

The shortage of proteins and the potential for legume seeds to meet part of the demand for both quality and quantity are being given global attention by national and international organizations concerned with nutrition and production. In line with this interest, the Laboratory has placed increased emphasis on research in nitrogen fixation and legume seed crops. Studies in genetic variability of peas for nitrogen fixation capability have the objective of increasing the factor through the plant as well as the micro-organism. Studies of plant cells are directed to interrelationships of cells and micro-organisms. Studies on photosynthesis have been included in the biochemistry with the objective of increasing nitrogen fixation through chemical control. Research on utilization of field peas and fababeans has been concentrated on production of flour, protein and starch by pin milling and air classification. Use and evaluation of the products are under study by a variety of Canadian industries and in a number of departments at the universities of Saskatchewan and Manitoba. Significant progress in research on cell fusion, transformation and morphogenesis indicate that increased efforts are warranted to develop this technique for the improvement of agricultural crops. A practical application is being made to the production of a virus-free Cassava plant in a contract with the International Research Development Centre.

The Radio and Electrical Engineering Division undertakes engineering projects of interest to Canadian industry and fundamental research in electrical science. The engineering program in the high-voltage field includes studies of corona loss and radio interference from direct-current transmission lines, and the development of current comparators for very accurate measurement of current and voltage ratios. An effort is being made to develop accurate tests of the lifetime of solid dielectrics used as insulation in high-voltage cables and components. The high-frequency laboratory is responsible for maintaining the national standards of RF power, voltage, impedance and attenuation and has recently participated in an international intercomparison of these standards. Assistance is given to industry in the design, production and evaluation of new equipment, and in the solution of such problems as the design of antennas, microwave film and paper dryers and moisture sensors. Many devices are now in commercial production.

In the field of bio-medical engineering, new techniques in electrocardiography and echoencephalography have been developed, a study of cardiac stimulation thresholds is under way and instruments that will contribute toward the rehabilitation of handicapped persons have been produced. The Division has co-operated with members of the medical profession in the establishment of safety standards in the use of electronic equipment in hospitals for treatment and diagnosis.

Much of the research in the computer laboratories of the Division is concentrated on the problem of communication between man and computer. Computer graphics techniques have been adapted to provide a versatile tool for the film animator and for the composer of music. Problems arising in computer-aided learning systems are being investigated, and a touch-sensitive screen has been designed and patented, an extremely flexible input device that permits an untrained person to communicate effectively with a computer. Special data recording and analyzing systems have been developed to suit widely varying scientific programs.

Fundamental research is carried out in solid state physics, wave propagation, quantum electronics, and the behaviour of particles at ultra-high vacuum. Patents have been issued recently on a ruby laser which is self-Q-switched, and on a thermal transpiration vacuum pump.

The Space Research Facilities Branch (SRFB) is a support organization which provides services to the Canadian scientists who are doing upper atmosphere and space research by means of sounding rockets, balloons and ground-based instruments. The main services provided include the procurement of rocket motors, the procurement and engineering monitoring of instrumented rocket payloads, the planning, designing and operation of temporary and permanent launching facilities, the acquisition and recording of scientific data, and the conversion of such data into formats which are readily usable by the scientists who are being supported. In addition, SRFB prepares and publishes engineering reports on all launches as well as general annual reports covering all Canadian activities in space and upper atmosphere research. The Branch carries out its procurement and operational activities by means of production and service contracts with Canadian industry.