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East Antarctica 'is losing ice'

By Richard Black

Environment correspondent, BBC News website

The East Antarctic ice sheet has been losing mass for the last three years, according to an analysis of data from a gravity-measuring satellite mission.

The scientists involved say they are "surprised" by the finding, because the giant East Antarctic sheet, unlike the west, has been thought to be stable.

Other scientists say ice loss could not yet be pinned on climate change, and uncertainties in the data are large.

The US-based team reports its findings in the journal *Nature Geoscience*.

The data comes from Nasa's Gravity Recovery and Climate Experiment (Grace) mission.

"It energises me as a scientist, but I'm not convinced that as yet it should energise anyone else"

Professor Richard Alley

Grace has previously shown that the smaller West Antarctic and Greenland ice sheets are losing mass.

These two bodies of ice contain enough water to raise sea levels by about six to seven metres (20ft) each if they melted completely.

Melting the East Antarctic sheet would raise sea levels by much more - about 50-60m.

But scientists have generally discounted the possibility of it happening because the region is so cold.

The Grace measurements suggest there was no net ice loss between 2002 and 2006.

But since then, East Antarctica has been losing 57 billion tonnes (Gt) per year.

"We felt surprised to see this change in East Antarctica," study leader Jianli Chen from the Centre for Space Research at the University of Texas in Austin told BBC News.

The loss still looks small by contrast with West Antarctica, which is losing 132Gt per year, and with Greenland, where a recent analysis combining Grace data with other measurements indicated an annual figure of 273Gt.

Previous Grace analyses - and those from other satellites - had given an inconclusive picture for the giant ice body.

The twin Grace satellites fly in close formation, detecting minute changes in the Earth's gravity through the marginal changes this causes in their relative positions.

Eastern energy

Measuring Antarctic ice loss is a tricky issue because the continent itself is rising and deforming.

Its ice cover was significantly thicker during the last Ice Age; as the ice melted, the weight pressing down on the rock abated, and the rock is "isostatically rebounding".

Readings from satellite missions have to be adjusted to allow for this rebound - and that is one source of uncertainty when trying to assess the significance of the new research, according to Richard Alley, one of the world's leading glaciologists.

"The first thing is that lots of this is dependent on the isostatic [rebound] model, and (recent work has) cast some doubt on the isostatic models that people are using," commented the Penn State University researcher (who was not involved in the paper).

"And then you get into the age-old question of 'is it climate or is it weather'

"So it energises me as a scientist, but I'm not convinced that as yet it should energise anyone else."

Rising potential

The Grace data gives a picture of where ice is being lost across the continent; and these areas are mainly on the coast.

It is not clear what physical processes could be driving any loss of mass here, although it is not simply melting due to high air temperatures, because temperatures are well below zero.

One clue could lie in research published last year by Leigh Stearns and colleagues, showing that lakes under the ice sheet can periodically overflow, with the liquid water then acting as a lubricant to speed glaciers on their way towards the sea.

Commenting on the new research, Dr Stearns told BBC News: "In these coastal regions the ice loss could be driven by some interaction with the oceans or some weather patterns, or it could be a sub-glacial lake that drained and caused some thinning - so it might not be climate-related.

"It's easy to jump to the conclusion that it's exceptional because it's the first time we've recorded it, but we do need a baseline of how things have been in the past so we do need to be cautious," said the University of Kansas researcher.

"Nevertheless, it awakens us to the fact that the East Antarctic sheet is more dynamic than we thought, and we do need to pay attention to it because its potential for sea level rise is so much greater than in West Antarctica or Greenland."

Dr Chen said that one of his team was currently conducting airborne surveys of one of the regions where mass loss had been detected, hoping to shed some light on the mechanisms involved.

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Ex-USSR cosmonaut Feoktistov dies

The USSR's first civilian cosmonaut Konstantin Feoktistov, a crew member of the Voskhod spaceship in 1964, has died in Moscow aged 83, Russian media say.

Feoktistov also designed and tested spaceships himself, and has a crater on the Moon named after him.

He worked on the design of both the Salyut and Mir space stations.

The 1964 flight is famous for being the first in which crew members were sent into space without wearing special space suits.

Feoktistov was born in February 1926 in the city of Voronezh, and was wounded while serving in intelligence in World War II.

In 1964 he became the first non-military person to be sent on a space flight. He was also the only non-member of the Communist Party in Soviet history to become a cosmonaut.

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Shuttle astronaut becomes father in space

A US astronaut on board the space shuttle Atlantis is literally walking on air, with the news of the birth of a daughter back on Earth.

Randolph Bresnik, who is on his first space flight, became a father for a second time when baby Abigail was born back home in Houston, Texas.

The event makes Bresnik the second astronaut to become a father in space - the first was Mike Fincke in 2004.

Mr Bresnik is due to return to Earth on Friday after an 11-day mission.

The 42-year-old Marine and his crewmates were awoken on Sunday by the song Butterfly Kisses, especially chosen by his wife, Rebecca.

Among the lyrics are the lines: "There's two things I know for sure, she was sent here from heaven and she's daddy's little girl."

The couple have a three-year-old son, who they adopted from Ukraine.

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Cern Collider makes fast progress

By Paul Rincon

Science reporter, BBC News

Researchers working on the Large Hadron Collider (LHC) say they are delighted with the progress made since the machine restarted on Friday.

One official said the collider had done more in a few hours than it did in nine days of operations last year.

The LHC is being used to smash together beams of protons in a bid to shed light on the nature of the Universe.

Housed in a 27km-long circular tunnel under the Franco-Swiss border, it is the world's largest machine.

During the experiment, scientists will search for signs of the Higgs boson, a sub-atomic particle that is crucial to our current understanding of physics. Although it is predicted to exist, scientists have never found it.

"It's all been pretty positive so far... Now, [the team] is knuckling down to the hard work"

**James Gillies,
Cern**

[In pictures: LHC restarts](#)

[Large Hadron Collider: Guide](#)

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[The LHC: worth the wait](#)

The machine was heavily damaged when an electrical fault caused a tonne of liquid helium to leak into the tunnel just nine days after it was first launched in September last year.

During 14 months of repairs dozens of giant superconducting magnets that accelerate particles at the speed of light had to be replaced.

Operated by the European Organization for Nuclear Research (Cern), the LHC will create similar conditions to those which were present moments after the Big Bang.

"We are further advanced now than where we were after five days of experiment last year," said Cern's director of accelerators Steve Myers.

He added that the extra year had allowed researchers to upgrade instrumentation and computer software.

Better beam

"It's all been pretty positive so far," said James Gillies, director of communications for Cern. "Now, [the team] is knuckling down to the hard work."

He added: "We're not expecting any major milestones to be reached over the next few days."

Operations team members spent Saturday injecting protons into the LHC's 27km-long "ring", attempting to improve the lifetime of the beams.

- 1 - 14 quadrupole magnets replaced
- 2 - 39 dipole magnets replaced
- 3 - More than 200 electrical connections repaired
- 4 - Over 4km of beam pipe cleaned
- 5 - New restraining system installed for some magnets
- 6 - Hundreds of new helium ports being installed around machine
- 7 - Thousands of detectors added to early warning system

"Right now we've got a beam lifetime of half an hour, which is pretty good for where we are. But ultimately, we want to keep a beam in the machine for 10-12 hours. There's a lot of detailed, nitty-gritty work in order to get there," said Dr Gillies.

Engineers had discussed the possibility of attempting to increase the collider's energy to a record-breaking level of 1.2 trillion electron volts this weekend.

Only the Tevatron particle accelerator in Chicago, US, has so far approached this energy, operating at just under one trillion electron volts.

However, this plan now looks unlikely. Instead, engineers will probably concentrate on preparing the machine for its first low-energy collisions, scheduled to happen in the next 10-15 days.

Progress on restarting the machine went more quickly than expected on Friday. It was not anticipated that engineers would try to circulate a proton beam until 0600 on Saturday at the earliest.

Two stable proton beams had already been circulated in opposite directions around the machine by midnight (GMT) on Friday.

Engineers first circulated a beam all the way around the LHC on 10 September 2008.

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Water mission returns first data

By Jonathan Amos

Science reporter, BBC News

Europe's latest Earth observation satellite has returned its first data.

Smos was launched earlier this month on a quest to help scientists understand better how water is cycled around the Earth.

The spacecraft will make the first global maps of the amount of moisture held in soils and of the quantity of salts dissolved in the oceans.

The data will have wide uses but should improve weather forecasts and warnings of extreme events, such as floods.

"Smos is performing like a dream," said Dr Yann Kerr, a lead investigator on the mission from the Centre for the Study of the Biosphere from Space (Cesbio), Toulouse, France.

"Everything went as clockwork and exactly as expected or better up to now. We did not expect to have images so soon," he told BBC News.

The European Space Agency's (Esa) Soil Moisture and Ocean Salinity (Smos) satellite was launched on 2 November.

