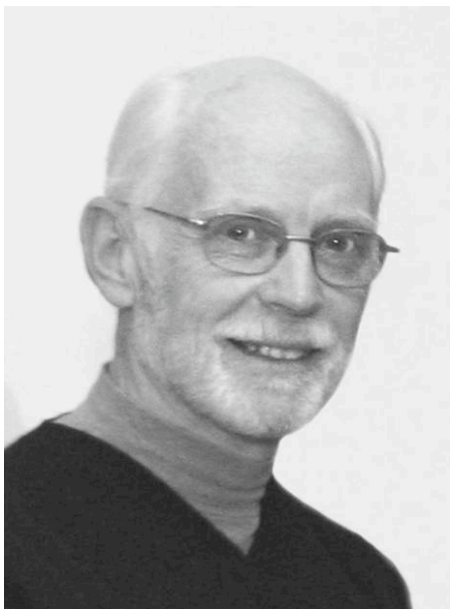# MICHAEL S. MAHONEY, 1939–2008

Perhaps the clearest testimony to the scholarly range and depth of Princeton's now-lamented Michael S. Mahoney lies in the dismay of his colleagues in the last few years, as they contemplated his imminent retirement. How to maintain coverage of his fields? Fretting over this question, the program in history of science that he did so much to build recently found itself sketching a five-year plan that involved replacing him with no fewer than four new appointments: a historian of mathematics with the ability to handle the course on Greek antiquity, a historian of the core problems of the Scientific Revolution, a historian of technology who could cover the nineteenth-century United States and Britain, and, finally, a historian of the computer-and-media revolution. In his passing we have lost a small department.

Best known for his exacting *The Mathematical Career of Pierre de Fermat, 1601–1655* (1973; rev. ed., 1994), Mahoney also authored a valuable translation of Descartes's *Le Monde* (1979) and saw a suite of his essential essays on seventeenth-century mathematics several times published in book form in Japanese (under a title that would be Englished as *Mathematics in History* [1982; rev. ed., 2007]). At the time of his death the better part of two manuscripts lay in the drawers of his book-filled office: a study of the mathematical thought of Christiaan Huygens, and a long-awaited volume on the history of computing and software engineering. It is to be hoped that both these works will yet find their way into print.

For many years a scroll of old-fashioned tractor-feed computer printout hung over his office door (on the inside, where he could read it from his desk), bearing in foot-high letters, birthday-banner style, the chastening motto of that towering figure of modern mathematics Carl Friedrich Gauss: *Pauca sed Matura*— which Mahoney's Latinists (he started his career as a medievalist and continued to prefer to read Newton's *Principia* in the original) knew was generally translated "Few, but Ripe," as in "Not a ton of stuff, but all of it very good." One sensed that it hung as a banner strung between scholarly pride and quiet self-mortification.

Though of the latter there was little need. Over the course of a forty-year career Mahoney published more than sixty articles and book chapters and many scores of book reviews and lectured on the history of science and technology from Tokyo and Beijing to Berlin and London, from Athens to Jerusalem—and to school teachers in suburban New Jersey. His intellectual reach and pedagogical generosity were fabled, and more than one graduate student can recall his improvisational lunchtime pencil-on-a-napkin reconstructions of the besetting geometrical paradoxes of the Pythagoreans, just as two full generations of undergraduates retain gulp-inducing memories of his drop-this-class-if-you-don't-want-to-sweat opening lecture in History 291, his class on the Scientific Revolution, in which, using a computer program of his own confection, he demonstrated the intricacies of the Ptolemaic cosmography, complete with dizzying loops upon loops of epicycles, eccentric deferents, and a speckling of equant points. The lesson was twofold: first, history of science was going to require that everyone gird up for problem sets; second, superseded explanations of natural phenomena might indeed have been wrong, but they were finely wrought things,

rigorous and, in context, generally very effective. Upshot? Historical understanding of the sciences would require both hard work and the sympathies of the imagination. If he had put his own motto up on the wall, it might have been that.

Born in New York City on 30 June 1939, Mahoney graduated *magna cum laude* from Harvard College in the class of 1960 with a double concentration in history and science. Mathematics, however, was his first love, and with the support of a German Foreign Service Fellowship he spent the next two years in Munich, studying with the celebrated historian of mathematics Kurt Vogel, whose late-career appetite for the computational quirks of Babylonians and Egyptian calendrical calculations rubbed off on the young American and left a shimmer. Returning to the United States to pursue a doctorate in the history of science in Charles Gillispie's newly created program at Princeton, Mahoney moved away from the archaeo-philological sifting of antiquity and took up the role of mathematics in the rise of the new sciences, a topic he would never entirely put down. His gifts as a scholar and teacher quickly recognized, Mahoney had the good fortune to be converted from graduate student to member of the faculty at Princeton, acceding to full professorship in 1980.

