

Ceramic Beats Heat

➤ **ALTHOUGH** the United States is more than halfway through its moon program, the basic problem of heat is still not entirely solved. And Air Force scientists are still fighting back.

Their latest weapon is a new ceramic material that promises to be useful for both spacecraft and high speed airplanes. It has already withstood temperatures up to 4,500 degrees F., including one continuous 260-hour stint at 4,000 degrees, without measurable deterioration or erosion.

The white, translucent substance, called Zircolite, looks like milky glass. Three scientists at Wright-Patterson AFB in Ohio experimented for three years with a super-pure powder of zirconium oxide in order to produce a material with Zircolite's specifications.

Zircolite would be of no use as heat shielding on a Gemini or Apollo spaceship, since they build up so much heat when entering the atmosphere that any mere ceramic would simply evaporate. The manned spacecraft use ablative coatings, which consume heat by boiling off as a variety of gases.

However, the moon flight might end up carrying some Zircolite anyway, in the form of rocket nozzle linings. The USAF will also need such materials in its missiles as they fly higher and go faster. The ceramic could be used on the other end of the missile too as a nose cone.

The problem in developing Zircolite was in manufacturing it. The material

was known, but tiny variations in processing had major effects on performance. The current procedure is to press the powder into shape at room temperature, then fire it briefly at 2,600 degrees F. in a special oxidizing furnace. Further improvements could come from increased purity of the raw powder.

All of the cubes, rectangles, cylinders, flat circles and rings produced so far have been less than two inches across.

• *Science News*, 90:39 July 16, 1966

SPACE

Moon-Scraper May Sample Lunar Surface

➤ **A SPINNING** abrasive wheel may be grinding away at the moon in a year or two, sending little bits and pieces of "lunar sawdust" flying up into an automatic chemistry laboratory for analysis.

The device may even compete with another gadget already scheduled to go on several Surveyor soft-landing flights: a long, thin tube that will thrust itself down into the lunar "soil" and then withdraw filled with samples of the material below.

Loose rocks and chips would just be knocked out of the way by the wheel, which would then grind a little of the underlying solid surface into dust particles of a measured size.

Supporting the project is the Jet Pro-

pulsion Laboratory in Pasadena, Calif., guiding light of the Surveyor program. Advance information about the material of the moon could be vitally important for astronauts landing there, and JPL is trying to cover all the ways of obtaining it.

The National Research Corporation, Cambridge, Mass., is studying the merits of the abrasive wheel, and is expected to make its report to JPL in a few months. The technique would not be limited to the moon, the company says, but would also be applicable to interplanetary probes.

In addition to the moon and planets, space probes to asteroids and even comets have been suggested. On some of these objects, a wheel that would grind off a bit of the surface might require considerably less power than a tube that had to bore downward for some distance.

The actual analysis of lunar or planetary minerals would be done by a device called a mass spectrometer, which would vaporize the sample, then shine light through it. The spectrum of the vapor would be radioed to earth, where scientists could use it to tell what materials were present.

• *Science News*, 90:39 July 16, 1966

ASTROPHYSICS

Lightning Seen Cause Of Puzzling Chondrules

➤ **LIGHTNING** flashes in the huge cloud of primeval dust and gas from which the planets in the solar system condensed may have caused formation of the puzzling objects known as chondrules.

This suggestion was made by Dr. Fred L. Whipple, director of the Smithsonian Institution's Astrophysical Observatory, Cambridge, Mass. Chondrules are the tiny, rounded granules about the size of poppy seeds found in stony meteorites.

Many theories have previously been suggested concerning the origin of these strange objects, but none of them completely satisfied all experts in the field. The newest one is Dr. Whipple's—dry lightning flashes could have been the source of the fast heating that, followed by quick cooling, is required to explain the glassy structure of chondrules.

He said that the turbulent motions in the primeval dust cloud were "ideal for the production of lightning." Water is not essential to lightning, as evidenced by its occurrence now on earth in the "dust devils" of dry arid regions and in flour mills.

Dr. Whipple also pointed out that lightning could provide the energy necessary to form complex carbon compounds in asteroidal bodies. He called for "much research, theoretical, observational and experimental" to evaluate the lightning hypothesis.

Details of Dr. Whipple's theory are reported in *Science* 153:56, 1966.

• *Science News*, 90:39 July 16, 1966



Sikorsky

BIRDS OF A FEATHER—One helicopter rescues another as a U.S. Army Skycrane retrieves a victim of enemy fire in Viet Nam. Built by Sikorsky, Stamford, Conn., the Skycrane may be the strongest helicopter for its weight in the world. It weighs 17,240 pounds, but can lift more than 20,000 pounds, equivalent to a 170-pound man lifting 200-pound barbells.