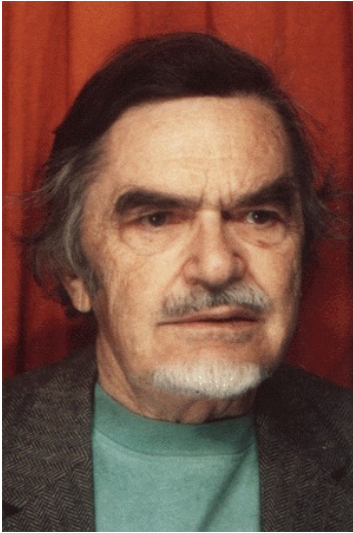


# Joachim Lambek, FRSC

## December 5, 1922–June 23, 2014

Michael Barr (McGill University), Philip Scott (University of Ottawa) and Robert Seely (McGill University)



Joachim Lambek

The following account of Jim's life and work is partly based on a talk given on the occasion of his 75th birthday, by Michael Barr.

Jim was born in Leipzig, Germany, in 1922. In the late '30s, he was among the last "children" (he was in his mid-teens) to escape Nazi Germany on the Kindertransport to England, where he worked on a farm. Shortly after, along with other male German Jews, he was deported (as an "enemy alien") to Canada and interned in a prison work camp. In later years, Jim often joked that they were not told until after the ship set sail whether they were headed to Canada or to Australia: being on a ship bound for Canada saved him from having to do 2-category theory. After he had spent about two years in a camp, mainly in New Brunswick (but including a week on Île Sainte-Hélène, later the site of Expo 67), the authorities decided that people like Jim should not have been imprisoned and he was released. During his time in the work camp he had begun studies in mathematics and logic, taught in the camps by Fritz Rothberger and other detained European mathematicians, and even entered into correspondences with other mathematicians and logicians, including Willard V.O. Quine. On release, those prisoners who found Canadian sponsors were allowed to stay in Canada; fortunately, a Montréal businessman agreed to sponsor him. So he settled in Montréal and entered McGill, earning an honours degree in mathematics in 1945 and an M.Sc. a year later. One result of all this is that he spent the war years safely in Canada, while his mother and sister, who were allowed to stay in England, endured the blitz, and came to North America only at the end of the war.

Professor Joachim (Jim) Lambek was a prominent member of the Montréal mathematics community throughout the second half of the twentieth century, active until his death last summer. During his career he was an inspiration, a mentor, and a dear friend to many generations of mathematicians, linguists, and other scholars, and his loss has left a huge gap in our community.

The following account of Jim's life and work is partly

based on a talk given on the occasion of his 75th birthday, by Michael Barr. He was immediately hired as a lecturer in mathematics at McGill. In those postwar days, McGill had to expand rapidly to make room for returning veterans and one way it dealt with the problem was by opening a satellite campus in St. Jean. Getting there was his responsibility. One of Jim's stories was that once he missed the train for reasons beyond his control and skipped the class. The chairman told him he should have taken a taxi—at his own expense of course. This would have cost \$10 (probably equivalent to at least \$150 today), considerably more than his pay for the class.

One of Jim's former students, Prof. Robert Raphael of Concordia University, recalls an amusing anecdote from Jim's student years at McGill in the 1940s. Jim faced a problem finishing his undergraduate degree, since taking a chemistry course was a requirement to graduate. But the director of the chemistry building denied Lambek entrance, as Germans were not allowed because of sensitive experiments taking place in the building. The McGill Senate acted and replaced the chemistry course with an arts requirement, so Jim graduated. After the war, the building director was arrested on charges of spying for the Soviet Union.

In 1950, he completed his Ph.D. under Hans Zassenhaus (in fact, he wrote two theses, one in mathematical physics, then one in pure mathematics) and was promoted to assistant professor. In those days, assistant professors taught at least 12 hours a week and were not expected to do much, if any, research. Yet, between 1951 and 1959 he had 14 publications. Half of those papers were joint with Leo Moser and appear to be in combinatorics and elementary number theory. However, even in those early days he had begun research on several of the areas of mathematics that would occupy the rest of his career. In 1958, he published his first paper in linguistics, on the syntactic calculus, as well as his first paper on rings of quotients.

Although there were two more publications in mathematical linguistics in the following three years, he appears to have abandoned the subject for over a dozen years. But the world did not abandon this work, and a small but lively group of researchers, mainly in Europe, developed the subject of "Lambek grammars." He returned to the area several times in his subsequent career, and it was a dominant theme in his last decade or so. During the same period, Jim published a short paper in the *Bulletin of the Canadian Mathematics Society* (1961) entitled *How to program an infinite abacus*. It turns out he co-discovered an important notion of abstract computing device (an alternative to Turing's machines), today called

Register machines. The idea was simultaneously (and apparently independently) developed by several leading researchers, notably M. Minsky.

