weakening of gravity. He told the meeting of the American Geophysical Union in Washington this week that the evidence comes from a study of the motions of the moon.

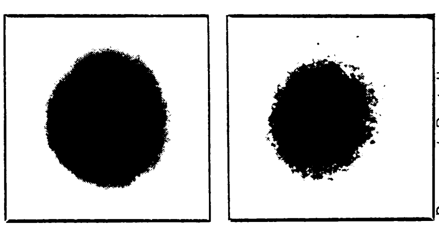
If gravity is weakening, the orbits of planets around the sun or of satellites around planets will expand, and the orbital period of these bodies will correspondingly increase. Some such expansion is provided by tidal forces in these systems, and the trick is to subtract out the tidal part and see if there is any left over.

Working with the calculations of two other observers, Van Flandern reports he has found there is an increase of four centimeters a year in the radius of the moon's orbit that is not accounted for by tidal action. "This is the first numerical result which appears to have as its most probable explanation that gravity is decreasing."

The amount of the decrease is about one part in ten billion per year. This leads to an increase in the lunar month (moon's orbital period) of about one two-thousandth of a second per year. It also means that a person weighing 70 kilograms would lose about seven millionths of a gram per year.

If Van Flandern is correct, the shock waves will reverberate, not only through cosmology but through all of physical science. Surely now there will be a number of observers poring over the orbital data of bodies in the solar system trying to confirm or reject Van Flandern's results. □

Photographing the insides of atoms



Ritz and Bartell

Neon, argon atoms at 500 million X.

Over the past century atomic physicists have built up a sophisticated theory of the structure of atoms based on indirect evidence, largely the light and X-rays the atoms emit. X-ray crystallography gave direct evidence for the existence of atoms, and in recent years electron microscopy has gotten overall images of single atoms (SN: 5/30/70, p. 524).

Now it is possible to look inside atoms, so to speak, to make images of the electron distribution within them. The apparatus that does it is a two-stage instrument at the University of Michigan in Ann Arbor that uses electron-microscopic techniques together with holography. It was designed by C. L. Ritz and L. S. Bartell. The achievement was reported at a symposium on molecular structure in Austin, Texas, in March.

They have obtained pictures of neon and argon atoms taken under conditions that show the electron distribution in the L shell (the second shell out from the nucleus) enlarged 500 million times. (Since the electrons are always in rapid motion, the distribution shows as a kind of haze.)

Already visual evidence of one piece of atomic-structure theory appears: Argon's L shell is only half the diameter of neon's. Theory expects this because the electric charge of the argon nucleus is twice as large as neon's. More such visual confirmations are likely to follow.

The idea for their apparatus goes back to a two-decade-old suggestion by Dennis Gabor, who won the 1971 Nobel prize in physics for the theory of holography. Gabor suggested using electron waves (electrons, like all physical particles, also behave as waves) to make a hologram of the electron distribution in an atom and then use optical techniques to make an enlargement of the holographic image.

To build the microscope Ritz and Bartell had to solve a serious problem in the making of an electron hologram, the provision of a reference beam. In making a hologram a train of waves that has been reflected from the object to be recorded is combined with a reference beam that has not been so reflected. The combination produces an interference pattern, which is recorded on film. If light is then later shone on this film it will reconstruct an image of the object.

But the reflected beam and the reference beam must be coherent—vibrate at all times in phase with each other. In the optical domain it took the invention of lasers with their extremely powerful coherent beams to make holography possible. How to provide an electron-reference beam in a world that lacks electron-wave lasers? Gabor didn't suggest.

But as they thought about the problem, it occurred to Ritz and Bartell that where pictures of an atom's electron distribution were wanted, the solution might be quite simple: In such a case an electron beam directed at an atom is multiply reflected. The electrons provide a weak reflection. A strong reflection comes off the nucleus of the atom. Why not use the reflection from the nucleus as the reference wave? Since it came from the same beam as the reflections from the electrons the necessity of coherence would be satisfied. They tried it and it worked. □

Conservation: Tigers or habitats?

Like so many paramedics evading battlefield crossfire to save the wounded, conservationists are learning the painful art of triage—how to rescue the salvageable while leaving the doomed to die. The process was dramatized last week as leaders of the World Wildlife Fund (WWF) confronted biologists from around the country in a meeting jointly sponsored with the Smithsonian Institution to assess the state of the conservation movement and to identify the crisis it is likely to face in the years ahead.

The challenge seems overwhelming. Speaker after speaker chronicled the demise of yet another species or habitat and spoke of "homogenization" of vast tropical jungles as an imminent event. In Indonesian Borneo, a new policy may allow lumber companies to cut practically all the trees below an elevation of 1,500 feet. "Slash and burn" agriculture follows the progress of trans-Amazonian highways, replacing virgin forest with crops until the fragile soil gives out in roughly three years, when useless scrub takes over. Japanese fishermen appear intent on driving various whale species into extinction, in a last desperate effort to find profit in an already dying business.

Against this global challenge stands a motley array of private and public ad hoc projects, funded at one end by less than $20 million from various United Nations programs, and at the other by groups such as WWF, which last year had only about $400,000 to devote to research. The meeting focused on how to use such limited funds more effectively in levering governments and industries into cooperation.

The lively debate, which took place in the secluded setting of a pre-Revolutionary estate owned by the Smithsonian Institution in Belmont, Md., divided roughly into two arguments: whether WWF and its sister organizations should jump into immediate action, purchasing land preserves and directly sponsoring the salvation of endangered species, or whether they should concentrate on conducting studies of problem areas and training professionals to handle the specific problems involved.

