

Michael Spivak: A Memorial

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Dennis Sullivan, and Michael Wolf*



Figure 1.

Michael Spivak [21] died October 1, 2020. This memorial article on his life and legacy contains personal reflections, as well as reviews and ruminations on his contributions to mathematics and the mathematics community.

Barbara Beeton discusses Spivak's contributions to and collaborations with the T_EX community. Spivak's authorship of the seminal manual *The Joy of T_EX*, and his leadership in the promotion and standardiza-

tion of AMS-T_EX as the primary mechanism for typesetting professionally published mathematics writing are described.

Robert Bryant describes his longtime acquaintance with Spivak from his perspective as a fellow gay man trying to navigate his way in the academic mathematics community in the 1980s. Bryant also discusses Spivak's books and his other contributions to society, notably his alternate pronoun scheme.

Fernando Gouvêa provides thoughts on Spivak's *Calculus*, the (in)famous textbook, from the perspective of someone growing up in Brazil who has used the book for decades at a small liberal arts college.

Michael Wolf provides thoughts on Spivak's magnum opus, *A Comprehensive Introduction to Differential Geometry*, the 2500-page, five-volume behemoth which is probably Spivak's greatest legacy. Wolf selects pointed excerpts that reveal the style and the substance of Spivak's writing.

Dennis Sullivan and Tony Phillips provide their memories of Spivak the man, the student, and the dinner companion, along with a short explanation of one of the many mathematical concepts associated with the Spivak name.

The article ends with a short unofficial obituary by Ron Buckmire, the coordinator of this article.

Michael Spivak, Creator of AMS-T_EX and Author of *The Joy of T_EX*

Barbara Beeton

I met Mike Spivak when I was sent to Stanford in the summer of 1979 to learn T_EX, with the intent of adopting it for book and journal production at the AMS. A house had been rented on the Stanford campus for the month of July to accommodate a small contingent whose remit was to learn T_EX and construct a working environment that could be used at the AMS. Dick Palais, then the chair of the AMS Board of Trustees, was in charge of the group; it was Dick who had learned of T_EX from Don Knuth's Gibbs Lecture [6] at the 1978 annual meeting and realized that this was a program directly applicable to AMS publications.

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The rest of the crew in this little commune included these individuals:

- Robert A. (Bob) Morris, a mathematician at the University of Massachusetts, Boston, who was to develop the macro interface to format the math structures that appear in AMS publications;
- Michael Spivak, who was charged with documenting the macros in a user manual for authors and their secretaries;
- Rilla Thedford, from *Math. Reviews*, to learn what would be needed to produce MR internal documents and, ultimately, MR itself;
- Barbara Beeton, to learn how to install T_EX at the AMS Providence headquarters and how to use it to develop macros first to produce “administrative publications” (including the AMS publications catalog, the Combined Membership List, and the journal *Notices*), and then journals and books.

The reason for Mike’s assignment was his known ability to write clearly on mathematical topics, in particular evidenced by his five-volume set, *A Comprehensive Introduction to Differential Geometry*, work for which he was awarded the 1985 Leroy P. Steele Prize in Expository Writing [20].

For reasons unknown to me, Bob Morris decided not to complete his assignment of writing the macros. Mike took over this task and not only produced the documentation but also developed a comprehensive and well-designed set of macros, which were given the name AMS-T_EX. Mike had a finely developed sense for what math should look like on the printed page. Building on this and on the strong base provided by Don Knuth, Mike applied his sensitivity for naming mathematical structures in a way that would be familiar to a mathematician. Together, these strengths have contributed to the acceptance of T_EX as a *lingua franca* among mathematicians.

After the initial Stanford sojourn, Mike and the in-house AMS technical staff worked to develop the macros to produce a “preprint” style, `amsppt.sty`, which together with the math macros, provided a structure for producing AMS journals in their accustomed format. Simultaneously, Mike was writing the user manual, *The Joy of T_EX* [17], which contained the instructions that would be needed for authors or their secretaries to be able to prepare manuscripts in AMS-T_EX for publication in AMS journals. (The AMS goal was to be able to switch from the previous composition system to T_EX in such a way that the change would be immediately noticeable only to readers who were paying extremely close attention.)

