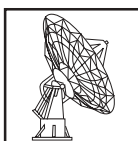


helps us to see him more vividly and to understand his life-saving words better. The reviewer found that reading perhaps up to three chapters a day (only one after a very hard day's work!) was about right, and best read at the end of the day. Those who are able to give the time may, of course, want to read more.

It is a very readable book, as stated earlier, and as has been demonstrated (we hope) by the

quotations in this article, and it has been nicely produced. It is unhesitatingly commended to all brothers and sisters and young people who wish to enter more fully into the mind of the altogether lovely one who is our saviour and our friend. If our Lord remains away, it will be good to have the second volume, which will deal with those momentous days leading to the crucifixion.



Science

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Science update

Recent news from the world of science

David Burges

The flight of butterflies

ONE OF THE most beautiful sights in nature is that of brightly coloured butterflies flitting among the flowers and settling to draw nectar. The writer well remembers viewing the spectacle of thousands of orange monarch butterflies arriving on the shore of Lake Ontario during their annual migration from Mexico.

It always seems incredible that these apparently fragile insects can fly with such power, some species over great distances. The fluttering of butterflies has the appearance of a random, erratic wandering, but research by scientists at Oxford University has established that their flight in fact results from the mastery of a wide array of aerodynamic mechanisms.¹ The researchers, who have spent twelve years studying insect aerodynamics, have designed a special wind tunnel in order to study butterfly flight. The wind tunnel used in the butterfly experiments took three years to construct and fine tune.

Red admirals (*Vanessa atalanta*) were trained to fly freely to and from artificial flowers in the tunnel. Wisps of smoke were blown over the insects' wings to see how they interacted with

the air, and the resulting visible turbulence was caught on an ultra-fast digital camera. The scientists identified six different ways the butterflies flapped and rotated their wings to stay airborne. They observed that the insects moved effortlessly through the different mechanisms "much like a horse might switch between walking, trotting and galloping depending on what it wanted to do". The red admirals could at times fly very efficiently, producing very little turbulence, whilst on other occasions their wings deliberately created vortices to achieve extra lift.

Clearly butterflies leave the world's leading aircraft designers far behind in their mastery of aerodynamics. For instance, it is known that insect wings produce ten times the amount of lift achieved by aircraft wings (per unit of area)! Yet how did they acquire these remarkable capabilities, which are preprogrammed in their genes and essential to their survival, without the benefit of advanced instruction at one of the leading universities? Significantly, engineers are today seeking to mimic the flight of insects in order to

1. "Butterflies point to micro machines", BBC On-Line Network, Sci/Tech. section, 16 Dec. 2002, reporting work published in *Nature*.

build micro air vehicles. The results of the experiments, they say, represent a major advance in our understanding of flight mechanics on the small scale, and will be invaluable to engineers, who confess they still have much to learn from the animal world. Yet all of these astonishing abilities are supposed to have arisen with no intelligent intervention, merely by natural selection acting upon random mutations.

Since all butterflies share the same capabilities, it must have been some supposed evolutionary ancestor that developed these abilities and passed them on to its descendants. Is it possible to credit its amazing abilities to chance and millions of years of trial and error? How much more satisfying to recognise the hand of God the Creator, Who fitted them perfectly for their place in the environment, for their role in plant pollination, and for giving pleasure to mankind!

ET search fails again

ATENTION has been drawn in previous articles² to the continuing search by astronomers for intelligent signals from outer space, referred to as SETI (Search for Extra-Terrestrial Intelligence). This is fired by the belief that, since life on earth is supposedly purely the result of evolutionary processes, it must also have arisen many times on planets circling other stars.

In the latest cooperative attempt, known as Seti@home, running since 1999, members of the public have been involved in screening large numbers of stars for candidates for further investigation. Millions of people from more than 200 countries have been running a special screensaver program on their desktop computers. It uses idle time on the PCs to sift data obtained by radio telescopes for patterns that might represent a communication from space.

Following this process, more than 150 candidate stars selected by the project as showing promise have been examined using the giant Arecibo radio telescope in Puerto Rico. But the astronomers running the project say that, once again, analysis of the data has revealed no evidence of any signal from an extraterrestrial civilisation.

However, in spite of yet another negative result, it has since been reported that NASA is to fund further attempts to locate such signals. It seems that nothing will restrain mankind from their futile attempts to dislodge the Creator from

His sovereign position as Designer and Sustainer of the universe, and to ignore His decrees concerning the earth and mankind.

How insects breathe

ANOTHER remarkable piece of research³ into the marvellous world of the insects has recently settled a long-standing controversy in science: insects do breathe. The debate apparently dates back to the time of Aristotle, who conceded that insects are alive but scoffed at the idea that they can breathe. Until recently, many entomologists held to the view that air merely diffuses in and out of tiny holes in the insects' bodies.

