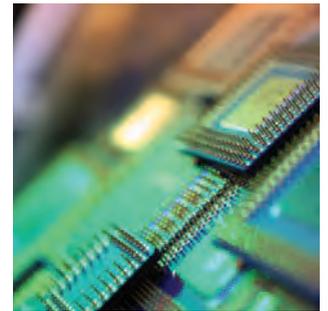
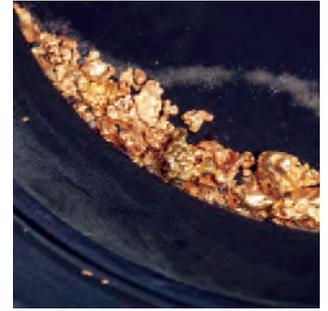


# What Do Engineers and Geoscientists Do?



**A P E G S**

*Association of Professional Engineers  
& Geoscientists of Saskatchewan*

Regulating the professions. Protecting the public.

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# Professional Engineers and Geoscientists

**They use the principles of science to turn ideas into reality. They are involved in every facet of our daily lives ...the cars we drive, the roads we travel, the houses we live in, the natural resources we use and the environment we affect, the communication networks that connect us to the world.**





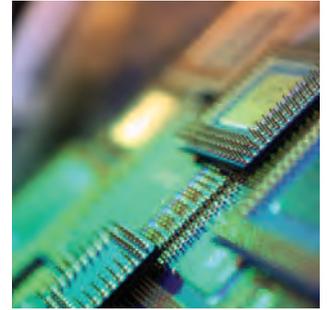
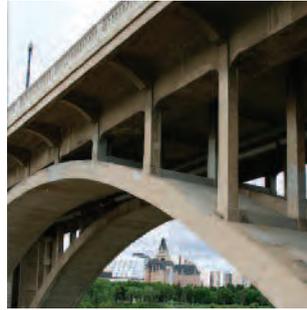
Professional engineers share in a heritage that spans more than 4,000 years, from the great pyramids of Egypt to the ever-changing technology of today.

Professional geoscientists have inherited a curiosity about our planet – its fossils, gems, minerals, and geologic phenomena – that goes back more than 2,300 years.

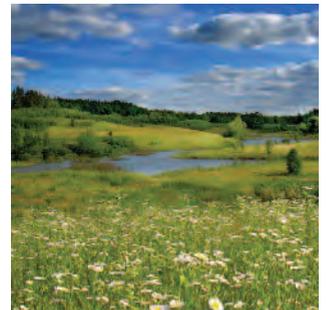
Today, we depend on engineers and geoscientists to build safety into our homes, schools, offices, factories, and mines.

To ensure we have clean drinking water on tap, efficient treatment of wastewater, and electricity at the flick of a switch.

To find new sources of oil, gas, and water. To improve our quality of life and enhance our range of opportunities, all while protecting the environment.



# Engineers...



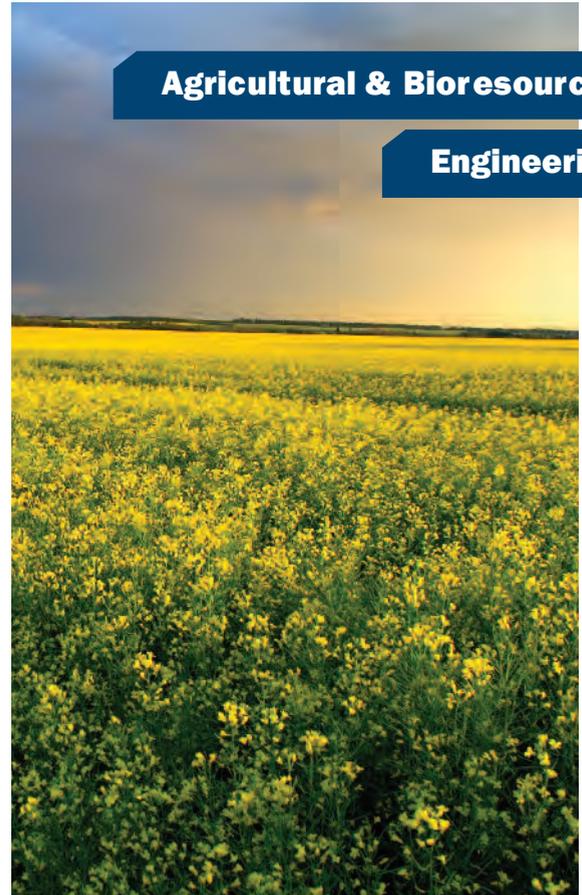
# Help feed the world.

