EDITOR'S PICK

Talking before technotelepathy

From Mary Midgley

MacGregor Campbell describes a future in which a vast network of brains communicate directly via sensors and implants (4 June, p 28). If we can train the neocortices of our brains to understand signals from others' brains and communicate directly, do we end up communicating with each other so thoroughly that we then merge into what he calls a single "noosphere" of cooperative individuals?

Unfortunately, this can't work. Our current difficulties about cooperating mostly do not arise from a failure of communication. They usually come from people not agreeing about what it is they want to do.

For this evil, a partial but often effective cure already exists. It is called "speech". The appropriate uses of it are being carefully studied, and there are already plenty of examples where it has been used successfully on problems that were certainly more complicated than the one that you quote, in which some (presumably unanimous) scientists managed to induce three monkeys to move a virtual arm.

So, as usual, what we shall need to work on is ourselves.

Newcastle upon Tyne, UK

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What renewable energy needs

From Maarten van der Burgt

Michael Le Page mentions that there are problems associated with large-scale renewable power sources when the grid gets overloaded (21 May, p 19). Thus their success depends on having some means of distributing the load. This could be, for example, a high-voltage direct current network enabling the transport of power over distances of up to 5000 kilometres.

Akersloot, The Netherlands

From Ted Webber

Le Page is on the money as far as he goes, but the way to make renewable energy sustainable lies in developing cheap storage options. It is true that lithium-ion batteries are expensive and likely to remain so, and suitable only for small-scale industrial or household applications. But they still offer the possibility of storing power from the grid overnight when it is cheap. This can reduce daytime and evening demand peaks and thus reduce the demand for more fossil fuel power stations.

There are more energy storage options, although they still require consumers to stay on-grid. These include flywheels, hydroelectric pumped storage, compressed air, gravitational potential energy storage (hauling weights uphill) and thermal storage such as melted salts.

Extensive research is needed to find which of these gives the best cost-benefit yield in particular circumstances. An example is the push by Beyond Zero Emissions to replace a fossil fuel power station at Port Augusta in South Australia with a solar power station that stores energy in molten salts.

Buderim, Queensland, Australia

From Paul Vann

The renewables revolution is indeed unstoppable, because it has to be. Alternatives that emit carbon or create nuclear waste are in reality much more costly than is reflected in their pricing, because they are literally costing the Earth. This is where the real subsidies are at present.

Harrold, Bedfordshire, UK

From John Wallace

Le Page points out that the global energy market is not a free market, and that renewables need subsidies in order to compete with fossil fuels. Ha-Joon Chang draws attention to the dangerous myth of the free market in his book *23 Things They Don't Tell You About Capitalism*. There are no free markets, and we wouldn't want one if there were.

Renewables need subsidies to compete with fossil fuels because of the subsidies governments give (and try to hide) to the fossil fuel industries. In the UK, oil and gas companies only have to hint that the North Sea may be past its prime and the government of the day showers incentives on them to remain. And, if you count the cost of waste storage and disposal, we don't even know yet the cost of subsidising the nuclear power produced in the 1950s.

Liverpool, UK

A new community for science

From Andrea Saltelli, Jerome R. Ravetz and Silvio Funtowicz

We would like to complement your analysis of a crisis in science relating to studies that can't be replicated (16 April, p 5 and p 38). One of us, Jerome Ravetz, predicted in 1971 in his book *Scientific Knowledge and its Social Problems* that the system of internal quality control of science would not easily withstand the evolution toward big science.

Quality in science depends on the existence of a community of scholars linked by norms and standards, and willing to stand by these. The historian Philip Mirowski in *Science-Mart* (2011), fills in the blanks of Ravetz's analysis with details of how science's internal quality control system stalled when "market" replaced "community" as a unifying principle, driven by firms funding research.

The crisis has deep significance, since the contract between science and power is a basis of modernity. Science offers legitimacy to power via its guarantee of "truth". If trust collapses within the research sector, how can public trust be maintained for the many policy-relevant functions of science?

Reform will depend on the emergence of a new "polity" of science including citizen scientists who take responsibility for rooting out corruption of all sorts, scientist-citizens working primarily in the policy arena and concerned journalists and teachers. Issues of ethics and quality, previously largely restricted to coffee-time grumbles, now attract public debates and activist campaigns.

Bergen, Norway; Barcelona, Spain; and Oxford, UK

Unpopular books wanted here

From Paul G. Ellis

For me, Tom Gauld's cartoon of unpopular science books has it wrong (Letters, 21 May). I would very much like to know "why you'll never truly understand" quantum theory, which diseases and disorders "could strike at any moment", and learn more than Steven Weinberg has already said about "the pointlessness of life".

As for "Mathematics which is probably way over your head", trying to make some sense of such, along with quantum theory, is indeed how I spend the most enjoyable (and perhaps Alzheimer's-preventing?) time of my retirement.

