

Going for green, and how

CARBON CLIMI Global atmospheric of

CHINA GAINED THE DUBIOUS DISTINCTION OF BEING THE WORLD'S GREATEST POLLUTER BUT IT IS NOW SHOWING THE WAY, POLITICALLY AND SOCIALLY, TO GO FOR RENEWABLE ENERGY AND REDUCE CARBON. SAYS S ANANTHANARAYANAN

he Kyoto protocol on reducing CO₂ emissions came to an end in 2012 and most member countries have report-ed success in achieving reduction targets. However, global greenhouse gas emission has grown faster than be-fore and while this continues to be the case, a series of articles in journals the world over has reviewed what has gone wrong. But China, the greatest emitter of them all so far, is now showing the way to reverse the trend. One trouble with the Kyoto protocol was that it set emission cap targets for developed countries but gave developing countries a free hand. This is why the USA, after first having signed the treaty, refused to ratify it and stayed out of the protocol. The treaty was left with 37 members, the USA — then the largest emitter of $\frac{1}{2}$ CO₂ — not among them, and emitter giants like China and India were without any emission reduction targets. The graph, Carbon Climb, shows that the Kyoto protocol had no effect on global emissions. The emission reduction achieved

by developing countries was partly by cutting down on manufacture and generation and partly by the econo-

mic crisis during the period. But the

developed countries did not produce,

they imported from China — and the

— what

AMAZING VELOCITY

TAPAN KUMAR MAITRA EXPLAINS THE ELONGATION

reduction was also illusory

Real saving

Local communities trading in carbon savings could often be creating illusory economics.

The true villain of CO2 genera

tion is coal and what counts is ways of burning less of it. An

instance of real carbon saving

is the investment that the Mum bai suburban railway made to

switch over its 88-year-old trac

tion network from 1,500 V DC to 25,000 V AC. This single change,

which is more easily spoken of than executed, reduced trans-

FACTORS OF PROTEIN SYNTHESIS

tional factors are required for the elongation of the peptide chain. The elongation factors Tu, Ts and G are soluble proteins that can be isolated from

EFTu (Tu stands for temperature unstable factor) forms a complex with an aminoacyl-tRNA and GTP

and brings them to the ribosome. In contrast with

IF₂, which is used only to transport F-Met-tRNA to the ribosome, EFTu is used to carry all other am-inoacyl-tRNAs to the site of chain elongation. Once

the IAA-tRNA is in place, the GTP is hydrolysed and EFTu is released from the ribosome. EFTs (Ts stands for temperature stable factor) cat-

alvses the formation of the complex between EFTu. AA-tRNA and GTP. The EFG factor, also called trans-locase, is involved in the translocation process that

occurs when the ribosome moves from one codon to

the next along the mRNA. The G factor binds GTP (hence its name) and carries it to the ribosome, where it is hydrolysed to GDP and inorganic phos-

The energy released is used for the translocation process and for the release of the deacylated tRNA

The energy for peptide bond formation is stored in the AA-tRNA and comes from an ATP molecule

used during the aminoacvlation of tRNA. Thus, pro-

used to translate the previous codon

bacterial cellular supernatants.

phate

nce protein synthesis has been initiated, addi-

same carbon was still burnt, only somewhere else. Power intensive industry in the West relocated to China and India, who celebrated "Foreign Direct Investment", as reflecting the confidence of investors in political stability, and in the West it was business as usual, with full marks for reducing carbon emission

"The reasons for the ineffective-ness of the Kyoto protocol are in its architecture "says Dieter Helm economist and professor of energy poli-cy at the University of Oxford. "It is based on carbon production, not car-bon consumption." The energy-in-tensive goods that China and India export to Europe and the USA make up about 50 per cent of the world's GDP, Helm says. China, he said in November 2012, was now an importer of coal and accounted for 50 per cent of the world's coal trade, pro-ducing more coal than four times the oil produced in Saudi Arabia. But a review by John Mathews and Hao Tan, from Australia, just published in the journal *Nature*, describes China's current energy initiatives, which may change the country's profile from being polluter No. 1 to world leader

in switching from coal to renewable energy sources like wind turbines or solar cells. China's economy grew by giant



World economic c Durban meeting 2010 RENEWABLES 2014 GLOBAL STATUS REPORT NEWABLES POWERHOUSE CHINA 378 giga

Wind power

itrating solar power

USA 172 gigawatts GERMANY 84 gigawatts INDIA 71 gigawatt SPAIN 49 gigawatts ITALY 49 gigawatts

strides since 2001 when it joined the World Trade Organisation, with new railway lines, manufacture, megaci-ties and, most of all, ample electric power, mostly from coal-fired plants. Today, China generates more than five trillion units (kWh) of electricity, which is a trillion kWh more than the USA. And it consumes 23 per cent of the world's coal production for electricity. But fossil fuels alone cannot pro-

vide all the power that China needs and since the mid-2000s it has invested heavily in hydro-electric, wind, solar and nuclear power generation. Between 2008 and 2012, the Mathews-Tan review says, investment in this sector increased by 40 per cent, while the share of investment in fossil fuel-based facilities fell from 50 per cent to 25 per cent.

