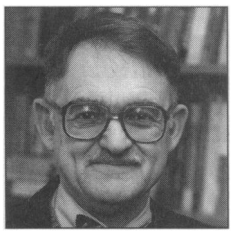
An Interview with Dirk Struik on the Eve of His One Hundredth Birthday

James J. Tattersall



Jim Tattersall (tat@providence.edu) earned his Ph.D. in 1971 at the University of Oklahoma in combinatorial topology under the supervision of David C. Kay. From the Northeastern Section, he received a Certificate of Meritorious Service in 1992 and the Award for Distinguished College or University Teaching of Mathematics in 1997. He teaches at Providence College in Rhode Island. His current research interests are in number theory, combinatorics, and the history of mathematics. His other interests include reading, gardening, and travel.

Dirk J. 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 was employed briefly as a high school mathematics teacher in Alkmaar before serving from 1917 to 1924 at the Technische Hogeschool in Delft as an assistant mathematician to J. A. Schouten. In 1922 under the supervision of the geometer W. Van der Woude, Struik received his Ph.D. in mathematics from the University of Leiden. In 1923 he married Ruth Ramler, who had received her Ph.D. from the University of Prague in 1919. With a Rockefeller Fellowship from 1924 to 1926 he studied at the University of Rome and at the University of Göttingen. Struik began his career in the United States in the autumn of 1926 as a lecturer in mathematics at MIT and in 1960 became professor emeritus at MIT. He was a founding editor of the journal *Science and Society* 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.

Tattersall: How did you first become interested in mathematics?

Struik: My interest in mathematics comes from my father, whose loves were mathematics and history. And like him I love mathematics and history. My father had a teacher's diploma in mathematics, but his type of mathematics was what you might call triangle and circle geometry. He did not know analytic geometry or calculus, which were supposed to be higher mathematics, and he never went that way. He loved to solve problems concerning geometric figures, such as dealing with the nine-point circle or the circle of Brocard. He subscribed to *The Friends of Mathematics*, a mathematics teacher's magazine. It published problems every month, which together with a friend, he tried to solve. He then sent in the solutions. I also tried my hand at it until I entered the university and found wider fields to study. At the Hogere Burger School in Rotterdam, my mathematics teacher G. W. Ten Dam, took an interest in me, gave me private lessons in the calculus and later helped me enter the University of Leiden.

T: Did you have any brothers or sisters?

S: My brother Anton studied engineering at the technical university in Delft. My sister Lena did not to go to a university. I don't know whether there was much money for her. She did however go on to become a teacher.

Figure 1. Dirk Struik (on the right) around 1912, with his brother, sister, and father.

T: Did you get a standard classical education?

S: No, the school I attended was what the Germans call a *Realschule*, which were founded during the nineteenth century in opposition, so to say, to the classical gymnasium or Latin high schools. Through the help of Ten Dam I had a chance financially in the fall of 1912 to enter the University at Leiden. In those days you could enter a university in the Netherlands only if you knew some Latin and Greek. So I had to pass a special examination in Latin and Greek.

T: How many languages are you familiar with?

S: It is difficult to say what you mean by "familiar". Dutch is my mother language and I have not lost mastery of it. My English is good, only I speak it with a Dutch accent. I speak and read German fluently. French I have learned in high school and have no trouble reading it, but I have had little practice in speaking. I can read scientific texts written in Spanish and Italian, and mathematical texts in Russian, but with a dictionary. Once I even ventured into Romanian.

T: As a youth did you began reading mysteries to improve your linguistic skills, or was that later in life?

S: No, that was later in life. Much later in fact. My father opposed detective stories, but I read lots of boys' books. We were fed on Jules Verne and Captain Marryat, who wrote very popular sea stories. I read a number of adventure stories and books on science fiction. I read *Tom Sawyer* and *Huckleberry Finn* first in Dutch translations as I did with *The Last of the Mohicans*. We, that is my brother and I, were thus also allowed to read stories about American Indians, but only if they were not too bloody like, for example, *Aimard*. One of the most popular authors on this subject was, and still is, Karl May. Curiously enough, he is little known in the States. Later on in my student days, I began to read the works of Arthur Conan Doyle, A. E. Mason, J. S. Fletcher, and others, and the then popular Dutch detective stories by Ivans.

