purification of the environment. However, the junction of two waterways of different characteristics and the presence of salty or brackish water in the estuary can promote the desorption of substances previously adsorbed on the surface of the sediments. Moreover, bacterial action in settling zones can biochemically transform previously inert pollutants, which then pass into the ecosystem's food chain. Further research must then be undertaken to determine the limitations of this self-purification mechanism.

In order to elucidate this question while still confining the subject to the limits of "Mission St. Lawrence", Dr. Soucy is currently studying the effect of salinity suspensions found in the middle estuary of the St. Lawrence. This section of the estuary was chosen because it represents a particularly fragile ecosystem, a zone where heavy mixing occurs between fresh and salt water. As a result, the relationship between biological and chemical equilibria is highly uncertain. The St. Lawrence estuary is characterized by an area of turbidity which is subject to cyclical variations in salt content.

There is no simple technique which would permit a representative sampling of such a vast estuary; the researchers use indirect methods and partial measures in order to follow a particular phenomenon. To study the quality of suspensions and examine their stability, samples are pumped to the surface and stored in polyethylene bottles, sometimes for a period of several days. It has been found that the greatest variations from the natural state stem from changes in temperature and turbulence, since suspensions tend toward a new equilibrium when subjected to a new milieu. Weight causes a sedimentation of suspensions, thus eliminating the heavier particles. To counteract this, the samples are shaken before being analyzed in the laboratory.

The researchers thus use three measuring techniques to obtain data: one, electron microscopy, makes it possible to visualize and photograph primary particles both individually and aggregated in masses. Another means of measurement, the Coulter meter, detects resistance variations in an electrical circuit when particles are forced through a small opening. In this way, 4,000 particles per second can be classified according to size or volume. Finally, scientists have developed a method of ultramicroscopy which uses an argon laser in continuous radiation at a maximum power of four to five watts. The laser passes beams of light through a cylindrical lens measuring 150 mm (6 in.) in diameter. As they exit, the beams are directed through an optical cell which contains the solution. A vertical microscope then receives the diffused light and an electronic trip camera follows the movement by photographing (on high speed film) the diffusion around each particle at fixed intervals. This technique eliminates the disturbances inherent in other measurement methods and makes it possible to count the particles directly while studying their motion as they disappear.

Using a laboratory model, researchers have developed a simulation of the process which occurs in nature. Both in the model and in the river, the distribution which occurs after three hours (a three-hour span equals a half-tide) is essentially the same as that which occurs after a two-day interval (the usual time for complete sedimentation to occur). In these experiments, scientists measure salinity, which is an important parameter in describing the behavior of suspensions. The variations in salt content found in the estuary can produce important and rapid transformations in the distribution of particles with respect to the amount of time the suspensions have been in the estuary.

Another of the 30-odd projects undertaken by CENTREAU is a study, under the direction of Professor Guy Rochon of the Photogrammetry Department at Laval University, which involves the analysis of telemetrical data taken by the first American teledetection satellite. ERTS-1 (Earth Resources Technology Satellite) offers a viable complement to sediment studies. The satellite detects and photographically charts the concentrations of solids in suspension in a body of water. Professor Rochon has devoted considerable effort to treating these ERTS-1 images numerically and interpreting the information they contain through the use of a computer.

The utilization of a teledetection satellite to quantify the earth's resources will soon increase in importance since ERTS-3 is due to be launched in 1977. This new facility will be able to photograph in the thermal infrared (making possible the detection of significant heat points). Its cameras will also be able to take high-resolution photographs; this should resolve the problem of cloud formations which often hamper photography. Moreover, ERTS-3 will be able to distinguish objects as small as 80 m (262 ft.) wide on the ground. For now, ERTS-1 furnishes data necessary to detect limnological changes (that is, changes dealing with living organisms, both plant and animal, in fresh water). The data obtained are also used to determine the presence of sediments in waterways, as well as other important hydrological characteristics.

Sediments can adversely affect the stability of the channel, harbor installations, industrial and urban water supply intakes, recreational areas and the development of riverbank real estate. For this reason, these research projects are closely linked to the protection and optimization of those benefits which we extract from water, one of Canada's most abundant and productive natural resources. Researchers within CENTREAU are helping to increase our knowledge of this vital sector of the environment. □

Diane Bisson

Mr. Jean-Louis Verrette of the Civil Engineering Department at Laval University, examines the dissemination cone on the sediment distribution apparatus attached to the estuary model.

M. Jean-Louis Verrette, du Département de génie civil de l'Université Laval, vérifie le cône de diffusion du distributeur de sédiments rattaché au modèle d'un estuaire.

Paul E. Lambert