

EIR Science & Technology

CO₂ increase could benefit Earth's biosphere

Research physicist Sherwood Idso and Rogelio A. Maduro discuss why the greenhouse effect model is flawed and how an increase in carbon dioxide might be beneficial.

Sherwood Idso is a research physicist at the USDA's Agricultural Research Service, and an adjunct professor of botany and geography at Arizona State University. Much of Mr. Idso's work has been devoted to developing techniques for the remote sensing of plant water stress and agricultural productivity. In this regard, he played a leading role in the creation of the Crop Water Stress Index, which is both a concept and technique that is widely used by scientists and farmers to schedule irrigations of crops ranging from turf-grass to trees.

Mr. Idso has also published a number of papers on real-world climate sensitivity and the direct biological benefits of atmospheric carbon dioxide (CO₂) enrichment, which suggests that state-of-the-art general circulation models of the atmosphere are predicting a CO₂-induced warming of the Earth is fully an order of magnitude too large, and that the likely real warming should be of just the right magnitude to indefinitely forestall the commencement of the next Ice Age.

His book Carbon Dioxide and Global Change: Earth in Transition is an extensive examination of the arguments of the greenhouse propagandists, which includes more than 2,000 literature citations. The book, in paperback, can be ordered for \$19.95 from IBR Press, 631 E. Laguna Dr., Tempe, Arizona, 85282.

Mr. Idso was interviewed Dec. 21 by Rogelio A. Maduro.

EIR: Do you believe that the rising CO₂ content of Earth's atmosphere is going to cause a catastrophic increase in the temperature of the planet?

Idso: No, I don't believe that at all. In fact, I believe there

may be no change in the temperature of the Earth as a result of the increase in CO₂ or just a minor increase. At the most, the largest warming we could expect is only a tenth as much as what is generally being predicted by state-of-the-art climate models.

EIR: Why do you disagree with the predictions of the general circulation models of the atmosphere?

Idso: First of all, I disagree with them on a philosophical basis. They are making predictions of what is supposedly going to happen in the real world, and to be absolutely correct, they have to be including everything of significance to the Earth's climate system. And I just don't believe that we have anywhere near the appropriate knowledge to claim such an expertise. In fact, there are new things being discovered daily which impact this problem; and it is admitted that even those that we do know something about are not being modeled properly. A very simple example has to do with clouds. The climate modelers have been saying for years that they are not even sure of the sign of the cloud feedback, whether changes in cloud characteristics would augment any greenhouse warming or tend to negate it.

EIR: There was a study last year which suggested that clouds may actually cool the Earth. Is that correct?

Idso: Yes, all the information that is coming out nowadays seems to suggest that the presence of clouds tends to cool the planet. In addition, every single study of the historical climate record designed to see what happens to cloud cover as temperature increases has found that cloud cover increases

right along with temperature. Consequently, Earth's climate system is highly buffered: Associated with any impetus for warming is a negative cloud feedback which counteracts the warming. And there are other things which may operate in a similar fashion that are not modeled properly.

EIR: Like ocean temperatures and currents?

Idso: Yes, most of the models don't treat ocean currents in a very realistic manner. Then, too, you have things that are related merely to the mechanics of the models. If you just change the size of the grid blocks that are used to represent the various portions of the Earth's surface, for example, the model-predicted change in the mean temperature of the planet may be just as great as the change obtained from doubling the CO₂ content of the atmosphere. I don't see how anyone can have much faith in such a model. Also, the initial starting temperature of the model has a great impact on the climatic sensitivity of the planet: The warmer the starting temperature is, the less sensitive is the climate to various perturbations. In fact, the models suffer from all kinds of frailties that even the modelers themselves readily admit. And that is why I find it so incredible that some of them make such strong claims for the reality of the catastrophic predictions which they are putting forth. They should know better than to make such drastic claims.

EIR: Is it not true, however, that recent stories in the front page of the *New York Times* and the cover story of *Forbes* magazine finally corroborated what *EIR* said a year ago, that there are many people in the scientific community who strongly disagree with the catastrophic climatic change predictions of the models?

