

NEWS

Air force had early warning of pulsars

It was one of the most important astronomical discoveries of the twentieth century, and it became one of the more controversial when only one of the discoverers received a Nobel prize. Now a fascinating new footnote has been added to the story of how pulsars were discovered with the revelation that some had previously been observed by a US Air Force staff sergeant at a remote Alaskan outpost.

Earlier this month, 81-year-old Charles Schisler came forward to tell the story of how he used a military radar to identify around a dozen radio sources, some of which were pulsars. Astronomers who have seen Schisler's meticulous logs believe that he spotted a bright pulsar in the nearby Crab Nebula months before the first scientific observation of a pulsar was published in *Nature* (A. Hewish *et al.* *Nature* 217, 709–713; 1968). Although Schisler never knew exactly what he was seeing, the story should be counted as an early pulsar spotting, says Jocelyn Bell Burnell, an astronomer at the University of Oxford, UK, and one of the authors on the original paper. "He happened to be a very observant person," Bell Burnell says.

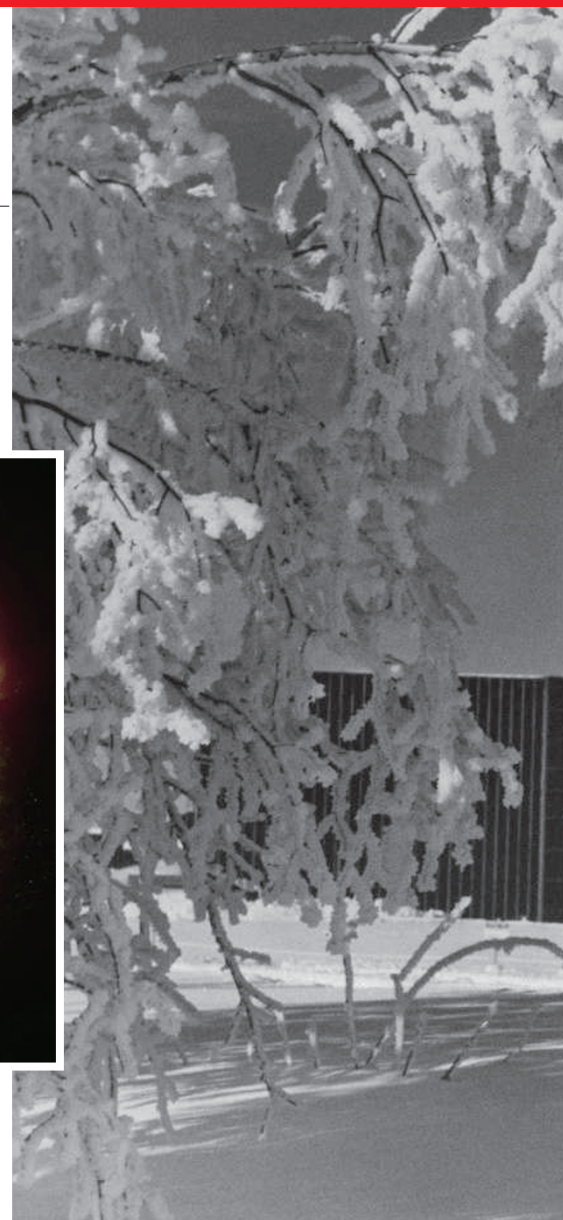
Schisler's story began in the summer of 1967 during a mind-numbing four-hour shift on an early-warning radar at Clear Air Force Station in Alaska. He was using the Ballistic Missile Early Warning System, a massive set of radars that looked some 4,800 km across Siberia for incoming warheads. As he sat at his station, the bored, 41-year-old staff sergeant noticed a faint signal on his scope. During the course of the



summer, the source continued to show up. "I kept seeing it week after week," he says.

Then one day Schisler noticed something — the mysterious blip appeared 4 minutes earlier than the day before. Four minutes meant a lot to the airman: before being stationed at Clear, he had been a navigator on a B-47 bomber, and he knew that stars rise 4 minutes earlier each night as a result of Earth's motion around the Sun.

Schisler calculated the source's approximate position in the sky and wrote it down on a scrap



of paper. Over the weekend, he drove 125 km to the University of Alaska at Fairbanks, where he met an astronomy professor who showed him the location of his source — the Crab Nebula, some 6,300 light years from Earth. At the centre

Market takes a gamble on carbon futures

The global carbon market is far busier this year than last, according to figures released this month. Around 1.2 gigatonnes of carbon — worth €15.8 billion (US\$21.4 billion) — were traded worldwide in the first half of 2007, primarily on the European Union (EU) Emissions Trading Scheme, according to analysts at carbon-market consultants Point Carbon in Oslo, Norway. Last year saw a mere

€22.5 billion change hands all year. But another Point Carbon analysis points out that the infant US market of ten northeastern states looks to be planning too many initial allowances.

