Laval University

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Laval University, Quebec City, Quebec

Fathi Habashi

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Laval University is located in Quebec City, the capital of the Quebec Province, on the St. Lawrence River. The city was founded in 1608 by Samuel de Champlain, and the university traces its history back to 1663 when Le Séminaire de Québec was founded by Monsignor François de Montmorency Laval, the first Bishop of New France.

Under the guidance of its scholars and founding members, the Quebec Seminary developed through the years a teaching program of ever-increasing quality. Toward 1850 the seminary undertook the task of founding an institution of higher learning and, in 1852, Laval University was granted a charter signed in London by Queen Victoria, thereby giving the Quebec Seminary university status. The Faculty of Medicine was established in 1853, in the following year came the Faculty of Law, then the Faculty of Liberal Arts, encompassing the fields of sciences and letters. In 1876, Laval University opened a branch in Montreal which, in 1920, became the University of Montreal. In 1920, the School of Chemistry was founded as part of Laval University and, in 1937, it was expanded and named the Faculty of Science. In 1938 the School of Mines, Geology and Metallurgy was added to that faculty.

At present the university is composed of 12 faculties, 9 schools, and 16 research centers. The university is also operating an experimental forest station about 50 kilometres north of Quebec City and an observatory located at Saint Elzear in the Beauce. There is a faculty of 1,531, and the total student enrollment in 1988 was about 35,000, including 5,711 graduate students. Among the foreign students there is a large enrollment.
from the African Francophone countries (Ivory Coast, Morocco, Senegal, Zaire, etc.). Every summer there is an intensive Language Course for the French and the Quebec culture, which attracts about 1,100 persons from North and South America. The school is also host to many national and international meetings that attract as many as 15,000 participants. The campus offers modern meeting rooms with audiovisual equipment for groups of any size.

LOCATION
Quebec City is characterized by the walls fortifying the Old Town. With its historic monuments and battlements, the city still retains the color of New France. The surrounding region has many attractions: the magnificent Montmorency Falls, La Rose Falls, and Sainte Anne Falls, the beautiful Île d'Orléans, an Indian village, an aquarium, and a zoo, to name a few.

It is connected to Montreal by frequent air flights, a train service, and nearby bus service. It is also connected to Levis on the eastern side of the river by a ferry and two bridges. The high snow precipitation in winter makes the region an excellent ski center. The present population of the metropolitan Quebec City area is 600,000.

MINING AND METALLURGY
The Department of Mining and Metallurgy is one of the 12 departments composing the Faculty of Science and Engineering (formerly Faculty of Science). It was founded in 1938 and is currently housed in Pouliot Pavilion together with Chemical Engineering, Geology, Civil, Mechanical, and Electrical Engineering. On the top floor there is the Museum of Geology, which includes a vast collection of minerals, rocks, and fossils.

FACILITIES
The laboratories of the department are fully equipped for instruction and research in the various areas of mining, metallurgy, and materials science. Some of the equipment available is as follows:

Mining
Drilling, ventilation and safety equipment; gas and dust measuring instrumentation; measurement of rock hardness, tensile strength, compression, elasticity; models for underground mines.

Mineral dressing
Crushing and grinding, gravity tables, Humphry spiral, magnetic and electrostatic separators, flotation machines; instrumentation for measuring density, surface tension, viscosity, image analyser; computerized closed circuit for grinding, instrumented tank for level and flow control, etc.

Extractive metallurgy
Pressure leaching reactors, furnaces, rotary kiln, pelletizer, apparatus for electrochemical studies, etc.

Physical metallurgy
Metallographic equipment, heat treating furnaces, melting furnaces, salt baths, etc.; measurement of stress corrosion, fatigue, etc.

Mechanical metallurgy
Hardness, tension, and compression testing; deep-drawing, impact testing; MTS apparatus, radiography, abrasion wear; forging, swaging, wire drawing, and rolling apparatus; melting and casting under controlled atmospheres, welding, etc.

Powder metallurgy and ceramics
Forging press, hot and cold isostatic presses, extrusion presses, porosimeter, high-temperature furnaces, atomizers.

General-use equipment
All types of instrumental analysis apparatus, Leco furnaces, X-ray diffraction and fluorescence, differential and thermal analysis, laser particle size analyser, etc.

