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OCEANIC RESEARCH AND THE PRESERVATION OF THE HUMAN ENVIRONMENT

Dr. Jacques Piccard Speaks at the Anglo-Swiss Society

Everywhere we hear of pollution, ecological problems, environmental disasters. In every newspaper we read that the sea is about to die, that the atmosphere is poisoning our lungs, that mankind itself may disappear within one or a few generations. Pollution has become the great problem of our century. And as always when a big subject becomes fashionable, all the most dangerous exaggerations are carefully mixed up with the most realistic facts. What should we believe? What should we fear? What is the role played in this by the oceans? I would like to analyse the general problem with you and try to see what can be done to increase the chances of human survival.

What Darwin could not foresee

The major problem of pollution is really the rupture of balance between man and his medium. Man did not appear on the earth abruptly in one day. He is the result of millions of generations starting from the very first primitive cells which possibly appeared in the sea. Since the beginning, these cells could survive because they were the "result" of their own medium. While nobody knows how man could start living, we understand, at least partly, how creatures could perpetuate themselves and evolve in the medium from which they were born. Every time that a cell has been modified by any kind of mutation, that modification could be for the best or for the worse; in the good case the modification reinforced the cell or at least put it in a better situation than the other ones. This very cell as well as its descendants

had then more chance to survive than the other ones. This combination of mutation and natural selection is probably one of the most beautiful laws of nature. Continuously, during millions of generations, the balance has been automatically maintained between life and the material world. Gradually, as Darwin first explained it, as the medium was changing (temperatures, pressure, mineral ambient), the species which were not perfectly adapted had to disappear and only the other ones could survive. This was possible because the earth evolution itself was extremely slow and the life of one generation of primitive animals was generally relatively short. When man appeared, the problem did not change much for hundreds of generations. The natural selection kept on going and all the individuals, as well as the races themselves, which were not as strong as others were gradually eliminated. The geological quarternary era, the one of mankind, has been relatively quiet and very few changes occurred on the earth surface. Man developed himself slowly without really affecting his medium.

However the industrial revolution combined with the revolution of hygiene, the modern discoveries and the fantastic technological development had two major results: firstly, the world population started to increase tremendously and secondly, in connection with this population explosion, the industry resulting from the modern inventions started to affect our medium. Since the beginning of the 20th century, considerable changes have occurred which are now seriously endangering our own life. These changes are hap-

pening so quickly that all the weak, which may be eliminated by the natural selection, will not have time enough to be replaced by the strong.

The first step of the ocean food chain

What are really the major dangers? Let us look at the sea. The sea is the biggest life reservoir of our world. There is probably not a single cubic foot of water which does not contain at least a small piece of plankton. Although a diver, either by Scuba or in a submarine, may see in the same amount of water thousands of different life species, nature has really organised the life in the ocean in a very precise order. Close to the surface of the sea, in an area where the sun is still acting, the phytoplankton, thanks to the solar energy, lives like any other plant on the earth with the photosynthesis reaction. This phytoplankton is the first step of the food chain. It is the food of the zooplankton which, as every animal, has to be fed, so to speak, indirectly with the solar energy. The zooplankton, in his turn, is used by the small fishes and later on by the bigger ones. In this way, the beneficial effect of the sun is transmitted everywhere in the ocean, down to the deepest places (and you may remember that we saw a fish at 35,800 feet), producing millions of gallons of oxygen and absorbing also fantastic amounts of CO². If the phytoplankton happened to disappear, not only the whole life in the ocean would be stopped, but the exchange between the sea and the atmosphere would be affected in such a way that unforeseeable disasters might happen.

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135 billion tons of Plankton

There is also another aspect of this problem. At a time when, because of the terrific population expansion, people are speaking of human explosion, economists are more and more considering the ocean proteins as a major source of food for mankind. Presently, close to 20% of our food is coming from the ocean and scientists expect that, in the future, about 40% can be found in the sea. It may seem little if we know that about 135 billions of tons of phytoplankton is produced every year by the sea, which corresponds roughly to 100 kilos of phytoplankton per day each inhabitant of the earth. Unfortunately, most of this phytoplankton is uneatable. Part of it is even poisonous. But how does it come that such a big amount of plankton which is used for feeding all the other animals in the sea, does not produce more eatable fishes? Just for the simple reason that the efficiency of the food transmission at every new link of the chain is roughly only 10%—in other words, if we are taking the 6th link, only a millionth part of the matter will be left, and there will remain only a tenth of a gram per man and per day, which obviously is totally insufficient. However, if the 6th link is too small and if the first one is not eatable, the 3rd link would give a thousand times more than the 6th one and we arrive now at about 100 grams (a quarter of a pound a day per man). These figures are obviously extremely theoretical. Nature is more complex in reality. But in reality also, scientists are considering more and more the possibility of using an intermediate link (for instance the krill) for food instead of trying to develop the conventional fisheries.

