

parent when volcanic debris was charted in wide areas on the floor of the eastern Mediterranean, first by a Swedish oceanographic expedition in 1947-48, then in the mid-1960s by the Vela, vessel of the Lamont Geological Observatory of Columbia University. In 1966 seismic and magnetic profiles were made of areas surrounding Thera from the Woods Hole Oceanographic Institution ship Chain.



Boston Museum of Fine Arts

Excavators uncover Minoan ruins.

From these oceanic probes and archaeological excavations, scientists have pieced together part of the story of the Thera eruption.

There may have been a cluster of active volcano cones on what was then called Santorin, in about 1500 B.C.—as many as a dozen, says James W. Mavor Jr., geologist at Woods Hole who recently returned from a summer's excavation at Thera. These cones erupted at different intervals of time and in different places, he says, drawing his conclusions from the various layers of tephra and pumice found throughout the island, sometimes as deep as 140 feet. The entire volcano finally erupted with a roar that may have been heard as far away as Scandinavia. It exploded and collapsed, part of it sinking into the winedark sea, leaving a 1,300-foot-deep lake or caldera about eight miles in diameter, around which stand three jagged islands today—Thera, Therasia and Aspronisi. The volume of ash, lava, gas and dust expelled by Santorin has been estimated to be five times that of Krakatoa, perhaps the most devastating volcano eruption in history. Krakatoa blew up in 1883, destroying nearly 300 Indonesian towns and killing some 36,000 people.

The Santorin eruption, by filling the atmosphere with dust and gas, may have changed the climate drastically, making agriculture almost impossible. One of the cities at Troy was abandoned about that time, as well as highly developed cities of Harappa and Mohenjo-Daro in the Indus Valley of India. More precise dating is still needed. The Greek Government, under the Archaeological Society of Athens directed by Dr. Spyridon Marinatos, is undertaking a 10-year program for further exploration.

Scientists already seem convinced that the sunken Santorin is the famed Lost Atlantis which Plato described in his Dialogues, "Critias" and "Timaeus." Plato took his material from Egyptian records that had been made from the words of Solon, a Greek poet who had visited Egypt in exile some 200 years before Plato. Plato described the circular island as having three naturally formed rings of harbors. Recent oceanographic probes indicate a suggestion of these inner harbors at Thera. For some obscure reason, Plato calculated dimensions of Atlantis too large to be located in the Mediterranean—so he assumed the land must have sunk beyond the "Gates of Hercules" or Gibraltar in the "Ocean Stream." By reducing Plato's dimensions of the city by a factor of 10, scientists found Atlantis would fit in the hole left by Santorin. Other parts of Plato's text confirm that the island was located in the eastern Mediterranean. ♦

SPARROWS AND EAGLES

Airlines: a Massive Le Mans

The most prestigious auto race in the world is the 24-hour French marathon known as Le Mans. It is open to big cars and small, and the top speeds of the big machines that always win are often twice those of the cars in the smallest classes. Yet for years there have been those among the world's ranking drivers who have steadfastly refused to race at Le Mans, and even those who race and win hate the event and call it a death trap.

They object to the very diversity that gives the race its color. Hurtling at 190 miles per hour down a straight-away dotted with other cars moseying along at half that speed is insanity, the holdouts declare.

A similar problem exists in the air, where 600-mph jetliners share the sky with spidery, single-seat prop jobs and other miscellaneous craft that outnumber the big birds almost 50 to one. Of course there are regulations, designed to protect the sparrows and the

eagles from each other, but every now and then they get together, and then the regulations are not always enough.

On July 19, an eagle and a sparrow came together and killed 82 persons. That one of them was U.S. Navy Secretary-designate John T. McNaughton may or may not have triggered the resulting furor, but within five days after the Piedmont Airlines 727 jet collided with a private, twin-engine light plane near Hendersonville, N.C., House investigators last week were prying into the whole story of in-flight collisions.

And a frightening story it is. July 19 was a bright, sunny day over western North Carolina, yet the accident occurred. Radio transmissions from the smaller aircraft indicated that the pilot thought he was heading northwest of the field just before the crash, yet the collision took place southeast of the airport (one report said the plane was "12 miles from where it should have been"). Since there was no radar—only 113 of the 547 U.S. airports used by the airlines have radar to keep track of the spacing between aircraft—regulations called for controllers to keep at least three miles laterally or 1,000 feet vertically between planes, yet both were cleared to or above 6,000 feet. The crash occurred 6,132 feet above sea level.

The piles of statistics describing sky traffic, all point in the same inescapable fact: the airways are fast becoming as crowded as the highways, and something will have to be done. Not only are four out of five airline-used airports without radar, but more than half of them don't even have control towers.

