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In this issue

Pg. 3 .. Our big, old Universe?
Pg. 4..... Animal travel plans
Pg. 6.....Young moons?
Pg. 8..... Summer Reading!

Upgrading Dinosaur Diets

by Moxie

Have you ever tried to imagine what a world without grasses would look like? The scenery might well be pretty bleak. Scientists have long declared that there were no grasses present in dinosaur communities. The plant eating dinosaurs had to make do, we have been assured, with cycads, ferns, horsetails and trees of flowering plants such as palms and magnolias. Today however, grasses (which are also flowering plants), actually contribute far more than beauty to the environment. They represent extremely important sources of nutrition. Indeed, our whole ecosystem could well crash if grasses disappeared. This plant group includes barley, oats, fescue and timothy grasses, rice, millet, sorghum, sedges, bamboo and corn among others. What large grazing animal does not depend upon one or other of these sources of nutrition? Nevertheless, scientists have steadfastly maintained that large grazing dinosaurs survived without grasses. This view will certainly be re-evaluated in the light of an article on dinosaur diets which appeared in the journal *Science* in November 2005.

In retrospect, scientists may well decide that it makes sense that dinosaurs ate grass. Many grasses grow continuously when they are grazed. Thus they provide a reliable source of food. Ferns and cycads on the other hand, restrict growth to once per year. Cycads, which look like squashed down palms, have indigestible leaves much like those of conifers. Cycad seeds could well be eaten, but some contain compounds poisonous, at least to people. The stems might be good, but the plant might not survive to grow next year. Altogether, without grasses, the vegetation would be hard pressed to support gigantic grazing dinosaurs.

The amazing teeth of the duckbill dinosaurs suggest that their lifestyles were similar to ungulate grazers (deer, bison, gazelles) that we know today. There were also mammals present, now extinct, which had teeth shaped much like today's grazers. It certainly makes sense that the teeth of those gondwanatherians were used for eating grass. In hindsight it all seems so obvious. Why did it take so long for scientists to recognize the presence of grasses in these communities? Plant spores and pollen are very resistant to

Continued on Page 7

Summer Near the Coast

Who of us does not enjoy studying nature? When one undertakes such a study, is it not wonderful to discover that that all nature is best interpreted in terms of the creation model? It is to demonstrate this fact that the creation science associations hold public meetings, publish newsletters and sell books and DVDs. In keeping with this agenda, this summer, the Creation Science Association of British Columbia is sponsoring a Creation Family Camp. It is scheduled for August 27–31, 2006 at Hope, B.C. To find out further details, consult information on the BC association's website (www.CreationBC.org) or the Alberta association's website (www.create.ab.ca) or send for a brochure from either association. This event is certain to be a wonderful time of learning for the whole family!

CAMPING FUN!!! ONCE AGAIN.

by Josh Munan

Hibernation on Demand?

Here is a question that has baffled me for quite some time. How could eight people on the Ark look after so many animals? Consider this: Noah and his three sons had to look after all these animals for 53 weeks while living in the ark. Now you could imagine the amount of food and drink required to meet the animals' metabolic demands to survive for so long. And think about the amount of waste produced during that time! How would they dispose of that enormous quantity of waste? The task would be daunting unless….

Recent studies have shown that animals and humans, can be put into a state of suspended animation without any harmful effects. This type of suspended animation could also be known as hibernation on demand. Hibernation is characterized by marked decreases in metabolic activity, followed by loss of body temperature such that it approaches the temperature of the environment.

Dr. Roth, a scientist at the Fred Hutchinson Cancer Research Center, has successfully induced a state of hibernation in an animal that normally does not hibernate – in mice. During this hibernation-like state, all cell activity slows to a near standstill. This, in turn, reduces the animal's need for oxygen. In effect, Dr. Roth has successfully shut down each cell's hunger for oxygen. In this state, animals will have a very low demand for nutrients and will produce very little waste.

How was Dr. Roth able to achieve this amazing feat? He did so by changing the ratio of atmospheric gases present in the mouse's environment. He added 80 parts per million (ppm) of hydrogen sulphide – the smelly gas that gives rotten eggs their characteristic odour. Within minutes of breathing this mixture, the metabolic activity of the mice dropped by 80%. Breathing also slowed from the normal 120 breaths per minute to less than 10 breaths per minute. Lastly the body temperature of these small animals fell from 37 degrees C to 11 degrees C. After a few hours the mice were given fresh air and their metabolism, breathing and body temperature returned to normal levels without any harmful effects.