Now researchers at the Chicago Field Museum of Natural History have studied insects using very high energy X-ray beams. The beams are produced by an enormous accelerator called a synchrotron, which speeds electrons nearly to the speed of light and uses them to generate X-rays a billion times more powerful than those used in hospitals, and so capable of viewing much smaller structures. With this equipment they have been able to observe, with startling clarity, pulsing, lung-like structures in insects, typically smaller than a comma, by which they breathe.

The studies have revealed that insects contract special muscles to exhale, and allow them to relax in order to inhale, the opposite of mammals. The breathing also appears to be synchronised with the pulsing of the insects' circulatory systems, implying the existence of a very complicated neurological system to keep them coordinated. Wherever scientists look in the living world they find unimaginable levels of complexity, even in what appear to be the simplest living creatures.

It is amazing to think that the tiny thunder fly that we might squash without a second thought possesses a brain, eyes, heart, lungs, mouth, digestive and reproductive systems, all within a body no more than a millimetre long! How wonderful are the works of the Creator, Who made "every thing that creepeth upon the earth after his kind: and . . . saw that it was good"!

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- 2 See, for example, "Science and the Creator: 'The earth is the LORD'S, and the fulness thereof'", Oct. 2000, pp. 387-9.
 - 3 "A bug's breath", *Washington Post*, 24 Jan. 2003, reporting work published in *Science*.

Global warming and 'hidden hunger'

THE release into the atmosphere of billions of tons of carbon dioxide (CO₂) since the Industrial Revolution is at least partially responsible for the well-known phenomenon of global warming, the steady rise in the average surface temperature of the planet, due to the 'greenhouse effect'. There ought to be a beneficial side of this process, however, because, as plants live on CO₂, the result should be that the world produces more food for its hungry population.

There is a general consensus among scientists that rising CO₂ levels do promote plant growth. Plants are today exposed to thirty per cent more CO₂ than in pre-industrial times, and levels are predicted to have doubled by 2100, leading to around a forty-per-cent increase in crop yields, which sounds like a very good thing. But researchers in several countries have discovered that there is a serious downside to this effect: the nutritional value of plants grown in high CO₂ is greatly reduced, due to a lack of many of the vital trace elements that humans require for good health.⁴

Plant tissues are built up from around thirty-two different chemical elements, and twenty-four of those are essential for the human body (see [table](#)). Several recent studies have shown that as the plants grow more vigorously the amounts of these trace minerals they contain decrease. It is thought this is because they become diluted by extra carbohydrate in the special cells that store them, and also because the processes by which elements are drawn out of the soil are interfered with.

This effect has already been seen to some extent with the new high-yield crops, developed in the 1960s and 70s as part of the so-called 'green revolution', which turned out to be low in essential nutrients such as iron, zinc and vitamin A. As a result, many parts of the developing world, where food supplies seem adequate, are now affected by so-called 'hidden hunger', chronic deficiencies of minerals and vitamins. Figures released by the UN say that iron deficiency is the world's largest health problem, affecting 3.5 billion people, over half the world's population. The effects of increased CO₂ could well bring similar problems to the developed countries.

Mineral	Function
Iron	Oxygen carrier (in blood)
Iodine	In hormone thyroxine which aids metabolic regulation
Zinc	Transport of vitamin A, wound healing, fetal development; in many enzymes, hormones, DNA and proteins
Copper	Absorption of iron; in many enzymes
Selenium	Antioxidant
Chromium	Energy release, sugar and fat metabolism
Molybdenum	In many enzymes
Manganese	In many enzymes
Cobalt	In vitamin B12

Ironically, one answer being worked on is genetic modification of crops to increase the levels of trace minerals they produce, so-called 'biofortification'. But this faces the familiar public resistance to GM foods. Already a 'golden rice' strain enriched with vitamin A, developed in Switzerland, has been held back because of environmental safety fears, in spite of its potential to prevent blindness in millions of people living in the tropics.

How the world needs the farsighted wisdom and just rule of the Son of God to solve these problems, caused in the main by overpopulation, greed, selfishness and exploitation! For in those days, agriculture will be carried out according to God's righteous laws and for the benefit of all mankind. Then "they shall build houses, and inhabit them; and they shall plant vineyards, and eat the fruit of them . . . and Mine elect shall long enjoy the work of their hands" (Isa. 65:21,22).

4. "Plague of plenty", G. Lawton, *New Scientist*, 30 Nov. 2002, pp. 26-29.

5. *Ibid.*