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Newton's alchemical pursuits a subject of serious interest and his alchemical manuscripts an object of detailed study. She followed *Foundations* with a series of articles too numerous to list here, though I will mention "Newton's Alchemy and His Theory of Matter" (*Isis*, 1982, 73) and her Smithsonian lecture *Alchemical Death and Resurrection*, published as a separate pamphlet in 1990. During this time Jo was also extremely active as a lecturer and reviewer. The quality of her work was recognized by prestigious fellowships—from the National Humanities Center, the National Endowment for the Humanities, and the Folger Shakespeare Library—and a Scholars Award from the National Science Foundation. In 1991 *The Janus Faces of Genius: The Role of Alchemy in Newton's Thought* summed up the conclusions drawn from more than two decades of concentrated attention to Newton, not solely to his work in alchemy. Despite the subtitle and despite the volume's publication of five important alchemical papers, it is at least as much a study of the role of religion in Newton's thought, relating his Arianism to other dimensions of his endeavor. Above all a work of synthesis, which insists on seeing the common themes that united all of Newton's major intellectual concerns into one coherent whole, *The Janus Faces of Genius* raises the

interpretation of Newton's career to a new plane of sophistication. It is bound to leave a permanent mark on the understanding of a crucial figure in the creation of modern science. Nor have we yet heard Jo's final word; together with Margaret Jacob, she is the author of *Newton and the Newtonians*, now in press.

Jo entered the academic world in middle age and realized her impressive achievement during the years when most of us are running down. The author of her obituary cannot help wondering with regret what she might have accomplished with the years that are generally considered the prime time of creativity—and wondering also whether the rest of us could have survived that competition. Last October Jo delivered the Distinguished Lecture at the annual meeting of the History of Science Society. No one understood at the time that it was her valedictory address; but it is entirely fitting that the Society, in that way at that time, should have placed its wreath of laurel on the brow of a scholar who embodied so well the excellence we all seek to pursue.

RICHARD S. WESTFALL

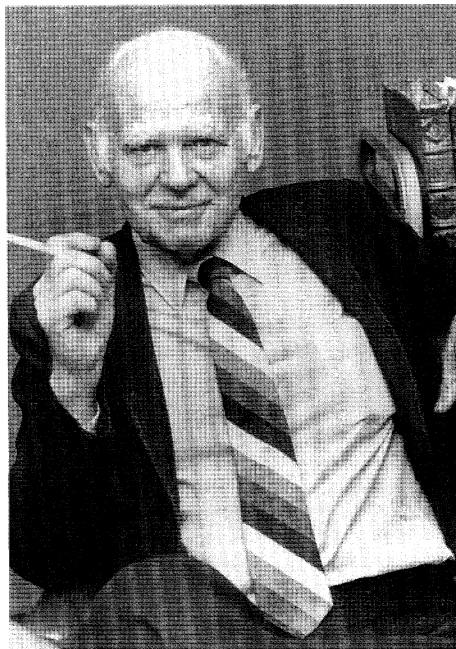
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STILLMAN DRAKE, 24 DECEMBER 1910–6 OCTOBER 1993

For the last forty years, the serious study of Galileo has been dominated by the work of one dedicated scholar, whose name is virtually synonymous with the works of Galileo as they are read today. With his characteristic instinct to begin at the top, in 1953 Stillman Drake published the first English translation since the seventeenth century of Galileo's *Dialogue Concerning the Two Chief World Systems—Ptolemaic and Copernican*, the first of a series of translations and studies that have probably brought more of Galileo's works to more readers than they had reached during the first three centuries after they were written. Graced with a foreword by Albert Einstein, in German and English, Stillman's translation of the *Dialogue* has ever since stood next to the original Italian as the standard version throughout the world, for it captures the eloquence, clarity, and sparkling wit of Galileo himself. When Salviati dismisses some scholastic arguments against the motion of the

earth quoted by Simplicio with, "But please, if there is anything more, let us hurry through this tedious stuff," and Sagredo remarks that if Simplicio can find nothing better he would prefer to take the air in a gondola, it is Galileo giving the back of his hand to academic pedantry; but it is also Stillman, who had as little patience as Galileo himself with what he saw as academic pretense.

Including his translations, Stillman wrote sixteen books on Galileo, contributed to fifteen others, and produced over a hundred scholarly articles, not counting such works as his 1949 *Book of Anglo-Saxon Verse*. In 1976 he published translations of two early satires by Galileo, which attack philosophers for their interpretations of the new star of 1604, under the title *Galileo against the Philosophers*. Stillman's own opinion of academic philosophy, present as well as past, was much the same as Galileo's, though, like his hero, he had himself been trained in philosophy. Still-



man had all the historian's tenacity at digging through archives, interpreting obscure documents, and vividly relating his discoveries. He was impelled by the same curiosity about science and nature as Galileo himself, whose work and mind he strove ever more deeply to penetrate. Galileo was for Stillman above all the epitome of the scientist, indeed the first true scientist, the first who looked clearly at nature to understand what it is that happens and how it works. He never changed his mind about this, entitling his last book *Galileo: Pioneer Scientist* (1990); he even considered calling it *Galileo for Scientists*.