T: How long have you been reviewing for *Mathematical Reviews*?

S: Since the beginning, in 1940. Already in Delft when I was an assistant to Schouten, I assisted him in reviewing mathematical papers for the *Revue Semestrielle* and the *Fortschritte*. The *Revue* was published by the Amsterdam Mathematical Society because reviews appeared in the *Fortschritte* about three years after the article had been published. This was too long, so the *Revue* came out only a few months after the papers were published, but mostly only with their titles. Later I did, independent of Schouten, some reviewing for the *Zentralblatt*. I would have continued this, if the Nazis had not begun to exclude Jewish mathematicians. This was the reason Neugebauer and colleagues (he was at that time already at Brown) decided to publish new, independent mathematical reviews. I then shifted from the *Zentralblatt* to the *Mathematical Reviews*. This was in 1940. I reviewed mainly papers on tensors and differential geometry, many of them in Russian. Until 1980 I did this reviewing after which date I have only been reviewing papers on the history of mathematics. In the *Reviews* I can sometimes introduce some interesting mathematicians of, say, Holland or Brazil. As for instance, recently about Mannoury. Mannoury is not well known outside of the Netherlands because most of his publications were in Dutch. Mannoury was a self-made mathematician. He began as a high school teacher, where he taught himself the then new science of topology. Around 1900, he was the first to introduce this subject into the Netherlands. Eventually he became a professor at the University of Amsterdam and wrote an interesting book on the foundations of mathematics. He was a great influence on Brouwer.

T: Did you know Mannoury when you were a student?

S: Yes, I knew him quite well, but not so much as a mathematician, though I had read some of his work which, by the way, was quite original. He was at the time, just as I was at the time, a radical Social Democrat, and later a Communist. I was on the committee with him in 1918 to set up the bylaws of the newly founded Communist party. He wrote on mathematics, socialism, and mysticism, and saw a relationship in all three of them. My friend Dirk van Dalen, the biographer of Brouwer, shares my respect for Mannoury and has republished some of his work.

T: Tell me about your university days at Leiden.

S: At Leiden one of my mathematics teachers was J. C. Kluyver and one of my physics teachers was Paul Ehrenfest. Ehrenfest had not only a great influence on me but on all his pupils mainly because of his inspiring teaching methods and the way in which he made science come alive to us. He knew most of the theoretical physicists of the time; Abraham, Hertz, Frank, Einstein and introduced several of them to us at his seminar. At Leiden, we worked only for two examinations, there was no high school policy as there is in the U.S. where exams are given every two weeks. After two years we had to take a bachelor's exam, and after two years more a doctoral exam. In order to be ready for these exams, we had to take *tentamina*, or special exams with particular professors. So we would go to every professor who was involved with our work, and take the special exam with him. *Tentamina* were given in physics, mathematics, astronomy, and geology. Only when the *tentamina* were accepted were you admitted to the doctoral exam, which was a formality. After you had sat for your doctoral exam you were ready to work on the Ph.D. When you accomplished your doctoral exams, your title became *doctorandus* or "man who is going to become a doctor". When you had completed your thesis, you became a *philosophae doctor* and then received your Ph.D. degree.

T: Your dissertation of 1922 was on Riemannian geometry. Wasn't it published in German?

S: Yes, it was a result of my collaboration with Schouten in Delft, though Van der Woude in Leiden was my thesis advisor. I wrote my dissertation in German, but I found a German mathematician to look over the language. Being a dissertation of more than 200 pages, I paid Springer to publish it. I was able to manage it because of the catastrophe in inflation in Germany at that time. Many monographs existed on aspects of multidimensional and Riemannian geometry and with the aid of these monographs and some ideas of my own I tried to produce a systematic text on Riemannian differential geometry. I used for this Schouten's affinar classification calculus, a complicated extension of the vector calculus, which unfortunately made the text hard to read, even if I occasionally explained a result in Ricci terms. Schouten and I soon afterwards abandoned this affinar calculus and began to use the Ricci calculus. I used the Ricci technique in a later book, now in English, on Riemannian geometry. Did you know that the first readable book on Riemannian differential geometry was written by Eisenhart?

