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May 2, 1988

Grote Reber
General Delivery
Bothwell, Tasmania
AUSTRALIA, 7030

Dear Sir:

I was really very happy to receive your nice letter and have finally succeeded in getting the subsequent articles. I trust you will enjoy them; I know I did.

What changes have taken place since 1939.

As usual, my very best wishes to you and congratulations on your 50th anniversary of your inventions.

Yours very truly,


(Miss) R. Parmeter
Assistant Branch Manager

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 * REQUESTED -020000216.2406 1 DOCUMENTS
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 * DATABASE NAME -T88 (TORONTO STAR)
 * USER NAME -NEWS ROOM 2
 * USER ACCOUNT -00002/004
 * QUERY -GROTE AND REBER
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DB = T88 DOCNO = 5297

DATE: January 23, 1988 LENGTH: 0548
 PAGE: M3 CLASS: MAGAZINE EDITION: SA2
 SOURCE: By Terence Dickinson
 PLACE:
 ILLUSTRATION: Photo*Grote*Reber*with reconstruction of his telescope
 MEMO:

First radio astronomer
 was backyard amateur

Today, hundreds of astronomers scan the heavens with giant radio telescopes capable of recording invisible radiation from celestial gas clouds in far-flung galaxies or measuring clock-like pulses from twirling neutron stars. Towering as high as a 10-storey building, a modern dish-shaped radio telescope moves with the precision of a timepiece and detects the natural whispers of the universe that reach Earth in intensities measured in millionths of a billionth of a watt.

But 50 years ago there was only one radio telescope on Earth. And it was not located at an isolated observatory, nor was it operated by a university astronomy department. It was a humble lattice of 2 by 4 lumber supporting a 31-foot diameter dish made from 45 pieces of sheet metal. It sat like a colossal bird bath in the suburban Chicago backyard of*Grote*Reber,*an electrical engineer and amateur astronomer.*Reber*designed and built it himself in 1937. It was the prototype radio telescope; most modern ones are scaled-up versions of*Reber's*original design. During the next two years he used it to make the first radio map of the Milky Way.

Before he built the telescope,*Reber*had written to all the top astronomers in America suggesting that they be the first to build a radio telescope, and that he, with his background in designing radio receivers, could provide the expertise. Nobody was interested. "They all turned me down,"*Reber*recalled at a conference recently, "so I did it myself."

For nearly a decade*Reber*was the only radio astronomer in the world. When he submitted his discoveries in a research paper to the Astrophysical Journal in 1939, the editor couldn't find a single scientist qualified to check it. "The astronomers

couldn't understand the radio engineering and the radio engineers couldn't understand the astronomy,"*Reber*says.

To the editor's credit, the article was published and is now a landmark in 20th century astronomical discovery.*Reber*was the first to intentionally map the sky's radio contours, although a few years earlier a Bell Laboratories engineer, Karl Jansky, had detected radio transmissions from outer space rather than natural low-temperature emissions from the Milky Way.

*Reber*read about the discovery in the newspapers and heard Jansky interviewed on radio. Jansky soon went on to other research at Bell Labs, but nobody picked up the ball. That's when*Reber*started writing to the observatory directors, got frustrated and did it himself.

*Reber*is now 76 but far from retired. He is currently working on frontier radio astronomy projects at the Herzberg Institute for Astrophysics of the National Research Council in Ottawa. A few weeks ago radio astronomers from across Canada and the United States gathered at the Herzberg Institute to celebrate the 50th anniversary of*Reber's*telescope and his subsequent detection of the Milky Way's "cosmic static," as he called it at the time. John Kraus of Ohio State University said*Reber*was "the right person in the right place at the right time doing the right thing. He was a one-man self-supporting scientific lab."

Even today*Reber*is involved in a research area everyone else is ignoring. This time it is long-wave radio astronomy. More about this in next week's column.

KEYWORDS: The Universe column

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 * QUERY -GROTE AND REBER
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DB = T88

DOCNO = 7011

DATE: January 30, 1988
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 SOURCE: By Terence Dickinson
 PLACE:
 ILLUSTR:
 MEMO:

LENGTH: 0539
 EDITION: SA2

Grounded shuttle still useful

EVEN though the space shuttle has been grounded for over two years, scientists continue to glean information from missions flown before the Challenger disaster. A flight of the Challenger in August 1985, provided an opportunity for radio astronomy pioneer*Grote*Reber*of the National Research Council's Herzberg Institute of Astrophysics in Ottawa to test an idea he has been experimenting with since 1955.

*Reber*built the first modern radio telescope in his backyard in Wheaton, Illinois in 1937. Since 1947 he has worked at radio astronomy observatories in the United States, Canada and Australia. He is 76 and still going strong, always looking for new challenges.

His shuttle experiment revolved around the well known natural blocking of long-wave radiation from space by the Earth's ionospheric layer. This layer also prevents certain radio frequencies from escaping; instead, they are reflected back, allowing radio stations to broadcast over the horizon.