Now what does this have to do with Noah's dilemma? Well, the smelly gas that gives rotten eggs their odour, is also the smelly gas that animals release as a byproduct of digestion. Imagine that hydrogen sulphide levels in the ark approached 80 ppm. This might induce a state of suspended animation in the animals. With such a low metabolic rate and low waste production, maintaining the animals becomes a whole lot more manageable for Noah and his family.

Of course it is not possible to know for sure whether this is what happened to the animals. But it is nevertheless thought provoking when you consider that all animals, including humans, have a latent ability to hibernate on demand given the right conditions. Perhaps the situation the animals faced during that catastrophic moment was the necessary trigger that caused them to enter into suspended animation. And then in time, when new atmospheric conditions were right, these animals could come out of their induced hibernation without any long term effects. Something to think about.

(See *Science* April 22/05 p. 518 and *Discover* January /06 p. 47)

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Evaluating our Universe

In recent years there have been many dramatic developments in the twin fields of astronomy and cosmology (the branch of astronomy dealing with the history and structure of the universe as a whole). We have heard and wondered about such strange concepts as dark energy, multiple universes, quasars, gamma ray bursts and so on. Many people want to know what the significance of these phenomena is from a creationist point of view. Although there was a flurry of popular and technical discussions of astronomy in the 1970s, since then there has been a dearth of such creationist publications.

Astronomer Danny Faulkner, on the faculty of the University of South Carolina, has stepped up to provide us with some badly needed insights. His new book is published in the style of the "Exploring …" books, which for the most part are aimed at junior high readers. The more sophisticated level of this discussion however makes it more suitable for high school students, and for adults. Dr. Faulkner has been careful to avoid mathematical equations, nevertheless many of the issues are complex and the early chapters are quite long. There is no easy way to discuss some of these issues. However, with the details comes enhanced understanding. A bald statement of the issues simply would not do.

The interpretive framework for the material discussed, then is refreshingly different from secular treatments. We read about distances in space, expansion of space, redshift controversies, exploding supernovas, cosmic background radiation and various other controversial issues. The author tries to deal with each hypothesis fairly with the arguments in favour and the arguments against each one. When the situation warrants it, he points out issues on which the creation model needs more work and more workers. This is not a rah! rah! treatment, but a careful discussion of the young universe model.

This book includes almost all the possible devices to make it reader friendly. It includes questions at the end of each chapter, answers in the back of the book, endnotes, index, appendix, and cute motifs in the upper outer corner of each page to indicate the theme of the chapter. The black and white diagrams and photos are suitable too. A glossary is the only other item which might have been helpful.

Altogether this book is a welcome addition to discussions of the creation model. There have been so many developments in the field of cosmology in recent years that an up to date evaluation of these implications is absolutely essential. High school level readers and adults who are interested in astronomy, or in the history of science, will thoroughly enjoy this book.

Danny Faulkner. 2004. *Universe by Design: an explanation of cosmology and creation.* Master Books. 142 pages.

ANIMAL Tr

by Marg Held

Since the advent of global positioning satellites, or at least since their availability for civilians, scientists have found many uses for these devices. One of the more interesting applications is to track animals such as 'fish with chips' program. This is a multimillion dollar Census of Marine Life project. In conjunction with this program, thousands of marine animals in the Pacific Ocean, including many fish, have been fitted with electronic surveillance tags. As of 2005, midpoint in a ten year program, some interesting results have been recorded. Thus far about 1800 sharks, tuna and turtles have been fitted with transmitting devices which relay information to a satellite when the animal surfaces. By this means, a bluefin tuna was tracked as it crossed the Pacific Ocean three times in 600 days. This fish swam 40,000 km with an average of 66 km/day. More dramatic still were the exploits of Nicole, a 3.5m long great white shark. This specimen swam 11,000 km from South Africa to Australia and back within three months. Nicole thus averaged 122 km/day. She swam in a straight line, never less than 5km/hr and 60% of the time she stayed within one metre of the surface. It is obvious she knew where she was going.

Scientists have been astonished to discover how far these and many other animals migrate. Another interesting study involved young fingerling salmon emerging from 16 river systems on the Pacific coast of North America. The tags on several thousand of these fish were scanned as they passed over special receivers placed on the ocean floor from Washington State up to Alaska. This study revealed that the young salmon follow precise migration paths which vary depending upon their river of origin.