T: Would you elaborate on some projects in applied mathematics in which you were involved?

S: When I was in Rome I worked for many months on a problem that Levi-Civita suggested to me. He had written on waves in canals with infinite depth. It was already a classical problem with diverse approaches, but Levi-Civita had used his own way of attacking it. He thought that I might try my wits on the case of canals of finite depth. I was able to solve my problem, which led to an integro-differential equation. The solution came in the form of a series and I was able to prove that this series was convergent. Later, when I was at MIT, a physicist from California visited me and told me of his experiments which were in accordance with my computations. I would never have been able to do this work without the suggestion of Levi-Civita. He suggested to me at the beginning that since I had done so much work on tensors and differential geometry that I should be better off with a bit of a change. On another occasion, in the summer of 1927, I went to the Bell Telephone Laboratory in New York and worked on a problem on wave filters with Thornton C. Fry. We discovered that with the aid of a certain continued fraction development, a certain type of wave filter could be developed. The idea led to my only patent. I still have a copy of it. I don't think that a wave filter was ever constructed that way, but the company still wanted to have the patent.

T: When did you first get introduced to the history of mathematics?

S: In my Leiden days I sat in on a series of lectures on the history of mathematics given by a lecturer named Vollgraff. He was one of the editors of the complete works of Huygens. His presentations were very erudite. I still have some of his notes on Newton. He came from a family of classical scholars and used plenty of Latin. The audience found the lectures rather dry and quit attending till only Hans Kramers and I remained. But this was only a diversion at the time, all my and Kramers' attention was focused on the wonderful mathematics and physics of the day, with our inspiring teachers. When I went to Italy I really got interested in the history of mathematics, mainly during a visit to Bologna when Ettore Bortolotti told me of his investigations on the Italian algebraists of the sixteenth century. In Bologna, in the *Archiginnasio* there were still many manuscripts of that time dealing with people like Scipio del Ferro and Tartaglia. Bortolotti showed me some of the manuscripts and got me deeply interested. Moreover, in places like Bologna and Rome you are surrounded by history. When I was in Rome I began to do some research in the history of mathematics during the Renaissance period by reading documents accessible in its wonderful libraries. I even gained admittance to the Vatican Library which was a privilege then and perhaps is even now. I also met some other historians of mathematics as Giovanni Vacca, one of

the first in western civilization to study Chinese mathematics, and Federigo Enriques, who got Ruth, my wife, to work under his tutelage (so to say) on the tenth book of Euclid's *Elements*. Ruth wrote her draft in German, her mother language. Then with the help of Maria Teresa Zapelloni, a pupil of Enriques, Ruth produced an Italian text.

T: Was Ruth a historian of mathematics?

S: No, Ruth studied mathematics in Prague at the Charles University and wrote her dissertation on the axiomatics of affine geometry in two and three dimensions. Her mathematics teachers were Gerhard Kowalewski, who was interested in the history of mathematics, and Georg Pick, who around 1911 told Einstein about Ricci's calculus. Pick and Kowalewski were her thesis advisors. Another of her teachers was the physicist Philip Frank. This was a good school indeed and Ruth may well have been the first woman ever to receive a doctorate in mathematics from the 500-year-old institution.

T: What are your recollections of Göttingen?

