Being Julia Robinson's Sister

Constance Reid

When I was asked to speak tonight, I could not refuse. This is a truly celebratory occasion, and I feel that as Julia's sister I should be here. Yet I find myself in a very difficult position. Here I am to speak about Julia, and being spoken about is the last thing Julia would want. As a mathematician, as was done by Carol Wood on Monday morning, yes. But as a person, no.

So I decided my subject would be simply "Being Julia Robinson's Sister". That is the one subject connected with Julia that I can talk freely about, because it's my life, not Julia's. But in the course of the evening, talking about our sisterhood—from not so much a personal point of view as from what one might call "a point of view pertaining somewhat to mathematics"—I can tell you something about Julia that will not violate her desire for personal privacy and something also about the feelings that she expressed to me on the subject of her other sisters—all the women here and the others who are mathematicians.

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Julia was born twenty-three months after I was, essentially two years—the worst possible difference in age for siblings, in my opinion: close enough for the younger to almost catch up with the elder, who is nevertheless always just a little bit ahead. I have to confess that as children we fought almost all the time. My earliest memory of Julia is of her tearing the hair off my doll while I poked the eyes out of hers! We were not close. In addition to age and sibling rivalry separating us, there was also a serious illness that was to keep Julia away from home for a year and out of school from the time she was nine until she was thirteen. It was to affect her entire life, preventing her from having the children she very much wanted and making it physically impossible for her to take on the rigors of a full-time professional position at Berkeley.

While I could tell you something about these early years, I prefer to concentrate on that longer period of our lives that extended up to Julia's death when we were very close. That period began in 1950 when I married and moved to San Francisco and Julia returned to Berkeley after a year at the RAND Corporation in Santa Monica. At that time she had been married since 1941 to Raphael Robinson, who had been her number theory teacher at Berkeley; she had gotten her Ph.D. in 1948 under Alfred Tarski with an important result in a combination of logic and

number theory, and at RAND she had solved an important problem in game theory. She had also begun to work on Hilbert's Tenth Problem.

I knew practically nothing about these mathematical achievements or interests. Once, a year or two before, when Julia came home to San Diego for a visit, she had tried to explain to me what she had done in her thesis. I did not have the faintest idea what she was talking about or why it was significant, but I remember feeling a little sorry for her because she could not explain something important that she had done even to her sister. Oddly enough, I did not feel sorry for myself for not being able to understand.

Later in the time I am talking about, when not only I but our entire family had migrated from San Diego to the Bay Area, Julia and I saw a lot of each other. We met for lunch in San Francisco and shopped furniture stores and talked endlessly both in person and on the phone. We had many common interests. She was a housewife who did mathematics, and I was a housewife who wrote. There was also politics—this was the era of Joseph McCarthy and the infamous Loyalty Oath at Berkeley.

When we got together as a family, which we frequently did, Raphael liked to make conversation with me by telling me things about mathematics. He was a remarkable expositor, as some of you know, and he told me about Gödel's work, and Turing machines, and the theory of sets, and the pearls of number theory, and n-dimensional geometry, and knot theory—maybe even about Hilbert's problems. I was somewhat used to such "teaching", because during a brief period in college when Julia and I shared a room she used to tell me about things she had read in *Men of Mathematics*, which had just appeared at that time.

Well, all this effort on the part of both Robinsons was to bear fruit one morning in 1951 when Julia, in the course of a telephone conversation, reported to me the success of a program of Raphael's for testing the primality of very large Mersenne numbers on one of the new giant computers—this one was SWAC (the Bureau of Standards Western Automatic Computer). These computers, which were popularly called "giant brains", had been invented during the Second World War and had been known to the public for only about five years. Julia also explained to me the connection between Mersenne numbers and "perfect" numbers. This achievement of Raphael's interested me; it struck me as something I could write about that would interest other people too.

Julia promptly encouraged me, in a very practical way, by inviting me to lunch with Dick Lehmer, the mathematician in charge of SWAC, so that I could find out from him what SWAC looked like and how it was operated. At that time neither Raphael nor Julia had ever actually seen one of the new computers, and it is still remarkable, even to experts, that Raphael had successfully programmed SWAC simply by studying the manual. Well, Dick was helpful, and his wife, Emma, was helpful, too; it was she who suggested that I send my article to *Scientific American*. To make a long story short, *Scientific American* published it, a publisher read it and wrote to ask if I, Constance Reid, who had left mathematics for Latin in her sophomore year in high school, would be interested in writing a little book on numbers for him.