Chichester, West Sussex, UK

"The technology has always been there: dipping hands in paint and smushing them on paper in preschool"

Kimberley Gordon is less alarmed than some about the fingerprinting of very young people (18 June, p 22)

That is a very watery steak

From Guy Cox

Arjen Hoekstra tells us that producing 1 kilogram of beef requires 15,000 litres of water (23 April, p 42). I have found a wide range of published figures, with an amazing 27-fold difference between the highest and lowest.

I estimate that a steer slaughtered when 2 years old will have drunk 90 litres of water per kilogram of body weight (so about 150 litres per kilogram of lean meat), based on figures for water requirements of cattle from the New South Wales Department of Agriculture.

Even that doesn't tell us much, since most of it will re-emerge as urine: the urea will be grabbed by the paddock and clear water will return to the creek. The remaining water requirement is what is used to produce feed. The lowest published figure of 3682 litres per kilogram counts only irrigation water because that is all that has alternative uses. Hoekstra's figure adds in rainwater that is taken up by the plants eaten by the cattle. Higher figures include all water taken up by the plants in the pasture, whether eaten or not. The highest appear to include all rain that falls on the grassland raising the cattle and on land for growing feed, even what runs off unused.

What is rarely acknowledged in this debate is how many cattle (and sheep) are raised on land that is unsuitable for arable farming – if it wasn't raising animals it wouldn't contribute to feeding the world.

Sydney, New South Wales, Australia

Together, we go faster than light

From Brian Horton

Timothy Revell tells us that optical fibres are "rolling off the production line at a rate nearly 20 times the speed of sound" (28 May, p 28). My mind boggled at the machinery needed to handle these speeds – until I realised how they were calculated. Using the same logic, a quick check on the number of kilometres driven per vehicle each year showed that collectively all the car drivers and passengers in the world must be exceeding the speed of light.

West Launceston, Tasmania, Australia

Bring me my arrows of desire...

From John Healey

Dave Hulme suggests that the word "toxophily" for the practice of archery arose from the fact that the yew from which bows are made is poisonous or toxic (The Last Word, 21 May). But right from the start, in classical Greek, "*toxikos*" meant "relating to the bow or archery".

Scythian archers smeared a mixture of dung, snake venom and human blood on the tips of their arrows. The Greeks called this "*toxikon pharmakon*" – "the archery drug". The adjective entered the Latin language as "*toxicus*", and the meaning of the noun "*pharmakon*" – drug or poison – attached itself to the adjective "*toxicus*", which thus came to mean not "of the bow" but "poisonous".

Semaphore, South Australia

Roman forts really are card-shaped

From Jean Wynne-Jones

Feedback is puzzled by a "playing-card-shaped fort" (4 June). These forts are commonly rectangular with curved corners. If the corners were right-angled, a defender at the corner would be able to observe only one side and would not see an attacker approaching from the other side.

Rushall, Herefordshire, UK

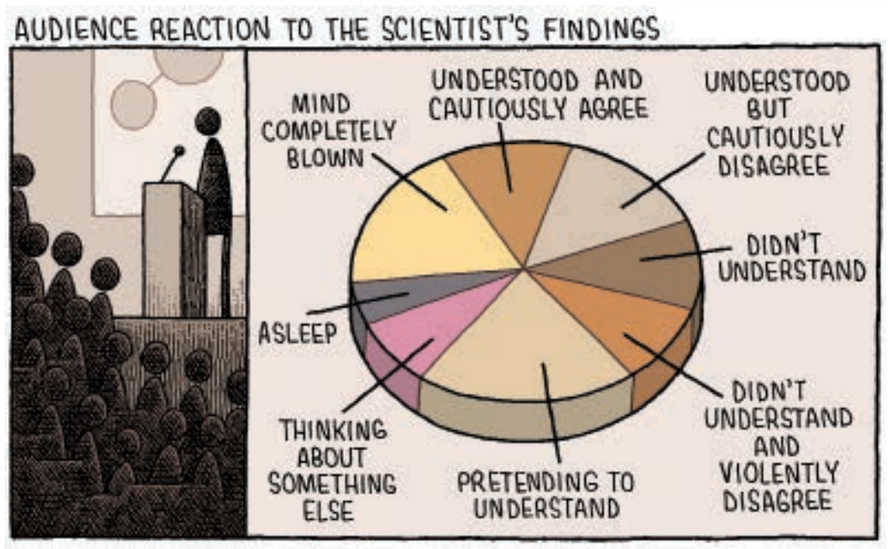
Why no mention of the birthday boy?

From James Stone

I was disappointed to see no mention of Claude Shannon in your article about information (14 May, p 28). Shannon created information theory almost single-handedly, and this year is the hundredth anniversary of his birth. In "A Mathematical Theory of Communication" he showed that information is a well-defined, and, above all, a measurable quantity.

Sheffield, UK

TOM GAULD



For the record

n Fat fingers: the data for a high-fat diet should have been credited to Trudi Deakin (graphic , 11 June, p 28).

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