Scientists warned of "gulf that threatens progress"

by Steve Connor, Science Editor

A gulf in understanding between scientists and the public threatens to undermine society's trust in medical and technological innovation, a leading figure in British science will warn today.

Sir Howard Newby, the incoming president of the British Association for the Advancement of Science, will say in his inaugural address to the Festival of Science in Leicester that the sheer pace of technological change has created a heightened sense of public uncertainty over subjects ranging from waste disposal to food additives.

This has generated a fear of the unknown over issues such as GM food and the MMR vaccine. At the same time, many scientists have retreated behind scientific barricades in the face of harsh condemnation by "turbulent" and at times "arrogant" critics, Sir Howard said.

"However understandable that reaction, its consequences have been unfortunate. The scientific community has retreated from an engagement with society, just as society at large has been excluded from the real world of scientific method," he said.

Whereas scientists are mystified by the idea that a moral dimension should direct their research, those who seek to make science more publicly accountable are equally baffled by its logic and its methods. Sir Howard said : "The public now feels it is reduced to the role of a hapless bystander or, at best, the recipient of scientific advance and technological innovation which the scientific community believes it ought to want. If the public decides it does not want it, it is regarded as either ignorant or irrational. The scientific community therefore ends up frustrated by the public's apparent disdain for the fruits of its labours and the publics lack of sympathy for an endeavour which as far as the scientific community is concerned, is for the public good." [...]

The Independent, September 9th 2002.

Vocabulary :

accountable (to)	responsable (vis-à-vis de)
advance, advancement	progrès
community	communauté
issues	problème (topic for discussion)
public, public at large, general public	grand public
scientist	scientifique
threat	menace

For women in sciences, slow progress in academia

[…] Even as the number of women earning Ph.D.'s in science has substantially increased - women now account for 45 percent to 50 percent of the biology doctorates, and 33 percent of those in chemistry - the science and engineering faculties of elite research universities remain overwhelmingly male. And the majority of the women are clustered at the junior faculty rank.

At Harvard, for example, there are 149 men with tenure in the natural sciences and just 13 women. Cynthia Friend, the chairwoman of the chemistry department, remains the only woman who has ever received tenure in chemistry at Harvard. (By comparison, women have done better in the humanities departments at Harvard, where 39 women and 98 men have tenure.) Nor is Harvard's record unusual. The faculties of most elite institutions are not only mostly male, they are also overwhelmingly white. According to a 2004 survey by Donna Nelson, a chemistry professor at the University of Oklahoma, there are 13,235 professors on physical sciences and engineering faculties of the 50 top research universities, and only 468 are black or Hispanic. Given the pipeline problems in some fields, as well as the glacial rate of faculty turnover in academia - tenured professors routinely hold their jobs for more than 30 years - the slow increase in the numbers of women is in part understandable, many experts say. But there are also vast differences in the efforts that some universities have made to move women along. Female scientists and senior female professors in general, have been particularly concerned about Harvard's record in the past decade, including the last four years under Dr Summers*, With the number of tenure offers to women on the faculty of arts and sciences dropping to 4 out of 32 last year from 14 out of 41 in the 1999-2000 academic year. After the firestorm surrounding his remarks, Dr Summers appointed two study groups to advise Harvard on how to recruit and retain more women. When the panels announce their findings next month their recommendations will draw heavily from the handful of universities that already have such programs in place, including the Universities of Michigan, Wisconsin and Washington ; Princeton ; Stanford ; and M.l.T. [...]

The New York Times, April l 5th, 2005.

*Presidént of Harvard since 2001.

Vocabulary :

academic	universitaire (attention : faux ami)
bias	parti pris (pas dans le texte mais sous entendu)
gender bias	parti pris contre le sexe féminin en général

European scientists have found a planet circling a distant star that could be home to life

The planet, the first detected so far that is enough like Earth for life to develop, orbits a star called mu Arae in the southern constellation Altar. The planet - astronomers call such things exoplanets - is only 14 times the mass of Earth and, like Earth, could be composed of rock and support an atmosphere.

