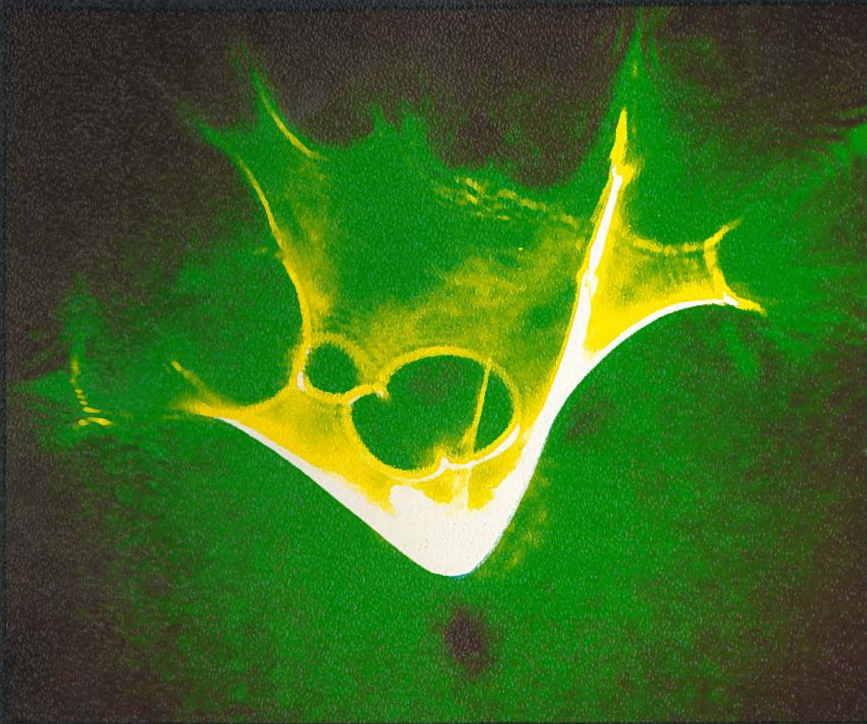
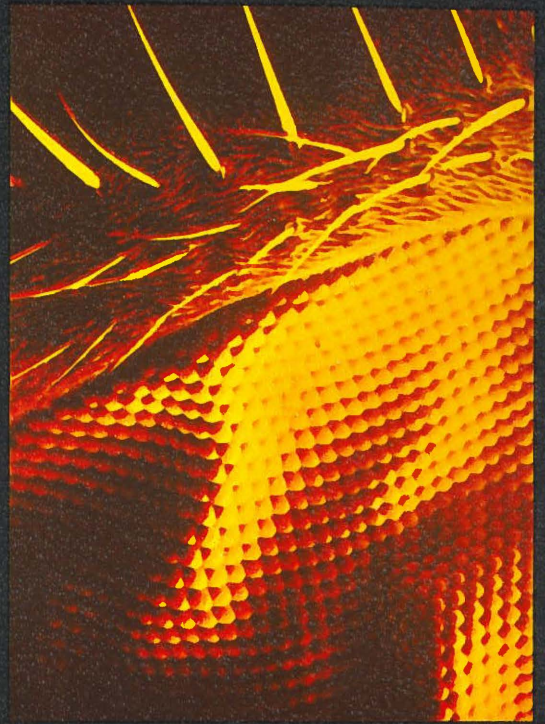
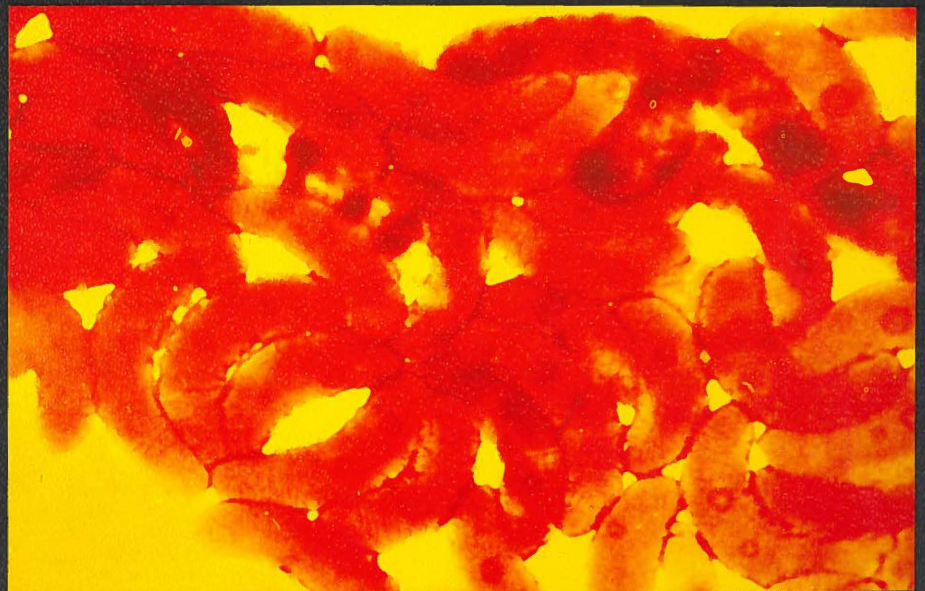