1985 Steele Prizes Awarded at Summer Meeting in Laramie

Three Leroy P. Steele Prizes were awarded at the Society’s Summer Meeting in Laramie, Wyoming.

The Steele Prizes are made possible by a bequest to the Society by Mr. Steele, a graduate of Harvard College, Class of 1923, in memory of George David Birkhoff, William Fogg Osgood and William Caspar Graustein.

Three Steele Prizes are awarded each year: one for expository mathematical writing, one for a research paper of fundamental and lasting importance, and one in recognition of cumulative influence extending over a career, including the education of doctoral students. The current award is \$4000 for each of these categories.

The recipients of the Steele Prizes for 1985 are MICHAEL SPIVAK for the expository award; ROBERT STEINBERG for research work of fundamental importance; and HASSLER WHITNEY for the career award.

These prizes were awarded by the Council of the Society (acting through its Executive Committee) on the recommendation of the Committee on Steele Prizes whose members at the time of these selections were Richard W. Beals, Jerry L. Bona, Charles W. Curtis, Harold M. Edwards, Frederick W. Gehring, H. Jerome Keisler, Yiannis N. Moschovakis (Chairman), Lawrence E. Payne, George B. Seligman, Patricia Lilaine Sipe.

The text which follows contains the Committee’s citations for each award, the recipients’ responses at the prize session in Laramie, and a brief biographical sketch of each of the recipients.

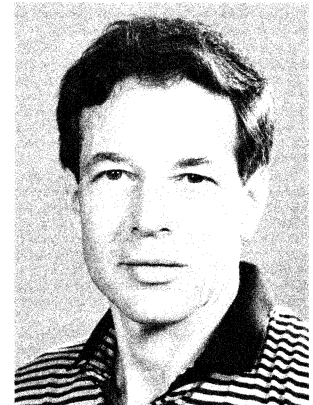
Expository Writing

Michael Spivak

Citation

The 1985 Steele Prize for expository writing is awarded to MICHAEL SPIVAK for his books in differential geometry. His five-volume set, *A Comprehensive Introduction to Differential Geometry*, accomplishes with style the seemingly impossible tasks announced in the title, presenting a novice to the field with a comprehensive view of the subject, from the classic early works of Gauss and Riemann to the various contemporary approaches of Cartan, Chern, Koszul, and Ehresmann. In the ten years since its completion, this work has become a kind of classic of its

own, providing the reader with important insights into the development of the subject, a well-selected set of central topics, and a unique and exhaustive annotative bibliography. Furthermore, it is written in a lucid and informal style that makes reading it a pleasure. An earlier “classic” by Spivak is his *Calculus on Manifolds*, one of the first books to make available to an undergraduate audience the basic concepts and techniques of differentiable manifolds and differential forms.



Michael Spivak

Response

It was as gratifying as it was surprising to learn that I was to receive the Steele Prize for my books on differential geometry. When I made my first intrepid, not to say foolhardy, attempts to fathom the multi-media world of differential geometry, I certainly hadn’t anticipated completing a work of such outlandish proportions. I hope this award will encourage others on similar ventures, and show that they can be accomplished even from the periphery of the academic world.

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Figure 2. Announcement of Spivak’s 1985 Steele Prize in Expository Writing [20].

The first formal edition of *Joy* was published in 1982, and the first all-T_EX issue of the AMS *Transactions* was printed in January 1985, following more than a year of experimentation and preproduction work.

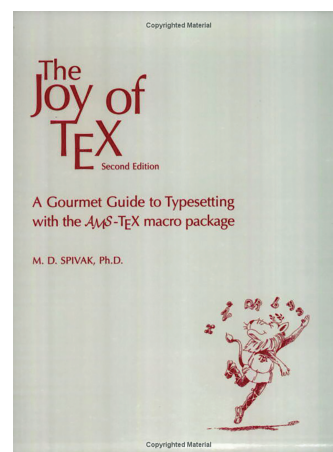


Figure 3. The cover of *The Joy of T_EX*.