S: One of the first things mathematicians did when they came to Göttingen was to pay a visit to Professor Klein. Ruth and I came to Göttingen from Rome on June 25, 1925, the day of his funeral. Some words of remembrance were said by Hilbert and others and then we took a spade and threw some soil on the casket. Later, thinking it over, I realized that there might not have been any Frenchmen present. Only in 1928 at Bologna were Germans and Austrians admitted to an international mathematical conference. Until then the French could not forgive the Germans for what they had done to their country. The first international congress after the first World War that I can remember was the meeting on applied mathematics and mechanics at Delft organized by professors Biezeno and Burgers with the assistance of Schouten. This was held in April of 1924 and was visited by more than 200 experts from Allied and Axis countries, and also seven from the Soviets, then just emerging from the civil wars. Still, only one mathematician from France attended. One of the Russians was Alexander Friedmann, a meteorologist, who spoke on hydrodynamics, but is best remembered for his work on relativity. Friedmann told us that he had to do his work in his laboratory during the winter in his coat, because there was no heat. Ruth invited several of the principals to a tea at our home, where we had a chance to meet Carathéodory, Courant, Levi-Civita, Van Karman, and Friedmann. Friedman showed an interest in Ruth's work on affine geometry and took the manuscript of her dissertation with him to Leningrad, where it still may be among the Friedman papers. Courant and Levi-Civita, who knew of my work with Schouten on tensors and differential geometry (Courant did not like the notation I used), promised that they would support an application for a Rockefeller Fellowship, just established, for study and travel to Rome and Göttingen. At Göttingen I met Norbert Wiener, who suggested that I might come to MIT. Since I had given up my assistantship in Delft I was unemployed after my fellowship had ended. So I accepted the invitation to lecture at MIT, where I arrived on December 1926. And where I still am, now emeritus. I think that the work Biezeno and Burgers did in 1924 to reestablish international friendship between mathematicians should be remembered. I knew Jan Burgers well, we studied together at Leiden. His dissertation on the Bohr-Rutherford model of the atom (this was at the eve of the quantum theory) brought him at 24 years of age a professorship at Delft. After World War II he came to the States and took a position at the University of Maryland. He, like Wiener, did much work on turbulence which was one of the earliest fields where "chaos" was studied.

T: Would you say a little more about Norbert Wiener's contribution in having you come to the States?

S: It was on his second visit to Göttingen, in the spring of 1926, that I first met him and we became right away good friends. He was from MIT and I was on a fellowship

and didn't know what to do for the future because I had no job anymore since the fellowship was coming to an end. My chances for an academic position in the Netherlands were very slim and even to get a position as a high school teacher would have been difficult, though eventually I did succeed if only for a while at the Vossius Lyceum in Amsterdam. So he invited me to come to the United States and suggested that I accept a position at MIT. In due time I accepted the offer. Of course I saw right away that he was an exceptional mathematician but very uncertain of himself because he had not found much appreciation for his work. He came to MIT because Harvard, where he had a minor teaching position, seemed to him less favorable for his career than MIT. MIT was also easier that time, I believe, in its acceptance of Jews in the mathematics department. When I came to MIT in 1926 there were several Jewish mathematicians on the faculty. Harry Tyler, the head of the department, wanted to build as strong a faculty as he could. After all, I was known to some extent through my work, but besides that I was a somewhat untried foreigner. I became an American citizen in 1934. Ruth became a citizen soon afterwards.

T: Was Wiener responsible for you getting into the local Sherlock Holmes Scion Society, the Speckled Band of Boston?

S: Wiener and I got into the Speckled Band of Boston through a gentleman called Percival M. Stone of Waltham. He was the grandson of a former mayor of Waltham, an old Yankee. The Stones and Saltonstalls were the founders of Watertown, Massachusetts. Stone was an expert on detective stories especially Sherlock Holmes and Thorndyke, the sleuth of R. Austin Freeman. When Stone invited us to his house he told us about the Band. Later I have joined another scion society in the Boston area called the Friends of Irene Adler.

T: What would you regard as the most significant world events in your lifetime?

S: The Russian Revolution and the two World Wars. During World War I studied at Leiden in the neutral Netherlands, but of course we were all deeply interested in the war and then, in 1917, in the Russian Revolution with its cry for peace and political liberation. It was followed by the German Revolution, in which I became indirectly involved by being a means of communication between different countries concerning the course of the continental revolutionary wave. During World War II, I was in the States and, as an anti-Nazi and anti-Mussolini, I was eager to support the war effort. But the world importance of the Russian Revolution lies also in the fact that it greatly stimulated the anticolonial revolt. Already in my student days I belonged to those who claimed the right of independence for what we now call Indonesia.

T: What do you think about Russia now?

