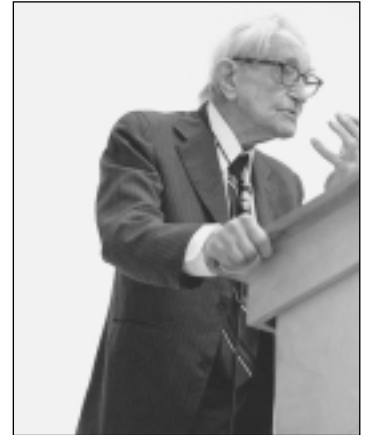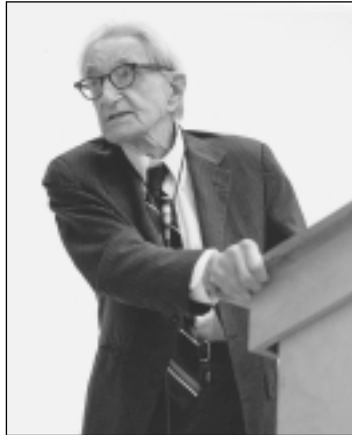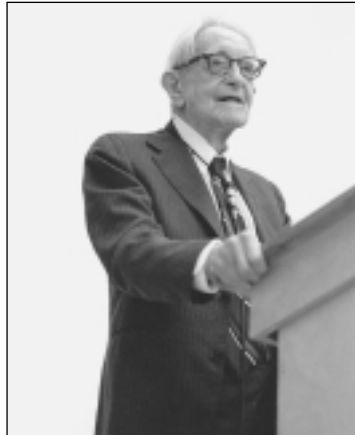# Dirk Jan Struik
(1894–2000)

Chandler Davis, Jim Tattersall, Joan Richards, and Tom Banchoff

Dirk Struik giving a talk at his own 100th birthday celebration, September 1994, Brown University. *(Photographs by John Forasté.)*

Dirk Jan Struik was born in Rotterdam on September 30, 1894. He attended the Hogere Burger School from 1906 to 1911 and the University of Leiden from 1912 to 1917. He spent the next seven years at the Technische Hogeschool in Delft as an assistant mathematician to J. A. Schouten. In 1922, under the supervision of the geometer Willem van der Woude, Struik received his Ph.D. in mathematics from the University of Leiden. As the recipient of a Rockefeller Fellowship from 1924 to 1926, he studied at the University of Rome and at the University of Göttingen. He began his career in the United States as a lecturer in mathematics at the Massachusetts Institute of Technology (MIT) in the autumn of 1926. Except for a five-year period during the McCarthy era when he was accused of having engaged in subversive activities, Dirk taught at MIT until his retirement in 1960, when he became professor emeritus. He was a visiting mathematician at the Universidade Estadula de Campinas in Brazil, the University of Puerto Rico, the University of Utrecht, the University of Costa Rica, and on several occasions at the National University of Mexico. He was a fellow of the American Academy of Arts and Sciences and a corresponding member of the Royal Academy of Science of Amsterdam. In 1928 he was given a Lobachevskii citation from the University of Kazan and in 1989 was awarded the Kenneth O. May Prize for the History of Mathematics from the International Commission on the History of Mathematics. He died October 21, 2000, at his home in Belmont, Massachusetts.

—Jim Tattersall

Chandler Davis

Dirk Jan Struik and his wife, Ruth Ramler Struik, were the first research mathematicians I knew. In the 1930s, when I was in school, I knew them as friends of my parents. They encouraged me in mathematics and in social criticism. They remained my friends up till Ruth's death in 1993 and Dirk's in 2000. Their eldest daughter, Rebekka Struik, now a (retired) mathematician at the University of Colorado, has been my friend since our childhood.

Dirk had studied in the Netherlands and was especially influenced by the differential geometer J. A. Schouten in Delft and the physicist Paul Ehrenfest at Leiden. After his thesis Dirk produced significant research, much of it in collaboration with Schouten. Ruth did her doctoral thesis in 1919 under Gerhard Kowalewski and Georg Pick at Charles University in Prague. Pick is remembered

Chandler Davis is professor of mathematics at the University of Toronto. His e-mail address is davis@math.toronto.edu.

by analysts for masterful contributions to interpolation of analytic functions, but Ruth's field was (and remained) axiomatics of affine geometry.

