

Sounds of Canons at Our Gates: Post-Modernism Comes to Mathematics Education

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In a conversation with a classicist colleague, the Cambridge number theorist G. H. Hardy once noted that from his perspective while the Romans had clearly been dead for millennia, the Greeks were rather like fellows from another college whom one just didn't happen to meet very often. Given that he expressed these sentiments close to a century ago, it is rather surprising to note how 'Hardyish' the mathematical world has remained at its core. Taking two recent examples, one need only think of the much-heralded, 'shoulders of giants' triumph of Andrew Wiles over the long-standing Fermat conjecture and the strangely Pythagorean life of Paul Erdős (given very accessible treatments, respectively, by Singh (1997) and Hoffman (1998)). From the viewpoint of many other disciplines, this continuing commitment to classical roots seems almost quaint, as the past two decades have seen extensive and often bitter debates leading, in some cases, to nearly complete capitulation on the part of scholars holding 'traditional' perspectives in several of the disciplines in the social sciences and humanities.

Many of the 'Visigoths' in this scenario have rallied under the banner of 'post-modernism'. Several forests and much magnetism have been sacrificed to the consideration of just what this term entails, but agreement seems hard to find. At a fundamental level, there is a rejection of orthodox conceptions of logic, linearity, value and hierarchy as they have been applied in literary, political, historical and sociological studies. The generators of the traditional 'English' curriculum, for instance, have, in the 'canon' wars at institutions like Stanford University, been subjected to tests of hue, penility and vitality and found to be all-too-largely pale, male and considerably-less-than-hale (hence the 'dead white male' descriptor).

Collage and pastiche have become accepted forms of presentation not just in the visual and plastic arts, but also in films and novels. The puerile and the pop have become as much grist for the academic mill as the abstruse and the esoteric. Subgroups emerge; linguistic and historical grit generates the pearls of post-structuralism and post-colonialism. Rationality wanes, deconstruction reigns, relativism rules. Yet again, as Marx had it: 'all that is solid melts into the air'.

The intellectual energy behind post-modernism has largely been French and German. The francophone 'front four' of Foucault, Derrida, Baudrillard and Lyotard have, in a barrage of baffling, cryptic, playful and frustrating texts provided a foundation, of sorts, for the post-modern

perspective. Working in the shadows of Heidegger and Nietzsche, the somewhat more sober Rhine-side scholars like Gadamer, Habermas and Schutze have presented us with interpretations of hermeneutic and critical theory. Deference is dead: long live 'differe(or a)nice'!

In the kingdom of science, where logic, linearity and hierarchy are titular gods of very long standing, little attention has been paid to the canon wars. This is behaviour consistent with the accepted practice of aristocrats. From time to time, reports of skirmishes at the frontier (in this case, among the philosophy of science hill-tribes) filter back to the laboratory palaces. Then, in 1996, a young and well-read physicist engineered a prank which catapulted science and post-modernism to the front pages of many journals. Alan Sokal, of New York University, submitted a paper, 'Transgressing the boundaries: toward a transformative hermeneutics of quantum gravity' to the fashionable journal, *Social Text*. There were, briefly, signs of satisfaction in post-modern ranks with this clear signal of advancing influence. Once published, Sokal revealed in another journal that his paper was naught but meta-twaddle. Much discussion; Nobellists pontificate, philosophers equivocate; the ethics of it all, *quelle scandale*. [1] In the far corner of the castle, the dowager empress, mathematics, seems restless.

Meanwhile, in the developing nation-state of mathematics education, some of the taller citizens have taken note of smoke coming from the language and society mountains across their border. And while their most comprehensive documents from the early and middle parts of the decade (Grouws, 1992 and Bishop *et al*, 1996) mention things post-modern only in the briefest of passes, it has been rumoured that some of the more adventurous young have crossed the river and embarked on major scouting expeditions.

