

Mathematicians and Mathematics Education

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I am both honoured and pleased to speak to you today, on behalf of the Australian Association of Mathematics Teachers, as a contributor to a program recognising the diversity and value of Bernhard Neumann's 90 remarkable years. For the honour, I thank the AAMT and the program organisers for choosing to invite me, but for the pleasure I thank Bernhard for giving us this occasion for celebration.

Why, one may ask, is the AAMT favoured by placing its representative in the opening session of this meeting? The simple answer is that its establishment as an Association was crucially dependent upon the vision, energy and activity of Bernhard and a small number of other key players. Let me briefly review the relevant history, as this is also germane to the title I have chosen.

H.S. Carslaw, soon after taking up the chair of Mathematics at Sydney University in 1903, interested himself in educational issues. Over his 30-odd years as Professor, Carslaw successfully combined the three functions of research, lecturing, and interest in developments in school mathematics. I quote from the History of the University of Sydney, Vol 1 : " With Frances Anderson, Carslaw had also been very much involved with the early reform efforts in secondary education. He was not impressed by the standard of mathematics and mathematical teaching in NSW schools, which he found inferior to Scottish standards. In an effort to improve them, he set about writing textbooks. In addition, he was appointed Chief Examiner in Mathematics, a position he held until his retirement and one which gave him a powerful position on the syllabus committee."

So Carslaw "... advanced the reform of the teaching of mathematics in NSW while at the same time advancing the tertiary study of mathematics by virtue of his own research contribution."

[Note that Carslaw recognised the importance of holding positions which could influence policy!]

A particular result of Carslaw's activity was the founding, in 1910, of the NSW Branch of the Mathematical Association (of Great Britain), the first precursor of the AAMT. This Association described itself as "...an Association of Teachers and Students of Elementary Mathematics".

Carslaw's stature and expressed interests in mathematics and its teaching surely encouraged others in Australia to practise this broad view towards the work and responsibilities of professional academic mathematicians, and I mention only one, T.M. Cherry, and his decisive influence in Victoria and in relation to the Mathematical Association of Victoria, in support of this claim.

In 1945, the NSW Branch began publishing its own journal, *The Australian Mathematics Teacher*, to complement the longstanding British *Mathematical Gazette*. The editorial to its first issue described it as: "... a journal to serve as a medium both for the exchange of ideas and experiences in the teaching of elementary mathematics, and for the instruction of teachers in trends and developments in mathematical education at home and abroad ...".

By the time of Bernhard's arrival at the ANU in 1962, there were a number of similar organisations around Australia addressing the teaching of mathematics, and in that year, the Australian Mathematical Society sponsored a national seminar on mathematics education. Among the many positive outcomes of this meeting was a decision in principle to form a national association. Realisation of this took a further four years, and was a non-linear process. For example, early in 1965 the *AMT* announced an inaugural Conference of the Australian Association of Mathematics Teachers in these terms: "The Mathematical Association of Victoria has generously undertaken to organise and conduct a conference for teachers of Mathematics on behalf of the Australian Association of Mathematics Teachers, to be held in 1966". The Conference theme was Mathematical Unity, it was to be held as a residential conference at Monash University, 29 August - 2nd September, and its program would include plenaries, sections on Primary, Secondary and Tertiary teaching, small discussion groups, excursions and displays of texts and teaching aids.

Behind the scenes, Bernhard and others vigorously canvassed the merits of a national body, sufficiently effectively that, when the MAV late in 1965 wrote to all Branches, inviting them to send delegates to meet as an 'Interim Council of AAMT, whose duty would be to found the AAMT, finalize its constitution and to select its officials', the response was immediate and complete. In consequence, a meeting of delegates from every Branch, held on 29 January 1966, founded on that day the AAMT as a federation of affiliated associations, whose aims are to "promote mathematical education at all levels, to encourage and promote research in the teaching of mathematics, to publish and distribute a journal, to hold conferences, to speak on national matters related to education in mathematics and to pursue such other activities as the Council of the Association shall see fit".

