# EMBODYING MATHEMATICS

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*Many people have mapped the boundaries of the 'social turn' in mathematics education. We do not want to push back the boundaries and so claim more territory for the social but to explore what sets those bounds and, drawing on Judith Butler's work, to imagine mathematics learning as always already social. We use data from 27 group interviews with 15-16-year-olds and undergraduate students. In particular we attempt to make sense of their talk about mathematicians, which was characterised by oppositions between normal and Other and by strong default images of mathematicians as White, middle-class, old men. We argue that this connection between mathematical identities and physicality 'naturalises' relationships with mathematics and acts to foreclose social understandings.*

In an interview, Manthia Diawara (1998, p. 57) contrasted the bodies of John Travolta and Samuel L Jackson in Quentin Tarantino's film *Pulp Fiction*:

> Travolta has literal masculinity, in terms of coolness and language and dress code; no door can be closed to him. But Samuel Jackson has the coolness of his own-immanent-blackness. To me, Jackson, who's a great actor, appears to not be acting; he just appears to be 'a black guy.' Let me give you another example of this. In *Boys N The Hood*, the single mother of Doughboy and Ricky is acting, but she looks so much like a typical welfare mother that she couldn't even be considered for an award for a supporting actress.

Diawara is concerned here with the mobility of 'Black cool', the way that stories about coolness stick to some bodies and slide off others, the way that the resources of 'cool' are not equally available to all. In this paper, we are interested in similar issues around 'mathematical ability'. Mathematical ability and cool are examples of categorisations of race, class and gender that "are not just classification or social positions but an amalgam of features of a culture that are read onto bodies as personal dispositions" (Skeggs, 2004, p. 1).

Our argument, which we can only sketch here due to limitations of space, is that the idea of the social that is normally used within mathematics education research is limited in the ways that it theorises things like ability that are amalgams of features of a culture that are read and lived as natural dispositions and essences. We suggest that Judith Butler's post-structural approach to subjectivity is more productive. We begin by presenting data from the *Mathematical Images and Identities* project (Economic and Social Research Council (ESRC) funded: RES-000-23-1454; www.londonmet.ac.uk/mathsimages) on participants' embodied images of mathematicians. We then discuss ways of theorising these which cut through oppositions between the biological and the social and the individual and the social and so destabilise ideas of essences.

## REPRESENTATIONS OF MATHEMATICIANS

The data sketched here are drawn from 27 group interviews with 15-16-year-old school students and undergraduate students in mathematics and humanities which we carried out during 2006-2007, audio-recorded and had transcribed. In particular we focus on the section where we asked participants to imagine mathematicians and to talk about what they look like, what they do and what their life is like.

Students have very precise ideas of what mathematicians look like, although, they also challenge these clichés. In one of the school focus groups this was reflected in a discussion about differences in hair length between mathematicians and scientists: the former having short hair, the latter long hair. This discussion also took in mathematicians' "scrawny" bodies and their "glasses". This embodiment is so strong that a significant number of participants believe that you can say whether somebody is a mathematician or not, just from how they look. In one case, mathematics was literally written on the body, when a sociology undergraduate described how her friend the "maths geek" had tattooed $\pi$ on his wrist.

The bodies of mathematicians are overwhelmingly constructed as White, heterosexual, middle-class, old and male, as a sociology undergraduate put it: "Old guy, grey hair, glasses, Einstein." There was a strong association between doing or being good at mathematics, masculinity, and higher forms of intelligence, as well as between higher forms of intelligence and middle/upper-classness. Men were sometimes seen as doing better at mathematics, and women as doing better at English/humanities, with mathematics being seen as a higher form of intelligence and these differences being essentialised. In one focus group of mathematics undergraduates, participants divided mathematics specialisms into 'female' ones and 'male' ones. With social class such associations are often made by drawing on categories which negate the political dimensions of class, for example, when students refer to mathematicians wearing a suit or tie, being wealthy or not swearing, or when they talk about 'posh' (that is upper-class) people or 'chavs' (a recent slang term used in the UK to denote particular parts of the working-class) In some cases, students operate a hierarchy on the scale of 'poshness', between their mathematics teacher and 'mathematicians', the latter being seen as posher and with higher forms of intelligence (and geekiness); this is part of a construction of mathematicians as an elite, both in relation to intellectual and economic capital. In the schools attracting students from a working-class background, this led to binary oppositions between 'us' and 'them'. The default White image of a mathematician sits alongside the inscription of Indian and Chinese pupils as naturally and remarkably able, in a process of Othering that parallels orientalist discourses.

Mathematicians are overwhelmingly seen as being 'nerdy' or 'geeky', even in many cases by mathematics undergraduates (who sometimes attempted to redefine those terms in a positive light), in opposition to being 'cool'. This is strongly embodied: students have a very precise idea of mathematicians' personalities, and see them as

nervous, hyperactive and socially awkward. This is linked to the way that many participants associated mathematicians with mental health issues.