Our world is growing – rapidly. By 2025, the world population is expected to soar from 7 billion to over 8 billion people. A healthy future depends on being able to produce enough food for everyone and protect the environment we live in. That makes Agricultural and Bioresource Engineers absolutely vital.

Agricultural and Bioresource Engineering integrates applied biological sciences with engineering science and design. Specialists in this area find solutions to issues involving plants, animals, and the natural environment. Working on teams and as independent consultants, Agricultural and Bioresource Engineers use their unique expertise in the agricultural and food sectors, in value added processing to generate biomaterials and biofuels, as well as in other resource industries such as forestry and mining.

**Agricultural & Bioresources**

**Engineering**



## **Agricultural and Bioresource Engineers...**

- Develop more efficient machines to seed, harvest and process crops or improve environmental controls for housing animals.
- Work on irrigation projects, finding better ways to preserve foods, and help increase crop yields.
- Develop more efficient processes for making products such as flour, tea, and cooking oil.
- Help find ways to sustain our natural resources by preventing soil erosion and conserving water systems.

## **Help our natural resources last longer.**

Supplies of some of our most important natural resources – oil, natural gas, wood, forests, even water in some areas – are dwindling. With the global population growing, pressure on remaining supplies is increasing. And our environment is being affected by the ways in which we mine, process, use, and dispose of spent resources.

Chemical Engineers are at the forefront of helping to solve many of these critical problems. They apply their expertise in many areas, from developing alternative sources of fuel, to better ways to clean and filter water.

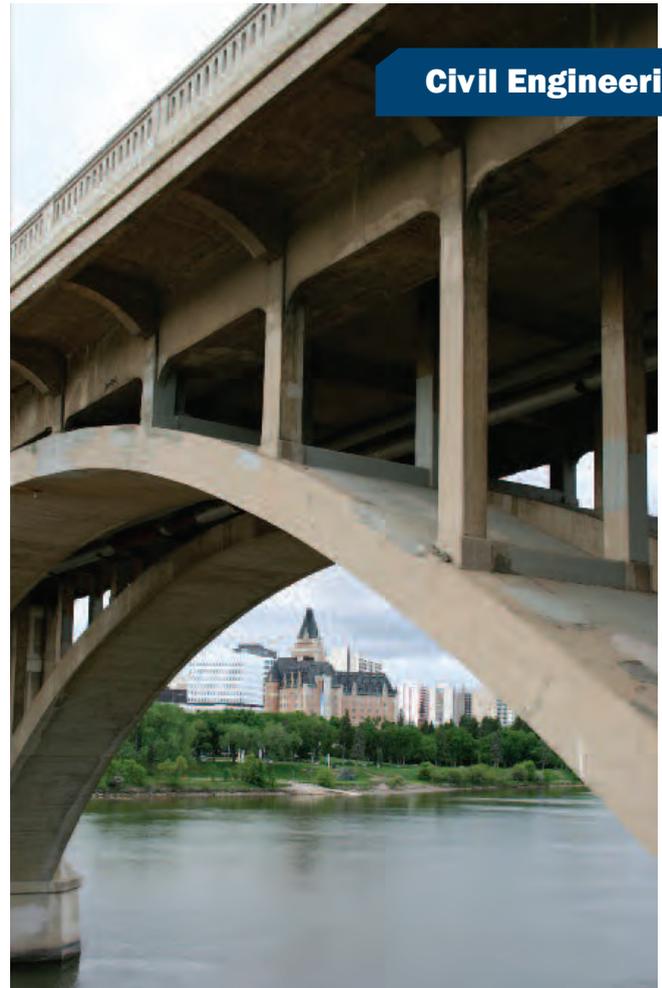
### **Chemical Engineers...**

- Work in petrochemical or biotechnology industries, or in natural resource mining and management.
- Are involved in the development of new medicines, revolutionary new building materials, environmentally friendly food packaging, safer automobile tires, and much more.