The announcement in the first issue of the *AMT* for 1966, from which this quotation is taken, then continued: "Every reader of this journal will be delighted to know that Professor B.H. Neumann ... has accepted the (Founding) Presidency. Under his inspiring leadership and with the help he can give because of his own strategic position, the success of the Association is assured." [Note again the attention paid to both personal and positional eminence!] Also in 1966, we learn that AAMT invited MANSW to organise the next Conference in 1968, and that MANSW resolved to transfer the publication of the *AMT* to the AAMT as from the first issue in 1967.

Thus, at the end of 1966, we see the national association created with a highly regarded and well-connected mathematician and teacher of mathematics as its inaugural President, we have the establishment of the biennial conference as a key national activity, and we also see in place the linking of an existing respected journal to this new body. This was, and remains, a remarkable achievement and a testimony to the collective goodwill and energies of those whose efforts lay behind it.

To complete the historical sketch, I note that the *AMT* in 1969 published notice of a decision of the ICMI to hold an International Conference in Mathematical Education in Lyon in that year. That was the first of the continuing ICMEs, held every 4 years. It was at the Karlsruhe ICME in 1976, when Bernhard was a member of ICMI, that the idea of holding such a conference in Australia was informally discussed among the 'AAMT delegates' to the conference and then pursued via Bernhard through the relevant chain of communication. The result was that, after four years of intensive work, a detailed proposal for ICME 5 to be held in Adelaide in 1984 was presented at the 1980 Berkeley ICME and subsequently accepted. The coordinated activity on the part of all national and local mathematics and mathematics education groups over the period 1976-1984, resulting in the successful holding of that Congress in 1984, was enormously productive and stimulating for all involved in it, and showed how much

goodwill and enthusiasm for the promotion of mathematics and its teaching continued to be exercised around the focus of the AAMT.

The interplay of areas of study and activity of disciplines and professions, and among many individuals, that lies behind developments in mathematics and its teaching, as exemplified by my brief historical comment, has in fact characterised our field of study for well over a century. The ways in which Bernhard, through his actions, demonstrated his commitment to this approach may be succinctly expressed in the words of some colleagues I consulted for their recollections of Bernhard during the early days of the AAMT: " He showed that he valued the contributions of teachers as well as those of educators and mathematicians and that he recognised the importance of active, collaborative discussion and work in facilitating developments in mathematics education."

Thinking about this led me to contemplate the work of Ernie Boyer, especially during his term as President of the Carnegie Foundation for the Advancement of Teaching, and in particular as expressed in his famous 1990 Report "Scholarship Reconsidered : Priorities of the Professoriate". On the genesis of this, Boyer wrote in 1995, not long before his death : "I began to reflect on how to define the meaning of scholarship as I had experienced it in various forms over the years—as a graduate student, academic dean, chancellor, and commissioner of education. Eventually, these thoughts led to the publication of *Scholarship Reconsidered*, in which I suggested that the work of the intellectual life included not only the scholarship of discovering knowledge but also the scholarship of integrating knowledge, the scholarship of applying knowledge, and the scholarship of teaching". He concluded these comments by expressing his hope that his Report "will contribute to the current constructive debate about the role of the professoriate,... , and that the full scope of scholarship I observed ... will be truly embraced and that the nation's colleges and universities will give new dignity and new status to the full range of intellectual life."

Boyer's Report continues to provide a basis for discussion and debate, and I note that the type of contribution identified above, where mathematicians are able to utilise their wisdom and knowledge constructively towards the achievement of desirable social and political outcomes in the related field of mathematics education, illustrates a need to complement Boyer's *Scholarships* with a parallel field describing interactions between scholarship and public policy via commitment and extended involvement at a scholarly level in the processes of public decision-making.

Boyer's work has been developed further by the Carnegie Foundation (for example, there is now a follow-up Report available, entitled *Scholarship Assessed*, which responded to requests from the professoriate for means of objectively evaluating performance against the identified scholarships). On the research aspects of the agenda, Lee Shulman, its current President, writing in the most recent issue of *Change* on the topic 'Taking Learning Seriously', asks "What do you need to create in order to take learning so seriously that you take active responsibility for understanding and treating its pathologies as well as enhancing its successes?"