Idso: I think that's true. In fact, I think that if you could poll everybody, you would find that most of the scientists in the world that have some knowledge of this topic would probably cast their vote against the catastrophic climate change scenario. In many cases, however, this "silent majority" is not as vocal as the minority that is promoting greenhouse warming. And the people that are pushing it are very brilliant people. They are very vocal, and they do an excellent job of pushing their particular point of view. Now, that they have pushed it so well, however, the other side is realizing that they have got to stand up and say something. So we are starting to see some pretty substantial scientists stepping forward to indicate that the story we have been fed about CO₂-induced climate change does not really have a firm foundation.

EIR: One of the things that *EIR* has documented is that environmentalist groups pushing the global warming theory are receiving over \$400 million a year in grants from private family foundations, such as the Rockefeller family foundation and the Mellon family foundation, for example, to publish their works. Are you receiving support to print your book?

Idso: No. I printed my book totally with my own money. In fact, I actually had to go to the bank and borrow the money to print it.

EIR: You mean to say that, unlike the environmentalists promoting the global warming scenario, you were not financed by anyone to publish that book?

Idso: That's right, I was not. I was originally going to have it published by an established scientific publishing firm, which would not have required me to go into debt. In fact, I actually had a signed contract with one. But then at the last minute I decided to do it myself. With the rapidly growing interest in the CO₂ greenhouse effect, I realized I needed to get the book out as quickly as possible, before the catastrophic scenario promulgated by the special interest groups you mentioned just overwhelmed everybody. Secondly, the book's price would have been in the order of \$80-100 if it had been put out by an established firm; by publishing it myself, I was able to get the price down to where almost anyone could buy it if he wanted to.

EIR: It seems that all that we hear from the news media nowadays are gloom-and-doom theories of CO₂-induced global warming. Are there any benefits to be gained from increasing carbon dioxide in the atmosphere?

Idso: Yes, definitely, there will be almost incredible benefits. We know for example, from literally hundreds of laboratory and field experiments, that if you double the CO₂ content of the atmosphere, say from 330 to 660 parts per million [ppm], you generally increase the productivity of all plants. Although there is a wide range of enhancement among species we find that when we lump all kinds of plants together, productivity increases by about one-third for this doubling of the air's CO₂ content. In addition, CO₂ is a very effective anti-transpirant. That is, it tends to partially close the small pores in the plant leaves through which water is evaporated and lost to the atmosphere. Again, the response of different plants is different in this regard; but when you average them all together, you find that the evaporative water loss is reduced on a per-unit-leaf-area basis by about one-third. So, you see, you are producing more dry matter, more organic matter, and you are losing less water when you do it. And if you put these two factors together to calculate something we call the plant water use efficiency, you find that the efficiency with which plants utilize water essentially doubles with a doubling of the atmospheric CO₂ content. And you can imagine how significant that is, to actually double the efficiency with which plants use water in manufacturing food, just by doubling the CO₂ content of the air. And it just doesn't stop at the doubling either. You can triple and quadruple the CO₂ content of the air and this effect keeps right on going. It begins to level out somewhat, but still, you can perhaps triple the water use efficiency of all plants by continuing to increase the CO₂ content of the atmosphere.

EIR: Does this mean that plants could start to grow again in areas like the Sahara Desert?

Idso: Yes, plants will soon will be able to grow where they could not grow but a few decades ago because of lack of water. There will be a tendency for grasses to expand into desert areas, a tendency for shrubs and brush to expand into grasslands, and I think there will also be a tendency for forests to make a substantial comeback into areas from which they have been excluded for many years.

Yet, as dramatic as these changes may appear, they represent but the tip of the iceberg of positive biospheric response. As the productivity of plants increases they begin to cover more of the surface of the Earth, there will be a reduction in soil erosion due to the ravages of wind and rain. And as more organic matter is returned to the soil as a consequence of greater plant productivity, there will be a significant enhancement of all the biological processes that go on in the soil. For instance, there are nitrogen-fixing bacteria that are associated with the roots of leguminous plants, and their activity is generally enhanced when you have an enhancement in the productivity of the plants with which they are associated. Hence, being thus stimulated by the plants themselves, they will convert more of the nitrogen in the atmosphere into a form that is usable by the plants. This, in turn, will help the plants grow faster and bigger. And as the plants grow bigger and expand their root systems, there will be an increasing microbiological industry, so to speak, in the surface of the soil. And this will do many things for the plants. There will be an increase in the growth of symbiotic fungi that are associated with plant roots, for example, and as these fungi grow outward from the roots, they will help roots mine essential nutrients from greater soil depths.