Joy is special in a number of ways. The title is a play on the title of a then-popular book *The Joy of Sex* [4], and *that* book’s title was a play on *Joy of Cooking* [12], a respected, time-honored, and well-organized recipe book. (One part of *Joy of T_EX* alludes to that source with the heading “Sauces and Pickles.”) Pronouns are gender-neutral — *E*, *Em*, *Eir* — but even though these are now called “Spivak pronouns,” Mike said he didn’t originate them. On the

other hand, that his name is attached to them indicates that his use was widely noticed.

The material covered by *Joy* is clear and easy to follow. As in Knuth's *The TeXbook*, the appendices were named alphabetically (A was "Answers To All The Exercises," B, "Bibliographies," ..., G, "{TeX Users}"); sadly, when the second edition was prepared, what was originally the last section of the main text was moved to Appendix A, compromising the alphabetical alignment. The second edition updated the technical coverage of the macros (which were Mike's work), but he had no part in the updating of *Joy*, which was the work of the AMS editorial staff. Long after AMS-TeX was superseded by AMS- $\LaTeX$, AMS-TeX was no longer accepted or supported by AMS. With Mike's permission, a PDF copy of the "final" corrected edition of *Joy* was posted to CTAN (the Comprehensive TeX Archive Network).

The original macros were documented by Mike, but he initially refused permission to post this material on CTAN. However, many years later, Mike did relent, and the documentation files were added to the CTAN AMS-TeX collection [2] early in 2019.

AMS-TeX was the production workhorse at AMS for several years, but it had obvious limitations that were noted by users with increasing frequency. The most serious was the absence of automatic numbering and cross-referencing facilities. If theorems were to be numbered or referred to later, that had to be input by hand with the obvious chances for errors. The same was true for displayed equations and bibliographic references. These gaps became a real problem if an author decided to rearrange the exposition.

By 1990, $\LaTeX$, which *did* have automatic numbering and cross-referencing capabilities, was in wide use, and with increasing pressure from authors, AMS gave in and commissioned the adaptation of the math macros into $\LaTeX$, resulting in what is now the `amsmath` package, a required part of $\LaTeX$.

In the font realm, Mike favored Times Roman, which had been used to set math journals and textbooks for many years before TeX and Computer Modern came along. Being quite particular about the appearance of math on the page, he created his own variation of Times, with a full complement of stylistically compatible symbols, which he called MathTime Professional 2 or MTPro2. This was made available through Personal TeX (later PCTeX), a small supplier of TeX software located in northern California.

Mike disagreed with the manner in which $\LaTeX$ implemented the text-related features and instead devised his own methods, which he implemented in a structure he called LAMS-TeX, with an accompanying manual, "LAMS-TeX—the Synthesis." But $\LaTeX$ had soaked too deeply into

the TeX publishing fabric, and LAMS-TeX never became the hoped-for alternative. The LAMS-TeX macros are posted at CTAN [8] but the sources for the manual have been lost.

During the preparation of the first edition of *Joy*, I was able to participate by developing the mechanism for producing the index. In later years, I was Mike's technical AMS contact, maintaining the bugs list and the errata supplement that was distributed online. And shortly before I retired, Mike agreed to my request to release *Joy* and his technical documentation to CTAN. Working with Mike and being part of the creation and adoption of the TeX tool chain has been a great pleasure.



Barbara Beeton

Memories of Michael David Spivak

Robert Bryant



Figure 4. Michael Spivak (May 1991).

As with most people in my general age group, my first introduction to Michael Spivak was through his writing. I was a graduate student at University of North Carolina Chapel Hill between 1974 and 1979, and it was during this time that I heard of Michael, first as an author of lecture notes for Milnor's famous book *Morse Theory* [10] (Milnor was Michael's thesis advisor), and then as the author of the massive five-volume *A Comprehensive Introduction to Differential Geometry* (ACIDG) [16]. At that time, I could only afford to own Volume I (which I had bought second hand), but I frequently consulted our library copy of the other

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volumes. I enjoyed his writing style in ACIDG, which was engaging and a little snarky at times, completely different from the textbooks and papers that were my more usual mathematical fare.

