

# A beginner's guide to an AES laboratory

The inorganic chemical analysis laboratory located on the fourth floor of the AES headquarters building, Downsview, is one of the service's major research laboratories both from the point of view of day-to-day analysis of chemical pollutants in the atmosphere and for special research projects. The main work of the 150 square metre laboratory for the past five years or so has been analyzing samples from the Canadian Air and Precipitation Monitoring Network (CAPMoN) with stations stretching all the way from Manitoba to the east coast. Alberta and British Columbia stations will be opened

in 1987. Work on this project is ongoing and a large proportion of the laboratory's equipment is used in some way for analyzing these atmospheric pollutants.

Special research projects involve the study of sulphur dioxide and oxides of nitrogen and how they are converted into sulphuric and nitric acids, the two acids that are primarily responsible for the acid rain problem.

A rapid tour of the laboratory might go like this:



The laboratory is relatively crowded with filters, tubes, computers, screens and other scientific equipment. Above the work bench is a typical cupboard storage area that contains jars filled with approximately 250 varieties of chemical reagents used in analysis programs. Chemical technician David Mactavish surveys the scene.



This is a general view of the main analysis area of the laboratory. The ion chromatograph used in the analysis of atmospheric particles takes up the major area of the centre right. Chemical technician Yen Art Tham sits in the operator's chair.



Co-op student, Peter Chang is seen loading filters obtained from the air portion of the CAPMoN network into an automatic sampler ready for the ion chromatograph.



Here is a more complete view of the ion chromatograph. The apparatus is in constant use carrying out analysis in the laboratory since it is able to determine major inorganic ions like sulphur in a solution.



Less frequently used is the Atomic Absorption spectrophotometer, designed for the measurement of trace metal concentrations in samples collected from the atmosphere. The cylinders supply the fuel for the flame that is used in the analyses of samples.



Peter Chang, takes readings on the frequently used Ph meter, to determine the acidity of solutions.



No inorganic chemistry laboratory would be complete without its wide array of glassware, from the lowly test tube to more sophisticated measuring vessels. The ancient pestle and mortar are still in use.



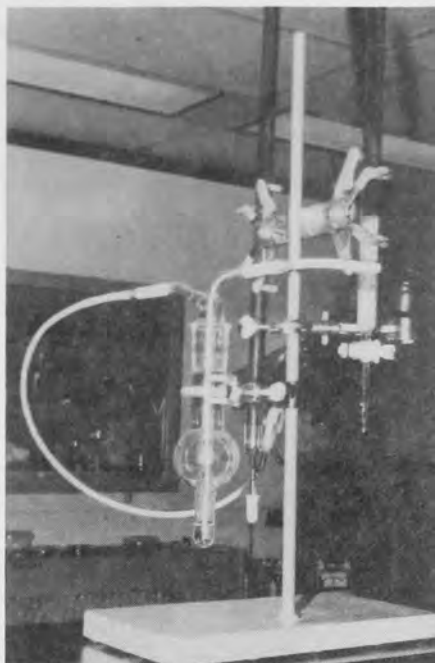
These are standard laboratory balances. The one on the right measures to the nearest ten thousandth of a gram; the one on the left to one tenth of a gram.



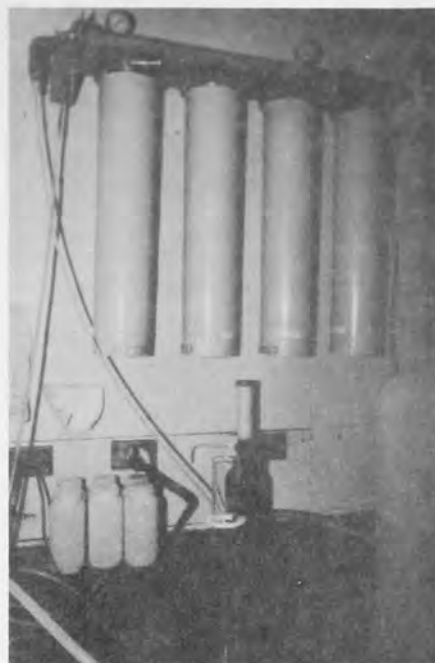
Yen Art Tham stands by the flow injection analysis system used for automatic analysis of pH levels. It is only used for measuring small volume samples.



Chemist Dr. Al Wiebe adjusts this inclined manometer, an instrument used to calibrate mass flow meters which record air volumes and air flow rates.



This gangling apparatus may remind you of your high school chemistry laboratory.



Another useful piece of equipment is the water filtration system, which produces water of high quality.



The AES inorganic laboratory is strong on safety features. This emergency shower is located in a central part of the laboratory. Dave Mactavish is just about to pull the chain that would release a shower of water on the laboratory floor. Its main purpose is to counter acid spills. It has yet to be used in an emergency.



Another more frequently used safety device is the stainless steel fume-hood. The furnace-like shield supplies an airflow to the outside which prevents scientists from breathing in chemical fumes.



A further safety measure is the provision of eye wash fluid in a specially marked container just in case some corrosive chemicals are accidentally splashed.



This laboratory furnace heats up to temperatures of 1200 degrees Celsius. It is used to remove the filters by charring, leaving only the sample. Any excess heat is controlled by the air conditioning in the room which has controls separate from the rest of the building.



The photo shows a collection of special research instruments used in "real world" field studies and brought to the laboratory for checking, calibrating and repair.



This analyser measures nitrous oxide in the atmosphere. It is an industrial model altered by AES for its own use to improve sensitivity. The alterations are experimental and the analyser is often used in chemical process research studies. Spaghetti anyone?