EIR: You mean to say CO₂ will be fertilizing the soil, not just the plants?

Idso: That's right. And these enhancements in soil fertility will have a positive feedback effect on the plants, making them grow better still. That, in turn, will increase the activity of the rhizosphere even more, creating a sort of a bootstrapping cycle. Another example of this phenomenon has to do with earthworms. Earthworms do wonders for soils in terms of enhancing soil structure, aeration, drainage, and fertility. They also enable plant roots to go deeper in the ground because of the channels they construct. And the single thing that is most important to maintaining good earthworm populations is the amount of organic matter in the soil. The more soil organic matter there is, the greater will be the populations of earthworms you have.

So again, we have another example of a biological bootstrapping mechanism. More plant growth induced by the original CO₂ enrichment of the air leads to more soil organic matter, which leads to more earthworm activity, which helps the plants to grow better still, and before you know it, the

whole biosphere is lifting itself up to a new level of productivity. And the original impetus for the whole cycle is the increase in the CO₂ content of the atmosphere.

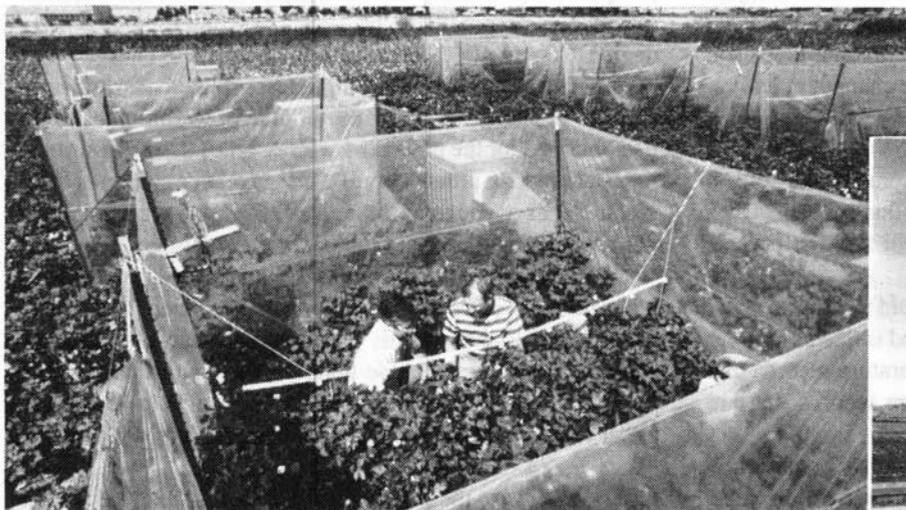
You know, I think it all makes sense from a broad philosophical standpoint, when you think of the fact that, other than the last two millennia, when we've had oscillating glacial and interglacial stages in our climate, the CO₂ content has always been much higher than it is presently. In fact, you go back to the beginning of the biosphere itself, maybe 3.8 billion years ago, there is evidence that the CO₂ content of the atmosphere was perhaps 70,000 ppm, and it has been decreasing ever since. So one can appreciate that, over the great immensity of time, the basic properties of life have developed on the planet, the CO₂ content has generally been much higher than it is today. Therefore, it's only logical to assume that plants should be better adapted to a richer CO₂ environment, particularly since the CO₂ is the basic raw material which plants use to produce food by the process of photosynthesis.

EIR: But don't all the global warming doomsayers claim that this is the period in Earth's history which has the highest atmospheric concentration of CO₂?

