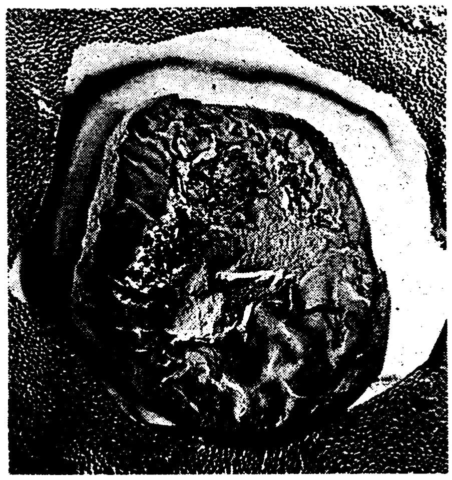

Harvey Bank, Oak Ridge

Cell frozen too rapidly turns into iceberg; cell frozen too slowly shrinks.

crystallize in their cytoplasm. Since then, the researchers have found that optimal freezing and warming temperatures vary depending on the kind of cell. The optimal temperature for yeast cells, for example, differs from that for bone marrow cells from mice, or for that for red blood cells from humans and cows. Harvey Bank, a graduate student on their team, has come up with conclusive visual proof that optimal cooling and warming temperatures are required for cell survival by cleaving cells that have been exposed to different temperatures and observing them with an electron microscope.

In recent months the Oak Ridge cryobiologists have also discovered that the membranes of cells are particularly vulnerable to too much cold, and that protection of cells against the deleterious effects of freezing probably occurs at the membrane, rather than inside the cell. Before sperm and blood cells are frozen in banks, they are usually immersed in glycerol to keep them from dehydrating. Masur and his colleagues placed cells in glycerol for varying periods of time before freezing them. They found that the survival of these cells was independent of how long the cells were allowed to absorb glycerol. So they concluded that glycerol protects the cells at the membrane level, rather than by passing into the cells.

These and other findings, Masur told Science News, are but a beginning toward understanding the microscopic effects of different temperatures on different types of cells. "Such understanding," he asserts, "is essential before tissues and organs can be frozen and successfully revived."

As far as earth organisms contaminating other planets—Mars, say, when the Viking spacecraft lands there in 1976—Masur says it is possible but unlikely. "Microorganisms might be able to survive the cool temperatures at Mars' poles," he explains, "but not the intense solar radiation that penetrates Mars' thin atmosphere." Of course the possibility of each bacteria reaching Mars is remote in the first place, since Viking will be sterilized.

Cryobiologists generally find discussion of reviving bodies frozen at death distasteful, since such revival is far beyond the competence of present-day scientists. Masur contends, though, that bodies frozen by present methods would probably not be able to be resuscitated. They are frozen at one temperature rate, and organs require different freezing temperatures to survive. □

Upward and onward: NAL at 300 GeV

When the National Accelerator Laboratory was originally planned, it was designed to accelerate protons to a maximum energy of 200 billion electron-volts (200 GeV). While construction was under way at the Batavia, Ill., site, improvements in the design of magnets and the technology of power supply made possible an improvement of the design so that energies up to twice the original maximum could be contemplated without increasing the size or cost of the machine.

Early this year the accelerator was completed far enough to begin running. On March 1 it reached the original design energy of 200 GeV. Now it is beginning to fulfill the promise of the improved design. At 9:13 p.m. CDT July 16 the accelerator produced its first beam at 300 GeV amidst great rejoicing by the staff. It had been a weekend of thunderstorms that knocked out the laboratory's power several times, but at the critical moment all worked well. Engineers from the Commonwealth Edison Company were on hand to measure the drain that operation at 300 GeV put on the company's grid. The size of that effect may determine at what times of day and for how long operation at such high energy will be possible.

The physicists are now hastening to extract a 300-GeV beam from the accelerator itself and run it into a 30-inch bubble chamber in order to measure what happens when probes of this energy strike stationary protons in the hydrogen. With higher energy probes than anywhere else in the world (the nearest competitor is a 76-GeV machine at Serpukhov in Russia) the NAL physicists expect to be able to resolve finer details of the structure and interactions of subatomic particles and hope to come nearer to an understanding of the fundamental structure of matter. □

Interplantary gases in lunar UV photography

The lunar surface is a nearly ideal place for astronomical observations. So most astronomers have believed and a preliminary report issued last week on the Apollo 16 ultraviolet camera/spectrograph results confirms it. About 190 frames of ultraviolet film were exposed while the Apollo 16 astronauts were on the lunar surface (SN: 7/1/72, p. 12).

"One of the most important results so far," says George Carruthers, principal investigator for the camera at the Naval Research Laboratory, "is the first spectrographic identification of the 584-angstrom line of helium in interplanetary space." The helium-line intensity is about one percent of the Lyman-alpha-line intensity, confirming that helium is present in about the expected proportions in interplanetary gas—somewhere between six and eight percent. It is thought the helium is produced by the interaction of interstellar gas with the solar wind and solar ultraviolet radiation. Helium was also identified for the first time in the earth's upper atmosphere as were ionized oxygen and ionized nitrogen.

Ultraviolet photographs show the spectral lines of atomic oxygen at 1,305 and 1,356 angstroms in the earth's night glow. The diffuse ultraviolet glow due to atomic hydrogen in space was observed in all directions from the lunar surface at about one-fifth the minimum intensity seen previously from earth orbit.

"Further analysis of the camera results may also shed some light on the major source of oxygen in the earth's atmosphere," says Carruthers. Some scientists think this source is from photodissociation of water vapor by solar ultraviolet radiation rather than photosynthesis by green plants. The hydrogen in the geocorona is believed to be the result of the same process. The hydrogen escapes to the geocorona and eventually into space, while the heavier oxygen remains in the atmosphere. □