FACULTY OF SCIENCE
Lakehead University
Thunder Bay Ontario Canada





Faculty of Science

biology

chemistry

physics

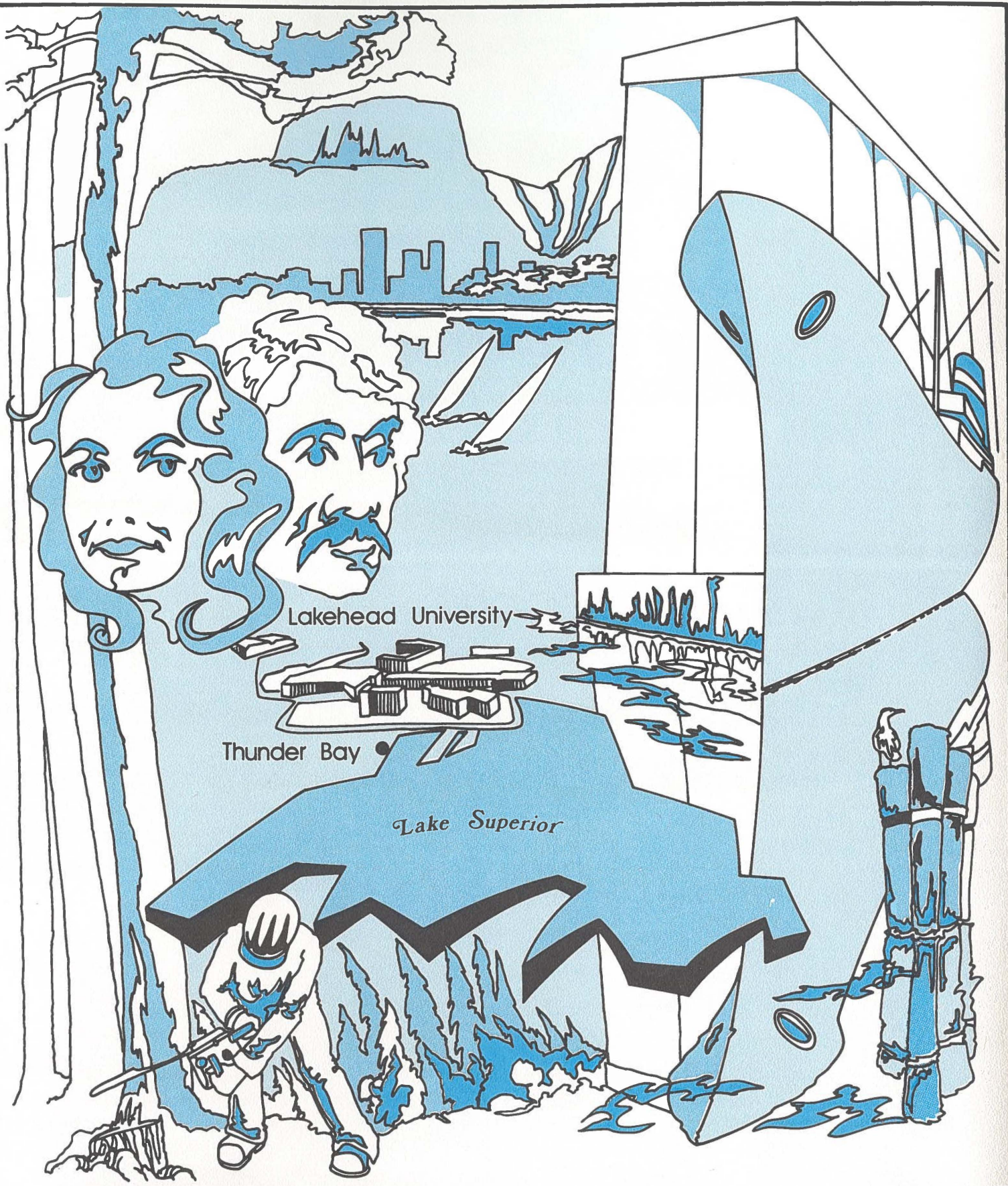
geology

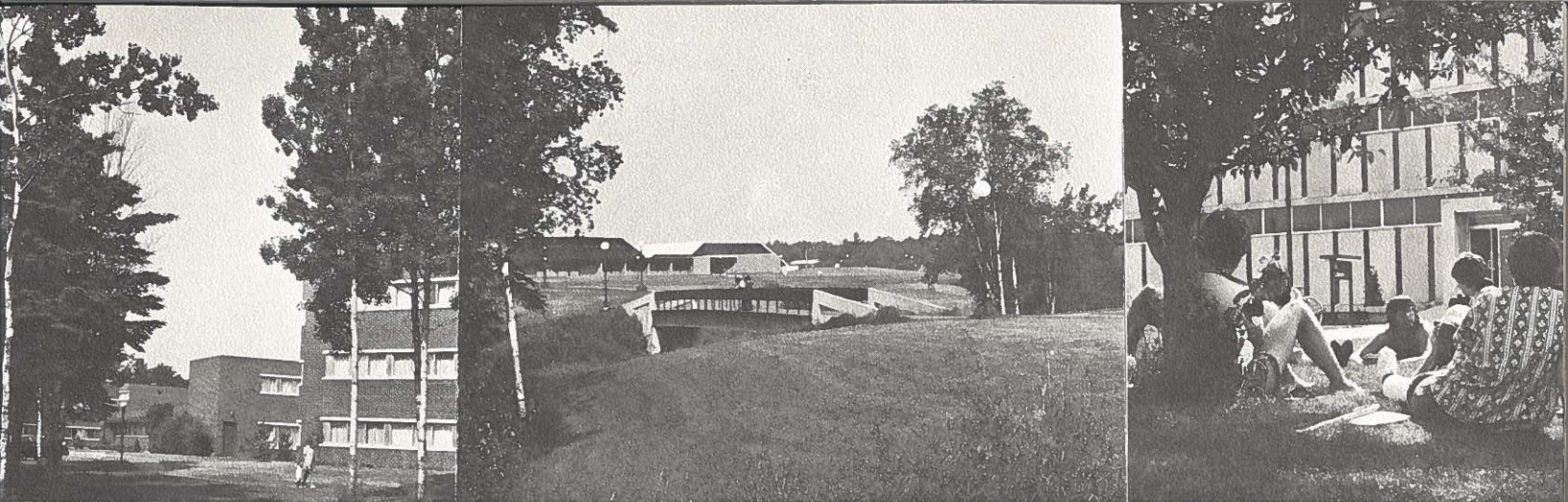
mathematical sciences

liberal science

geography

energy and fuel science





Lakehead University is ideally situated at the head of Lake Superior in Thunder Bay, Ontario. This thriving community is the working hinge of all Canada. The great bulk of Canada's natural wealth — grain, minerals, wood pulp — are distributed through this vital inland port.

The immediate environment comprises one of the world's outstanding natural laboratories. The boreal forest, the Pre-Cambrian Shield, and the massive water-shed of Northern Ontario, provide a limitless challenge to man's thirst for knowledge and to his capacity for improving his way of life. Vital decisions regarding the future of Canada's natural resources will be based, in part, on research which is going on at Lakehead University right now!

Facilities at Lakehead University include: residence accommodations for over 600 students; a university centre complex which includes lounges, cafeteria, student government office, a shopping mall, and a 380-seat theatre; an athletic complex which compares in versatility to any in Canada. Of more immediate concern to the students of science, the Centennial Science Complex represents an investment in excess of \$20 million in buildings and equipment; an excellent library provides nearly 200,000 volumes and a seating capacity over 1,000; a Model 50H computer is available on a twenty-four hour basis for the use of the entire University community.

faculty of science

Teachers and researchers in the subjects of Biology, Chemistry, Geology, the Mathematical Sciences, Physics and Geography are intensely committed to the disciplines of science. But they are also oriented toward the individual student.

Comparatively small classes, which prevail in the Sciences at Lakehead University, provide a setting for easy rapport between and among students and faculty. Close individual attention ensures more effective learning. Should problems of an academic nature arise, the Dean of Science, his deputies, and the department chairmen are constantly available for counselling. The active personal contact which students enjoy with their professors in the Faculty of Science is supplemented by a formal structure of student/faculty liaison committees, organized on the departmental level, which keep students and faculty aware of each other's problems and viewpoints.

Nearly every four-year program in the Faculty of Science gives students the opportunity to become involved in practical research projects. Special research facilities in the Faculty of Science include a well-equipped machine shop, glassworking laboratory and an instrument division which houses the latest scientific instruments including electron microscope, spectrometers, diffractometers, etc. These facilities are all managed and staffed by professional personnel.