In 1924, at the suggestion of Tullio Levi-Civita, one of the leading experts in tensors, and Richard Courant, Dirk applied for and got a Rockefeller traveling fellowship—a boon, and one that was rare at that time. The Struiks' travels to Rome, Göttingen, and Paris were productive and exciting. The meetings with Vito Volterra and Jacques Hadamard made an especially profound impression on Dirk. Dirk's love for the history of mathematics was reawakened when Ruth and he wrote a joint article probing (but not solving) the question of whether A. L. Cauchy, when he was in Prague (1833–1836), might have met the Prague mathematician Bernard Bolzano [15].

In Göttingen he and Norbert Wiener formed a personal and scientific friendship that was to last. Wiener successfully recommended Dirk for a faculty position in his own department at MIT, and Dirk remained there until retirement.

The study of tensor calculus had lively insiders practicing it in the early 1920s, and it had prestige among outsiders, both other mathematicians and the general public. General relativity was the motive. By the mid-1930s tensor calculus was no longer center stage. Differential geometry of manifolds was still studied for many motives, some of which were much more venerable. Dirk retained his love for the subject and spoke with enthusiasm not only about the lore but also about unsolved problems. He always preferred the tensor formulation. (To represent a matrix by a single unsubscripted letter seemed to him to be playing favorites. Why is this particular type of tensor singled out?) His preferred treatment, which I enjoyed thoroughly as a student and which is still accessible, especially in his *Lectures on Classical Differential Geometry* [9], retains a friendly appeal even in an era when discourse about manifolds has quite a different ring.

By the late 1930s his research had been redirected almost entirely to history of mathematics [2]. He had not kept up with developments in topology that made his classical approach to differential geometry and tensor analysis passé. It is doubtful that we should explain this redirection solely on the basis of his style of mathematics having become less fashionable: history of mathematics was, after all, even more unfashionable. It is doubtful that we should call this one more instance of aging mathematicians resorting to history when they lose the power to prove new theorems: if he had done history as a last resort, he most likely would not have had the power to write good history. I see two other causes. The first is Dirk's lifelong love of world culture, which opened other countries and other centuries for his exploration, even when he was in his twenties and mathematically most
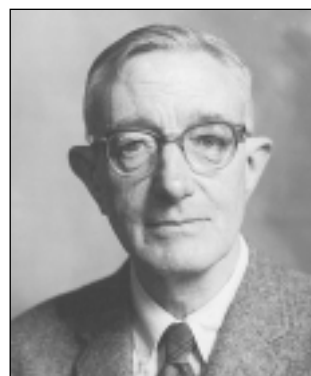
active. The second cause is Marxism.

He had been an active socialist since before the First World War. One of the attractions of the United States for him in 1927 was the relative freedom that it promised from punishment for his left-wing views, and for his wife America had always been the land to dream of. Another factor was Ruth's fragile health. In the U.S. he worked actively with the Marxist intellectual movement,

MIT yearbook, 1932.

which was then flowering. Dirk was one of the founders in 1936 of the Marxist quarterly *Science & Society*, which is still healthy today; it proclaims itself to be "the longest continuously published journal of Marxist scholarship in the world" and still lists Dirk J. Struik as an editor emeritus. In the first volume he contributed the first of several influential essays on the social sources of mathematics [4]. Fifty years after his 1936 essay he surveyed the fate of the field in the anniversary volume of *Science & Society* [11].

In the period 1947–60 many left-wing academics in the U.S. (though far from all) were harassed by government Red-hunters, the press, and university administrations. Dirk was annoyed to be called as a witness by the House Committee on Un-American Activities in 1949, but not surprised. Even he was a bit surprised in 1951 to be indicted under a rarely used state law for his part in the Samuel Adams School. The school had offered "workers' education", which was declared by the indictment to constitute "conspiring to teach and advo-

Above, Dirk and Ruth Struik, ca. 1958.

cate" the overthrow "with force and violence" of the governments of the Commonwealth of Massachusetts and the United States of America. ("My," Bertrand Russell is reputed to have said of this, "that Struik must be a powerful man indeed!") He remained under indictment until 1955, when another state subversion indictment, the Steve Nelson case in Pennsylvania, was thrown out by the U.S. Supreme Court on the grounds that subversion was a federal, not a state, offense; this invalidated the Struik

Left to right: Dirk Struik, sister, father, and brother. Ca. 1910.

mathematics as a vocation. His orientation is plain in his research books and articles and in his *Concise History* [5], but these are used and respected by all historians of mathematics. When the International Commission on the History of Mathematics established a medal for achievement in the field, Struik was among the first awardees—not for achievement in one wing, but for contribution to the field as a whole.