After its initial check-out in orbit, its sole instrument - an interferometric radiometer called Miras - was sent live on Tuesday this week.

The first publicly released image on this page has not been properly calibrated by researchers but they say it proves the instrument is in good shape.

Miras is some eight metres across; it has the look of helicopter rotor blades.

It measures changes in the wetness of the land and in the salinity of seawater by observing variations in the natural microwave emission coming up off the surface of the planet.

It does this through 69 antennas positioned on a central structure and along the lengths of its three arms.

Generally speaking, the "colder" (blue) the "temperature brightness" of the microwave signal, the saltier the water and the wetter the soil; but a lot of processing will be needed before any real values can be attached to the measurements coming down from Smos.

"Moreover, there seem to be radio frequency interferences (RFIs) over China, western Russia and parts of Europe (the reddish stripes)," explained Dr Kerr.

"We will have to tune the reconstruction algorithm before we can reduce or address these."

Scientists were well aware before launch that RFIs might be a problem. Smos is operating in the so-called L-band (21cm) which is supposed to be protected, but pre-flight testing established known interference hotspots, such as airports.

The 315m-euro (\$465m; £280m) Smos programme, although led by Esa, has with significant input from French and Spanish interests. The satellite is expected to operate for at least three years.

- The amount of water retained in soils varies between about 5% and 50%
- This will cover most conditions from 'bone dry' to 'mud bath'
- Smos sees the entire range with an accuracy of 4% at the 50km scale
- Natural salinity in water covers the range from near zero to 30%
- Drinking water might be one extreme; salt lakes would be the other extreme
- Smos is seeking sea waters which are typically in the 3-3.5% range
- This needs high accuracy (0.01-0.02%). Maps are at the 200km scale

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Fish 'at risk' in acidified ocean

Ocean acidification could cause fish to become "fatally attracted" to their predators, according to scientists.

A team studying the effects of acidification - caused by dissolved CO₂ - on ocean reefs found that it leaves fish unable to "smell danger".

Young clownfish that were reared in the acidified water became attracted to rather than repelled by the chemical signals released by predatory fish.

The findings were published in the journal *Ecology Letters*.

Danielle Dixson from James Cook University in Queensland, Australia, led the study.

She and her colleagues tested orange clown fish larvae that were raised in water with the same slightly alkaline pH as their ocean reef habitat, and those raised in more acidic water.

The team released the fish into a "flow chamber" with two water sources flowing in parallel.

One source was taken from tanks containing the clown fishes' natural predators and one was drawn from tanks in which non-predatory fish were swimming.

"The flow rates are identical, so the water won't mix," Ms Dixson explained. "This allows the fish in the chamber to choose which water cue they prefer or dislike."

In the test, the fish reared in normal water avoided the stream of water that their predators had been swimming in. They detected the odour of a predator and swam away from it.

But, Ms Dixson said, fish raised in the more acidic water were strongly attracted to both the predatory and the non-predatory flumes.

The researchers say that their study shows that fish larvae "might exhibit a fatal attraction to predators at CO₂ and pH levels that could occur in our oceans by 2100 on a business-as-usual scenario of greenhouse gas emissions".

Smell of danger

Previous studies have shown that fish rely on their sense of smell, or olfaction, to avoid being eaten during the what is known as their settlement process. This is when the recently hatched larvae find a suitable, and safe, place to live.

At this vulnerable juvenile stage, the researchers pointed out, "the ability to detect and avoid predators is one of the most important mechanisms to ensure survival".

Ms Dixon told BBC News: "Ocean acidification has the potential to become a widespread problem and it's unknown how many organisms and ecosystems will cope with the decrease [in] pH.

"This study shows that ocean acidification could lead to an increase in the mortality of larvae."

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Palaeo-celebrity

This year has seen the discovery in Ethiopia of Ardi, the fossil skeleton believed to be the oldest human relative. But long before Ardi came Java Man, who was unearthed in the Indonesian village of Sangiran 120 years ago. Christine Finn has been on a quest to find the origins of this paleo-celebrity.

Sunday afternoon in Solo, also known as Surakarta, and I had a date with Java Man.

"Sangiran Museum" the taxi driver asked me.

And so my first ever ride on a motorbike taxi began after the broadly-smiling driver convinced me an "ojek" was the only way to get there.

We wove through the hooting, revving, steaming Solo traffic along a road lined with motorbike parts and benzine stalls; the fuel funnelled from glass jars straight into the tanks. A refuelling stop as much as the warung or food stands dispensing spicy sata and nasi goreng.

Java Man. The name sounds like a 1970s men's aftershave. One possibly not much used because the face, lovingly reconstructed by the palaeontologists, suggested he was no great shaver.

He also had small, deep-set eyes and an enormous jaw.

But Java Man was still a hero when he surfaced at the end of the 19th Century: *Pithecanthropus erectus*, an early contender for the title of missing link between the first upright hominids and modern humans.

Fossil finds

The ojek roared into the countryside, turning off to a small village and the museum, its smart entrance overarched by a pair of mammoth tusks.

"I wait" said Mr Ojek. The museum was small, and all of the text was in Indonesian, which I could not read. We would be back in Solo within an hour.

A life-size diorama showed Java Man and his family.

He was pure Hollywood alpha male, all that was missing was a gold medallion.

He had a full complement of black body hair. As did Java Woman.

Charles Darwin's face peered out from a glass case, beside two names most identified with the ancient hominid: Eugene Dubois, the Dutch man who came across the top of his skull on the riverbank at nearby Trinil in 1891, and Ralph von Koenigswald, a German

paleoanthropologist, drawn to Sangiran in the 1930s by its rich fossil finds, which emerged especially after it had been raining heavily.

Koenigswald proved very popular with the locals who were soon earning money from all the fossils they brought to his door, some of which were the remains of ancient humans.

And all this fitted local legend.

A hero from Sangiran, an important archaeological excavation area in Java, was said to have once used supernatural powers to fight off marauding giants.

The resulting heap of corpses scattered around the village were soon concealed by a spring which gushed out of the pile.

Even today the Sangirans name their fossil finds "Balung Buto" or "Giant Bones".

There were plenty of "Balung Buto" in the museum but Java Man was not amongst them.

Treasure hunt

On a dusty shelf, I saw some plaster casts of the fragments but the originals, I discovered, were scattered in bigger museums.

This hardly thrilled my bones. But if I could not see Java Man, I could maybe see where he hung out with his family, and dip my toes in his local river.

I bought the museum's two most likely treasure maps: An academic report on Sangiran from 1987, written in English, which had a survey map, and a new illustrated children's guide, in Indonesian, which had photos of the landscape.

Mr Ojek was up for a challenge.

We hurtled off, and I think he was equally disappointed when we quickly found a sign which read: "*Homo erectus* 400 metres."

That was far too easy, I thought.

But Java Man's river bank was not to be found quite that quickly.

The sign, and others, led us round in circles.

Mr Ojek now took charge, stopping at intervals, the child's guide in hand, showing the photos to playing youngsters, villagers in their front yards, or fuelling their bikes.

The arms and fingers pointed in all directions.

So I went by foot alongside paddy fields to ask the farmers.

What a strange apparition, I thought as I walked - not Mr Ojek wielding his incongruous kids' book, but me, another Sangiran giant, melting in my bike helmet.

In the seeming middle-of-nowhere, we found a monumental, but rather neglected, concrete marker to another even earlier hominid, *Meganthropus paleojavanicus*, who lived there around 1.5 million years ago.

But it was all, it has to be said, a bit of an anti-climax.

However, Mr Ojek had glanced again at the guide. Now he reckoned he had found the river.

Final destination

After a short bike ride we were there - on a track reaching right into the Solo river.

The late afternoon light was fading, shadows were rising. It was perfect.

I walked down to the water trying to picture what it must have been like there a million years ago with the hairy Java man, his wife and Java children going about their business.

But I could not quite imagine it. The present was intruding too much.

The sight of water buffalo disporting, children splashing in the shallows and there, right in front of me, two 21st Century Java men, up to their knees in this river on a late Sunday afternoon - tenderly washing their motorbikes.

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Harrabin's notes

In his regular column, the BBC's environment analyst, Roger Harrabin, assesses the arguments sparked by the leaking of information on climate change.

CLIMATE CHANGE: METHODOLOGY QUESTIONED

Scientists at the Climate Research Unit at the University of East Anglia are facing a fierce attack from climate sceptics following the hacking of the university's computer.

The hacker stole thousands of e-mails and data. Much of it has been posted on the web. And some of the e-mails are causing acute embarrassment.

My contacts at the CRU tell me the e-mails are being taken out of context and insist they are part of the normal hurly-burly of conversations between scientists working on some of the most complicated questions of our times.

