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Here is the complete article:

In the March/April issue of Geneva Times Mr. Simon Watkinson offered his views on global warming. In a recent report from the International Panel on Climate Change (IPCC), the panel concluded that the atmospheric accumulation of human-created combustion gases (principally carbon dioxide, i.e. CO<sub>2</sub>) are a major cause of global warming ([www.ipcc.ch](http://www.ipcc.ch)).

The tenor of his letter is that we ought to be cautious about changing any of our lifestyle practices (i.e. economic and energy) because the issue isn't really settled. Indeed, the subject is not as clear-cut as some other topics in the physical sciences. There is no debate about classical thermodynamics, quantum mechanics, or general relativity, for example, because all of these are amenable to experimental tests that either corroborate them or not. Each has survived many tests. One cannot, however, perform experimental tests with global climate. It can be observed, measured, and its consequences uncovered by several avenues of research. Over the past three decades there have arisen several computer-driven modeling programs to examine many of the most prominent aspects of global climate, some of which are well understood, others of which are less well understood. As these decades have passed the computers have grown vastly more powerful and the several models have gradually converged to yield results that are impossible to ignore, considering the severity of the consequences that will arise by ignoring them.

The global warming "debate" is only a "debate" because the phenomenon is not capable of direct experimentation. When it first emerged onto the public scene, almost three decades ago, opposition grew primarily for economic reasons. The problem suggested that a significant change in lifestyle and business practices would be required to stop, or at least lessen, the impact. Large corporations, with long-term investments in their infrastructures, would, at great cost, have to reorganize their operations. During the decade or two that followed (the 1980s and the 1990s) many economic enterprises, governments, and sundry scientists questioned the validity of the issue. A few took the stance that it was all "poppycock", as one well-known British botanist described it. (More about him later in this article.)

As physical evidence of warming began to accumulate, it was no longer possible to deny it. Then a fallback position arose "Yes, the planet is warming, and sea levels have begun to rise (several low lying Pacific and Indian Ocean island communities have already been moved to higher ground, and the gradual saline incursion of the Mediterranean into the Nile delta has begun to affect agriculture there), however (the argument goes), it is not due to human activity but rather to fluctuating natural causes.

The number of scientists in atmospheric physics who originally questioned global warming has almost disappeared, however, there is still a small group of individuals who make statements, appear before governmental committees, and write letters to the editorial pages of journals and newspapers casting doubt upon the effect of any human interaction with world climate.

Although Mr. Watkinson's item in the Geneva Times appears, at first blush, not as a denial, but rather offered as a word of caution about proceeding too rapidly, his supporting statements involve selective quotations and paraphrases all of which

support the fallback position. This is indicated in the title that he has given to his article, "Global Warming "What's responsible?" The use of the word "what's" rather than the word "who's" signals his view that human activities are not causal factors. Let us examine some of the evidence he offered.

Mr. Watkinson is not an atmospheric physicist. He holds the Master of Arts degree in Fine Arts. His name has been associated with Tyndall Centre for Climate Change at the University of East Anglia, Norwich, UK. This center is dedicated to the design of buildings and other structures compatible with the environment. Mr. Watkinson has created some imaginative designs in the UK and in continental Europe.

In his article in Geneva Times he cited the work of Dr. Sami Solanki, director of the Max-Planck Institute for Solar System Research. Dr. Solanki has determined that the sun has become brighter during the past 100 to 150 years. This suggests to Mr. Watkinson that a warming climate on earth may be due to this natural solar phenomenon.

Dr. Solanki, based on his team's research, personally states, however, that the sun's recent increase can be responsible for, at most, only a small part of the warming over the last 20 to 30 years. Mr. Watkinson acknowledges this. In fact, Dr. Solanki's group says, "Although the changes in the two values (i.e. solar output and temperature rise) follow each other for roughly the first 120 years, the Earth's temperature has risen dramatically in the last 30 years while the solar brightness has not appreciably increased in this time". Mr. Watkinson failed to mention this in his article.

