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## **ON HUMANISTIC MATHEMATICS EDUCATION: A PERSONAL COMING OF AGE?**

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### **INTRODUCING RESONANCE**

It is an established PME custom that the retiring President of the organisation is invited to give one of the plenary papers at the conference that ends his/her term of office. The conference venue for PME31 had been decided before I began my term of office as PME President in 2004, and the theme of the PME31 conference was selected as usual by our conference hosts without influence from PME's International Committee.

This means that outside factors (quite correctly) totally beyond my control have led to my giving this plenary paper in Seoul at a conference with the theme 'School Mathematics for Humanity Education'. I mention this as I have become increasingly aware of some remarkable synchronicities that this situation has created that resonate strongly with several aspects of my involvement over the years in the field of mathematics education.

A welcome PME-linked resonance comes from the fact that I attended my first post-apartheid PME conference in the nearby city of Tsukuba in Japan in 1993 and have not missed a PME conference since then. However, the main resonance takes me back to July 1986 when, for the first time after my appointment to the University of Cape Town, I presented papers at the national mathematics education conference.

Varela, Thompson and Rosch (1991, xv) describe the term 'structure' as a fluid and temporal self, which is formed 'by the combined influence of one's biological constitution and one's history of interaction with the world' (Davis 1996, 9). The enormous influence that this has on the way in which each one of us sees the world is emphasised in the following quotation:

In the enactive approach reality is not a given: it is perceiver-dependent, not because the perceiver 'constructs' it as he or she pleases, but because what counts as a relevant world is inseparable from the structure of the perceiver. (Varela 1999, 13)

So my relevant world of mathematics education is both formed and informed by my history of interaction with the world. In thinking about the topic for my plenary paper, I decided to honour the synchronicities of the occasion by re-entering that time of my life in 1986 and then reflecting on the journey I have taken since then. Having

made this decision, I noticed that July 1986 is exactly 21 years ago. In my country, many youngsters hold 21<sup>st</sup> birthday (or 'coming of age') parties to mark the occasion of their 'becoming adult' and are often presented with the key of the front door of the house as a symbolic recognition of this rite of passage. I will leave it for you to decide at the end of this paper whether you think that I have come of age to a sufficient extent to be given a key!

## **1986 – 21 YEARS AGO**

I had been appointed as the first full-time mathematics educator at the University of Cape Town towards the end of 1982. In 1986, the national congress of the Mathematical Association of South Africa (MASA) took place at the nearby University of Stellenbosch and as a newly appointed colleague from a neighbouring university I was expected to make a contribution to the academic programme of the conference. I submitted two papers for consideration by the review committee and both papers were accepted.

### **Resonance One: Humanity Education**

In many ways, my first paper was a manifesto of planned classroom practice that traced the influences that had informed and formed my teaching practice and beliefs. It dealt with the challenge of introducing pupil-centred activities into schools (Breen 1986a), and it was dominated by a section headed 'Humanising Mathematics Education' in which I outlined the powerful influences that had led me to be interested in this approach. In the first place I drew on the work of Caleb Gattegno (1970, 1974, and 1987) who had emphasized the importance of subordinating Teaching to Learning by stressing the following:

- a deep respect for and acceptance of the capabilities of learners;
- an acknowledgement that in the teacher/student dyad, the learner is central;
- the recognition that it is the learner who must do the learning, and that the teacher's function is to create situations and experiences that focus the learner's attention on the key concepts of the mathematics being presented;
- the discipline to provide the learner with the minimal essentials for understanding to occur, to not 'tell' the learner everything, or almost everything, in the belief that 'telling' fosters learning;
- the further recognition that conversations among and between learners is a valuable tool in a teacher's instructional repertoire;
- the understanding that teaching is subtle work in terms of it being delicate, restrained, and finely grained;
- an appreciation that "only awareness is educable" (Gattegno 1987, p.vii), by which is meant that learners can only acquire knowledge of that of which they are aware.