The UNC mathematics department gave our mathematics Graduate Student Association a little money to invite a colloquium speaker, and we chose Spivak, who came and gave a talk, which was mostly about his 1975 paper “Some left-over problems from classical differential geometry” [15]. I could tell that he was a talented and inspiring teacher from the style of his lecture, which was humorous, inviting, and engaging. It must have made quite an impression on me because I remember the visit so well. We graduate students took him to lunch and then to dinner, at a locally famous barbecue place that, unfortunately, turned out not to agree with him.

At that time, Michael was something of an anomaly among geometers, in that he was no longer in academia. After he received his PhD at Princeton in 1964, he was at Brandeis, as a lecturer and then an assistant professor, from 1964 to 1970; but, after that, he had concentrated more on his career as the founder of Publish or Perish, Inc., a mathematical publishing house, while sidelining as a visitor and lecturer at various universities. I remember how much fun we graduate students had speculating about the meaning of the covers of the five volumes of ACIDG, especially the yellow pigs.

In the spring of 1978, I met Michael again when I followed my advisor out to UC Berkeley for his sabbatical. Michael was living in a house in the East Bay hills at the time and sitting in on classes and seminars in differential geometry at Berkeley, so I saw him frequently and we chatted off and on. For me, visiting Berkeley as a graduate student then was like visiting Olympus, where giants of mathematics walked the earth, gave lectures, and would talk with mere graduate students. Michael definitely had a more critical attitude about the lectures and courses we attended, and he was quick to laugh (or complain) about poor exposition when it happened, and he was merciless about pretension. I got to know and enjoy his sharp wit and sense of humor.

One day, I mentioned to him that I was looking to buy the remaining volumes of ACIDG, and he offered to sell them to me directly. He invited me to his house, and, after I bought the books, we fell to talking. I was curious about how he wound up in Berkeley when he had grown up on the East Coast. He shrugged and said, “I came out to the West Coast to be gay. I just couldn’t do it on the East Coast; I knew too many people there.”

Of course, I knew what he meant. (I was not “out” then, but I knew that I was gay and, at that time, I could not imagine coming out to my family and friends.) In fact, I

was more-or-less doing the same thing he was while living in Berkeley. It was my first time living near one of the gay meccas, and I was exploring San Francisco, particularly the Castro area, every chance I got.

That was also when I learned that Michael was a talented pianist. His piano rack held a copy of Brahms’ solo piano version of his “Variations on a Theme of Haydn.” After my coaxing, he gave an impressive impromptu performance of the piece. He was amazingly knowledgeable about recordings of some of my favorite pieces. I remember that my visit ended with him introducing me to Pollini’s transcendental recording of Beethoven’s Op. 110. I felt that I had met a kindred spirit; I never hear that recording without thinking of Michael.

Michael and I kept up with each other for many years. I saw him a few times at various places in New York while I was at the Institute for Advanced Study for an NSF Postdoc in 1979–1980.

I moved to Houston in 1980 for my first tenure-track job at Rice University and, lo and behold, shortly thereafter, Michael moved to Houston as well. We would get together from time to time, to listen to music or talk. Michael was busy: taking ballet, writing, promoting AMS- $\TeX$, and running his publishing company Publish or Perish. He always had a hilarious take on the news (or weather) of the day, which, for those living in Texas, could always be counted on to be controversial. *Plus ça change...*

It was while teaching at Rice that I became acquainted with Michael’s wonderful 1967 book *Calculus* [13], which he himself described as “a critical success, but a commercial failure.” Over the years, I have found that his calculus book can always be counted on to inspire talented young mathematicians. It’s so satisfying to see the hard work of building the foundations carefully pay off with great theorems such as the transcendence of e and the Fundamental Theorem of Algebra. Beautifully laid out and conversational in tone, with a great choice of topics that intrigue and excite a student who longs to understand just how calculus really works, it’s now one of my favorites of his books.

