Science *in* Society

ISSUE 22 Summer 2004 £3.50

Quantum World Coming

Nature is quantum and so are you • Catching Schrödinger's cat

Quantum jazz competition

GM Ending? • Puncturing the GM Myths

Unravelling AIDS • At long last, an AIDS vaccine?

How traditional medicine, cheap generics and exercise may help

In this issue

Can Exercise Help Prevent And Treat AIDS? - page 46

Can Traditional Medicine Help AIDS? - page 40

African AIDS Epidemic? - page 38

A Happy Ending to GM Maize Farce - page 14

Contents

Published by
The Institute of Science in Society
PO Box 32097
London NW1 OXR
www.i-sis.org.uk
ISSN 1477-3430

Editor & Art Director: Mae-Wan Ho
Assistant Editor: Lim Li Ching
Production Editor: Julian Haffegee
Production Assistant: Andrew Watton
Marketing and PR: Sam Burcher

Associate Editors: Joe Cummins, Peter Saunders, Claire Robinson and Peter Bunyard

Other Contributors to this Issue: Martin Khor, Lim Li Lin, Anastasia Stephens, Veljko Veljkovic

Enquiries, Sam Burcher sam@i-sis.org.uk
tel: 44 20 7383 3376

ISIS Director:
Mae-Wan Ho m.w.ho@i-sis.org.uk
tel: 44 20 7272 5636

Full references and sources are available to ISIS members on the ISIS members website

GM Ending?

Jubilation swept through the green and pleasant land like a sunburst after the storm as Bayer CropScience abandoned growing GM maize in Britain, just weeks after the government gave it the go-ahead, aided and abetted by pro-GM scientists shamelessly bending science and scientific evidence. Bayer said the conditions imposed by environment secretary Margaret Beckett made growing GM maize "economically non-viable".

Bayer is not alone. Novartis has also told the government that no GM crops will be grown this year. In fact, all GM trials in the UK have been abandoned except for one, a herbicide-resistant pea tested for drought resistance at John Innes Centre, Norwich. This reflects a precipitous fall in applications for GM field trials from a peak of 159 in 2000-01, 140 in 2001-02 and 42 in 2002-03.

Developments elsewhere have been equally dramatic.

In just over a week at the end of March, 4 States in Australia ruled out large-scale planting of GM crops: Western Australia, the nation's biggest crop producer, took the lead by announcing an outright ban. The next day Tasmania, too, voted for a ban. Victoria followed two days later by extending its moratorium on GM crops for four years. A few days later, New South Wales ruled out a 3 000 hectare trial of GM oilseed rape. And South Australia passed a bill that prevents GM crops from being grown for three years, except under strict conditions. This effectively puts Australia's plans to grow GM crops "on hold indefinitely".

Simultaneously, a grassroots uprising has been gathering momentum in the United States, top grower and exporter of GM crops. In March, Mendocino County of California passed 'Measure H', which bans growing GM crops. A month later, the California Department of Food and Agriculture stalled the planting of a transgenic rice that produces dangerous pharmaceuticals. Then Vermont made history by becoming the first state in the country to require the labelling of GM seeds, and North Dakota drafted a ballot measure that could block Monsanto's GM wheat.

On 21 April, President Chavez of Venezuela announced a ban on cultivation of GM soya in favour of the indigenous yucca. This followed on the heels of Angola's rejection of GM maize aid from the US. Angola has aligned itself with four southern African nations - Zambia, Zimbabwe, Mozambique and Malawi - which have already banned imports of GM maize grain. Zambia made world headlines in rejecting US GM maize aid two years ago in the face of projected famine, opting instead for purchasing food surpluses from within the region (see SiS 16 and 17). Zambia has recovered so well that it is now exporting maize surpluses to Angola.

These are stunning victories for democracy and for science. ISIS and members of the Independent Science Panel (ISP) have been tireless in exposing the corrupt and corrupted science that has fed the GM bubble and brought financial and ecological ruin to family farmers in North America, Argentina and elsewhere.