Now what still amazes me is that Julia did not try to talk me out of this project but actually encouraged me. Raphael did not encourage me, but he was not negative either. The publisher was thinking about a book on numbers to go with a book he had published on the alphabet. This suggested to me a book about the digits, since the *Scientific American* article had been in a way a story about "6" as the first perfect number. I thought I would just treat the other digits in a similar

Constance Reid, left, and her sister Julia Robinson in 1979.

fashion: a mixture of number theory, history, and what you might call numerology. Julia and Raphael seemed to think that I could do that. Later, though, when I got to the chapter on "9", which was to be about "casting out 9s" and other such checks, Raphael insisted that there should be some real mathematics in the book, so he explained congruences to me and the Law of Quadratic Reciprocity.

Well, that first book, *From Zero to Infinity*, was something of a success: it has been in print now for forty-some years. One book led to another and another, and these I wrote more and more on my own, although Julia and Raphael always read the finished manuscripts.

While I was writing these books, handling the financial side of my husband's law practice, raising my children, and working to improve the San Francisco public schools, Julia had become so absorbed in politics that she had virtually given up mathematics.

You know that Julia was a solver of mathematical problems, but do you know that she put her mind to all sorts of other problems—relatively small problems like how Marina Ratner's little daughter could learn English quickly and enjoyably (Julia's solution was to give her stories about Nancy Drew) and larger problems of the University of California (and it had plenty of problems during those years), the Democratic Party, the United States, the world.

I can give you an example of Julia's nonmathematical problem solving on a major scale. In 1952, when Adlai Stevenson was badly defeated by Eisenhower and the Democratic Party was in what can best be described as disarray, Julia was concerned about the fact that the intellectual grassroots support for Stevenson was separating itself from the Democratic Party and from party politics. She decided that her sister Constance should convey her ideas in a letter to the editor of the *New Republic*, since in her view I could write and she could not. Well, this past Sunday I went down to the library and looked up that letter. There it was: a column and a third at the beginning of the Letters to the Editor column in the *New Republic* of January 26, 1953. It was odd to read it. The words were Constance Reid's, but the political passion was Julia Robinson's! The letter appeared just before an important meeting of Democratic Party leaders at Asilomar, to which interested citizens were also invited. At Julia's urging my husband and I went with her and Raphael. We found to our amazement that all the bigwigs at the meeting were talking about my letter and were asking, "Who is this Constance Reid?" I know people have sometimes suspected that Constance Reid was really Julia Robinson, and on this occasion it was so. I do not remember exactly what happened, but the end result was that Julia involved herself during the following half dozen years in the nitty-gritty of Democratic Party politics: she registered voters, stuffed envelopes, and rang doorbells in neighborhoods where people expected to be paid for their vote. She even served as Alan Cranston's campaign manager for Contra Costa County when he successfully ran for state controller, his first political office.

This political period of Julia's life ended about 1960 when, her physical condition having become much worse, she underwent major heart surgery. The surgery greatly improved her general health, although she still lacked the stamina of a normal person; and when she taught a single class at Berkeley, as she frequently did, everything else had to be put on hold.

At this time, after writing three books explaining mathematics to laymen, I felt that I had exhausted not mathematics, but the mathematics that I was capable of explaining. So I was rather at loose ends in my writing. I wanted to do something different. Well, after three popular books about mathematics Julia had begun to think of me, not only as a writing asset, but as an asset to mathematics. One day she came across an obituary of some mathematician who had recently died. She read it with interest and, remembering what E. T. Bell's *Men of Mathematics* had meant to her when she was a college student, she decided it would be good for students to be able to read about more modern mathematicians than those in Bell, mathematicians whose names were also attached to theorems in their textbooks.

Constance should update E. T. Bell.

To set this proposed project in the context of Julia's mathematical career, I should say that she and Martin Davis and Hilary Putnam had just published their joint paper, "The decision problem for exponential Diophantine equations", but Julia was becoming somewhat discouraged about her ideas on the subject. A year or so before, again at Asilomar, she had explained the Tenth Problem to me. By this time I had a little more understanding than I had had when she explained her thesis. She had said to me then—which had impressed me greatly—that she did not care whether she solved the problem herself, she just *had to know* the answer, she would not want to die *without knowing*.