Enough. The form, or lack thereof, especially for a novice, is quite intoxicating. But properly-reared Canadian folk know that the siren of self-indulgence leads most often to excess and regret, and hence with the merest flicker of disappointment at scuttling the possibility of "Gullible's Travels", we choose the Lewis Carroll-like wormhole that spins us out of the land of pomo and back to *terra* more-or-less *firma*, where not everything goes.

The three books in question that form the focus of this essay review are significant and substantial attempts to broaden and deepen the nature of discourse about, and activities in, the field of mathematics education. These publications of Brown, Dowling and Davis [2] share many attributes; there are significant differences between and

among them as well. [3] They are all ambitious. All three try to extend, or to change, the foundations of mathematics education by viewing the field from some aspect or aspects of a post-modern perspective. The focus of attention is, in each of these works, basically linguistic. They are all, to a greater or lesser degree, personal narratives. They span, not always easily, the considerable distance between day-to-day classroom activities and texts, and some exceptionally difficult contemporary intellectual terrain.

Tony Brown makes the deepest foray into new territory. The eight chapters of *Mathematics Education and Language* are divided into four sections: Experiencing mathematics, The classroom environment, The teacher's perspective and Conclusion. The first part of this book, comprised of a 'Short review of recent research', and Chapters One and Two entitled 'Hermeneutics and mathematics education' and 'The production of mathematical meaning: a post-structuralist perspective' respectively, is particularly rough going. In some cases, this is somewhat outside Brown's control as the passages he cites from post-modern thinkers do little to clarify his claims. Consider, for instance, this passage (p. 58) which begins the section in Chapter Two entitled, 'Post-structuralism, education and mathematics'.

Post-structuralism permits a breaking free from tradition in a multiple "play" in language. Meaning is to be found in the "textuality"; in the play of different accounts offered. For example, Barthes' notion of teaching is akin to a conversation where the "correcting and improving movement of speech is the wavering of a flow of words" (Barthes, 1977, p. 191). There is no delivery and no receipt but rather the learning space is a discussion where "no one, neither teacher nor students, would ever be in his final place" (*op cit.*, p. 205).

For this reader at least, "the wavering of a flow of words" gets high marks for poetic imagery and does relatively poorly as an aide to comprehension. Nor is the funereal picture of teacher and students occupying some 'final place' one which meshes well with most conceptions of the educational enterprise. In other passages, the author would seem to have to take full responsibility for some rather strange phrasings. The claim, for instance, that: "Knowing occurs in an environment full of historical leftovers" (p. 48), brought nothing so much to mind as midnight mischief in a mouldy refrigerator. On page 64, we find:

The signifier has a holding effect on the signified resulting in a stable notation being associated with a conceptualised phenomena (*sic*), subject to contextual and chronological changes.

Overall, one has the sense that Brown has not been served particularly well by his sources, his editors or his production team. Some Kluwer publications are models of technical quality; the aforementioned Handbook (Bishop *et al.*, 1996) among them. This is, and it is unfortunate for several reasons, not least being the cost of the publications in the Mathematics Education Library, not the case with *Mathematics Education and Language*.

Having struggled to set his stage in the first few chapters, Brown turns to a consideration of the insights that these new perspectives provide for individuals trying to understand the multiple dimensions of mathematics classrooms. In doing this, he draws heavily on his own previous research and on the work of John Mason. The insights provided in these pages go a long way toward validating the efforts required to engage with the first part of the book. In his concluding chapter, Brown brings his focus around to the challenges facing contemporary teachers, many of which are moral:

In the current world-wide climate of rapid economic restructuring, choices for teachers are not clear. (p. 237)

His claim, very close to the end of the book, that:

in our "post-modern" age, our words are more sturdy than the things they describe but none of these ways of talking exist for very long either and often become invalid before they become familiar (p. 242)

is not likely to be totally convincing to a reader finishing her or his first mathematics education text with a post-modern perspective. That it is more likely to be considered as a possible question for dialogue (wavering words?) is a tribute to the author.

