SCIENCE NEWS of the week

Chernobyl May Be Worst Nuclear Accident

What the Soviet government termed "a disaster" occurred this week at the Chernobyl Nuclear Power Plant 60 miles north of Kiev. The accident has resulted in a number of deaths and hundreds of casualties and has prompted an evacuation of perhaps thousands in the region, according to reports from wide-ranging sources, including TASS, the Soviet news agency. First official word of an accident – which some believe may have involved a partial "meltdown" of the affected reactor – came late Monday, April 28. By Tuesday, there were reports out of Moscow that an 18-mile-radius "security zone" had been set up around the four-reactor facility. Western scientists were speculating that this was perhaps the worst commercial nuclear accident ever.

Chernobyl plant area, as identified in February 1986 SOVIET LIFE *magazine, appears to include large residential section.*

At press time, details were sketchy. What was known is that the Soviet government had requested advice from the Swedish and West German governments on battling fires in graphite. That fueled speculation about the possibility of a fire in the affected reactor's graphite "moderator." It was also known that high levels of radiation were measured over Scandinavia on Monday and Tuesday – suggesting to many nuclear experts that the affected reactor probably was among the many Soviet plants lacking a "containment building" – a steel-reinforced concrete dome over the reactor to trap radioactive vapors that might otherwise be released into the environment during a major accident.

The Soviet accident apparently occurred in what is known as a "channel-type, light-water-cooled graphite-moderated reactor," according to Scott Peters of the Atomic Industrial Forum, a nuclear industry group based in Bethesda, Md. The U.S. industry does not build that type, he says. In fact, since the Soviet reactors were not covered by International Atomic Energy Agency safeguards, they have never been inspected by Western nuclear experts, according to Phil Kief, an Energy Department spokesperson.

Nevertheless, some U.S. experts are somewhat familiar with the Soviet design. According to nuclear engineer Weston Stacey, of Georgia Institute of Technology in Atlanta, the channel houses long cylindrical fuel rods. Water flows through the channels, picking up and carrying away the heat produced by a fissioning of the fuel. Each fuel rod and channel arrangement is packed within a separate graphite boxlike arrangement, he says. (The graphite "moderator" is used to slow down fissioning neutrons to an energy level that makes them more conducive to contribute in another fission reaction.)

Stacey speculates that one possible scenario of what might have caused the accident is that the water coolant stopped flowing through one of the channels. Then, when heat was produced and not carried away, "the fuel could have increased in temperature until it melted." It is possible, he says, that the fuel "could have gotten hot enough to reach the combustion temperature of graphite," initiating a graphite fire. Stacey notes that depending on the type of graphite used, its burning point could have been near the melting point of the fuel.

Others believe no meltdown was involved. Nuclear physicists D. Allan Bromley of Yale University in New Haven, Conn., and William W. Havens of Columbia University in New York City suggest instead that a graphite fire may have been ignited during the attempted removal of "Wigner energy" – a phenomenon that occurs when neutrons, set free by nuclear fissions in the uranium oxide fuel, bounce off carbon atoms in the graphite. An accident may have occurred, they speculate, when workers tried to remove the Wigner energy – something that should be done once a year – by heating the graphite until the displaced atoms return to their positions.

Photos: SOVIET LIFE

Photo published two months ago shows technicians working on what U.S. experts suggest is probably the Chernobyl reactor core; blocks within grid are probably graphite. Cooling water would circulate through channel holes visible in center of blocks. Inset: Chernobyl plant.

While Stacey says a meltdown may have occurred, he suggests that only a small number of the fuel rods actually melted.

Though containments were included in some Soviet reactors starting in about 1980, the fact that the Chernobyl reactors came on line in 1977, '78, '81 and '83 suggests to U.S. reactor experts that the four are among those still lacking this last line of defense against radioactive releases.

– J. Raloff with D.E. Thomsen

Bird fossil defended against hoax charge

There was a disturbing sense of *déjà vu* last year when the British Museum's *Archaeopteryx* fossil, long thought to be the earliest known bird, was branded as a hoax by several prominent scientists. Could this be another Piltdown Man? researchers asked. Also housed in the British Museum, the Piltdown Man was exposed as a fake in 1953. But a careful analysis of the *Archaeopteryx* fossil confirms that it is authentic, reports a team of paleontologists in the May 2 SCIENCE.

Alan J. Charig and his colleagues at the British Museum in London say that ultraviolet and microscopic photographs show that, contrary to allegations, the animal's flaring feathers could not have been pressed by a forger.

The 150-million-year-old *Archaeopteryx* specimen was discovered in 1861 in a Bavarian limestone quarry that has yielded five other fossil birds generally considered to be of the same species.

John Ostrom, from *Fossils and the History of Life*, © 1983 W.H. Freeman & Co.

The controversial Archaeopteryx *fossil.*

The fossil is thought to be a prime example of evolution in action because it appears to represent a species in transition between reptiles and birds. Imprints on two pieces of a stone slab that formed a mold around the fossil outline a creature that had the teeth and many skeletal features of a reptile, most likely a small dinosaur, along with birdlike characteris-