End of the world: You won't feel a thing

"This is the way the world ends, not with a bang but a whimper."
— T.S. Eliot, "The Hollow Men"

Suppose the world "ended" and we didn't hear the whimper. According to two astronomers speaking at this week's joint meeting of the American Astronomical Society and the Canadian Astronomical Society in Vancouver, British Columbia, two kinds of end-of-the-world catastrophes could happen to our Milky Way galaxy, and we probably wouldn't feel either, or even both combined.

Mitchell C. Begelman of the Joint Institute for Laboratory Astrophysics at the University of Colorado in Boulder described what would happen if a quasar should "turn on" in the center of the galaxy; Marshall L. McCall of the University of Toronto predicted a collision between our galaxy and the spiral galaxy M31 in Andromeda in about 4 billion years. The collision could trigger the quasar, which would boil away the interstellar gas clouds in our galaxy, ending the galaxy's ability to make new stars. On the other hand, the collision by itself could tear the galaxy into pieces and possibly send the sun off on a track of its own into intergalactic space.

However, the earth would be unlikely to feel very much of either cataclysm, the two astronomers agreed. McCall suggested that what we really should worry about is the possibility of a nearby star undergoing a supernova explosion.

Begelman's scenario begins with recent observations that the centers of many galaxies, including that of our own, seem to contain very massive black holes with up to a billion times the sun's mass. It is now also well accepted that such supermassive black holes are the things that power quasars. Where large amounts of matter happen to be falling into the black hole, friction and gravitational stresses on the infalling matter can generate the radiation characteristic of a quasar, which far outshines all the rest of the surrounding galaxy. In many cases, however, including the center of our own galaxy, these black holes are lying quiescent, waiting for some happening to bring large amounts of matter near them, which would then begin to fall in and so turn on the quasar. A collision with another galaxy could be such a happening.

If the quasar turns on, Begelman says, most of its radiation will come as X-rays. These X-rays will heat the interstellar gas — the material out of which new stars are continually forming — and give the gas enough energy to escape the gravitational holes of the galaxy. Gradually, from the center outward, the interstellar gas would evaporate into intergalactic space, ending the galaxy's ability to make new stars. This would radically change the evolution of our galaxy and seriously alter our surroundings. However, the catastrophe would stop at our atmosphere, Begelman says. Our atmosphere is much thicker than the interstellar gas, and the X-rays would not be able to penetrate or damage the earth's atmosphere. Thus, we would not feel their effect.

Astronomers have believed that the Milky Way and the Andromeda galaxy, M31, form a binary system, bound together by gravity and orbiting their mutual center of gravity. According to this belief, the Milky Way is following an orbit in the shape of a narrow, flat ellipse that takes it away from M31 and will eventually bring it back to a close encounter with M31. On the basis of such a supposed motion, astronomers have calculated both the age of the universe, which is the time since the motion began, and the total mass of the two galaxies.

As a result of his own studies of the motions of several nearby galaxies, McCall says he no longer believes estimates of these two important cosmological numbers that have been calculated in this way. He finds that the binary system of the Milky Way and M31 is not as isolated as some astronomers have thought. Two other nearby galaxies, IC 342 and Maffei 1, strongly influence the motion of the Milky Way, making its orbit not a simple ellipse but a very complicated curve.

The collision with M31 is still in our future. Yet even if the collision tore the galaxy apart and shot the sun off on a career of its own, the planets are so tightly bound to the sun that they would just go along. The sky we see would change drastically, but that would be the only major effect.

The thing to be afraid of, McCall says, is that a giant star like Betelgeuse should explode into a supernova. The recent supernova 1987A proves that giant stars can explode in this way. At a distance of 300 light-years from Betelgeuse, the earth would get a blast of ultraviolet and X-rays strong enough to burn off the atmospheric ozone layer. Then more ultraviolet, either from the supernova or from the sun, would fry us.

So maybe it would end with a bang after all. — *D. E. Thomsen*

AIDS may affect course of syphilis

The incidence of syphilis and its associated mortality have declined dramatically since the discovery of penicillin. But the syphilis-causing spirochete, *Treponema pallidum*, is far from extinct; last year nearly 28,000 new cases of syphilis were reported in the United States, according to the Centers for Disease Control in Atlanta. And while most of these cases were apparently cured with single huge doses of penicillin, there is a growing debate about the ability of these shots to kill spirochetes that may be lurking undetected in the central nervous system. Indeed, there have been several reports in recent years of failed treatments for neurosyphilis — an advanced form of the disease in which the invading organisms infect the cerebrospinal fluid.

Now there is evidence that a patient's own immune system is more important in fighting syphilis than was previously believed, and that the standard 2.4 million units of intramuscular penicillin may in fact be insufficient to halt the progress of the disease in some patients with weakened immune systems. The new findings, reported in the June 18 NEW ENGLAND JOURNAL OF MEDICINE, are particularly relevant to patients with AIDS.

Donna Felsenstein and her colleagues at Massachusetts General Hospital in Boston looked at four recent cases of neurosyphilis in men with antibodies to HIV — the AIDS-causing human immunodeficiency virus. Two of the men developed the advanced form of syphilis despite having been treated with standard doses of penicillin. In the other two, syphilis was not discovered until it had reached the neurosyphilitic stage; the researchers subsequently determined that the disease had progressed to that stage much more rapidly than usual. In one case, within four months of his first exposure to syphilis, an AIDS-exposed man developed a form of neurosyphilis that normally takes five to 12 years to develop.

The precise mechanism by which AIDS may accelerate the course of syphilis remains unclear, but AIDS is known to impair the body's two major defenses against treponemal infection — spirochete-eating macrophages and antibody-producing B cells. In addition, the authors hypothesize, HIV-induced inflammation of the meninges surrounding the spine may facilitate treponemal penetration into the central nervous system, while antibiotics tend to remain in the blood. They suggest that for HIV-positive patients — and possibly for others — larger doses of penicillin, given over longer periods of time, may be necessary to get therapeutic levels of the antibiotic into the cerebrospinal fluid. Meanwhile, the debate goes on about the need for such augmented therapy in otherwise healthy patients, or in patients with non-AIDS immunodeficiencies caused by certain drugs or by chemotherapy.
— *R. Weiss*