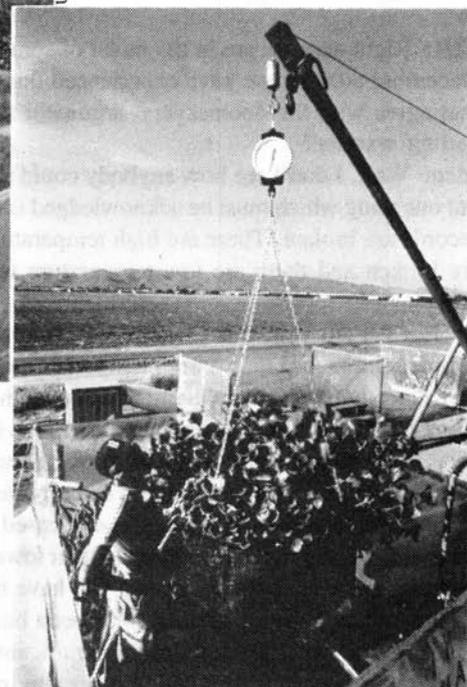
Idso: If they do, they are taking a very myopic view of Earth's history, for although the atmosphere is currently at the highest level of CO₂ that it has experienced for many thousands of years, that's just a drop in the bucket, compared to the billions of years that life has existed here. Consequently, life must be much better adapted to a higher CO₂ content than that of the present era. In fact, throughout the entire history of man's habitation of the Earth, the biosphere has literally been starved for carbon dioxide. During the Ice Ages, for example, there is evidence that the CO₂ content of the Earth dropped to perhaps 180 ppm. And when you realize that most of the plants which inhabit the planet cannot live when the CO₂ content of the atmosphere drops much below a range on the order of 50 to 100 ppm, you see that we are getting very close to the point, at least during glacial ages, when some plants are almost to the point of having to struggle to survive. In other words, throughout the last 2 million years of the Quaternary, or throughout the glacial-cycle stage of Earth's history, the biosphere has been basically starved for CO₂. And we know this to be true, because whenever you enhance the atmosphere with CO₂, everything the plants do, they do better.

EIR: And these experiments have been done in laboratories?

Idso: Yes, there have been about hundreds and hundreds of them performed by literally hundreds of different scientists. And these aren't speculations or calculations, either, as the predictions of the climate models are. They are the results of real experiments with real plants where we have actually measured the results.



Above: Open-top enclosures of clear polyethylene are used to study the effects atmospheric CO_2 enrichment on the growth and water use of cotton at Phoenix, Arizona. Pure CO_2 gas is mixed with ambient air and continually released into the treatment chambers through perforated tubes which lie upon the ground. In the hot environment of summer, a doubling of the air's CO_2 content practically doubles the yields of the plants.



Right: Growth rates of water hyacinth plants in ambient and CO_2 -enriched plastic enclosures are determined by weighing them each week. The plants are lifted out of their retaining water tanks. Daily water level measures provide a means of assessing transpirational water losses. Throughout most of the period of active plant growth, a doubling of the atmospheric CO_2 content generally doubles the plant's water use efficiency.

EIR: So you mean to say that man by increasing the levels of carbon dioxide in the atmosphere is actually helping the biosphere?

Idso: That is precisely what I mean. It may be the one good thing we have done for the other life forms with which we share the planet, albeit we have done it inadvertently. That is not to say that everything that man has done to the environment is good or even benign. In fact, we probably have done a lot of things that are bad for the biosphere. Chopping down the tropical forests, for example, is destroying untold numbers of species of both plants and animals. But this one aspect of our global activities, the flooding of the air with CO_2 , is a tremendous benefit to all of life. And I think it needs to continue. We need to put more CO_2 in the atmosphere. However, we need to do it as cleanly as possible; for there are certain by-products of the combustion process which are detrimental. Nevertheless, the basic end-product of the burning of fossil fuels, the carbon dioxide thereby produced, is good. We need to put more of it into the air.

EIR: In terms of geological history, CO_2 levels and temperatures during the previous interglacial were similar to what we see now, where they not?

Idso: Glacial cycles have been examined in this way as far back as 160,000 years ago, via the Vostok ice core; and the

CO_2 levels that we have now turn to be higher than anything that has been noted over that cycle. It is hard to be very precise about temperatures back then, however. But the one interesting comparison that I think can be made with a fair amount of confidence is to go back just 6,000 years, to the middle of our present interglacial. Temperatures then are believed to have been perhaps 1-2°C warmer than they are now. And we know that the CO_2 content of the atmosphere then was about 80 ppm less than what it is today. Hence, it is possible to have considerably warmer temperatures than we have now, with less CO_2 in the air. In fact, going back only about 1,000 years, to the time when the Vikings were making trips to North America, it was also a degree or so warmer than it is now; and the CO_2 content of the air at that time was again about 80 ppm less than it is today.

EIR: You mean to say it's been documented that the atmospheric CO_2 concentration was actually *lower* when the Earth's temperature was *higher*?