The results of these tracking studies intensify the question, long pondered, as to how animals navigate long precise routes through the oceans or skies. As our tools for study become ever more sophisticated, our insights might be expected to increase too. This may be, but the more famous cases still abound in unanswered questions.

Arctic birds

In certain instances a simple navigating system may suit the needs of an animal. This situation applies for example to arctic birds on their annual migration south. Navigation apparently is most difficult near the poles since many useful parameters, like magnetic field, all converge.

During the late summer of 2005, scientists carried out a study of arctic bird navigation. As flocks of birds passed over the Bering Strait between Alaska and Siberia, scientists briefly tracked them by radar. From hundreds of such tracks, the travel trajectories (direction) could be calculated. Already the scientists had calculated the various routes that birds would follow if they were using one or other navigational cue. If the birds were navigating by means of a magnetic compass, for example, they would proceed towards the northeast (not an ideal direction). If they used the sun as their reference point, adjusting their calculations according to time of day, they would proceed towards the east. However if they followed the sun without adjusting direction for time of day, they would proceed in a southeast direction. This was indeed the path these birds appeared to follow. The end result of this strategy is that their route then traces an arc, part of a great circle. Such a route is by definition the shortest distance connecting two points on the globe. For people relying on technology, a great arc requires continuous changes in compass direction. Navigating by compass (magnetic field) is longer but much easier. Obviously however one expends less energy on a shorter route. In the case of arctic birds, lacking complex computer programs, they nevertheless manage to follow a sophisticated path out of the arctic. Scientists cannot refrain from asking how these birds learned such a navigational strategy.

There is no doubt that recent tracking studies have revealed exciting details about animal navigation. In addition, physiological studies continue to give us glimpses into methods which these creatures use to plot their routes. None of these environmental cues however would be any help at all without senses designed to perceive them, and brains to interpret the data correctly, and to act upon it. Secular scientists may eventually describe the tracking mechanisms ever so precisely, but they will never be able to tell us why or how these remarkable designs were

avel PLANS

conferred on these creatures. These talents obviously are a design feature programmed into the animal brains.

Sea Turtles

Most of the seven species of sea turtle can be found throughout the world's tropical and subtropical seas. Despite this wide range, local populations exhibit very specific nesting site preferences and sometimes even a specific preference in feeding site as well. This scarcely seems remarkable until we realize that the nesting and feeding sites may be thousands of kilometers apart. After decades of ecological studies, scientists still have only a poor understanding of the wonders of sea turtle navigation.

Green turtles are a rugged, long lived species (up to 70 years). As is typical with sea turtles, the female lays her eggs at night in the sand of a wide beach along the seashore. She digs a pit, and lays as many as one hundred eggs. After covering the eggs, the mother then retreats into the sea. Several weeks later, all the eggs hatch at the same time. The hatchlings emerge from the sand and head straight for the ocean. Once immersed, they swim straight out, farther and farther from land with its multitude of avian, crustacean and human predators. Only about one in one thousand hatchlings survives long enough to mature.

Once in the open sea, young turtles apparently set out for the feeding grounds. Green turtles hatched on beaches of Costa Rica, later turn up in Spain, Chile and Brazil. Then once mature, females return to the very same beaches from which they hatched fifteen to thirty years previously. Tagging programs with young turtles have never revealed an adult female nesting on a beach other than the one from which she emerged. How do these turtles, out at sea, navigate towards the appropriate beach?

One of the more remote destinations on earth is Ascension Island. Situated in mid South Atlantic Ocean, this island of 88 square kilometers lies about 1100 kilometres northwest of Saint Helena, itself an island famous for its remote location. (Napoleon Bonaparte spent his last days on Saint Helena, a site chosen as his prison because its distance from everywhere made escape impossible). However Ascension Island is even more isolated than Saint Helena. Nevertheless green turtles, feeding in shallow waters along the Brazilian coast, and others in similar habitats near Gabon (Africa), swim due east or west (respectively) to nest on the beaches of Ascension Island. The journey from Africa to the island is 2500 km and from Brazil to the island is 2250 km. It is like finding a needle in a haystack. Nevertheless adult female turtles make the journey once every three to four years. Moreover they do not eat at all during the entire eight month return trip.