The faculty of Science maintains close liaison with industry and scientific associations in order to ensure that academic and professional standards are met or surpassed in every program.

There is a growing awareness of the important role that science can play in the development of Canada's future. This awareness has kindled greater cooperation among different disciplines in the Faculty of Science. This fact is reflected, not only in the trend toward inter-disciplinary research, but also in programs specially designed to provide a knowledge of many Science subjects in breadth rather than in depth. The Inter-departmental Program is a three-year general program in which a student selects courses from within the departmental offerings in the Faculty

of Science, and supplements these with electives from the Humanities and Social Sciences. And the Liberal Science Program consists of courses designed to cover all aspects of science in order to promote an appreciation of our environment among those who are not interested in specialized study.

Whatever your interest in science, the Faculty of Science at Lakehead University can help you choose a satisfying program.

The Faculty of Science offers three-year programs leading to the Bachelor of Science degree in the following disciplines: *Biology, Chemistry, General Science, Geology, Liberal Science, Mathematics, Natural Sciences, Physics, Geography and Energy and Fuel Science.*

Also offered are four-year programs leading to the Honours Bachelor of Science degree in the disciplines listed below: *Biology, Chemistry, Geology, Mathematics, Mathematical Physics, Physics and Geography.*

Admission to the first year of the Faculty of Science will be granted to candidates who have completed their final year of secondary school studies in good standing. Evidence of a candidate's standing shall include:

1. *A recommendation by the principal of the secondary school last attended regarding fitness for university studies.*
2. *A complete academic report for the final three years of secondary school.*
3. *The results of standardized test offered by the Service for Admission to College and University.*

The general principles of course selection in grade 12 and 13 remain unaltered.

Should you require further information, please contact: Dr. R. A. Ross, Dean, Faculty of Science, Lakehead University, Thunder Bay, Ontario, Canada.

Close individual attention and a place to learn "naturally" are hallmarks of instruction in the Faculty of Science at Lakehead University.



department of chemistry

Why study Chemistry? What does a chemist do that inspires you to be one or prompts you to learn something about the subject even if you do not plan to pursue it as a career?

Specifically, the science of chemistry is involved with the properties and structures of substance, and their preparation from and interaction with other substances that constitute man and his environment. Since Chemistry is a very broad subject the boundaries that separate it from engineering, geology, pharmacy, physics and the biological sciences are often indefinite. The importance of Chemistry in your daily life is abundantly evident. Chemical changes in your body produce energy and growth from food and air; bodily functions themselves are controlled by sets of complex chemical substances called vitamins, hormones and enzymes. The food you eat is indirectly produced by the chemical reaction called photosynthesis, and the clothes you wear consist in large part of synthetic fibres produced by chemical processes. The metals for automobiles and machines are produced by chemical processes, and the operations by which glass, bricks and pottery are made are further examples of chemical processes. More recent triumphs of Chemistry include the development of antibiotics and other drugs to combat pain and disease, the production of improved gasoline from petroleum, and the synthesis of many new plastics. Entire industries have evolved from the development of these new materials, giving employment to many thousands of people. Chemistry operates in and around us every moment of our lives, and thus we need to know something about it. Many of today's most pressing problems, such as air and water pollution, malnutrition, drug addiction, mental and physical sickness and over-population rage out of control because the citizenry has not proceeded with imaginative application of chemical knowledge.

To the question, *Why study chemistry?*, there is a practical and an intangible answer. The practical answer is not the same as that of a generation ago; in part, today's answer is a need to make up for the blunders of the past. The intangible answer arises from the things we can know from Chemistry that we had no hope of knowing a generation ago: what life is, where it came from, how it operates, what our solar system is like and how it arose.

A Chemistry graduate may become involved in such areas as plastics, drugs, pollution, paper, metals and atomic power. Chemistry is also a key requirement for entering the fields of medicine, dentistry, pharmacy, some areas of engineering and almost any branch of the sciences. A degree in Chemistry can lead to involvement at a number of business, industrial and academic levels, including manufacturing, product control, technical service, sales, marketing, teaching, research, and governmental employment. In fact, chemistry provides a student with a broad training which enables him to tackle a wide variety of jobs.

Lakehead University offers courses in most branches of Chemistry: *Analytical* — almost everything we eat, wear or handle has been subjected to chemical analysis at some stage of production. It is the key to pollution control. *Biochemistry* — the study of life processes, vital to medical students, biologists, etc. *Inorganic* — a rapidly developing area of Chemistry. It deals with the structure, properties and uses of metals, non-metals and their compounds. *Organic* — the branch of Chemistry which fulfills the basic need of society in the form of chemotherapy (drugs), manufacture (plastics, man-made fibres) and food (agriculture and forestry). *Physical* — deals with the determination of the properties and structure of matter and the laws and theories of Chemistry. *Polymer* — industries associated with polymeric materials are the major employers of all chemists and chemical engineers. The courses at Lakehead University examine the synthesis, structure and properties of synthetic and natural macromolecular substances.

