A pioneer astronomer tries a down-to-earth idea at frosty Bothwell

An ugly duckling of solar energy

By ROWAN BURNS

PIONEER American radio astronomer Dr Grote Reber lives in a house at Bothwell which is attracting as much interest as its more historical counterparts.

It's not a very attractive house. Sitting on a block of land next to the Bothwell District High School in relative isolation, it looks more like a football grandstand.

But, despite its relative ugliness, the house Dr Reber built may make a valuable contribution to Tasmanian history — in the field of energy conservation.

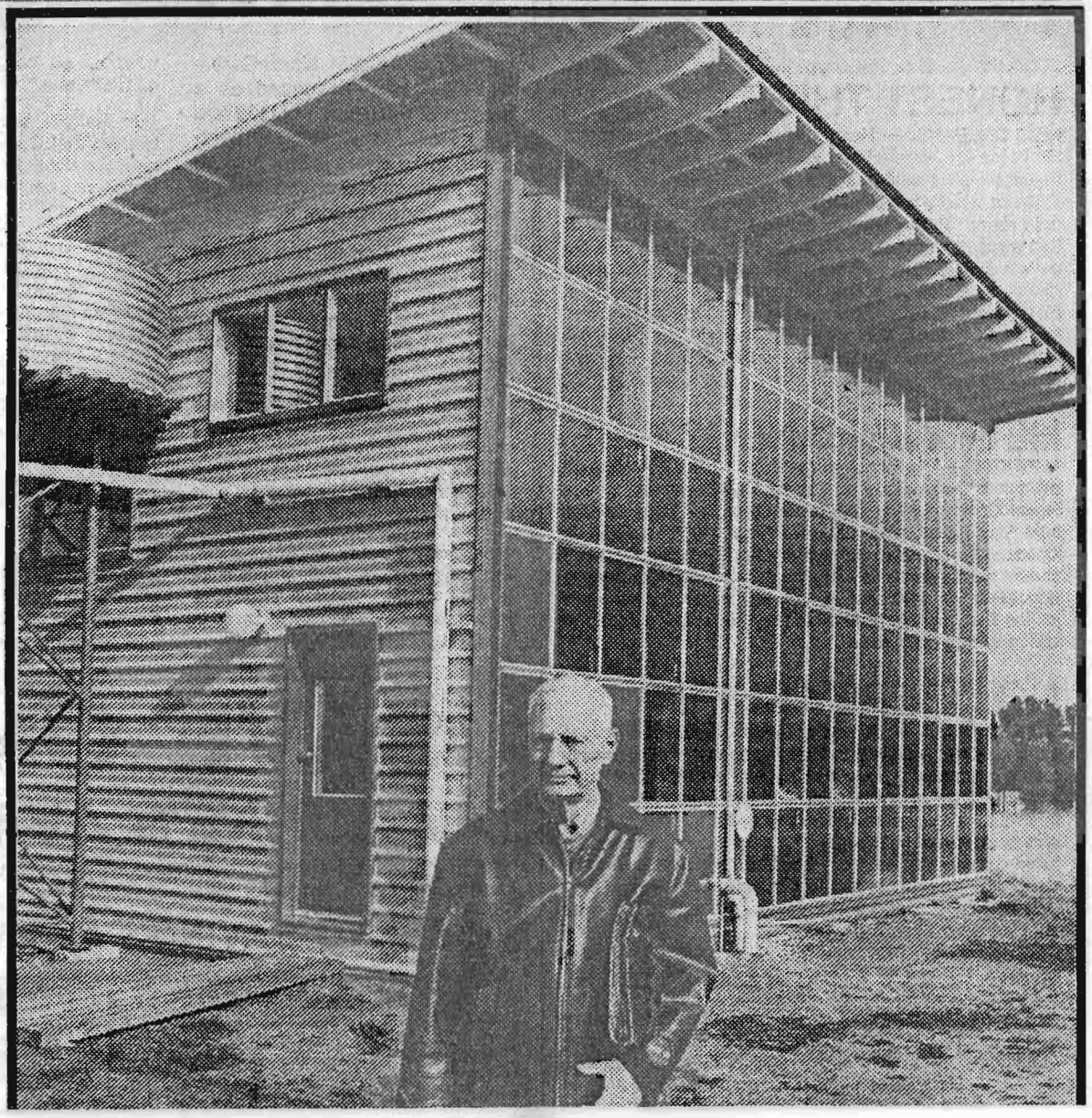
Dr Reber combined much of his knowledge of physics and engineering to design and construct the house over three years.

