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JOHN B. DAVIES argues that it is time for a paradigm shift in psychology.

# Bring on the physics revolution

**S**OME years ago a student submitted a practical assignment in which he wrote something along these lines:

*I collected the data on Sauchiehall Street on Friday afternoon. I asked any young-looking males (who didn't look too scary!) to fill in the questionnaire. It started to rain about four o'clock so I went in Costa Coffee, and when I came out there weren't so many people about, so I finished it off on Saturday morning.*

Colleagues felt this was inappropriate in a practical essay on a scientific subject. They objected to the use of the word 'I', which by definition made it a subjective account; and they suggested that a phrase such as 'Data were collected from a random sample of young males' would have been more suitable. But I disagreed strongly, arguing that the student account was more informative, more scientific, more honest, and there was no attempt to hide behind scientific rhetoric. And obviously, the sample could not be called random.

My reaction was sparked by the realisation that for years I had trotted out the phrase 'psychology is a science' without really knowing what 'science' was, apart from something to do with being 'objective' and searching for 'truth', without allowing any sort of personal bias, opinion or motive to intrude on the process. But isn't this impossible? How could I be 'objective' when everything I do is a consequence of my own preferences, biases, previous experiences and emotional states? And I don't know how to do anything without a personal motive; when one of my studies works out the way I hoped it would, I run through the corridors punching the air and shouting, 'Yes!'

I do not propose at this stage to regurgitate the scientific philosophy of Popper, or the empiricist doctrine of Ayer; nor am I going to contrast these with the

Khunan idea of paradigm shift as a motivated social process rather than the inexorable march of an objective science into a golden future. These arguments are far from new, and should in my opinion form a key part of all our undergraduate courses. I regret that generally they do not.

However, for decades another mantra of mine had been 'psychology is a science like physics'. But the idea that psychology is a science 'like physics' turns out to be deeply unhelpful, because of arguments about what physics is all about. Modern physics basically commences with Newton, whose genius imposed rationality and predictability on phenomena that had appeared metaphysical or mystical at the time. Newton's physics is deterministic, it explains the movements of bodies and planets in ways that make prediction possible, and has pragmatic usefulness that is fundamental in making the modern

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**'For years I had trotted out the phrase "psychology is a science" without really knowing what "science" was'**

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world work at a macroscopic level. But Newtonian deterministic physics is over 300 years old, and since that time there have been three revolutions (four if you count string theory) that have shown serious flaws in the Newtonian argument, if one takes it to be a 'real' account of how the world works. Newton's science then is valuable not because it reveals truth; but rather because it solves problems of a certain type. And according to contemporary philosophies of science, that's what it (science) always does.

It seems to me that we have become so obsessed with the Newtonian deterministic version of physics that we forget a fundamental fact. We adopt the Newtonian

model of how concrete objects behave, by analogy, to the study of human behaviour. This manifests itself in a number of ways, including the prioritisation of mechanism (the 'cogs and wheels' underlying action) over purpose and intention, and the assumed measurement of psychological entities whose existence is dubious. However, Newton says nothing about people, except in so far as they have mass and move around. On the other hand, 20th-century theoretical physics offers alternative brands of physical science, in the shape of Einstein, Heisenberg, and Feigenbaum, that offer new analogies. The remainder of this article suggests that it is now time to adopt a different physics for the explanation of human action.

## New paradigms

There are books about relativity, quantum mechanics and chaos theory that are accessible to the lay reader and that outline the basic conclusions about the nature of the universe that these approaches lead to. I find them absolutely compelling, and have tried to consider where, by analogy, they have implications for the work we do as psychologists. My conclusions are (a) that their implications are fundamental and (b) that if we wish to be scientists after the model of the physical sciences, it would be nice if we adopted a model consistent with contemporary physics, rather than a model developed three centuries ago, which is useful for some purposes, but which is now clearly not the best analogy for solving problems with people.

A conclusion from Einstein is that measurement is relative. Using Einstein's own homespun example of playing table tennis on a moving train, the answer to the question 'How fast was the ball travelling after you hit it?' has a multitude of answers between which one cannot choose until the question 'Relative to what?' is answered. By analogy, abundant empirical evidence

exists to show that the same is true for psychological measurement. It is not necessary to cite volumes on this point; merely to note that when we wish to assess the test–retest reliability of one of our tests we insist on re-administration in exactly the same form; the same people, the same setting, the identical instructions. This amounts to an admission on our part that changing the setting is likely to change the results. So obtaining high reliabilities is not a measure of the intrinsic reliability of the test itself, but rather a measure of the extent to which we are able to produce identical conditions.