Paul Dowling's book *The Sociology of Mathematics Education: Mathematical Myths/Pedagogic Texts* is somewhat less eclectic in its range of sources and concerns than is Brown's text. This is by no means to suggest that it is modest in either scope or tone. Quite the opposite is true. There is, in fact, something verging on the oxymoronic in a text which is based on a number of fundamental post-modern ideas but which identifies itself with utter self-assurance as *The Sociology of Mathematics Education. Not A Sociology of ...*, nor *Aspects of a Sociology of ...*, but, straight-up, in your face, this is the way it is, take it or leave it.

Nor can it be said that Dowling is terse. The book's twelve chapters are entitled: Mathematical myths; Juggling pots and texts; Sociology, education and the production of 'ability'; The analysis of school texts: some empirical antecedents; Towards a language of description: some theoretical antecedents; Constructive description and social activity theory, An introduction to the empirical text; The textualizing of algebra; Genres of production; Setting and the public domain, Interpellating the teacher; Disturbing and re-establishing equilibrium. Each of these chapters is composed of a number of sections with titles like: 'The development of the sociocultural modality as an equilibrating hypersystem'.

Early in his first chapter, Dowling identifies a sociology as a:

theoretical space [] concerned with patterns of relationships between individuals and groups and the production and reproduction of these relationships in cultural practices and in action. (p. 1)

He goes on to note that his principal aim in the book is to introduce a 'language of description' (one called 'social activity theory') to enable the analysis of empirical data. Eight lines from the end of the Dowling book we find the following sentence.

Regrettably, lucidity is of secondary importance, from this point of view. (p. 305)

Suffering rather badly from sociologese by that point, I was tempted to feel that this statement should be stamped in large letters on the cover of this text. Dowling takes a considerably narrower slice of the post-modern *oeuvre* to explicate than Brown does, but despite this he manages to be even more obfuscatory than his compatriot. Not all the credit for this can be given to Foucault. Take, for example, this paragraph from the twelfth and final chapter:

My analysis of the SMP 11-16 texts in Chapters 8-11 constructed school mathematics as an activity through its (re) production by the positioning and distributing strategies which comprise these texts-as-texts. In particular, I illustrated how the Y and G series of books constructed a hierarchy of reader voices through the distribution of the myths of reference and of participation. As I established in Chapter 1 and in the subsequent textual analysis, the myth of reference must constitute the sociocultural as a divided space. This enables its prioritized practices – its esoteric domain – to appear to refer to practices other than themselves. These practices are recontextualized and constituted by the gaze of the activity as its public domain. What the myth achieves is the concealing of the productivity of social activity in constituting its esoteric domain as very substantially self-referential. This is to say that the esoteric domain refers to the practices of other activities only as a system of exchange values which therefore simulates its referents. It is the constructive nature of this simulation that is concealed by the myth of reference (pp. 292-293)

To the extent that the passage above is not atypical of the style of argument through much of *The Sociology of Mathematics Education*, one suspects that there will be many readers who will quietly abandon ship part-way through this book and move on to more conventional sources of insight. A dutiful reviewer does not have this option and having persevered, I confess, after the fact, to some pleasure at having stayed the course until the sections where Dowling brings his theoretical armour to bear on a prominent series of U.K. school texts. Even a sketchy grasp of the intellectual framework for his critique is sufficient for a reader to gain much from this powerful and thorough deconstruction of the ways in which ideas about class and power are embedded in these books.

Brent Davis's *Teaching Mathematics: Toward a Sound Alternative* is based on research he carried out during graduate study at the University of Alberta. Forewarned of this and also of the fact that the major research tradition he draws on is that of hermeneutics, one might not consider oneself unduly pessimistic to be braced, once again, for very tough going. If so, one is in for a most pleasant surprise. This is a gem of a book in a number of ways. Rich, provocative and superbly written, it reveals new depths with each rereading. Central to Davis's theme – as subtly indicated in his subtitle – is a shift from the visual to the auditory.