Amazing skills in navigation are not unique to green sea turtles. Studies on the largest turtle of all, the leatherback, reveal some interesting details too. Unlike the green turtle, the leatherback forages for food in the deep ocean so they are less tied to specific feeding grounds. Nevertheless there are only a few dozen places in the world where these turtles lay eggs. Of these, only four beaches attract large numbers of nesting leatherbacks. One of these four beaches is Playa Grande Beach on the west coast of Costa Rica. Tagging studies have revealed that these turtles travel 2500 km west from Costa Rica toward the Galapagos Islands and beyond into deeper waters. They confine this travel to a narrow corridor up to 480 km wide. The females however return to Playa Grande to lay eggs up to ten times per season. The females of another leatherback population, which feeds on jellyfish in the waters off Canada's Nova Scotia coast, later proceed to beaches within the Caribbean Sea in order to nest.

Studies on turtle navigation have revealed that young hatchlings react positively to wave direction, the earth's magnetic field, moonlight, and perhaps chemical gradients. Nobody has however established precisely how adult turtles navigate thousands of kilometers in the open ocean, or even why they do so. Even if turtles are able to orient themselves in a specific direction, how do they locate the particular beach from which they hatched so many years previously and on which they spent so short a time? Research challenge: investigate another amazing story of animal migration such as monarch butterflies, freshwater eels or various birds.

More excitement from Cassini

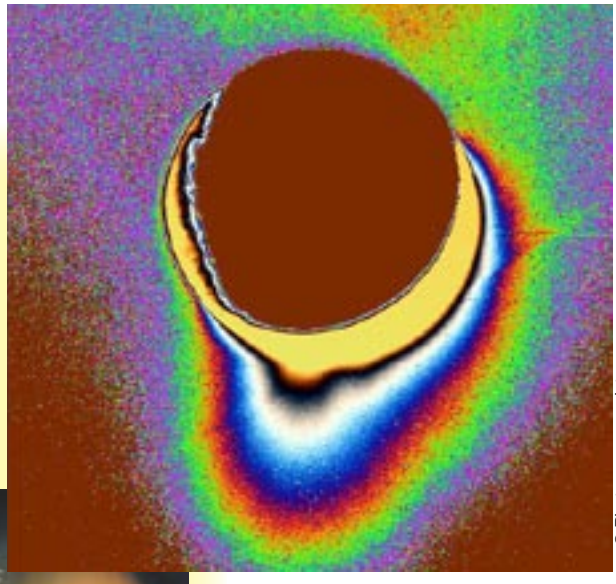
As far as our solar system is concerned, astronomers have grown accustomed to expecting the unexpected. Certainly nobody expected liquid water spewing from a small moon of Saturn. An article published in *Science* (March 10, 06) describes how the Cassini spacecraft discovered Yellowstone-like geysers of water vapour and ice particles shooting 430 kilometres into space from Enceladus. One scientist confided to the media that this discovery is a "big deal." Who would ever expect a tiny body with a diameter a mere 500 km, to be warm enough still to contain liquid water. It is not as if this moon is substantially warmed by the sun, it is not. If this small satellite of Saturn has been around for billions of years (as most astronomers presume), then it should have lost its original heat energy long, long ago. What we see however is enough energy to force water to explode out of vents in the moon's surface.

There are two possible explanations for the liquid water on Enceladus. Firstly the planet may be very young. Assuming that the moon was once hot, then evidently it has not completely cooled. That would imply a very short time interval for such a small object. Alternatively some process may be operating, as yet unobserved, which caused the moon to retain hot water. The moon is so small however that there seems little scope for such a presumed process. The obvious conclusion is that the moon is very young. Most scientists ignore that possibility, preferring instead to speculate that the scene could be ideal for origin of life processes.

During this past year, the Cassini spacecraft also surveyed Saturn's largest moon Titan. This too is a body which scientists consider a potential host for extra terrestrial life. Based on their belief in the old age of this moon, and on their hope for an origin-of-life friendly environment, scientists expected to find oceans of liquid methane on the surface. The Huygens lander, which descended to the moon's surface on January 14/05, would hopefully confirm that prediction.

The actual scene on Titan was so contrary to expectations that scientists could not believe their eyes. One NASA scientist, reported *Nature* (January 20/05 p. 181), declared that if these scenes were really from Titan, then they were all "in big trouble." At first these scientists believed that they were viewing old footage from Mars, with its barren boulder-strewn landscape. But there was no mistake! The solid objects however were of pebble size rather than the big rocks of Mars. The surface thus turned out to be a big surprise. Its texture was like moist sand. This news represented "big trouble" for scientists' hopes for Titan.

