Paleontologic Agitprop?

By Fred Heeren

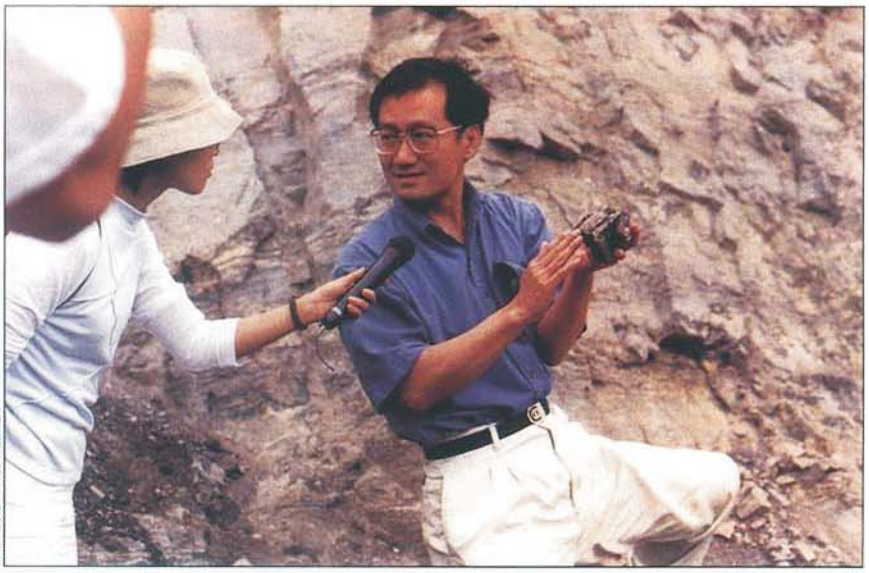
Life in China must have developed in an entirely different manner than in the West – at least according to scientists who hold very different views of evolution.

Before smiling officials escorted an international group of foreign scientists to fossil sites in southern China last summer, they made sure gangs of road-building political prisoners were trucked out of sight. The fossil hunters who caught on to this little routine shrugged it off as a problem far from their concerns.

The scientists might have been concerned about their own efforts to hide troublesome matters — matters that became more apparent when they settled into a resort for a weeklong symposium called "The Origins of Animal Body Plans and the Fossil Record." Though Western journals *Nature* and *Science* later carried articles about the 530-million-year-old fossil discoveries announced at this conference, they made no mention of the central questions emphasized by the discoverers themselves: Why do virtually all the 40-some major animal groups, called phyla, appear in the fossil record at the same time? Why don't we see new phyla continuing to evolve after this? And why does the Chinese fossil record show evolution's subsequent history running opposite to traditional evolutionary-tree diagrams?

In the West, the evolution of life is viewed as a cumulative process, the accumulation of change by innumerable, small steps over hundreds of millions of years. Westerners picture an ever-widening tree of life, growing from a single trunk at the bottom and achieving maximum diversity at the top.

In China, however, scientists view evolution more like a onetime event, the greatest changes occurring at the very start of the Cambrian period. Chinese paleontologists interpret their fossil cache as a record of a "macroevolutionary" event that took place 543 million to 535 million years ago. Within that unique window of opportunity, something special happened, something involving a coordinated influx of complex genetic information — something that demands "harmony," as Chinese paleontologists put it, rather than chance and competition.



PHOTOS BY FRED HEEREN

Truth be told? *Li, top and left, says the discoveries prove the theory of a macroevolutionary event.*

Chinese evolutionary theory rarely is discussed in English-language academic journals, even though China is the place Western scientists must go to learn about the origins of animal life on Earth. China contains the only fossils in the world that are dated near the start of the Cambrian period, when complex animal groups first exploded onto the scene. International groups make regular pilgrimages to Yunnan province and other paleontological hot spots.

Westerners have had several decades to get used to the idea of "quicktime" evolution and bushlike, instead of treelike, evolutionary diagrams — mostly through the writings of Harvard paleontologist Stephen Jay Gould. Perhaps the best-known paleontologist in the West, he remains the most controversial, and his work receives short shrift in undergraduate textbooks.

Recognizing the lack of fossil evidence for expected transitions between major animal groups, Gould and his colleague Niles Eldredge (of the American Museum of Natural History) promoted a concept they called "punctuated equilibria." According to "punk eek," the fossil record of each animal is characterized by long periods of "equilibrium," where nothing much happens; this tranquil state occasionally is "punctuated" by quick jumps involving massive changes in the animal. Gould stresses the role of "contingency," or chance happenings, in provoking these major changes. Rerun the tape of life, he says, and vertebrates, let alone humans, might never appear.

In his 1989 book, *Wonderful Life*, Gould praised the Burgess Shale fossils — another key group of Cambrian fossils discovered in Canada — for the "exquisite detail" of their preservation, providing scientists with insight into a crucial period. From his study of these fossils, Gould concluded that no gradual steps possibly could connect pre-Cambrian fungus with the Cambrian animals. He called paleontologists' efforts to make such connections "fanciful at best."

But the Chengjian fossils, all Westerners agree, are far more exquisitely

preserved — and 15 million years closer to the beginning of the mysterious evolutionary explosion. Indeed, the chance to engage Chinese paleontologist Jun-Yuan Chen is one of the prime motivations for Westerners to travel east. Chen has coauthored half of all papers on the Chengjian animals, and he recently discovered *Homo sapiens*' earliest traceable ancestor, a small fish-like animal called *Haikouella*. (While other paleontologists have claimed to have found Cambrian chordates, Chen assembled more than 300 specimens of *Haikouella* before announcing this discovery.) *Haikouella* had a full complement of eyes, a brain, a heart, an esophagus, intestines and so on — organs so sophisticated that some are classifying the animal as a vertebrate. As a result of Chen's work, paleontologists now include our own chordate phylum with those that appeared in the early Cambrian.

