Review of Elaine M. Riehm and Frances Hoffman, *Turbulent Times in Mathematics: The Life of J. C. Fields and the History of the Fields Medal*. American Mathematica Society and the Fields Institute, Providence, RI, 2011.
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Elaine McKinnon Riehm and Frances Hoffman, *Turbulent Times in Mathematics: The Life of J. C. Fields and the History of the Fields Medal*. American Mathematical Society and the Fields Institute, Providence, RI, USA, 2011. 258 pp. $45.00. ISBN-10: 0-8218-6914-0.

John Charles Fields was a mathematician and professor at the University of Toronto from 1902 until his death in 1932. He is primarily known for having established a gold medal for outstanding discoveries in mathematics. The Fields Medal is awarded every four years at the International Congress of Mathematics to two to four individuals. There is no Nobel Prize for mathematics and the Fields Medal is seen as one of the greatest honours that can be bestowed on a mathematician. An individual must be under the age of forty to be eligible to receive the medal. Although this restriction seems to have originated in an attempt to stimulate research by younger investigators, the medal itself has become an award for midcareer achievement. A typical recipient of the Fields Medal is a man nearing forty of exceptional mathematical accomplish-ment who is well positioned in his career with an established program of research.

The book under review is the first full-scale biography of Fields. The authors combine the history of mathematics, local history and the history of international relations in the early twentieth century to produce an engaging and well documented narrative tracing Fields' life and times. Fields was born in 1863 in Hamilton, Ontario, the second of three children of a successful leather merchant. His father died when he was eleven, his mother when he was eighteen; he was left with an inheritance that ensured his financial security. He pursued undergraduate studies in mathematics at the University of Toronto and received a doctorate in mathematics from the Johns Hopkins University in Baltimore. He enjoyed the financial means to spend eight years studying and carrying out research in Europe, first in Paris and primarily in Berlin. His mathematical work was in an area of complex analysis pioneered by

the great German mathematician, Karl Weierstrass. When he was appointed to the faculty of the University of Toronto he was thirty-nine and a respected researcher. Fields never married and as far as is known had few activities outside of his professional work in research and administration. He seems to have been very sociable and throughout his career enjoyed travelling and conferring with colleagues in the United States and Europe.

An important event in Fields' career was his organization of the International Mathematical Congress that was held in Toronto in 1924. The congress was supposed to take place in the United States, but planning bogged down over the refusal of the French to allow mathematicians from the Central Powers (Germany and Austria) into the International Mathematical Union (founded in 1920) or to be represented at its congresses. The decision to hold the congress in Canada was a compromise prompted by American reluctance to follow through on their original agreement and by Fields' willingness to act as an alternate organizer. Although Fields was himself a committed internationalist, there was sympathy for the French position in Canada. The country had a substantial French population and had suffered much greater losses (in relation to its population) than the United States in the war. The congress was held in Toronto without the participation of mathematicians from Germany and Austria. Fields oversaw the preparation and publication in 1928 of an impressive two-volume collection of papers presented at the congress.

Riehm and Hoffman devote relatively little attention to Fields' mathematics. The abstract character of his work, its remoteness from applications, reflected the prevailing tenor of advanced mathematics of the period. It was somewhat at odds with public positions taken by Fields, who emphasized the utility of science and mathematics and their usefulness in industry in his appeals for government support of research. This contrast is also apparent in his organization of the 1924 congress, where papers on pure mathematics were presented side by side with a range of topics in engineering, physics and economics. In his address to the congress Fields proclaimed that the congress brought together 'the mathematician whose occupation it is to spin fine webs and elaborate beautiful configurations in the realm of the subjective and the applied man who takes all the risk of assuming that over against the subjective network presented by the mathematician there is something corresponding to the external universe' (p. 148).

The events for which Fields is remembered occurred during the last ten years of his career. The initiative to establish a medal came very late in his life, just two years before he died. There were various prizes and awards for mathematics given by national academies of science, but no honour that was truly international in character. Following the 1924 congress Fields continued to be concerned about what he called the 'rift' between mathematicians of Germany and those of France and Britain. His conception of the medal was that it would be international and bear no indication of country or institution. Fields died in 1932, but the administration and awarding of the modestly endowed medal became the responsibility of the International Mathematical Union, a body that was re-established and made international in fact as well as in name following the Second World War. Fields stated that the award was to honour achievement and to encourage further research on the part of the recipient and others. It is interesting to note that in all of the original documents there is no mention of the age restriction that became such a distinctive feature of the award.

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