My plea for the use of learner-centred materials owed a great deal to the work of David Wheeler (1970, 1975) who had stressed the need for humanizing mathematics

education. According to Wheeler (1970, 27) the task of the teacher is to “accept the responsibility of presenting them with meaningful challenges that are:

- not too far beyond their reach
- not so easy as to appear trivial
- not so mechanical as to be soul-killing
- but assuredly capable of exciting them”

In my paper I argued for the foregrounding of the mathematics through the use of activities which offered students an entry into the essence of the mathematical concept to be covered, so that whatever work they then did would inevitably be focused on that core concept (an early constructivist approach). I pointed to Trivett’s warning at the problems that could arise if teaching methods were prioritized at the expense of the mathematics:

I began to see what I had been doing over the previous years: glamorize the mathematics, obscure it, ... to make it attractive and pleasing to the learners. I had dressed up the subject matter and the learning of it with the subtle implication that real mathematics is hard, is dull and is unattainable for the majority of boys and girls and that the best we teachers can therefore do is to sweeten the outward appearance, give extraneous rewards and indulge in entertainment to sweeten the bitter pill. (Trivett 1981, 40).

### **Resonance Two: School Mathematics for Humanity Education**

My second paper was very different and reflected the context in which mathematics education was taking place in South Africa in 1986. The struggle against the apartheid government had moved into the schools in the Western Cape the previous year and many schools were unable to run normal classes for extended periods during the year. Matters came to a head at the end of 1985, when members of the Western Cape Teachers Union refused to administer examinations on the grounds that the current climate meant that learners would be severely disadvantaged by being asked to write examinations on work that had not been covered during the year. In the end examinations had taken place in some schools under armed police presence (Breen 1988).

During 1986, the security police increased the severity of the action taken against students and teachers. One of my mathematics student teachers of the class of 1986, a quiet, socially responsible, liberated and tolerant woman, who was taking a year’s break from school teaching to get her teacher’s diploma, was arrested that year:

On 12 June at 1am she was detained from her home by the police. As I write this it is 30 July. Jane is still in Pollsmoor Prison. Her detention was acknowledged in the newspapers for the first time this week. She has had medical treatment during this time and was returned to prison against medical advice. No reasons have been given for her arrest... (Breen 1986b, 60).

This was the background against which the annual conference of the white-dominated Mathematical Association of South Africa had taken place in 1986. I remember many heated discussion with my Dean before I was convinced that I should participate in

this conference which would almost certainly not address the pressing political and contextual issues of the day. In the end it seems as if I made my own sort of peace at attending this conference by contributing a very different second contribution.

This second paper was titled *Alternative Mathematics Programmes* (Breen 1986c) and signaled my attempt to ensure that mathematics educators attending the conference paid some attention to the broader contested political struggle that was taking place in schools. In particular I focused on the call that was being made for the development of ‘alternative’ subject programmes in schools as I believed that mathematics educators could not stand outside this debate. In the conference paper, I explored the issue of whether mathematics was neutral and culture-free, and how one might begin to construct a non-trivial programme that tackled issues such as a global perspective on the historical development of mathematics, content issues, the use of different contextual examples to challenge dominant realities portrayed in textbooks and classroom teaching methods.

I ended the last section on classroom teaching methods with the view that an emphasis on humanistic mathematics education would ‘provide an exciting basis for teaching in a way that will combat elitism, racism, and sexism as a by-product while focusing attention on the deep structure of mathematics’ (Breen 1986c, 187). This seems a plea for ‘*Humanistic Mathematics Education for a Future Society*’ – a strong resonance for me with the PME31 conference theme of ‘*School Mathematics for Humanity Education*’.