Volume is up in the EU market, experts say, because traders are looking to the future. Trading on emissions allowances from the first, experimental, phase of the exchange collapsed in April 2006

and has never recovered. Most trading now is on allowances for the second phase, which begins on 1 January 2008 and runs to 2012. Currently, a credit bought on the open market for a tonne of emissions from the developing world through the Kyoto Protocol's Clean Development Mechanism costs less than buying the straightforward allowance to emit a tonne. As a result, many companies

in the industrial world are selling off the maximum permissible percentage of their allowances and making up the difference with these 'certified emission reductions' (CERs). This lowers prices (see *Nature* 448, 401; 2007) but increases volume. It has also led to a secondary market in buying and selling CERs. Another inducement to trade now is that companies can save allowances from the second



was designed to pick up man-made pulses bouncing off incoming missiles rather than steady signals, Schisler believes most of the things he saw were pulsars. By his own count, he spotted about a dozen sources. "My commanders didn't know what the hell I was doing," he recalls.

The work preceded by several months the observations made by Bell Burnell, then at the University of Cambridge, UK, which led to the first paper on the subject. A Nobel prize for the discovery was subsequently awarded to her supervisor Antony Hewish, but, controversially, not to her. Schisler was not the only one to "pre-discover" a pulsar, though, according to Bell Burnell. "There are actually a lot of stories," she says. In the 1950s, a woman visiting the observatory at the University of Chicago, Illinois, pointed out that there was a regularly pulsating source of visible light in the Crab Nebula. Elliot Moore, an astronomer at the university, dismissed the woman's claim, telling her that all stars seem to flicker. Another radio astronomer she knows of will, after a drink or two, confess to having dismissed observations of a pulsating source as the result of faulty equipment. "He's a bit embarrassed now," says Bell Burnell.

For his part, Schisler says he never quite understood what he was looking at until he heard of Hewish and Bell Burnell's discovery on a short-wave radio. When he learned that they had discovered a pulsating radio star, Schisler says, the significance of his own work became clear. But he says he didn't dare speak about the log until nearly half a century later, when the old early-warning system at Clear was finally decommissioned. He says that he feels he deserves no credit for his work, but he still regrets that he was unable to share what he had seen. "I wish we had had a way to communicate with the scientific community," he says. ■

Geoff Brumfiel

An early-warning radar in Alaska picked up pulses from the Crab Nebula (left) before astronomers did.

of the Crab, a supernova remnant, there sits a bright pulsar.

Schisler returned to Clear with the coordinates of other radio sources that he thought

he might be able to detect with the radar. Throughout the late summer and early autumn, he began a meticulous log of anything he could spot on the scope. Because the radar

phase for use in any year in the future, a feature called 'infinite banking'.

The increased activity is good for the health of the market, according to Guy Turner, director of New Carbon Finance in London. For one, it smooths out ups and downs in price, calming skittish investors. "It's the weight of numbers," says Turner. "Things move much more sluggishly." And, according to Endre Tvinnereim, senior analyst at Point Carbon, increased volume is good for the planet as well. "Increased activity increases the number of

actors with a financial stake in a better environment," he says.

Across the Atlantic, as the US Congress lurches towards passing a bill that would establish a carbon market in America, a few vanguard states have started their own. But analysts say that this scheme may face the same problem that crashed the European market. The value of phase I credits in the EU scheme fell to nearly nothing because there were far more credits floating around than companies needed. Point Carbon's analysis indicates that the US Regional Greenhouse

Gas Initiative (RGGI), comprising ten states on the northeast coast, from Maine to Delaware, may be planning allowances for 13% more carbon than they need. Meanwhile, Arizona, California, New Mexico, Oregon, Washington, Utah and two Canadian provinces have agreed to develop a cap-and-trade scheme within the next 12 months.

Janet Peace, an economist at the Pew Center on Global Climate Change in Washington DC, points out that the number of credits in the RGGI had been set before the EU phase I crash. "RGGI had already

put their model rule out there. I don't think you can blame them for the lesson that came later." She also says that over-allocation will not necessarily spell doom for the nascent US market, which is to start trading in 2009. Many states will auction off their credits, some with a minimum bid, thus giving them some value from the off.

But there is a lesson for future schemes in the over-allocation crash and subsequent rebound in the EU, Peace says: "You need good data on which to hang your cap." ■
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