

environment

The real mileage thief

The need for emission control systems on automobiles is obvious from an ecological standpoint, but car owners frequently complain that the devices reduce gas mileage. Late-model cars, equipped with the anti-pollution systems, the argument goes, get poorer mileage than pre-1968 vehicles without such equipment.

Now the Environmental Protection Agency reports that although emission control systems do reduce mileage, they are not the chief culprit. Fuel economy data from 2,000 cars show that pollution control systems reduce fuel economy (in miles per gallon) by only 7 percent. Air conditioning, in contrast, reduces mileage by about 9 percent on the average, and by as much as 20 percent on a hot day in urban traffic. The loss due to automatic transmission is about 6 percent. Another major factor is the weight of the car. Over the years, vehicles—even new versions of the same model—have become heavier. The EPA study shows that a change of only 500 pounds (for example, from 3,000 to 3,500 pounds) can lower mileage from 16.2 miles per gallon to 14.0 miles per gallon—a decrease of 14 percent.

Southwest energy study

Last week the Department of the Interior announced completion of what it calls the first intensive regional energy study—a survey of energy needs, potential energy sources and environmental effects in a seven-state area of the Southwest. The results are not encouraging.

The study found there will be 30,000-megawatt increase in Southwest energy consumption by 1980 and that coal-fired steam electric generation in the Colorado River Basin will have to fill at least one-fourth of the need. Though there are sufficient deposits of coal, the needed volume of cooling water from the Colorado River can be supplied only at the expense of other future uses. Furthermore, existing plants lack equipment for control of sulfur dioxide emission and will probably exceed Federal standards. Particulate emissions at the Four Corners Plant already exceed Government standards and significant quantities of trace pollutants such as lead, mercury and cadmium are being emitted by other power plants. Attempts to revegetate reclaimed mined land have been unsuccessful.

A clear cut is better

There are two general approaches to harvesting timber: Selecting only those individual trees desired, or clear-cutting—removal of all timber from an area.

Where the selective method is used, regeneration of the forest comes slowly because growing conditions in the shade of existing trees are poor. On the other hand, two ecologists at the Pennsylvania State University, Russell J. Hutnik and Gene W. Wood, have found that after clear-cutting oak forests recover rapidly. Within three years plant production can be up to half that of undisturbed stands of trees.

The rapid recovery is possible because removal of large trees increases soil water available to new plants, breakdown of logging litter produces nutrients, and the large root systems of stumps that are left gather nutrients and water to support growth of new sprouts from the old stump.

physical sciences

Einstein-Brans-Dicke controversy

Two rival theories of gravitation attract the attention of astrophysicists: one by Albert Einstein and the other by Carl H. Brans of Loyola University and Robert F. Dicke of Princeton University. The difficulty in deciding between them observationally is that in most of the effects predicted by both theories the difference is less than six percent, and observations of sufficient accuracy to make a distinction have not been possible because of instrumental difficulties.

Now one of slightly less than six percent distinction has been done with the radio interferometer at Westerbork in the Netherlands. It concerns the gravitational bending of beams of electromagnetic radiation by the gravity of a heavy body. It involves the bending of the radio signal from the quasar 3C 279 as the sun passed in front of it on Oct. 8.

The Westerbork array has 12 telescopes. Six of them were connected to form two separate interferometers with the same baseline. The two interferometers were continuously switched back and forth: One observed 3C 279 while the other made a calibration measurement.

The most recent measurement as reported by Kurt H. Weiler comes to 1.01 plus or minus .05 of the Einstein prediction. Thus, he says, the "black shroud" of disbelief begins to cast doubt on the Brans-Dicke side.

X-rays from another radio pulsar

Of the 89 known radio pulsars only one up to now, the Crab nebula pulsar, also gave X-ray pulses. (There are a number of so-called X-ray pulsars, but these do not show up as radio pulsars.) Now the pulsar in the supernova remnant in the constellation Vela becomes the second. Paul Gorenstein of American Science and Engineering Inc. in Cambridge, Mass., reports that a sounding rocket observed X-ray pulses from the Vela object at the pulsar period of 89 milliseconds. The X-ray pulse is one-third of a period out of phase with the radio one, so the Vela pulsar can be said to have a radio main pulse and an X-ray interpulse.

The discovery gives an interesting piece of information about pulsar evolution: The brightness ratio of the Vela to the Crab is one to one thousand in the optical part of the spectrum and one to two in the X-ray. In the evolution characterized by the change in period from 33 milliseconds (Crab) to 89 milliseconds (Vela) light suffers more than X-ray.

The moon as gravity-wave antenna

For several years Joseph Weber of the University of Maryland has talked of using the moon as an antenna for detecting gravitational radiation. Apollo 17 gave him the chance. A gravimeter he designed, which would, among other things, detect quadrupole vibrations of the moon due to gravity waves, was set up by the Apollo 17 astronauts.

It was the most complex device ever flown to the moon. Unfortunately it didn't survive intact. Apparently a supportive wire broke in transit, and this makes it operate at 1-second vibrational periods but not at the 20-second period originally planned. The installation, however, is giving data. It was able to detect the astronauts walking nearby.