PROGRAMS OF STUDY
The department offers bachelor of science degrees in mining and mineral engineering and also in materials and metallurgical engineering, both of which are recognized by the Corporation of Engineers of Quebec and the Canadian Institute of Engineers. Studies leading to each degree take 4 years. In each year there are required courses and optional courses, which orient students toward physical metallurgy, extractive metallurgy, or mineral engineering.

Teaching is conducted in French, but all teaching staff have a good knowledge of English. The courses stress both basic and applied science. The curriculum is continuously revised to incorporate the most recent topics that are vital to engineers. Well equipped laboratories are at the disposal of undergraduate students to combine theory with practice. Experiments are set up for students to demonstrate a certain phenomenon or theory, or simply to give them the opportunity to gain practical experience.

Within a cooperative program, under-graduate students spend three summers working in industry or in government laboratories. They write reports on their work during this period, which are then reviewed by the teaching staff and credited. Key personnel from industry are frequently invited to talk to undergraduates and to expose them to industrial problems at an early stage. Visits to industrial plants also are organized to help students discover the connection between the university courses and the engineering professional work.
Graduate students can obtain the master's or doctor's degree in either mining or metallurgy. Studies for the master's degree require normally three to four trimesters for a full-time student. Admission is subject to the approval of the departmental committee for graduate studies. Studies for the doctorate are open to students having a master's degree or its equivalent and a grade of at least 70 percent in their graduate courses. A student may also study directly toward the doctorate without writing a master's thesis.

In 1988, the department celebrated its 50th anniversary. During this period of 50 years, it has graduated 718 mining and metallurgical engineers, conferred 143 master's degrees and 51 doctorates. The enrollment at present is 200 undergraduates and 50 graduates. Many of the alumni now occupy key positions in Quebec industry, at teaching institutions, in research organizations, and in Quebec and Federal Governments.

The department maintains good relations with other Canadian universities and has specialties with French-speaking institutions, both in Quebec and abroad.

The department has received numerous grants from the Federal and Provincial governments as well as from other sources and has been able to develop excellent research facilities for training graduate students as well as solving problems of interest to industry.

GENERAL AREAS OF RESEARCH

Mining
Mine ventilation, safety, slope stability, mine planning and scheduling, rock mechanics.

Mineral Dressing
Analysis, simulation, optimization and control.

Extractive Metallurgy
Pressure leaching, recovery of uranium from phosphate rock, anodic dissolution of sulfides, electrowinning and electorefining, hydrometallurgy of gold.

Physical & Mechanical Metallurgy
Phase transformation of steel, wear resistance and surface hardening, stress corrosion cracking of steel, corrosion inhibitors and protection of metals, nondestructive testing, weldability of micro-alloyed steels.

Powder Metallurgy
Development of composite powders (cermets) and wear-resistant materials (steel matrix containing cermet particles), P/M magnetic materials alloyed and coated powders, etc.

Materials
Preparation and densification of borides and carbides, amorphous alloys, asbestos.

STUDENT LIFE

The university operates four residences with 2,300 rooms, two cafeterias and a dining room, an athletic center, with Olympic-sized swimming pool, an ice skating arena, tennis courts, etc. There are skiing and hiking trails on the campus, a theater, and a discotheque. The School of Music offers a free concert nearly every week. Not far from the campus is the Grand Theatre, where the Quebec Symphony Orchestra, as well as other visiting orchestras and opera groups, performs.

There are three main festivals in Quebec in which the students participate. The Winter Festival in February (construction of an ice castle and snow statues), the National Festival of Saint Jean-Baptiste in June (folksongs, dancing, etc.), and the Summer Festival in August (open-air theater, concerts, chansons, etc.).

There are a number of student newspapers, and the university publishes regularly its weekly journal Au Fil des Evenements.

ADMISSION

Undergraduate admission requires a Quebec CEGEP (upper high school) diploma or its equivalent (for example, Ontario grade 13). Each case is considered by a departmental committee.

CAREER OPPORTUNITIES

Quebec is the world's largest producer of chrysotile asbestos and is among the top producers of iron ore, copper, zinc, and gold. Moreover, it is one of the few producers of niobium and lithium ores, titanium slag, ochre, feldspar, and dolomite. Quebec ranks first among the Provinces of Canada in aluminium production from imported bauxite because of its abundant hydroelectric resources. For the same reason, a large number of electric furnaces are installed for the smelting of limonite ore, for the
production of ferrosilicon, ferromanganese, ferrochromium, and other ferroalloys. The largest electrolytic copper refinery in the world is in Montreal East. A recently constructed electrolytic magnesium plant renders Canada the fourth largest producer of this metal.

