

Another influence that man has had that is reducing the input of solar energy is the jet airplane. These aircraft produce a vapor trail. Dr. Roberts of the National Center for Atmospheric Research has produced some beautiful pictures showing these contrails evolving into cirrus clouds. The cirrus clouds reflect sunshine back into space and it does not get to the plant.

There is also an increase in the number of freezing nuclei. Vincent Schaeffer of the State University of New York at Albany has shown an increase in freezing nuclei. These nuclei contribute to the growing haziness of the atmosphere. These influences, which are over and above what Dr. Cole has mentioned, threaten the oxygen supply of the atmosphere because they reduce the energy that drives the photosynthetic process.

Mr. DADDARIO. On your jetstreams, are you theorizing?

Dr. SARGENT. I do not refer to the jetstreams, but to the contrails made by jet aircraft. The picture on the front of my article which you have shows—illustrates this phenomenon. Dr. Roberts gave me that photograph.

Mr. DADDARIO. By jetstreams, I really meant jet aircraft disturbances. Are you theorizing there or do you believe it is a hard reality that this is what is taking place?

Dr. SARGENT. Yes, I believe it is taking place. More and more frequently one sees the vapor trail or the contrail evolving into a cirrus deck.

Mr. DADDARIO. Why don't we continue on? Either Dr. Cantlon or Dr. Sargent can continue with their remarks.

Dr. SARGENT. I think we had Dr. Cantlon scheduled next.

Dr. CANTLON. Let me first make one observation about the oxygen matter since it is before you.

It is worth reflecting that a fairly sizable percent of the oxygen released from the sea is released in a relatively small number of the major upwelling areas in the ocean surface. The recent disaster on the English coast of an oil tanker, and the more recent one in Puerto Rico, is enough to give us pause. What happens if one of these increasingly more massive tankers flounders in a place that contaminates these big upwelling areas, and what happens if the petrochemicals it is carrying happen to be reasonably herbicidal in nature?

We are dealing now with phenomena, the scale of which requires somewhat more care. These matters shouldn't alarm us, but we should be thinking forward to what might be the result of, and what are the probabilities of occurrence of a series of these kinds of things. I don't think it is necessary to be overly worried about this at the moment, but these are things we ought to begin getting better data on.

Chairman MILLER. Where do these upwellings in the ocean take place? Aren't they pretty much located all over the ocean?

Dr. CANTLON. No; they are highly localized. For instance, the big Peruvian upwell. As a matter of fact they occur in the very places in which the great world fisheries occur, and the reason the fisheries are there is the presence of the upwell.

Chairman MILLER. I can tell you a story about that. I used to be executive officer of California fishery and game. We used to catch sardines off the coast of California and they made extensive studies trying to find out why this took place, but it wasn't until after I was