While *Report on Business 1000* focuses on the performance of shareholder-owned companies, it also contains selected information on Canada's largest private companies, Crown corporations and foreign controlled banks.

Canadian banks as group most profitable in world

Canadian banks as a group were the most profitable in the world last year, according to a London-based company that regularly rates the world's banks.

IBCA Banking Analysis says that the Canadian banks earned an average real return of 10.6 percent on their equity in 1983. Second came the US banks with a real return of 7.9 percent, followed by Japanese banks at 7.4 percent.

British banks were in fourth place with an average real return of 7.0 percent.

Technology

Water knife cuts through metal, bone

A surgeon performing a delicate operation prepares to cut through a section of bone. Instead of reaching for a saw, he uses what looks like a garden hose and directs a high-pressure jet of water at his target.

A worker in a shoe factory guides leather through a machine, where a pencil-thin jet of water cleanly slices it to the pattern desired.

Scientists at the National Research Council (NRC) in Ottawa are hoping that such events will soon become commonplace.

After working with high-pressure water jets for the past ten years, they have developed cutting methods that work on everything from ice to plastic to fur. An extra-strong blast of water will even bore through rock.

The water-knife or water-laser is based on nothing more sophisticated than the idea that pressure moves objects. Blasted through a tiny opening in a nozzle, the water becomes a narrow, high-powered slice of liquid that cuts through its target.

Already, HDRK Mining Research Corp, a creation of four major Canadian mining companies, is experimenting with the technique for mining in the Canadian shield.

One of General Electric Co Ltd's plants now has robots cutting out car parts with thin jets of water. And Bata Shoes Ltd of Batawa, Ontario, is studying the feasibility of using high-precision water jets to cut the leather shapes used in shoe manufacturing.

Also, University of Ottawa medical researchers recently tried using water jets to cut through bone. Preliminary studies showed that the normal Stryker saw used in osteotomy – bone surgery – can cause heat damage to the bone through friction. The water does not cause this problem.

New robot eye for simple tasks

A psychology professor at Memorial University in St John's, Newfoundland, has designed an eye for a robot that is less expensive and more efficient than any existing system.

What makes the system different is that it can see like the human eye. In other words, it can recognise shapes at a glance, and does not have to waste time filling in the whole picture.

Robots are already doing some detailed visual jobs better than any human could – for example, inspecting an object for cracks. However, until this new system was developed, there were no low-priced robots that could do *simple* visual tasks as rapidly or as cheaply as any human could – for example, distinguishing between a connecting rod, say, and a crankcase cover.

Dr Michael Zagorski, who developed the eye, says his system would be limited to locating and recognising objects a human can locate and recognise at a glance.

'This would be useful in applications where the robotic system is being explicitly designed to replace people who have to recognise objects on, say, a well-lit assembly line.'

Existing systems do not have a simple and fast way of describing non-geometric shapes.

'Instead, they describe shape by describing all the points,' Dr Zagorski says, 'so that they have a video display that has a resolution of 1000 by 1000. Then they describe the shape, if it's black on white, or white on black, by listing 1000 times 1000 points.'

But this is complicated, costly and time-consuming – and unnecessary for simple tasks, Dr Zagorski says. He believes the solution to the problem of defining shape, like the problem of defining colour, is to be found in copying human visual processes.

Psychologists have discovered that the eye has three colour receptors – one for each primary colour. Hence, colour can be defined in three numbers – one each for red, green and blue.

By means of a mathematical model he developed in 1975, Dr Zagorski says he can analyse complex shape images into 20 dimensions. He will not disclose the technique because his patent search is not completed.

Using 20 numbers to calculate an outline would involve well under 1000 multiplications, Dr Zagorski says. This means the shape analysis can be done instantly on a computer.

Medicine

Detecting the cause of muscular dystrophy

An important step forward in the search for a gene that causes the most common and severe form of muscular dystrophy has been made at the Hospital for Sick Children in Toronto.

Researchers have found a way to zero in on the gene, which so far has defied detection despite intense efforts by scientists in many parts of the world. The discovery may provide a better way to determine whether some women who risk having children with the disabling condition are carriers of Duchenne muscular dystrophy, Dr Ronald Worton of the hospital's department of medical genetics says. It may also help detect muscular dystrophy in a foetus.

It is not known how the gene causes muscular dystrophy, but Dr Worton says it is believed the gene instructs a cell how to make a muscle protein. If the gene is not working, that protein is lacking and muscles weaken and shrivel.

The debilitating disease, which causes sufferers to fall frequently and have difficulty standing and climbing stairs, typically affects boys and often leads to early death.

Computer-linked device pinpoints knee problems

A new diagnostic device, researched and developed in Montreal, is helping physicians to assess knee injuries, many of which are sports-related.

The device, called *Genucom*, incorporates computer-based diagnostics which give the examiner a complete clinical description of the patient's knee disability, during both active and passive knee motions.

The Genucom was researched and developed in Montreal by FAR Orthopedics, Inc, a company that specialises in the development of computerised orthopedic equipment.

Culture

International prize honours Glenn Gould

An international Glenn Gould Prize for distinguished contribution to music and communications has been established by the Glenn Gould Memorial Foundation.

The $50 000 prize, in memory of the late Canadian pianist, will be awarded every three years. The first prize, which also includes a commemorative work to be commissioned from a Canadian artist, will be awarded October 4, 1987, the fifth anniversary of Gould's death.

An international jury to select winners will be chosen jointly by the Canada Council and the Glenn Gould Memorial Foundation.

Glen Gould

People

Canadian wins Leeds competition

Jon Kimura Parker from Vancouver has won the 1984