The history of ideas

by Earl Happ

One's personal history is written in obituaries, and when it suits things are changed around according to the survivor's point of view.....the old story about those who win the war get to write the history of the war.

Those currently at Oxford University, have written a history of atmospheric research carried out at the university viewable here.

Professor Gordon Dobson (1889-1976) was an experimentalist of unusual ingenuity who devoted much of his life to the observation and study of atmospheric ozone. The results were to be of great importance in leading to an understanding of the structure and circulation of the stratosphere. He came to Oxford in 1920 to take up the position of University Lecturer in Meteorology, having previously been Director of the Experimental Department at the Royal Aircraft Establishment, Farnborough, during the War. Together with Professor Frederick Lindemann he worked on studies of meteor trails, from which they deduced that the temperature profile above the tropopause was not constant - as simple theory would predict and the name 'stratosphere' implies - but rather that there was a region where temperature increased substantially with height.

Dobson inferred correctly that the cause of the warm stratosphere was heating by the absorption of ultraviolet solar radiation by ozone, and he set out to make measurements of the amounts and their variability. He decided to measure ozone by observing its absorption in the solar ultraviolet spectrum, as Fabry and Buisson had done a few years before.

But Dobson did not actually believe that the cause of the warm stratosphere was heating by the absorption of ultraviolet solar radiation by ozone as we see in his summary of his life's work in measuring ozone accessible here:

The paper is entitled 'Forty Years Research on Atmospheric Ozone at Oxford: a History'. On page 399 March 1968 / Vol. 7, No. 3 / Applied Optics, Dobson writes:

"The wartime measurements of the humidity of the upper atmosphere, showing that the stratosphere is very dry, were of interest in relation to the question of the equilibrium temperature of the stratosphere. The temperature of the stratosphere was generally regarded as being controlled by the absorption and emission of longwave radiation, the chief absorbing gases being water vapour, carbon dioxide, and ozone. If the air in the stratosphere were nearly saturated with water vapour, then water vapour would far outweigh the others in importance. When it was found that the stratosphere only contained a few percent of the water vapour required to saturate it, the picture appeared quite different and the three gases appeared to be of equal importance in determining the temperature of the stratosphere. Another interesting result to come out of the measurements with the frost point hygrometer was that there were often layers of very dry air quite low down in the troposphere, which must have descended from high in the troposphere if not from the stratosphere. The results of this wartime work were presented in the Bakerian Lecture of the Royal Society for 1945."

I want to remark on Dobson's expressed opinions, a product of what he learned from observations that he personally collated from the global network of about 100 instruments that he designed and built, securing the willing collaboration of many individuals across the globe:

- There were often layers of very dry air quite low down in the troposphere, which must have descended from high in the troposphere if not from the stratosphere.
- Chree,' 2 using the first year's results at Oxford had shown that there appeared to be a connection between magnetic activity and the amount of ozone, the amount of ozone being greater on magnetically disturbed days. Lawrence used the Oxford ozone values for 1926 and 1927 and in each year found the same relation as Chree had done. However, when he used the average ozone values for Northwest Europe-which should be less affected by local meteorological conditions-he found no relation at all, so it was concluded that both Chree's results and his earlier ones had been accidental. This investigation has never been repeated.
- Ozone maps surface pressure. Specifically, low pressure cells exhibit the highest total column ozone.

The first point is evidence that stratospheric air containing ozone is entrained in descending air in high pressure cells. As surface pressure increases geopotential height also increases and it is ozone in the descending column that can account for that. This is related to the evaporation of cloud cover caused by atmospheric heating and confirms the origin of the known relationship that: as geopotential height increases at 500hPa the surface of the Earth warms. This is natural climate change in action on daily and monthly time scales due to change in cloud albedo. Because the ozone content of the air depends primarily on dynamics at the winter pole, in direct response, we see that surface temperature is most variable in January and July driven by the Arctic and the Antarctic respectively. The influence of the Arctic drives variability to as far south as 30° south latitude while the Antarctic, with weaker flux in the ozone content of the air, at least on monthly time scales, is seen to produce the most intense variability of surface temperature in July. I document this here.

In relation to the second point. The study of the relationship between ozone content of the air in the mid latitudes and magnetic activity pursued by Chree and Lawrence, but then abandoned at Oxford, that relationship has been investigated by others and is confirmed. On that basis we would expect a 200 year cycle in climate change due to the influence of the solar wind.

In relation to the third point. Climate science today takes no cognizance of the relationship between ozone and surface atmospheric pressure. Accordingly, the planetary low in surface pressure at 60-70° south that sees also the greatest variability in surface pressure on inter-annual and centennial time scales remains a mystery. Seventy years of decline in surface pressure south of latitude 50° south is simply not observed and its implications unrealized. The agent of surface pressure change, ozone, is, so far as climate research is concerned, a NO GO ZONE. If you search you discover that many researchers assume that the movement of the air in the troposphere is responsible for the differences in ozone in the lower stratosphere according to the variation in surface pressure. This is a 'clueless' notion. Cyclogenisis requires a warm core. Polar Cyclones have their warm core aloft rather than at the surface. Upper level troughs represent low density air heated by ozone. Upper level troughs propagate to the surface when they are strong enough. Manifestly, they are strongest at 60-70° south latitude with winds equally powerful to those and a category 5 tropical cyclone.

Dobson was succeeded as reader at Oxford by his long-time collaborator Brewer and shortly after by Brewers post graduate student Houghton who later went on to promote the notion that the carbon dioxide content of the air determines surface temperature going on to co-chair of the Nobel Peace Prize winning Intergovernmental Panel on Climate Change's (IPCC) scientific assessment working group. He was the lead editor of first three IPCC reports. He was professor in atmospheric physics at the University of Oxford, former Chief Executive at the Met Office and founder of the Hadley Centre.

So, we see that pioneering work done by capable people of great integrity can go to nought when it does not suit the point of view of their successors. Frequently, one pursues a line of work designed to yield a result that is satisfactory from one's personal point of view and this is the case for many 'scientists'. Some of us cannot help being missionaries. One has a 'vocation'. Of course, there is also the money aspect. If the government is funding the research the opportunity to suit their particular brand of 'spin' must be considered. Some lines of inquiry yield better.