The GM fight is by no means over. More GM crops are approved for growing in India, despite devastating counter-evidence. The Philippines, Indonesia, Kenya and other African countries are still under threat. The US lodged a complaint against the EU in the World Trade Organisation, and is demanding that the EU lifts its de facto moratorium on GM crop approvals and pay at least US$1.8 bn to the US in compensation for loss of exports over the past six years.

Further evidence of possible GM health hazards has surfaced: debilitating illnesses in villagers living near GM maize fields in the Philippines observed during the last growing season are repeated this year.

The French newspaper Le Monde has seen secret documents revealing health impacts of Monsanto's GM maize Mon 863, which has just received a positive assessment from the European Food Safety Authority. They include kidney malformations and increases in white blood cells in male rats and increase in blood sugar and decrease in reticulocytes (immature red blood cells) in female rats.

It is clear that major struggles remain. The ISP's two-hour briefing to the UK Parliament filled the 100-seater Grand Committee Room to near capacity. Former environment minister Michael Meacher joined the ISP to call for a comprehensive enquiry into GM food safety, for transparency and independence in scientific research, and an end to the victimisation of scientists whose research findings are 'inconvenient' for industry.

The GM-Free sustainable world is within our grasp. Don't let it slip out of reach.

From the Editor

Unravelling AIDS

AIDS (Acquired Immune Deficiency Syndrome) is perhaps the most researched yet most misunderstood disease in the world, about which the most misinformation is spread for political purposes.

Consequently, the multi-billion international projects for addressing the "AIDS pandemic" may well miss their targets of alleviating suffering and death, and could even make things worse.

That's why we are offering an important series of articles, not only to go some way towards unravelling the complex debates surrounding the AIDS pandemic, but also to review effective treatments that are safe, effective and affordable for all.

This series is part of an in-depth report to be published later this year. There is still time to order a copy of the report, "Unravelling AIDS" at a special pre-publication price of £7.50 plus p&p. Please e-mail: sam@I-sis.org.uk

Quantum world coming

As a special treat, we offer a glimpse into the happening quantum revolution that may bring us the quantum computer, quantum cryptography and teleportation. But most of all, it may well change your life; or at any rate, change how you feel about yourself and the world you live in. It is spooky, but very, very nice, I think.

To celebrate the quantum world coming, we are running a competition for original artwork or music that most fits the title, "Quantum jazz" (see announcement on page 33). To know what this means, you will have to read the series, at least.

Nature is Quantum, Really

Matter, even big clumps of it, is simultaneously wave and particle.
***Dr. Mae-Wan Ho** explains*

Which slit did the buckyball go through?

One of the first experiments to show up the strangeness of the quantum world consisted of shining a light through two narrow slits onto a photographic plate placed some distance behind the slits (Fig. 1).

When only one slit is opened, an image of the slit is recorded on the photographic plate, which, when viewed under the microscope, would reveal tiny discrete spots. And this shows how individual particle-like photons, on passing through the slit, have landed on the photographic plate, where each photon causes a single silver grain to be deposited.

When both slits are opened, however, an interference pattern of alternating bright and dark zones forms on the photographic plate, which is consistent with a wave-like behaviour of the light: the two wave trains, on passing through the slits, arrive at different parts of the photographic plate either in phase, where they reinforce each other to give a bright zone, or out of phase, where they cancel out to give a dark zone.

On examining the photographic plate under the microscope, however, the same graininess appears, as though the light waves become individual particles as soon as they strike the plate (see Fig. 2).

If a photon detector is placed behind one of the slits so as to tell which slit the photon has passed through, then no interference pattern would be found. Instead, the image would be like that of a single slit.

Numerous other more sophisticated experimental configurations have been devised to investigate this phenomenon, and always the same conundrum remains. Photons are given the choice of two paths or alternatives: reflected and transmitted, or right and left polarized, which are capable of interfering like a wave when brought together again. But as soon as information is gained as to which alternative the photon has taken, or which polarised state it has adopted, then it behaves like a particle.

