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The Wide Scope of Euler’s Work

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Welcome to Issue 2 of Volume 3 of *Euleriana*. We never cease to be amazed by the wide scope of Euler's works. This issue includes entries from Euler's contributions to astronomy as well as more earth-bound mechanics, to more mathematical pursuits spanning analysis and number theory. In addition, Euler's work sometimes extends the earlier work of others, such as Stirling, and sometimes anticipates future work of others, such as Legendre. As you peruse this issue, we hope you will also gain an appreciation for how prolific and wide-reaching Euler's many interests were.

This issue's Translation & Commentary section begins with a translation of "De Motu Nodorum Lunae Eiusque Inclinationis Ad Eclipticam Variatione" (E138; "On the Motion of the Nodes of the Moon and the Variation of its Inclination to the Ecliptic") by Patrick Headley. This is an early-career publication written by Euler in 1735, in which he analyzed the orbit of the moon. This work followed close on the heels of *Mechanica* (E15, E16), written only a year earlier, in which he applied analysis systematically to solve problems in Newtonian mechanics. This is Euler's first foray into a difficult subject, one to which he would return numerous times in his career.

The second translation in this issue is "Resolutio formulae diophanteae $ab(maa + nbb) = cd(mcc + ndd)$ per numeros rationales" (E716; "Solution of the Diophantine equation $ab(maa + nbb) = cd(mcc + ndd)$ using rational numbers"), by Georg Ehlers. It is concerned with Diophantine equations, specifically the equation $A^4 + B^4 = C^4 + D^4$. In this 1778 work, Euler sought to generalize his results from "Observationes circa bina biquadrata, quorum summam in duo alia biquadrata resolvere liceat" (E428; "Observations about two biquadratics, of which the sum is able to be resolved into two other biquadratics") in which he found integer solutions to $A^4 + B^4 = C^4 + D^4$. His smallest solution in that paper was $(477069, 8497, 310319, 428397)$. In E716, we find the much-smaller solution $(134, 133, 158, 59)$ along with three methods for deriving solutions. Helpfully, Ehlers' translation also comes with a Latin transcription.

Our Articles & Notes section begins with a trio of papers by Alexander Aycock. In the first of these, "Euler and the Legendre Polynomials," Aycock details how the now-named Legendre polynomials follow from more general work of Euler across a variety of papers. Next is a pair of research notes in which Aycock discusses some applications of the difference equation solved by Euler in "De serierum determinatione seu nova methodus inveniendi terminos generales serierum" (E189; "On the determination of series or a new method of finding the general terms of series"). In the first note, Aycock uses Euler's work in this paper to calculate positive integer values of the Riemann ζ-function. In the second note, he shows how Euler derived Stirling's formula in E189.

In the next article, Sylvio Bistafa traces the history of elastica theory from Jakob Bernoulli's early work in the 1690s to Euler's contributions in 1744's "Methodus inveniendi lineas curvas maximi minimive proprietate gaudentes" (E65; "A method for finding curved lines enjoying properties of maximum or minimum") and some subsequent applications.

The final article in this section discusses Euler's contributions to advancing the study of perfect numbers. In "Perfect Numbers," author Uwe Hassler details how Euler showed that many Mersenne numbers were in fact composite.

In our ongoing Euler Archive Spotlight series, Michael Saclolo highlights the translations available in languages other than English. Readers may be interested to know that the Euler Archive has not only several translations into German, but also a smattering of translations into other languages, such as French, Portuguese, Italian, Dutch, and Turkish.

If you have ideas or articles to submit for subsequent issues, please let us know; we are always accepting submissions.

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