Mystery of night lights explained

One needs only to view the lights which trip and dance through the night skies in the northern latitudes to appreciate their fascination.

Nonetheless, the degree of international scientific co-operation the Northern Lights have engendered is surprising. Especially when such co-operation is, says Dr. Gordon Rostoker, "as difficult on the scientific scene as on the political one." And one gets the impression that the University of Alberta physicist speaks from experience — likely experience gained as a member of the steering committee of the latest international effort to unlock the secrets of the Northern Lights, the International Magnetospheric Study.

In many respects, says Dr. Rostoker, the IMS, begun in 1976 and ending this year, is a follow-up to the first international co-operative look at the Lights, the International Geophysics Year of 1958.

The current co-operative effort involves 40 countries contributing data from satellites and from ground-based monitoring equipment. "Our lab is the world," says Dr. Rostoker, explaining that the study of a phenomenon such as the Northern Lights has to involve people all over the world; it is not something one country alone could do.

But why such an interest in the Northern Lights? Dr. Rostoker explains that there is energy around us in different modes; we are all familiar with the energy transferred from the sun to us by "good, old, ordinary light," but, says the geophysicist, energy from the sun is also brought to us via a wind of charged particles which brings the magnetic field of the sun "kicking and screaming behind it." As they approach the earth the particles are greatly accelerated and it is their knocking about that creates the Northern Lights.

"By following the Lights, we can say something about the entire phenomenon," says Dr. Rostoker. He also notes, as a matter of interest, that the physics involved in understanding the Lights is the same as that involved in nuclear fusion research — the same processes that create the Northern Lights go on inside the fusion reactors that scientists hope to develop to provide a more or less infinite supply of energy for the world.

While Dr. Rostoker doesn't view the energy at work in the Northern Lights as being harnessable, he says that it can have implications for mankind, especially as man becomes increasingly active in the North and in near space. There is evidence that electric currents induced by the magnetism associated with the Lights can have adverse effects on pipelines and powerlines built in arctic regions and on orbiting spacecraft, especially those such as communications satellites which remain stationary relative to a point on the earth. And there might even be some relationship between the Lights and the weather, on a long-term basis.

Canada's contribution to the IMS consists of ground based monitoring; the Western Canadian base for that monitoring and the focal point for Canada's involvement is the University of Alberta.

The important role being played by the University is not surprising, given the pioneering work done at it by Dr. Rostoker and his colleagues. They were the first to use co-ordinated arrays of magnetometers to monitor the magnetic activity of the Lights. Dr. Rostoker says that, previously, magnetometers, devices used for detecting magnetic fields — the detection devices used for airport security are magnetometers — were located randomly; the University of Alberta researchers were the first to place the magnetometers at regular intervals along a line of latitude. He and his colleagues were also the first to record the information gained at the monitoring stations digitally on magnetic tape; this improvement over the older mechanical tracing method allowed the University of Alberta group to do in one night analysis which previously might have taken two years. As a result, "we had the field to ourselves for quite a few years," says Dr. Rostoker. Now other groups are also recording digitally.

The IMS is to end this year, but that doesn't mean that the work associated with it will. Scientists will be working with the information gained from it for a long while as they try to piece together the puzzles of the Northern Lights.

photo Russ Sampson

Energy from the sun brings the magnetic field in tow. Charged parties accelerate and form the Northern Lights.

The science page is a biweekly feature in the Gateway. Contributions on any aspect of science and society are welcome. Contact Julie Green, room 282 SUB 432-5168, with your ideas.

Clothes conscious

by Maggie Coates

When you go out to buy clothes, do you ever wonder if they are flammable?

Dr. Betty Crown, of the clothing and textiles division of the Faculty of Home Economics, and Dr. Sheila Brown of the Department of Marketing and Economic Analysis in the Faculty of Commerce, have found that because federal regulations on textile flammability exist, people assume all textiles are safe.

But just because textiles meet a standard doesn't mean they won't burn, they say.