Michael got some well-deserved recognition in 1985, when, at the AMS Summer meeting in Laramie, he was awarded a Leroy P. Steele Prize for Exposition for his books on differential geometry [20]. We all were delighted and congratulated him, but, by that time, he had already become fascinated with $\TeX$, and was deep into its inner workings. He was one of the few who carefully read Knuth’s *Metafont* book [7]. He designed the MathTimes font.

Eventually, I moved back to North Carolina to take a position at Duke University, and Michael and I saw each other mainly at AMS meetings, where Michael would often have a booth promoting $\TeX$ or Publish or Perish. A

particularly memorable occasion was in 1995 at the Joint Meetings in San Francisco (which had been relocated from Denver because of Colorado's anti-gay Amendment 2). That was when we had the first meeting of the LGBT Math Caucus (which eventually became Spectra), a story told at greater length in a *Notices* article [3]. Anyway, the interesting thing was the off-site social reception that we had for the LGBT caucus, which Michael attended and was his usual entertaining and self-deprecating self. Of course, Michael was, by that time, a famous author (among mathematicians, anyway), and I remember that several people at the reception, who had not known that Michael was gay, were excited to see him there.

Unfortunately, I saw Michael at AMS meetings less and less as time went on. We were both busy with our lives, and I didn't get back to Houston very often. He would send me copies of his books and I would write appreciative notes. In particular, I think that his 2010 book *Physics for Mathematicians: Mechanics I* [18] is beautifully written and deserves to be better known.

I was truly sad to learn that he had passed away; I very much miss his sense of humor and his clever conversation.

In some ways, he was far ahead of his time. Not many people remember now, unless they are $\text{\TeX}$ experts, that Michael promoted a version of gender-neutral language more than 30 years ago in his *The Joy of $\text{\TeX}$: A Gourmet Guide to Typesetting* (the title itself a clever parody that is, perhaps, no longer much appreciated). In the first few pages of JoT, he introduced his convention for gender neutral pronouns: E/Em/Eir. It's a pity that Eir proposal didn't catch on more widely, as I thought it was an excellent solution to a vexing problem. E would have loved to have its use associated with Em.



Robert Bryant

Michael Spivak's *Calculus*

Fernando Q. Gouvêa

Let me begin with some autobiography. I was introduced to calculus during my first year at the University of São Paulo, in Brazil. At that time, we didn't use a textbook; instead, we used references and small booklets of notes, prepared by one of the teachers. The references were a variety of books that our professors felt could be consulted with profit. Among them was Spivak's *Calculus* [13]. I didn't buy a copy at first, because I was fairly happy with the notes and with the books I already had. But the name stuck in my head.

A couple of months into the course, I was strolling through the aisles of my favorite bookstore, and saw a big gray calculus textbook. I think it was the first edition. It was definitely in soft cover, perhaps an edition for sale in third world markets. I recognized the author's name, bought the book, took it home, and set to reading it.

It was love at first sight. I'll admit that I wasn't doing all—or even most—of the problems. (There are lots of very hard problems; instructors will be glad that there is an answer book.) But Spivak's account of what calculus is all about, his careful but precise account of the theoretical underpinnings of the material, his chapter on the "hard theorems" (the ones that require an understanding of the completeness of the reals), his pictures, even his asides. . . This was calculus as an intellectual adventure, deep, compelling, and beautiful. I read the whole book, making my way far beyond what we had covered in class by that point. I even read, with some small level of understanding, the sections on complex power series and the explanation of Dedekind cuts.

It will give you a measure of Spivak's impact on me to note that I took quite seriously the annotated suggested reading list given in the back. I sought out many of them, read a good chunk of the ones I bought, and understood a few of the ones I read.

I never forgot some bits of the book. Spivak's comment that "mathematicians like to pretend that they can't even add, but most of them can when they have to" (on page 179) stuck in my mind. I've used it in class many times. His chapter on integration in finite terms is another I remembered, and especially problem 7 in that chapter (described as "Potpourri. No holds barred."). I remember "the world's sneakiest substitution" $t = \tan(x/2)$. One of the problems was marked as "An exercise to convince you

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that this substitution should be used only as a last resort.” The next problem had the note: “a last resort.”

