One of my colleagues, Jean Taylor, in conversation using e-mail, said about the t-shirt,

> Contrast it to, say, "Puzzles are fun". Puzzles can also be hard, of course, and the 'fun' part is in finding ones that are hard enough to be challenging but easy enough to be do-able To say "Puzzles are hard" somehow implies a more negative attitude toward them than to say "Puzzles are fun". On the other hand, to say "Puzzles are challenging" captures both the difficulty and the enjoyment in overcoming it. Sticking with "Puzzles are hard" somehow only captures the difficulty.
>
> Now, if a t-shirt said "math is hard - but I can do it" or even "math is challenging", then the message would be more positive (though not as pithy as just "math is hard")

Is replacing "math is hard" with "math is challenging" the answer? It does send a message of being do-able, but would it speak to those who struggle but don't see the fun?

What I like to tell my students is that yes, "math is hard", but so are music, chess, in-line skating, snowboarding and [choose your own favourite activity]. Everything worth doing is hard. Activities that are too easy bore us quickly. But, to work hard we need a reason and a hope that we can succeed. "math is hard - but you can do it"- yes, maybe this would be a good message for the next t-shirt.

A process of becoming

MARY BEISIEGEL

When talking to a friend recently about my upcoming oral defense (called the candidacy examination in Canada) of my doctoral research proposal at the University of Alberta, and trying to understand why this examination felt so different from all of the examinations I have taken in mathematics and statistics, I remarked "It's interesting becoming something that you've never been before." The statement to my friend was a realization that this examination signifies a part of a process of becoming - when it is done, the process will still go on.

In contrast, the examinations I have taken in mathematics and statistics tested fixed pieces of knowledge. When the examinations were done, they were done, the process completed by my knowledge written into a test booklet with seemingly few implications for who I was as a mathematician or statistician Just to share an anecdote, during an orientation for a graduate program in mathematics, my cohort was told that we were now mathematicians because we were being paid for our work. So, all of a sudden, I became a mathematician. I had arrived.

This new experience of the candidacy feels quite different. It feels like a part in the process of becoming something - a researcher, an academic, an educator - part of a community. However, I won't move (hopefully successfully) through *this* rite of passage and all of a sudden become that thing. It will continue to be an evolution - a process of and attentiveness to being There is a sense of empowerment that the proposal for my research will continue to have a life beyond this examination; that it, too, is in a process of becoming.

This sense I have of my own process of becoming seems to parallel the process of mathematics graduate students 'becoming' mathematicians and mathematics teachers. This is what I wish to study. They are in their own process as well. However, I am not sure that it has been conceptualized as such. Many dichotomies exist in mathematics and, in that community, you either are or you are not a mathematician. There is little focus on the process. As a friend of mine in a PhD program in mathematics said during a discussion about a joint effort of mathematics and mathematics education students to work with school children, "I know the mathematics and you know how to teach it." I was the mathematics teacher and he was the mathematician - we had to be one or the other.

So, in thinking about this process or the idea of becoming future academics, professors, researchers, teacher educators, or mathematicians, where do we look for what we are supposed to become? For indications of how we should be? Of how we attend to our work, students, our discipline, ourselves? What has meaning for us in how we present ourselves within our disciplines?

For graduate students in mathematics, what are their experiences, what is it that they interpret or understand their lives to be like in mathematics? What has meaning for them in their process of becoming? What do graduate students in mathematics interpret as having meaning for who they should be and how they should be as mathematicians and as teachers of mathematics? In my own experience in mathematics, what had meaning for me? Who did I feel I needed to be and how did I feel I needed to be in mathematics?

For me, this looking at the process of becoming, of being a mathematician, resonates with my sense of mathematics - more a way of being than a body of knowledge to know. For me, who I am (thoughtful, reflective, hard working, passionate, interested, curious) allows me to move into mathematics, explore it, work with it, have patience with it. Who I am allows me to dwell with it, live with it, to work with it in a process, and it helps me think about the world in this wonderful way, to be what I think is a mathematician.

The questions that I am asking have pointed me to hermeneutics as a theoretical framework for my study Davis (2004) offers a description of hermeneutics as

> a mode of inquiry that is oriented by two intertwining questions: What is it that we believe? How did we come to think that way? (p. 206)

Smith [1] states that hermeneutics asks the questions:

> How is it, how has it come about, that I use the words or act in these ways? (p. 28)

Through my own line of questioning, how is it that graduate students come to their lives in mathematics, their ways of being in mathematics and being teachers? How did they come to be that way? What texts or messages did they interpret as having meaning for their way of being? Thus, the attention hermeneutics pays to different texts and their

interpretations allows insight into the texts and experiences graduate students take as having meaning for "how it has come about that they act in these ways".