More remarkably, the two-slit experiment has been repeated with increasingly massive particles and essentially the same results were obtained: electrons, neutrons 1800 times as massive as the electron, 'buckyballs', a newly identified form of carbon molecule consisting of 60 atoms of carbon arranged in the shape of a football, and recently, even a small protein.

Professor Anton Zeilinger, who leads a group in the University of Vienna engaged in these experiments, said when giving the 16th Schrödinger Lecture in London last November that they are planning to try a small virus next, and is quite confident that it too, will behave as both wave and particle.

There is quite a gap between a virus and a mouse or a human being, but who's to say we are not both a wave spread out in space and a seemingly solid body that can bump into furniture?

Macroscopic quantum objects?

Schrödinger would have been astonished by all these findings if he were alive today. After all, he invented the parable of the cat named after him to show what absurd things quantum theory would have us think about: that an entity could be simultaneously in mutually contradictory states until the instant it is 'measured'.

But what constitutes a measurement? Quantum physicist John Bell, who died a few years ago, had apparently called for the word 'measurement' to be banished from quantum theory.

At a workshop in 1990 concerned with how quantum effects can manifest on a macroscopic scale, the concept of measurement became very ambiguous. Philip Ball, reporting in *Nature*, said, "the most profound message from that meeting was that interpretations of quantum theory are no longer a matter of philosophical taste." Why? It was because of the development of electronic systems of remarkable sensitivity, and many 'thought experiments' could be directly tested.

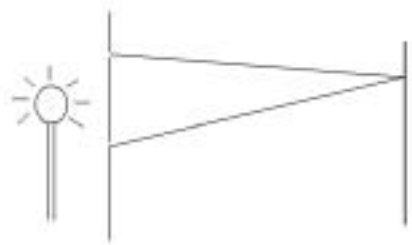

Figure 1. The two-slit experiment

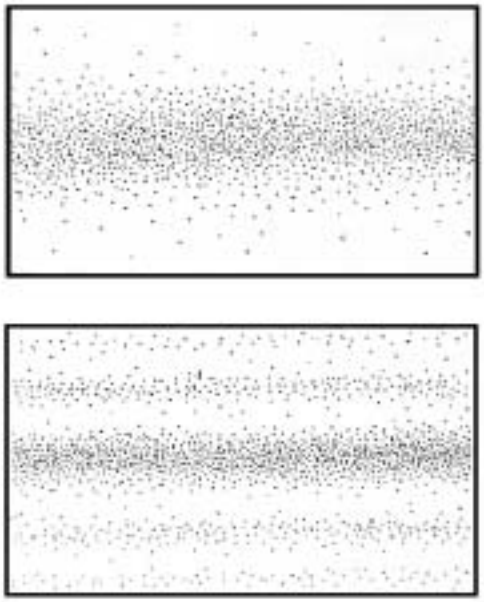

Figure 2. Pattern on the photographic plate when only one slit is open, above, and when both slits are open, below.

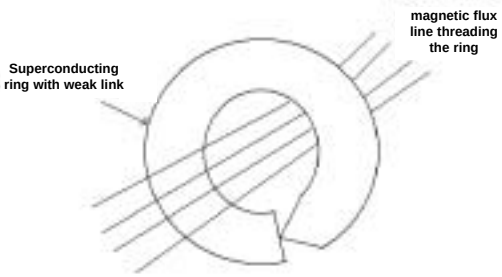

Figure 3. The super-conducting ring with a weak link.

It had become possible by then to create individual 'macroscopic quantum objects', perhaps a few centimetres in size, that behave in a quantum way. Among the first most promising candidates for displaying macroscopic quantum behaviour were various kinds of electronic circuits, particularly semiconductor structures, in which electrons behave like a two-dimensional gas, and super-conducting rings (which conduct electricity with zero resistance) contain-