[Book review of:] Ronald S. Calinger, Leonhard Euler: Mathematical genius in the Enlightenment

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of mathematics within science, is similar to ours. This represents a counterexample to Blay's thesis. The whole of Hellenistic science – medicine, geography and so on – is scarcely compatible with the picture traced by Blay.

In the fourth chapter ('L'ordre économico-cosmique énergetiste'), Blay faces the concept of nature created by contemporary science. The thesis of this chapter is that, starting from the end of the eighteenth century, the concept of nature changes. Nature becomes a part of the economic order, something to exploit from an economical point of view. Thence, the difference between nature and artefacts tends to become insensible. Nature is seen as a mere engine, as a reserve of work (p. 237). The concept and the language of science become suitable for this new conception: the two most important notions of physics become 'work' and 'energy'. The principle of energy conservation becomes the cornerstone of the whole physics. This is coherent with the necessity to conserve energy and to exploit work, which is typical of the contemporary economic order. Blay develops an interesting analysis of the way in which the concept of work was introduced and conceived by Coriolis (pp. 237–260), and of the way in which Helmholtz characterized the principle of energy conservation (pp. 261–271). These analyses are implemented by several considerations on the links between the development of science and the development of the economy within society. Albeit interesting, Blay's analysis is incomplete in this case, too, because parts of physics, which were fundamental in the science of the nineteenth century, are neglected because they do not enter into the picture traced by Blay. There is reference neither to Faraday, Maxwell or Hertz, nor to the problems of electricity and magnetism. Finally, Blay's attempt to inscribe quantum mechanics and theory of relativity within his picture seems rather weak. A consistent part of physics was developed according to Blay's idea, but another important part was not.

This confirms that the general picture traced by the author, although stimulating, does not seem to rely upon solid bases.

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Ronald S. Calinger, **Leonhard Euler: Mathematical Genius in the Enlightenment**. Princeton, NJ and Oxford: Princeton University Press, 2016. Pp. 669. ISBN 978-0-691-11927-4. $55.00/ €40.95 (cloth).
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Leonhard Euler is one of the most intriguing eighteenth-century philosophers. The life story of this Swiss prodigy, who worked as a mathematician at the academies of sciences in St Petersburg and Berlin, illustrates what practising mathematics could (and could not) mean, and how the role and function of the sciences evolved in Europe at the time. His contacts with other scientists, and his rather glorious career (despite also his unsuccessful role as courtier), reflected in an enormous production of books and papers on all kinds of subjects, as well as a vast amount of correspondence, make Euler one of the obvious candidates for any attempt to understand the European Enlightenment. The subtitle of this biography by Ronald Calinger therefore holds a double promise: we are going to learn about the Enlightenment and what was regarded as constituting mathematical genius in the eighteenth century.

The reader who starts Calinger's book with these two promises in mind will be disappointed before he or she has finished the first page of this biography. At that point it becomes clear that the author has the much more modest aim of writing a life story, taking both the mathematical genius of Euler and his contribution to the Enlightenment for granted. There is no historical question behind this biography. There is much historical awe, however. One cannot escape awe when one is confronted with the sheer size, breadth and intellectual depth of Euler's work. And Euler being Euler, historical awe might be enough to produce a biography worth reading. Indeed, once recovered from an initial disappointment, I found a meticulously documented treasure

trove of Euleriana, well worth the attention of anyone with an appetite for eighteenth-century history of ideas.

Historical synthesis and a historical question you will not find, but the book is rich in interpretation of mathematical achievements and levels of learning. Sometimes this is short; for example, Basel University was 'mediocre, and instruction was poor' (p. 17). Sometimes it is more extensive; for example, Euler's textbooks on analysis are discussed in quite some detail (pp. 287–292; with a salient typo in one of the decimals of π on p. 289) and are described in exalted words, as having done 'for calculus what Euclid's *Elements* had done for theoretical geometry and Al-Khwarizmi's *Algebra* had done for the field' (p. 291).

As soon as historical interpretation of facts is needed, Calinger is superficial, or he leaves all conclusions to the reader. For example, Calinger describes the hopes by Euler to become president of the Royal Prussian Academy of Sciences as the idle hopes of someone who 'occasionally lived … not in the aristocratic restrictions of his time' (p. 221). These 'restrictions' are, of course, the possibilities that patronage offered to mathematicians. Reading Calinger's book, one easily recognizes several instances where Euler behaved as if he was blatantly unaware of his position. Some of these are well known: the way he was mocked by court philosophers (pp. 186–187) has been well documented. Next to these, many occasions I was not aware of are to be found in Calinger's book. In 1743 the plans for the funding of the academy that Euler had sent to the Prussian king Frederick II were answered with a friendly reproach – on the occasion the king mocked the possibilities of algebra (p. 191), thereby making the too eager mathematician attentive to his position. In 1756 Euler started a lawsuit against a count, for which he was frowned upon by both friend and foe (p. 411). After all that, I doubt whether Euler in 1763 still thought he could become president of the academy, as Calinger suggests (p. 431): Euler wasn't stupid, and he must have recognized that he was an unsuccessful courtier.

These are interesting situations that allow historians to grasp in detail the rising recognition of mathematics as a science that could help describe, unravel and tame the mysteries of the world. The role of Euler's acquaintance with the Bernoullis was crucial to his rising star. The Bernoulli family was much closer to European nobility, and knew how to secure university positions for its members, in contrast to the more mundane Euler family. In that light, for example, it would have been instructive to read in detail about the 'small and temporary misunderstandings' (p. 66) between Euler and Daniël Bernoulli. Calinger does describe many letters between members of the Bernoulli family and Euler, but never really touches upon that subject.

Nevertheless, it is absolutely a joy to read all the details that Calinger does mention. For although he carefully avoids historical questions and interpretations, everything is so well documented that one recognizes the hand of a knowledgeable person. The reader is offered so much detail that one can actually take this book as a starting point for many years of research. And after all, who doesn't want to know about Euler?

This book, therefore, is an absolute must for anyone who wants to start a project on Euler, the role of science in eighteenth-century society, or the various meanings of the Enlightenment outside France. The biographer regards it as a starting point for research into the intellectual achievements of Euler. More importantly than that, I would claim, this biography offers a starting point for research into the intellectual life of Enlightenment Europe, how this was entangled with the courts, and what was the role of mathematics therein. Indeed, building upon Calinger's work, we might be able to obtain a better understanding of what 'the Enlightenment' and 'mathematical genius' could have meant in the eighteenth-century intellectual world.

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