The Department of Chemistry at Lakehead University, offers some unique advantages, the most important of which is the combination of highly qualified staff with the availability of excellent laboratory and instrumentation facilities. This allows instructors and staff to provide the individual student with a large degree of personal attention and gives the student frequent access to modern instruments.

An apparatus used in the field of Physical Chemistry to sample gases.



department of physics

The most incomprehensible thing about the universe is that it is comprehensible. Albert Einstein.

The primary concern of the Physics Department at Lakehead University is the development of a sound and interesting undergraduate program. Because the number of students is relatively small, instructors can give each student individual attention. Personal contact is also emphasized in the labs where students are encouraged to do progressively more independent work.

Physics is a systematic study of the properties of all things, from nucleus to the stars. There are only a few fundamental laws. The physicist is not required to memorize a body of facts, but only to pit his mind against ideas. His theory is meaningful only if it makes correct predictions about the physical world. A great deal of ingenuity is required to devise experiments to verify these predictions. A study of physics provides insight into technology, natural phenomena and the basic nature of things. In contrast to other disciplines which study specific areas in detail, physics gives a broad understanding of our world. It teaches one how to think logically and objectively about any given problem. This, combined with the proper design and interpretation of experiments, is the essence of the scientific method. The power of this method when applied to physical science is indisputable, but its application to social problems is fairly recent. A physicist contributes to the technological advancement of society; as examples physicists are eagerly searching for new sources of energy, studying ways to improve the efficiency of existing energy sources and are deeply involved in the problems of pollution control.

Do you find excitement in understanding the world and in contemplating the universe? Perhaps you are a bit skeptical when told "the facts". Then you should enjoy the study of physics.

Physics forms the basis for most of the physical sciences and graduates can embark on worthwhile endeavours, not only in physics, but in a variety of allied fields, such as astrophysics, geophysics, chemical physics, biophysics and engineering. Some of the careers to which a degree opens the door include high school teaching, meteorology, astronomy and cosmology, computer programming, atomic energy, acoustics, radiation physics, industrial research and development, sale of scientific equipment, laser

technology, space science, theoretical chemistry, environmental protection, energy production and many others.

A wide range of programs in the Department of Physics accommodates both the group of students who have the experimental and theoretical skill to follow a highly concentrated and rapidly moving program in preparation for graduate studies, and also those students who like a challenge but are not so certain that they want to devote themselves single-mindedly to the subject. A good variety of options makes it possible for students, particularly in the general degree program, to choose courses of particular interest to them.

It is impossible to cover more than a bare fraction of the field of physics. The Department of Physics therefore offers a good basic course, with few frills. Consequently, students enjoy more personal attention than is customary in university studies. Whether your bent is towards laboratory research or theoretical physics, opportunity for development is assured. The essence of both these approaches is a judicious combination of basic concepts and challenge to initiative, both of which are stressed in physics at Lakehead University.

Although the main emphasis is upon undergraduate teaching, lively research projects take place in physics at Lakehead University. Many faculty members are involved in research concerned with solid state physics, which refers to the search for new materials, and new uses for old ones. Specifically, this research is restricted to areas closely allied to electronics. Transistors and devices like them are closely studied and analysed. Results of such experiments are of particular interest to radio, television and communications equipment manufacturers.

Another research project involves a search for methods of improving the electrical properties of capacitor paper produced by a regional mill. In addition, a group of physicists is applying a scanning microscope to the study of chromosome behaviour.

Some upper year undergraduate students become directly involved in these projects and all students benefit from the up-to-date knowledge that active research provides for faculty members.



department of mathematical sciences

Mathematics is exploding. Where 50 years ago mathematics could aptly be called the "hand maiden of the sciences", there is now hardly a field of human endeavour which escapes the interest and contribution of mathematics, and the mathematical method. It has far outstripped its description as the "science of number", and non-numerical mathematics studies subjects from the essential properties of knots and communications systems to the workings of the human mind.