No planet beyond the solar system has been seen by optical telescopes. But astronomers can infer the presence of a dark orbiting companion. Almost all the 120 exoplanets discovered so far have been Jupiter-sized or bigger : gas giants far too big to support life.

But the planet that orbits mu Arae every 9.5 days lies at the threshold of the largest possible rocky planets. The discovery, across a distance of 50 light years, was possible only because of the accuracy of an instrument called Harps, a spectrograph on the European Southern Observatory's 3.6m telescope at La Silla in Chile. With this tool, researchers can measure changes in the radial velocity of a star to an accuracy of a metre a second. Any such cyclical changes are evidence of the gravitational tug of an invisible companion.

Researchers had already detected- one Jupiter-sized companion to mu Arae, and a closer look with their new instrument showed an additional planet.

François Bouchy, one of the observing team, said: “This new planet appears to be the smallest yet discovered around a star other than the sun. This makes mu Arae a very exciting planetary system".

The Guardian, August 31st, 2004.

Note:

…. *composed* of rock …
… *support* an atmosphere. (Maintenir une atmosphère)
… the *accuracy* of an instrument called Harps…
… lies at the *threshold* …
… gravitational *tug* of an invisible companion.

accuracy : précision
threshold : seuil
Tug : coup, saccade, tirer sur

Transits of Venus

In the planetary race around the sun, Venus occupies an inside track and so runs faster than Earth. Given the relative speed of the two planets, one would expect transits to occur every 584 days, when Venus overtakes Earth. But transits are actually rarer than that, because Venus' orbit around the sun is tipped relative to that of Earth. A special coincidence is therefore needed for all three bodies to line up.

The first person to work this out was Johannes Kepler, imperial mathematician to the Holy Roman Empire, and a disciple of Copernicus's heliocentric theory of the solar system. Kepler used his own newly discovered laws of planetary motion to predict a transit of Venus would happen in 1631. He was right but nobody saw it. Kepler had a good excuse : he had died the year before. As for his colleagues, the transit was not visible from Europe, and nobody bothered to cross the globe to see it, even though Kepler had warned they would need to wait 130 years for the next one.

About that he was wrong. In one of the more charming episodes in the history of astronomy, Jeremiah Horrocks, a youth from a village near Liverpool, England, outcalculated the imperial mathematician and found that another transit would happen in 1639. Transits often happen in eight-year pairs. Indeed, after this year's transit, the next is in June 2012. This is because of a bit of numerology : when Earth has completed eight orbits, Venus has completed almost exactly 13, bringing everything back into nearly the same alignment. (Nearly, but not quite – which is why transits do not happen every eight years.) Horrocks worked out that, contrary to Kepler's calculations, such a pairing would indeed occur in the 1630s.

Horrocks and his friend William Crabtree were thus the only people who saw Venus's silhouette in 1639. But when the next transit came around in 1761, all the world's astronomers were ready. They wanted to put into practice an idea dreamed up by Edmond Halley, England's second Astronomer Royal, for measuring the scale of the solar system.

The Economist,May 20th 2004.

Vocabulary :

bother	se donner la peine
dream up	imginer, concevoir
line up	aligner
overtake	dépasser
outcalculate	faire un meilleur calcul que
scale	échelle
tip	incliner

Five alive !

An odd, new subatomic particle the "pentaquark", has been found.

James Joyce would have been delighted. Quarks, one of the basic building blocks of matter, were named in the 1960s after a line from his novel *Finnegan's Wake* - three quarks for Muster Mark! - because they were then thought to come in three types (the number is now known to be six). Protons and neutrons, however, do consist of three quarks each. And physicists have now discovered a particle that is made of five quarks - a bit of a promotion for Muster Mark.

The pentaquark, which has been dubbed "theta-plus", was found by a collaboration at the Spring-8 accelerator in Hyogo, Japan. The collaborators found the particle in three-year old data, after they were told what to look for by Omitri Oiakonov, a theoretician at the Petersburg Nuclear Physics Institute in Russia.[...] .

Independent confirmations of the result is proof that the theta plus is a real particle and not an artefact of the data.