"Some of these specimens are absolutely gorgeous," says primitive-chordate specialist Nicholas Holland of San Diego's Scripps Institution of Oceanography, who worries about a problem this discovery raises. "Where are *Haikouella*'s ancestors? The sixty-four dollar question is, 'What is this hooked to?' That nobody knows."

Three years ago, the search for ancestors to the Cambrian animals took Chen and Taiwanese biologist Chia-Wei Li to a pre-Cambrian mining site called Weng'an. Knowing that the pre-Cambrian rock there had preserved seaweed, they dreamed of finding developed arthropods — or fossils showing steps leading to any of the diverse Chengjian creatures. At a minimum, they hoped to find animals with bilateral symmetry, the most basic characteristic of Cambrian animals (and most animals today). A bilateral animal is one with a top and a bottom, with left and right sides that are nearly identical.

Soon after they began digging, Chen and Li found sponges and tiny sponge embryos. The West publicized the event on network television and the front pages of major newspapers as a great stride in finding the long-sought pre-Cambrian animals. But Chen and Li were disappointed not to have found bilaterians — they failed to find what they had sought, a viable ancestor for the animals appearing in the Cambrian explosion.

Moreover, by finding sponges and their microscopically tiny embryos in pre-Cambrian rock, Chen and Li inadvertently rebutted Western wisdom. Charles Darwin himself held that the ancestors of the Cambrian animals must have been evolving for long ages prior to their Cambrian appearance. The reason scientists haven't found appropriate fossils, according to Westerners, is that the ancestors must have been too small or too soft or the conditions for fossilization too poor. But Chen and Li's discovery demonstrated that small, soft creatures were preserved in pre-Cambrian strata.

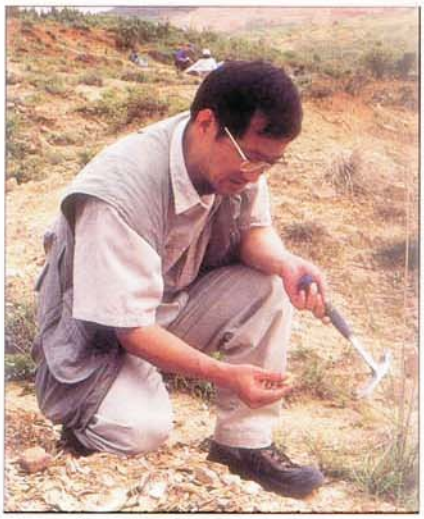
"The 580 million-year-old phosphorous rock has good potential to preserve animals, if they exist," Chen reported to the conferees at Chengjian. "I think this is a major mystery in paleontology, because we didn't find hard evidence to show that this large number of Cambrian phyla was existing earlier. For me, natural selection is not enough to explain the number of evolution novelties." Li also was direct: "Evolution is built on gradual change — mutation plus mutation creating the species, and then the genera and then the family — so how can these animals appear suddenly?"

Western scientists would have none of it. "It doesn't matter if you find it or not!" declared German biologist Dieter Walossek, rallying his colleagues around him. "It's there! It's by law! All of the major taxa should have been there in the pre-Cambrian, whether proved or not!"

Valuing theory over data has given Western science a bad name in the East. During the same week that Westerners read reports in *Science* and *Nature* that stressed Darwinian lessons in Chen's discoveries, the Communist Party's *Guang Ming Daily* presented a different story. "Evolution is facing an extremely harsh challenge," wrote Chinese reporters in an article, "Darwinism — Science of Religion?" Using adjectives such as "dogmatic" and "authoritative" to describe neo-Darwinism, the paper suggested the theory had taken a wrong turn somewhere in the West. The article concluded that, because of the need to contend with creationists, scientists became hypersensitive to any dissent from their "immature science," and "evolution eventually changed into a religion."

Today, as a result of Chinese paleontology, biologists must choose between classic Darwinism and "saltation," the idea of evolution in quick jumps, says biologist Holland. Chinese fossil discoveries have wrought havoc upon the West's once-tidy tree of life. "You just hardly know what order to put the material in now," says Holland. "I mean, you might as well just present the phyla alphabetically. It's come to that."

In China, the Cambrian mystery has inspired the building of government-sponsored research centers devoted to its investigation. At the heart of their research lies a declaration anathema in the West: a proclamation of the mystery of animal origins on Earth. Rather than "survival of the fittest," Chen believes scientists should focus on why life kept evolving beyond the fittest. If life depends upon chance and competition, the conventional forces of evolution, "then complex, highly evolved life, such as the human, has no reason to appear."



Bone of contention: *Li examines a fossil find near southern China.*

At the conference, Chinese scientists encouraged the investigation of a variety of new hypotheses to explain the Cambrian explosion: hydrothermal eruptions, sudden seafloor changes, even intelligent design. This last was too much for one American scientist attending the Chengjian conference, who stood up and shouted, "This is not a scientific conference!" Such a tactic, say critics, is the West's ultimate tool for keeping Chinese scientists at bay: Define all dissent from neo-Darwinism as outside the realm of science.

Ironically, Communist China is famed as a repressive society; the West is supposed to promote the free dissemination of information. Indeed, the American president of the National Academy of Sciences, Bruce Alberts, recently compared science to democracy, in that both accommodate, and are strengthened by, dissent.

For now, however, data contrary to non-Darwinian ideas are as closely guarded as nuclear secrets. Just how powerful is Chen's "mystery of life"? And why would anyone want to keep neo-Darwinism's shortcomings a secret? Westerners attending paleontological conferences in the East prefer to steer the discussion away from such questions. •