# Build bridges to the future.

Civil Engineers design, build, and operate the structures that make up our cities and towns: office buildings, hospitals, schools, hotels, and more. They are responsible for our transportation systems, including highways, streets, railways, and airports. And they design and maintain the municipal infrastructure we all depend on.

Civil Engineers are also stewards of the environment. They use their skills to design and manage secure storage facilities for domestic, industrial, and resource-generated wastes. They are responsible for water treatment systems that ensure safe water supplies and proper treatment and disposal of wastes.



Civil Engineering

## Civil Engineers...

Get involved in:

- Mining, transportation and resource development.
- Designing and overseeing construction of hazardous waste storage facilities.

# Make computers work faster and smarter.

Computer Engineering, also called Digital Systems Engineering, has evolved over the past two decades. Today, the field involves embedding computers in machines and systems, building networks to transfer data, and finding new ways to enhance computer speed, size, and capabilities.

Computer Engineers work with embedded processors, which use real-time operating systems to control external mechanical or electrical systems such as automobile braking systems; digital signal processing, which uses special purpose computers for real-time signal processing such as digital video and music technologies; and logic gate arrays, a rapidly advancing technology used in smartphones.

## Computer Engineers...

- Work with computer scientists to develop new products.
- Work in hardware or software positions or blend the two.
- Work in diverse fields and industries such as automotive, transportation, financial services, computer manufacturing, chemical, consumer goods, and others.

# Help power the future.

Ever wonder how the flick of a switch can brighten your room, power your computer, tune in global radio stations? It's really not that complicated ... if you're an electrical engineer. Electrical Engineers make the generation and use of electrical energy safe, efficient, and reliable. They're also involved in communications, computer engineering, digital signal processing, electronic materials and devices, and instrumentation.

Electrical Engineering is an integral part of our daily lives. From hospital equipment to aeronautical and automobile components, from electronic communication systems to computers, Electrical Engineers help generate a powerful future.

**Electrical Engineering**



## **Electrical Engineers...**

- Work with complex power systems, like those that generate electricity for a whole city.
- Also work with things as small as a semi-conductor chip in a cell phone or laptop computer.

## **Electronic Systems Engineers...**

- Work in aviation, telecommunications, radio and television, oil industry, computer design and programming.
- Work as part of a hardware or software design team, become an entrepreneurial electronics resource for small manufacturers, or move into project management and oversee commissioning of electronic systems.

## **Make a difference in communications.**

Our world is becoming increasingly dependent on advanced technology. Complex electronic and computer systems are now used to handle vast amounts of information and control a wide variety of processes and systems, from industry to telecommunications.

Electronic Systems Engineers design, build, and operate a broad spectrum of products and systems, including telecommunications, industrial controls, and electronic consumer products. But it's not all wires and integrated circuits. 'Systems engineering' also looks at social, legal, and economic impacts.

# Reach for the moon and Mars.

The space shuttle would still be a dream if not for engineering physicists. As the name implies, Engineering Physics combines the skills of engineering and physics. It provides a bridge between pure and applied science. Putting physics to practical use is a challenging job, but the rewards match the efforts.

Engineering Physicists integrate new discoveries in physics and science into the manufacturing and technology sectors. They apply their specialized knowledge and skills in emerging areas of physics, high technology, instrumentation, and communications.

