

Big Splash From an Ancient Fall

It has been 50 million years since an extraterrestrial body landed in the ocean off the Nova Scotia coast, but the crater left over from this impact is currently making a big splash among scientists. The crater is the first such structure ever identified in the ocean, reports a pair of Canadian geologists. Moreover, its identification may help scientists who are trying to determine whether an earlier impact led to the extinctions of the dinosaurs.

Hundreds of known craters on land record the impact of meteorites, asteroids or even comet nuclei. Scientists have posited that many more bodies must have fallen into the ocean, given that water covers more than 70 percent of the earth's surface. Indeed, several sites have been *proposed* as possible marine impact craters, but "this is the first time that an impact crater at sea has been *identified*," says Georgia Pe-Piper of St. Mary's University in Halifax, Nova Scotia.

Interest in this structure, known as the Montagnais crater, dates back to 1974, but the site was initially misidentified and its true identity had eluded scientists. Now Pe-Piper and colleague Lubomir F. Jansa of the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, report in the June 18 *NATURE* that they have accumulated enough geochemical and seismic evidence to confirm that it is an impact crater.

The crater, at least 45 kilometers in diameter, is located on the relatively shallow continental shelf, 200 km southeast of Nova Scotia. While it sits in only 113 meters of water, the crater itself is 2,800 meters deep. It closely resembles impact craters on land: A central mountain, left over as an artifact of the impact, rises from the inside of the crater. The researchers believe the object that created the crater must have been 2 to 3 km in diameter.

In recent years, a controversy over prehistoric impacts has been making waves in the scientific community as geologists debate whether a large impact 65 million years ago could possibly have initiated a round of mass extinctions concurrent with the boundary between the Cretaceous and the Tertiary periods (SN: 5/16/87, p.309). Scientists gauge extinctions at this K-T boundary by a line of demarcation in sedimentary rocks: Below the line, the fossil evidence of flora and fauna is rich; above the line, in rocks slightly younger than 65 million years, the evidence is poor, indicating that many species perished at the time of the boundary.

The evidence for such a devastating impact rests in the unusual con-

centrations of iridium that geologists have been finding at the K-T boundary around the world. Iridium is rare on the earth's crust, but impact sites often have relatively high concentrations of it, leading some geologists to conclude that an extraterrestrial source provided the anomalous iridium at the K-T boundary. As yet, however, scientists have been unable to positively identify the crater from this proposed impact, although some possible sites have been suggested (SN: 6/7/86, p.356).

Finding the Montagnais crater will enable geologists to test one aspect of the K-T impact theory, says Blyth Robertson of the Geological Survey of Canada in Ottawa. Since previous impact sites were located on land, and the surrounding areas are often subject to high erosion rates, geologists have yet to find conclusive evidence that an impact could eject extraterrestrial iridium, which would then settle far from the original crater, says Robertson. However, a well-preserved sedimentary record surrounds the submerged Montagnais site,

and geologists can trace this record away from the crater and search for an iridium layer. "This gives us the opportunity to prove that the iridium anomaly in an ejecta [debris] layer can be traced back to the crater," says Robertson.

This same sedimentary record, says Pe-Piper, will allow scientists to test "the influence of such impacts on the marine ecosystems." Specifically, paleontologists will try to determine whether Montagnais caused any localized extinctions in the area around the crater.

Other scientists are equally stirred by the identification of a submerged crater. When informed of the Montagnais structure, geophysicist H. Jay Melosh told *SCIENCE NEWS*, "It sounds wonderful. It's about time—there clearly must be craters down there, but they're hard to see." Melosh, from the University of Arizona in Tucson, says analysis of the crater will also "tell us something about the mechanisms of formation of craters with a water overburden." This knowledge, he says, may help in locating other submerged craters.

— R. Monastersky

High court rejects creationism law

In a 7 to 2 decision last week, the U.S. Supreme Court ruled as unconstitutional a Louisiana law that would have required the teaching of "creation science" whenever public schools taught evolution. Because of legal challenges, this 1981 law has never been implemented.

According to backers of the law, creation science is a body of scientific "evidence" indicating that all life forms now on earth appeared suddenly, several thousand years ago, in much the same form they hold today. Evolution, by contrast, holds that present life forms slowly evolved from earlier beings that first made their appearance many millions of years ago.

Ironically, while the scientific community has largely castigated creation science — calling it nonsense or religious dogma — the scientific basis for its teaching was not the central issue here (although it presumably would have become an issue once the state set about implementing the statute). Instead, as in the Arkansas creation-science suit (SN: 1/2/82, p.12), the court was asked merely to decide whether the state's law violated the First Amendment's separation of church and state or a teacher's right to academic freedom.

Writing for the majority, Justice William J. Brennan Jr. said the Louisiana

law indeed violates the First Amendment "because it seeks to employ the symbolic and financial support of government to achieve a religious purpose" — either the banishment of evolution from classroom teaching, or the "presentation of a religious viewpoint that rejects evolution." Though supporters of the law claimed it would further academic freedom by offering a more "balanced" teaching of life's origins, Brennan argued that its "discriminatory preference for the teaching of creation science" proved the law was anything but balanced. In fact, he noted, Louisiana educators had not been prohibited from teaching any science that challenged evolution.

Justice Antonin Scalia, in his dissent (joined by Chief Justice William H. Rehnquist), challenged the ruling, arguing that just because creation science coincides with the beliefs of certain religions, "a fact upon which the majority relies heavily, does not itself justify invalidation of the [law]." Though Scalia conceded the law would be unconstitutional if there were truly nothing scientific to be taught under the rubric of creation science, he also noted that "the evidence before us [in the case record] includes ample uncontradicted testimony that 'creation science' is a body of scientific knowledge."

— J. Raloff