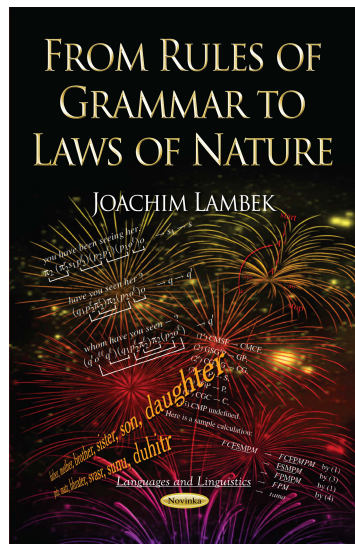
From the mid-50s to the mid-60s, Jim put most of his efforts on ring theory, particularly rings of quotients. He published many papers on the subject, culminating in the very successful and influential book, *Lectures on Rings and Modules* (1966).

Jim spent his sabbatical year 1965-66 in Zürich at the Forschungsintitut für Mathematik der Eidgenössische Technische Hochschule where Beno Eckmann had gathered together a group of people interested in algebraic topology, homological algebra, and, incidentally, category theory. That year in Zürich reoriented his research into category theory. Two mathematicians who subsequently became pivotal members of the Montréal Category Theory group also were in Zürich around the same time, and met Jim then, or shortly after his year there. Michael Barr remembers being given Jim's monograph *Completions of Categories* (SLNM 24, 1966) as soon as he arrived in Zürich; he first met Jim in Chicago shortly afterwards. Marta Bunge was in Zürich the same year as Jim (along with Bill Lawvere, among others), and remembers being struck by his quick grasp of what was important in the subject. Jim arranged to bring both of these future colleagues to Montréal.

During the 1970s, his research combined ring theory, torsion theory and category theory, much of the latter in collaboration with Basil Rattray. During this decade, he renewed his interest in mathematical linguistics, including formal studies of verb conjugations in French and Latin. As well, he began working on applications of category theory to logic. This last interest resulted in a fruitful collaboration with Phil Scott (initially a postdoc of Jim's, later a professor at U. Ottawa), culminating in the now-classic book, *Introduction to Higher Order Categorical Logic*, in 1986. Lambek's works in categorical proof theory were of seminal influence. They ranged from his early applications of Gentzen's methods to coherence theorems in category theory, to his later introduction and promotion of multicategories, substructural logics, and bicategories in widely varying areas, from algebra to linguistics to physics.

Over the years, Jim's research work never slacked off. He regularly published papers in categorical algebra and logic, in linguistics, in philosophy, and even in quantum physics, returning to a topic he addressed in his first Ph.D. thesis. Indeed, he was an enthusiastic supporter of using Hamilton's quaternions in physics; a popular account of his views and of his meeting with Dirac is contained in his article *If Hamilton had prevailed: quaternions in physics* in the *Mathematical Intelligencer* (1995). During this period he also wrote an undergraduate text on the history of mathematics with Bill Anglin, *The Heritage of Thales* (1995), which is unique in its deep coverage of a wide range of topics.

In a quite extraordinary series of works late in his career, Jim developed an entirely new approach to his earlier work in linguistics, which he called "pregroup grammars," a formal typing system for natural language processing, which actually arose from his growing interests in higher category theory. He wrote a book for linguists *From word to sentence* (Polimetrika, 2008), as well as numerous articles for mathematicians on his new theories of linguistics.



Math Reviews lists more than 130 publications at present, and that does not include his last book *From Rules of Grammar to Laws of Nature*, which he wrote and saw to publication during the last months of his life.

Jim Lambek's reputation does not depend only on the quantity and quality of his research, however. Many of his past students, post-doctoral fellows, colleagues and friends have commented on his generosity (and insis-

tence on high standards). He helped launch many a career in mathematics by putting innumerable students on the track of promising research projects, and providing beginning researchers with postdoctoral fellowships and opportunities to develop and present their results. He was also a good friend and colleague, a generous host, and excellent company.<sup>1</sup> He will be deeply missed, personally and professionally.

<sup>1</sup>We cannot resist mentioning one of Jim's favourite stories. Jim would often organize workshops and conferences in Montréal, to which both mathematicians and linguists were invited. Jim, always the convivial host, would lead the group to some downtown restaurant. The problem, he observed, was that the mathematicians could never figure out the bill, and the linguists couldn't speak French!

[...] *But it may be Jim Lambek who had the biggest impact on my career of any McGill professor, through the kind of chain of accidents that so often affects a life course. Jim taught a course on the Theory of Computation and Mathematical Linguistics. That came in handy when, in my first week of graduate school at Harvard, we were assigned a technical paper in that field on the problem of language acquisition. Thanks to his class, I was able to understand it, and wrote a course paper which became my first major publication. That led to my being hired to teach language acquisition in my first job, which led to an encompassing interest in all aspects of language, from how it evolved to how it is used at its best in good writing.*

Steven Pinker (Harvard University)  
*To professor, with love, The McGill News, Fall-Winter 2014*