Before Stillman, Alexandre Koyré had persuasively argued that Galileo's work had little if anything to do with experiment. Stillman never believed any such thing. After Thomas Settle (*Science*, 1961, 133:19–23) showed that Galileo's inclined-plane demonstration of the law of the acceleration of a falling body could really be done, Stillman carefully studied Galileo's manuscript notes on motion, which he published in 1979. Through meticulous, clever analysis he argued that Galileo had indeed experimented, and that he had done so superbly. For forty years Stillman carefully, thoroughly analyzed virtually every aspect of Galileo's work,

thinking through one question after another and often enough changing his mind. He wrote with a rare grace and clarity that let every reader listen in on his ruminations and reason out all the issues for himself. His most popular book, since the day of its publication in 1957 the best introduction to Galileo and one of the two or three best-sellers in the history of science, is the *Discoveries and Opinions of Galileo*, containing translations of most of the *Starry Messenger*, the *Letter to the Grand Duchess Christina*, excerpts from the *Letters on Sunspots*, and the *Assayer*, along with other documents and letters in the introductions to each work. In 1960 he published a complete translation of the *Assayer* in the *Controversy on the Comets*, with C. D. O'Malley, and in 1983 the most charming of his many books, *Telescopes, Tides, and Tactics*, in which he embedded a reading of the *Starry Messenger*, now complete, in an authentically Galilean dialogue between Salviati, Sagredo, and Galileo's old friend from the Veneto, Paolo Sarpi.

The most demanding of Galileo's works, containing his discoveries in mechanics and the resistance of bodies to fracture and his most powerful attack on Aristotelian and scholastic natural philosophy, is the *Discourses and Mathematical Demonstrations Concerning Two New Sciences Pertaining to Mechanics and Local Motion*, which Stillman translated and published in 1974. Stillman had always been concerned with Galileo's mechanics and had previously published, with I. E. Drabkin (1960), translations of the early tracts *On Motion* and *On Mechanics* as well as (in 1969) translations of writings on mechanics by Niccolò Tartaglia, Giovanni Battista Benedetti, and Guido Ubaldo. But now, with the translation of the *Two New Sciences* and his study of Galileo's manuscripts, mechanics became central. It was above all this thorough knowledge of Galileo's work in mechanics that made possible *Galileo at Work: His Scientific Biography*—as Stillman put it, "Galileo in his working clothes, tending his scientific garden"—surely the finest and most comprehensive study of Galileo ever written, and invaluable as a source for every scholar of Galileo, particularly for its exploration of the forty-year background of research and discovery that led to the *Two New Sciences*.

Stillman's most impressive scientific achievement concerned Galileo's laws for falling bodies. He for the first time arrived at a clear understanding of the profound difficulties Galileo faced in correctly describing

continuously accelerated motion, with a new, critical emphasis upon the signal role played in Galileo's work by Euclid's book 5, which presents Eudoxus's theory of proportion. He showed that, although Galileo's mathematics did not countenance the formation of ratios between quantities of unlike kinds, such as distance and time, he nevertheless produced a self-consistent system based on novel procedures for comparing continuously changing quantities with one another. Stillman's work here was one of the major creative accomplishments of the history of science, just as Galileo's was for early modern science itself, requiring profound and sympathetic understanding of now-unfamiliar mathematical techniques and methods of reasoning.

Stillman knew how difficult it is to understand older ways of thinking and, in particular, to elicit them from the sources. At the end of the introduction to his translation of the *Two New Sciences*, he turned for help in making this clear to an earlier, now forgotten, writer he greatly admired, Alexander Bryan Johnson. He quoted Johnson's plea, in his 1836 *Treatise on Language*, that a reader seek always for the best "creditable interpretation" of a text that is possible. "This," Stillman wrote, "is a very good rule for reading any book worth reading at all, and especially a pioneering work. Not only does it assure a fair hearing to the author in return for his pains—and Galileo's pains were plentiful, both those he took to make his ideas clear, and those he received for doing so—but it assures the reader the maximum reward for his trouble. For how can a reader gain more from another's words than by forcing himself to arrive at the best which he can conceive?"

Stillman's opinions about academic scholarship and scholars were not always admiring; he had the advantage of looking from a distance as well as up close, as he did not live most of his life in the academy. Stillman was highly practical and knew the way the world worked; for thirty-three years he was a municipal finance consultant in California and, later, in Puerto Rico. His undergraduate degree was taken, perhaps surprisingly, in philosophy at the University of California, Berkeley, in 1932, where he met Kenneth O. May, who later became a historian of mathematics. Two years later he obtained a teaching certificate in mathematics. During the Depression Stillman held several jobs as a financial consultant, and he worked for the U.S.

government during the war as a specialist in bonds. His later education in Galileo and the history of science was entirely his own, but it was indubitably a more rigorous one than anything he had received in the academy, for Stillman was an exacting critic of his own work as well as that of others. In 1967 Stillman and Florence Selvin Casaroli were married in California. That same year Ken May and John Abrams, a noted historian of technology, who had together founded the Institute for the History and Philosophy of Science and Technology at the University of Toronto, asked Stillman to join them there as a full professor. This was Stillman's first, and only, academic appointment. He taught until his retirement in 1979, after which he wrote more than ever. Stillman regarded his appointment at Toronto, his second career, as a great honor; but even more, it was Stillman who was an honor to the institute.