Idso: That is correct. But because of the fact that there has been a slight climatic amelioration over the last century or so, a lot of people are claiming that this increase in temperature is due to the contemporaneous increase in atmospheric CO_2 content. Well, there is absolutely no reason that one should make that claim, because it can clearly be much warmer

than it is now with much lower CO₂ concentrations. So, just because the air's CO₂ content is rising right now and the global temperature may be rising a bit also, there is no reason to say that CO₂ is causing the temperature change, at least at this stage.

EIR: Right now we are in the midst of some of the coldest December weather we have experienced this century. Does that agree with the doomsayers' argument that the U.S. is getting warmer?

Idso: Well, I don't see how anybody could say that it does, but one thing which must be acknowledged is that every year records are broken. There are high temperature records that are broken and there are low temperature records that are broken.

But I'll tell you, it is a whole lot harder to break a low temperature record than a high temperature record, because of the fact that population has increased over the past century, cities have been built up, and the urban heat island effect is very, very strong, especially in most of the cities whose temperature records are monitored and reported in the news. In addition, the urban heat island is expressed mostly during the night, when temperatures drop to their lowest. Therefore, to break a low temperature record you have to fight against all that urban warming bias that has been built up over the past century, so it is much more significant to get a low temperature record than a high temperature record. Consequently, you can imagine just how significant this cold weather is that we are having right now.

EIR: Do you see a trend in cold winters? Last year's winter was very cold also.

Idso: Well, I think that a person cannot make too much of a single year, or even an entire decade. I would criticize the global warming advocates, for example, for saying that the hot summer of 1988 was evidence for an intensifying greenhouse effect, as some did. Therefore, I will not turn around and say that the cold of this winter is evidence of the contrary. It is just interesting to observe that we are still getting these very cold temperatures, in spite of everything that is acting to prevent them.

EIR: In terms of the temperature record itself, there is a lot of dispute in the scientific community over whether Jim Hansen's warming figures are accurate, especially over the continental United States. What do you think of them?

Idso: An associate of mine, Robert Balling, and I published a paper about a year ago where we looked at the historical climate records of a large number of basically rural stations in the United States to see if there had been any non-urban warming or cooling over the last century. We found that some parts of the country did indeed warm somewhat, but that the largest section of the country cooled, so that there was little net change for the nation as a whole. But when we

compared our results with the Hansen and Lebedeff record over the eastern half of the U.S., we found about a half-degree Centigrade discrepancy between their data set and ours—with theirs exhibiting the greater relative warming, of course—which is just about the amount of warming that they had obtained for the globe as a whole. So, if there is a similar unaccounted-for urban warming bias in other portions of their global data set, much of their apparent global warming may not be real. But the whole subject is very complex.

All I can really say is that if there has been any warming, it has not been extraordinary. Nevertheless, there were other people who looked at this problem last year as well, and some of them did conclude that, for the contiguous United States at least, there has definitely been no net change in either temperature or precipitation over the last 100 years.

EIR: Who were these people?

Idso: Kirby Hanson, Maul, and Tom Karl. Karl is one of the very good people that who is looking at temperature data at the present time, and I think his studies show that there has been little change in mean annual temperatures in the U.S. over the past century. In fact, Karl, along with George Kikla and Joyce Gavin, has done some work which suggests that there has been a slight decrease in maximum temperatures over this time period, but a sizeable increase in minimum temperatures. And it is very likely that this pattern might be the signature of the greenhouse signal.

EIR: Can you explain this point further?

Idso: Yes, I will give you a little background on why this might be so. To begin, there is a lot of evidence which suggests that if there were to be an impetus for truly global warming, there would be an increase in the productivity of the unicellular algae or phytoplankton which live in the surface waters of the world's oceans. And as they increased their metabolic activity, they would produce more of a chemical substance which buffers them against the osmotic pressure of seawater. Now this substance escapes from their bodies either when they die or when they are eaten by zooplankton, and it makes its way into the atmosphere, where it is converted into particles which function as cloud condensation nuclei. These aerosols then cause clouds to form, where before there were none, and they increase the number of droplets in pre-existing clouds. Both of these effects tend to reflect away more of the incoming radiation from the Sun, and they feed back negatively upon the original impetus for warming.