Championing the need for a new breed of conservation professionals is Yale professor F. Herbert Bormann, who likens the struggle to a military campaign. "The British Empire started at Sandhurst," he declares, and proposes foundation of a similar, practical-oriented institution for training conservation warriors.

No time for that, replies Daniel H. Janzen, a zoologist at the University of Michigan. If animal and plant species are to be saved, large tracts of land must immediately be set aside, and with its limited funds, about all the WWF can do is act as a broker for rich persons and corporations who would invest in the areas as art patrons invest in a Van Gogh. Practically speaking, "you could knock out all the jaguars in the Amazon and not affect anything," Janzen says, and the only way to save them is to save their environment for basically aesthetic reasons.

The wildlife fund is considering sponsoring demonstration sites where endangered species could be preserved and studied, with the data produced going to help save other species. But such projects have already been carried out, and the worldwide count of field research stations is steadily shrinking, with most of the knowledge they generated resting peacefully in scholarly journals. One speaker told how one research project he knew of had been duplicated almost a dozen times, for lack of communication and coordination, and another speaker pointed out that government and industry were unlikely to listen to any data that did not have immediate economic importance.

At the heart of the problem is an inability of conservationists and decision makers to speak the same language, observes Lee M. Talbot of the President's Council on Environmental Quality. And the "alleged" interdisciplinary conservation programs touted by many schools have, in reality, done little to prepare leaders or even restructure the university's own vested interest in research. Better to have a "floating faculty," he suggests, which could visit several institutions and set up programs, particularly in developing countries where the education system might be more amenable to such innovation.

After years of struggle, some lessons, at least, have been learned. Conservationist attitudes are shifting from a species-by-species approach ("Save the tiger") to the larger issues of habitat protection ("Save the Amazon"). The realization has grown that prevention of endangerment is more practical than crisis response and that habitats are more likely to be salvageable before business interests take notice of them. Still, with growth and development the bywords of the age, a conservation ethic is basically subversive. As self-styled devil's advocate Janzen puts it, the leverage of organizations like WWF comes by commanding a moral force all out of proportion to their numbers and economic power, as they forge government and industry policy through a kind of "political subterfuge." On that, Bormann agrees: "Conservation is not just building fences around pieces of land, it is a matter of attitudes—of man's relationship with nature." □

Salt, a cause of hypertension

For years, the origins of hypertension (high blood pressure) have been obscured by a maze of conflicting data and interrelated causes. Now some order is emerging out of the chaos, with common table salt appearing as the commonest single dietary culprit. Though low-salt diets have been common for some time in the *treatment* of hypertension, little has been known about what role sodium in the salt might play in *causing* hypertension. Recent studies, though not revealing a mechanism for the action, strongly indicate a cause-and-effect relationship between salt consumption and development of high blood pressure. They offer, for the first time, a hope of reducing the incidence of hypertension through dietary control.

One of the leaders in the studies is Lewis K. Dahl, chief of staff of the Medical Research Center Hospital at Brookhaven National Laboratory. In an invited lecture last week at Georgetown University Medical School he summarized the results of current research. According to Dahl, the key to understanding the role of salt in causing hypertension lies in its ability to trigger an inherited defect. Persons free from this defect can apparently eat large quantities of salt without developing hypertension; those who have the defect suffer increased blood pressure while eating only a little salt. Between the two extremes lies a broad spectrum of susceptibility, where the amount of salt a person eats can play an important role in how soon he develops hypertension. As yet there is no way of clinically testing for susceptibility.

Results of both laboratory and cultural dietary studies have led to the conclusion that salt can act as a trigger for hypertension. White Americans eat about 10 grams of salt a day and have about a 10 percent incidence of hypertension. Black Americans eat twice as much salt and have about twice the incidence of hypertension. Eskimos, who eat only 4 grams of salt a day have virtually no hypertension, while people in northern Japan consume 26 grams a day and have a 40 percent chance of getting high blood pressure.

Genetic susceptibility to hypertension has been studied in rats, which were interbred for either tolerance to salt or for resistance. While the genetic factor has still not been isolated, the susceptibility to salt-induced hypertension has been demonstrated dramatically. As dietary salt was increased for the two groups, the resistant strain of rats showed almost negligible effect, while the susceptible strain quickly developed hypertension, with most of them dying before the experiment could be completed.

The rats were found to be particularly susceptible to salt exposure early in life. When baby rats were fed on human baby food, for example, many quickly developed high blood pressure. Dahl blames this effect on salt that is unnecessarily added to baby food to please mothers' tastes.

Other environmental factors, besides salt, may also trigger the inherited weakness, which is thought to involve some genetically transmitted kidney malfunction. Whatever the trigger, Dahl stresses that the physiological mechanism producing high blood pressure always seems to be the same. An individual developing hypertension from one cause would probably have developed it later from another.

Other experts agree. They hope disclosure of the role salt plays in causing hypertension may lead to basic dietary changes. "This has opened the doors for the first time on how to prevent hypertension," says Georgetown cardiology professor Frank Finnerty.

Some baby food manufacturers are already beginning to remove extra salt from their products, but James Scala, director of nutrition for the T. J. Lipton Co., warns of consumer resistance. When his company tried reducing the salt content of some of its products "they went over like a lead balloon," though consumers apparently could not detect the difference in other products.

SCIENCE NEWS asked Dahl what rule of thumb the average person, not already suffering from hypertension, might follow in his intake of salt. He replied that if a family history of high blood pressure exists, intake should be limited to around two grams a day; otherwise, to five. (Minimum standards have not been set, but are certainly less than one gram a day). The average person may have trouble attaining these reductions, however, since almost all processed foods, except for fruits and juices, have salt added to them. □