OBSERVING THE RADIO UNIVERSE

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A few months ago, a strange problem arose at the observatory. There were periodic bursts of intense interference that had never been encountered before. Because radio telescopes operate at extreme levels of sensitivity, using them effectively involves vigorous efforts to control interference. The problem had to be found, and when it was, revealed a new class of potential challenges.

To illustrate the sensitivities required for modern radio astronomy, imagine a cell phone on the Moon. The signals reaching us from it would be far stronger than any cosmic radio emissions we receive. Of course, if you are marooned on the Moon, this could be useful. The 26m-diameter dish at the observatory could pick up that cell phone if it were on Mars, although a conversation with anyone on the Red Planet would be impossible.

It is food for thought that the first radio telescope, an instrument specifically designed for detecting cosmic radio waves, was built in the yard of a suburban house in Wheaton Illinois, back in the late 1930's. Today radio astronomy from that location would be pretty well out of the question. Since those early days, the use of digital and radio transmission devices has risen astronomically, and in most cases we don't even think of what we are using as radio devices. Our smart phones are radio devices; so are our blue-tooth headphones. In addition, any time we switch an electric current on and off we generate pulses of radio waves. Light switches are a simple example. Digital devices such as computers and smart phones switch electrical currents on and off billions of times a second, making then excellent sources of radio

interference. As an experiment, put a radio tuned between stations next to your computer. You will even hear the interference change when accessing data on the hard drive. The latest potential threat is the launch of tens of thousands of satellites providing global Internet access, which of course involves radio transmitters on the satellites, sending data to the ground.

The situation is actually not quite as dark as it might appear. There is a national and international process by which the radio spectrum is shared out between users. This is how you avoid having your smart phone messing up your TV and the microwave oven (which has a transmitter in it) taking out your home Wifi system.

The UN has an agency called the International Telecommunication Union, of which Canada and almost all other countries are members. Through its meetings the needs to accommodate new radio services without messing up existing radio services are dealt with. Radio Astronomy is an internationally defined radio service, just like remote environmental sensing from spacecraft. While these services don't transmit anything, they are vulnerable to possible interference by other services, so this has to be taken into account when new services are set up, or existing services extended. This of course means that radio astronomers have to be involved in these conferences and meetings, If our science is important to us, we are obliged to do our share of the work in protecting it and ensuring it has a future. Sometimes it is exciting, or even stressful. Most of the time it is neither of these. However, it is a humbling experience to be sitting in a meeting room in Geneva, behind a card saying "CANADA".

It turned out that the strange bursts of interference were coming from someone's new car. It was periodically transmitting data to its masters out there somewhere. This system was switched off, and the interference vanished. As we become more and more connected, encounters with problems like this will increase. We will have to make sure we stay on top of things.

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