If I spoke about the phytoplank-

ton, it is to show you how the life of the ocean, which is of such a big importance for us, is depending from it. Obviously, in these conditions, every possible step should be taken to preserve the life of the phytoplankton in the ocean. Is it really what we are doing? Again, it is difficult to give precise figures but the National Academy of Science of Washington DC admits that mankind is wasting in the ocean close to one hundred million tons of oil; with the gas of our cars, we spread into the air some five hundred thousand tons of lead every year, from which the biggest part ultimately reaches the sea. Incidentally, modern historians attribute the fall of the Roman Empire to a general poisoning by lead (used for water distribution and wine conservation); mercury, cadmium, arsenic and others are also thrown into the ocean by thousands of tons every year, as well as hundreds of thousands of tons of herbicides, insecticides, detergents and others of these modern and dangerous chemical products. According to U.N. statistics, 15 billion tons of CO₂, 250 million tons of CO, 150 million tons of SO₂, 50 million tons of nitrogen oxides, millions of tons of various dusts are blown into our atmosphere and the biggest part of it finally arrives into the ocean. The precise action of these chemicals on the phytoplankton is not yet known, but there are many scientists who believe that within 30/40 years these poisons may kill the phytoplankton.

The poisoning of Plankton

Another danger is that some of these chemicals gradually accumulate themselves in the phytoplankton and later on in other living beings and may turn to be deadly poisonous for man the day one of these food links arrives into our meals. We also have to remember that the concentration of toxics is continuously increasing in a living being staying in a contaminated area. The concentration is also increasing gradually as the chemical is going down in the food chain. As a precise example, I would like to mention that scientists already found in various marine organisms well-known carcinomatous polybenzonic hydrocarbons of the type benzo 3,4 pyrene. This is only one example which shows you how serious this problem is.

We all have responsibilities. The innumerable chemicals produced by the modern technology either for themselves or as by-products, may cause damage everywhere and, which is even more dangerous, in a way which is yet often totally unknown or that scientists only start to presume. Continuously, we can read in the press that chemicals used since many years and everywhere are suddenly found to be a possible source of danger to public health. Scientists have no longer time to test their products on a sufficiently wide

scale before businessmen spread them on the market. Everywhere, the health of people is attacked. Our stomachs have not been designed by nature, have not been kept by the natural selection to stand the artificial tastes, the artificial colours, the artificial preservatives which are found everywhere.

But the danger of our modern industries goes even further than this. The air pollution is obviously affecting the sun radiation on the earth but is still too early to know what will be the consequences of it. Some scientists are fearing that the dust in the atmosphere will prevent the sun from heating our medium and that a new cold era may come, covering millions of square miles with ice. On the opposite side, others are afraid that the heat pollution, by-product of the energy used by industries, will, on the contrary, heat our atmosphere so much that the polar ices will melt and that consequently the sea level will rise by about 500 feet. Incidentally, this may be an excellent way to clean radically some big cities like New York, Paris, Tokyo and London!

Concrete and urgent measures

What can we do about this? The problem is double: we have to consider the governmental responsibilities and the individual's ones.

I am convinced that only an international agency with a global authority could oblige the world industries to really and radically decrease the pollution level. I know of course that for the time being, this world-wide authority is pure utopia. But one door is still open on the international level; it is one of the multi-national agreements and treaties. Dumping in the oceans has already been somewhat limited: some nuclear tests have been banned; but much more has to be done, for instance:

— Pollution of rivers by dangerous products (even the ones from landlocked countries like Switzerland) has to be severely reduced, when not totally stopped.

— Same for all sorts of direct dumping in the ocean.

— Special rules have to be established for oil products and penalties have to be increased. Usually, fines are insignificant; experts consider that prison would be much more efficient!

— New engines for cars have to be adapted everywhere—many types already exist. Air pollution by cars could be reduced by a factor of 10 and sometimes 100! Lead in gasoline happens to be a pure nonsense.