They ask how many of us would feel completely comfortable if our own inboxes were emptied out for the world to see. How much of what we had said to close colleagues in industry jargon would be liable to misinterpretation

"If the IPCC (Intergovernmental Panel on Climate Change) can't do closed e-mail, no-one with any expertise could do anything. I don't know how you are supposed to work if you don't have e-mail," my source said.

But the e-mail stash is proving a treasure trove for sceptics who have challenged every facet of climate science and policy.

Some of the e-mails reveal the frustration and annoyance among mainstream climate researchers about the probings they face from critics who relentlessly question their methodology.

And although my contact insists that the e-mails are about how data is presented and interpreted, sceptics say the e-mailers may have been discussing how the data could be manipulated.

The CRU has been repeatedly asked to publish the entire data set from which it compiled an important grid-based record of global temperatures.

It says it will publish full details when it has clearance from all the world's meteorological offices whose permission is needed.

But speaking to my source at the CRU, it is also clear that the unit has been dragged down by what it considers to be nit-picking and unreasonable demands for data - and that there is personal animus against their intellectual rivals.

Now this sort of hostility is nothing new in academia - but the revelations come at a sensitive time as the world's nations gather for the climate meeting in Copenhagen.

My CRU source points out that its unpublished full data set is almost identical to the ones at the National Climatic Data Center and the Goddard Institute of Space Studies.

Both of these are in the US, where there are no restrictions on publication. The CRU view is that when the sceptics see the full data in due course they will be very disappointed.

The scientific establishment is likely to support the CRU. Despite continuing uncertainties in some areas of climate science, they say officially that their overall confidence that humans are warming the climate is now more than 90%.

One leading figure told me unofficially that confidence was now at 99%.

But the e-mail controversy may prove an uncomfortable moment in the careers of some of researchers in the spotlight and will undoubtedly provoke demands for renewed scrutiny of the CRU's influential work.

These demands are likely to surface in the US Senate, where climate change sceptics and their supporters are holding up the energy and climate bill which President Barack Obama needs before he can sign a legally binding agreement over cutting emissions.

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In pictures

Smashing! Cern's particle cruncher finally restarts

Earth Watch

Korean model for Obama as Copenhagen looms

UK climate unit's e-mails hacked

The e-mail system of one the world's leading climate research units has been breached by hackers.

E-mails reportedly from the University of East Anglia's Climatic Research Unit (CRU), including personal exchanges, appeared on the internet on Thursday.

A university spokesman confirmed the email system had been hacked and that information was taken and published without permission.

An investigation was underway and the police had been informed, he added.

"We are aware that information from a server used for research information in one area of the university has been made available on public websites," the spokesman stated.

"Because of the volume of this information we cannot currently confirm that all of this material is genuine.

"This information has been obtained and published without our permission and we took immediate action to remove the server in question from operation.

"We are undertaking a thorough internal investigation and we have involved the police in this enquiry."

Researchers at CRU, considered to be one of the world's leading research bodies on natural and human-induced climate change, played a key role in the Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report, which is considered to be the most authoritative report of its kind.

'Inside information'

Graham Cluley, a computer security expert, suggested that December's key climate summit in Copenhagen, which has made headlines around the world, could have increased the university's profile as a possible target among hackers.

"There are passionate opinions on both sides of the climate debate and there will be people trying to knock down the other side," Mr Cluley, senior technology consultant for Sophos, told BBC News.

"If they feel that they can gather inside information on what the other side is up to, then they may feel that is ammunition for their counterargument."

Mr Cluley added that universities were vulnerable to attacks by hackers because some many people required access to IT systems.

"You do need proper security in place; you need to be careful regarding communications and make sure your systems are secure.

"I trust that they will now be looking at the systems, and investigating how this happened and ensuring that something like this does not happen again."

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Two of Hubble's instruments to go on display at US museum

Two instruments that served more than 15 years aboard the Hubble telescope have gone on display in the US.

Washington DC's National Air and Space Museum is the new home for the WFPC-2 and Costar, which once served as the telescope's eyes and its spectacles.

The two instruments were replaced during a servicing mission in May.

They will depart in December for a brief tour of California before returning permanently to the museum in March 2010.

The Corrective Optics Space Telescope Axial Replacement, or Costar, was a suite of optics providing the fix for a manufacturing fault that initially stymied Hubble's mission.

A tiny flaw in the curvature of the telescope's main mirror meant its first images were blurred.

In 1993, Costar was installed to act as "spectacles" to correct the images for a range of Hubble's instruments and cameras. In addition, the Wide Field Planetary Camera 2 (WFPC-2) was installed, which already had the optical fix built into it.

The rejuvenated telescope then began to produce some of the most stunning images astronomers - and the public - have ever seen.

The WFPC-2 was responsible for the ubiquitous image of the Eagle Nebula, dubbed the "Pillars of Creation", among 135,000 others during its 15 years in space.

The two instruments were removed in the final Hubble servicing mission in May and returned to Earth.

"This was the camera that saved Hubble," said Dr Ed Weiler, associate administrator for Nasa's science mission directorate.

"I have looked forward for a long time to stand in front of this very instrument while on display to the public."

The Smithsonian's National Air and Space Museum holds thousands of artefacts from the history of aviation and spaceflight.

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Giraffes use 'supercharged' heart

Giraffes use a small, powerful, supercharged heart to pump blood up the neck to the head, new research reveals.

New skin 'may help burns victims'

French researchers say they have found a way of using human embryonic stem cells to create new skin which could help serious burns victims.

They say the stem cells grew into fully formed human skin 12 weeks after being grafted on to mice.

The researchers, writing in the Lancet journal, say the skin could solve the problems of rejection that burns patients currently face.

One stem cell expert said they had made an important advance.

Burns techniques

For more than 20 years, patients with serious burns have benefited from a technique which grows new skin in the laboratory using their own skin cells.

"This report takes research into regenerative skin stem cells to the next level"

Holger Schluter, Peter MacCallum Cancer Centre

But the technique takes three weeks, putting the patients at risk of dehydration and infection.

Skin from cadavers is used during this period to cover the wounds but its availability is limited and it is often rejected by the patient's immune system.

Artificial nets which cells can grow on have also been tried. But they do not work on large burns, where they increase the risk of rejection and disease transmission because they can contain material from cows and other humans.

Skin formation

The researchers duplicated the biological steps that lead to skin formation during embryonic development.

They placed the cells on an artificial net which helped the cells to form a layer of skin.

This was grafted on to five mice and 12 weeks later, the skin had a structure consistent with human skin.

Dr Christine Baldeschi, from the Institute for Stem Cell Therapy and Exploration of Monogenic Diseases in Evry, France, who led the research, said the results were promising.

She said the technique could lead to "an unlimited resource for temporary skin replacement in patients with large burns awaiting grafts of their own skin".

Researchers are now planning a human trial of the new technique.

An accompanying editorial by Holger Schluter of the Peter MacCallum Cancer Centre in Melbourne, Australia, said the research represented an important advance.

He said: "This report takes research into regenerative skin stem cells to the next level.

"This finding suggests that skin derived from embryonic stem cells could be transplanted onto burnt patients awaiting skin grafts, with a reduced risk of rejection."

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Spacewalk for shuttle astronauts

Two astronauts from the space shuttle Atlantis are making the first spacewalk of their mission.

Michael Foreman and Robert Satcher will hook up a spare antenna and cables on the International Space Station (ISS).

Three spacewalks are planned during the shuttle's 11-day visit, which began with a smooth docking on Wednesday.

Atlantis blasted off from Florida's Kennedy Space Center on Monday; it will deliver spare parts to the station and bring back a crew member.

The spacewalk is due to last for about six hours.

The astronauts have already unloaded several tonnes of large spares, including pumps and gas tanks.

The hardware should keep the space station operating well past next year's retirement of the space shuttle fleet.

None of the other spacecraft which visit the station is big enough to carry such large pieces of equipment.

The six all-male crew of Atlantis will spend the US Thanksgiving holiday in orbit.

They will return to Earth with a seventh crew member, Nicole Stott, who has been living at the space station for nearly three months.

But this will be the last such shuttle crew rotation before the fleet's retirement.

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First test for record solar plane

The prototype of a solar-powered plane destined for a record round-the-world journey will make its first trip across a runway on Thursday and Friday.

This week saw the Solar Impulse plane outside its hangar for the first time, with tests of its engines and computer.

The plane's maiden flight is scheduled for February, and a final version will attempt to cross the Atlantic in 2012.

As wide as a jumbo jet but weighing just 1,500 kg, it will be piloted by Swiss adventurer Bertrand Piccard.

"It's very exciting, we are moving now toward a very concrete phase," said Solar Impulse chief executive Andre Borschberg.

"You have to realise this airplane is quite special and you cannot just put it on the runway, apply full power and go in the air - it has to be done really step-by-step," he told BBC News.

Wright stuff

To that end, the team has spent several days ramping the plane's engines up to full power, and the "taxiing tests" of Thursday and Friday will give the test pilot a feel for how the plane moves on the ground.

