Briefly. . .

Clouds under a microscope

When you look at a cloud, what does your mind's eye see — a gentle puff drifting across the sky, or a complex physical relationship between moisture content, ice, water droplet size, temperature, wind velocity, and turbulence? The latter is how cloud physics researchers in the Flight Research Laboratory view clouds, at least during working hours. For several years NRC, together with the Atmospheric Environment Service, has studied the properties of clouds with special attention to methods of making rain.

When and if researchers do develop reliable and environmentally safe methods of rain-making, two obvious areas of application would be drought-stricken areas and out-of-control forest fires. The NRC researchers have had some success to date at inducing rain and, at the same time, collected a wealth of data on clouds. In continuation of this program the NRC team has joined several American agencies for the last two summers at Miles City, Montana, in one of the most comprehensive programs yet launched to investigate clouds. NRC's contribution, besides personnel and expertise, is a Twin Otter aircraft equipped with sophisticated gear for measuring the various parameters in clouds.

Delayed leap

The Bureau International de L'Heure has announced that there will not be a "Leap Second" at the end of 1980. The decision not to inject this extra second into the time scale is based on a slight increase in the rate of the earth's rotation rate during June of last year. As a consequence, the astronomical time scale (based on the earth's rotation), differed by only 0.7 seconds from the atomic time scale, instead of the usual one second annual difference observed in the past few years. The atomic time scale, based on the microwave frequency of cesium-133, has an error of only three seconds per million years. As a consequence, the introduction of the leap second will be delayed until the end of March or June, 1981.

It has not yet been established what changes in the motion of the fluid part of the earth — the atmosphere, oceans, and fluid core — cause these small changes in the rotation rate of the earth's shell. If Canadian astronomers have it their way, the so-called Very Long Baseline Array of radio telescopes used to pinpoint radio sources in the heavens will be used to measure the rotation of the earth 100 times more accurately than current methods. It might then be possible to determine the causes of rotational change, and to better understand the physics of the earth, its weather, and earthquakes.

Gaseous old age

Research into the old age of stars is coming up with some surprises — the most recent being the discovery of a star that produces ammonia by NRC scientists using the 46 m telescope at the Algonquin Radio Observatory in Ontario's Algonquin Park. Unknown until just 10 years ago when it was detected with instruments sensitive to infrared radiation, star CW Leo has proved to be one of the brightest objects in the sky in this region of the spectrum. Thick clouds of gas and dust surround the star, making optical spectral analysis nearly impossible, but radio telescopes have probed through the obscuring mists to detect ammonia in the star's *immediate atmosphere*. Ammonia, however, proved to be but one of many complex molecules found in the star, which is also producing some of the family of cyanopolynes (HC_5N and HC_7N) discovered in interstellar space by scientists at the Herzberg Institute of Astrophysics several years ago.

Discovery of ammonia forming in a stellar atmosphere is another step in the ongoing investigation of the mechanics of stellar geriatrics (See *Science Dimension*, 1980# 2). NRC scientists M. Bell, S. Kwok and P. Feldman, the ammonia discoverers, stress the usefulness of their find in assessing the terminal condition of a star. Previously, it was believed that complex organic molecules could form only in deep space, well away from stellar radiation. The new NRC data shows that older stars which are cool enough can not only allow such molecules to form, but actually promote their creation by adding heavy atoms to their composition. What is more, the discovery of the ammonia molecule provides a yardstick for measuring temperatures of such stars and aids in calculating the amount of material they are ejecting into interstellar space.

Solar heating in industry

NRC's energy project office is currently contracting out projects to Canadian businesses aimed at evaluating the technology and cost effectiveness of solar water heating systems. A Montreal food processing firm, Gaza Products Inc., is one of the businesses taking part in this solar project. The objective in Gaza's case is to investigate the application of solar heating to the 16 000 to 18 000 L of hot water used daily in the food canning process. Even though steam is required to sterilize some of the canned foods, most of the water is at a temperature ranging from 45°C to 85°C, used mainly for washing and warming up purposes.

The total cost of the project for NRC is $128,664 of which $83,160 pays for the hardware. The installed solar system consists of 144 collector panels from Thermo Solar Inc. representing a combined area of 252 m^2. On final approval of the installation, Gaza will buy the solar system from the Crown at 10 per cent of the hardware cost. Monitoring of the system started this winter and will continue during the next five years.

The Gaza Solar Project, one of ten handed out to industries to date, is part of Phase III of the Solar Energy Project's Systems Trial. Phase III is concerned with the technical and economic evaluation of active solar systems for use in commercial process hot water applications.

In Phase I of this program, an evaluation of first-generation active solar systems was made for single-family dwellings. Monitoring began last winter for Phase II projects which involves active solar space and water heating for multi-family residences.