Large (human-generated) output of CO<sub>2</sub> commenced in the mid to late 1800s, when major industrial development began, fueled principally by burning coal. The crucial fact of the CO<sub>2</sub> output lies in ice core records from both Antarctica and Greenland. (Mr. Watkinson does not mention these data.) As ice accumulates it traps within it bubbles of atmospheric gases. Samples from ice cores (the deepest being 3.2 km long, preserving a record of about 800,000 years of past time) are chipped from various lengths, crushed under controlled conditions and the atmospheric gases that were trapped in the ice can be extracted, analyzed, and quantitatively measured. They contain the usual gases, nitrogen, oxygen, carbon dioxide, carbon monoxide, argon, helium, methane, volcanic aerosols, dust, etc, the same components found in the air today. Plotting the quantity of CO<sub>2</sub> against time one sees an interesting pattern. The layers show an oscillating pattern representing natural variations in atmospheric gases during the past 800,000 years. The values range between 180 and 300 parts per million (ppm) over this long interval of time. Then, in the 1800s it begins to climb, rising to over 360 ppm at the present time. (A part per million, incidentally, is a common measure in geochemistry. One ppm is 0.0001%. It seems to be a small amount, however, in systems such as the earth's atmosphere, ppms make big differences). This high a value has never occurred during the past 800,000 years. In the words of Dr. Eric Wolff of the British Antarctic Survey, which has been responsible for core drilling in Antarctica, "Over the last 200 years human activity has increased carbon dioxide to well outside the natural range and we have no analogue for what will happen next."

Atmospheric scientists, analyzing these data, conclude that the climate is sensitive not only to the level of carbon dioxide in the atmosphere, but also to the rate at which this level is attained.

Other measures are also available. Certain trees, especially at high altitudes, reach ages of well over 500 years. Cores of their trunk growth rings can be dated backward and measured, and the variations in annual temperatures can be determined.

These data show an increase in temperatures over the latter part of the 20th century, higher than during the past 500 years. These results are published in major, refereed publications (Jacoby, G.C. et al, 1996, *Science* v.273 no.5276, pp.771-773; Jacoby, G.C. and D'Arrigo, R.D., 1997, *Proc. Natl. Acad. Sci. USA*, Vol. 94, pp. 8350-8353; D'Arrigo, R. et al (2000), *The Holocene*, v.10, no.6, pp. 669-672; D'Arrigo, R. et al (2000), *The Holocene*, v.10,no.6, 669-672).

Mr. Watkinson also cites the views of a Dr. David Bellamy, OBE, FRS. Dr. Bellamy's formal career is in botany. He has no background in atmospheric physics and he doesn't profess to know anything about computer climate modeling. In the UK he was, at one time, a very popular television celebrity, where he established himself as a scientist promoting conservation. He has been a leader in certain efforts to stop activities that cause environmental destruction. In recent years he has decided to join the small group of scientists in the world in denouncing global warming from the fallback position. In this stance he has become quite strident and has labeled all of it "poppycock"(as mentioned here earlier). He, however, relies primarily on his credentials as a "scientist" (botanical, but not atmospheric). In spite of his career in science he offers no quantitative information of his own and does not address the 800,000 year record of carbon dioxide increase in the ice. Instead, he quotes from the website of Dr. S. Fred Singer, an Austrian born physicist, who received his graduate degrees and spent his working career the United States. Singer has established an international reputation by acting as a scientific witness denying a variety of environmental and health issues. More of him later. Back to Bellamy.

One of Dr. Bellamy's most noted denial statements, for example, is a letter he published in the British journal, *New Scientist* (16 April 2005). The *New Scientist* is a highly reputable journal and the articles it publishes are refereed and vetted by other scientists. Letters to the editor, however, are often not refereed, and for a person with Dr. Bellamy's credentials any letter to the editor would be accepted without question. In his letter he stated that contrary to the notion of global warming, a high percentage, 555 of 625 of the earth's glaciers, as observed by the World Glacier Monitoring Service, were actually increasing in size. This comes out to be 88.8% of the glaciers.

This assertion piqued the interest of George Monbiot of the *Guardian* newspaper. Bellamy's use of the word "percentage" is particularly interesting in that he did not actually state a percentage, but rather an absolute number, 555. Monbiot tracked the source of the statement and found it on the website of S. Fred Singer. When questioned, Singer attributed this "fact" to a 1989 article in the highly respected journal *Science* (publication of the American Association for the Advancement of Science: the AAAS). All papers published in *Science* face multiple referees who review them, and the rejection rate is very high. An archival search of *Science* failed to reveal such an article in 1989, or any other year. The article does not exist. Then Monbiot examined the use of the word "percentage". Monbiot noted that the key on a computer (or typewriter) keyboard for the number 5 is shared with the % symbol. Typing 55% would easily turn out to be 555, if the shift key was missed. When confronted with this, Bellamy agreed that there had been "a glitch of the electronics". 55% is, of course, a long way from 88.8%, however, the issue is moot anyway, because the source of even the 55% number does not exist in the journal *Science*, or anywhere else.