## Engineering Physics



Photo courtesy of International Space Station

## Engineering Physicists...

- Work in the communications industry, the oil industry, or nuclear engineering.
- Study global changes in weather and environment patterns.
- Develop new technology and products for space research, design satellite and payload packages, or get involved in building the international space station.



## Manage our impact on the environment.

Environmental Engineers combine skills from civil, chemical, geological and bioresource engineering to manage our water resources, air quality, and waste. Environmental Engineers work to find solutions to environmental challenges associated with resource and energy development, waste management, urbanization, industry, and other aspects of our modern society. Environmental Engineers are highly trained, flexible, and well positioned to lead teams of engineering and related professionals.

### Environmental Engineers...

- Work in the resource and manufacturing sectors in a variety of settings:
  - Contracting and consulting engineering companies,
  - Non-profit organizations,
  - Municipal, federal or provincial government agencies.

# Keep the environment safe for the future.

The expectations of society and direct pressure from industry have led to demand for unique technical abilities. Environmental Systems Engineers work with interdisciplinary teams to solve a range of environmental problems in urban and remote areas.

Environmental Systems Engineers plan, design, and evaluate solutions for waste management, air quality management, automobile emissions, and alternative fuels, as well as the development of energy alternatives and energy conservation, transportation, and water resources supply and treatment.

## Environmental Systems Engineering



### Environmental Systems Engineers...

- Plan, design, and manage environmental and transportation systems and conduct environmental impact and remediation studies.
- Work in environmental departments in municipal, provincial and federal governments, environmental management organizations, and engineering contracting and consulting firms.

## Geological Engineering

Photo courtesy of www.pnwec.org



## Develop resources and protect the environment.

We live in a world that is dependent on resources extracted from the Earth. Geological Engineers design and manage the processes involved in extracting these resources. They are also aware of the environmental impact and long-term sustainability of the systems they design. Whether drilling for a rural water supply, designing a spoil dump for an open pit mine, or creating a computer simulation of a contaminant plume, Geological Engineers balance the technical, economic, environmental, and social aspects of their work.

### Geological Engineers...

- Work in geotechnical and geoenvironmental areas and are often employed in the mining and petroleum industries.
- Work in a variety of government and industry-related environments from a major city to a field at a remote mine or well site.
- Work in Canada or for international companies around the world.

# Play a part in shaping industry.

## Industrial Systems Engineering

Industry continues to fuel world economies, pushing the boundaries of innovation and productivity to new heights in western societies, and opening the door for economic growth in developing countries. Industrial Systems Engineering plays a vital role.

Industrial Systems Engineers know how to organize and effectively use the total resources of modern manufacturing and process industries – materials, energy, machinery, facilities, people, and capital. Their expertise in the nature, behaviour, control, and monitoring of systems enables them to respond to real-world engineering challenges.



### Industrial Systems Engineers...

- Work in project management, chemical and food processing, energy generation, petroleum and gas industries, automated systems, and advanced manufacturing.

## Mechanical Engineering



## Create a new generation of machines.

Mechanical Engineers tinker, see what makes things work – and make them work better in a wide variety of fields: aerospace, automotive, manufacturing, nanotechnology, biomedical engineering, robotics, space exploration, energy conversion, traditional and alternative energy sources, heating and ventilating, advanced lightweight and high-strength materials, and more.

Mechanical Engineers combine technical expertise with materials, machines, and economics to create new and better products. A career in Mechanical Engineering involves designing machines that manipulate energy to do useful work. Look around you. Any device that involves motion is an example of Mechanical Engineering.

### Mechanical Engineers...

- Design the machines that make our society function.
- Work in different areas designing automobiles, aircraft, artificial hearts, sports cars, and space-age materials, to name a few.

# Develop the world's petroleum resources.

We live in an energy-hungry world. The sustainable, safe, and cost-effective production of petroleum resources is essential to our economic health. Petroleum Systems Engineers evaluate, design, and manage technologies in reservoirs, surface collections, and treatment facilities for oil and gas. This involves advanced computer utilization and automation, combined with effective communications skills. Techniques developed for the recovery of petroleum can be applied to the extraction of other important minerals. Petroleum Systems Engineers also contribute to activities such as pollution remediation and greenhouse gas control.