The treatment of power series also stuck with me; as a result, I’ve been a fan of series ever since. I’m grateful that the edition I read didn’t include the section on Kepler’s laws, added in the third edition, because I don’t think I could have followed it. The reading list, alas, was never updated.

A calculus textbook that does everything honestly, even if gently enough so that good first-year students can follow it, is not for everyone. Many people would want to see more applications or more history. In addition, there is no multivariable calculus, which is a pity; I’d have loved to see what Spivak could do with that at this level. (His *Calculus on Manifolds* [14] is, of course, a classic, but it is so terse as to be impenetrable for most students.)

When I use it in class, students always find the book very hard to read and understand. But they also understand that they are getting the real thing, that they are being treated as intellectual adults. Spivak’s achievement was to produce a textbook that has the potential to lead talented students into an appreciation for both the subject and the methods of mathematics. There must be many mathematicians today who cut their teeth on this book; may there be many more.



Fernando Q.
Gouvêa

Michael Spivak’s Differential Geometry Textbooks

Michael Wolf

I met Michael Spivak only once: he lived only a few blocks from Rice University where I spent more than three decades, but his visits to the department were very rare, and we crossed paths just momentarily. But I was a great admirer, as his five-volume *A Comprehensive Introduction to*

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Figure 5. The covers of all five volumes of *A Comprehensive Introduction to Differential Geometry* [16].

Differential Geometry [16] was very important to me. In particular, it was in his writings that, in the early part of my career, I learned the foundational results of differential geometry and, more importantly, how to read the writings of differential geometers.

As the volumes emerged in the 1970’s, the *Bulletin of the American Mathematical Society* published two excellent reviews, the first in 1973 by Victor Guillemin [5] on the first two volumes, and the second in 1978 by Stephanie Alexander [1] on the full five-volume set. These were thoughtful reflections by very accomplished geometers describing books whose contents they knew, with an eye toward guiding the reader who knew less geometry on how to use the texts. I definitely can’t improve on those reviews—they remain fresh and I recommend them—so my perspective here is that of a student a few years later who needed to be able to work near the subject and was just pulling books off the library’s QA641 shelf, then later used the books as references for more advanced topics, and then finally came to appreciate the volumes not only for the math they contained, but for the expository philosophy they exhibited.

Perhaps what is at first striking about the series is Spivak’s ambitions and his concomitant confidence in undertaking such a vast project and presenting it to the mathematics community. His preface, of course skipped by students, lays out the initial motivation for his organization. As always he explains himself better than anyone else might; he writes,

Today a dilemma confronts any one intent on penetrating the mysteries of differential geometry. On

the one hand one can consult numerous classical treatments of the subject in an attempt to form some idea of how the concepts within it developed.... Unfortunately a modern mathematical education tends to make classical mathematical works inaccessible, particularly those in differential geometry.... Most students eventually find that this ignorance of the roots of a subject has its price—no one denies that modern definitions are clear, elegant, and precise; it is just that it is impossible to comprehend how any one ever thought of them.

So, Spivak sets out to earnestly do both. The original works of Gauss and Riemann are printed in Volume II. Then they are explained from multiple perspectives and computational schemes. The fundamental “test case” theorem of Riemann is proved seven different ways, with the steps collated across the versions. What Spivak doesn’t assert explicitly, but is why I return to the volumes over and over again, is his commitment to the reader. He has a vision for what a “comprehensive introduction” should comprise (and he is aware of the tension inherent in that phrasing)—and then he contractually binds his writing to that conception. The pacing in the initial background material continues while he treats more advanced topics: he is neither impatient describing what was already in many textbooks, nor in a hurry to get through the more intricate advanced discussions. In the later volumes, in what seems to have become a somewhat personal journey, he chooses foci not only of interest to himself, but what he feels is important for his imagined audience. One senses a sincere interest in explaining, and so we trust him later when we need a source to learn from.