In addition, the sparrows are having a population explosion. In 1956, there were 62,886 private, corporate and other aircraft registered in the U.S. under general aviation, plus 1,802 commercial airliners; a decade later there were 107,085 general aviation craft and 2,379 on commercial lines. In other words, the sparrows multiplied by 70 percent while the eagles increased by almost a third.

The chances of getting in one another's way are bound to increase almost as rapidly unless somebody moves to untangle the mess. One approach is an electronic device called a collision avoidance system, which would automatically tell the pilots of approaching aircraft to go up, down, right or left. Unfortunately, such systems would be expensive—possibly up to \$50,000 per plane—and probably too big and heavy for use in lightplanes. The airlines' national organization, the Air Transport Association, has been concerned enough about collisions and near misses between airliners that last January it formed a task force of half

a dozen avionics manufacturers to crash-produce a design for a collision avoidance system.

The team recently came up with a results and for lack of competition it could conceivably get somewhere toward production. But it is, as predicted, complex—each plane must carry a precision atomic clock, expensive and bulky. And even if it advances without a hitch, the system will probably not see use until 1971, by which time the traffic problem will have gotten much worse. So the sparrows are still out in the cold.

In the next five years or so, however, the coming of several new superplanes could give the eagles problems right up there with the sparrows. The ATA's collision avoidance system, for example, would give a 60-second warning to planes approaching too near to one another. But the supersonic transport will travel 30 miles in that time. Thus, the FAA plans to give the SST its own routes, and has already decided that SST's on similar routes should always be going in the same direction at the same time (SN: 4/8).

But just imagine what will happen when the gigantic barnliners—the Boeing 747 and the Lockheed L-500—come along. The harrowing possibility is a headline says, 500 DIE IN MIDAIR COLLISION. ♦

ACCELERATORS PROLIFERATE

The Japanese Join In

The world's largest particle accelerator, the machine that goads protons to energies of 33 billion electron volts at Brookhaven National Laboratory, will soon be surpassed by a 70 Bev instrument at Serpukhov that the Russians hope will send its first experimental beam no later than Oct. 1.

Also in the works is the much-debated 200 Bev accelerator planned for Weston, Ill., and a 300 Bev machine to be built by a group of European countries organized along the lines of CERN, the European Council for Nuclear Research, which already operates the world's second most powerful accelerator, 28 Bev.

Now the Japanese Government has approved construction of a 40 Bev machine, also an alternating gradient synchrotron for protons, and is in the process of site selection. This energy level was selected, apparently, because it is higher than the 33 Bev Brookhaven machine, and because financial, as well as space restrictions made it impossible to build a machine besting the 70 Bev in energy.

Japan's current draft budget calls for

\$1.39 million for design studies, picking a location and building models of the proposed 40 Bev machine. The total cost is expected to run to \$80 million with an operating cost of some \$14 million a year.

The Japanese accelerator will be 404 meters (a quarter-mile) in diameter, with the particle beam confined by 128 magnets whose exact shape is now being designed.

About 10 locations are being investigated.

Meanwhile, as Britain deliberates its association with CERN on the 300 Bev (see page 137), the U.S. 200 Bev is nearing another crisis.

The refusal of the Illinois legislature this year to enact open housing legislation has endangered the location of the giant machine at Weston, the site selected by the Atomic Energy Commission.

Senator John O. Pastore (D-R.I.), chairman of the Joint Congressional Committee on Atomic Energy, was defeated both by the Committee and by the Senate in his effort to have the \$7.3 million design and engineering money for the 200 Bev deleted from the AEC authorization (SN: 7/15).

But because of the increasing importance of civil rights questions in the

nation and the continued tight budgets imposed by the war in Vietnam, the question will continue to come up. The handwriting may already be on the wall; science is losing some of its partisans.

Sen. Pastore called the 200 Bev "an educational gadget for the physicists" and The New York Times said, editorially, the accelerator is an "interesting but unnecessary scientific luxury" when the nation "is engaged in a bloody war in Vietnam; the streets of its cities are swept by riots borne of anger over racial and economic inequities; millions of Americans lack proper housing, adequate medical care and essential educational opportunity."

It was in the shadow of these shifts that the House of Representatives opened the debate last week, and approved appropriation of the funds to do the engineering and design on the 200 Bev allowed in the authorization bill. Without the funds, the authorization is meaningless. And even though the appropriation survived the objections of civil rights advocates—backed by proponents of sites in other states in the House—Sen. Pastore has every intention of reopening the question when the appropriation comes before the Senate this week. ♦



Villain and victims—a brown rat surveys baby chicks he has killed.

RATS

After 50 Million Years, a Respite for Rodents

Rats had been around this world for about 50 million years when what were to be men first swung down from the trees.

Since then, both rats and men have

flourished—the rats mostly at man's expense—until today there are roughly 3.3 billion of each. Of those, around 200 million people and 90 million rats live in the United States. Each Ameri-