Has the biosphere done a flip-flop?

Today, plants depend on carbon dioxide and water to survive. In turn, they produce organic matter, which settles on the ground or in a body of water, and oxygen, which floats into the atmosphere. Animals consume some of the plants and give off their own by-products — and the closed cycle of photosynthesis and respiration continues.

However, during the Archean age more than 2.5 billion years ago, the biosphere lacked oxygen and was replaced in the cycle by dissolved iron, proposes James C.G. Walker, a University of Michigan atmospheric scientist, in the Oct. 22 NATURE. The presence of dissolved iron caused the Archean biosphere to be a total flip-flop of today's, he says. If accepted, this picture could change how geologists classify Archean fossils and how scientists view human evolution.

According to Walker, the oxygen-replacing dissolved iron, which is denser than organic matter, settled in sediments or stagnant pools, while volatile carbon and gaseous hydrocarbons scattered in the atmosphere and oceans. "My suggestion will profoundly change, if not turn upside down, how we look at the Archean environment," Walker told SCIENCE NEWS.

The prevailing thought has been that yesterday's "animals," or single-celled organisms, either fermented organic matter or consumed dissolved sulfate. The organisms then released organic matter or sulfide that settled on the ground or in the sea. According to this view, these substances would be plentiful in areas where life was flourishing.

Geologists have maintained that fossils found in Archean sediments rich in either carbon or sulfide are the remains of organisms that lived in productive areas. But according to Walker, a fossilized organism found in iron-rich and carbon-poor or sulfide-poor rock lived in a very productive area. Walker defends his theory by maintaining that iron was more plentiful than sulfur during the Archean.

"The Archean world has few fossils," Walker says. "Maybe that's why no one has really thought about it. [But] it's important to figure out who was eating whom and what properties in the environment they were exploiting."

Donald Lowe, an authority on early sedimentary rocks at Louisiana State University at Baton Rouge, says, "Right or wrong, [Walker's theory] will ... make people think about the system in ways they haven't before." — *S. Eisenberg*

How effective are bulimia treatments?

Results of a preliminary study to track the responses of young bulimic women to psychiatric treatment over an extended period are not encouraging, particularly for teenagers, according to a report presented last week at the annual meeting of the American Academy of Child and Adolescent Psychiatry in Washington, D.C.

After 18 months of treatment that included both psychotherapy and the use of antidepressant drugs, eight of 18 teenage bulimics were unimproved, reports David B. Herzog of Massachusetts General Hospital in Boston. The remaining 10 improved significantly for at least two months, he says, but by the end of the study, five had again developed symptoms of bulimia.

Bulimia is characterized by episodes of binge eating accompanied by feelings that the binges are abnormal and cannot be controlled. Depression and anguish, as well as induced vomiting, often follow a binge. Some bulimics employ extreme diets, constant exercise or laxatives to lose weight.

Several studies have used prior medical records and self-reports to estimate the long-term effectiveness of bulimia treatments among women in their 20s. Treatments and diagnostic criteria in the studies varied, as did estimates of symptom recurrence. Herzog and his co-workers used current psychiatric standards for bulimia and assigned each patient her own treatment plan, which included individual, group and family psychotherapy, antidepressant medication and nutritional counseling. Four follow-up interviews were conducted during the 18-month study.

In addition to the poor outcomes of the 18 bulimics between the ages of 15 and 19, the researchers found that four of 12 bulimic women in their 20s did not significantly improve for at least two months during the study. In contrast, notes Herzog, it is estimated that 22 percent of severely depressed, hospitalized patients do not improve after 18 months of psychiatric treatment.

About half of the bulimic women were also diagnosed as suffering from severe depression or milder mood disturbances. But there was no clear link between the two disorders, says Herzog. Significant improvement during the study, for example, was the same for bulimics with mood disorders and those without them.

A clearer picture will emerge from a larger sample, says Herzog. He and his co-workers recently received funding from the National Institute of Mental Health to conduct a similar study of 225 women with eating disorders, including 125 bulimics, over five years. — *B. Bower*

Cosmos 1402's uranium remains

When a Soviet satellite called Cosmos 1402 was launched into orbit around the earth on Aug. 30, 1982, it carried a nuclear reactor containing up to 50 kilograms of uranium-235. After the satellite had finished its job, the reactor — used to power an ocean-reconnaissance radar system — was supposed to be separated from it and boosted to a higher orbit, where its radioactive core would presumably stay aloft for centuries. However, a malfunction prevented the orbit from being raised, and on Feb. 7, 1983, the reactor reentered the atmosphere.

But what happened to it then? The consensus was that the device had burned up from atmospheric friction high above the South Atlantic Ocean. This would have reduced its radioactive heart to dust-like particles that would circle on the winds for months or years before settling out, rather than coming down as solid pieces of debris. But at the time, according to a group of U.S. researchers whose report appears in the Oct. 23 SCIENCE, "there was no direct evidence that this occurred."

Both scenarios have occurred before and both have the potential for being harmful. Heavier chunks represent greater concentrations of radioactivity, while fine particles can cover far more terrain by the time they finally do fall, depending on the winds, the altitude of burn-up and other factors.

Now the scientists' analysis, based on samples collected in paper filters by high-altitude balloons before and after the satellite's reentry, has indicated that most or all of the reactor's uranium-235 "dust" was indeed still present in the upper atmosphere more than a year later.

The technique involved using mass spectrometry to measure variations in the exposed filters' relative amounts of uranium-235 and -238, both of which exist in tiny amounts in the atmosphere and even in the unexposed filter paper. The uranium-238 showed similar concentrations in the samples from both before and after Cosmos 1402's reentry, as well as in several unused filters, according to Robert Leifer of the Department of Energy's Environmental Measurements Laboratory in New York City, together with colleagues from that lab and from the National Measurements Laboratory of the National Bureau of Standards in Gaithersburg, Md. A clearly measurable excess of uranium-235 was found, however, in one of the three post-reentry filters.

The timing of the balloon launches to give them the best chance of detecting radioactive fallout from Cosmos 1402 was based on measurements that had been made after the 1964 reentry of a plu-