The Princeton program in its early years was housed in a small building on Washington Road, where Mahoney, Ted Brown, and Tom Kuhn had their offices and where graduate seminars were held. Mahoney worked with Kuhn as a "preceptor" in Kuhn's course of lectures on the entire history of science, and it was during those early years that Mahoney inaugurated his own courses. He did not dabble lightly in early science, and neither were his students allowed to. Mahoney had, for example, translated many of Huygens's papers on the pendulum and on colliding bodies, and his students were expected to work line-by-line through the material, to take it apart and put it back together in ways that revealed the essential go of the arguments. He expected hard work and was masterful at guiding discussion in ways that permitted students to show what they could do. Both of us studied with Mahoney—Buchwald in the late 1960s, Burnett in the early 1990s—and throughout all those years Mahoney's respect for, and interest in, his students never changed.

Mahoney's dissertation had concentrated on the complex of changes involved in the emergence of analysis during the seventeenth century and on the manifold ways in which the concept of proof evolved throughout that period; from early on he focused his attentions on one of the most enigmatic mathematicians of the period, Pierre de Fermat. When Mahoney's book on Fermat eventually took shape, it had the singular, and at the time unusual, feature in the history of mathematics of setting his subject squarely in the context of the period. Instead of mining Fermat's work for nuggets of future developments, Mahoney linked it with great care to the period's conceptions of the subject's central problems and techniques. Fermat, he wrote, "was a French mathematician of the first two-thirds of the seventeenth century. His thought, however original or novel, operated within a range of possibilities limited by that time and that place. His odyssey had its boundaries; his drummer beat to a tune of the times."[1]

As his research assistant at the time, Buchwald had the opportunity to learn directly from Mike as he gathered material on Fermat and worked hard to understand the logic behind the mathematics of, in his words, that "secretive and taciturn" man.[2] Many times one would enter Mike's study to find him surrounded by meticulously drawn diagrams and pages of elaborate geometry and analysis, all done in seventeenth-century fashion. He would occasionally break from his desk to enjoy flying a model plane in what were then the cornfields behind the university. On one occasion the plane disappeared into the field, never to be found, which reminded Mike of the forever-lost pages on which Fermat had reportedly proved his famous theorem. His particular insights came strikingly together in a magisterial piece entitled "The Mathematical Realm of Nature," in which he allied mathematics with mechanics to show that "as a calculus of motion, analytic mechanics made motion a form of machine to be taken apart and reassembled. In that calculus, created at the turn of the eighteenth century, the new mechanics and the new mathematics met to form a new metaphysics."[3]

In the mid-1960s, anyone wanting to use a computer at Princeton punched FORTRAN programs onto a series of cards and then, having fed the card stack into a reader, waited for the printout on the ubiquitous green-striped sheets of perforated paper. At the time Princeton's machine was an IBM 7094, which had by today's standards an utterly insignificant memory in the form of diminutive magnetic cores equivalent to about 144K. Mahoney was even then interested in mechanical computation, and he encouraged students to use the machine. In 1969 Princeton installed the first time-sharing arrangement, based on the IBM System 360, which allowed both input and output from remote IBM Selectric typewriters. Mahoney had by then recognized the revolutionary importance of the new

procedures, and that summer Buchwald had a chance to work with him in exploring its potential.

Despite all this, Mike tended to be self-deprecatory about his own very early engagement with computer programming, and he enjoyed joking about how irritating the machines could be. At a 2004 lecture at the Center for Computing in the Humanities, at King's College, London, he told the crowd: "During my final year at Harvard in 1959–60, I had a job as a computer programmer for a small electronics firm in Boston. It involved writing code for a Datatron 204, soon to become through acquisition the Burroughs 204, a decimally addressed, magnetic drum machine. Programming it meant understanding how it worked, since it was just you and the computer: no operating system, no programming support. Six or seven months of that persuaded me that computers were not very interesting, nor did they seem to me to have much of a future. So I abandoned my thoughts of going into applied mathematics and became a historian instead. With foresight like that, it was probably a good choice."[4]