### **Multiple lives?**

In order to demonstrate the way in which dominant societal realities could be challenged through the use of different contextual examples I provided conference participants with a collation of some worksheets that students (including Jane) had completed for an assignment at the start of 1986 (Breen 1986d). Students had been asked to design mathematics worksheets from materials found in the newspapers. Several groups of students decided to base their worksheets on some of the radical anti-apartheid community literature that was being circulated at the time - some of which was banned by the government soon after publication. Reaction to my second conference paper unsurprisingly centred on these worksheets rather than on the main body of the paper, with one respondent describing the worksheets as ‘inflammatory material which fans the flames of revolution’ and expressed his ‘grave reservations about introducing politics into the mathematics classroom’ (De Villiers 1987, 21).

Looking back 21 years later, I can revisit the struggle between the various parallel lives that I was experiencing at the time. In one of these lives, everything was reasonably safe and orderly and I could go about my business of exploring the teaching of classroom mathematics, focusing on content and pedagogy without having to deal with the outside context. In another life, I tried to acknowledge the broader educational school realities and align these with mathematics education debate and practice. In yet another life, I tried to come to terms with the broader

political struggle and rapidly deteriorating context. My various contributions on humanistic mathematics education, alternative mathematics programmes and the alternative mathematics worksheets seem to represent aspects of these various lives.

However, I am now aware that the inclusion of the worksheets in my conference presentation had the inevitable effect of deflecting attention away from the important debate that I wanted to begin about the role of mathematics educators in addressing urgent contextual projects in the greater educational arena. It seems as if I had decided in advance that my linking the current political context to mathematics education at the conference was certain to ruffle feathers, so I might as well go the whole way and make a radical intervention. This would allow others who took up the debate later to appear to be much more reasonable.

### **Developing a New Methodology.**

The very act of writing and presenting these fractured conference contributions forced me to re-think my practice and 1986 became a watershed year in my teaching methodology for pre-service students. It was the last year in which I used a traditional lecture format with an appeal solely to logic and rationality. 1986 was also the last time that I ran my lecture sessions in a formal venue of tiered fixed seating. By the end of 1986, I felt the hopelessness of trying to lay some foundations for debate for a future democratic education system in our country through an appeal to the research literature and personal experience. Many students resisted any attempt to bring the social and political into the teaching of mathematics, saying that they had chosen to teach mathematics precisely because it was politically neutral and they would not have to get involved in the tensions of addressing the larger political context. The enormity of the obstacle of trying to challenge and influence the beliefs and assumptions of the student teachers through reason became starkly evident for the first time and it was clear that I needed to change my strategy entirely.

My fundamental project at that stage was to prepare student teachers for a very different non-racial and democratic education system. In trying to develop a teaching style and methodology which would address the need to prepare teachers for a new society I decided that the core of the problem lay in the fundamental beliefs that were entrenched in each one of us through our lived experiences. The aim of my sessions began to focus on causing what I called at the time cognitive conflict (Breen 1992). In a variety of ways including role play, students were asked to engage with activities and then to reflect on their own actions and responses in community with the rest of the class. Reflective journals had to be completed after each session to record the insights that each student had gained into herself as teacher, learner and mathematician. Central to each activity was the tackling of the subject of mathematics as a human interaction, and my aim was to ensure that the engagement with other's of different opinions would assist in opening up the student to a new range of possibilities.

### **TELLING TALES**

One of the features of what I saw to be humanistic education was a focus on the stories of individual learners. In particular I was influenced by the work of David Kent who had written a series of articles in the 1970's which contained the name of the student in the title (for example, Kent 1978). In fact, I now see a reflection of the paradoxes of the time in 1986 that I used the same technique in entitling my article about political dimensions of mathematics teaching and Jane's detention without charge, *What has happened to Jane?*

In the rest of this section of the paper, I will introduce you to a small selection of the many memorable students who have crossed my path since 1986 and have shared their stories with me along the way.

### **The Context fights back.**

The aim of my post-1986 methodology had been to sensitize students to the variety of challenges that would face them in schools as we moved towards a democratic future in our country. In particular, in accord with my second paper, I wanted them to foreground a humanistic mathematics education approach as articulated in my 1986 papers. It proved to be an unexpectedly difficult challenge for many.

