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The Spirit of Invention

From the Stone Age on, invention has been one of the great occupations of mankind. It has brought us immense benefits, but it has also brought problems in its wake. The question is how to make invention work in our best interests, knowing that it will never cease . . .

□ One of the toys that Canadian stores will be displaying this Christmas shopping season is a little auto that runs on "top" or "gyro" power. You simply roll the wheels of the toy car by rubbing them swiftly along the floor; this in turn imparts a spin to a fly-wheel made of lead hidden inside the miniature vehicle. Because of the relatively heavy weight of the fly-wheel, it will maintain its rotation for a long enough time to drive the little car around a room — a feat accomplished without benefit of a spring motor or electric battery.

The device is an inventive application of the spinning and stabilizing force of a top, and the ability of a fly-wheel store energy. These phenomena have been known for centuries, and have been put to use in many different ways. The top goes back to ancient times, to the playgrounds of Greece and China. Its more complex cousin, the gyroscope — a device that seems to defy the force of gravity in some of its tricks of balance — has led to such no-nonsense inventions as the gyro-compass, gyro-pilot and the gyro-stabilizer, transportation aids which an airline or shipping company would have difficulty getting along without.

It is not surprising that many inventions have had their roots in toys. That whimsical zeal and freedom from practicality that impels a creative person into designing a delightful plaything would also appear to open new avenues to a mind striving to cast aside the restraints of convention, and seeking to create useful new things.

Toys not only anticipate future machines and devices, but reflect the current state of technology. Small boys in Canada play with toy space rockets today, just as small boys in Paris played with balloons after the Montgolfier brothers made their first balloon flight in 1783.

The world has always revelled in the wonder of invention. The ability to invent — a universal characteristic of mankind through the ages — is an attribute that has enabled people to adapt to various environments to improve their living standards. Through invention, man has tamed fire, electricity and the atom, discovered the fundamentals of mechanics and chemistry, learned to record his thoughts in writing and pictures, and has made some of civilization's most admirable creative thrusts.

Invention is usually defined as a creative effort that is embodied in physical equipment. It is, of course, closely linked with scientific discovery — finding out what nature already holds. Inventions themselves are not confined to new devices. They may be improvements or ingenious combinations of existing things.

In a sense, the application of a principle used in a toy to the workaday world may only be a kind of improvement on the original idea. The steam engine, a favourite subject for those who study invention, had its roots in an ancient toy invented by Hero of Alexandria. The device consisted of a small hemispherical container of water suspended over a flame. The steam that blasted through small jets in the sphere made it spin.

Oddly enough, Hero's gadget failed to stimulate any significant development of the steam drive

principle until the late 17th or early 18th centuries. These long-delayed practical experiments culminated in the invention of the modern condensing steam engine by a Scottish engineer, James Watt, who patented it in 1769.

Not all of the great inventions had whimsical roots, yet Canadian patent records seem to bear witness to many fanciful turns of mind pursued by this country's inventors in an earlier era. In 1889, for example, a lady in Calgary invented a mechanical skirt-lifter designed to raise her hem discreetly as she crossed a dusty street.

If inventive skill is any measure of national accomplishment, Canada has justification for a great deal of pride. The Canadian patent office has a list of impressive inventive contributions dating as far back as 1791 when the Governor General in Council granted a series of patents for a process to make potash. Since then, Canadians, or Canadian residents, have broken new inventive ground in such fields as transportation (snowmobiles, hydrofoils, short take-off and landing aircraft), food and agriculture (harvesting machines, the pre-cooked cereal known as Pablum, early ripening and disease resistant wheat), and communications (the telephone, the AC radio tube, and the wirephoto).

Some other less publicized but still important inventions made in Canada were kerosene in 1846 by Dr. Abraham Gesner, of Halifax, N.S.; the first controllable pitch propeller in 1927 by Wallace Robert Turnbull, of Rothesay, N.B., and the first panoramic camera in 1887 by John Connor, of Elora, Ont.