In the arena of nuclear power, Quebec also possesses a CANDU power station at Gentilly, near Trois-Rivières.

A Scientific Research Complex was established in the early 1970s in Sainte-Foy, a suburb of Quebec City, to pursue pure and applied research relating to the needs of the Province. The complex is composed of the Mineral Research Center, Industrial Research Center, National Institute of Research of the University of Quebec, Agricultural Research Center, the Research Center for the Ministry of Transport, the National Optics Institute, and the National Institute for Magnesium Technology.

Not far from the university is the Defence Research Establishment Valcartier, which is the Department of National Defence's largest research and development laboratory.

In Varennes, near Montreal, a Materials Science Research Center was established in the late seventies. Its proximity to the Hydro-Quebec Research Center makes this region of special importance to metallurgists.

Also of interest to the metallurgist are the many novel processes that were developed or operated for the first time in Quebec, such as, for example, the Noranda Process for copper, the Midrex Process for the direct reduction of iron ore, the production of iron powder, and the coproduction of iron and titanium slag.

COST OF STUDY AND FINANCIAL AID

The cost of tuition for full-time undergraduate and postgraduate students ranges from $900 to $1,300 (CDN) for Canadian students or permanent residents and for citizens of Francophone countries. Tuition fees for other foreign students are considerably higher; information can be obtained from the University Registrar.

Financial support for graduate students is available through the following sources:

- Teaching assistantships for supervising undergraduate laboratory work.
- Research assistantships and industrial scholarships.
- Scholarships of the Canadian National Research Council and the Canadian Council of Arts.
- Scholarships of the Quebec Department of National Resources and the Department of Education.
- Postdoctoral research fellowships.

CONTACTS

For further information, please contact:

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FACULTY

MINING

Claude Bourgoin, Associate Professor (mining methods, hygiene and safety at work, mine management)

Pierre Choquet, Professor (rock mechanics, support of rock masses, slope stability, numerical modeling)

Jean-Luc Collins, Associate Professor (materials handling, open-pit mining, mineral economics, computer applications in mining)

Kostas Pytas, Professor (ore reserve estimation, mine ventilation, mining system optimization)

John Hadjiioannou, Assistant Professor (rock mechanics, modeling, optimization)

Jacek Paraszczak, Assistant Professor (mine exploitation, mining equipment)

Raj K. Singhal, Adjunct Professor (geotechnics, open-pit mining, materials handling)

MINERAL DRESSING

Claude Bazin, Assistant Professor (mineral liberation analysis, surface chemistry of flotation, flotation machine hydraulics, flotation circuit simulation, wear in grinding mills)

Rene del Villar, Assistant Professor (modeling and simulation of mineral processes)

Daniel Hodouin, Professor (modeling, simulation, optimization and control of mineral processes, industrial data filtering, applications to grinding, classification, flotation, cianodiation, adsorption on carbon, pellet induration)

Daniel Lagutin, Adjunct Professor (modeling of mineral processes)

Heriban Soto, Assistant Professor (flotation and concentration of ores, surface chemistry, flocculation)

EXTRACTIVE METALLURGY

Edward Ghali, Professor and Chairman (electrometallurgy, electrolysis, corrosion and protection of metals)

Fathi Habashi, Professor (extractive metallurgy, history of metallurgy)

MATERIALS SCIENCES

Roch Angers, Professor (ceramics, powder metallurgy, rapid solidification, composites)

Michel Fiset, Professor (wear of materials nondestructive evaluation)

Andre Galibois, Professor (phase transformations, martensitic transformations, operations research, engineering economy, hydrogen embrittlement)

Madhavaran Krishnadev, Professor (advanced steels, weldability, stripcasting, metal matrix, composites)

Robert Schultz, Adjunct Professor (superconductivity, amorphous materials, metallic glasses, characterization of solids (TEM, SEM, Auger, SIMS, etc.)

Real Tremblay, Associate Professor (ceramics and composite materials, rapid solidification, powder metallurgy)

Andre Van Neste, Professor (rapid solidification, amorphous alloys, mechanical alloying, consolidation, laser applications in metallurgy)

Tan Vo Van, Associate Professor (structural transformations and mechanical properties of alloys, rapid solidification, welding)