For example, Catriona wrote to me of her dismay at the effect of the school's testing regime on her class. Writing to me as her class were busy writing a test in front of her, she described her battle to control and teach mathematics to this particular bottom set in her privileged school as she struggled with an overlong and overcomplicated syllabus. She wondered how much bleeding these shapes in blue uniforms in front of her were doing as a little more creativity and natural freedom was stamped into conformity each day. She then said words that remain with me vividly even though they were written 20 years ago:

Chris, do you know what really hurts – I realise that over the past year and a half I have been one of the causes of their pain, The odd smile, laugh and sometimes even touch can never make up for the frustration, the worry, the anger (whatever) they must feel. (Breen 1987, 45)

Several years later I decided that it was time to research the effects of this curriculum on the lived realities of the students who had passed through my hands. The results were generally favourable in terms of the educational experience but there were indications in some of the stories that the reality of the teaching situation had claimed several victims amongst those who were attempting to bring changes into the school system (Breen and Millroy 1994).

For example, Thabo left the university all fired up to play a major role in the upliftment of his community. He entered the teaching profession with enthusiasm and showed remarkable staying power in overcoming the lack of teaching aids in the school as well as the challenge of teaching 5 classes of the same year with an average class size of 70. His class motto was 'take risk' and he pushed his students into using group work. He compensated for the extra time taken to introduce these new methods by offering Saturday classes. Thabo soon became extremely popular with the students

and the Headmaster decided to sit in on a lesson to see at first hand what was happening. The Head became excited and earmarked Thabo for accelerated responsibility and promotion. By the end of the next year he was promoted to the position of Head of Department. During the end of year break things started falling apart for Thabo. The other more senior teachers objected to his promotion and agitated in the local community and succeeded in getting Thabo suspended from the school. The Head was subsequently transferred to a new post and only after support from the students was Thabo re-instated to his post but this time it was at a junior level.

### **Assessment and the Psychology of Fear**

Doing mathematics has long been linked to achievement in tests and examinations and the pursuit of marks carries with it all sorts of normative consequences. One of the highlights of a school learner's achievements in mathematics is to win an award in the local Mathematics Olympiad competition. One year at the prize-giving I tried to open up the way in which such a competition focused one's gaze on the competition rather than on the inherent qualities of the subject and the joy of learning (Breen 1990). Trivett (1981) spoke of the way his teaching methods were distracting the learners from the core of the subject being learnt. In a similar way, achievement in tests and the subsequent positioning that it brings to one's position in society creates a barrier between oneself and learning and the subject.

This insidious nature of this positioning became more evident in a piece of research I did a few years ago where student teachers wrote a test to examine their knowledge of the school syllabus (Breen 2004a). Students were asked to predict which of them would achieve the top marks and which of them would do badly. They were quite happy to enter into this artificial game even though they had no evidence other than their class interactions of the past few months. In general the class was somehow able to position each other reasonably accurately. However they were all surprised at the success of Nkosinathi, a quiet Black African student whose silence did not fit into the apparently dominant expectation of extroversion for achievement. More worrying for me was the fact that Nkosinathi also quite clearly did not value his own ability and did not consider that he might feature in the top group of achievers.

The tragic consequences of early failure in mathematics can quite readily be seen in classes of pre-service primary school teachers who are forced to take mathematics as one of their subjects because primary school teachers are required to teach each subject in the curriculum. I have previously described the case of Marissa who was one of those most scarred by her previous experiences in mathematics (Breen 2004b). Initially she could not pass even a basic junior school content test on operations and got headaches or became physically ill whenever she felt under pressure in the mathematics classroom. During the year's mathematics course we battled together to turn her anxiety and sense of failure around and at least get her to pass the year, and were both excited when she eventually passed the course.