— Sewage arriving directly or indirectly into the oceans has to be controlled. Purifying plants have to be installed wherever necessary and their use has to be enforced. Too often, good and expensive plants are built but their use remains partial in order to reduce the operational costs. Fre-

quently, people do not realise how much cheaper it is to prevent pollution than to pay for its consequences.

— Long life insecticides—a general way to speak of organochlorides—have to be gradually replaced by short life insecticides. This last measure is of vital importance even for the sea. It has been established that even if we stop using an insecticide today, its concentration in the fish will still increase for at least 20 years!

Everyday wash

Many more examples could be mentioned but these are the most important. Once more, international agreements about these matters can—and certainly will be reached. But one should not forget how time is short.

I told you that individuals also have their responsibilities; among them, especially authorities, school teachers and university professors, as well as newspapers, radio and TV reporters.

In many cases 10 to 20% of any kind of products used for private or public services could be spared without anybody being seriously affected. In many cases, it would even be directly profitable to the consumers. For example, if we would accept to reduce the temperature of the heating or the air conditioning by just a few degrees, it would roughly save 100 million tons of oil per year for the western hemis-

phere. And besides this, the public health would be considerably improved as the over-heating as well as the over-cooling is obviously unhealthy. Everybody will agree that it should be very easy to save 10% of our electric consumption; well, the 10% of our present production happens to be equal to the full production of electricity (coal, oil, water) of the world just before World War II. In how many cases could we do without our car, thus sparing the car itself, gaining time and avoiding many other inconveniences? Millions of people are driving millions of miles just to find a parking lot which only spares them ten minutes of walking. Millions of Kwh could be saved by turning off our lights, frigidaire, televisions or radios when we do not use them.

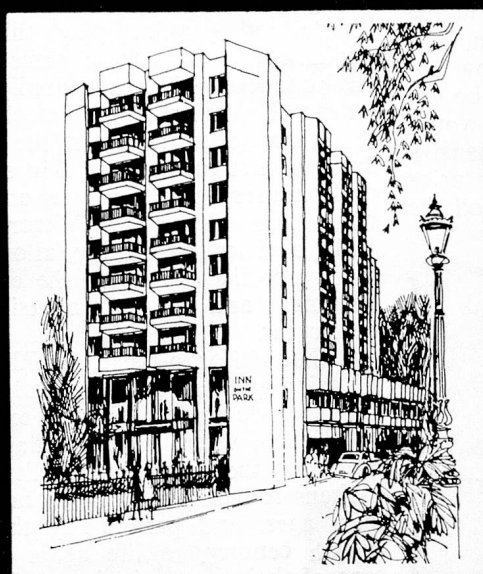
The problem is serious and it is too easy just to say that mankind always found a solution to its problems. As a matter of fact, up to now, mankind has never had a major problem to solve: no war, no earthquake, no hurricane has ever been a global problem. It is the first time in the history of the earth that a global danger threatens us and nothing proves that we will be able to dominate it. In fact, everything tends to indicate that if we do not change our way of life we will certainly draw a disaster down upon us. Thus, our only chance is to change our way of life radically. This will not be easy. The problem is so general that a global solution will have to be

found at the highest level. And we have to realise that a complete change in our habits, which are thousands of years old, will never be achieved without considerable personal sacrifices. But we have no choice. You certainly know about the careful study made under the direction of Prof. Forester at the M.I.T. in conjunction with the Club of Rome: to the question "How can we reach a general and human equilibrium by the year 2000?", the answer was drastic but not hopeless: we have to reduce our investments by 40%, the birth rate by 50%, the natural resources exploitation by 75%, the food production by 20% and we have to keep the pollution level at 50% lower than it is now. Only in these conditions would we have a reasonable chance, at least in the computer's mind, to solve our problem...

Blueprint for Survival

In a remarkable work entitled "Blueprint for Survival", some British experts led by Sir Edward Goldsmith suggested a few solutions for reaching the goals of the Group of Rome. All of them tend to decrease the pollution, to spare the natural resources and to reach a better equilibrium in our relationship with nature.

