

He therefore appealed to them as an affectionate spiritual father speaking to his sons: "I write not these things to shame you, but as my beloved sons I warn you" (v. 14).

Paul was not sending Timothy to them to 'wave the big stick', but rather in love and the spirit of gentleness. Paul was the spiritual father of Timothy, and he was Paul's "beloved son, and faithful in the Lord" (v. 17). Timothy had spent much time in Paul's company as his fellow-worker in the Lord's service, and was therefore in a good position to demonstrate in his demeanour the Christlike character of Paul and his loving care for all the churches. So Paul wrote that Timothy "shall bring you into remembrance of my ways

which be in Christ, as I teach every where in every church" (v. 17).

Paul evidently had great confidence in Timothy's ability to handle this delicate situation. Timothy was to be like an elder brother, setting a good example to his younger siblings, and by his personal association with them he would be able to reassure them of Paul's sincere motives. And, just in case some of Paul's critics should think that he was sending Timothy in order to avoid meeting them face to face, Paul reiterated his intention to visit them personally: "But I will come to you shortly, if the Lord will" (v. 19).

(To be concluded)

Science

Science update

Recent news from the world of science

David Burges

An epic journey

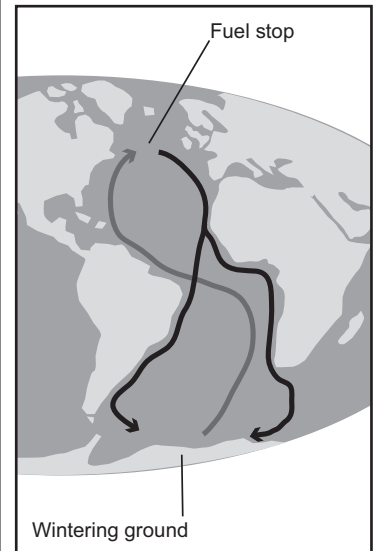
THE INCREDIBLE annual migratory journey of the Arctic tern from the Arctic to Antarctica and back again is well known from bird-ringing studies. Now scientists have been able to map the entire migration route using a tiny tracking device fitted to the birds, which has revealed that they fly a total of 43,000 miles (70,000 km) on their annual round trip.¹

Leaving their breeding grounds in Greenland in August and September, these small birds, weighing little more than 100 g (3.5 oz.), fly south, heading for the Weddell Sea on the shores of Antarctica. It has been discovered that on the way

they make a lengthy refuelling stop in the middle of the North Atlantic, about 620 miles (1,000 km) north of the Azores. Satellite imaging shows that this is an area much richer in plankton and fish than the tropical waters further south. The terns then fly down the west coast of Europe and Africa before dividing, some continuing to follow the African coast, others crossing the Atlantic from the Cape Verde Islands to fly down the coast of Brazil. The reasons for this separation are unclear but may depend on wind direction.

After spending the northern winter months on the shores of Antarctica, the terns head north again, but, rather than retracing their route south, their flight path traces a gigantic 'S' pattern up the middle of the Atlantic Ocean. This takes them towards Africa for the first part of their return journey and then across towards

the Caribbean and North America for the second part. Although this entails an additional distance of several thousand miles, it utilises the prevailing winds and so is more energy efficient. Overall,



Arctic tern migration routes

1. Jonathan Amos, "Arctic tern's epic journey mapped", BBC News Channel, 11 Jan. 2010; <http://news.bbc.co.uk/1/hi/sci/tech/8451908.stm>.

Arctic tern



Picture: © iStockphoto.com/Richard Hawksworth

the terns cover around 200 miles per day on their southern journey and 325 miles per day on the return north.

Many other species of bird make long migratory journeys, but that of the Arctic tern surely excels, in terms of both endurance and navigational ability. Science can trace the course of such an epic journey but currently has no understanding as to how it is achieved by such a small creature. Jesus declared that our heavenly Father feeds the birds of the air, which neither sow nor reap (Mt. 6:26), and Jeremiah observed the regularity of bird migration (8:7) as a witness of obedience to God's laws, in contrast to the disobedience of His people. So we may conclude that it is God Who has implanted the remarkable powers displayed by His creatures, enabling such impressive feats as those of the Arctic tern.