Patience suffered similarly as a very weak student in mathematics, but had the added disadvantage of being a music student from a disadvantaged background. She had to work in a local supermarket after hours to earn sufficient money for her studies but her plight was largely ignored by our department. Some lecturers chided her publicly for her poor work but did not provide any assistance or guidance. Her fellow students took up her plight and confronted lecturers with her lived reality and the need to give her proper support. As it happened the last timetabled lecture of the academic year was Mathematics Method. When I arrived for class that day, I could sense an enormous energy in the room as they came to the end of what had been for them a very difficult year – especially as they had stood up together against the staff of the department on behalf of Patience and several other students who were in a similar position. I offered them the opportunity to take the time at the end of my class to bring the year to completion by taking turns to say goodbye and anything they wanted to say. The students and I stood in a circle and held hands and went around taking turns. Each student took this ritual very seriously and showed a powerful grace, compassion and unity in expressing their thanks to each other for their interactions during the year. Patience's turn to speak came at the very end as she was standing next to me. She gasped a few times and then collapsed to the ground with a heart-rending large wail as the frustration of her silenced voice of the year could even now not find an outlet.

### **Teacher Research**

In 2000 I introduced a new taught Masters module called 'Re-searching Teaching' which took its much of its theoretical framework from enactivism and included in its methodological tools Mason's Discipline of Noticing (see Breen 2002). The emphasis in the course has been for students to become more aware of their practice in the moment and to lay their own authentic path while walking. Several students took to this approach and wanted to continue these ideas in their research dissertations. In different ways, Neil, Agatha and Kendal insisted on following their own paths and inserted their own interests and histories into their research with unusual yet successful results. In a paper presented at the 2005 conference of Complexity Science and Educational Research (CSER) (Breen 2005a), I outlined these different paths and showed how these different paths had brought them into different degrees of opposition with my academic colleagues who had taken on the task of being the traditional gatekeepers of research. In the CSER paper I described a series of nine different dilemmas that arose along the way for me as supervisor as I was placed in the position of having to mediate their continued progress through the lens of traditional practice, which was often framed in the guise of official policy. At each step I found myself having to face the probability that what I considered to be the appropriate and authentic course of action would bring me into conflict with my colleagues in the department.

### **LIGHT AND SHADOW**



We notice that when sunlight hits the body, the body turns, bright, but it throws a shadow, which is dark. The brighter the light, the darker the shadow. Each of us has some part of our personality that is hidden from us. Parents, and teachers in general, urge us to develop the light side of the personality — move into well-lit subjects such as mathematics and geometry — and to become successful. (Bly 1988, 7)

I used the above quote in an article I wrote for a special edition of *For the Learning of Mathematics* (FLM) which focused on psychoanalytic and therapeutic approaches to mathematics education. It is interesting to remember that David Wheeler played a significant role in the creation of the journal and that the journal's name draws inspiration from Gattegno's entreaty to subordinate teaching to learning.

In this FLM article (Breen 1993), I tried to respond to an accusation from a Jungian psychologist that Plato's emphasis on Logic ... encourages separateness, class war and apartheid. ..Thinking without feeling is not the God Plato thought it would be; it is closer to the Anti-Christ (David 1992). My aim was to try to explore ways of creating a classroom environment for mathematics teaching in which the teacher could hold the tension of the opposites between the light and shadow of mathematics and classroom teaching.

Many of the people who have been introduced to you on the pages of this plenary paper have introduced aspects of the shadow into my attempts to keep mathematics education in the light. At a time when I thought that I had developed a teaching methodology which would sensitize and prepare teachers for a future non-racial and democratic South Africa, Catriona and Thabo told stories which emphasised the fact that individuals do not operate outside of a context – the social and political are ever-present in our teaching.

Nkosinathi shows the powerful positioning role that mathematics places on an individual, both internally and externally – unquestionably a shadow consequence of all assessment practices. At first attempt I tried to script Marissa as an example of a wonderful successful remedial teaching process. With some prompting from Dick Tahta, I tackled the task of looking into the shadows to explore different dimensions of what was going on in our interactions, some of which even now I am still choosing to leave in the dark (Breen 2007, in press).

