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SIR DAVID PRICE'S LETTER COVERING SIR GEORGE PORTER'S LECTURE

1. Research into the mechanisms whereby water can be converted to hydrogen and oxygen using visible light and appropriate catalysts has recently produced a number of exciting scientific discoveries. This reaction is, in essence, what goes on inside green leaves and much effort has been expended in trying to understand exactly how plants carry it out. It is clear that two distinct sites are both used and needed for light absorption and the oxygen evolving site is quite distinct from the reducing (i.e. equivalent to hydrogen evolving) site. The oxygen evolving and reducing sites are organised on different sides of a membrame within which are a complex of carriers which ensure that electrons can pass between the four reactive sites.

2. Two approaches have been used to try and utilise this process technologically. The first (usually associated in the UK with Prof. D O Hall of King's College) is to isolate the entire reactive system from the green plant and, by appropriate means, increase its stability. Success has been considerable - stabilities have gone up from a few minutes to several days over the past decade.

3. The second (with which Sir George Porter is associated) is to reproduce the chemistry of what goes on in green plants with analogs of the natural entities which are themselves inherently more stable. This means obtaining two photosystems, an oxygen evolving site and a hydrogen evolving site all ~~contained~~ in an artificial electron conducting membrame with the appropriate relative geometry. There is not too much of a problem with the photosystems (appropriate modified plant pigments can easily be obtained) or with the hydrogen evolving site but a lot of work has still not resulted in good analogs for the oxygen evolving site. Sir George claims in his lecture that ruthenium dioxide has shown promise but he says "The efficiency seems to be low, the results are irreproducible at the moment, but there is no doubt that oxygen is evolved". IF ruthenium dioxide can be made to catalyse oxygen

evolution with reasonable efficiency, reproducibly and in a controllable manner then Sir George would have made a "genuinely hopeful breakthrough" as you put it. Time will tell. However, probably the biggest hurdle is yet to come - the construction of an artificial membrame with the right electron conducting properties which will keep the four sites in an appropriate structural relationship one with another. What is so impressive about living things (at all levels of organisation) is their ability to construct precise and functionally elegant shapes. It is this attribute which has so often frustrated those who wish to emulate Nature and it is such attributes which prove most difficult to preserve outside the whole organism (and thus lead to the "instability" of Prof. Hall's systems).

4. I enclose a copy of a news item from a recent New Scientist which covers some of this ground and which puts Sir George's work in context. You will note that in the last paragraph he is quoted as saying that he "envisages no major problems in ... scaling up the system to the commercial production of hydrogen". Scientists often say things like that, they have always been shown to be (expensively) wrong in the past!

5. Through the EEC the UK participates in a programme of solar research and a separate one devoted to what is sometimes called the hydrogen energy economy. Both programmes are, in the opinion of D.En. officials, too expensive and the UK tries to cut them whenever possible. In the UK work in this area is supported on grounds of intellectual or scientific excellence through the Research Councils. The newly formed Venture Research Unit of BP (head D W Braben) is interested in supporting basic research work in this area and I know Don Braben has had a number of discussions with Sir George Porter about providing support for his laboratory.

6. Perhaps more useful to you in the present context is that as part of the Government's response to the Spinks report on Biotechnology (which Sir Goerge quotes with approbation) a committee under the chairmanship of the Chief Scientist and Engineer, DoI has been set up to expedite the commercialisation of fundamental work in this, and other "biotechnological", areas.

7. I attach a draft letter you might wish to send in response to Sir David Price.

JA

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DR J M ASHWORTH
26 August 1980