All of this constructed mathematicians as something Other and not normal. Some think mathematicians can have 'normal' lives, some not. However, the fact that students need to state that mathematicians can have 'normal' lives suggests this is far from being obvious. However, many believe that their lifestyle is dominated by mathematics, as they are obsessed with mathematics. In one school focus group, three participants variously imagined mathematicians as "working endlessly at a desk trying to work out a formula or something", as spending "their spare time … doing extra maths questions", and as "dedicated to what they do." Thus, mathematicians are seen as leading lonely lives. Their relationships are permeated by mathematics and they only relate to people who share their interests.

Those participants who think that mathematicians can have 'normal' lives and relationships, generally see this as possible only for 'normal' mathematicians or mathematics teachers as opposed to 'real' mathematicians or geniuses. Mathematicians were overwhelmingly constructed as geniuses. The figure of the mathematical genius is constructed in opposition to those using mathematics. As one school student said:

> There's different types of maths, there's like genius maths, which is working out these equations and winning big prizes. … Then there's loads of different other sorts of maths like the sort of maths that apply to engineering or apply to accountancy or anything. … So I think there's, like there's maths maths, like working out complex equations and stuff, is more a thing that you see as someone who just sits at home with a desk, staying up till two o'clock working out this equation. Whereas applied maths you just think someone, just like a more normal person in a job, even though the maths might be similar.

Many adhere to the idea that there is something called the 'mathematical mind'. There is a recurrent tension between natural ability and being able to get better at mathematics through effort, and a recurrent opposition between being a hard worker and being naturally able.

To sum up: there are very strong default images of mathematicians that are easily called up and are deeply embedded in people's psyches; these default images of mathematicians are of old, White, middle-class men and are associated with markings onto and into the body, including states of clothing, posture and mental health; discourses of mathematicians are characterised by oppositions, for example between 'normal' mathematicians and 'real' mathematicians, people with natural ability and those who just can't get it or who need to work hard to do so. In the next section we argue that this close connection between mathematical identities and physicality naturalises relationships with mathematics and acts to foreclose social understandings and to re/produce inequalities and that these foreclosures are often reproduced when we come to theorise these relationships.

## THEORISING MATHEMATICAL ABILITY AS SOCIAL

As discussed in the last section, the labels ‘mathematically able’ and ‘mathematician’ attach to some bodies and not others, in complex ways. In the rest of this paper we want to talk about ways of making sense of these.

The association of bodies with mathematical ability serves to naturalise and essentialise this ability. It does this because when we think about the relationship between the biological and the social we generally posit the idea of an interaction between these two. The details of this interaction are rarely considered and the context is one in which “we habitually think of the social as less real than the biological, what changes as less real than what stays the same” (Connell, 1987, p. 81). Thus the “model of interaction (however complex an interaction is asserted) leaves the idea of an unmediated biology unchallenged” (Henriques, Hollway, Urwin, Venn, & Walkerdine, 1984). An opposition is constructed between the social and the biological which forecloses the possibility of building new ways of understanding the role of biology in making us who we are. It constructs part of the individual as untouched by the social, an unalterable essence, a truth of the self.

The production of an asocial space in the individual is enacted in many forms of theorising that present themselves as social. There has been a growing acknowledgement of the role of the social in mathematics education, that has been called the ‘social turn’ (Lerman, 2000) and that this working group reflects. Perspectives drawing from situated cognition are more thoroughly social than are radical or social constructivist ones and are commonly used in this field. Within these approaches mathematics and learning are conceived of as social practices, taking place within communities, and learning is never context free (Holland, Lachicotte Jr, Skinner, & Cain, 1998; Lave, 1988). However, the word practice as it is used in situated cognition enacts a division between the social and the individual. Valerie Walkerdine (1997, p. 63) highlights this:

> For Lave, practices were activities and people acting in a setting, specified by a dialectical relationship. I do not think that this is at all clear and carries the danger that neither the people nor the setting is theorized. Thus we are left rather too close to the traditional individual-society dualism than I would presume Lave would like.

The model of interaction between individual and social has the same problems as the model of interaction between the biological and social. That part of the individual that is prior to the social can only be thought of as an essence. An alternative approach is provided by a post-structural analysis. In post-structuralism the discursive practice is the place in which the subject is produced. Thus we avoid dispositions such as mathematical ability remaining with the individual and so excluding the possibility of a thoroughly social understanding of these.

Since the practice is the place in which the subject is produced, subjectivity becomes a very ambiguous project and one that is about power. Judith Butler’s work on

understanding how we become inscribed within sex/gender is useful for this. Like mathematical ability, sex/gender positions must be lived as essences. She speaks about our subjection to these discourses:

> Within subjection the price of existence is subordination precisely at the moment in which choice is impossible, the subject pursues subordination as the promise of existence. This pursuit is not choice, but neither is it necessity. (Butler, 1997, pp. 20-21)

In other words, to be recognised as human, to possess a liveable life, to exist at all requires becoming part of gender, being written and writing oneself as man or woman (or man trapped in a woman's body or any of the other socially legible narratives of gender). There is nothing before this, we are *always already* gendered, and there is no choice but to be subjected to gender. Thus, while it is felt as natural and must be performed and produced as such, it is not natural. It is always outside of us, and Other.

If we start to work with these ideas in relation to mathematical in/ability we can start to understand these identities anew as 'always already social' and so begin to disrupt the deep rooted associations between particular bodies and particular positions.

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