S: Russia is in a mess today. Russians are not getting the best, but the worst of capitalism. However, their situation is not as bad as after the First World War when there was starvation, a bitter civil war, and thirteen nations attacking them. Then the majority of the population were illiterate farmers, now most Russians are educated. I have little doubt that the Russians will find a way out of the mess and may eventually lead a step forward to a new form of socialism. Under the Soviets, Russian mathematics flourished. Let us hope it also will overcome its present difficulties.

T: Is it true that you were suspended from MIT for trying to overthrow the Commonwealth of Massachusetts and the Federal Government? That must have been pretty hard to do.

S: Yes indeed. I was indicted for conspiracy and "conspiring to teach" those insidious things, in particular, the overthrow of the Commonwealth of Massachusetts by means of force and violence. All, supposedly, in my spare time. It was of course ab-

surd, but such things were possible in the days of Nixon and McCarthy. When in September 1951 the local district attorney found a grand jury willing to indict me, and the local newspapers had glaring headlines, MIT suspended me from teaching, but I kept my salary. There were numerous defense committees and I traveled around the country defending the right to free speech. The ordeal lasted till 1955, when the United States Supreme Court, in a related case, declared State subversive laws unconstitutional. Since I was indicted under a Massachusetts law my indictment was quashed and I was allowed to resume my teaching at MIT. I have written up my version of the case in the January 1993 issue of the *Monthly Review*. During these years of leisure from teaching I edited the mathematical works of the Dutch mathematician Simon Stevin. Incidentally, in 1986, at my ninety-second birthday, I received a special congratulation from the House of Representatives of the Commonwealth of Massachusetts. It seems I have been forgiven.

T: What do you think of the state of mathematics today?

S: With more participants than ever mathematics is flourishing. But I have concentrated for many years on the history of mathematics and have little contact with the present many highly specialized branches of mathematics. The specialization is so strong that there are even books published with titles I do not understand. And I am not alone. It is also difficult to see which of the many fields of mathematics now pursued are of permanent value or will turn out to be just hobbies, even though pleasant ones like, for instance, much of the work in enumerative geometry popular in the early part of the century. Let my younger colleagues decide. However, we see that certain problems in mathematics retain their interest throughout generations, as the last theorem of Fermat or the four-color problem.

T: Do you think that mathematicians' attitude toward history of mathematics has changed significantly over he last half century?

S: If you look at the *Mathematical Reviews* each month under the history of mathematics there are always thirty to fifty people mentioned as either authors or reviewers. You saw it in January at the Cincinnati meeting. There were hundreds of mathematicians interested in my lecture on mathematicians I have known. After the Second World War, not after the First so much, the history of science has become a respected academic subject and it was a remarkable fact that Otto Neugebauer got his Ph.D. in Göttingen on a historical subject. It was still highly exceptional. His thesis under Courant was on Egyptian mathematics. Now, of course, every year you have people who get doctorates in the history of mathematics. Not only here but all over the world. So that today there is an entirely different outlook. Still there are plenty of mathematicians who don't care. On the other hand, very talented people now study and publish in the history of mathematics. Our knowledge of the role mathematics has placed in history has been greatly improved, in size as well as in depth.

T: What do you consider is the most serious challenge for historians of mathematics in the next century?

S: To understand better how mathematics has originated and developed under different cultures, from the Stone Age to the present time. The new field of ethnomathematics is important because of its connection with education. But there are other challenges, such as research in archives or composing good biographies of leading mathematicians. I should add that several beautiful biographies have appeared recently.

T: Would you discuss your *Source Book in the History of Mathematics*?

S: It was not so much a difficult work as a work of perseverance, attractive in its mixture of scientific and scholarly endeavor. First I had to select the papers or chapters

typical for the period and find out whether there were already English translations in existence. When there was none I had to produce one myself. Here my knowledge of Latin, acquired in 1911–12 for my admission to the university, came in quite handily. For example, there existed already an English translation of a part of a famous 1684 paper on the calculus by Leibniz, also complete German and Italian ones. My English translation was based on comparing these translations with the original Latin. When, after all, I was not certain in a translation, I mentioned it in a note. In the case of Leibniz's paper on logic I found the explanation of an obscure citation by Leibniz to Grotius' iambus by consulting a Dutch classical colleague who found the poem by Hugo Grotius for me. Then while writing or copying the English text I had to add the learned footnotes. It was a lot of work, but also lots of fun. At the same time I had the feeling that this book could be of considerable help to colleagues who teach the history of mathematics.