"As a result, China's wind power capacity has increased fivefold. And in 2013, the generating capacity from new water, wind and solar sources surpassed that of new fossil fuel and nuclear facilities." the review says. "Along with increasing wind farms and area under solar panels, China has also created the means to integrate electricity from these sources with the existing electric distributi-on network, and is an exporter of 'intelligent grid' technology. Zero car-bon sources now contribute 9.6 per cent of the energy used in China, up from 5.6 per cent in 2000," the review



adds. "In 2013, China hit its tarto be replaced in 2015 with a new in ternational understanding, has been get — two years early — to gen-erate almost 30 Europe-centered and has relied on mechanisms like taxes and trading in carbon credits. The creation of a per cent of elec-tricity from renewables. No low carbon regime through market forces may take too long, given the rate at which the economies of Chiother country is na and India are growing - they are investing so much money or slated to double by 2020. A regime based on consumption of carbon, SO generating SO rather than on creation, would clear much renewable ly address the relevant concern more directly. Import levies on products would also be a restriction, though The expansion of the renewable sector in China is also reducing the

tax on their production would help the producing nation benefit, rather than the importers' government. sector in China is also reducing the need to import oil and natural gas. Achieving the 2017 targets of water, wind and solar power, Mathews and Tan reckon, would lead to a 45 per cent reduction of the oil and gas import bill. The expansion of the cotor hea clos areated a hura more But a more direct route to low car bon would be through technolog and creating competitive renewab les. This is what is happening in sector has also created a huge mar-ket for its many components, like wind turbines and photovoltaic pan-China, with the growth of the wind turbine and the solar panel market. The understanding that manufac-ture in China is largely based on els, and the economy of scale has brought prices down. From 2010 to coal-driven power has brought about a misguided import levy on Chinese 2013, the solar generation capacity in China went up from less than a GW photovoltaic cell panels. This is most to eight GW, a 22-fold increase, while the global market, which was already at 40 GW, increased only to counter-productive, as use of coal-based power, however harmful, to manufacture solar panels is vastly

THE WRITER CAN BE CONTACTED AT

Perhaps more important is that

smell, taste and touch are not very sus-

ceptible to imagination. It is fairly easy to close your eyes and imagine what something looks like, or to replay a con-

versation and "hear" people talking.

more productive than use to manu-facture the many consumer goods that developed countries import from 140 GW. The economics of supplying the domestic and international markets has then benefited solar power users the world over. The transfer, so vigorously pursued in China, from fossil to renewable China and India. The regime of carbon pricing and trading is viewed as the only way to is not only a change to carbon-free incentivise investment in low carbon energy, it is also an assurance of sec technology. But effective state policy ure energy sources. Fossil fuel res-ources are limited and as they get to leverage technology and increas the market for renewables would depleted, developing economies ur-gently need alternatives. Conversely, sources of water, wind change the perspective and it is for using other means that one would need incentives. Yes, China gained

and solar energy are perennial — all one needs is wind and solar is vacant the dubious distinction of being the world's greatest polluter, but now it is showing the way, politically and land. Creating renewable capacity further supports manufacturing and frees the state from dependence on socially, to go for renewable energy and reduce carbon markets and imports. The Kyoto protocol, now past and

'Why no smells in

vividly.

dreams?'

PLUS POINTS

'Electronic skin'

Detecting breast cancer at an early stage is crucial to saving many lives and it can now become a lot easier with researchers having developed an "electronic skin" that "feels" and images small lumps that fingers can miss and mammography cannot trace. The researchers, including Ravi Saraf of Indian-origin, made this "skin" out of nano particles and polymers.

Current testing methods. including MRI and ultrasounds, are sensitive but expensive and mammography may not be perfect especially when it comes to testing young women or women with dense breast tissue.



the most common type of cancer among women can help save lives," said Saraf from the University of Nebraska, Lincoln, in the USA. To test how it might work on a



Using a silicone model of a breast and embedding objects representing lumps, scientists have successfully tested an electronic skin that can accurately ⁴⁴feel" and image lumps much smaller thar those detectable by manual exams.

> human patient, they embedded lump-like objects in a piece of silicone mimicking a breast and pressed the device against this model with the same pressure a clinician would use in a manual exam. They were able to image the lump stand-ins, which were as little as five millimetres and as deep as 20