If the tests are successful, the next step will be a short hop in about two weeks' time.

"We'll take off at the beginning of the runway, fly a few metres above it - a little bit like the Wright brothers did in 1903 - and then land again, to see how it behaves at the beginning of the flight.

"If this is satisfactory, we will dismantle it and transport it to [Payerne air force base in western Switzerland] where will we do the real first flight of about two hours, in February."

But each step will be a careful one, Mr Borschberg stressed.

"This is truly a new design - an airplane the size of an Airbus and the weight of a mid-sized car - so we're not taking risks by not understanding something."

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Mammoth dung clue to extinction

By Victoria Gill

Science reporter, BBC News

Mammoth dung has proven to be a source of prehistoric information, helping scientists unravel the mystery of what caused the great mammals to die out.

An examination of a fungus that is found in the ancient dung and preserved in lake sediments has helped build a picture of what happened to the beasts.

The study sheds light on the ecological consequences of the extinction and the role that humans may have played in it.

Researchers describe this development in the journal *Science*.

The study was led by Dr Jacquelyn Gill from the University of Wisconsin, Madison, in the US.

She and her colleagues studied the *Sporormiella* fungal spores contained in the sediment deep within the bed of Appleman Lake in Indiana.

Many very large mammals including mammoths, mastodons, ground sloths and giant kangaroos inhabited forests in this area of North America about 20,000 years ago.

Sporormiella produces spores in the dung of large herbivores. These are then preserved in the layers of mud and can provide an index of the number of these animals, or megafauna, that roamed the environment at a particular time.

"Sediment cores are much like ice cores, except with lake mud," explained Dr Gill. "The spores [and other materials] settle out into the lake mud and get buried over time."

She and her team simply counted the pollen, charcoal and *Sporormiella* in these layers of mud, tracking the timescale of ancient environmental changes.

Their results showed a slow decline in megafauna that began about 15,000 years ago and appeared to last for about 1,000 years.

This discovery rules out one idea that the extinction might have been caused by an extraterrestrial object striking Earth 13,000 years ago.

The scientists also spotted signals of major environmental changes around the time of the extinction.

"This study is exciting because we're getting some solid data about the ecological consequences of the removal of these animals," said Dr Gill.

"After their decline we see an increase in the more warm-adapted deciduous trees, and an increase in charcoal [which means there was] an increase in the number of forest fires.

"So we can see that the forest is reassembling following the extinction."

Human or environment

The study also shows that the decline began about 1,000 years before the Clovis period - when the archaeological record shows that humans were making the tools specifically to hunt large animals.

Prior to this discovery, some scientists believed that Clovis people hunted the animals to extinction.

But Professor Christopher Johnson from James Cook University in Queensland, Australia, said that the study still supports the hypothesis that humans were primarily responsible for the mammals' decline.

Professor Johnson was not involved in the study but wrote an accompanying article in the same issue of Science, outlining its significance.

He wrote: "If people were responsible... they must have been pre-Clovis settlers.

"The existence of such people has been controversial, but archaeological evidence is slowly coming to light."

Dr Gill commented: "We can't resolve the climate versus humans debate but we have eliminated one of the main hypotheses for each camp."

She added that there were "modern conservation implications" to the study.

"We know the large herbivores on the landscape today are some of the most threatened," she said.

"And we're starting to learn that they're ecological keystones. They're not just charismatic, they might also be ecologically significant."

Professor Johnson told BBC News: "If we want to understand the history of ecosystems across the planet we really need to understand the effects of megafaunal extinction."

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Corps blamed for Katrina floods

A US judge has ruled that negligence by army engineers led to massive flooding in an area of New Orleans as Hurricane Katrina struck in 2005.

The court upheld complaints by six residents and a business against the US Army Corps of Engineers over its maintenance of a navigational channel.

They were each awarded \$720,000 (£431,000) damages, and the ruling could lead to thousands more claims.

About 80% of New Orleans was flooded by Hurricane Katrina.

More than 1,800 people died on the US Gulf coast in the devastating storms.

The Army Corps is responsible for maintaining a system of canals and earthworks that protect New Orleans from storm surges.

US district judge Stanwood Duval ruled "negligent failure" to maintain the Mississippi River-Gulf Outlet - a shipping channel - had led to flooding in the city's Lower 9th Ward and nearby St Bernard Parish.

Forceful attack

However, he said the corps had not been responsible for flooding in eastern New Orleans.

Government lawyers have argued the system had been overwhelmed by the hurricane and that levee breaches could not be blamed on the channel alone.

In his 156-page ruling, Judge Duval said he believed it was the failure to shore up the outlet that "doomed the channel to grow to two to three times its design width" and "created a more forceful frontal wave attack on the levee".

It was the first time a US court has found the federal government directly responsible for some of the damage caused by Hurricane Katrina.

The government can appeal against the ruling.

Correspondents say that if upheld, it could set a precedent for thousands more flood victims to sue the government for damages.

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In pictures

Helena Christensen documents climate change

Energy-saving bulbs 'get dimmer'

Energy-efficient light bulbs lose on average 22% of their brightness over their lifetime, a study has found.

In some cases they emit just 60% as much light as traditional models which are being phased out of shops, it says.

The study in *Engineering and Technology* magazine concluded that consumers were being misled by the bulbs' packaging.

Of the 18 energy-saving bulbs tested over 10,000 hours by the Institution of Engineering and Technology, three stopped altogether.

'Migraines'

The magazine's editor, Dickon Ross, told the BBC that packaging claims about the power of the bulbs did not live up to what they delivered in terms of people's perceptions of light.

He said: "It may not be deliberate, but because of the standards set, you end up with figures that are exaggerated compared to what people really experience."

Traditional bulbs lose no more than 7% of their brightness by the time they burn out - equivalent to about 2,000 hours from first use.

But the new energy-saving models, known as compact fluorescent bulbs, use up to 80% less electricity than traditional bulbs and could save up to £37 a year on energy bills.

Critics, however, claim they can trigger migraines, make skin conditions worse and lead to other health problems.

EU Countries started the mandatory phase-out of 100W and frosted incandescent light bulbs earlier this year.

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Baby ibex's epic struggle to live

Amazing footage of a baby ibex's perilous escape from a fox is captured on film by a BBC natural history cameraman.

Alcohol 'protects men's hearts'

Drinking alcohol every day cuts the risk of heart disease in men by more than a third, a major study suggests.

The Spanish research involving more than 15,500 men and 26,000 women found large quantities of alcohol could be even more beneficial for men.

Female drinkers did not benefit to the same extent, the study in Heart found.

Experts are critical, warning heavy drinking can increase the risk of other diseases, with alcohol responsible for 1.8 million deaths globally per year.

The study was conducted in Spain, a country with relatively high rates of alcohol consumption and low rates of coronary heart disease.

The research involved more than men and women aged between 29 and 69, who were asked to document their lifetime drinking habits and followed for 10 years.

Crucially the research team claim to have eliminated the "sick abstainers" risk by differentiating between those who had never drunk and those whom ill-health had forced to quit. This has been used in the past to explain fewer heart-related deaths among drinkers on the basis that those who are unhealthy to start with are less likely to drink.

Good cholesterol

The researchers from centres across Spain placed the participants into six categories - from never having drunk to drinking more than 90g of alcohol each day. This would be the equivalent of consuming about eight bottles of wine a week, or 28 pints of lager.

"People should not be encouraged to drink more as a result of this research"

Professor Martin McKee

London School of Hygiene and Tropical Medicine

For those drinking little - less than a shot of vodka a day for instance - the risk was reduced by 35%. And for those who drank anything from three shots to more than 11 shots each day, the risk worked out an average of 50% less.

The same benefits were not seen in women, who suffer fewer heart problems than men to start with. Researchers speculated this difference could be down to the fact that women process alcohol differently, and that female hormones protect against the disease in younger age groups.

The type of alcohol drunk did not seem to make a difference, but protection was greater for those drinking moderate to high amounts of varied drinks.

The exact mechanisms are as yet unclear, but it is known that alcohol helps to raise high-density lipoproteins, sometimes known as good cholesterol, which helps stop so-called bad cholesterol from building up in the arteries.

'Binge-drinking'

UK experts said the findings should be treated with caution because they do not take into account ill-health from a range of other diseases caused by excess drinking.

"Whilst moderate alcohol intake can lower the risk of having a heart attack, coronary heart disease is just one type of heart disease. Cardiomyopathy, a disease of the heart muscle, is associated with high alcohol intake and can lead to a poor quality of life and premature death," said the British Heart Foundation's senior cardiac nurse, Cathy Ross.

"The heart is just one of many organs in the body. While alcohol could offer limited protection to one organ, abuse of it can damage the heart and other organs such as the liver, pancreas and brain."

The Stroke Association meanwhile noted that overall, evidence indicated that people who regularly consumed a large amount of alcohol had a three-fold increased risk of stroke.