I am looking forward to working with mathematics graduate students to understand their process of becoming mathematicians and teachers of mathematics, to understand what has meaning for them in determining who and how they should be, and how they feel their lives as mathematicians, their 'being' as mathematicians has meaning for how they are as teachers of mathematics. I believe that this understanding is necessary before we attempt to change their teaching practices. For their interpretations of how they need to be in mathematics may prevent them from teaching in ways we might hope for or envision.

Notes

Smith, D (1983) *The meaning of children in the lives of adults: a hermeneutic study*, unpublished doctoral dissertation, University of Alberta, Edmonton, Canada. Contact paramita@telus.net. See also Smith (1999, p. 28)

References

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Afterwords

DAVID PIMM

Recounting Cantor was one of the final pieces Dick Tahta wrote; he had circulated an earlier version of it as a Christmas note a year before. His gentle but pointed retelling of elements of Cantor's history illustrate a number of themes that ran through his own work, not least a striking sensitivity to the psychological intertwined with the mathematical, the personal striving for and living in relation to the impersonal. It also reflects Dick's intellectual activity that can, unlike many, be fittingly described as *scholarly*. It is with regard to his omnivorous reading that he most closely approximated Matisse's autobiographical comment, "I overdid everything as a matter of course".

This re-reading of the two main English sources of Cantorian biography (by Ivor Grattan-Guinness and Joseph Dauben) allowed him the opportunity to nudge up against some psycho-mathematical issues that both these historians had sought to downplay or deny outright. (Some readers may well recall Dick's special issue **13**(1) of this journal on psychodynamics and mathematics education.) Both Grattan-Guinness's and Dauben's work was done in their relative youth: the former was 30 in 1971 and the latter 35 when he published his biography of Cantor in 1979. Dick, in his mid-seventies, was re-engaging with pieces written by much younger men thirty to thirty-five years previously. Was there nothing more recent that had been written on this topic?

The trigger for this short note was my recent encountering of a more current lecture that Dauben (2005) had given on "the battle for Cantorian set theory". The talk was first presented in the late 1980s (at the AMS centenary meeting): this text, however, had only just seen the light of day in print. It is evident to me that Dick never saw this chapter, despite the fact that the book containing it was in the same Canadian Mathematics Society series (volume 21) that Dick's own final mathematico-psychoanalytic chapter was to appear (volume 25), made worse by the fact he never held this latter book (Tahta, 2006a) in his hands even though it had been published some days before he died. Had he come across it earlier, no doubt he would have noticed the title and acted accordingly.

As just one instance relating to what Dick wrote, Dauben in his chapter (p. 222 especially) shifts without acknowledgement the attribution of the medical 'diagnosis' given in the Grattan-Guinness account (and quoted on p. 10 of this issue) to one Karl Pönitz (a medical contemporary of Cantor), pushing it some seventy years back in time. Compare this with footnote 8 in Tahta's article. And while Dauben acknowledges the existence of *Infini et inconscient* by Nathalie Charraud (1994) (in footnote 3), he referred to her only as a Lacanian 'psychiatrist' and not also as a senior lecturer in mathematics at a Parisian university (her doctoral supervisor was Charles Ehresmann), as she then was.

Just before starting to write this short note, I received a copy of Fitzgerald and James's (2007) *The mind of the mathematician*. Ioan James was Savilian Professor of Geometry at Oxford University. In this book, following some general psychological discussion, there are capsule snapshots of twenty 'mathematical personalities', one of which is of Cantor. While much of the same material and sources are used as in Dick's writing here, and it is of a comparable length, the Fitzgerald and James piece seems without direction (I feel this to be the case of many of these 'portraits'). The subtlety of listening inside the life as well as the making of suggestive allusions based upon it are two hallmarks of Dick Tahta's style (evident too in his more extensive mathematical biography of Thomas Kirkman - Tahta, 2006b).

I end with a passing biographical note: Ioan James was an undergraduate student at Oxford while Dick was also there studying mathematics: James was apparently an intimidating figure due to his marked mathematical prowess. Dick was interested in James's current interest in Asperger's syndrome and mathematicians for a number of reasons. But despite his affinity for such questions, Dick remained decidedly suspicious of psycho-biographical diagnosis.

References

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