It was during this period that she came up with the idea of my writing a collection of short biographies of modern mathematicians, and she spent a great many hours with me going through *Math Reviews* and making out three-by-five cards for all the obituaries, memoirs, autobiographies, and biographies of mathematicians that we could find between the first issue in 1940 and the most recent one in 1964. I should mention that

in 1964, although there were lots of obituaries, there were no full-length biographies. There were two autobiographies, Norbert Wiener's *Exprodigy* and G. H. Hardy's *A Mathematician's Apology*, which was somewhat autobiographical. That was all. This situation has changed dramatically in the interim, as you know—if not in numbers, at least in percentages.

Well, Julia was very persistent, and I became interested if not excited, so we decided to go to Europe, where I could absorb local color and interview some relatives of the mathematicians on our list, all of whom had been born after the First World War and had died.

It happened that, at the time, Julia was auditing a class of Alfred Tarski's in which the person who always arranged to sit next to her was a young Ph.D. from Göttingen, a probabalist then, named Volker Strassen. She told him that her sister was planning to write a book about men and women of modern mathematics, and Volker said that of course then we must come to Göttingen and when we came he would show us around.

It was on that trip that I first realized the respect in which Julia was held by other mathematicians.

Volker's Ph.D. adviser, Konrad Jakobs, was eager to entertain us— rather, to entertain Julia. It was clear that Volker had scored a coup with his "Doktorvater" by bringing her to Göttingen. (Incidentally, Julia told me later that it was her paper on game theory, the only paper she ever wrote on that subject, which so interested Jakobs.) Volker himself, whose wife was momentarily expecting their second child, told us that if the baby was a girl—in those days people did not know before the event—he was going to name her Julia. The baby was born while we were still in Göttingen but turned out to be a boy, so Volker named him Tyko after Tycho Brahe, which showed me the class Julia was in as far as Volker was concerned.

The result of our visit to Göttingen, however, was that I abandoned the project of updating E. T. Bell and decided that I, who knew almost nothing about mathematics but what Julia and Raphael had explained to me, would write a life of David Hilbert.

I should say here that Julia had not suggested that I write about Hilbert. I came to him on my own; Hilbert simply enchanted me as he had enchanted all the young mathematicians and physicists who had flocked to study with him in Göttingen. But if you think Julia tried to discourage her mathematically untrained sister from writing the life of the greatest mathematician of the first half of the twentieth century, you did not know Julia.

For my birthday she gave me the three volumes of Hilbert's collected works, and when her mathematical friends inquired about my qualifications for writing the life of Hilbert, she told them with a perfectly straight face that I was reading all his papers.

(Incidentally, I did read *all the words* in Hilbert's collected works—mathematicians of those days wrote more in words than they write today—and Hilbert's were quite enlightening in regard to his ideas and feelings about mathematics.)

Julia then suggested that I interview mathematicians in the area who had actually known Hilbert: Lewy, Pólya, Szegö, even Siegel, who was passing through Palo Alto on his way back to Germany. But I was hesitant about talking to real mathematicians about writing about Hilbert—Julia and Raphael, OK; they were family, but Carl Ludwig Siegel? I remember Julia's saying slyly, "You're afraid they will find out that you're a hoax, Constance"—which, of course, I was.

Now, even a quarter of century after the publication of *Hilbert* and the other biographies that have followed, I still do not really understand why Julia encouraged me as she did when I might have disgraced, certainly embarrassed, both her and Raphael.

I think that perhaps at least part of the explanation lies in something Julia said to Olga Taussky after *Hilbert* was published and was an unexpected success among mathematicians. Olga was complaining that there were other important things that she would have told me about her mathematical relationship to Hilbert if she had known "that EVERYBODY was going to read the book," but many people had come in the past to talk to her about her days in Göttingen and then nothing had ever happened, so she had thought it would be the same with me.

"Olga," Julia said, "you should have known that the Bowman girls always finish what they start."

At that time Julia had not been a Bowman for thirty years, and I had not been a Bowman for twenty; but I think that the strong sense our parents conveyed to us that being a Bowman was something special, although in actuality the Bowmans were quite ordinary people, was at the foundation of Julia's sense of herself, and of course she knew it had rubbed off on me too. I might write as Constance Reid, but at bottom I was Constance *Bowman*.

Well, after *Hilbert* I wrote a life of Richard Courant at the suggestion of K. O. Friedrichs, who became my mathematical collaborator in that project. I can not say that Julia and Raphael were exactly "miffed" to see me going off on my own, but they did feel a little out of it, although both of them read the manuscript.

Julia Robinson, 1982.