Drs. Crown and Brown say that in order to make the regulations more effective, a certain level of consumer awareness is necessary. As well, it's necessary to know how important those regulations are to consumers, because there are a lot of trade-offs.

Banning highly flammable textiles reduces choice in the market. Also, adding flame retardants affects the harshness of textiles, the ease of their care, and their price.

Thus, consumers often ignore the question of flammability, they say.

With this in mind, Dr. Crown and Brown conducted pilot experiments using blanket and upholstery samples which varied according to price, flame retardance, laundry instructions and comfort. Dr. Crown says that more stringent regulations are needed in this area.

Consumers from the university population were asked to rank samples according to the ones, they would most likely buy. Also, a larger sample of consumers were mailed blanket samples and asked to do the same.

In that pilot study Drs. Crown and Brown found consumers did not value flame retardance in blankets and upholstery. This is in contrast with findings from studies using clothing, especially children's clothing. Dr. Crown says people may be more conscious of the danger of fires in bedding and furniture.

Textile flammability studied

In the project's second phase Drs. Crown and Brown hope to sample more people acorss Canada by mail. However, they say a lot depends on whether they can get funding from the Ministry of Federal Consumer and Corporate Affairs.

The important aspect of this project is it doesn't rely on consumers' stated attitudes, but their actual behavior says Drs. Crown and Brown.

A lot of work, much of it interdisciplinary, has been done in this type of consumer research in the last decade, they added. The results of this research are being used to design meaningful consumer education programs for the general public.

Dr. Crown says there is a great need for such programs right now.

relative perspectives

by W. Reid Glenn

It had been postulated by early Hindu priests, over two milleniums ago, that the world and all its elements were constructed from different atoms. Now until the late nineteenth century, however, had man's scientific apparatus advanced to a point where such theories could be actually investigated.

One of the early investigators of the structure of the atom was Ernest Rutherford, a New Zealander who spent a portion of his research at McGill University in Montreal. His pioneering work in Canada led to the Nobel Prize in chemistry in 1908. Subsequently, he transferred to Cambridge, England where he spent the rest of his life advancing our state of knowledge in atomic physics.

Alongside such discoveries into the physical structure of the atom were corresponding mathematical theories which supported and explained the laboratories' results. Many physicists such as Bohr, Einstein and Planck developed then-radical theories which profoundly shaped our perception of the universe and its basic building block, the atom.

Hitler's rise in Europe greatly influenced the development of atomic power from 1935 onwards. Many scientists such as Einstein and Fermi, fled from Fascism in Europe and settled in Britain and the United States. In late 1939, Germany overran Belgium and acquired her large stocks of uranium from mines in central Africa.

Einstein was abreast of the quickening pace of atomic research and was fearful that Germany, with these stockpiles, could develop nuclear power first. Einstein's letters to Roosevelt in August and October, 1939 eventually resulted in the "Manhattan" project; a top secret military program which developed the first atomic weapons. Great Britain was also aware of this threat and wished to join efforts with the US to accelerate atomic development.

The United States government was fearful of information leaks through the many exiled scientists which Britain was employing on her nuclear program and so initially turned down this offer of assistance. However, in the early 1940s, the only producing uranium mine in the free world was in the Canadian North West Territories, at Radium City on Great Bear Lake. This mine's output was contracted by the US government but Canada informed the US that unless multinational development of atomic power was instituted, the US wouldn't receive any more uranium shipments.

Soon the "Manhattan" program involved all the Allies, except the USSR, and results were forthcoming. In 1941, Enrico Fermi, in Chicago, supervised the construction and operation of the first nuclear pile. Four years of secret research and development later saw the explosion of the first atomic weapon on July 16, 1945 at Alamogordo, New Mexico.

This first plutonium bomb was followed by the first uranium bomb over Hiroshima on August 6 and the second plutonium bomb near Nagasaki a few days later. The war with Japan was over by the middle of the month. The war brought Britain, Canada and the United States over the threshold of nuclear power; afterwards they embarked on their own development.