After about 2500 pages, our perennially self-aware guide begins the final chapter of the final book: “The Generalized Gauss-Bonnet Theorem and What It Means for [Hu]mankind.” Of course, this final 200 pages will draw on the previous 2500, but it will have the same tone as the first few hundred pages, with clarity, full details, and deft explanations in a conversational tone of why we are now doing what we are doing and how it all fits together. Yet here at the end, having reached a mid twentieth century topic, he gives a reflective coda to his original vision:

In previous chapters, we have seen that interesting and challenging questions can arise even in the lowest dimensions, and that the methods used to resolve these problems...have the satisfying concreteness of geometrical arguments, and something of the charm of antique music. Nevertheless, it is futile to deny the decisive influence which has been wrought upon the shape of modern math-

ematics by the daemonic spirit of functorial constructions. So, it is appropriate that this book end with a topic that represents one of the triumphs of machinery in mathematics.... As a final affirmation that we have plunged into the icy stream of modern mathematics, hardly a picture appears.

Yet a picture does appear. An expositor who writes from the perspective of a reader. His was not the first book to attempt this, of course, and today I consult other texts with similar ambitions and similarly accessible styles. But these particular books of Spivak, like his other works, stand out with an important timelessness. They filled a gap in the literature at the time, but they remain important both for what they declare to be a proper introduction and what they model in their reach for comprehensiveness.



Michael Wolf

Music or Mathematics

Dennis Sullivan

For more than a half-century one has heard the phrase “The Spivak spherical fibration” in discussions about the question “What is a manifold?” It’s rather neat really.

To any finite d -dimensional complex X is associated a set of closed manifolds obtained by taking the boundaries of nice neighborhoods of X in Euclidean spaces of large dimensions denoted $N + d$. Then, the inclusion mapping of the boundary into the nice neighborhood is homotopy equivalent to a fibration with fiber the $N - 1$ sphere (up to homotopy equivalence) if and only if X satisfies homological Poincaré duality relative to dimension d .

This is the famous Spivak spherical fibration of a Poincaré duality space, and this is the main result in his PhD thesis at Princeton.

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As denizens of the common room of the old Fine Hall (at Princeton University) in the midsixties, I began hearing about Michael Spivak, observing him on occasional visits to common room tea and later getting to know him on scattered occasions. This included our final meeting about three years ago, which was a nice dinner with Michael and two of my sons who all lived in the same old neighborhood near Rice University in Houston. The dinner was my treat and Michael enlivened us with stories about the magic of the phrase “free dinner” from his early background. This was like Woody Allen disparaging the word “retail” as opposed to “wholesale” in one of his well-known movies.

As part of the Spivak legend in the Fine Hall common room, there was an entire lore built around the word “pig” which could be positive or negative as a noun, verb, an adjective, or an adverb. During my first year in the common room of Old Fine Hall there was also a Spivak legend about precision of statements and about a fearless confronting of established dogma in mathematics, science or anything really. This, with probing math questions like “construct a discontinuous linear function defined on all of Hilbert space” or “show that the fundamental theorem of algebra holds for any continuous $f(z)$ if the ratio of $f(z)$ with some power of z tends to one as z tends to infinity.” There was also the Spivak principle that everything worthwhile has to be held up to the highest standards. For example, in music and in mathematics. A tongue-in-cheek echo of these ideas is the name of Spivak’s company “Publish or Perish.”

The example that meant a lot to me personally was the inclusion in his book on differential forms and geometry of his English translation of Riemann’s dissertation. I taught from this book to Princeton undergrads, thereby learning the subject from a demanding, honest, and clear accounting, and was also exposed to the masterpiece of Riemann. This translation by Spivak was reread every few years and one learned, thanks to Michael Spivak’s rigorous and skeptical nature, the remarkable fact that Riemann himself questioned the accuracy at small scales of the smooth continuum he had virtually created to model a curving space. Riemann’s genius was confirmed by general relativity and Riemann’s premonition was confirmed by quantum physics.



