



Thomas Muir: 'Lad O' Pairs'. The Life and Work of Sir Thomas Muir (1844–1934), Mathematician and Cape Colonial Educationist

by Peter Elliott

Reviewed by Christian Krattenthaler



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The Life and Work of Sir Thomas Muir (1844–1934),
Mathematician and Cape Colonial Educationist

Peter Elliott

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Sir Thomas Muir (1844–1934) was a renowned mathematician of his time. His research focused on the theory of determinants, a fashionable research topic in the late nineteenth and early twentieth centuries. Muir dedicated himself particularly to identities for “compound determinants,” that is, determinants of matrices whose entries are themselves determinants. Although several such identities carry his name, Muir’s most outstanding achievement in mathematics is certainly his five-volume treatise consisting of *The Theory of Determinants in the Historical Order of Development, Parts I–IV*, and *Contributions to the History of Determinants 1900–1920*. Together, these five volumes survey essentially all the writings on determinants from the beginnings by Leibniz in 1693 to works written only ten years before the publication year of the last volume.

Now, one might think that such an endeavor, while commendable at the time, is completely obsolete today, given our myriad digital resources. This, however, is not quite so. Anyone who has ever tried to look for something particular in the literature knows—regardless of the integration of the *Jahrbuch der Mathematik* in zbMath and MathSciNet—that such a search becomes the more laborious the farther we reach back in time and, in particular, if we search for something before 1900. Muir, in his treatise, did not content himself with just setting up a list of works. For each one, he briefly described the contents, put them in relation to other works of the era, and finally classified them according to a cleverly devised thematic scheme of his own invention. Indeed, it is astonishing how effective Muir’s classification scheme is, how quickly one finds what one needs (if there was a contribution during the time covered by the treatise), and how informative Muir’s synopsis is.

However, Muir did mathematics only “on the side.” He was born in Stonebyres, Lanarkshire, Scotland, in 1844 and, after public school, studied mathematics and physics at Glasgow University. After graduation, he held short-term positions as tutor at St. Andrews and as an assistant at Glasgow University before serving for eighteen years as mathematical and science master of the High School of Glasgow, the oldest and foremost school in Scotland. In 1892, with his wife in ill health owing especially to the rough Scottish climate, he looked for a position in a place with a milder climate. A passionate teacher with firm and pronounced ideas about what an efficient education system should be, he successfully applied for the vacant post of Superintendent-General of Education in the Cape Colony (under British rule) and moved with his family to Cape Town. Retiring after twenty-three years, he remained in South Africa, where he died in 1934.

Sir Thomas Muir was a remarkable man, a “lad o’ pairs.” According to the explanation given on the inside cover (quoting from the *Britannia Scots Dictionary*) and a complementary internet search by the reviewer, “lad o’ pairs” refers to an ideal encouraged by the Scottish educational system of the nineteenth century: a boy, in particular one from a humble background, who is extremely talented and promising, broad in knowledge, and at the same time

practical. Indeed, Thomas Muir was a universally educated man, with interests ranging from mathematics and physics to languages and music; he took harmony and composition classes as a student. According to witnesses, he was above all an outstanding scholar and teacher.

The present book offers a biography of Sir Thomas Muir, but it is also much more. The author, Peter Elliott, is a great-grandson of Muir's who grew up in South Africa, studied law at the University of Cambridge, and subsequently pursued a legal career in England. A lifelong interest in history drew him to biography. He presents Muir's life and work in the context of his time, acquainting the reader with the circumstances in Scotland in the late nineteenth century and with the situation in the Cape Colony around the turn of the twentieth, both with particular emphasis on the school systems. He provides background information on the ideas and (political) movements that were relevant and influential, and he also comments on Muir's movements and actions, not shying away from critical assessments informed by modern-day sensibilities. The times were indeed turbulent: the language conflict between English and Afrikaans, the Anglo-Boer War, the subsequently emerging Union of South Africa, the beginnings of apartheid—all of these developments occurred during Muir's tenure as Superintendent-General of Education and obviously had implications for Muir's actions and his room to maneuver.

Looking back into the past lets us contemplate comparisons with and conclusions for our own times. For example, Muir tried to camouflage his humble background by “promoting” (in the marriage register) his father, a wagon greaser in a railway company, to a “railway superintendent.” Today, we are proud of having moved our way up from working class to middle or upper class; at that time, this was apparently a defect in a CV. Timeless and forever valid is Muir's statement that “the highest kind of teaching is that which kindles in the student a spark of enthusiasm for the subject, and awakens a longing to know more and explore for himself” (p. 12). As described in the book, Muir initiated and implemented an extensive process of reforms (which, however, largely concentrated on the white population). These continue to have implications to this day, particularly his school-building program.