In his Introduction, 'Setting the tone', he writes:

I do not strive to resolve the current tensions, but to explore alternatives to the systems of thought on which they are founded. In this project, the notion of listening is used both as a starting place for the inquiry and as a sort of collecting point for the various strands of thought that challenge our modern ways of seeing things. Listening, I argue, offers a more generous, more compassionate, more encompassing alternative to the divisiveness and violence of watching; whereas we steal a glance and take a look, we lend an ear and give a listen (p. xxvi)

There are many factors which contribute to the coherence of this text. Two of the central ones have to do with the book's foundation and with its structure. In a sense, Davis has been less of a pioneer than Brown or Dowling. His continental sources are numerous and substantial, but he has had the advantage of going part of the way in the enactivist tracks so carefully laid down by Tom Kieren and his colleagues over a period of many years.

With respect to structure, *Teaching Mathematics* could not be less post-modern; it is saturated with order, logic and hierarchy and much of its power comes from the carefully planned connections in the framework: here, commensurability is all. A glimpse of the book's architecture can be grasped (stolen?) from its Contents page. Each of five chapters is subdivided into three sections. The chapter headings are: Close your eyes and listen – conceptual underpinnings; An ear to the ground – the subject matter; Stood on one's ear – the educational endeavor; All ears – cognition; Playing it by ear – teaching. Section titles include: Enactivism, Hermeneutics, Listening, Mathematics, Artistry – the place of the teacher, Knowing, Play, Mathematics teaching as listening.

In a feature of this book that is consistent with post-modern conventions, Davis waits until the last page to be explicit about his motivation for carrying out this work:

I left the public school mathematics classroom because I could not abide what I was doing. Although I lacked a means of articulating the source of my disease, I had reached a point that I could no longer ignore it. I think that I have now found a language to express these troubling intuitions, a language to support alternative patterns of acting [. . .] In the end this research was worth the effort not if it has convinced everyone to listen to reason, but if it has provided someone with a reason to listen (p. 281)

And now, in true classical form, we come to the end and return to the beginning. Having heard bits of these traveller's tales, what might one conclude? The summaries have been brief, the reports dense: perhaps a time more for impressions than convictions. First, a view which may well not be very warmly received by our travellers. These seem, despite all the implicit messages to the contrary in the texts themselves, to be highly 'masculine' exercises. This is because at their centres they are, fundamentally, about ritual, terrain, ego and conflict.

The ritualistic elements are perhaps easiest to isolate. Beneath the slender camouflage generated by copy-editor's pens, glossy covers, congratulatory introductions and back-cover blurbs, most readers will perceive the hulking architecture of doctoral dissertations. Hence, the carefully-crafted rationale, the self-conscious positioning, the sudden shift to the real world of children and teachers, the dampened claims, the cautious recommendations for future work. The terrain, ego and conflict factors are contiguous with, and flow out of, the ritualistic aspects of doctoral work. One vision of research is that of pushing back frontiers – in itself a very territorial image. But in forging into new territory, one is simultaneously positioning oneself to challenge the work of one's parental surrogate, the doctoral supervisor. Oedipus rocks? (rules? lives?)

The best and the brightest set out to define themselves relative to the unknown, but intriguing 'other'. This is a time-honoured exercise, not only in academic circles, but also in cultures ranging from that of Australian aboriginal peoples (the 'walkabout') to that of the eighteenth-century English aristocrat ('The Grand Tour'). Brown, Dowling and Davis's messages on returning from scholarly visits to their respective, and related, 'elsewhere communities' [4], is not so far removed from the classic voyager's 'In my search for the grail I have been far and seen many wonderous things – let me tell you of marvels unimagined in our philosophies'. The challenge on hearing claims like these is somehow to separate the flawed and fallacious from the enlightening and evocative.