Dennis Sullivan

Addendum

Anthony V. Phillips

Mike was also a wonderful pianist (and a great lover of the music of J. S. Bach). As he told the story, at one point he had been considering the piano as a career. But after hearing a recording of Vladimir Horowitz playing Liszt’s Hungarian Rhapsody No. 2 he realized he would never be able to play at that level and completely abandoned his study of the instrument. Unfortunately, I believe, the same relentless perfectionism and self-criticism kept him from appreciating, enjoying, and thoroughly exploiting his own great mathematical gifts.



Anthony V. Phillips

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A Brief Obituary of Michael Spivak

Ron Buckmire



Figure 6. Michael Spivak (circa 2004).

Michael David Spivak was born May 25, 1940 in Queens, New York and died October 1, 2020 in Houston, Texas. He received an undergraduate degree from Harvard in 1960 and a PhD in Mathematics from Princeton University in 1964, with a thesis titled “On Spaces Satisfying Poincaré Duality” [19] supervised by John Milnor. He was an assistant professor at Brandeis University from 1964 to 1969.

Spivak was awarded the Leroy P. Steele Prize for Expository Writing in 1985 for *A Comprehensive Introduction to Differential Geometry*, a five-volume, 2500-page textbook which became an instant classic when first published in 1970. He wrote several other books including *Calculus on Manifolds* (1965), *Calculus* (1967), *The Joy of T_EX: A Gourmet Guide to Typesetting With the AMS-T_EX Macro Package* (1990), *The Hitchhiker’s Guide to Calculus* (1995), and *Physics for Mathematicians—Mechanics I* (2010). Eventually he founded his own publishing company, Publish or Perish [9].

Spivak is recognized for his contributions to the development and promotion of the T_EX typesetting language. In addition to publishing the ubiquitous manual *Joy of T_EX*, he was a prominent member of the T_EX Users Group (TUG) for many years and developed MathTime Professional 2, a set of fonts for mathematical symbols that can be used with the Times Roman font family.

Spivak is also known for his early use of gender-neutral pronouns: “E/Er/Eir,” which appeared in *The Joy of T_EX*, and although he did not coin them, they are referred to as Spivak pronouns [22].

Spivak is survived by his sister Susan Spivak, and his longtime partner Michael Kramer. Spivak and Kramer met in 1997 and never married although marriage for same-sex couples became legal nationwide in 2015 after the US

Supreme Court decision *Obergefell v. Hodges* [11]. Instead, they decided to avail themselves of the strong common-law marriage statutes in Texas where they lived together for decades.

In private communication, Kramer shared the following thoughts (which he gave me permission to publish here):

Michael hated the idea of memorials and obituaries. He didn’t even want me to pay to have his body picked up! He said, “When I’m dead, I’m dead! The county will come and dispose of my remains for free.” In the end we had him cremated, but because he died during the height of COVID in Fall 2020 (but not from the disease) there was a huge backlog and we weren’t actually able to get it done until Spring 2021. I hope to finally inter him in a local cemetery in Houston where people who admired him and his work can visit and pay their respects.

Michael was very particular about his public image. He almost never saw a picture of himself that he liked and this is why there are very few photos of him available on the internet. The pictures of him accompanying this article were provided and I believe Michael would have approved of them.

Michael’s legacy is very important to me and the question I get the most at Publish or Perish is what will happen to his books now that he’s gone. I can’t get into details right now but I am very confident that an announcement will be forthcoming which will ensure that all of the books that Michael Spivak wrote will be in print for the foreseeable future!

Afterword. This article has been in the works for a long time. In spring 2022, Ron Buckmire agreed to coordinate the writing, even though he had no direct connection with Spivak other than sharing the same sexual orientation and an interest in learning more about the life and legacy of an openly LGBT mathematician.

Happily, when the article was passed on to Buckmire there were several people who had already expressed an interest in contributing to it. Eventually, Buckmire was able to get in contact with Spivak’s life partner, Michael Kramer, who became a *de facto* coauthor of this article, providing helpful suggestions, memorable anecdotes, personal remembrances, and photos that helped to strengthen the final version.

Ron Buckmire is a professor of mathematics at Occidental College. His email address is ron@oxy.edu.



Ron Buckmire

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