His answer is "you must create a scholarship of teaching to pursue these goals", and, in discussing what this means, notes that "blindness and amnesia are the state of the art in pedagogy"—i.e., that there is no wealth of scholarly literature through which higher educators study examples of teaching and can build upon that work. He writes that "we just don't know what our colleagues before or elsewhere have done—we don't even document and analyze our own efforts."

This judgment, from a Professor of Education at Stanford, says that we are indeed fortunate to be involved in mathematics education, because we can refer to studies of learning that do document and analyse teaching, and know that our colleagues have been active in this field for some years, and that this type of research activity has been stimulated, supported and encouraged by AAMT and MERGA as well as by the AAS and our national research support bodies such as ARC. Moreover, the longstanding associations in the mathematics field linking academic mathematicians and educationists with teachers in all education sections have facilitated the acceptance of this kind of research and development activity as a broadly based, professional responsibility for all concerned.

I emphasise these general features of our work because, when stresses emerge within mathematics education through disparate views being strongly expressed, all of us should retain respect for the considered viewpoints of others, and recognise that the complex tasks of learning and teaching admit no facile, quick fixes, that the learners and the teachers of today are not those of yesteryear, and that the dynamics of social and educational change are not understood well by any of us.

Nevertheless, it will continue to fall upon the mathematicians and mathematics teachers of today to grapple constructively with the conflicting demands of today's social, cultural, educational and political forces in order to try to obtain disciplinary and educational pathways in our field that are both acceptable to the broader community and professionally acceptable and respectable. Meeting this continuing challenge will tax some of our most able and astute colleagues and will require that some willingly devote time and effort into negotiation and discussion within the field and externally.

As an example of likely difficulties one might face, let me draw your attention to two current projects currently engaging the AAMT. One, in collaboration with Monash University and funded by a SPIRT grant, will develop 'national professional standards for excellence in teaching school mathematics', supported by an assessment scheme and protocols for certifying this excellence. A second project will address the use of graphics calculators and their associated algebraic manipulation capabilities. Given the contentious nature of each of these, the planned involvement of colleagues and community members across a wide spectrum of positions will be a necessary but not necessarily sufficient condition upon each project for it to achieve satisfactory outcomes!

Contrary to a widely held public perception, I find mathematicians to be a passionate lot, willing to mix faith, love, hope and beliefs with rational argument and cold facts in defence of their discipline and, by ready extension, in defence of those freedoms which permit and encourage creative and sometimes heretical thought. Such personal attributes don't normally find their way into the testamurs and formal citations of achievement we use to recognise outstanding contributions, and they are indeed absent from the citation accepted from the AAMT Council in 1975 when it resolved to confer the Association's first Honorary Life membership on Bernhard. We, who have shared some of our personal and professional lives with him, know well the man behind this award. Few here today will, I suspect, have shared the personal experience of having to leave one's own country, culture, family and friends in order to preserve one's cherished freedoms.

Bernhard, on behalf of the AAMT, may I offer you a small token in recognition of that experience in your case? It is an original copy of the January 1936, Volume 1, part 1 issue of 'Deutsche Mathematik', with a quotation from the Fuhrer as its frontispiece. In presenting this, with the words "You won, he lost!", I do not wish to trivialise what this means to you.

To accompany this, and in celebration of today, may I also offer you, on behalf of all members of the AAMT, not a 90 year old Aussie red(none has kept as well as you have!), but a representative sample of the excellent 1990 vintage and with it, the congratulations and best wishes from us all on your birthday.

References

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3. 'Scholarship Reconsidered' (Ernest L.Boyer,1990,Carnegie Foundation for the Advancement of Teaching,Princeton)
4. 'Scholarship Assessed' (Glassick,Huber,Maeroff, 1997,Jossey-Bass,San Francisco)
5. Shulman, Lee: 'Taking Learning Seriously', *Change*, July/August 1999, pp11-17.