



J. E. LOVELOCK
Bowerchalke Salisbury Wilts SP55BQ
Telephone 0722 78 387

24th January 1977

Dr. S Ranganayaki
Chemistry Department
Allahabad University
68 Dilkusha
New Katra
Allahabad 211002
India

Dear Dr Ranganayaki,

Thank you very much for your interesting letter about homeostasis and the earth. I am sorry to have been so long in replying but have been much occupied with travelling recently.

As a general answer to your questions there is fairly good geological evidence that during the period from the start of life about 3.3 giga years ago to somewhere around 2 giga years ago there was no oxygen in the earth's atmosphere. ~~Reduced sedimentary rocks~~ are to be found corresponding to this period. It also seems likely that the surface was covered with active photosynthesizing life forms which withstood the short wave ultra violet light from the sun unfiltered by an ozone layer. My colleague Dr Lynn Margulis has recently conducted experiments which were reported in Nature, in which she exposed blue green algae to ultra violet light as and more intense than unfiltered sunlight and found that they survived this insult well. Apparently they are able to produce membranes containing iron which strongly adsorbs the ultra violet but allows the visible light for photosynthesis to penetrate. I see no problem in life originating and continuing during the period when there was no ozone layer.

I agree with you that carbon burial is the most likely explanation of the current oxygen excess in the Earth's atmosphere. H. Holland has reported in a number of papers calculations to show that the average reduced carbon concentration of sedimentary rocks such as limestone is adequate to account for the excess of oxygen in the atmosphere. Its true that the total amount of coal and petroleum is quite small but these are rare for any concentrated forms of carbon whereas most limestones contain much faster although dilute amounts of carbon. Enclosed are some reprints which follow from the article you mentioned in The Origins of Life Symposium in Barcelona. I hope that they will be useful for you.

With best wishes
Sincerely yours,

Jim Lovelock

enclosure