The problem is that there is considerable (about 5%) methane in the atmosphere around Titan. Since methane in the atmosphere is expected to completely break down after a mere 10 to 20 million years, there should not be any of the gas left on a satellite that is a billion or more years old. Since there is methane in Titan's atmosphere, either the planet must be young, or some thus far undetected process must be adding new methane to the atmosphere. This is what the methane oceans would have accomplished.



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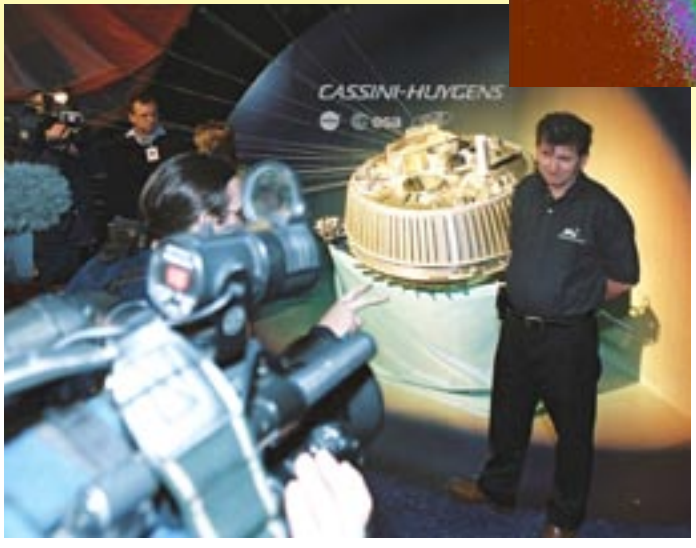


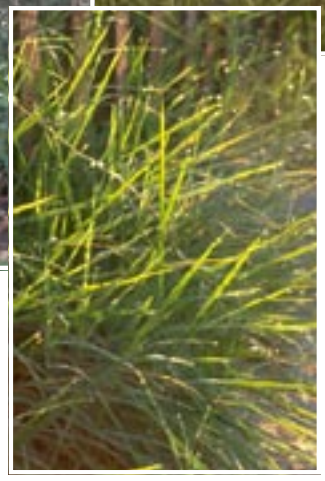
The secular scientists seek a weather cycle which could keep methane circulating into and out of Titan's atmosphere. Unfortunately there does not seem to be a realistic source of energy to drive such a cycle. A news item in *Nature* (Dec. 1/05) reports: "The sun provides very little light, and radioactive decay and internal movement caused by Titan's orbit around Saturn don't seem to add much power." Another possibility is volcanoes, but there is little support for this idea also. Thus the mystery of the methane in Titan's atmosphere is an unexpected legacy of the Cassini program. Indeed everywhere that space probes go in our solar system, startling situations, best explained as recent in origin, are observed. So hurray for Cassini and the other probes. Long may they explore.

UPGRADING DINOSAUR DIETS

Continued from page 1

decay. Why was grass pollen not identified in sediments with the dinosaurs? That is a very good question.

There are few issues in palaeontology as controversial as the study of fossil pollen grains. It is the case that non seed producing land plants reproduce by means of spores and seed plants release pollen as part of the reproductive process. The outer coats of both spores and pollen grains are made of an exceedingly tough organic compound called sporopollenin. It so happens also that these outer coverings are characteristically shaped and decorated in ways which are diagnostic of the plants which released them. The main criterion distinguishing the non-seed plants' spores from pollen of seed plants, is size. Also the pollen grains of flowering plants show lots of variation. Because the sporopollenin is so resistant, these small artifacts can be concentrated from sedimentary rock samples by treatment with strong acids or alkalis which dissolve away everything else. Obviously this technique provides a wonderful way to establish the presence of plant material in sediments which lack large plant fossils.



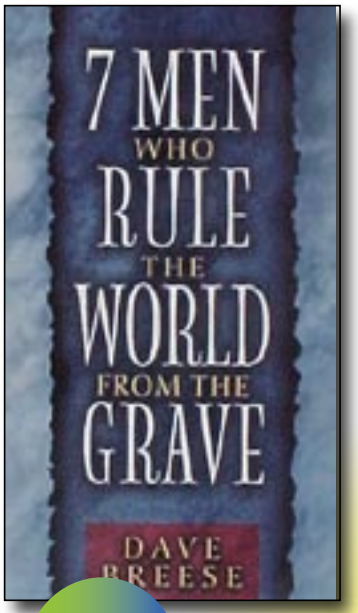
One of the early companies to exploit this technique was Royal Dutch Shell in the 1930s in Venezuela. They used the presence of specific pollen types to establish the sequence of rock layers and thus to locate oil bearing rocks. Apparently this technique was highly successful for Shell. None of this, of course, is controversial. What is controversial is the suggestion that these pollen grains came from plants like our modern ones. Based on evolutionary assumptions, most scientists refuse to acknowledge that deep sedimentary layers might contain remains like those of modern plants.