> mm. The study appeared in the journal ACS Applied Materials and

Avatar-inspired

Last Thursday, scientists announced they had discovered the fossils of a flying reptile called a pterosaur, which lived 120 millions years ago, and named it *ikrandraco avatar* meaning "Ikran dragon" because it closely resembled the graceful creatures ridden by the human-like blue characters in James Cameron's 2009 blockbuster movie Avatar Their findings were published in the journal *Scientific Reports* and involved the fossils of two specimens of *ikrandraco avatar* unearthed in China's Liaoning province



about eight feet (2.5 metres) and lived in a warm region teeming with life, with feathered dinosaurs, birds, mammals, frogs, turtles and other creatures along with a variety of trees and other plants. Having a throat pouch similar to that of a pelican, the creature most likely lived off small freshwater fish from lakes, which it would catch by skimming its small-tooth filled lower jaw in the water, scientists

ikrandraco avatar did not have a crest on the top of its elongated head. It did, however, have an unusual blade-like crest on its lower iaw — oddly similar to the animals in Avatar. Behind the lower jaw crest was a hook-like structure that appears to have been the ancho point for the throat pouch. Pterosaurs were earth's first flying vertebrates, with birds and bats

making their appearances later. They thrived from about 220 million years ago to 65 million years ago. when they were wiped out by the asteroid that also doomed the dinosaurs. "The head structure is similar in

this pterosaur to the Ikran in Avatar," said paleontologist Xiaolin Wang of the Institute of Vertebrate Paleontology and Paleoanthropology, Chinese

Academy of Sciences, in Beijing "Of course, nobody and nothing can ride this pterosaur," he added. Paleontologist Alexander Kellner, of Brazil's National Museum at the Federal University of Rio de Janeiro, who also worked on the study, jokingly assured reporters, '(There were) no blue hominids

IT COULD BE BECAUSE THIS SENSE, ALONG WITH TASTE each amino acid incorporated, one ATP and two GTP molecules are required. The large subunit contains the enzyme peptidyl-transferase, or peptide synthetase, which catalyses the formation of the peptide bond. Another function AND TOUCH, IS LESS 'GENERATIVE', WRITES PAUL KING research study published in 1896 looked at the prevalence of differ-A ent sensory experiences in dreams and found the following occurrence fre-quency (percentage of dreams featurof the 50S subunit is to provide two binding sites for two tRNA molecules: the aminoacyl or acceptor site and the peptidyl or donor site. ing each sense): visual - 85; auditory 69; touch - 11; smell - seven; and taste

The stepwise growth of the polypeptide chain in-volves: (1) the entrance of an aminoacyl-tRNA into the aminoacyl site; (2) the formation of a peptide bond and consequent ejection of the tRNA that was occupying the peptidyl site; and (3) the translocation of the tRNA (prove accurate the provide achie) form of the tRNA (now carrying the peptide chain) from the aminoacyl to the peptidyl site. This process should be coupled with the simultaneous movement of the mRNA to place the following codon in position. This translocation, in which the ribosome moves along the mRNA in the 5' to 3' direction, requires the G factor and GTP.

The velocity with which these coordinated processes occur can be illustrated by the fact that it takes only about one minute to construct a haemo-globin chain consisting of 150 amino acids.



General diagram of the initiation steps in protein synthesis involving 30S and 50S ribosomal subunits, messenger RNA, the initiation factors F3 and Fj + F2, GTP, the elongation factors T and G, formy/methio-nine-tRNA (F-Met-tRNA) and lanine-tRNA: 1, isolated 30S; 2, binding of the RNA and FA to the 30S; 3) binding of the F, F2 + GTP and F-Met-tRNA to make the initiation complex; 4, binding of the 50S subunit to lete 705 ribosome: 5. binding of the second aminoacyl-tRNA: 6. synthesis of the first peotide bond: 7. liberation of the free make the co tRNA after translocation

THE WRITER IS ASSOCIATE PROFESSOR, HEAD, DEPARTMENT OF BOTANY, ANANDA MOHAN COLLEGE, KOLKATA, AND ALSO FELLOW, BOTANICAL SOCIETY OF BENGAL, AND CAN BE CONTACTED AT

So visual experience dominates dreaming, while touch, smell and taste are quite low. But why? No one has actually tried to find the answer experimentally.

But here are some possible reasons based on what is known about the brain.

Visual and auditory processing is much more "cerebral". As much as two-thirds of the cerebral cortex (the main cognitive and perceptual part of the brain) is involved in one way or another in vision. So it is no wonder that vision might show up so frequently. Auditory processing is closely tied to language, and language is central to the conceptual structure of our inner life, particularly in the formation of meaning and communication with other humans. Language is also processed entirely in the cerebral cortex.

Smell and taste, on the other hand, barely interact with the cerebral cor-tex. Smell is regarded as possibly the most primitive perceptual system in the brain. Unlike the other senses, it connects directly into the memory and emotional systems, which is why a smell can bring back a memory so But it is not as easy to imagine a smell, taste or touch. This may be because these senses are less "generative Vision and hearing require the brain to generate an internal model of perception and map it onto information patterns coming from the sensory receptors. This can involve a lot o "top-down" processing. Smell is a fairly direct measurement of the chemical composition of the air, and touch is a direct measurement of skin pressure. Because there is less "imagination" involved in smell perception, it might be less influenced by the brain activity

happening during dreaming. Finally, it has been proposed that dreams may be a side effect of the brain reorganising information — - SOcalled memory consolidation. The information with the most complex structure, and therefore in the most need of reorganising, would be visual and spatial, along with language (audi-tory) and knowledge of facts, events, meaning and human relationships. And, coincidentally, these are the ele-ments that seem to populate dreams.

THE WRITER IS A COMPUTATIONAL NEUROSCIENTIST



The animals had a wingspan of

belie Unlike many other pterosaurs, the