All experiments work in roughly the same way. Everyday particles (the Japanese and Americans use electrons; the Russians, protons) are boosted to high speeds in a circular accelerator. This causes them to emit gamma rays, which are then used to bombard atomic nuclei (carbon, hydrogen and xenon respectively) that have been set up as targets in the accelerators. When the gamma rays interact with particles in the nuclei, they create short-lived pentaquarks. When these in turn decay, they do so in a way that identifies them uniquely. It is the particles produced in this decay that actually give the game away.

Dr Oiakonov's theory predicts that nine other pentaquarks should make up a "decuplet" of the beasts. Whether he is right remains to be seen. But in any case, the zoo of particle physics has just acquired at least one new animal.

The Economist, July 5th, 2003.

Vocabulaire du texte

building-block	composante
decay (n.)	désintégration
decay (v.)	se désintégrer
dub	surnommer
roughly	à peu près
theoretician, theorist	théoricien

An invisible hand ?

An unexplained effect during solar eclipses casts doubts on General Relativity.

"Assume nothing" is a good motto in science. Even the humble pendulum may spring a surprise on you. In 1954, Maurice Allais, a French economist who would go on to win, in 1988, the Nobel prize in his subject, decided to observe and record the movements of a pendulum over a period of 30 days. Coincidentally, one of his observations took place during a solar eclipse. When the moon passed in front of the sun, the pendulum unexpectedly started moving a bit faster than it should have done.

Since that first observation, the "Allais effect", as it is now called, has confounded physicists. If the effect is real, it could indicate a hitherto unperceived flaw in General Relativity - the current explanation of how gravity works.

That would be a bombshell - and an ironic one, since it was observations taken during a solar eclipse (of the way that light is bent when it passes close to the sun) which helped establish General Relativity in the first place. So attempts to duplicate Dr. Allais's observation are important. However, they have had mixed success, leading sceptics to question whether there was anything to be explained. Now Chris Duif, a researcher at the Delft University of Technology, in the Netherlands, has reviewed the evidence. According to a paper he has just posted on arXiv.org, an online publication archive, the effect is real, unexplained, and could be linked to another anomaly involving a pair of American spacecraft. [...]

The Economist, August 21st, 2004.

Vocabulary :

assume	supposer, présupposer
be a bombshell	faire l'effet d'une bombe
casts doubts on	mettre en question, questionner
confound	déconcerter
flaw	défaut, problème
go on to	aller ensuite
hitherto	jusqu'alors
motto	devise
spring a surprise	réserver une surprise

Gonna make you a star

Dirk Volkmer and his team, at the University of Bielefeld, in Germany, are now working on tiny marine organisms, the radiolaria, and their exquisitely structured siliceous skeletons.

The team realised that these tough little kritters are extraordinary chemical conjurers that can turn the main source of silica, in salt water, silicic acid, into a myriad of solid shapes and structures. By emulating radiolaria and by mixing the right ingredients, they hope to be able to create micro-components in the test-tube.

It is not well understood how bio-mineralising organisms such as the radiolaria make their silica casings but the team has enough clues to start work. Its members have already found that they can copy the sophisticated processes by which radiolaria form their intricate shells, and have made some spiky silica structures that resemble radiolaria casings.

To make their mock shells, the researchers used a cocktail of soapy surfactant molecules to produce minute but stable oil droplets that could be emulsified into a water-based solution. The oil droplets contain a small amount of metal oxide that act as a precursor for the reaction. As soon as the droplets come into contact with water, they begin to link together to form chains, which build up into a solid metal oxide coating on the oil droplet.

The researchers used video microscopy to see what happens as the metal oxide diffuses to the surface of the oil droplet. They were startled to see star-shaped mineralised shells, about 80 micrometers in size, forming from the originally smooth interface between the oil and water, as the metal oxide crystallises out of the mixture. The reaction is disarmingly simple, and, says Dr Volkmer, is the first approach that truly mimics biology.

One of the first applications of these structures might be to use them to support catalysts. The structures have a very high surface-to-volume ratio. A large surface area is ideal for speeding up chemical reactions, as it is easier for molecules to meet up with each other and react.