## Petroleum Systems Engineering



## Petroleum Systems Engineers...

- Work all over Saskatchewan and around the world in energy-based production, oil and gas exploration, drilling and recovery, and surface treatment management.



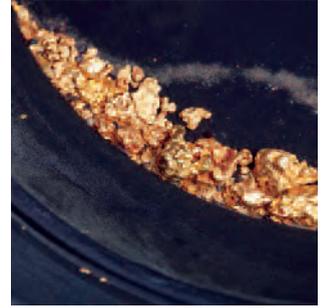
## Build connected communities.

Whether browsing on the World Wide Web, instant messaging friends across the country, or taking care of business via online services, Canadians have quickly made computers and online systems a part of daily life. Behind the scenes, Software Systems Engineers help make it work.

Software Systems Engineering involves the professional engineering and construction of software systems and their life cycle, from web transaction, to management of information, to interactive multimedia systems.

### Software Systems Engineers...

- Create software development tools and do testing.
- Work as computer program architects.
- Design and manage human/computer interfaces.
- Design and construct software.
- Manage software processes.



# Geoscientists...



## **Explore distant worlds right here on Earth!**

It took 100 million years to raise and then erode a mountain; 1 million years to raise sea levels high enough to cover the earth's continents; and 500,000 years to produce enough lava to cover nearly a third of the continent of India. But it took only a few seconds for a 10 km meteorite to ensure the demise of dinosaurs and rise of mammals.

The history of the Earth is written in stone; the study of the Geosciences provides the skills and knowledge needed to read this history and understanding more about planet Earth.

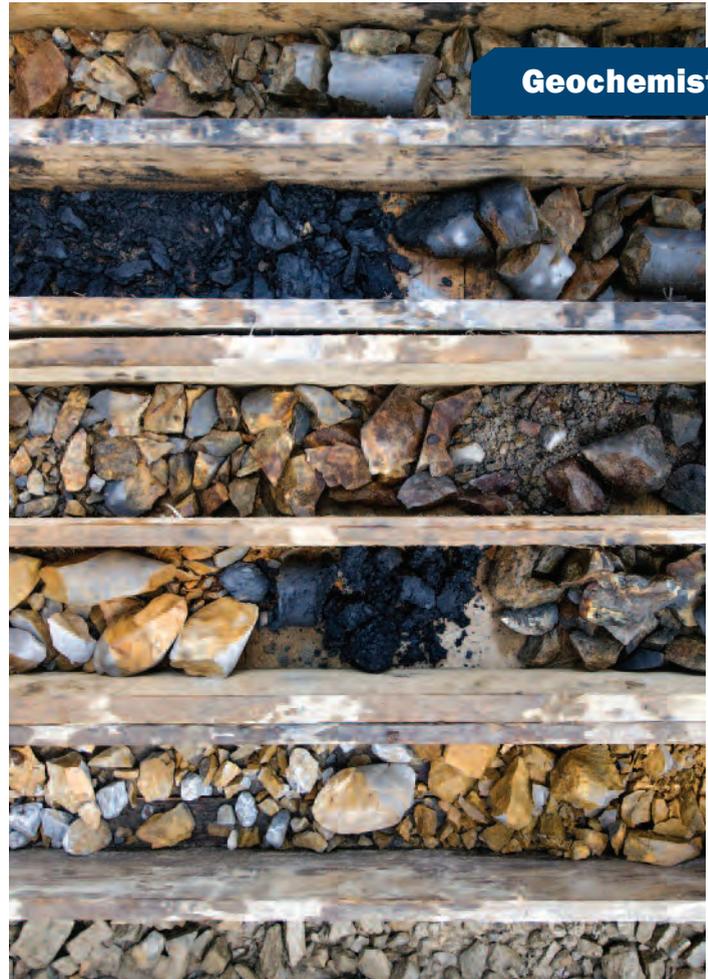
### **Geoscientists...**

- Work in geochemistry, geophysics, geological engineering, hydrogeology, mineral exploration and mining, paleontology, petroleum geology, and quaternary geology.