There is no such thing as a genuine single inventor

J. J. Brown, a Canadian author who has written several books on invention, observes that Canadians have made contributions to world science and technology out of all proportion to their numbers. He complains, however, that many good ideas have been taken abroad for development, a shortcoming that can be remedied in the future by more public and official recognition of the Canadian inventor and his ideas.

In a broader sense, it is evident that good ideas are not confined to geographic boundaries. Brown notes that "there is really no such thing as a genuine single inventor who is uniquely responsible for a particular invention. Every man stands on the shoulders of his predecessor". Lord Ernest Rutherford, whose experiments at McGill and Manchester universities in the early 1900s yielded evidence as to the hidden structure of the atom, used to say that "science is international, and long may it remain so". The same could be said for invention.

The record of invention around the world proves the universality of innovative thought. It is common for similar developments to be born in different countries at the same time — simultaneous invention, as it is called. It is not as coincidental as it might appear; inventors are bombarded with the same stimuli of daily life as the rest of us. Up-to-date reports of developing technology tend to spread quickly, so it is only reasonable to expect creative minds to pounce on what is most interesting and pursue similar lines of exploration. No wonder the history of invention is shot through with litigation and prior claims.

Little would have resulted without the entrepreneur

If a museum of simultaneous invention were ever founded, it would, as Brown has suggested in his book *Ideas in Exile,* "show how the electric light, the telephone, sound recording, calculus, anaesthesia, jet propulsion, the airplane, topology, non-Euclidian geometry, the theory of evolution, were all discovered in different parts of the world at about the same time."

One might put it down to the old saying: Great minds think alike. There is, however, disagreement among observers of innovation as to the need for a "great mind". One school of thought puts the emphasis on the correct preconditions, the events and developments that will inspire invention. Technical advancement in one field is frequently dependent upon technical progress in another. It has been said that if Watt had invented his steam engine earlier, machines to produce the metal parts would have been available earlier too.

Whether or not, or when, the condensing steam engine would have been invented if Watt had not been on this earth is a hypothetical question which can never really be settled satisfactorily. Yet it does seem clear that without the business backer or entrepreneur, very little would have resulted from his deed. The role of men named John Roebuck and Matthew Boulton in the story of the steam engine should not be forgotten. It was they who provided the capital and business know-how to make Watt's machine a success.

Inventors are often characterized by their persistent, and often vain, efforts to win support for their brain-children. Not only do they seek direct financial backing, but public recognition of their ingenuity. What inventor has not had to combat social resistance to change, to new ideas and new ways of doing things? The history of invention and technology is full of examples. While one part of society has been innovative, adept and daring, another part has been conservative, protective and fearful. The Wright brothers were ridiculed after their first attempts to fly. In the 18th century Scottish engineer Andrew Meikle, a miller who invented an improved windmill and threshing machine, drew sharp criticism for his fanning mill. Country people regarded grain cleared by it with suspicion, and some clergymen argued that "winds were raised by God alone, and it was irreligious for man to attempt to raise wind for himself".

When industrial innovation first developed in Europe, opposition came from those whose lives and work were still stratified under the rules of medieval trade guilds. Workers feared, often quite correctly, that the new machines might dispossess them of their jobs.

One of history's most famous anti-technological reactions took place in the early 19th century when the Luddite movement arose in Nottingham and neighbouring districts in England. Named for a real or legendary man known as Ned Lud, the Luddites launched machine-breaking riots, an ostensible protest at the poor quality of goods produced by the new machines.

The movement spread through parts of Europe during a depression that followed the Peace of 1815 and a serious crop failure. It came to an end after severe repressive legislation was enacted, and after prosperity gradually returned.

There is no doubt that, today as then, the introduction of modern inventions and new technology exposes society to some disruption and displacement of the work force. Indeed the effects of new technology are transmitted much faster in this age than they were in the past.

While the practical application of the steam drive principle had to wait some 1800 years, modern society translates invention or discovery into application in a matter of a few years. Sometimes this happens too fast for society to adapt.

Can the soft sciences keep pace with the hard sciences?