How does the space shuttle fit into this? It so happens that the ionosphere is affected by the space shuttle's small manoeuvring engines used to adjust the spaceplane's orbit. If fired at the correct altitude above Earth, the exhaust from these engines can produce holes in the ionosphere for a few hours.

Apparently the exhaust gases (water, hydrogen and carbon dioxide) temporarily neutralize the natural electrically charged particles that make up the ionosphere.*Reber*figured that if he was under one of those holes with a long wave radio telescope, he might pick up radiation from space that had never been detected before.

And that's just what happened. On August 4, 1985, when

Challenger was cruising over the University of Tasmania's radio telescope near Hobart, Australia, a quarter ton of fuel was purposely fired through the manoeuvring rockets, opening a hole for*Reber*to detect radiation from space at 1.7 megahertz. This was the first time such radiation has been recorded. The experiment is written up in detail in the November 27 issue of the technical journal Science.

The incident reminded*Reber*of what happened 50 years before when scientists expressed no interest whatever in his idea of detecting radio wavelength radiation from space using a dish-shaped antenna. He eventually built the world's first radio dish telescope in his backyard and mapped the Milky Way with it in the late '30s.

Apparently his shuttle experiment met with the same indifference. "The experts told me the same thing as before," *Reber*chuckled with a gleam in his eyes. "They said: 'It won't work, the atmosphere always blocks those long waves.' "

*Reber's*current project utilizes an obsolete defence department antenna near Ashton, southwest of Ottawa. He wants to complete a survey of the Milky Way at 2 megahertz, the longest wavelength that does penetrate our atmosphere from space. He has already mapped most of the Milky Way from the observatory in Tasmania, but he needed a northern site to finish it.

The Ashton instrument is about as far from a conventional telescope as it could be. An array of 25 utility poles, evenly distributed over 14 acres, is laced with wire and supporting cable - a wood and metal web to capture the whispers of the stars.

KEYWORDS: The Universe column

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DATE: February 13, 1988
 PAGE: M3 CLASS: MAGAZINE
 SOURCE: By Terence Dickinson
 PLACE:
 ILLUSTR: Photo Mars showing polar cap
 MEMO:

LENGTH: 0508
 EDITION: SA2

Mars gets seasonal climate
 but other planets may not

Mars certainly does have seasons because its rotation axis is tipped by 25.2 degrees, slightly more than Earth's tilt. The polar caps expand and contract something like the pack ice sheets in the Arctic and Antarctic. But Mars's polar caps are water ice topped by a deposit of frozen carbon dioxide - dry ice. The variations seen from Earth are almost entirely changes in the coverage of carbon dioxide deposits.

Nothing like the seasonal climate changes seen on Earth and Mars are visible on the solar system's other planets because they are either completely shrouded in clouds or haze (Venus, Jupiter, Saturn, Uranus and Neptune) or are barren like the moon (Mercury and Pluto). We also know from space probe findings that there is virtually no variation in temperature from day to night or year to year below the cloud decks of the five shrouded planets. The thick atmospheres of these worlds are very effective insulators.

However, recent observations of Pluto suggest it might have a thin atmosphere in summer and none in winter. Pluto's orbit is the most elliptical of the nine planets. That means it is significantly closer to the sun on one side of its orbit compared to the other. It is now mid-summer on Pluto, because the planet's solar near-point occurs next year. The temperature is about 50 degrees above absolute zero, high enough for frozen methane on Pluto's surface to become a gas. Recent studies have revealed a thin methane atmosphere. When Pluto reaches the far side of its orbit 125 years from now, it will be mid-winter, a superfrigid 30 degrees above absolute zero, cold enough to freeze the thin methane atmosphere solidly on the ground.

* * *

I would like to clarify and add a few details to the column on radio astronomy published on January 23. It concerned the first detection of radio emissions from space in 1932 by Karl Jansky.

Jansky's historic observation occurred accidentally. He was an engineer at Bell Laboratories in New Jersey assigned to find out what was causing low level static on sensitive radio receivers. Jansky built a 100-foot-long antenna on a turntable so he could rotate it and pinpoint the source. Eventually, he realized the static was coming from a fixed position in the sky. At first he thought it was the sun, but soon it became clear that the Milky Way was emitting radiation in radio wavelengths.

When Jansky published his findings in 1933, it caused a sensation. Radio was still relatively new and many people assumed from newspaper reports that Jansky had detected radio transmissions or signals from some planet in outer space, rather than natural low-temperature emissions from the Milky Way. Jansky then went on to other research at Bell Labs. The only one to follow-up on his work was amateur astronomer*Grote*Reber*who built the first dish-shaped radio telescope and went on to make the first radio map of the Milky Way in 1939.

* Terence Dickinson's most recent book, published by Camden House, is The Universe And Beyond.

KEYWORDS: The Universe column