But the truth was that, despite this puckish anecdote, "mike@princeton.edu" (a handle that attested to his there-at-the-founding place in the digital university) never really stopped tinkering with computers and the code that makes them run: long before the World Wide Web existed, he was conducting online discussion sessions for his classes by email; he helped configure the first workstations for nonscientists at the residential colleges at Princeton; and by 1980 Mahoney's own research interests turned directly to the techno-scientific revolution unfolding all around him—the dawning of the age of the "personal" computer. Mike was always justifiably proud of his ability to talk turkey with the current crop of computing techies on campus, and his enthusiasm for this sort of active engagement with technology was more than an avocation; it went to the heart of the questions that drove his intellectual life: head and hand, the abstract and the concrete, the mind and the machine. Threading between these hoary antitheses throughout his career, Mahoney sought again and again to understand the means by which history's finest thinkers left the stuff of the world behind, only in order to find it again, transformed.

His earliest work on the shift from geometrical to algebraic mathematics in the early modern period is perhaps the hallmark of this research, since the episode represents one of the mythical moments in the history of "abstraction." More-

over, Mahoney's later research on the origins of the programmable computer can be understood as something like the obverse of those very first problems to which he turned his attention: if algebraic mathematics had disembodied the world of inked lines and circles, the world of compass and straightedge, the history of twentieth-century computing amounted to something like the "reincarnation" of mathematical operations and their crystalline logic. A Turing machine is, in the end, not a *machine* at all, in much the same way that Descartes's hyperbolic lens-grinding machine in *La Dioptrique* was a fantastic illustration of the geometry of conic sections, but a mechanical fantasy. These slips—from logic, to heuristic, to model, to (if the engineers would cooperate) actual device—preoccupied Mahoney for close to half a century and led him to a deep interest in the history of technology and handcraft, an interest nevertheless inextricable from his grounding in the history of mathematics. Huygens's sea-clock, for instance, sat irresistibly at the nexus of these seemingly diverse concerns, since its gambit for resolving the consummately practical problem of the longitude hinged (literally) on a peculiar feature of the geometry of the cycloid (which is its own evolute) and required materializing the mathematical operation of the "evolution" of a curve by means of brass flanges and little bits of thread. It worked like a charm—but only, alas, on paper. Out of brilliant stories like these, brilliantly told, Mahoney explored the myriad ways that reason has fantasized its own transcendence and craft has picked up the pieces. The result, as Mahoney taught in decades of well-attended lectures and intimate graduate seminars, is what we call modernity. To understand it, he argued, required rolling up your sleeves: many scholars have their students over to the house for tea or supper; only Mike had them over to use his workshop to reconstruct working models of several of the optical devices of Ibn-al-Hazen.

Both of us first encountered the field through Mike's remarkable lectures. As he once put it to a younger colleague: "the students have a right to see you think up there"; and to that end he was sparing about his notes and worked every year and every week to steep himself afresh in the primary sources that were the mainstay of his pedagogy. So exhilarating was it to watch him inhabit lost learning that one of us recalls feeling as a freshman, scribbling madly in the closing minutes of the final lecture of History 291, a vertiginous collapse of past, present, and future redolent of the sibylline climax of García Márquez's *Hundred Years of Solitude*: one felt, for a moment, perched on a fixed seat in Dick-

inson Hall, that the whole history of thought and action was collapsing on this very instant; that if we were patient for one more moment, the archive would become prophecy. It didn't, exactly; but then again, it did, since both of us had found our callings. And we were not alone.

Sadly, now, we are.

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NOTES

[1] M. S. Mahoney, *The Mathematical Career of Pierre de Fermat* (Princeton, N.J.: Princeton Univ. Press, 1973), p. x.

[2] *Ibid.*

[3] M. S. Mahoney, "The Mathematical Realm of Nature," in *The Cambridge History of Seventeenth-Century Philosophy*, ed. Daniel Garber and Michael Ayers (Cambridge: Cambridge Univ. Press, 1998), Vol. 1, pp. 702–755, on pp. 744–745.

[4] Cited from the oral version of the presentation "Histories of Computing(s)," delivered 20 March 2004 as part of the *Digital Scholarship, Digital Culture* series; available at http://www.princeton.edu/~mike/articles/histories/kingscch.htm (accessed 31 Jan. 2009). A revised version of the piece was subsequently published under the same title in *Interdisciplinary Science Reviews*, 2005, *30*:119–135.