"Six units within six hours is considered 'binge-drinking' and anyone indulging in regular 'binge-drinking' increases their risk of stroke greatly," said research officer Joanne Murphy.

Public health specialists warned no-one should be encouraged to drink more as a result of this study.

"The relationship between alcohol and heart disease remains controversial," said Professor Martin McKee of the London School of Hygiene and Tropical Medicine.

"While there is good evidence that moderate consumption is protective in people who are at substantial risk of heart disease - which excludes most people under the age of 40 - we also know that most people

underestimate how much they drink. This paper adds to the existing literature but should not be considered as definitive. "

In the UK, the recommendation is no more than two to three units of alcohol a day for women - the equivalent of one standard glass of wine - and three to four units for men.

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Tribe's resistance could help CJD

Darwinian natural selection could help halt human "mad cow disease", experts say after finding a tribe impervious to a related fatal brain disorder.

The Papua New Guinea tribe developed strong genetic resistance after a major epidemic of the CJD-like disease, kuru, spread mostly by cannibalism.

Medical Research Council experts assessed more than 3,000 survivors of the mid-20th Century epidemic.

Their findings appear in the New England Journal of Medicine.

Kuru, a prion disease similar to CJD in humans and BSE in animals, was transmitted at mortuary feasts where - until the practice was banned in the late 1950s - women and children consumed their deceased relatives as a mark of respect and mourning.

But a gene variation, G127V, found in people from the Purosa valley region of the Eastern Highlands seems to offer high or even complete immunity.

"The fact that this genetic evolution has happened in a matter of decades is remarkable"

MRC Prion Unit director Professor John Collinge

And experts believe this could be the strongest example yet of recent natural selection in humans.

MRC Prion Unit director Professor John Collinge said: "It's absolutely fascinating to see Darwinian principles at work here.

"This community of people have developed their own biologically unique response to a truly terrible epidemic.

"The fact that this genetic evolution has happened in a matter of decades is remarkable.

"Kuru comes from the same disease family as CJD, so the discovery of this powerful resistance factor opens up new areas for research taking us closer to understanding, treating and hopefully preventing of a range of prion diseases."

Survival advantage

University College London's Institute of Neurology geneticist Professor John Hardy said the findings were fascinating.

"It's fantastic demonstration of natural selection.

"Because people who have this mutation were protected from this fatal disease their proportion in society increased massively."

But he said a similar resistance to CJD would be less likely to develop.

He said: "In Papua New Guinea kuru became the major cause of death, so there was a clear survival advantage and the selection pressure was enormous.

"Here in Britain the numbers with CJD are very small and so the selection pressures will be less."x

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Skate may be fished to extinction

By Victoria Gill

Science reporter, BBC News

A species of skate could become the first marine fish driven to extinction by commercial fishing, say scientists.

A study reveals that an error in the classification of the species has meant researchers have failed to see just how close to the brink it is.

The French team reports its findings in the journal *Aquatic Conservation*.

Marine biologist Nicholas Dulvy from Simon Fraser University in Canada says the skate is now "the most precarious marine species on Earth".

The team's genetic studies have revealed that what is referred to as the common skate is actually two clearly distinct species - the flapper skate (*Dipturus intermedia*) and the blue skate (*Dipturus flossada*).

The fish were originally categorised separately, but an influential study in 1926 recognised only one valid species - *Dipturus batis*. This classification has been unchallenged since.

The 80-year error has ensured that fisheries have not been catching what they thought, explained Dr Dulvy, who is also co-chair of the World Conservation Union's (IUCN) shark specialist group.

The result has been that catches of the smaller, more resilient blue skate has entirely masked the decline of the flapper skate.

Disappearing fast

The research team, led by Samuel Iglesias from the Marine Biology Station in Concarneau on the west coast of France, paints a very bleak picture for the future of the flapper skate.

Dr Iglesias and his team spent over a year working with French fisheries and taking DNA samples from the skate that was caught.

His findings finally revealed that the larger *D. intermedia* species was indeed in serious decline.

Dr Iglesias said: "The threat of extinction for European *Dipturus* together with mislabelling in fishery statistics highlight the need for a huge reassessment of population for the different *Dipturus* species in European waters.

"Without revision and recognition of its distinct status the world's largest skate, *D. intermedia*, could soon be rendered extinct."

Dr Dulvy added: "As far as we can tell, [humans have] not yet driven anything fully to extinction by over-fishing."

He and many other marine scientists are now very concerned that this skate species will be the first.

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Shuttle docks with space station

The space shuttle Atlantis has successfully docked with the International Space Station, according to Nasa officials.

The shuttle blasted off on Monday with six astronauts on an 11-day voyage to deliver new equipment to the station.

The docking was manually completed by commander Charlie Hobough as the two spacecraft travelled towards each other at 17,000 miles an hour.

The astronauts' arrival will be met with a traditional welcoming ceremony.

The mission is set to include three spacewalks to store hardware on the outside of the orbiting outpost.

These parts include pump modules, gas tanks, two control moment gyroscopes and components for the space station's robotic arm.

Atlantis is also carrying up to a million microscopic worms as part of an experiment to help scientists understand why human muscles waste away in zero gravity.

The all-male crew of Atlantis will spend the US Thanksgiving holiday in orbit.

They will return to Earth with a seventh crew member, Nicole Stott, who has been living at the space station for nearly three months.

But this will be the last such shuttle crew rotation before the fleet's retirement in 2010.

This mission will be the last shuttle mission for 2009.

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Spaceman

Countdown to maiden flight of Falcon 9 rocket

Seahorse 'hitchhikes' Atlantic

An American seahorse is found in European waters.

DNA clue to save rare Darwin bird

A rare mockingbird could be reintroduced to the Galapagos Islands - with the help of some specimens collected by Charles Darwin.

A team of geneticists extracted DNA from two birds that the famous naturalist collected in 1835.

By comparing this to DNA from living sub-populations on two other islands, the scientists revealed genetic clues about how best to conserve the birds.

They report their findings in the Royal Society journal *Biology Letters*.

The researchers used two specimens that Darwin and Robert Fitzroy - the captain of HMS *Beagle* - collected from Floreana Island during their trip to the Galapagos more than 170 years ago.

The Floreana mockingbird (*Mimus trifasciatus*) became extinct on the island soon after this famous expedition, mainly because of the human impact on its delicate habitat.

Today only two small sub-populations survive on two tiny satellite islets - Champion and Gardner-by-Floreana.

Survival of species

Karen James, a Natural History Museum of London researcher who was involved in this study, said the Floreana mockingbird was one of the rarest birds in the world.

"It was also important for Darwin's realisation that organisms might evolve independently on islands," she told BBC News.

The Charles Darwin Foundation, which carries out conservation research in the Galapagos, plans eventually to reintroduce the birds to Floreana.

But for this reintroduction to be effective, Dr James said, a population would have to be restored that was "as close as possible to what existed before".

To find out what this population would look like, the scientists needed to study the Floreana birds.

"There are very few of these specimens," Dr James explained. "But the Natural History Museum has two of them and they just so happened to have been collected by Darwin and Fitzroy."

Dr James and her colleagues were given the opportunity to take tiny samples from the toe pads of each historic specimen, from which to extract DNA.

The team found "genetic signals" in each of the two surviving species that were also present in Darwin's samples.

This revealed that the two sub-populations split from each other very recently. This split, the researchers said, was likely caused by the Floreana mockingbird becoming extinct.

Its extinction would have severed a "bridge" between the two populations - meaning that it was no longer possible for them to interbreed.

Even though they have evolved independently and become inbred, this study showed that the tiny sub-populations have retained much of the important "genetic variation" once found in the mockingbirds on Floreana.

This is good news for the survival of the species.

It has led the researchers to conclude that future conservation plans should focus on protecting "the two satellite populations in situ and establishing a single third population on Floreana".

This reintroduction could use birds from both islands, the researchers said, "to maximize genetic diversity".

Dr James said the project highlighted the importance of historic specimens.

"Though Darwin knew nothing of DNA, the specimens he and Fitzroy collected have, after 170 years of safe-keeping in collections, yielded genetic clues to suggest a path for conservation of this critically endangered and historically important species," she said.

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Climate: A question of justice

VIEWPOINT

Kumi Naidoo

This week, lifelong human rights activist Kumi Naidoo takes over as international executive director of Greenpeace. Here, he explains why he is making the jump to a mainstream environmental organisation, and what role he sees for organisations such as Greenpeace in the modern world.

I join Greenpeace in the "eye of the storm", in the final weeks before the crucial UN climate summit in Copenhagen.

It is the most important opportunity to tackle the greatest threat facing the planet: climate change.

I believe that the convergence of crises that we find ourselves in - food, fuel, poverty, financial and climate - have led to a "perfect storm" to which we can respond in one of two ways.

One is the route of "business as usual".