The Economist January 25th 2003.

Gonna …. De l'argot pour "Going to" . Ici, « *Gonna* » a un effet de surprise dans le titre. On ne l'utiliserait pas dans un texte scientifique.

Vocabulary :

casing	revêtement, enveloppe	clue	indice
coating	couche, revêtement	conjurer	prestidigitateur
droplet	gouttelette	intricate	complexe, élaboré
mimic	imiter	minute	minuscule
mock shells	coquilles reconstituées, imitations, fausses		
silica	silice	siliceous	silicieux
smooth	lisse	speed up	accélérer
spiky	pointu, hérissé	startled	surpris
surface area	superficie, surface	surfactant	tensioactif
test tube	éprouvette	tiny	miniscule
tough	dur, résistant		

Riemann's riddle

When Andrew Wiles, a British mathematician working at Princeton University, announced a decade ago that he had solved Fermat's last theorem, his discovery was reported on front pages around the world. The Frenchman's mathematical conundrum had taken more than 350 years to unravel.

Three new books grapple with what is arguably an even tougher problem : Riemann's hypothesis, a puzzle that has perplexed mathematicians for the last century and a half.

Riemann's hypothesis is just 15 words: “The non-trivial error of the Riemann zeta function have real part equal to ½”. But explaining it so that non-mathematicians can understand it is more complicated. The distribution of prime numbers, such as 5, 7 and 11, does not follow any regular pattern but they become less common as they grow bigger. In an 1859 paper, Bernhard Riemann, a 33-year old German mathematician, observed that the frequency of prime numbers is very closely related to the behaviour of an elaborate function « z(s) » which came to be named the Riemann zeta function.

The Riemann hypothesis asserts that all non-trivial solutions of the equation *z(s)=0* lie on a straight line. This has been checked for the first billion zeros, but no proof appears to be in sight. [...]

The Economist, July 12th, 2003.

Vocabulary :

conundrum	énigme
prime number	nombre premier
riddle	énigme

Fractals

Dr Mandelbrot needed to get people to pay attention to his work : he began employing powerful computers capable of generating graphical images. He started off using graphical plotters of the kind used to produce architectural line drawings, to draw artificially generated river patterns that could not be distinguished from the real ones. Then in the late 1970s, Dr Mandelbrot began to explore a set of equations that had previously been investigated by Gaston Julia, a French mathematician, in the 1920s. Generalising from Julia's work, and plotting the result using specially written graphic software, Dr Mandelbrot produced the first images of the Mandelbrot set in 1980. “When the first pictures came out, it was an extraordinary event,” he recalls.

Suddenly, people began to pay attention, as Dr Mandelbrot's obscure formulas and eccentric geometrical theories were revealed as the source of images of astonishing beauty and complexity. [...]

Dr Mandelbrot's work also demonstrated the usefulness of computer-based visualisation and experimentation in mathematics. Many mathematicians, he says, liked the idea that certain structures defined by formulas were simply unimaginable. [...]

Fractals such as the Mandelbrot set are commonly associated with the study of complexity, also known by the trendier moniker of chaos theory. But the study of chaos is now somewhat discredited, having failed to make useful progress. Dr Mandelbrot defines his work as having provided “a reasonable beginning of a science of roughness”.

The Economist Technology Quarterly, December 6th, 2003.

Vocabulary :

moniker	nom
plotter	traceur (de graphiques)
roughness	approximation
set	ensemble (n.)
trendy	à la mode

Think big: the world is shrinking

A band of scientists believe they can push the boundaries of chemistry and physics to create a host of tiny particles that could revolutionise products we use every day. Welcome to the wonderful world of nanotechnology.

You may already be digesting and using nanoproducts without even knowing it. Fizzy drinks and fruit juices get their neon rainbow of colours from tiny particles that dissolve in liquid and disappear without a trace. Many vitamins are insoluble in water but can be added to food by making them into particles smaller than the eye can see. Cosmetics such as sunscreen are made of mini-particles that act as miniature solar soldiers that absorb harmful ultra-violet light to protect your skin from the sun.