Heisenberg surely offers the most fascinating analogy from a psychological point of view. Firstly, Heisenberg recasts the fundamental nature of the universe as probabilistic rather than as deterministic; a fundamental shift from Newton. But Heisenberg then demonstrates, at a subatomic level, something we all know but usually prefer to pretend is of no importance: that the act of observation changes the phenomena being observed. Heisenberg also shows that the results you obtain are a function of the methods you use to obtain them. Several experiments are widely cited, stemming from the famous studies by Bohr, in which single photons were fired through two slits, and onto a screen. In a number of variations on this theme, the very stuff of the universe ‘knows’ when it is being observed, ‘knows’ when other particles are being observed, and ‘knows’ when it is about to be observed even before the physicist knows. The idea that as soon as you observe something you change it seems to me to be the most exciting and challenging starting point for a modern psychological science that it is possible to imagine. It opens the door to the need for some serious methodological development, and sheds fundamental doubt on decades of past work (including my own of course). How marvellous! How long overdue!

By comparison, the analogy with chaos theory is perhaps a little more mundane. Chaos theory starts with the observation that many cause–effect relationships do not fit a dose–response model. In such circumstances mathematical models produce oscillating and frequently contrary solutions that cycle around alternative foci or ‘strange attractors’. In a universe characterised by non-linear relationships, and populated with strange attractors and sensitivities to initial conditions that

demand infinite levels of precision in measurement (which are, of course, non-achievable), Feigenbaum and his like-minded fellows suggest that the actual act of measurement becomes self-defeating. The finer the level of detail in which you measure something, the more it looks the same; and where non-linear systems are concerned, this happens without any improvement in prediction. The saying ‘Shit happens’ appears to summarise the Feigenbaum position fairly succinctly. Feigenbaum certainly makes me think twice every time I read a paper on complex (non-linear?) social problems (most of

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**‘More research is necessary’ is sometimes an excuse to put one’s head in the sand**

which have been under investigation for decades, if not centuries) that concludes with the phrase ‘It is clear that more research is necessary’. I have to say it is frequently not clear to me! And the assumption behind the assertion, namely that more research will one day tidy things up once and for all, frequently fails to convince me these days.

Instead, it seems to me that the raw materials for solutions to some of the major problems that confront us are already out there if we are prepared to grasp them, in the shape of existing knowledge about race, gender, education, social class, politics and history. These are all areas where psychologists have a fundamental part to play; as part of social movements, politics, histories and cultural change. Yet historically we have viewed the psychologist as achieving the ‘gold standard’ when he or she conducts studies in a way that is deliberately unconnected with the way the real world works and divorced from the reasons why people behave as they do; as if the things that make the world go round, motives, beliefs, intentions, imaginings, are correctly viewed

as error when they are very well-springs of behaviour. And that, I believe, is the result of using Newton as our analogy for so long; a science that explains quite brilliantly the behaviour of planets, apples and other things devoid of any motive, purpose or intention, but which unfortunately stops right there.

**Time to grasp these nettles**

If these new (relatively speaking) paradigms suggest new ways of going about our subject, then our routine assertion that more ‘scientific research’ is necessary starts to sound a little thin if by ‘more research’ we simply mean more experiments, more randomised controlled trials, more studies from which the influence of the outside world has been expunged, carried out by dispassionate scientists searching for ‘truth.’ Clearly, there is an important place for experimental studies and RCT designs, but they are merely one option when it comes to accumulating data and, perhaps but not necessarily, gaining some useful knowledge that might even accumulate. However, the ‘gold standard’ they are certainly not. Whilst experiments may be brilliantly contrived in terms of design, control groups, experimental setting and cool instrumentation, the ghosts of Einstein, Heisenberg and Feigenbaum stand groaning in the background, insisting respectively that our measurements are context specific and do not generalise, that what we see is *not* what we get, and finally that if we keep looking at phenomena in more and more detail, we’ll get finer and finer grained data but be none the wiser!

Let me conclude by saying that the views expressed here are no longer particularly radical, although the argument here is based on paradigms of science, rather than on sociological or sociolinguistic arguments. Nonetheless, I see few signs of a willingness to grasp these nettles, and plenty of evidence of a reluctance even to subject the dominant paradigms to serious scrutiny. At the end of the day, carrying out (allegedly) context-free experiments and scrupulously missing out the word ‘I’ in our reports are not the defining features of science. It’s time for something more fundamental. Bring on the physics revolution.

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