Everyone involved in science must be able to use the tools that mathematics provides. It would be impossible to study physics, chemistry or any science subject without some knowledge of calculus, algebra and statistics. But it is a mistake to believe that a mathematician's role is simply to provide tools for other people to use. An important value of mathematics to a mathematician lies in the fact that it gives him pleasure. It may reveal the harmony of the universe; it may result in great technical advances; it may even lower the cost of groceries. But, in the end, mathematics is studied by people because they enjoy it. If you liked mathematics at school, and were good at it (for it is one of the most difficult and demanding courses at University) then you should consider taking a degree in it. The faculty at Lakehead University would be pleased to discuss this with you and to offer counsel in your choice of courses.

A serious mathematics major graduate will have little difficulty in obtaining good employment. There is a continuing demand in teaching with a strongly developing trend towards the applications of mathematics to industry, commerce and government. There is always a demand for the person who can accomplish what others consider difficult, and in the longer range the demand for mathematicians may well outstrip the supply, as more disciplines and activities become mathematical in nature. Who could have seen, a few years ago, the extent to which mathematics is now used in economics, the social and behavioural sciences and business, and the opportunities that these disciplines now provide to mathematics graduates? At Lakehead University, class sizes

in mathematics are generally sufficiently small that students have an excellent opportunity to get to know one another and to consult faculty members. Students are encouraged to participate in the life of the department, to attend the seminars, use the reading room, and work closely with the faculty, so that their education need not be bounded by the classroom and the library.

A prospective university student should weigh carefully whether his, or her, potential will be better developed in a large (and often impersonal and highly competitive) university, or in the freer atmosphere of small classes, close faculty contact, and close working relations with other students. A great deal of mathematical learning comes about through trading ideas and criticizing the work of one's fellow students.

At Lakehead University the mathematics program is being reorganized around the concept of "applicable mathematics". This includes the mathematics which is useful in the new and expanding fields of applications, as well as the older applications to physical science and engineering. We are interested in teaching any branch of mathematics which might be applied, and this means we must also provide an introduction to "pure" mathematics, because history has amply proved that it very quickly becomes tomorrow's "applied" mathematics.

The greatest surge of the present is to the mathematics of computing, and modern high speed computation is revolutionizing mathematical thinking. We believe that it is important to reorient almost all mathematics teaching to this important new development so, while we have courses just in computer science, we also have computer science in most of our courses. Lakehead University has been able to maintain an extremely favourable computer/student ratio, and our students probably have better access to modern high speed computer facilities than those in any other Canadian university.

A mathematical "problem" can be solved in many ways and in many places.



the liberal science programme

It is impossible to over-estimate the importance of science in today's careening technological world. Science is the only branch of human enquiry which applies itself to the systematic observation and interpretation of our physical environment. As such, science provides a fountain of well-defined data upon which to base important judgments which must be made now if we are to survive.

The influence of science and technology upon modern man staggers the imagination. And yet, there have been very few systematic attempts to bring this home to future teachers, legislators and decision-makers. The Liberal Science Program aims at giving such people a broad view of science, rather than producing professional scientists. The program brings science out of the confines of the laboratory in order to explain its effects upon man and his environment, and also to explore ways in which science can influence our daily lives for the better.

Students entering the Liberal Science Program must have successfully completed Grade 13. But science and mathematics are not prerequisite, as they are for other programs in the Faculty of Science. Requirements include a mature mind and a desire to understand the role of science.

Liberal Science students may concentrate on any Arts subjects to meet the requirements of the program. Indeed, it is essentially designed to provide a broad background in science study for students specializing in the social sciences, humanities, or education. It is extremely flexible, allowing easy transfer in and out of the program from other Arts and Science programs. In addition to at least three subjects from the Faculty of Science and up to seven from the Faculty of Arts, the three-year Liberal Science Degree Program requires at least five of the following courses:

L.S. 1120 Physics for Poets – An introduction to classical and modern physics without extensive use of mathematics.

Biology 1121 Natural Science – A course which integrates the earth's physical feature with plant and animal life on earth by emphasizing the relationships of the three. The course deals with the origin of the earth and development of its physical features; origin, structure and function of living organisms; organisms and the environment, evolution; the future.

Geology 1101 Fundamentals of Geology – The external and internal processes which have formed the crust of the earth, the ocean basin and the hydrosphere; and the general physical and chemical principles relating to the origin and development of the earth as a whole. Laboratory work will include the mineralogy of the main rock forming minerals and economic sulphide and oxide deposits, the petrography of the principal rock types in the earth's crust, the identification and use of fossils as indicators of relative time, and the interpretation of geological maps.

Mathematics 0120 Mathematics, the Analytical Tool of Science – The role of mathematics in formulating and solving problems, both from the traditional sciences and the newer areas of the social sciences. The emphasis is on the "mathematical method", rather than the mathematics. The topics chosen range widely to accomplish this goal and will include history and the development of geometry.