I have been a lifelong disciple of Dirk Struik, and to me he was important not only for his mastery and intellectual grasp (for after all, I was working in other areas)—and not always for guidance (for I did not always accept his judgment; we had our disputes)—but as a stabilizer and a model for all radicals. He was a passionate advocate of ideas that were derided. Nevertheless, he maintained imperturbable good humor and unflinching honesty and made it look easy.

indictment, and the government never threatened action against Dirk again [13].

The MIT administration passed up the opportunity to punish him in 1949 for his failure to "clear" himself of the charge of Communism. In 1951 it put him on paid leave pending settlement of his felony indictment. In 1955 it returned him to his professorial position, where his duties continued until his retirement in 1960. It was conspicuous at the time how much better MIT responded than other U.S. universities in similar cases. True, the administration gave no spirited affirmation of support for freedom of thought or for Struik individually. Indeed, in 1955 the then president, James Killian, ungraciously censured him for failing to declare himself not a Communist. In 2000, in its press release on his death, the present administration recalled that censure without apology. It would have been in order instead, one would think, to claim credit for retaining a dissident on the faculty from 1949 to 1960. But what do you want? I never heard Dirk complain. The unusual defense of academic freedom that the administration had undemonstratively made he accepted undemonstratively. He valued highly his membership in the MIT community, and when, years later, the Dibner Institute for the History of Science and Technology was established there, he was an ever-friendly presence.

The field of history of mathematics has a wing of "internalists" (theorems are passed from generation to generation and new ones added), a mainstream (theorems are studied and made by people, who are much the same whatever the context), and a wing of social historians (theorems are produced in a social context, and understanding the context is part of understanding how they arise). Evidently Dirk Struik was in the latter wing, and I have said that his socialist commitment was an essential part of his taking up history of

Jim Tattersall

Struik's father, Hendrik Jan, was a grammar school teacher and piqued his children's interest in mathematics at an early age by involving them in solving problems from the *Friends of Mathematics*, a magazine for mathematics teachers. His sister, Lena, became a teacher, and his brother, Anton, an engineer. At the Hogere Burger School, Struik's mathematics teacher, G. W. Ten Dam, encouraged him to pursue his studies at the University of Leiden. Struik matriculated at Leiden with the intention of becoming a high school mathematics teacher. There he studied mathematics with J. C. Kluyver, astronomy with Willem De Sitter, physics with Paul Ehrenfest, and history of mathematics with J. A. Vollgraf. After graduation he taught high school mathematics in Alkmaar for a brief period of time before beginning a productive association with Jan Schouten at the Technische Hogeschool in Delft. Struik's collaboration with Schouten led to his dissertation on Riemannian geometry [7].

In 1923 he and Saly Ruth Ramler were married. At a meeting of the Deutsche Mathematiker-Vereinigung in June of 1921, they had been introduced by Ehrenfest. Dirk and Ruth were married for seventy years.

In 1926, at the University of Rome, Struik solved a problem suggested by Levi-Civita involving properties of waves in canals with finite depth [6]. At the invitation of Ettore Bortolotti, Struik visited the Archiginnasio in Bologna and viewed sixteenth-century manuscripts of the Italian algebraists

Jim Tattersall is professor of mathematics at Providence College. His e-mail address is `tat@providence.edu`.

Scipio del Ferro and Niccolo Tartaglia. In Rome he gained admittance to the Vatican Library and did research in the history of mathematics in Italy during the Renaissance.

After a nine-month stay in Italy the Struiks migrated to Germany, arriving in Göttingen the day of Felix Klein's funeral. During his stay in Göttingen, Dirk attended the lectures of Hilbert and Courant and was instrumental in preparing Klein's lectures on the history of nineteenth- and early twentieth-century mathematics for publication. Norbert Wiener, on hearing that Struik's stipend would soon run out and that his academic future in the Netherlands seemed bleak, suggested that Struik come to MIT. When Samuel Stratton, then president of MIT, offered him a position, he accepted. Struik spent the summer of 1927 at the Bell Telephone Laboratories in New York working with Thornton C. Fry. Together they developed a new type of wave filter and obtained a patent for it. Dirk became a U.S. citizen in 1934; Ruth, in 1939. During the five-year hiatus from teaching at MIT in the 1950s, he edited the works of the Dutch mathematician Simon Stevin [10]. Later he wrote a popular account on the subject [8].