T: Do you consider it your most important work?

S: I do not think so. Writing *A Concise History of Mathematics* was as creative as was the *Yankee Science in the Making*. In both cases I believed that I could shed light on the social and cultural atmosphere in which science is created. In the case of *Yankee Science* I had to consult a large number of monographs, culled from different libraries, but above all, from the Vail collection at MIT. When the manuscript was finished I found that my friend Angus Cameron, then an outstanding editor at Little Brown & Co. in Boston, was very pleased to publish it, but he found it too big, so I had to cut out several chapters, among them a chapter on agriculture. The book received little publicity, because Little Brown that year (1948) concentrated its advertising on another book, I believe one by Stefan Zweig. But there were some good reviews, among them one by Henry Steele Commanger, the historian. Its appreciation has mainly come by word of mouth. Later I tried the same method I had used for *Yankee Science* for my book on the science of the Golden Age of the Netherlands which I called *The Land of Stevin and Huygens* in imitation of that Dutch masterpiece of cultural history *The Land of Rembrandt* by Busken Huet. My book is short and very sketchy, but I thought that it was about time that somebody showed the Dutch that they had neglected to pay due attention to the remarkable science produced in the Low Countries in that period. Except for a book on the history of medicine, the literature on Dutch science consisted only of monographs. Since the time I wrote that book a whole group of excellent younger historians have written on the history of science in the Netherlands. Perhaps out of this will also come a good history of mathematics in the Netherlands, from Bishop Adalbold of Utrecht to Hans Freudenthal. As a matter of fact I also would like to see a book on the whole history of mathematics in North America.

T: Of all the historical works that you have written which is your favorite?

S: *Yankee Science in the Making*, perhaps because it opened a whole new field. My work on *Stevin and Huygens* was an attempt to repeat on a more modest scale my work on New England, but this time on the golden age in the Netherlands.

T: How did you use the history of mathematics in your own teaching?

S: Occasionally, usually as offering an anecdote, such as the quarrel between Newton and Leibniz on the invention of the calculus. In my book on differential geometry I have many historical remarks. Figures like Gauss or Monge are interesting. Meusnier died as a revolutionary general during the siege of Mainz by the Germans, when the French troops carried the general's body with them after the surrender. Goethe, who was with the Germans, heard the Marseillaise, sung perhaps for the first time. Or so I have read.

T: Did you ever teach a history of mathematics course?

S: I never taught full-time courses in the history of mathematics. I tried it once or twice, but there was hardly any interest for it. I was disappointed because the students didn't know any language besides English. So it was like giving a lecture on Shakespeare to people who cannot read English. So I gave it up. My book on the history of mathematics was written for those who know a lot of mathematics, for instance, when I mention Steiner surfaces I don't tell my readers what a Steiner surface is. They have to find out for themselves. The text is written for people in the profession or knowing sympathizers. In this I seem to have been successful, as shown by the many translations, even one in Persian.

T: You once said that you were interested in the history of mathematics because of the challenge it offers to test the possibility for Marxian research in this field.

S: Yes that is true. How does it fit? Is it possible to have an historic materialist approach to mathematics and, if not, perhaps to the history of mathematics? In the history of mathematics it is fairly easy to see that there are periods where the influence of society on mathematics is very obvious and there are other periods where it is not so. There are even fields of mathematics such as number theory where the whole subject is almost a purely internal development. But it is certainly one of the reasons I became interested in the history of mathematics. Of course, the whole internal history, from the Stone Age to Wiener, is also fascinating by itself.