During his years in finance, Stillman had already become an astute collector of rare books in science. His library eventually contained virtually all of Galileo's works and over two thousand books on Galileo, as well as works of other scientists who particularly interested him, such as Heinrich Hertz and Einstein. It today forms the core of the science collection of the Thomas Fischer Rare Book Library at the University of Toronto. Stillman and Florence were at the very center of the activities at the Toronto institute. For over two decades of entertaining evenings at their home, Stillman and Florence's friends and colleagues met to enjoy their unparalleled hospitality and the liveliest conversation in Toronto. Talk at the Drakes' flowed about many things—Stillman's latest work, dogs (one was always present and usually participated directly in the evening's entertainment), music (Stillman knew much about the subject and himself played the *viola da gamba*), anecdotes about life in Depression-era California, old movies—but it sooner or later always turned to Italy and things Italian. The atmosphere that those who were lucky enough to visit experienced at Stillman and Florence's home is nicely represented by the dedication to *Galileo at Work*, which reads, "With ambiguity but without equivocation this book is dedicated to Florence."

Over the years Stillman received many honors, including the Sarton Medal of the History of Science Society in 1988, and held prestigious grants, including two from the Guggenheim Foundation. He was particu-

larly proud of receiving in 1992 La laurea ad honorem in fisica dell'Università degli Studi di Padova, four hundred years nearly to the day after Galileo read his own inaugural lecture there. Stillman was certainly not indifferent to honors, but he was always much more interested in talking about his latest thoughts on Galileo's mechanics. His influence on those who knew him extended far beyond his work. One of us was Stillman's colleague for nearly two decades; the other was in constant correspondence with him. Both of us were strongly influenced by him. We well recall the anecdotes he would bring to bear on nearly anything, drawing, for example, illuminating comparisons between talented auto mechanics and scientific acumen. Some of his opinions were idiosyncratic. He had little patience with the abstractions of quantum physics or modern cosmology. He most deeply admired Hertz and Einstein, whom he thought of as having sought to fulfill Galileo's (and his own) goal of a physics without "spooky" (Stillman's word) things like forces. Much of twentieth-century physics, he believed, represented a decline, and not merely a technical one, for he did not like the scale of modern science, its cost, and its arrogant claims to know what he regarded as simply unknowable.

For Stillman true science was about the world of the skilled craftsman, who knows exactly what to do to produce precisely the right effect and then knows just how to measure it. Even more than the craftsman's, his way of thinking about science was often that of an engineer, who knows the stresses on

towers of brick or the turbulence in basins of water and who can work out, for example, what effect the rotation of the earth may have on them. On these very criteria, he made judgments about past science, judgments grounded in his deep knowledge of, particularly, mechanics, from antiquity through the seventeenth century. Though it is no longer à la mode to think one past work better than another, Stillman's great strength as a scholar derived precisely from his devotion to quality and to truth, as he saw it, and to his refusal to cater to modern (not to say postmodern) tastes in such matters. One may quarrel with one or another analysis or reconstruction, all of them quintessentially Stillman, even when he changed his mind. Nevertheless, Stillman Drake's Galileo will continue to engage, to instruct, and to inspire long after lesser creations have been forgotten.

There is a complete bibliography of Stillman Drake's publications in *Nature, Experiment, and the Sciences*, edited by T. H. Levere and W. R. Shea (Dordrecht: Kluwer, 1990).

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DESIDERIO PAPP, 21 MAY 1895–31 JANUARY 1993

Desiderio Papp died on 31 January 1993 in Buenos Aires, Argentina. He was a distinguished historian of science, a former professor of the subject at the University of Buenos Aires and at other universities in Latin America. Despite his great age (he was almost ninety-eight when he died), he was lucid and working until just before his death.

Papp was born in Sopron, Hungary, on 21 May 1895 and received his Ph.D. in philosophy from Budapest University in 1917. He began his academic career as a *Privatdozent* at the Budapest and Vienna universities. While in Vienna he was a well-known popularizer of science, writing hundreds of newspaper articles. At the same time he started publishing books in the history of science.

Papp emigrated to France in 1938, where he continued this work and became well acquainted with French culture. He then emigrated again, this time to Argentina, arriving in Buenos Aires in 1942.

There he collaborated with Aldo Mieli and José Babini in producing the *Panorama general de la historia de la ciencia* (General Panorama of the History of Science), which was edited in twelve volumes. Mieli wrote the first five volumes and Papp and Babini the last seven. This work was for many years the most important textbook in Spanish on the history of science.

Papp was instrumental in developing programs in the history of science in Latin America. In Argentina he taught at Buenos