This is what we tend to witness from the G8 and G20 leaders, as well as other individual governments, who have all paid lip service to poverty and climate change with statements about greening the world's economy without providing any substantive propositions or action to back it up.

"More equality and the equitable sharing of the planet's finite resources are our only chance to save the planet for the future"

The current apparent lack of political will to sign a fair, ambitious and binding treaty on climate change in Copenhagen is a prime example of this.

The other route is one that truly engages with the radical changes the world needs, and where governments, businesses and civil society all work together to make the far-reaching decisions that are required to ensure that we keep the planet safe for future generations.

Industrialised world leaders still have the ability to turn the situation around, by attending the Copenhagen climate summit, personally committing to slash their countries' emissions, and showing developing countries that they mean business by providing the funding needed - at least \$140bn per year - to enable them to adapt to and tackle climate change and protect their forests.

This is substantially less than the trillions of dollars that governments risked in bailing out the banks last year.

Be the change

I believe that change is possible. I have witnessed profound changes in my own life time and my own life.

Make Poverty History white wristband" border="0" vspace="4" hspace="4">

I have been an activist for the majority of my life, and my personal journey began at the age of 15 in apartheid South Africa where I was involved with the liberation struggle, eventually having to flee to the UK in 1987.

After the release of Nelson Mandela, I returned to South Africa and was involved in strengthening citizen action and civil society around the world, both through Civicus - the global organisation aiming to boost citizen involvement in issues - where I served as secretary general for the past 10 years, and through the Make Poverty History campaign of which I was one of the founders in 2003.

I have always personally connected the poverty movement with stewardship for the environment; and having served for the past year as chair of tcktkctck, the global campaign for climate action, it felt like a natural progression to move to Greenpeace.

I see a need to bring together the poverty movement and the environmental movement as we face up to the greatest challenge of our time: climate change.

Climate change is real and happening now. It already accounts for over 300,000 deaths throughout the world each year, according to the Global Humanitarian Forum.

Not only that, but I am aware that time is very much against us. We must take radical action, and I believe that the work that Greenpeace does across the globe is vital in our understanding of climate change and also the actions that are needed.

Pathfinders

While some may wonder what a poverty activist is doing moving to an environmental organisation, I do not view my role at Greenpeace as an abrupt detour.

I believe the struggles against poverty and climate change are inextricably linked, while the solutions are the same.

"Let's be clear; time is running out to address the issue of climate change"

More equality and the equitable sharing of the planet's finite resources are our only chance to save the planet for the future.

We in civil society have to believe there is a new pathway.

We have to have the confidence to tread this new path; indeed, to demand this new path.

We must take the leap of faith that says the strategies may need to be fluid, but the objectives are abundantly clear.

We need to organise ourselves and work together in new and more transparent ways. We have to break down the barriers that exist, and realise that our struggles and causes are not independent.

They are not about the people or the planet; they are in fact one single common cause - justice.

Justice is applicable to all of life: human, plant and animal. This is why I came to Greenpeace - for climate justice.

In the past we might have believed that we had more time to make incremental progress. The logic in the anti-poverty movement has been that the struggle to end global poverty is a marathon, not a sprint.

The difficult questions now are: do climate change and the recent shocks to the world's economic systems allow us the luxury of running a marathon over the course of the next 10-15 years

Can we afford to delay the implementation of significant policy and essential change

Devastating picture

Let's be clear; time is running out to address the issue of climate change.

It requires urgent solutions - solutions which, as the science makes clear, must be implemented within the next five years if we are to stand a chance of preventing runaway climate change and the social, economic and environmental devastation that it would bring.

Everything is in play. We have heard the warnings from scientists, economists and even military leaders: unchecked climate change will result in mass starvation, mass migration, mass extinction and amplify the causes of conflict.

We know what a climate-saving deal looks like, and we know what needs to be done to get one.

We must all seize the opportunity to change the planet's trajectory, to invest in a green economy generating millions of jobs, delivering power to the poor and reducing global security threats over access to climate-changing fossil fuels.

Nature does not negotiate.

It will not wait for our political leaders to set aside their petty differences and short term self interest. It will not wait for civil society to join in common cause.

The time is now, the time to act and the time to set the world on a new path to a green and peaceful future.

Do you agree with Kumi Naidoo Is climate change essentially an issue of justice Are politicians addressing the issue with the speed that the science mandates What role should organisations such as Greenpeace be playing in the modern world

Send us your comments using the form below:

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From space race to human race

VIEWPOINT

John Manoochehri

Forty years on from humans reaching the Moon, it is time for another epochal moment in history, says John Manoochehri. In this week's Green Room, he calls for us to recapture the spirit that took us into space and use that energy to save the planet.

"A great idea did not put men on the Moon 40 years ago; a vast, risky, people-driven and hugely uneconomic undertaking did"

In July, the UK government launched its Low Carbon Transition Plan, which it described as the best carbon plan of any developed country.

Unnoticed, it was unveiled 40 years to the day after the launch go-ahead was given for Apollo 11, the mission that put a human on the moon, and ended the space race in improbable, epochal success.

Enthusiasm for sustainability is everywhere. But is enough actually being done

The day following the launch of the low carbon plan, operators managing the switchboards of the three departments responsible for the scheme said the same thing when I asked to speak to someone responsible for "sustainable technologies".

They asked: "Um, what do you mean specifically" They then went on to tell me that there wasn't anyone particular.

Back to the future

In 2010, the future was set to arrive in style, in the form of the Dongtan eco-city, for at least 50,000 people as part of Shanghai World Expo.

They'll need to hurry up, or phone to tell the world's architects who still swoon over the artistic renderings, since not a single brick has been laid, and planning permission has been revoked.

So far, the low carbon vision has been going nowhere fast Tyre tracks on the low carbon road

Same for Europe's most spectacular eco-homes project, Mata De Sesimbra in Portugal. Five years after it becomes a rallying cry Nothing.

Vision and feel-good are big parts of making change happen. But a great idea did not put men on the Moon 40 years ago; a vast, risky, people-driven and hugely uneconomic undertaking did.

Right now, the sustainability movement is heading for a monumental reality check, within the decade, as governments, businesses and people realise that the contemporary hullabaloo is built on no such undertaking. In fact, sustainability as currently proposed is unsustainable.

Back when the modern environmental movement was making waves for the first time in the 60s and 70s, the driving forces of change were big science, big government and big personalities. The Moon landings was no small part in such confidence at solving big problems.

Nowadays, sustainability is awash with fey compromisers, unburdened by brilliance. And the debate is not about grand governmental stances, or a world led by deep science, still less by ethics.

Rather the technical basis, and the whole worldview, of "planet saving", is essentially economics: if we can sell it (to industry, to a populace, to consumers), or if we can tax it, we'll have a go.

Sure, there's some science here - but it's pretty much limited to counting: enumerating environmental impact - such as the "eco-footprint" - and then trying to work out the "cost".

Specialist "environmental experts" now extol something calling sustainable development, which supposedly knits together environmental, social and economic development in one grand sandwich of wholesomeness.

Unsound foundations

Nothing is meaningless in this context, everything is possible. Leaders in this domain have perfected the art of saying everything and yet nothing.

But as it turns out, conventional economics and sustainable development are two of the most unsound foundations for grand societal change - the type required for sustainability - that have been devised.

"Cities need to be designed for conviviality and convenience, without so much useless infrastructure - transport, waste, parking - clogging everything up"

Sure, investment, markets, and the consumer economy are possible that don't trash resources and people - in the way that fat, carbohydrate, and sugar don't have to have to make people obese.

Ideologies of social renewal are possible that are modern and inclusive; ie. not very ideological, and rather pragmatic.

Yet to build a sufficient sustainability movement requires much more truly scientific framework of economics, and much more rigorous formulation of sustainable development.

Today's economics is like Ptolemy's model of the solar system: devilishly clever, but oh so wrong.

Sustainable development currently is like a kaleidoscope: all you can do is keep going and enjoy the pretty patterns because there is no conceptual framework, still less a map or timetable that might tell you what it all means.

Both must be redesigned, and both injected with a huge new dose of basic, universal ethics.

It's time to relaunch the movement. The recent report from the Sustainable Development Commission - Prosperity Without Growth - ought to be a bomb under both economics' and sustainable development's easy chairs, with its tough message that growth economics is incompatible this particular planet.

But for the bomb to go off, a new generation of thinkers, agents, designers, and communicators needs to push the current "leaders" aside and set out a new, clear vision and build a truly grand project on truly robust foundations.

That would involve, as a start, colossal investment in a material economy that cycles everything, and compels industry (more than consumers) to design and produce things as part of that cycle.

Regions need to manage all their own energy and resources starting yesterday, through efficiency and building-integrated production.

Cities need to be designed for conviviality and convenience, without so much useless infrastructure - transport, waste, parking - clogging everything up.

Citizens need to take a break from worrying about recycling and climate change (which they have been unfairly dumped with solving) by taking time away from soulless work for unsatisfying consumption.