# Learn the secret language of rocks.

Geochemists are geologists with a fondness for chemistry. They read the chemical messages in rocks and minerals, and use this to decipher how the earth's atmosphere, hydrosphere, and lithosphere interact, or how the earth functions as an organism.

Using natural chemical tracers in rocks and minerals, Geochemists have studied the origin of continents and ocean basins, and the chemical evolution of life on our planet. High-tech instruments enable Geochemists to determine the age of rocks and minerals, including rocks brought back from the Moon by Apollo astronauts. These rocks have stories to tell!



Geochemistry

## Geochemists...

- Work in all areas of the natural sciences, particularly environmental.
- Work as research scientists, environmental consultants responsible for impact studies, field sampling, chemical testing and remediation, or as laboratory managers in a private, government, or university lab.

## Geophysics

Photo courtesy of www.directindustry.com



## Become the eyes and ears of geoscience.

Geophysicists use their unique skills to measure the interior properties of our planet – areas we cannot reach physically. By measuring the earth’s seismic properties and gravity, magnetic and electrical fields, Geophysicists help us “see” inside the earth.

Geophysicists' skills are used to help locate new sources of oil, gas, and minerals ... or give early warning of earthquakes and volcanic eruptions.

### Geophysicists...

- Work in the mining and natural resource industries, in research laboratories, government departments and agencies, private consulting, and teaching.

# Tap the Earth to keep water on tap.

It is estimated that, excluding water in polar ice caps and glaciers, ground water accounts for over 98% of our freshwater resources. In fact, about one quarter of all Canadians and one half of all Saskatchewan people depend on ground water for drinking.

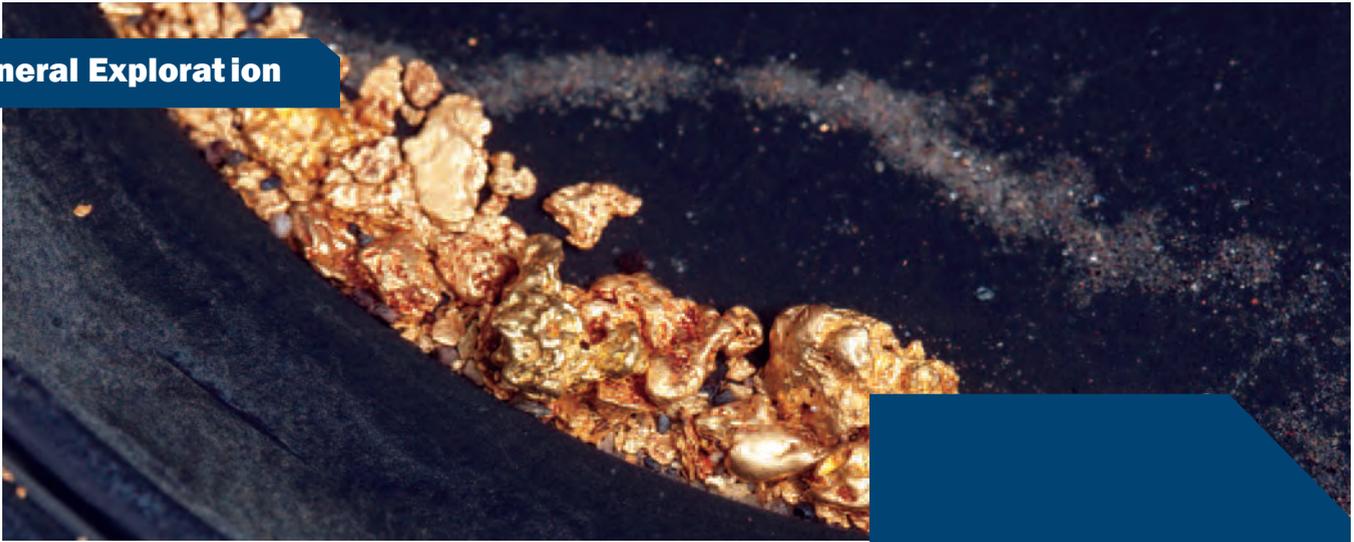
Hydrogeologists study the occurrence and movement of ground water. They play an important role in developing and maintaining healthy water supplies for communities and industries. They help protect workers by controlling groundwater seepage in mines and other industries. They also help protect the environment through development of strategies to prevent contamination of ground water supplies.