Another factor which supports the military/explorer image of these books is that they, or at least Brown's and Dowling's, appear as new entries in two of the most prominent fleets of mathematics education publications, Kluwer's *Mathematics Education Library* and Falmer's *Studies in Mathematics Education*. The Dutch (Kluwer's) presence in these waters is one of long standing. The tradition is that of depth and quality, but there are signs, as noted above, of sloppiness creeping in. The English upstart – good yeoman stock reinforced with a few professional soldiers of fortune – while smaller in number is second to none in its imperial ambitions.

Davis's book is the exception in several of these categorisations, and for the most part this is to his (our) advantage. Unburdened by the boredom induced by the series production line, published by a smaller publishing house (Garland), his text is sleeker and more focused than either of the other two. It is not so uncommon in Britain, but very unusual in North America, to have a doctorate awarded on the basis of a collection of published writings of the candidate. One thing this can result in is acceptance of publishing standards that can differ from those of the conventional academic thesis.

Sadly, the reverse is far more common, namely subsequent publication of dissertations that have not been sufficiently transformed into something other, which can make for some very 'lumpy' books if a firm editorial hand is not wielded (Lakatos once accused a Wittgensteinian colleague of having produced an 'unspeakable book object'). Both Brown and Dowling have fallen prey to this hazard to some extent (the Falmer series is currently more than half dissertations in origin). Unshackled from the heritage of the

doctoral hurdle, one senses that there could have been slimmer, more coherent stories told.

In summary, one gem (Davis) and two significant but flawed attempts (Brown and Dowling). Davis can be recommended without hesitation to any intelligent and thoughtful observer of the mathematics education enterprise, whether they be student, parent or professor. Brown and Dowling both point in the direction of interesting frameworks and phenomena. Whether they will come to be regarded as more than this remains to be seen. Another unresolved but intriguing question is that of the relationship of mathematics to post-modernism. All three authors contribute partial insights, but the challenge of a comprehensive response remains.

Notes

- [1] *L'affaire Social Text* continues apace with numerous contributions (many of the 'Pomolotov cocktail' genre) in journals representing a broad range of political inclination. Sokal's book *Impostures Intellectuelles*, co-authored by Belgian physicist Jean Bricmont, was published in France in late 1997, in the United Kingdom as *Intellectual Impostures* in mid-1998 and in North America in late 1998 as *Fashionable Nonsense*. Surfers with a taste for the vitriolic and considerable free time can gorge themselves at Sokal's web site <http://www.physics.nyu.edu/faculty/sokal.html>
- [2] The three books are:

Brown, I. (1997) *Mathematics Education and Language: Interpreting Hermeneutics and Post-Structuralism*, Dordrecht, Kluwer, 270 pp. (Volume 20 in the Mathematics Education Library series)

Dowling, P. (1998) *The Sociology of Mathematics Education: Mathematical Myths/Pedagogic Texts*, London, Falmer, 335 pp. (Volume 7 in the Studies in Mathematics Education series)

Davis, B. (1996) *Teaching Mathematics: Toward a Sound Alternative*, New York, NY, Garland, 324 pp.

- [3] Coincidentally, in some sense at least, while I was writing this piece, Davis (1999) had a review of Brown's book published, spelling out from within a shared allegiance to a hermeneutic tradition both their commonalities and a space of differences.

- [4] In examining this phenomenon in the 1997 Massey Lectures for the Canadian Broadcasting Corporation, the literary critic Hugh Kenner (1998) coined the phrase 'The elsewhere community', and speculated about the disembodied electronic journeys available to today's citizen via the Internet.

References

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- Singh, S. (1997) *Fermat's Enigma. the Epic Quest to Solve the World's Greatest Mathematical Problem*, Toronto, ON, Viking. (Singh's book grew out of an award-winning documentary film he co-produced for the BBC's Horizon programme. It was first shown in North America under the title 'The Proof' on the Public Broadcasting Service's *Nova* series in the fall of 1997.)