As I tell my story, I am aware that these stories have a much greater impact and consequence than the personal. Patience brought a different challenge to my department that we were not able to grasp and we kept her in the dark as long as we could. It took the support of her fellow-students to bring her out of the shadows, but we had already done the damage. Certainly the responses to the different research approaches that Agatha, Kendal and Neil wanted to pursue brought forth a strong reaction and pressure from colleagues for them to stay in the light.

Thinking about PME, one might argue that PME conferences have always been held with the express purpose of annually celebrating the light. Our aim is to share new knowledge with each other and discuss the way forward with as much certainty as we

can manage. We each have our own template of what that light looks like and how it should be explored, and we judge each other's contributions against this template in our search for certainty. We often just seek out 'sound bites that confirm our position' (Wheatley 2005, 210). Only on momentous occasions has something lurking in the shadows been brought to our attention and caused great consternation. This desire for the light is, I think, exemplified by the example of one reviewer who wanted Marissa to stay in the dark and recommended that the proposal that I had submitted discussing her experience as a case study should be rejected because someone so poor at mathematics should not be allowed to become a primary school mathematics teacher.

### **Living between the opposites.**

To live between the opposites means that we not only recognise opposites, but rejoice that they exist...Living in the opposites does not mean identifying with one side and then belittling the other... (Bly 1990, 175).

In this paper I have taken a reflective look at some of the events of the past 21 years since I presented those two contrasting yet separate papers at my first mathematics education conference. Looking back I do not believe that my passion for the learning of mathematics has diminished. I also believe that my sense of promise for the approach discussed in the paper on pupil-activities has not diminished as shown by my recent development and re-conceptualising of these ideas against an enactivist theoretical framework (Breen 2001). I think that what has changed is that I have come to believe that it is important to see mathematics education as both light and shadow and the challenge is to live between the opposites and consciously foreground one or other aspect without belittling the other side.

In 2004, the organisers of PME28 chose a theme that asked us to look into the shadows and consider the theme of Inclusion and Diversity. At PME29 in 2005, members of PME at the AGM voted to change the aims of PME to allow a broader range of topics and research fields to be presented at our annual conference. At PME30, one of the Discussion Groups considered whether these changes meant that it was no longer necessary to hold a separate Mathematics Education and Society conference. For me these developments indicate a welcome willingness on PME members' part to look beyond the light of mathematics education and embrace the shadow as an integral part of our field.

### **Willing to be disturbed.**

Noticing what surprises and disturbs me has been a very useful way to see invisible beliefs. If what you say surprises me, I must have been assuming something else was true. If what you say disturbs me, I must believe something contrary to you. My shock at your position exposes my own position... If you're willing to be disturbed, I recommend that you begin a conversation with someone who thinks differently than you do. Listen as best you can for what's different, for what surprises you. Try to stop the voice of judgment or opinion. Just listen. (Wheatley 2005, 212)

The difficulty is that I have needed much more than a willingness to embrace both light and shadow in thinking about mathematics education. My habits and beliefs have been formed and entrenched in the light over a long period and it is extremely difficult to ‘notice what one fails to notice’ (Goleman 1997, 24).

I have been exploring ways of tackling this in the Master’s module by bringing critical incidents that concern us to the rest of the group for comment using the strategy of accounts-of (Mason 2002). Nicky had collected accounts that highlighted her frustration at the lack of completed homework being done by her extra lesson pupils (Breen 2005b). She shared a typical account with the rest of the class and stepped back to listen to the variety of different responses and ways of handling the situation that came from the rest of her colleagues. Their responses highlighted for the first time the singular and fixed way that she had been looking at the problem of homework and she could begin to plan a new response. However, even this next step proved to be complex, and her description of her evolving process of realisation of her anticipated way forward and the degree of discipline and awareness that was necessary to put a new plan into operation were extremely sobering.