In the 1940s he and Norbert Wiener joined and began attending meetings of a local Sherlock Holmes society, the Speckled Band of Boston. In the 1970s Dirk became an active member in the Sherlockian group "Friends of Irene Adler". He was given the appellation "An Acute Reasoner". At their annual Christmas dinner at Harvard's Phoenix Club, Dirk invariably gave the toast to Dr. Moriarty, Holmes's archenemy. It was at just such a meeting that I was introduced to Struik and had the first of our many conversations about the history of mathematics. Several of our discussions involved his *A Concise History of Mathematics* [5] and *Yankee Science in the Making* [14], which he considered important because they shed light on the social and cultural atmosphere in which science is created. He was very proud of the time and effort he and Ruth put into researching *Yankee Science* [14]. They traveled to old factories in Rhode Island, the Slater Mill in Pawtucket, the Saugus Iron Works, the Lowell mills, and the Blackstone and Middlesex Canal sections in an effort to highlight the scientific and engineering activities of New Englanders in the first century of the Republic.

As a youth Struik honed his linguistic skills on novels by Mark Twain, James Fenimore Cooper, Jules Verne, and Captain Frederick Marryat. Later he became an ardent reader of detective fiction, in particular, works by A. E. W. Mason, J. S. Fletcher, and Arthur Conan Doyle. I visited him in Belmont on a semiregular basis mainly to discuss detective fiction and the history of mathematics. I was always in awe as to the sharpness of his mind and his inquisitiveness. He never failed to ask a few penetrating questions or to raise interesting points. Invariably he seemed to be excited about some correspondence he had just received or an aspect of the history of mathematics that I might find of interest. He never failed to suggest a book or article that I might enjoy reading. Once, after I had read Mason's *The House of the Arrow*, we had a lively discussion of the plot, albeit he had probably last read the book seventy years earlier.

With Ruth Struik, 1973.

During his stay in Delft, Struik assisted Schouten in reviewing mathematical papers for the *Revue Semestrielle* and the *Fortschritte*. Later, independent of Schouten, he reviewed for the *Zentralblatt*. In 1940 he shifted from the *Zentralblatt* to the *Mathematical Reviews*. He felt strongly that such timely reviews provided an important contribution to the mathematical community. It was a job he enjoyed very much and took very seriously. During the period from 1940 to 2000, he reviewed 875 articles for the *Mathematical Reviews*; the last appeared in March 2000, when he was 105. Until 1980 he reviewed mainly papers on tensors and differential geometry, many of them in Russian. After that time he preferred to review papers on the history of mathematics. He was fond of saying that he spent the first fifty years of his life doing mathematical research and looked forward to spending the second fifty doing research in the history of mathematics. His linguistic ability was phenomenal: he was fluent in Dutch, German, and English, and could read Latin, Greek, Italian, French, Russian, Rumanian, Portuguese, and Swedish. In 1969 his expertise was put to use when he translated and edited the seventy-five articles for *A Source Book in Mathematics* [12].

With daughter Rebekka, 1993.

At home, Belmont, MA, 1998.

Much of Struik's interest in the history of science stemmed from the challenge the field offered to the social responsibility of the scientist [1]. He may have begun research in the history of mathematics as a hobby, but he soon became interested in how society influences the development of mathematics. He was a witness and heavy contributor to the rise in prominence in the mathematical community and in academic potential of the history of mathematics [3]. His best advice to those embarking on

a career in the subject was to know lots of mathematics and be persistent. Mainly because of its connection with education, Struik later became very interested in and supportive of ethnomathematics, the study of how mathematics has originated and developed under different cultures.

Dirk was a good friend, and I will miss his company very much. He was from a gentle and erudite European breed now vanishing from the American academic scene.

Joan Richards

I first met Dirk Struik in 1974. At the time I was a first-year graduate student in the history of science department at Harvard. "Dirk Struik is giving a course in the history of mathematics at MIT," my professor told me. "You should take it." It seemed like a good idea. I had long admired Struik's *Concise History of Mathematics* [5] and thought it would be interesting to meet the author. So twice a week over the course of that spring, I abandoned the familiar world of Harvard Square for a tiny room at MIT. There Struik exuberantly led me and perhaps ten MIT students through all of the history of mathematics: the relationship between algebra and geometry in ancient Greece, the development of the calculus in the seventeenth century, logarithms in the work of Simon Stevin, the tensor calculus of Tullio Levi-Civita. Struik was a mathematician, but the world he shared with us was filled with all kinds of people—merchants, travelers, philosophers, and gamblers. Struik was a fascinating teacher.

I considered myself especially privileged that spring, because I was acutely aware that about two decades of MIT students had been denied the experience of learning from Struik. I also believed that few would have it in the future; after all, he was almost eighty.

