GEOBROWSER

They're getting younger all the time...

The story of how two 14-year-old schoolboys, Richard Blachford and Roger Mason, found the Precambrian fossils *Charnia* and *Charniodiscus* in Charnwood Forest (see *Mercian*, 2011, p226) bears out a somewhat anecdotal suggestion that many important geological discoveries have not actually been made by geologists. But the possibility that those in the forefront of field-discovery are becoming even younger was confirmed in 2009, when a five-year-old girl noticed fossilized bones along the sea shore on the Isle of Wight. Her find was made in a landslip area on the Atherfield Clay Formation, and was brought to the attention of palaeontologists at the University of Southampton. The partial pelvis and associated sacral and dorsal vertebrae were subsequently confirmed as belonging to a new species of pterosaur, and are described in the online publication PLOS ONE of March 2013 (doi:10.1371/journal.pone.0058451). The species, which is from the Lower Cretaceous about 115 million years ago, was named *Vectidraco daisymorrisae*, which honours both the name of its young discoverer and also the location - *Vectidraco* meaning "dragon from the Isle of Wight".

Another predatory dinosaur

Yet another newly discovered species of flying dinosaur, this time from the late Jurassic strata in Kimmeridge Bay, Dorset, has been given an unusual name which is, for this year, particularly topical. The specimen has been called *Cuspicephalus scarfi* after the satirical political cartoonist Gerald Scarfe, who was chosen because his caricatures of the late Margaret Thatcher once famously depicted her as a pointy-nosed *Torydactyl*. Found by fossil collector Steve Etches, and identified by University of Portsmouth palaeontologist Dr David Martill, it is believed to be the most substantial pterosaur skull to be found in Britain for nearly 200 years (Acta Palaeontologica Polonica, doi:10.4202/app.2011.0071). The specimen, 33 cm long, is now in Dorset's Museum

of Jurassic Marine Life, and according to Dr. Martill is unique because of its complete skull, which is extraordinarily slender, hence its 'pointed head' name. Gerald Scarfe said he was "... thrilled and flattered - I never thought Mrs Thatcher would do anything for me - even if it is to be immortalised as a 155-million-year-old fossil. I have spent many holidays in Kimmeridge and to think my namesake was buried beneath my feet is wonderfully bizarre."

Evolution, creationism and flying spaghetti

The Church of the Flying Spaghetti Monsters is a spoof rival to the creationist school of thought, and is generally held to be a light-hearted parody religion whose devotees are called 'Pastafarians'. The church's name was first coined in a satirical open letter written by Bobby Henderson in 2005 to protest the Kansas State Board of Education's decision to permit teaching intelligent design as an alternative to 'Darwinian' evolution in public school science classes. Perhaps because of the mirth that it engenders, but also because of its more serious undertones with regard to the teaching of science in schools, the Flying Spaghetti Monster has had widespread exposure on the internet. Its underlying tenet relates to an argument (*Russell's teapot)* put forward by Bertrand Russell, which refutes the notion that the burden of proof lies upon the skeptic to disprove the claims of religions, and concludes instead that the philosophical burden of proof lies upon those who make unfalsifiable claims (for example supporting a literal interpretation of the Book of Genesis), and not on those who reject them.

In his letter, Henderson satirized creationist ideas by suggesting that whenever a scientist carbon dates an object, a supernatural creator that closely resembles spaghetti and meatballs is there "changing the results". Arguing the equal validity of his beliefs, Henderson called for Flying Spaghetti Monsterism to be allotted equal time in science classrooms alongside intelligent design and evolution. The theme was elaborated further in Henderson's book, *The Gospel of the Flying Spaghetti Monster*, which preaches that an invisible and undetectable Flying Spaghetti Monster created the universe. Pirates are revered as the original Pastafarians, and their important role in causing global warming is demonstrated by a graph showing a steady decline in numbers of pirates plotted against rising global temperature. This argument was put forward to show that correlation does not always imply causation, and is a counter to the suggestion from some religious groups that the high numbers of disasters, famines, and wars in the world is due to the increasing lack of respect and worship shown towards their deity.

