through difficult passages. And best of all, the translation is excellently done, cast in faithful but readable English.

Professor Bruce has recently moved on to the *Institutionum calculi integralis* (E342, E366, and E385), and has already completed the first two volumes. He tells me that when this Herculean task is finished, he'll move on the *Calculi differentialis*, and may then (gasp!) leave Euler, moving on to Newton's *Principia* and Lagrange's *Mechanics*.

I stated earlier that I thought that Euler's long works might be the single biggest factor standing between us and the rendering of all of Euler's works into English. Thanks to Ian Bruce, there will soon be a fairly small number of untranslated books by Euler. Depending on what precisely we count as a book, these comprise the colossal three-volume *Dioptrica* (E367, E386, E404), the *Methodus inveniendi* (E65), the *Reckenkunst* (E17), the two lunar theories (E187, E418), and the three books on ships and navigation (E110, E111, E426). This list is, of course, still long enough to provide a formidable challenge, but is now happily short enough that we can count the remaining books on the fingers of one Eulerian.

Each year, it seems, more papers are being translated. I've been very happy with the trend of student translations of Euler's works (usually in collaboration with a faculty advisor). Rob Bradley has led students in these efforts several times over the last few years, as have many others—Stacy Langton, Erik Tou, and your favorite *Opusculus* columnist come immediately to mind. The recent leaders in this enterprise, however, are clearly the professors of Rowan University. Tom Osler began this work years ago, and since then he has been ably joined by Hieu Nguyen and Abdul Hassen. At Carthage College, two of my students have begun work on translations to satisfy "honors contracts" in their language classes: Emma Sorrell is working on one of Euler's algebra papers (E310), and RJ LaHue has begun work on Euler's 1755 treatise on comets (E67).

Translating is also becoming a popular activity of working mathematicians. In addition to the members of the

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# A New Twist on an Old Problem

In the well-known Sudoku puzzle, readers are asked to fill in missing numbers to uncover a 9x9 Latin square, i.e., a square grid in which all nine digits appear exactly once in each row and column. (However, not all 9x9 Latin squares are valid Sudoku puzzles, as the game also requires that each digit appear only once in each of nine 3x3 squares.)

In E530, Euler examined the mathematics of Graeco-Latin squares. (Euler used Greek and Roman letters instead of Hindu-Arabic numerals; hence the name.) These squares consist of two overlaid Latin squares that are *orthogonal*: each Greek-Roman letter pair can appear only once in the grid.

Below you can see a partially-completed 5x5 Graeco-Latin square, using the letters A-E and numerals 1-5. Complete the square, and remember you can use orthogonality to help you out (i.e., if B/4 appears in one part of the grid, it can't appear anywhere else).

| | | | | |
|---|---|---|---|---|
| D | 3 | | E 1 | |
| 5 | C | | | A |
| | | 3 | | 1 |
| C 3 | | | D | E |
| | E | 2 | C | |

*The solution to this puzzle will appear in the next issue.*

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Euler Society who have been translating for years, new scholars are joining the charge. Michael Saclolo has begun a series of translations of Euler's "philosophical" works. Paul Bialek was recently granted a sabbatical to translate and write about Euler's papers, during which time he translated three of the number theory papers from Latin. In Texas, a Big Spring High School science and math teacher, Dr. Mo Seghier, recently finished a translation of Euler's first paper in spherical trigonometry (E214). Christine Stephens and her brother (a classicist) have begun joint work on E282, in which Euler works on resolving equations of arbitrary degree.

It is, in short, an exciting time to be an Eulerian.

It is also time for a call to arms—for a rallying cry. The accelerating rate of progress can and does give us hope for the future. Counting those papers that are in the final stages of revision, and which we expect to have available soon, about 140 of Euler's papers have been translated. There are about 850 distinct items in the Enestrom index, once we eliminate those numbers given to collections of works. This leaves 710 papers to be translated. And we have an important date coming up. 2033 is the 250th anniversary of Euler's death, and we can confidently expect another 2007 – a year of Euler in which the world celebrates his work.

Is it possible we could translate all of Euler's works into English by 2033? If 710 works remain, we need average about thirty works per year. Given our current rate of about twenty per year, this seems not out of the question. If we here dedicate ourselves to encouraging capable people to do this important work, there is every reason to believe that we can get this done. I hereby call upon readers of this newsletter to consider how they might help this effort, by working with students, encouraging colleagues, and even translating themselves. Collectively we can accomplish much, and in 2033, I believe we can announce a complete rendering of Euler's works in English.

Imagine what a party we'll have.

***— D. Klyve***

All information regarding the Euler Society's 2010 conference can be found on the Society's web site: www.eulersociety.org. Both the program and abstracts are currently available.

Proceedings will be available after the conference concludes. Check the Autumn issue of *Opusculus* for more information.


# Translation and Archive Update

**Google Books** continues to grow its collection. Some more of Euler's works (in their original languages) are now available there:

- **[E791]** *Commentationes arithmeticae collectae* (*Collected arithmetical commentaries*) is available on the Greek mirror site.

  Volume 1: http://books.google.gr/books?id=jVsPAAAAQAAJ

  Volume 2: http://books.google.gr/books?id=sVsPAAAAQAAJ

- **[E786]** *Oeuvres completes en français de L. Euler* (*Complete works of L. Euler in French*) is also available:

  http://books.google.com/books?id=aMkEAAAAYAAJ

**Ian Bruce** continues his impressive translation output of Euler's works. A complete English translation of the *Institutionum Calculi Integralis* (*Foundations of Integral Calculus*)—all three volumes [**E342**, **E366**, **E385**]—is now available on Bruce's web site:

http://www.17centurymaths.com/contents/integralcalculus.html

**Ernest Hirsch** has translated most of *Anleitung zur Naturlehre* (*Introduction to Natural Science*) [**E842**] into English:

http://www.17centurymaths.com/contents/contentse842.html

**Archive.org** has posted a high-quality electronic copy of Euler's *Recherches sur une nouvelle espece de quarres magiques* (*Investigations on a new type of magic square*) [**E530**]:

http://www.archive.org/stream/nieuweverhandeli09zeeu#page/84/mode/2up

**Todd Doucet's** web site of Euler translations has moved:

http://lambentresearch.com/euler/

*All documents mentioned in this column are available via the Euler Archive:* http://www.eulerarchive.org.

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**Dominic Klyve**, Columnist

Letters, articles, and other contributions to the *Opusculus* are very welcome. Send any contributions, observations, or news items to Erik Tou at etou@carthage.edu.

The mission of *The Euler Society* is threefold: It encourages scholarly contributions examining the life, research, and influence of Euler. The Society also explores current studies in the mathematical sciences that build upon his thought. And it promotes English translations of selections from his writings, including correspondence and notebooks.



**www.eulersociety.org**