He moved into the building at Christmas, but he still has about another 12 months to go before it is finished.

The house probably represents the first major effort in Tasmania to build from scratch a unit using only solar energy for space heating.

"There's nothing really new in it. It's been done before in other parts of the world, including the United States," Dr Reber says.

The planning started with a basic scientific fact of life — the greater the surface area for a given volume, the



greater the heat loss.

It's the same principle which keeps elephants cool — the hundreds of wrinkles in their skin result in a far greater heat loss than if they have smooth skins.

Of course, in Tasmania's less-than-tropical climate, and in the cause of energy conservation, Dr Reber was looking for the best shape which had a large volume but minimum surface area.

"These ranch-style houses (single storey and with a large floor area) lose a lot of heat because they have much big roofs. They're not very efficient at all," Dr Reber says.

The most efficient shape is a sphere, but there are problems in building and living.

"Even if you can build a sphere, people and their chattels don't fit into a sphere very well," he says.

"The next best shape is a cube, and that is how I designed the house."

The cube also allows greater utilisation of space, with two floors under a given roof area.

Into one side of the cube, Dr Reber has put a glass wall, the secret to the structure's heating efficiency.

The wall faces north to collect the greatest amount of the sun's radiation.

● *Dr Grote Reber with his energy-conscious house and the glass wall.*

It contains 96 glass panels, but only 11 serve as windows, and there is a vertical row of panels near the centre. The rooms inside have normal wall linings.

The glass panels are interconnected vertically, and are open at the top.

Inside each panel is a sheet of specially coated copper sheeting, imported from America.

The sheets are dimpled, again to increase the surface area and improve the heat collection efficiency, and are coated on one side with a black compound.

The coating is applied through electrolysis and has the ability to absorb heat radiation, but not reflect nor radiate it.

"It's very interesting stuff. I scratched one of the pieces and found a shiny metal underneath — like chrome — then copper under that," Dr Reber says.

When the sun's rays have been absorbed, the temperature of the panels rises and in turn heats the surrounding air through the uncoated side.

The air then rises through the columns to the opening at the top and spills out into the living areas of the house.

"The panels get very hot at the top. A friend was up there and asked how hot they got. I told him to touch one and find out. He got white spots on the ends of his fingers," Dr Reber says.

The whole system works efficiently now, but Dr Reber has further refinements to make.

He intends collecting the heated air at the top and ducting it with the aid of a fan back down the central, covered column to a simple storage heater — an arrangement of stones which will absorb the heat during the day and radiate warmth during the night.

To stop heat leak through the roof and other walls, Dr Reber has installed four layers of aluminium foil. The exterior walls are paint-bonded steel sheeting which does not serve any purpose other than weather protection.

"I looked at using bricks and weatherboards, but this was easy to put up and cheaper," he says.

The most heat loss at the moment is through the uncurtained windows, and the frosts at Bothwell give a good indication of how much.

"When there is a frost, all the 'black' panels are white, but there is just enough heat which escapes through the windows to stop the frost from forming," Dr Reber says.

"The temperatures here have been 35 to 38 degrees (farenheit) — just above freezing — when I have been getting home about seven o'clock at night, and when I go inside, it is about 50 degrees.

"That's not hot, but it's better than outside."

Dr Reber is making some concessions to "that expensive hydro," with a mains connection to run a hot water service and light, and to cook.

He is not sure which options he should use to make the house virtually self-sufficient.

"There are solar cells and batteries, but they are too clumsy and expensive. Then there are wind generators, but they need wind all the time . . ." Dr Reber says.

"Perhaps the answer is a combination of both."

Dr Reber says the construction of an energy-conscious house such as his should be treated as a whole project — pulling down existing structures to get the same effect just would not be practical.

Cost is another factor which may, at this stage, be prohibitive. For instance, Dr Reber's glass wall cost about $1,000 more than a normal brick or weatherboard wall would have.

"With the cost of fuel oil now, there is no need for anyone to build a house like this. But, when they are restricted to three or four gallons a week . . ."