Naturally, after I had written *Hilbert* and *Courant*, and Julia had become famous, and Saunders Mac Lane had proposed her for membership in the National Academy of Sciences, and Alfred Tarski and Jerzy Neyman, who were old and not well and who didn't much care for each other, had both made the trip back to Washington, DC, just so that they would be present to help explain the importance of Julia's work, people began to make what they always thought was an original suggestion: *why don't you write a life of your sister*?

The truth of the matter is that I never considered doing so.

I knew Julia and I knew myself, and neither of us would want our biographies written by anyone. I did think, however, that Julia should let herself be interviewed for *More Mathematical People*, which I was helping to edit, because—and this was a telling point—she had objected in regard to the earlier book, *Mathematical People*, that it had contained interviews with three women—me, Mina Rees, and Olga Taussky Todd—*people*, not *mathematicians*, being the operative word in the title—but only one of the three was a research mathematician.

"Julia," I said, "how can you object when you yourself refused to be interviewed?"

She of course had no answer to that.

Well, after her election to the National Academy of Sciences in 1976—you have all heard, I am sure, the story about Julia's being identified as "Professor Robinson's wife" when the university press office called the mathematics department to find out just who Julia Robinson was—Berkeley started to think how it could get this new academician into its stable. There was the problem that Julia because of her health, although it was much improved, did not want and could not handle the rigors of a full professorship.

(Incidentally, Julia once told Cathleen Morawetz—this must have been in the early 1970s when she and Raphael began to talk about his retiring early so he could devote more of his time to mathematics—that what she would really like was to share a job with him, but I am sure she had never suggested this to anybody in the Berkeley department. Certainly I had never heard anything about it nor, according to Raphael, had he, but it is a kind of "Julia solution" to a problem.)

Well, to go back, after she was elected to the Academy, the Berkeley mathematics department came up with the idea of offering her a full professorship with the duty of teaching just one-fourth time, which was just about exactly what she had been doing for a number of years. The department seems to have been a little concerned about the appropriateness of such an offer, because the chairman consulted Saunders Mac Lane, who recently sent me a copy of his response:

"In my opinion it would be eminently appropriate that Dr. Robinson receive a professorial appointment, under such part-time arrangement as may be mutually agreeable," Mac Lane wrote. "Her accomplishments in mathematical logic and related topics are, in my considered opinion, outstanding and would justify her appointment as a Distinguished Service Professor, or its equivalent, at any leading American university, but most appropriately at the University of California at Berkeley."

As you know, Julia accepted Berkeley's offer. But that was not the end. She was showered with more and more honors. I can still hear her, telephoning me about some new award, saying, almost in despair— anyway in mock despair—"Constance, what next?"

This may in fact have been when she was asked if she was willing to have her name put up as the unopposed candidate for president of the American Mathematical Society. Raphael did not think that she should accept but should save her energy for mathematics, as he would have done. He did not try to impose his view on her; he simply stated his opinion. But when she consulted me, I said that I felt there was no way she could not accept, and she agreed, not because it was my opinion, but because it was the same as her own. It might be a long time before another woman mathematician was offered the position. In fact, of course, it was almost ten years.

I should tell you, however, that Raphael accepted Julia's decision with grace, cooking and taking care of himself during her many absences.

So here my sister was, famous for her mathematical work and famous for her "firsts", steadfastly refusing to be written about. "Dear So and So," she wrote to someone who wanted to include her in a book about women scientists, "I am of course very flattered to be considered for your

book, but I must ask you not to write about me. I am appalled at the prospect of details of my life and beliefs appearing in print. (I don't even want to be written about after I'm dead but that is difficult to manage.) This has nothing to do with your abilities and qualifications, as I will continue in the future to discourage any account of my life."

In her view a mathematician was his or her work; personality/personal details could do nothing to illuminate that and so were of no importance. She detested what she saw as the *cult of personality*: the prying into every aspect of what was private that was and still is prevalent in biographical—and, for that matter, autobiographical—writing.

Although I felt very much the same, I thought that her position in relation to any writing about her life and views was logically untenable. She, however, stubbornly maintained that position until it was clear to her and to me that she was going to die.

Then I brought forth my most telling argument. Given her achievements, somebody was bound to write a biography of her. How much better if her sister wrote it and she herself had the opportunity to approve it! She finally agreed.

On June 30, 1985—as it turned out, just thirty days before she died—we had an interview about what she recalled as significant about her life. She was lying on the couch in her living room and Raphael was present, although he never said a word or even made a sound, except to agree with a chuckle that Julia was indeed very stubborn.