For me, a willingness to acknowledge both the light and shadow is only the first step. Our skills at listening will provide a necessary entry into further awareness. Davis (1996) introduces us to three levels of listening, two of which are very familiar to us all. It is the third type that he lists, that of hermeneutic listening which has provided me with the greatest challenge to employ. ‘This manner of listening is far more negotiatory, engaging, and messy, involving hearer and the heard in a shared project’ (Davis 1996, 53).

Maturana points out an attitude that is necessary to adopt if one wants to be open to new perspectives.

When one puts objectivity in parenthesis, all views, all verses in the multiverse are equally valid. Understanding this you lose the passion for changing the other....If the others can also put objectivity in parenthesis, you discover that it is easier to explore things together, because one is not denying the other in the process of exploration.

(Maturana 1985)

I have reported elsewhere (Breen, Agherdien and Lebeth 2003) on the approach that two in-service mathematics education field workers had made to me to assist them in their workshop teaching practice. We found ourselves attempting to follow Maturana’s example of exploring things together, but we learned a crucial lesson in the process. The defining moment came when as the one with power, I chose to make myself vulnerable by inviting them to comment on my teaching practice rather than sit in on their lessons and talk down to them. The expected practice would have taken me as expert to pronounce on their competence. Instead we placed my teaching under the spotlight and they explored aspects of my teaching that they selected as being important to them.

One of the most important lessons that I learned from working with Agatha, Neil and Kendal as they attempted to forge their own paths in the research journey is that students and colleagues can be wonderful sources of perturbation if one is willing to be disturbed and open up the space to trust and listen to them. I tried to reflect on this insight by encouraging teachers to remain true to their research goals in the concluding section of a chapter on Teachers as Researchers.

The teacher research movement can assist by causing dissonance and trouble. Trouble that comes from conviction based on evidence drawn from research by those in the field who know that we haven't got education right and who are prepared to put their energies into getting something changed. The minute teacher research becomes comfortable; someone else needs to take over... If your research endeavour is uncomfortable, you know you are close to the edge, and you can be sure that beneficial learning is taking place. (Breen 2003, 541-542).

I think my challenge is the same as that of our PME community but I will address the questions to myself in the first place. To what degree am I willing to be disturbed? Am I willing to stop the voice of judgment and listen? Am I prepared to enter into a joint project of communication with the person whose ideas have surprised or disturbed me? Am I truly willing to learn from my students and embrace both light and shadow? This seems to me to be the essence of the challenge that I face 21 years later.

## **A COMING OF AGE?**

I like the idea that the work a person does on his shadow results in a condensation, a thickening or a densening, of the psyche which is immediately apparent, and which results in a feeling of natural authority without the authority being demanded. (Bly 1988, 54)

In ending this plenary paper, I look back to those two 1986 papers and see the presence of both light and dark. The first paper was entirely in the light as it sought to further the learning of mathematics through a humanistic perspective that foregrounded both concept and learner. The second paper was more complicated. It was created with the express purpose of getting participants to talk about the issues that were very present in society but had been consigned to the shadow in conference presentations. In two distinctly different and paradoxical moves in that second paper, I assumed that many would be angered by my introduction of this shadow into the conference so went a whole step further by introducing radical material that ensured that those who did not want to listen would have good cause to rationalize their opposition. The second move seemed to try to trivialize the extent of the problem and tried to push it into the light by concluding that salvation would come from taking on a humanistic mathematics education approach and so provide an exciting basis for teaching in a way that will combat elitism, racism, and sexism as a by-product while focusing attention on the deep structure of mathematics.

My hope is that I have been more direct in describing my journey over the past 21 years and the challenges that currently face me, so that you will decide that I have indeed come of age. I hope that some of the things that I have said have surprised or even disturbed some of you and that you will be able to show your willingness to be disturbed by engaging in Maturana-like hermeneutic conversations with each other.

**References.** (Since many of my own articles will be hard to access, I hope to post most of them with permission on [www.chrisbreen.net](http://www.chrisbreen.net)).

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