L.S. 2100 Science and Man – The profound influence of science on the individual and society is the central focus of this course. The effects of great experiments and theories on the development of civilization are studied in detail. The relationships between science, technology, philosophy and politics are identified and discussed. Also, the role of science in determining the way we think and act is probed as far as possible.

L.S. 2200 Chemistry and Everyday Life – This is a survey of those aspects of chemistry which affect our lives every day. The material will include a general historical introduction. Following this, a basic understanding will be provided for such popular activities as photography, wine-making and pottery. Also, such topics as the energy crisis, birth control, pollution, physical and mental health, the use and misuse of drugs will be discussed from a chemical viewpoint.

L.S. 2080 Contemporary Physical Thought – Important scientific literature is often ignored because its language is too technical or mathematical for the general reader. This course purposes to interpret such writings to promote understanding in the theories of the Universe and its creation, in the laws of physical science, and in recent scientific thought. Proficiency in mathematics is not required.

L.S. 2300 Astronomy – This course is designed to acquaint the student with the principal features of the Solar system, our Galaxy, and the known Universe. The student will make observations of the moon, planets and stars, plot their movements and deduce some of their properties. Photographs from observatories will supplement the student's observations. No previous background in physics or mathematics is required.

L.S. 3100 Canadian Science and Technology – The organization of science and technology in Canada with special reference to energy distribution and communication networks.

L.S. 3400 Problems in Pollution – Interdepartmental course on problems of land, water and air pollution. Effects on the environment and its conservation.



the energy and fuel science programme

Universities have a vital part to play in the resolution of the energy crisis by producing those (people) with the necessary skills to meet future demands. The problem of energy seems destined to take on a less ephemeral nature within the curriculum than the current fashions of environmentalism. David Dickson

This programme will be offered initially in September 1975.

Our future on this small planet will be largely determined by the manner in which we meet the energy crises that surrounds us and, at times, threaten to engulf us. Can we find effective solutions to energy problems? Are the solutions economically and technologically possible? How drastically will our lifestyles be altered by the introduction of new and perhaps radically different forms of energy?

If these questions are to be met and answered, intelligent men and women possessing a broad range of knowledge must do the seeking. That is why Lakehead University has developed the Energy and Fuel Science Programme.

The Energy and Fuel Science Programme follows an interdisciplinary approach to energy science. It combines courses on the basic scientific aspects of energy with applied scientific, engineering and

economic approaches to the solution of energy problems.

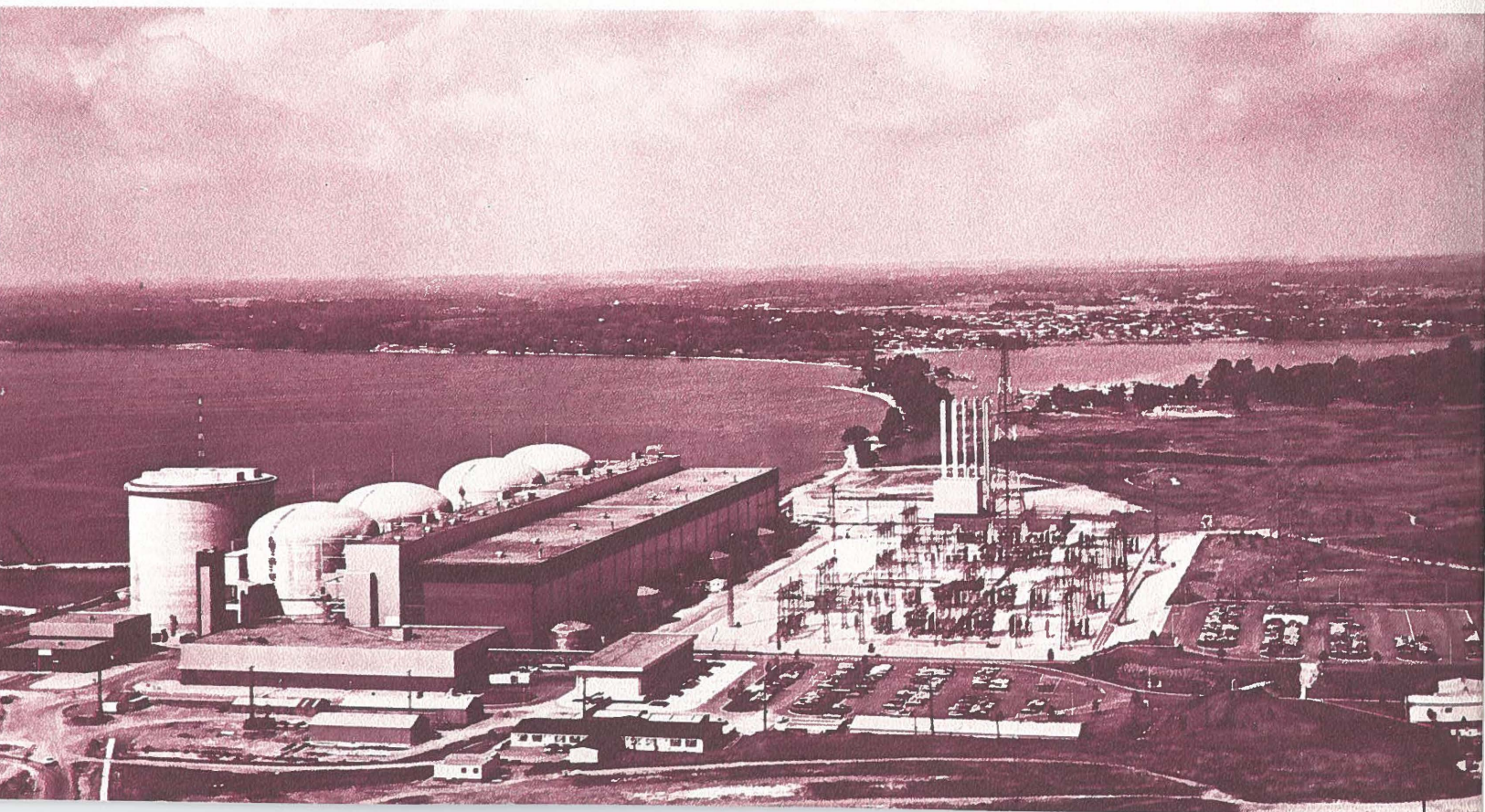
Thus, this programme will give you an effective, cohesive knowledge of scientific principles which cover a broad spectrum of subject areas — Physics, Chemistry, Biology and Mathematics.