The narrowing time gap between invention and application can have socially and environmentally damaging effects. For example, DDT was hailed as the world's most effective pesticide, and was used liberally for many years before there was any true understanding of the complex damage it caused to the ecology.

The problem of unemployment due to technological change is said by some to be a failure of the social or "soft" sciences to come up with innovations of their own to match the advances of the physical or "hard" sciences — to invent such social devices as unemployment insurance, for example, to maintain economic stability in a community until new jobs are eventually created. The ideal is to let innovation solve the problems of innovation. An admirable goal, of course, but difficult to achieve.

Even forecasting the use that will be put to an invention or discovery is an effort fraught with pitfalls. The ebullient Lord Rutherford, often called the father of the nuclear age, assessed the possibilities of nuclear power in an interview with the New York *Herald Tribune* in 1933: "The energy produced by breaking down of the atom is a poor kind of thing. Anyone who expects a source of power from transformation of these atoms is talking moonshine."

Thomas Edison was more on target when he forecast some of the possible uses for the phonograph, which he invented in 1878: music, dictation, and talking toys. But it is doubtful that Edison foresaw the growth of the recording industry into what it is today. That would be too much to expect.

Edison got the idea for the phonograph while placing a disc of paper in a telegraph repeater, a machine used for transmitting telegraph messages. He noted a faint musical note coming from the revolving apparatus and built a machine to explore the quirk. This bit of luck known as serendipity — the happy accident — is not all that uncommon in the field of invention. Charles Goodyear discovered vulcanized rubber after accidentally dropping a mixture of raw rubber and sulphur on a hot stove.

Despite team invention, we still need those great minds

Modern inventors cannot simply rely on luck. It is common for them to work in large research laboratories as mission-oriented teams which use the most methodical methods possible. Lone inventors find it more difficult to tackle the immense jobs which enlargement and complication of science and technology necessitate.

Nevertheless, there remains a demand for great minds, geniuses with a flare for new ideas which can be embodied into machines and new processes. They still provide the seeds from which modern "team" invention may grow.

Despite the problems of social acceptance of new developments and the disruptions sometimes caused by them, the pattern of invention and technology has been that of man's victory over adversity. At the same time, the diversity of invention has matched the challenge of a variety of environments. To some extent all of us have to show inventive skill to cope with our environments, whether it be finding a more convenient way of working, devising a computer program, modifying some household appliance to suit a special purpose, or concocting a new recipe. Invention, therefore, is a fact of life which is all around us. It cannot be avoided or ignored.

Mankind cannot shun the computer, the jet engine and the communications satellite and retreat back to cottage industry. As John Dewey, the U.S. philosopher, psychologist and educator, once said: "There is no greater sign of paralysis of the imagination than the belief, sedulously propagated by some who pride themselves on superior taste, that the machine is the source of our troubles . . . it is hard to think of anything more childish than animism that puts the blame on machinery."

The onward push of technology is much more powerful now than in the social environment of the first half of this century, during which Dewey lectured. There are, for example, worrisome trends of invention and research in the fields of weaponry and genetic engineering. There is new concern about the environmental damage and waste of resources which invention may bring in its wake.

The Frisbee may presage the flying saucers of tomorrow

It all comes down to how mankind's intelligence and imagination are put to use, how society will employ its collective wits to avoid the dangers inherent in new things, and how nations can enjoy the fruits of invention in a way that will meet social as well as immediate practical goals.

If history is any guide, mankind will go on to invent ever more new gadgets and machines. Toys will continue to reflect current technological advances, and lead the way to future inventive pursuits. The Frisbee may presage the man-carrying flying saucers of tomorrow. The toy robots becoming popular with children today may be a first step towards designing and marketing of cheap household robots. That toy car with the gyro-fly-wheel drive could well be a predecessor of a widely used fly-wheel power system for buses and subway cars.

From the cave-men on, each age has had its own fascination with invention. It has proved to be an integral element of the spirit of human kind. Let us in this age take joy in its discoveries, while at the same time ensuring that they will be used in a responsible manner to build a better life in the future. Let us learn to live comfortably with Man the Inventor, for he will be with us until the end of time.

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