

The next challenge is to map the human mind

An ambitious project aims to chart the territory of ideas: vast but, conceivably, not infinite.

Sir— Can we comprehend the ideas and thoughts of other beings? The scientific literature from a variety of fields, including psychology, sociology and ethics, suggests that we can. The methodology used in the disciplines of genetics, psychology, animal behaviour, sociology, history, public understanding of science, and religious studies — to mention only a few — can and should be collected to design an integrative approach to understand the extent of human ideas. Readers are invited to a meeting in Japan on 15 February 2003 to start such a project (see www.biol.tsukuba.ac.jp/~macer/index.html).

If we define an 'idea' as the mental conceptualization of something — including physical objects, an action or sensory experience — then the number of objects in the universe of a living being is finite. Both the number of possible choices for action and the sensory states of animals are finite. In that sense we can expect to be able to count ideas. The initial methodology could separate classes of

ideas, as follows: (1) conceptualization of physical objects; (2) psychological meanings of images associated with objects (such as colours); (3) memories; (4) plans for short- and long-term future; (5) intention to modify one's behaviour; (6) intention to modify behaviour of surrounding beings and the environment; (7) sensory states such as pain, pleasure, libido; (8) inhibition of a response based on immediate evolutionary benefit, for example, memes; and (9) interactive conceptualization of ideas in a community-based response.

I propose a 'mental mapping project' to explore similarities between cultures and communities, both at the individual human level and as members responding inside biological communities. There are implications for cultural identity. How should the culture that tries to maintain its uniqueness face up to the reality that the full range of idea diversity is found in every culture? Idea diversity is found in almost all cultural groups, excluding those formed to promote particular political aims, such as

those who fight for or against the right to choose abortion or euthanasia.

The universality of ideas is important for the development of global society, when we're faced with dilemmas such as whether to have common international guidelines to regulate the use of new biotechnology, for example, or of assisted reproductive technology using cloning. It is time to start thinking scientifically about this in a coordinated way.

Although the human mind appears to be infinitely complex, and the diversity of humankind and culture has been considered vast, I would suggest that the number of ideas that human beings have is finite. Hence my call for a project to map the ideas of the human mind. We already have the means to embark upon a human mental map with the goal of describing the diversity of ideas a human being makes in any given situation or dilemma.

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Moving beyond 'industry vs ecologists' stereotype

Sir— I agree with your statement in your News story about my 'superweed' research (*Nature* 419, 655; 2002) that academic researchers need better access to pre-commercial transgenes to be able to carry out independent, empirical research on environmental risks of genetically modified organisms (GMOs). Yet the fragile relationship between seed companies and university researchers is improving, and readers may not get this impression from your story.

A small community of ecologists and population geneticists is working with agricultural biotechnology companies and regulatory agencies to assess the environmental effects of transgenic crops. In my case, two multinational companies invited my colleagues and me to evaluate the effects of pre-commercial *Bt* sunflowers on wild sunflowers, which are a common weed in the midwestern United States. The companies agreed to fund a research project that would be published independently in peer-reviewed journals (A. A. Snow *et al.* *Ecological Applications*; in the press). They provided us with a *Bt* transgene in a cultivated sunflower, as well as valuable technical assistance.

This liaison was not always easy, as companies are bound by confidential business plans whereas academic

ecologists are eager to talk about work in progress. I'm glad we carried out this research, even though it was frustrating when we were not allowed to continue using university funds. The companies had decided not to commercialize this variety of *Bt* sunflower, but we wanted to carry out a larger-scale project because so little is known about the ecological and evolutionary effects of transgenes that could spread throughout natural populations.

Unfortunately, polarization of views on GMOs often hinders the use of ecological research in risk assessments. Seed companies have been slow to acknowledge that ecological studies are needed to evaluate some of their products. They also fear the media's tendency to emphasize unwelcome findings and ignore results showing environmental benefits or 'no impact'. At the other end of the spectrum, objections from advocacy groups have reached the point where risk assessment research is often blocked by regulatory delays or eco-terrorism, especially in Europe.

Much of this debate hinges on ethical and political concerns, which are outside the realm of ecological science. Nonetheless, academic ecologists can help to answer questions that arise about the environmental effects of GMOs. I urge that we progress beyond the standard stereotyping of 'industry versus ecologists' to facilitate more effective dialogue and to

introduce sounder science to the debate.

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Liberal world of science

Sir— Raymond Pierotti's Correspondence expressing his opinion (*Nature* 419, 667; 2002) that academic scandals are less well known than business ones reminded me of Michael Faraday's description of his "desire to escape from trade, which I thought vicious and selfish, and to enter the service of Science, which I imagined made its pursuers amiable and liberal".

Faraday, a bookseller's apprentice, had written to Sir Humphry Davy at the Royal Institution of Great Britain in pursuit of a career move. Davy advised him that experience would correct his opinion of the "superior moral feelings of philosophic men" (see *The Philosopher's Tree*, ed. P. Day, 2–3; IoP, Bristol, 1999).

Business and science have long been interdependent. Faraday's "philosophic" researches, for example, paved the way for vast technologically based industries and many other scientific, technological and business developments.

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