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-

can rat, it has been estimated, does about $10 worth of damage a year.

To combat this $900 million a year pest, the Johnson Administration proposed and the House of Representatives took up—and disposed of—what was to have become the Rat Extermination Act of 1967, a $40 million, two-year grant program to aid cities in getting rid of their rats.

The bill never saw the light of day. A resolution to debate it on the House floor was defeated 207 to 176. President Johnson observed that Congress was doing more to protect cattle than to protect American children.

An almost identical measure, contained in a Senate housing bill, is awaiting action by a subcommittee.

The wily little animals the bills are aimed at have been man's deadly enemies ever since they found out that cities contain easily accessible food supplies. In India, where there are 10 times as many rats as people, they are blamed for the loss of 3 million to 5 million tons of food a year—enough to feed every hungry Indian with plenty left over.

Rats have been likened to man in their incredible adaptability to new situations. Over 50 million years, this single trait has probably been their secret of survival and success.

Still gnawing after 50 million years.

The long-tailed rodents, for example, are especially wary of any new form of food. They will not hesitate to foul any suspected form of bait, World Health Organization experts say, to warn other rats to ignore it.

They are also wary animals that normally stay as far as possible from man himself while consuming his food. When driven to it, however, they will not hesitate to attack an animal of any size. There are reports of rats gnawing the feet of living elephants and attacking sick persons who are too weak to beat them off.

While average life expectancy of city rats is a mere six months, their rate of reproduction insures against any diminution of a colony. It has been calculated that one pair of rats, given ideal conditions, could produce 20 million descendants in three years if all the females had three litters a year—by no means difficult for a rat. A cared-for and cultivated rat can live three to five years.

Just about every known way of killing rats has been tried, from throwing rocks to electrocution, but the best way of eradicating them is the oldest—protect food supplies and feed the rats poison.

The best of the rat control techniques apparently still goes back to the time of the Pharaohs, from whose domain rats may first have invaded the Western World.

This best and ancient anti-rat weapon is a poison known as red squill that has been used since 1500 B.C. Squill is the powdered inner bulb of the Mediterranean squill plant.

Rats love it when mixed with hamburger and it can rapidly decimate a colony, according to the Wildlife Bureau. It is also safe, they say, because any other animal that eats it will vomit and just get sick for a while. Rats can't vomit and so retain a full dose of squill, dying in short order.

Anti-coagulant poisons that kill the rat in a week's time from internal bleeding are also used and are safe, but strains of resistant rats are apparently developing in England, according to the World Health Organization. ◈

MICROSCOPY

A New View of the Brain Cell

Packed into the human skull are 10 billion nerve cells with up to 50,000 intercellular links apiece, lying in layers of tissues so thin and translucent that light passes through without producing contrast. Under the conventional microscope, gray matter looks just like gray matter.

So to see cells, scientists stain brain tissue in a rainbow of colors—blue, green, red, yellow, silver—each dye chosen to reveal a particular structure.

Then, under a powerful microscope, the brain cell emerges in all its enormous complexity.

The trouble is that neuroanatomists are rarely able to verify their laboratory findings in the living, working brain. Most stains poison living cells and the few that don't offer little information.

Even with a stain, microscopic probes of living tissue get lost in the thick complexity of layers upon layers of brain material and electron microscopes, which require a high vacuum, are unsuitable for studying living tissue. That leaves the old light microscope with its paltry magnification powers—about 1,500 times compared to a quarter of a million—as the only clear hope for studying the natural brain cell.

Now a Yale University electrophysiologist reports a new light microscope that could offer scientists their first good look at the unstained working nerve cells.

The instrument, however, currently lacks an adequate light source. But Dr. M. David Egger, who with Czechozlovakian scientist Mojmír Petráń, head of the Institute of Biophysics in Plzeň, is developing the microscope, says he is confident they will find a light powerful enough to illuminate the tissue.

At the moment Dr. Egger is using the sun as a light source while he looks at an exposed section of the salamander brain. But the sun is too undependable, says Dr. Egger, and so far he has been unable to see anything spectacular, though he can observe the tiny cells.

Dr. Egger says, however, that the main problem has already been solved. It was to design a microscope that would zero in and focus on a single plane, avoiding all confusing reflections from underlying tissue layers.

The Egger-Petráń instrument does this with a rotating copper-foil disk that cuts out all but .001 percent of the light entering the microscope—thus the need for an extraordinarily strong light.

Once the light problem is solved, says Dr. Egger, he plans to attach a needle-like glass cone. The cone, about two to five millimeters long, could be inserted directly into the brain, through an aperture in the skull, and by bringing the microscope's objective right down to the top of the cone, Dr. Egger hopes to see into the enclosed brain.

If the new instrument does indeed reveal the tiny nerve endings, called dendrites and axons, it would help to answer a question central to neurology: are the links between brain cells fixed and permanent, or are they in a constant state of change?

The answer would bear major im-