I know that to save, to spare, to reduce our spending is totally in opposition with many of our instincts, our economical taboos, our expansion de-



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sires, our tradition of free people in a free world. I know. But I also believe that death by pollution, decomposition by lung cancer, heart attack by stress, is in opposition too with our most secret desires. And, to speak abruptly, we may one day have no choice. Remember that 100% of man production is condemned in advance to become waste and pollution. How can we at the same time hope to expand our production lines and to reduce our pollution? We will have to reduce our expansion, our material progression. If you like one more typical example, note for instance that the number of new cars is continuously increasing faster than the mileage of the new roads, which means that the average and theoretical distance between two cars is decreasing continuously. In Switzerland, that distance was 75 meters in 1963 and only 46 meters in 1968. Here, it is probably about the same.

Everywhere, natural resources will have to be spared, either for pollution control or just for keeping them as long as possible. But the most important is our fresh water. It is commonly admitted that the main reserves are the underground waters; they amount to approximately 2.10^6 tons per man with the present world population. If pollution destroys those waters, it could produce major disasters. In many cases, part of that water has been already damaged by industrial wastes. Remember that one gallon of oil is sufficient to make one million gallons of water undrinkable.

As you see, I do not believe that the problem is only located in or just around the ocean. Air, soil, food, fresh water are problems too. But the ocean is the biggest surface in the world, it is the most important regulator factor and also the final place where pollution can go. Thus, it is one of the very first places to be studied it seems logical that a large amount of money should be spent to understand it, to measure it in all possible ways, to study it by

surface boats, by submarines, by satellites; and that every possible step should be made to prevent its destruction.

Encouraging signs

The figures I gave you about the ocean pollution are certainly not precisely encouraging. However, I do not think the situation is lost. But I do know that our only chance is in a better understanding of the problem, in a continuous study of the situation, in a constant search of the truth beyond the polluted waters of our lakes and seas, beyond the darkness of our industrial smokes, beyond our troubled atmosphere . . .

There are a few places in the world where a few people have understood the problem and decided to act immediately. These places, these people should be taken as examples for the successes they have obtained are remarkably encouraging. London is one of them. The air has been cleaned to such a point that bugs, butterflies, birds, who had completely vanished are coming back and can now be found again in the many parks of the city. By introducing strong regulations concerning sewage and polluted waters previously admitted in the Thames, that river is already cleaner than a few years ago. Fishes are starting to come back. In US, the city of Pittsburgh, for instance, made a remarkable effort to clean its air and the results have been completely successful too. In Switzerland, the lake of Zurich has been widely improved.

But these examples are only a few. What Pittsburgh, London and Zurich did should be done everywhere in the country, everywhere in the world. The sacrifices which are required now are only minor. Tomorrow, it might be too late, and at the best, for sure, it would be thousands of times more expensive and more painful because to the price of pollution fighting will be added the

cost of damages repairs.

Ladies and Gentlemen: Think about are beautiful countries, our mountains, our forests, our rivers and lakes. Think about the ocean which contributed so much to build up your power.

Industry, science, research technology, trade mark mankind what it is today, but we have now to use these very means to find the solutions to our major problem. For this, we need also time. Our best chance of survival is that this worldwide threat does not materialize completely before we have found a way to reach a reasonable equilibrium between the constraints of industry and those of ecology.

(Jacques Piccard)

TOY MUSEUM NEAR BASLE

When in Basle, the opportunity should be taken to visit the Toy Museum at Riehen on the outskirts of the town. Its exhibits have come partly from the Swiss Museum of Ethnology in Basle, which has always attracted many visitors. They have been supplemented by purchases and donations, particularly from the collection of Hans Peter His, already well known beyond Swiss frontiers.

Toys from all over Europe may now be admired in a house which, with its cobbled courtyard, loggia, fine old rooms and splendid gateway, itself seems almost an outside toy. An old Swiss stately home, the Wettstein-Haus, has thus become a museum in a village which is worth a visit merely for its proud old houses and aristocratic vistas. The toys are divided into groups and thus lead from the touchingly simple and genuine play things of Alpine cowherds to basic forms of serially produced objects and finally to the industrially manufactured mechanisms that characterise the age of the railway and the first motor cars. Tin soldiers, dolls' houses, puppet-theatres and automatic toys of the late Victorian era make a charming display, allowing us a retrospective peep into the everyday pastimes and festive occasions of yesteryear.

The visitor to Basle, the Rhine city of fairs and art and carnival, would therefore do well to plan an excursion to Riehen, where among villages surrounding the world of the little ones wakens romantic memories and brings past ages, and particularly the nineteenth century, to life again through one of their most winning attributes—their toys.

(S.N.T.O.)

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