proposal was submitted to the United States National Aeronautics and Space Administration for the examination of lunar glass by this technique.

The nature of this work and its scientific aims are described in a contract between NASA and NRC, in which the responsibilities of both parties are outlined. The provisions, which are common to all lunar-sample investigations, cover such aspects as the availability and release of the lunar material, its receipt, safeguard and return to NASA, and the reporting of analytical results.

Two samples of dust from *Apollo 12* and a fragment of glass from *Apollo 11* have been examined and the laboratory will receive further samples during the ensuing year. Minerological studies also are being performed, in collaboration with the Geology Department of Dalhousie University.

THRUST-MEASURING SYSTEM

The Division of Mechanical Engineering and Computing Devices of Canada Limited are co-operating in a research project on the design and development of an "in-flight" thrust-measuring system for jet engines.

The system, to be flight-tested in the near future, will consist of gasflow sensors mounted on the aircraft engine and an airborne special-purpose computer for calculating actual thrust of an engine. The calculation will appear on a cockpit indicator in front of the pilot. The computer also will calculate the thrust the engine should be capable of developing if properly operating.

Under normal operating conditions, pilots of jet aircraft have no problem in assuring that their engines will deliver sufficient thrust. However, this is not the case when jet aircraft are taking off on hot days from marginal runways or runways at high elevations. Under such critical conditions, there is no direct way for a pilot to know the real thrust developed by his engines. There also is no way for a pilot to be made aware of degradation of thrust as a result of in-flight damage to an engine.

The capacity of the thrust-computer to make this assessment, regardless of the flight mode or ambient conditions, would constitute a major improvement over any existing engine-performance equipment.

WASTE DISPOSAL

A research project has been undertaken by the Division of Biology in an effort to assist food-processing plants, particularly those in rural areas or small centres, which are having difficulty in disposing of waste.

Waste from such plants is, in many cases, highly concentrated, nutritionally unbalanced and variable in nature or is produced intermittently. The treatment-method chosen for the study is anaerobic digestion-decomposition in the absence of free oxygen.

This method shows promise of being economical and able to handle high-strength wastes. Pear-waste was selected as the medium for initial work at the suggestion of a major canning company that felt it was one of the more troublesome wastes. Four 30-litre continuous fermenters have been designed, built and put into operation.

IMMUNOCHEMISTRY

Natural immunity occurs when an animal produces antibodies (serum globular proteins) in response to foreign material introduced into the body by infection or injection. A prime characteristic of this immune response is its high order of specificity, e.g. immunity to pneumonia does not protect against tuberculosis. The specificity is due to the matching-up of determinant groups or active sites on antibodies and antigens (substances that stimulate the production of antibodies) and variations are caused by subtle differences in chemical geometry.

Work in NRC's Biochemistry Laboratory has been aimed at the isolation of specific antigens from disease-causing fungi, yeasts, and bacteria and the characterization of their determinant groups. Polysaccharides (complex carbohydrates) in the cell walls of a series of dermatophytic (skin-attacking) fungi have been shown to be group antigens. A higher order of specificity was found in peptidoglycan antigens isolated from the same organisms and the peptide part of the molecules were established as the determinant groups. Through collaboration with the Skin and Cancer Hospital of Philadelphia these peptidoglycans are being developed as diagnostic agents.

A most significant advance during the past year has been the development of new chemical methods for preparing synthetic antigens. By this means, a compound that is not by itself antigenic can be joined to an antigenic carrier molecule. Subsequent injection of the conjugate into an animal induces the formation of antibodies specific for both parts of the conjugate. It is therefore possible to make synthetic antigens using only a specific determinant group and an antigenic carrier. Practical exploitation of this development requires the isolation of the specific antigens from disease-causing micro-organisms and characterization of their determinant groups. At present such efforts are being concentrated on meningitis and gonorrhea in collaboration with the Communicable Disease Centre.

This work has required the close collaboration of bacteriologists with facilities to grow highly dangerous micro-organisms, chemists and biochemists with experience and interest in immunology, and access to animal facilities. It represents the interdisciplinary approach to research that is essential for major advances in the life sciences.

MICROWAVE HEATING

Further progress has been made by the Radio and Electrical Engineering Division on industrial applications of microwaves, with emphasis on moisture sensing and drying.

(Continued on P. 6)