It will give you an understanding of the engineering principles which are necessary to make a reality out of a dream.

And, the Energy and Fuel Science Programme will give you a solid grounding in the principles of economics and social dynamics.

Laboratory and plant work will have a special emphasis in the second and third years of the programme and specialized courses in "Energy and Fuel Science" will be taken each year.

The present programme requires three academic years and plans for an honours year are at an advanced stage.



integrated science programme

The important thing is not to stop questioning. Curiosity has its own reason for existence. One cannot help but be in awe when one contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries merely to comprehend a little of this mystery each day. Albert Einstein.

Today the physical and natural sciences are becoming increasingly interdependent and in recognition of this, Lakehead University is offering a unique science programme at the first year level. It combines biology, chemistry, geology, mathematics and physics and will be given from February to April primarily for the benefit of high school semester graduates. It will consist of twelve weeks of lectures and laboratories followed by a week of field work.

If you graduate in January, you can begin your post-secondary education immediately by enrolling in the Integrated Science Programme. Think about it: Instead of waiting until September to begin your first year of university, you could be entering second year.

There are many advantages to an integrated approach to science. It is possible to gain a better concept of the natural unity of science and of the co-ordinate material that, traditionally, has been treated by different departments. The student need not decide on a major until the second university year when he or she has a better appreciation of science as

a whole. At the same time, it is very probable that much of the most exciting work and opportunities in science in the future will occur in interfacial or overlap areas among the classical divisions.

If you are thinking about a university major in any science subject, or if you want a general background in science, then the Integrated Science Programme is for you.

(An understanding of reality, from the elementary particle to the living world, is the ultimate challenge to the human mind. It can provide you with challenge for the rest of your life. In addition, it can offer you a livelihood and a means of solving many of the problems of modern society. The first step towards the solution of any problem is understanding, and the goal of science is the understanding of the world.)



THE SECRETARY
OFFICE OF THE DEAN
FACULTY OF SCIENCE
LAKEHEAD UNIVERSITY

Please send me further information on the Faculty of Science Programme.

NAME _____
STREET _____
CITY _____
UNIVERSITY ATTENDING _____
FACULTY _____
DEGREE YEAR _____ (please print)

Lakehead University rests at the heart of Canada in the rugged and beautiful Superior Country. The photograph at right shows but a small portion of the country that surrounds the university — a place to find enjoyment through canoeing, skiing, backpacking, or simply looking; a place to seek knowledge in the thousands of miles of natural laboratories to be found at random in this Canadian Shield country; and a place where many important events in Canadian history have happened (*that's a reconstruction of the Old Fort William Fur Trading Post in the foreground*) and where an important part of Canada's future will be determined by the faculty and students at Lakehead University.

THE SECRETARY
OFFICE OF THE DEAN
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