These are all the biggest, riskiest, most urgent projects the world has ever known. Rock on: who said history was over

So near, yet so far

Enthusiasts - such as government ministers, hot-flushed with flabby economics and sustainable development rhetoric - will say they are taking steps in the right direction. The Low Carbon Transition Plan guarantees 1.2 million "green jobs" by 2020 - which leaves only 30 million "non-green" jobs.

"Four decades after the West won the space race with crazy bravery, why can't we do something similar for the human race"

Sustainability isn't exactly rocket science, but if this plan is a step towards it, cobbling together a big firework is a step towards building a Moon rocket.

Right now, the euphoria of the summer has died down anyway.

The pre-Copenhagen climate talks in Barcelona have made it clear just how far governments are from really taking climate change seriously, let alone sustainability in any more systematic sense.

By all means, blame environmentalists and "sustainability experts" for their poor formulation of conception of change, but we must blame politicians for their disgraceful clinging to failed and outmoded concepts of perpetual, materialised, economic growth - and thus their inability to put any more substantial framework on the dynamics and direction of change.

The outcome from Barcelona, and raw data from so many sources, shows that things are not getting better at the scale that counts, despite the green enthusiasm buzzing in our ears.

The real deal of sustainability - truly massive reconfigurations of material culture - has sunk in a quicksand of ultimately unscientific economic mythology, and wilfully incoherent sustainable development generalities.

It's time, once again, to evoke an epochal response to an epochal challenge.

Four decades after the West won the space race with crazy bravery, why can't we do something similar for the human race

John Manoochehri is guest researcher at the Royal Institute of Technology, Stockholm, and leads the sustainable design project studio, Resource Vision

He also wrote Consumption Opportunities, the policy on sustainable lifestyles for the UN Environment Programme, and the philosophical basis of the Green Party's manifesto

The Green Room is a series of opinion articles on environmental topics running weekly on the BBC News website

Do you agree with John Manoochehri Is there too much talk and too little action Are we missing the "can do" attitude of past generations What do we need to do to ensure our long-term survival

Sustained economic Growth! That's the key, and ultimately ridiculous, statement. Things will change when, and only when, a world leader has the guts to stand up and say that we should not aim for economic growth, just a sustainable economy and we will now focus are efforts on quality of life and not the size of peoples wallets.

Chris, Bristol

So many people pointing the finger at population.

I wonder, have you all had yourself sterilised without having children or are you just hypocrite, who have had children (or intend to), yet think the solution is to stop other people from doing so

Environmentalism is, at it's very core, a pursuit of the wealthy, healthy, well fed and educated, who seem hell bent on ensuring that the rest of the world do not get to enjoy the quality of life that they do... because that would be 'unsustainable'.

The problem is not population. The problem is distribution and governance. We could easily feed the world, have enough clean water, wholesome food - if the political will existed.

We need to stop hunger, spread knowledge and education - medicine, agricultural science and engineering worldwide to ensure the benefits of the modern age are available to everyone.

People who hanker for a mythical agrarian lifestyle are part of the problem, not part of the solution.

Ian Lowe, Airdrie, UK

Aside from the fact that the article above is poorly edited and somewhat repetitive, where are the clearly stated alternatives/ ideas

I agree with many of the contributors following the article, that we are heading toward massive overpopulation and that many lives are lived only to satisfy their own need to consume ever more resources.

Two fundamental issues are linked - wasteful overconsumption and widespread poor parenting, producing generation after generation of bigotted, self-seeking, underachieving, non-contributing 'world citizens'.

To the dreamers who hope for a solution in transporting people to the stars - that will never happen. Even if technically and economically possible, whose decision would it be to infest the universe with our poor and needy billions

The speed at which our world-wide problems are chasing us means, I fear, that the solution will find us - not we, the solution.

Mike Snell, Birmingham

40 years into the future

Are you mad man The very definition of 'singularity' on my computer's dictionary is "a point of time generally agreed upon to be 2030AD when overwhelming technological change makes future predictions impossible"

That's 21 years.

I became interested in this topic when I (as technology integration expert) wrote a powerpoint and showed it to my business partner for an idea I had. We believe it could cause a technological singularity (thou I didn't really understand at that time what that meant) - which is a full 20 years before its predicted; regardless - nobody wants to talk about it.

Why likely it will alter the concept of money and bring about a better world.

Clearly not something the present world wants to consider - so my present efforts are to further the existing dystrophy we are presently building till eventually something gives.

Thus my new mantra to maximize profits regardless of social or environmental cost.

btw - I'm fully aware how fiat currency works and a whole host of other interesting topics - I'm a big reader...

Think I'm kidding I've given you my name and my email address and I'm easy to look up but I assure you that I'm not going to tell you how to build this device.

Other eventualities are likely to be necessitated first. But if you think we need another space race - ok cool anything to speed up the present technological advance...

Matt Chaney, Hermosa/CA US

Thank you for this concise and o point assessment.

I work for NASA at Kennedy Space Center here in Florida.

It is a significant disappointment to all of us at NASA that most citizens of this world no longer see the value in space exploration.

I won't bore you with the endless stream of of trickle down technology that enhances all of our lives. Suffice to say that even if you do not believe in the noble exploration of our universe, you must recognize the technological, medical/biomedical and materials research that has vastly improved your quality of life, safety, and health.

Yes, we once again must undertake these endeavors "not because they are easy, but because they are hard, and because that goal will serve to organize and measure the best of our energies and skills"

Mark R, Kennedy Space Center Florida

The US President should issue an emergency broadcast about the impending crisis; the perfect storm of issues building in intensity set to culminate in an environmental disaster the likes of which the Earth has never seen.. These are different times than when the race for space was thrown down as a gauntlet to bring the people together and inspire the brightest minds and the imaginations of a whole generation of both young and old alike. Clear thinking is needed now and a plan for action that does not cut corners.. It's going to take everyone's participation as nothing has ever done before to pull it off. These truly are the times that test people's souls as Thomas Paine said so brilliantly when a United States was in the process of being formed. When words could inspire men to put aside their differences and stand together, side by side, for a common purpose. This call to action should be considered part and parcel of the upcoming climate summit in Copenhagen and bring to t!

ruth as the author pointed out the need to start yesterday in a venture so grand. It should ring loud enough in the ears of all who hear so all Nature can hear. Nature so beautiful it gives sustenance to the heartbeat of life will give strength and hope. It needs our participation and help to undo a destiny that should not be allowed to occur.

Dale Lanan, Longmont, Colorado, USA

I agree, sustainability as currently proposed is unsustainable. How often we hear the rhetoric calling for "sustainable growth", when growth and sustainable development are mutually exclusive. Conventional business and political minds need to change, but change is the one thing they fear above all else.

Yes, Apollo was "a vast, risky, people-driven and hugely uneconomic undertaking", but John Manoochehri is quite wrong to say "A great idea did not put men on the Moon 40 years ago". But for the insight of John Houbolt, we would all be commemorating a noble failure, instead of celebrating a triumph of human endeavour and the opposition he faced made him "a voice in the wilderness". I guess every forward-thinking, concerned environmentalist knows that feeling!

George Low, a top NASA leader in the 1960's wrote in 1982 "had the Lunar Orbit Rendezvous Mode not been chosen, Apollo would not have succeeded."

James R. Hansen, the space historian wrote, Houbolt and his associates "were the first in NASA to recognize the fundamental advantages of the LOR concept, and for a critical period in the early 1960s, they also were the only ones inside the agency to foster it and fight for it."

It took them more than two years to change the majority conventional view within the NASA team and they had a common goal. To judge from the reaction of different political hues to the idea of 'Prosperity Without Growth', there's no prospect of even finding a common goal to aim for. Can the entrenched positions of opposing sides ever be reconciled

What we need is a continual stream of great ideas to create innovation in technology, economics, business models and political thinking. Actually, I have some good ideas to contribute, but nobody will listen, not even the Minister for Science and Innovation.

Dave Smart, Vale of Neath, South Wales

Most environmentalists aren't scientists and have jumped on the CO2 bandwagon. There is stronger evidence that global warming is caused by sunspot activity. This is more likely since for the past decade the average temperature has cooled yet the CO2 level has risen, while sunspot activity has decreased.

Please focus on scientific facts rather than speculation.

The road to hell is lined with good intentions.

Selwyn Firth, Toronto Canada

The author of this article is 1000% right! It is time for a supreme, coordinated effort to save the future. Yes, we can!

Andreas Jaffe, Krefeld, Germany

firstly, there is absolutely no anthropogenic global warming, it is a complete hoax, used by politicians as a means of control. Secondly, the

United States military and Russia are sitting Tesla technology for the past hundred years using zero point energy. These are established facts. So, even if global warming was real which it is not, save what is caused by the sun, we have the technology to allow every person on the planet to create their own electricity for free.