But here I was wrong. I as well as many others continued to encounter Struik in conferences, lectures, and seminars for decades thereafter. Over the years I realized that what made him so special was not so much that he was interesting, but that

Joan Richards is associate professor of history at Brown University. Her e-mail address is Joan_Richards@brown.edu.

he was interested. I remember vividly a stifling summer conference at Vassar. Struik was there, sitting straight in the front row, though the mercury in a historic railroad thermometer on the wall hung stubbornly just below the point marked "Blood". At the time, Struik's age, like the temperature, was in the mid-90s, but he responded to each paper with sharp questions. In mine I struggled with eighteenth-century concepts of rigor in ways that were disturbing to many of the others at the conference. Struik, however, was unperturbed. "I'll have to look at Euler again," he said cheerfully, and he did. About a month later he called to give me a reference that he thought might be helpful in my thinking.

Struik's historical interests focused on mathematics; he ushered me into that world at the very beginning of my academic career, and I have been fascinated by it ever since. At the same time, he became for me a model for ways to be engaged in a community of scholars who strive to explore that world together. I will always be grateful.
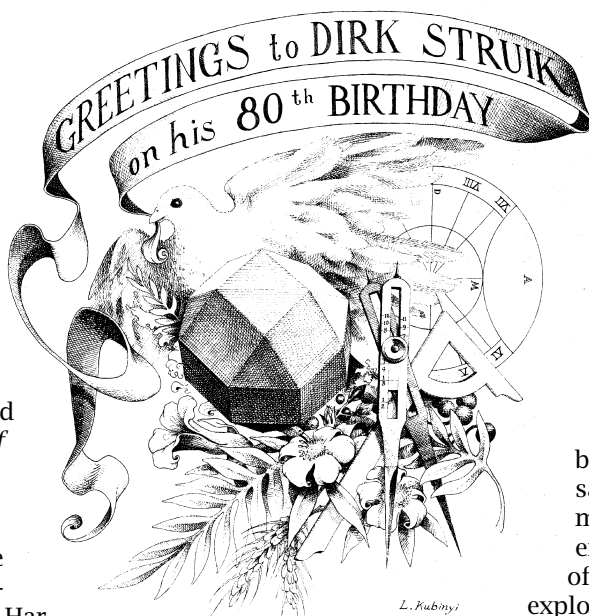
Drawing by L. Kubinyi to celebrate Dirk Struik's 80th birthday, 1974.

Tom Banchoff

My first formal introduction to differential geometry of curves and surfaces came through Dirk Struik's excellent book *Lectures in Classical Differential Geometry* [9]. The hardcover version that I purchased in 1960 is featured on my geometry shelves, along with the Dover paperback edition that I still assign to my students. No matter what other text materials are used in introductory courses, this small and inexpensive volume remains the best resource for putting the subject into historical context. Only later in my career did I come to appreciate the thoroughness and care that the author had put into accumulating examples and exercises based on primary sources. As a graduate student I was sometimes frustrated when these references forced me to interpret geometry expressed in notations different

Tom Banchoff is professor of mathematics at Brown University. His e-mail address is tfb@cs.brown.edu.

from those in any modern book. Forty years later I appreciate this contribution to teaching literature even more, as I have become aware of the way Dirk Struik continued to contribute to a wide range of mathematical topics in their historical contexts. I look forward to introducing new generations of students and mathematicians to this classical text and to telling them about my interactions over these past years with its remarkable author.

It was when Dirk Struik was ninety-seven that I asked him casually during a visit about his plans for the inevitable hundredth birthday soon to come. He said that he would almost certainly spend it with his family, including several generations of descendants by that time. I had an immediate idea: "What about a lecture?", thinking about him sitting in the front row smiling while some distinguished geometer/historian held forth at an event in his honor. I should have known better. "A lecture?" he said. "Yes, I would love to give a lecture on my hundredth birthday." And so he did, at Brown University in front of a large audience consisting of about a third geometers, a third historians and coworkers in various causes, and the rest people intrigued by the idea of watching a hundred-year-old man giving his own centenary lecture. His presentation, "Mathematicians I Have Known"— including David Hilbert, Tullio Levi-Civita, John von Neumann, and Emmy Noether—rewarded all of us.[1] Afterwards many of us, including, of course, his family, gathered for dinner to share stories from all the areas his life had touched.

He was a good friend to many of us, and we will miss him even as we celebrate the good long time he was here with us.

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Note: Photographs for this article are courtesy of Rebekka Struik and the Struik estate, Jim Tattersall, and the MIT Photo Service.

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[1]*See also Dirk J. Struik, Some Mathematicians I Have Met, in* A Century of Mathematical Meetings *(Bettye Anne Case, ed.), Amer. Math. Soc., 1996; Allyn Jackson, Dirk Struik Celebrates His 100th,* Notices Amer. Math. Soc. **42** (1995), 43–45.