Over land, a very similar phenomenon occurs. The activity of soil microbes is such that they also produce more of this same substance, dimethyl sulfide (or DMS) when the climate warms. So over both the land and the sea, there is reason to expect cloud cover to increase when it warms; and, in fact, this is exactly what we find in the historical climate record. In a number of studies of cloud cover changes over the last several decades when the Earth has appeared to experience

Greenhouse white lies

The most prominent proponent of the "global warming" theory today is Stephen Schneider, whose snake-oil salesman's pitch can be heard from a recent special report on the greenhouse effect aired by the Public Broadcasting System, and on the evening news. Schneider, as one of the leading scientists at the National Center of Atmospheric Research in Boulder, Colorado, is supposed to uphold the principles of scientific truth above and beyond any hidden agenda.

Yet Schneider both practices and openly advocates a policy of deception as the proper means to implement a world "ecological" dictatorship. In an interview with the October 1989 issue of *Discover* magazine, Schneider said, "As scientists, we are ethically bound to the scientific method, in effect promising to tell the truth, the whole truth, and nothing but—which means that we must include all the doubts, the caveats, the ifs, ands, and butts. On the

other hand, we are not just scientists, but human beings as well. And like most people we'd like to see the world a better place, which in this context translates into our working to reduce the risk of potentially disastrous climatic change. To do that we need to get some broad-based support, to capture the public's imagination. That, of course, entails getting loads of media coverage. So we have to offer up scary scenarios, make simplified, dramatic statements, and make little mention of any doubts we might have. This 'double ethical bind' we frequently find ourselves in cannot be solved by any formula. Each of us has to decide what the right balance is between being effective and being honest."

In the early 1970s, Schneider was one of the most adamant supporters of the theory that a new Ice Age was about to wipe mankind off the face of the Earth. In support of his arguments, he published an article in *Science* magazine (1971), claiming the warming capability of carbon dioxide was overrated. He said that even an eightfold increase in carbon dioxide over existing levels would warm the Earth's surface by less than 2°—which is 180° opposite what he claims today.

some degree of warming, cloud cover has always been found to increase. And if the cloud cover has increased, it would be expected to have reduced maximum temperatures during the day, when solar radiation is present to be reflected; but at night it would be expected to intensify the natural greenhouse effect of the atmosphere, trapping heat and raising minimum temperatures. So what you would likely get in the historical climate record is a slight decrease in maximum temperatures, a significant increase in minimum temperatures, and very little change in the mean temperature, which is exactly what Karl and his colleagues appear to have found. And, again, such a phenomenon would be very beneficial to the biosphere, in terms of reducing plant stress at both ends of the temperature spectrum and increasing the length of the growing season.

EIR: So more food could be produced?

Idso: Yes, and not only from these obvious effects, but from an important interaction with the aerial fertilization effect of atmospheric CO₂ enrichment. We have done considerable work at our laboratory, for example, where we have looked, not only at the plant growth effects caused by increasing atmospheric CO₂ alone, but at the synergistic response elicited by increasing CO₂ and temperature together, and we find that raising the temperature, especially the minimum temperature, greatly enhances the positive effect of atmospheric CO₂ enrichment. In fact, increasing the minimum tempera-

ture by just a few degrees can nearly double the already phenomenal effect of doubling the atmospheric CO₂ content by itself. It's really incredible. So the best of all possible worlds would appear to be looming on the horizon, with increasing minimum temperatures and increasing atmospheric CO₂ contents both tending to propel the biosphere to higher levels of productivity.

EIR: So what is your overall "world view" of the CO₂ problem?

Idso: First of all, it can in no way be referred to as a problem. In fact, it is really a blessing in disguise. In the long term, for example, our burning of fossil fuels reverses the great decline in atmospheric CO₂ content which has been in progress since the very inception of the biosphere, thereby providing the potential for all current life forms to maintain a viable presence on the planet. In the medium term it may provide just the moderate amount of warming needed to prevent the initiation of the next "scheduled" Ice Age, which, geologically speaking, is due any day now. And in the short term, it gives us hope that we will yet be able to meet the food and fiber requirements of the burgeoning mass of humanity; for if the problems created by man's inhumanity to man can ever be solved, the rebirth of the biosphere occasioned by our flooding of the air with CO₂ will enable us to both meet and exceed all of the temporal needs of a world population several times greater than that of the present.