I hope this answers some questions. All I have said can be easily verified from the appropriate sources, sadly we are stuck using carbon technology again to keep the power and money in the hands of the few. What a stupid backward species we are.

nick,

The population isn't the problem. Finite resources are the problem. We need to continue what we started last century and figure out how to colonise space. Otherwise we are doomed as a species.

Fred Harrington, UK

Yes, a space colony program will only be the beginning. At Mars, the real estate is vast, and so far unsurveyed. Little beyond Mars, the asteroid belt is half a million floating mountains made of nickel and iron and ices. Solar power is plentiful in at Venus and Mercury. Ten times more intense. We can harness these resources. We should begin with surveying Mars and parsing it into 100 km blocks that we can sell to investor guys or unions or corporations who help at the ground floor, 'early days'. Early days are today. Mars is the new 'Americas'. Let's go.

Ron Burke, Ottawa, Ontario, Canada

Why don't we export the carbon to the moon or Mars, creating/enhancing the greenhouse effect and also allowing a bit more space for the human population explosion.

Neil, Fulchester

I agree with Mr Manoochechri, and with a lot of the people bringing their ideas forward. Things to consider are 1) Even if the population could be reduced by reproductive laws, you would still have a growing population. As human beings there would always be a cluster of peoples who would either ignore the law or flaunt their wishes upon the rest of us without a care. This is all beside the fact that the population will still rise to 9 or 10 billion people by the year 2100. So control it or not we have a growing population. 2) Consumerism and consumption clearly have to be curbed. This is a pretty tough thing to do in a free market economy. Since corporations/governments survive on rising profits/taxes we will have to rethink the "normal" methods of doing business/government. Good luck. 3) Sustainable/renewable sources of power are out there and

being developed. We are in a limbo of transition from a purely industrial society to a fully technical/scientific/environmental one.!

We can see the renderings and discuss the future, but our social economic structure is holding us back. We don't have another structure. We either have to scrap the current one or rearrange it to conform to a new way of life. In all, we are talking about a lot of time to make these things happen. I hope we get it right. This is the Human "Race".

Ed Szklarz, Olmsted Falls, Ohio/USA

Nice to see the overpopulation nazis out in force as is usual when someone attempts to speak rationally about issues regarding sustainability. Nevermind the fact that its the the wealthiest 1 billion people (a section of the population which hasn't changed much in recent times) that generates the majority of the resource depletion and environmental destruction. Oh no, must tell those wretched brown and black people to stop having babies!

Seanan,

I have to agree with both concepts posited above - but if we can't get anywhere with industry and politicians on vastly changing the way the world "does business" because the challenge seems so monumental, why aren't we taking the easier route of reducing the population It seems ludicrous to me that you have to jump through so many legal hoops to adopt someone else's child yet any muppet with half a brain cell is allowed, and even encouraged through government handouts and a misplaced sense of human rights, to procreate freely At what point are we going to say enough is enough - is the human right of an individual to have their third or fourth child really compatible with the overarching human right to survive at a species level This will happen at some point! The question is will we do it of our own accord and scrap this human rights nonsense in a civilised way

Simon H, Stirling, Scotland

Nice to hear a positive spin on this issue for a change! I must agree so many of our current schemes on the subject fall epically short of the mark; build things to last, not market cheap things that can be recycled. I often get called a cynic for criticising, insignificant 'green' thinking; but in taking part and feeling better about ourselves are we not all missing the point Just because the answer doesn't seem achievable, doesn't make it the wrong answer, and now, as the author suggests, we have momentum on our side.Â...

Reef, Liverpool

Population! Population! Population! Is anyone in governments listening An eco-town is a contradiction in terms as is sustainable development, unless a non eco town is demolished to make way for it you are just developing more land perhaps destroying the planet more slowly, but destroying it nevertheless. These houses at present will be more expensive though technology will advance greatly and lower bills will be persuasive, I'm sure you would still have to convince the public to live in perhaps non traditional style houses. It's clear that 6 billion people, never mind the soon to be 9 billion cannot live to our standard of living even if we only use a third what we do now. The loss of wildlife should be intolerable to anyone with a thought for what we are leaving for future generations, but also the loss of quality of life as we are crammed into ever smaller accommodation in more congested and crime ridden streets should not be tolerable either. Freemarket fundamentalists talk of ever more growth but this is for the benefit of a few, it doesn't and can't make sense. We in the west cannot now increase our material living standards without keeping other peoples down, of course they won't be kept down!

steve johnson, whitwick,leics

It sounds very extreme but the only way we will make any difference no matter how much recycling, energy efficiency reviews and vegetarianism we carry out, is to control an already vastly too big world population. Without all countries agreeing to set laws to attempt to fix child numbers at 2 children per set of parents. While at the same time punishing those who chose to have large families (no matter race or religion as this is a humanwide issue),we have no chance of stemming climate change. Not to mention feeding and watering the majority of the world population and preventing the human race reducing our earth to a burnt out shell and leaving ourselves the fate of the dinosaurs.

James Higham, Edinburgh

Nice! I totally agree! The catalyst for the moon race was the eagerness in beating the opponent - the communist Soviet union/the capitalist USA. Why is it that people don't realise that Death is the final opponent of our time Shouldn't death make us eager to win over ourselves in this everlong spiral of doom What I think needs to be done is to educate people that if we continue like this, we will die. All of us. It should not have to come down to a really bad scenario for us to take a stand and do something about it. To need to experience change before changing ourselves is bad.

Henrik Bejmar, Stockholm, Sweden

So the guy says transport and parking are relatively useless in a city. Funny idea. Wonder how i'll survive in a city where no food can be transported into. Guess i'll join the eco freaks in the countryside then; better than starving.

Karl Schlonz, Neustadt Am Rubenberge, Germany

Carbon is a smokescreen for what really ails the planet: massive human overpopulation that is taxing the limits of the planet's resources and crowding out the other species that inhabit the world. No politician has the guts to talk about it but the problem of overpopulation can't be solved by the developed world recycling or using renewable power nor by transferring wealth to the third world. Changing our lifestyle may squeeze out enough resources to add another billion or two but if the human species continues to breed like rabbits while stuck on this single planet then we're doomed.

Scott W, Port Orchard, USA

Too much talk and not enough action. Large scale, anonymous infrastructure and industry which is in the control of private companies will surely never change their policies for a sustainable future while it is not in their economic interest. It is also far too easy to blame consumers for all the problems, when the systems that deliver our resources are geared directly towards over-consumption. De-centralised systems are the only way forwards for people to manage their own consumption and waste

Richard Outhwaite, London

Seeking possibility in space, in such a short duration is going to be a very tough task. Controlling population and current trends of life styles, development and market based economy are comparatively less difficult options. Controlling population would reduce our shape and would provide strength to handle this challenge. 'Leaving planet earth after spoiling' is not the right approach. We are the ones who have spoiled the planet. Therefore, it is our duty to make everything in order.

John Manooch is not happy with the responses of the political leaders. An epochal response to epochal challenge is quite necessary. Either we must adopt 'radical changes' or some 'effective interventions' are needed urgently. Politicians should not try to place blame on each other on the 'frivolous issues' or for the things of the past. Anything which is obstructing efforts to reverse the climate change must be considered as 'frivolous'. In the time to come, politicians too, would not be able to promise moons when major problems would start surfacing.

Sanjay Singh Thakur, Indore, India

Enthusiasm for sustainability is everywhere. But actual works are not done. How did the human being reach to the moon What spirits are worked with them The same spirits are to be need for sustainable development. We must have to put effort to save our rainforest, marine environment, biodiversity. That is world political leader must take initiative to reduce 25 percent green house gas emission by 2050 to avoid serious changes in the earth's climate system.

Engr Salam, Kushtia, Bangladesh

I completely agree with Mr Manoochechri - using outmoded ways to measure well-being (misused measures such as the GDP) and traditional cost/benefit analyses are leading us nowhere fast. Yet the change we truly need, a widespread use of cradle to cradle manufacturing (endlessly recyclable materials, no waste), and a more localized approach to energy generation and waste management (solar collectors, grey water systems anyone) seem to far away from our current system. The task at hand is almost incomprehensible in its scope; we are facing the most wicked problem ever encountered by modern man. A wicked issue is so complex that we cannot fully comprehend the extent of the problem until we throw solutions at it, and learn from our mistakes. A wicked problem requires a shared understanding of the different facets of the issue in order for us to move forward. A wicked problem requires mankind to be infused with a shared commitment to changing their ways and moving forward with our history.

Philippe Mineau, Kingston, Ontario, Canada

Nothing is worthwhile unless the human population is controlled. With effective population control, everything is possible. We can argue about how "clean" or "dirty" a lifestyle we want to live and set a target population appropriately. To live like we in the developed world do at the moment, we need to reduce our numbers to well under one percent of the current. 30 million - about half the current population of the UK - could probably live our existing lifestyle without wrecking the planet.

Brian Beesley, UK

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