The wandering glider

THE migrations of birds are well known. Less familiar are the astonishing migrations of insects, made all the more remarkable by their tiny size and the fact that, since insects are short-lived, migrations often take place over several generations. Perhaps the best known is the annual migration of monarch butterflies between the south of Canada and Mexico, a journey

of 4,500 miles, and over four generations.

Now a British naturalist living in the Maldives, a group of islands in the Indian Ocean about 500 miles southwest of India, has claimed that a dragonfly species known as the global skimmer or wandering glider (*Pantala flavescens*) migrates in swarms between southern India and Mozambique in Africa.

If confirmed, this would imply a round trip of around 12,000 miles, and again involve four generations.² He observed that the dragonflies arrive in their millions in the Maldives each October, heralding the start of the northeast monsoon, some time after similar swarms are seen in southern India. The insects subsequently appear in the Seychelles, between the Maldives and Africa, in November, and in Tanzania and Mozambique in December. In Uganda, around Lake Victoria, they appear twice a year, in March and September.

The naturalist believes that the insects use favourable weather systems, such as the northeasterly trade winds, flying

at an altitude of more than 3,000 feet, to carry them to Africa, and that they return via the Maldives the following spring. Dragonflies need fresh water for their larvae to grow, and these weather systems provide the necessary rainfall. Unlike most dragonfly species, in which the newly hatched larvae live underwater for up to a year, the global skimmer's life cycle is adapted to its journey: its larvae can emerge from the water and metamorphose in just six weeks.

Additional confirmation for the new observations is that many medium-sized birds, such as falcons, cuckoos and nightjars, make a similar winter migratory journey, making use of the same winds, and are probably feeding on the dragonflies as they go. One insect specialist has commented: "Animals and plants do

2. Andrew Buncombe, "From India to Mozambique, the insect world's greatest migrant", *The Independent*, 21 Jul. 2009, kindly submitted by a reader; reporting a paper published by Charles Anderson in the *Journal of Tropical Ecology*.



Picture: Wikimedia Commons/yinhaitz

The wandering glider

amazing things. This is another example of wonderful things they can do to evolve to make their way in the world". It would indeed be wonderful if dragonflies could have worked out for themselves how to navigate between continents, across thousands of miles of ocean, and how to instruct their offspring, which only hatch after they themselves are dead, of the correct route and weather patterns. A much more realistic explanation is that the planning and the genetic code to control this extraordinary behaviour was programmed by the Creator Himself.

'Intelligent' trees and guardian ants

ACACIA trees are ubiquitous across the African savannah and in the tropical rainforests. The wood of the desert acacia (Heb. *shittim*) was used in the construction of the tabernacle (Ex. 25:10, etc.). Their leaves provide food for many grazing herbivores, such as giraffe and elephant. However, the trees are also home to aggressive, stinging ant species which live in special structures beneath the bark. These feed on the sugary nectar the trees provide and defend them against other animals. They will even attack giraffe, stinging and biting their faces until they move away. From this it might appear that the ants overrun the trees, but it has emerged that in reality it is the trees that control their retinue of 'ant guards'.³

Scientists studying this 'symbiotic' relationship between trees and ants have uncovered the remarkable way in which the plants employ an array of chemicals to manipulate the behaviour of the ants. Using the ants to repel other animals

is valuable for the trees, except for one vital aspect of their lives: flowering. It is clearly essential that insects such as bees can access the nectar and pollen in the flowers to pollinate them without interference. Some other species of plant use physical barriers to keep ants off their flowers, but acacias have no such defence. They do provide small supplies of nectar on stems away from the flowers to supply the ants, but beyond this it has been found that they employ chemical methods to deter the ants from approaching the flowers.

Most flowers produce scents, mixtures of volatile organic chemicals, to attract pollinators such as bees and hummingbirds. In the case of the acacia, however, this scent, though irresistible to these creatures, is repellent to the ants. It contains a chemical that seems only to be produced at the time the flowers are producing the most pollen, and is probably present in the pollen. The scientists found that they could transfer the repellent effect from fresh young flowers to old ones by brushing some of their pollen on the older flowers. When they placed some flowers in a syringe and puffed the scent over the ants, they became agitated and aggressive. It is thought probable that the chemical produced by the tree mimics a pheromone that the ants themselves release to signal danger.