Nanotechnology has been heralded as one of the key technologies of the 21st century. By manipulating particles 50,000 times smaller than a human hair, materials can be merged into products or can create new properties.

Manufactured products are made from atoms. Their properties depend on how the atoms are arranged. What nanotechnology does is build things one atom at a time to create myriad novel molecular goods possessing amazing properties. The magical trick is to manipulate the molecules individually and place them where they are needed to make the right structure. Nature has played an inspirational role in pushing this mini-world forward.

The leaf of an exotic flower inspired the creation of a miracle spray that refuses to let dirt stick to shoes. The lotus flower from Asia has leaves with a strange arrangement of wax crystals on its surface that repel water. This structure creates a jagged texture on the leaf like a row of pointed teeth that water drops roll off. As the liquid rolls over the leather, it takes any dust or dirt along for the ride, leaving your shoe spotless.

The Daily Telegraph, January 15th, 2003.

boundary	frontière	*dirt*	saleté
drop	goutte	*dust*	poussière
fizzy	gazeux	*harmful*	nocif, nusible
herald	prédire, annoncer	*host*	foule, armée
jagged	irrégulier	*leather*	cuir
magical trick	tour de magie	*merge*	fondre
myriad	myriade	*pointed*	pointu
rainbow	arc-en-ciel	*repel*	repousser
roll off	rouler de	*roll over*	rouler sur
row	rangée	*shrink*	rétrécir
spotless	sans tâche, impeccable	*tiny*	miniscule
trick	astuce, truc	*wax*	cire

Nanotechnology's Unhappy Father. Room at the bottom ?

[…] The ecological niche that the term nanotechnology now inhabits is much closer to traditional chemistry than to the Drexleresque world of assemblers and molecular manufacturing. Pretty much anything that involves making molecules with more than a few dozen atoms in them is climbing on the bandwagon. Indeed cynics, of whom there are many, doubt whether the term actually describes anything at all, beyond a trend that would have happened anyway to do ever more precise chemistry. Cynics have reason for their scepticism, for the one thing the term nanotechnology undoubtedly does describe is big budgets. [...]

Yet ecological shifts do not happen for no reason, either in biology or in sociology. And although a lot of the “new wave” nanotechnology would indeed have happened anyway, it is, nevertheless, actually happening - unlike molecular manufacturing. There are few commercial products yet, but some are clearly on the horizon. Objects called carbon nanotubes, for example, are employed in a new generation of display units that combines the sharp picture-generating method used in cathode-ray tubes with a screen as flat as that of a liquid-crystal display. Nanotubes may also form the basis of a new electrical conductor that would be as good at power transmission as copper, but cheaper and one-sixth of the weight. Nor is Feynman's vision of truly miniature computers neglected. Molecule-sized transistors and other electronic components have now been created, and researchers are trying to work out how to fit them together. "Nanoparticles" of controlled dimensions have even been used in sunscreens.

But nanotubes are grown from gases, using traditional catalysts. And molecule-sized transistors and nano-sunscreens are also synthesised without a molecular assembler in sight. Does it matter? In the grand scheme of things, probably not. As Shakespeare said, “What's in a name? That which we call a rose, by any other name would smell as sweet.” If nanotubes, molecular electronics and even sunscreens end up smelling sweet - in other words, generating useful and profitable products - the user will not care whether the methods used to make them are called chemistry or nanotechnology. But there are, perhaps, two more subtle reasons to worry about the mimetic mutation that has sexed-up chemistry with a brand new label.

The Economist, March llth, 2004.

Vocabulary :

brand new	tout neuf
climb on the bandwagon	prendre le train en marche
copper	cuivre
Drexleresque	référence à Drexler, l’un des scientifiques qui est censé avoir inventé la nanotechnologie
ever more	toujours plus
grand	grandiose, majestueux
in sight	en vue
label	étiquette
on the horizon	à l’horizon
pretty much	presque
shift	changement
sunscreen	écran solaire
work out	metre au point