**Hydrogeology**



## Hydrogeologists...

- Work in environmental and water supply consulting firms, large mining and natural resource corporations, government agencies, and universities.



## Discover the glitter of gold!

Whether it's the glitter of gold in a quartz vein or a rusty weathered rock surface hinting at a large nickel deposit, Mineral Exploration Geologists use their knowledge to find new sources of minerals.

Mineral Exploration Geologists piece together parts of an intricate puzzle to determine the potential location of mineral deposits. The pieces of the puzzle include things like magnetic or electrical anomalies, the distribution of certain rocks and ores, the ages of these rocks and ores, and any physical or chemical changes they've undergone. By recognizing and understanding these things, Mineral Exploration Geologists are able to identify potential new sources of useful minerals.

### Mineral Exploration Geologists...

- Work with mining and mineral exploration companies in Canada or abroad or in universities or government research organizations.

# Come face to face with T. Rex.

Paleontologists have the opportunity to discover the skeleton of Tyrannosaurus Rex, the huge meat-eating dinosaur that roamed this land 70 million years ago. Or look down a microscope at an intricately shaped foraminifer – a microfossil only 0.3 mm in diameter. Or study 2 billion year old fossils preserved in rock.

Paleontologists study fossils, ancient life forms preserved in rock that tell us much about our planet. By comparing fossils to present day lifeforms, for example, they can study the evolution of life on our planet. Depending on their specialty, they might help interpret the geography and climate of ancient continents, or identify potential locations of oil, gas, and coal deposits.

**Paleontology**



## **Paleontologists...**

- Work in museums, universities, oil and gas companies, and government research organizations.
- Find, prepare, and market fossils to teaching institutions and museums.



## Help fuel our high-energy world.

Every drop of gas and oil you put in your car has to come from somewhere ... Petroleum Geologists are directly involved in finding out where. They are on the forefront of exploring for new oil and gas reserves, and they help ensure effective extraction and use of existing reserves.

To do this, Petroleum Geologists analyze data from surface rocks, geophysical signatures from sub-surface rocks, and even data on seismic activity and pressure changes in given areas. Like a detective sifting clues, they use this information to help determine the most likely locations to explore for new reserves of oil and gas.

### Petroleum Geologists...

- Work as part of a team of geoscientists and engineers for oil, gas and mining companies, in university or research facilities, or in government agencies.

# Unlock the future in ancient glaciers.

Just think, only a few thousand years ago most of North America was covered by large glacial ice sheets, some as much as 3 km thick! This ice is responsible for shaping much of North America's present landscape.

Quaternary Geoscientists study the age of glaciers, when ice sheets advanced and retreated over most of North America, northern Europe, and Asia. They are involved in answering important questions. Why did glaciers grow and advance? Why did they melt away again? Did the earth's climate change cause them to grow? Could it happen again ... and when?

They apply their skills to test for minerals in glacial deposits and reconstruct glacial movement to find new sources of minerals. Their understanding of the landscape allows them to make informed choices about land use, and their knowledge of past climate changes helps the world prepare for any future changes.

## Quaternary Geoscience



### Quaternary Geoscientists...

- Work in natural and environmental geosciences, and mineral and gravel extraction industries.
- Are also field or laboratory scientists, private consultants to industry or government, or university professors.