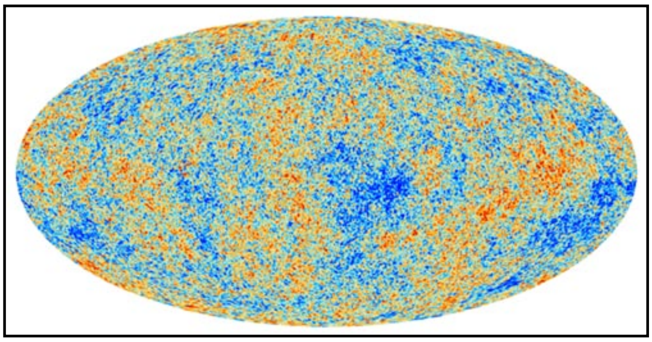
Creationism can be identified with a variant of Christian fundamentalism that has persisted down the centuries, often resulting in the persecution of scientists and philosophers. However, in a 2012 paper entitled *The Evolution of Creationism* (*GSA Today*, v22, n11, p4-9) David Montgomery argues that the modern creationist school finds its roots in the teachings of George McCready Price (1870–1963). A Canadian Seventh-day Adventist, Price was an amateur geologist with no formal training who in 1923 published a book with the rather misleading title *The New Geology: A Textbook for Colleges, Normal Schools, and Training Schools; and For the General Reader*. Here he asserted that there was no order to the fossil record, and that the apparently logical progression of species-types favoured by geologists was really just a mixed-up sampling of communities that lived in different parts of the ancient world. He considered the fossil record too incomplete to confidently reconstruct the past, citing the occasional discovery of animals previously thought to be extinct and known only from fossils.

Trouble in Paradise?

While geological thought has evolved over the past several centuries, so too has Christianity, and Montgomery notes that the creationist school is currently being torn apart by bitter arguments. *Young-Earth creationists* believe the world is no older than about 10,000 years, and that Noah's Flood formed its present-day topography during a single event a few thousand years ago. *Old-Earth creationists* accept much geological evidence but endorse ideas such as progressive creationism (also known as theistic evolution), which argues that God guided evolution in creating the diversity of life. In a later step, creationism was repackaged as *intelligent design*, which embodies the inherently untestable assertion that God designed the world with a particular purpose or goal in mind. Interestingly, the name *God-particle* has strayed into the realms of astrophysics, although it is a populist term disliked by many scientists and clergy alike and, in any case, it has recently been supplanted by the discovery of the Higgs-boson. Montgomery concludes that after losing repeated court battles over efforts to teach creationist views in science classrooms, the creationist strategy appears to have shifted to questioning evolution, particularly in the wake of the Charles Darwin bicentenary celebrations (see G*eobrowser* 2009). He notes that "Geologists assess theories by how well they fit the data, and creationists evaluate facts by how well they fit their theories", which are philosophies that cannot be reconciled. By discussing the development of creationism in classrooms alongside the teaching of evidence-based Natural Sciences, students could be given useful insights into the science *vs* spirituality debate, and how the two approaches can be evaluated evidentially in the context of the planet's geological evolution.

...and there was light

Thanks to the European Space Agency's Planck telescope, we are now within a chronological hairsbreadth of observing the very act of Creation. The latest images of the cosmic microwave background constitute the most detailed map yet of the situation that prevailed only 380,000 years after the Big Bang. They show variations in the heat-radiation left over from that event, with red and blue regions representing areas that are slightly warmer and colder, respectively. It is these small fluctuations in the early universe that developed into the stars and galaxies we see today. This map of the remnant glow largely affirms scientists' theories about the universe's early history (The Guardian, 21 March, 2013).



For example, the data support the theory of simple inflation in which, around 10-30 seconds after the Big Bang, the universe briefly expanded faster than the speed of light. It also broadly confirms previous calculations of universe age, but with the proviso that it commenced 13.81 billion years ago, some 80 million years earlier than previously thought. As with all major scientific advances, there are also some new problems to solve. The universe now seems to contain more matter, of both visible and invisible types, and less of the mysterious entity called dark energy than earlier observations suggested. The Planck data also delivered an unexpectedly low rate of expansion for the universe, a figure called the Hubble constant that describes how dark energy is increasingly stretching the fabric of space. "This is one of the most exciting parts of the data," says Martin White, a Planck scientist at the University of California, Berkeley, "the hope would be that this is actually pointing to extra physics we're not aware of." This should move us closer to answering the two outstanding questions about our existence – what happened at the Big Bang, and what came before it?