Almost immediately I got the idea of writing her life, in imitation of Gertrude Stein, as "The Autobiography of Julia Robinson". I think this was because Julia had told me at this time how struck she had been by something Kay Boyle had written to the effect that the only reason for writing one's autobiography was to give credit where credit was due. There were people to whom Julia very much wanted to give credit. Beyond our parents and others from her early days, these were all men. A young assistant professor at San Diego State College who, in opposition to the head of his department, told her to go and to go to Berkeley. Her husband, Raphael Robinson, of whom she said that she did not think she would have become a mathematician if it had not been for him. Alfred Tarski, her thesis adviser, whose mathematics was so completely right for Julia that it is hard to imagine her career if he had not come to Berkeley when he did. Jerzy Neyman, who by providing financial support made it possible for her to continue graduate study at Berkeley after she got her A.B. Yuri Matijasevich, who provided the last thing that was needed to prove that the solution of the Tenth Problem is indeed negative and whose friendship and collaboration over the barriers of age, sex, geography, and the cold war were so satisfying to her during the last years of her life.

I worked very hard on the "autobiography", knowing I was working against time, and each day read what I had written to Julia, who was back in the hospital. She listened attentively, making suggestions or deletions. Today when I reread the "autobiography", I feel that I am reading something that Julia herself wrote. It is an eerie sensation.

"The Autobiography of Julia Robinson" was published in the *College Mathematics Journal* in 1986 and reprinted in *More Mathematical People* in 1990. I felt that I had done all that was needed. Then, at the beginning of 1995, Raphael Robinson died, and I became the executor of his estate. Since he had not disposed of Julia's papers, photographs, and memorabilia when she died ten years earlier, I became her executor as well. This was the last service I was called upon to perform for my sister, a sort of closure of our "somewhat mathematical" relationship.

I knew very well Julia's feelings about privacy, and I tried to observe them in making decisions. I gave her mathematical letters to the Bancroft Library with the proviso that nothing personal was to be quoted without my permission. I cooperated with the American Mathematical Society in its wish to publish her collected papers along with the very fine memoir Solomon Feferman had written for the National Academy of Sciences. But after I had disposed of the mathematical correspondence and the mathematical papers, there were still many photographs and much memorabilia. I could not help wishing that I had had these to illustrate the "autobiography", particularly those that were relevant, although not technically mathematical, to Julia's mathematical career. It seemed that something more about Julia was wanted: a book that could be placed in the hands, not only of professional mathematicians, but of mathematics teachers and students and even nonmathematicians. My first thought was perhaps the "autobiography" should be reprinted in a little book of its own and expanded with some of the illustrative material that I had found among Julia's things, yet never going beyond the content of the "autobiography", which was all she had wanted to leave as a record of her life. But then I felt that the book should include as well something about Julia's mathematical work that gave a sense of the character of her thought and the personal warmth that she brought to collaboration. So I asked Lisl Gaal, Martin Davis, and Yuri Matijasevich for permission to reprint articles they had written earlier that had been published in widely separated places. The result of

our "collaboration", the book *Julia, a life in mathematics*, is being published by the Mathematical Association of America.

I do not feel that I want to profit from these books about Julia, so I am donating my share of the royalties from the collected works and all the royalties from *Julia* to the San Diego High School Foundation to fund a Julia Bowman Robinson Prize at the high school where, after the sophomore year, she was the only girl taking mathematics. The prize is not gender-designated. It is simply to go to the *best* mathematics student in the graduating class. Last year it happened that it went to a young man and this year to a young woman; and I understand from their teacher, a remarkable and dedicated woman, that the ratio of females to males in the advanced mathematics class is now 50:50.

Julia firmly believed that there is no reason that women cannot be mathematicians, and she just as firmly believed that there should be affirmative action to bring women onto mathematical faculties at colleges and universities. "If we do not change anything," she said to me in that last interview, "then nothing will change." She did not expect the ratio to be 50:50, but she felt that affirmative action should continue until male mathematicians no longer considered the presence of female mathematicians to be unusual.

Julia thought of mathematicians—these were her words once to a group of young people—"as forming a nation of our own without distinctions of geographical origins, race, creed, sex, age, or even time (the mathematicians of the past and you of the future are our colleagues too)—all dedicated to the most beautiful of the arts and sciences."

As the nonmathematical sister of the mathematician Julia Robinson, I would like to close with that thought.