The book also offers considerable complementary material. For example, the author has a rich archive of photographs and other images, which are used, together with material from other sources, as illustrations in the book. (The numerous caricatures are particularly delightful.) Several pages are dedicated to the “private” Sir Thomas Muir, in particular his cultural interests, such as literature and music.¹ Furthermore, there are sections on Muir's family and children, with a family tree included.

As a bonus, the author has included six diaries that Muir kept during the six tours that he undertook in the years 1909–1912 as Superintendent-General in the Cape Colony. Reading them, one is struck by how full a schedule he kept, how consistently he used gaps in the schedule to do mathematics, and how much he enjoyed, especially during (long) evening hours, conversations and discussions with people whom he met on his tours.

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Not surprisingly, a section is also dedicated to Muir's mathematics. After a brief report on his scientific papers and on *The Theory of Determinants in the Historical Order of Development*, the author, drawing on published sources as well as on personal correspondence, moderates a discussion in print on how the role played by determinants in research mathematics has evolved over time, the significance of determinants today, and the permanent value of Muir's treatise. As a mathematician who frequently uses and investigates determinants in his publications, this reviewer feels obliged to object to some of the conclusions that Elliott draws in this regard.² It is certainly true that the significance of determinants is not the same today as it was in Muir's time. Undoubtedly, many applications of determinants (in solving linear equations, for example) have been replaced in practice by much more efficient numerical algorithms that can be run on computers. Thus, the quotation in the book that “today determinants are of theoretical more than practical interest” (p. 69; quoted from *Linear Algebra* by David Poole) is entirely correct. However, mathematics—including numerical and applied mathematics—requires theory (when, for example, one wants rigorously to establish approximation bounds for numerical algorithms). Consequently, since determinants are ubiquitous in linear algebra, and since linear algebra is ubiquitous in (almost) all research directions of mathematics

¹Although discussed elsewhere in the book, mathematics was likely also a part of culture for Sir Thomas Muir.

²I certainly do not blame the author, though. He is a non-mathematician, who quite obviously looked into many sources, and even contacted several research mathematicians, in order to get information on these issues. The conclusions he presents reflect, probably, the opinions of a majority of research mathematicians. This does not mean, however, that the corresponding assertions are correct. Rather, it speaks to a certain narrow-mindedness of many specialists nowadays who do not even try to see the bigger picture.

(but also other sciences such as mathematical physics and theoretical computer science), determinants are simply and unavoidably there. The same is true in today's research-level mathematics. Thus, the conclusion that "contemporary mathematicians are no longer particularly interested in determinants and certainly would no longer contemplate doing research on them" (p. 70) does not withstand critical reflection. Of course, the questions posed around 1900 are not the same as those posed today, and it is sometimes new objects that arise from (classical) determinants that are investigated (such as Fredholm determinants). As a matter of fact, in 2006 one of the Fields Medals was awarded to Andrei Okounkov for, among other things, work on certain combinatorial models of probability theory and statistical physics that can be described as "determinantal point processes."

To summarize this discussion, the reviewer fully subscribes to another quotation in the book (by the great-great-granddaughter of Muir and professor of mathematics at the University of Virginia, Jennifer Morse):

It is difficult to emphasize properly to the non-expert just how important and beautiful determinants are in contemporary areas of mathematics and physics, in which the determinant is widely used. It is used as the very definition of fundamental objects in research, and

the properties of determinants, reflected in Muir's volumes, provide essential tools for extracting key information about them (p. 70).

The extreme usefulness of Muir's volumes has already been described. That they are not used as much nowadays as they should be is not his fault; it falls back on those modern scholars who neglect this wonderful resource. Undertaking the writing of such an all-encompassing survey is (almost) without parallel in mathematical history. (The only exception of which the reviewer is aware is Leonard Eugene Dickson's *History of the Theory of Numbers* in three volumes from the 1920s.) We wish that there were more compendia in the vein of "Theory of . . . in the Historical Order of Development," but we are at the same time (sadly) aware that this wish will (probably) not materialize.

As should have become clear by now, this is not a standard biography, but rather a portrait of the teacher and educationist, scientist, philanthropist, and human Sir Thomas Muir. Drafted and written with great care and love (as well as with love for detail), it seduces the reader to undertake a journey into a past but exciting period of history: the transition from the nineteenth to the twentieth century, with all of its disruptions and repercussions that continue to affect us to this day.

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