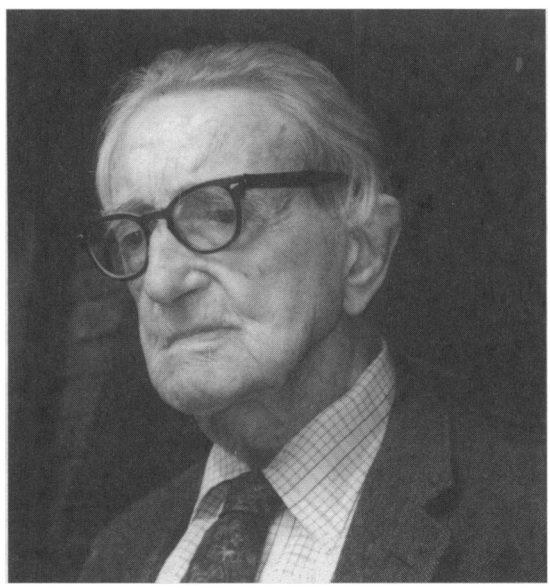


Figure 2. Dirk Struik, 1998

T: This interest also has to do with your concern with social responsibility of the scientist.

S: Indeed. A mathematician, has, as every citizen, certain social responsibilities, but as a mathematician he also has special ones, toward education, industry, peace, and warfare.

T: There have been a lot of mathematical achievements in your lifetime; what do you consider to be the most significant mathematical achievement?

S: I am not very familiar with the latest results in mathematics. In the first half of the century I witnessed the breakthroughs by Lebesgue and Gödel. I am myself most familiar with the breakthroughs in tensor calculus due to Einstein's gravitation theory. There were breakthroughs in analysis and communications connected with names as Hilbert, Kolmogorov, Wiener, Birkhoff, and Von Neuman. The Ramanujan phenomenon is also of interest.

T: If you could meet any mathematician of the past who would it be?

S: Gaspard Monge, a revolutionary in politics and education. Stevin, the Dutchman, a cheerful soul in difficult times. Spinoza, who was a mathematician in his thinking, to find out more about *amor intellectualis Dei*. I would also be interesting to talk with Euclid, to find out why he wrote his book. Was it to get a rigorous understanding of the principles of mathematics, or had he a premonition that it would be selected as a text for the young for more than 2000 years? I sometimes have the feeling that Euclid was pestered by the youth of Alexandria and wrote the *Elements* as a fiendish deed of revenge.

T: At the Joint Mathematics Meeting in Cincinnati last month you spoke on a number of mathematicians that you have known. Are there any others that you would like to say more about?

S: I was, and am, acquainted with a number of Dutch mathematicians, as Van der Woude, my thesis advisor, but I selected Schouten because I knew him best. Still other mathematicians I knew in the Netherlands were Brouwer, Korteweg, Van Danzig, Boomstra, and Freudenthal. Other outstanding figures I have met are Volterra, Veblen, Birkhoff, Emmy Noether, Hadamard. I met Emmy Noether in Göttingen, where in my memory I still see her walking along the road in deep conversation with two of her paladins, Grell and Van der Waerden. We called them her *Unterdeterminahten*. It was in Göttingen that modern algebra was born. After her exile from Germany Noether visited MIT, I do not know why MIT never offered her a position. Like several other exiles of those days, like Bergmann, Neurath, and Szász, Noether also visited us. Stephan Bergmann was at MIT for a while and gave a series of lectures on functions of two complex variables, beautifully combining analytic and geometric arguments. When I think of this field I always think of it in Bergmann's curious English. Freudenthal and Van der Waerden are mathematicians who turned to the history of science, a wide field also including the history of mathematics. If I may compare myself for a moment with these great mathematicians, then the history of mathematics was originally for me also a side issue. Tensor calculus and its application to differential geometry was my main concern. By and by you discover that studying the historical development of your field deepens your insight. History of mathematics became my main interest only after World War II. I was lucky because just at that period history of science acquired full respectability as an academic subject.

T: To what do you attribute your longevity?

S: How do I know? Perhaps marriage, mathematics and other *m*s such as Marxism, moderation, and meditation. Having a job that you like and getting paid for it. Having descended from solid Dutch stock, though my father died at age seventy-two and my mother at fifty-two. But my sister Lena died an octogenarian and I had cousins who died in their nineties. Also perhaps because I had the good luck of escaping speeding automobiles.

T: What advice would you have for a young person just starting out in a career in the history of mathematics today?

S: Know a lot of mathematics and persevere.