Naturally the researchers attribute this cooperation between plant and insect to some clever evolutionary development. But it is difficult to see how such extremely complex interactions could develop by natural selection. A modern research chemist with sophisticated laboratory equipment would find it a major challenge to synthesise a chemi-

cal that was *attractive* to bees but *repellent* to ants; but evolution is supposed to have achieved it quite by chance! Furthermore, there are many different species of acacia, each with its own species of 'ant guards', so that the supposed evolutionary process would presumably have been different each time. It suggests, on the contrary, that the Creator is involved at a deep level in the design of these remarkable systems, which provide a natural balance between animal consumers and consumed plants.

Creatures that glow in the dark

THE latest Hollywood science fiction blockbuster *Avatar* apparently features alien humanoids with glimmering blue skin. The filmmaker purportedly drew his inspiration from the many creatures of the ocean that glow in the dark, a phenomenon known as *bioluminescence*. In fact a whole range of plants and animals, especially those of the deep ocean, are capable of activating the clever chemistry which causes the emission of light, whether for finding food, attracting a mate or defending against predators.⁴ Because it is found in such widely differing species, scientists blithely assert that it must have evolved at least forty different times!

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3. Victoria Gill, "Plant chemical manipulates ants", BBC News Channel, 29 Dec. 2009; <http://news.bbc.co.uk/1/hi/sci/tech/8383577.stm>.
 4. Adam Hadhazy, "Shining Examples: 10 bioluminescent creatures that glow in surprising ways [slide show]", www.scientificamerican.com/article.cfm?id=bioluminescent-avatar; Marc Branham, "How and why do fireflies light up?", www.scientificamerican.com/article.cfm?id=how-and-why-do-fireflies.



Firefly

Researchers studying the light production of fireflies have discovered that a complex cascade of chemical reactions is responsible, triggered by their nervous system. The abdomens of fireflies contain special cells called *photocytes*, harbouring two chemicals called *luciferin*

and *luciferase*. When oxygen enters the cells these two react to emit a beautiful glow, without producing any heat that would harm the insect.

Normally oxygen entering the cells is bound to structures called *mitochondria* and is not available. It takes another gas,

nitric oxide (NO), produced by enzymes close to the photocytes, to activate the oxygen and switch on the light.

The only explanation scientists can bring forward for the appearance of such astonishing chemical complexity is 'aeons of time'; given long enough, they claim, anything is possible. Intelligent design by the Creator stands as a far more satisfying explanation.

Long before the imaginary *Avatar*, God caused the face of His servant Moses to shine (Ex. 34:29-35) as a sign that Moses had been in the Divine presence, and subsequently revealed His glory in the face of Jesus Christ (Mt. 17:2; 2 Cor. 4:6). Bioluminescence is just one product of the God of all wisdom, the great Designer Whose handiwork is everywhere evident in nature and before Whom we stand in awe.

Watchman

The Greek crisis and the Roman Empire

Michael Jenner

The debt crisis in Greece is seen by some as a threat to the survival of the euro as a common currency. However, the leaders of Europe see the solution to this financial difficulty in closer political integration, a development that Bible prophecy leads us to expect.

EVEN BEFORE European bureaucrats have determined what the newly ratified Lisbon Treaty will mean in practice for the daily running of European institutions, the debt crisis in Greece has led leaders to call for more treaty changes to facilitate further moves towards European political union. This may perhaps trigger the next leap forward towards the creation of the

European beast power that will "stand up against" our Lord upon his return.

The hopes of the Lisbon agenda, which was supposed to make Europe "the most dynamic and competitive knowledge-based economy in the world . . . by 2010", remain unfulfilled,

and so European leaders met at a summit on 25 March to discuss how they would fulfil those goals in the next ten-year economic plan. However, the summit was hijacked by the more immediate problem of the Greek debt crisis and its potential to bring down the euro. Together, France's Nicolas Sarkozy and Germany's Angela Merkel agreed the foundations of a financial rescue package for