Palynologists (spore/pollen grain experts) routinely recognize pollen grains of extant genera and species, if these are found in recent sediments. When it comes to the sediments which buried the dinosaurs, and also even lower sedimentary layers, it is a widely accepted convention that the pollen grains will be identified by appearance only. Any resemblance to modern plants is entirely ignored. Specialists who had previously identified such pollen collections in terms of modern plant names, later saw their conclusions discounted by others and names based on form only were substituted for the modern names.

The problem of identifying the presence of grass plants in dinosaur communities now becomes clearer. The sediments might contain ample grass pollen, but nobody would identify it as such because of the custom of describing appearance only. At the higher levels where pollen grains are compared with living plants, grasses have variously been said to have first appeared in Oligocene rocks (about 35 million years ago by evolutionary estimates) or Paleocene rocks (about 55 million years ago by similar reckoning). According to such evolutionary scenarios, this would place the first appearance of grasses ten to twenty million years after the extinction of the dinosaurs.

It was the identification, in dinosaur dung, of tiny silica crystals produced only by grasses, that led to the dramatic announcement concerning grasses in dinosaur diets. These crystals, called phytoliths, form in the thickened walls of certain plant cells. These artifacts are typically destroyed by the strong acids used to concentrate pollen grains. Thus phytoliths would never be found along with collections of pollen grains. The shapes of these crystals are so specialized, that scientists can identify the general characteristics of the plants which produced them. Recently five very different types of grass phytolith were found in the dinosaur dung. Some of the phytoliths resemble those produced by modern rice. Some of the plants may have looked like bamboo, only smaller. All we know to this point is that there was considerable variety in the characteristics of the grasses. Evidently these plants were an established part of the ecosystem.

Thus we return to the question as to why it took the scientists so long to document the presence of grasses with the dinosaurs. It is evident that the scientists were not looking for grasses at these deep levels in the rocks. The pollen grains which could have been assigned to the grasses, were instead described merely in terms of appearance. Phytoliths did not show up because nobody was looking for them. The preparation of pollen grains, in fact, eliminated phytoliths. The fact is, this recent discovery complicates theories about the speed of plant evolution. Indeed this is a classic example of the way in which evolutionary preconceptions can bias discovery. It is always good to be a little skeptical about conclusions which scientists draw from fossils.



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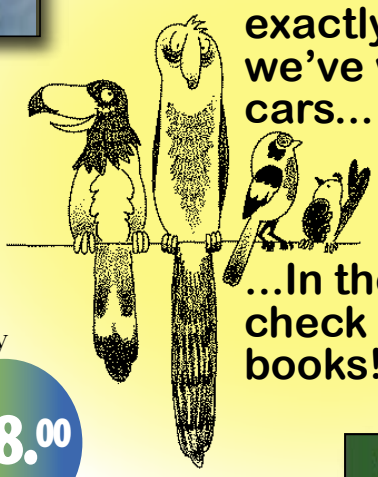

Science has not yet discovered how birds know exactly when we've washed our cars...

...In the mean time check out these books!

Universe by Design

Danny Faulkner

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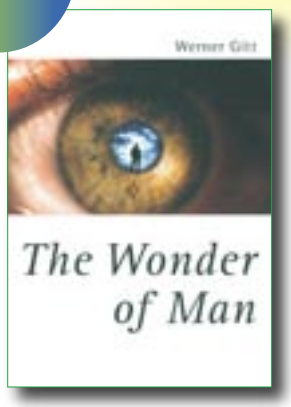

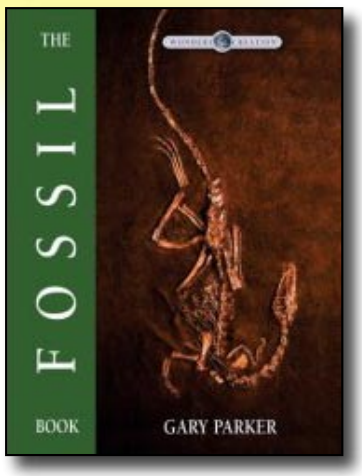

The Fossil Book

Gary Parker

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