(Incidentally, it must be noted here that no model of the consequences of global warming indicates that all locales, all over the world will be simultaneously warmer. There will be some regions that will be decidedly colder. Only the planetary average will increase. For example, when fresh water, released from massive melting

of Greenland's ice cap, enters the North Atlantic one effect would be the shutdown of the Gulf Stream. Northern Europe would become, on average, colder than at present.)

S. Fred Singer does have the background to assess atmospheric physical conditions. Throughout much of his career he has thrived on taking contrary positions. He has, through the latter part of the 20th century, written, testified, and spoken against a number of issues: denial that manmade chlorofluorocarbons (CFCs), chemicals once widely used in refrigerators, air conditioners, and some industrial applications, were the cause of the observed depletion of the upper atmosphere ozone layer, and hence, related to the increases in skin diseases caused by solar ultraviolet radiation (which ozone largely filters out of the sun's rays): he assembled a team of experts to testify against the U.S. Environmental Protection Agency's (EPA) establishment of secondary tobacco smoke as a public health hazard (his experts were assembled from individuals who were affiliated with tobacco companies): He has spent recent years denying the idea of human-induced global warming.

Returning to Mr. Watkinson. In his article in the Geneva Times he quotes that "20,000 scientists, 2,700 of whom are physicists, geophysicists, climatologists, meteorologists, oceanographers or environmental scientists" have signed a statement that there is no evidence for global warming due to the release of greenhouse gases by human activities and that if the world climate is warming, by utterly normal natural causes, it could turn out to be a good thing for a variety of reasons. (We have paraphrased the latter part of the lengthy quotation he includes in his article; it can be seen in its entirety in the March/April issue of Geneva Times).

This is an interesting statement. Mr. Watkinson quotes no source for it. It would be very interesting to know the source. A search leads immediately to a Baptist church publication, Christian View of the News (v.32, No.1, Jan. 2007) located in Hampton, Georgia, USA, that repeats the statement, word-for-word, quoted by Mr. Watkinson. Christian View of the News reported this from another source, The Berean Call (Oct. 18, 2006).

The identical verbatim quotation is also published in an "end-of-time", apocalyptic church publication, Friday Church Notes (Oct.27, 2006) of the Way of Life Church, also citing the same source, The Berean Call of Oct. 18, 2006. Several other evangelical websites also cite this statement, each time identically word-for-word. Each quotation attributes it to The Berean Call. Finally, a search of The Berean Call gives the source of this statement. The statement is attributed to "Anonymous".

Clearly, no scientific credence can be given to an anonymous statement. In fact, it surpasses belief that a worldwide survey could have been made of as many as 20,000 scientists and there is no record of it other than an anonymous statement made in newsletters for evangelical, apocalyptic churches. Thus, this statement, along with the earlier mentioned (non-existent) paper in Science, appear to have been created by those who wish to undermine the causal relation between global warming and human activities.

In summary, the article in the March/April Geneva Times by Mr. Watkinson is ostensibly a note of caution. In reality it is another of the "fallback" position articles that followed the almost 30 year delay in facing the problem. His citations of Dr. Solanki are correct; however, they were selected out of context from the larger works of Dr. Solanki. The "clinching" statement about the 20,000 scientists who were apparently surveyed worldwide; a survey that was utterly secret from the rest of the scientific community, national academies, and science reporters from a host of newspapers, and then transmitted only to an evangelical newsletter anonymously is

absolutely preposterous. He apparently did not bother to question his sources.

It is true that the science of predicting climate over future decades is not as accurate as predicting the weather for tomorrow, or even next week. One must always keep clear the distinction between weather and climate. A record in the ice of a well-known heat-trapping greenhouse gas, carbon dioxide, over the past 800,000 years is a record that cannot be ignored. The availability of cheap, carbon-based energy has driven the economic success of western countries, and has now begun to drive the economies of two very large eastern countries, China and India.

There is, of course, going to be enormous resistance to any change in this pattern. On the other hand, there is also an enormous economic opportunity for innovations that will arise from work to ameliorate the negative effects of heavy reliance on carbon-based fuels.

Mr. Watkinson's caution not to proceed precipitously to radical measures is a point well made. Witness the recent precipitous lunge into war in Iraq with no analysis of the consequences a forehand.

A plenary session of the IPCC will take place right here in Geneva on the 1st through 3rd of September 2008. Keep tuned for announcements that will come from it.