MARINE BIOLOGY POLLUTION AND THE PROTECTION OF NATURE

Professor Wilfried Gunkel
f. Director
Biologische Anstalt Helgoland
Germany

It is a great pleasure and privilege for me to be invited to participate and contribute to the Sakharov Festival on "Biopolitics - The Bio-Environment - Bio-Culture in the Next Millennium," here in Athens. I am especially thankful to Dr. Agni Vlavianos-Arvanitis, President and Founder of Biopolitics International Organisation, who has made it possible for me to come. It is a great honour, task, and responsibility to give a lecture to such an important circle of people.

As a marine biologist by profession, I have, for 35 years, dealt with many different scientific and technical problems. It is now justifiable, desirable and necessary to try and reflect on the wider implications of the whole story of "Marine Biology, Pollution and the Protection of Nature."

At a recent meeting of the Lutheran Church in North Germany, where about 200 delegates discussed questions on the preservation of God's Creation, one of the members of the group reported that he had strolled around the grounds and counted the 135 cars, used by the delegates to come to the meeting. We too have used modern technology to come together here in Athens. We came by plane, train, ship and car. So we are all responsible for the emission of additional carbon dioxide and the harmful effects of this substance upon the environment.

Looking at this panel, one could guess that the average age of the members of this Symposium is well above 50 years of age. At the end of the medieval period - a time when life and the environment were believed to be in harmony to a certain extent- the life expectancy of a new-born child was 29 years. Therefore, most of us owe the fact that we are still alive to technical progress in agriculture and food production, pest and parasite control, progress in medicine, pharmacology, and to a raised standard of living. The elimination of unhealthy, difficult, manual labour and noxious living conditions, made possible partly by improved technology, has also contributed to the lengthening of life. Now, life-expectancy, world-wide, is 64 years of age for men and 67 for women. In Central Europe the figures have risen to 73 and 79 years. Must we not also appreciate the high productivity and profits of industry, since they give communities and governments the opportunity to subsidise scientists and institutes and to invest in research on the influence of harmful substances and changes in the environment?

However, are not most of these developments and most or much of this progress, in one way or another, highly detrimental to nature? Many questions arise, discussion of which creates great controversy. How justified is the view that natural science and technology cannot, in principle, solve environmental problems? If this is true, it would mean trying to find an answer using the same methods which led to the problem. We cannot expect, by definition, to find the solution to a problem by using the same method which created it. How justified, as a consequence of this, is the opinion that only the arts, ethics, morals, theology and aesthetics can provide answers to these problems? Is it not necessary and justifiable to protect nature, and with it God's Creation, simply because it is beautiful? Who can answer all these fundamental questions? Are they so difficult and complex that one can only become an expert in this field after a very special training of many years? And then, how shall this expert decide what to do?

Those of you who know Popper's monograph entitled, The Open Society and its Enemies, know the criticism which this important philosopher and democrat levels against all enforced application of knowledge and findings, even when they seem logical and necessary. This is his main criticism of Plato, and all those who recommend acting in a similar way.

I would like to contribute just a few ideas and report on some experiences gained during my work as a marine biologist, as well as draw your attention to the many works published during the last decades, in the field of marine pollution and the influence of humanity upon the environment. It is impossible to give even an overview but some examples include: the books and articles, edited or authored by: Altner (1991), Capra (1983), Clark (1992), Rat von Sachverständigen für Umweltfragen (1980), GESAMP (1991), Gunkel and Gassmann (1980), Kinne and Bulnheim (1980), Kinne (1984), Lozan et al. (1990), Ocean Science Board (1985), Office of Research and Development (1978), Verbeck (1990), von Weizsäcker (1990). Most of the books available are highly professional; some are popular; and some are filled with apocalyptic prophecies.

The oceans are the largest living-spaces on earth. They cover about 70% of the surface of the earth and their average depth is 3,800 metres. The oceans are the great donors of water for rain, the great buffers for temperature, the great recipients of carbon dioxide. Humanity uses the oceans in many ways: as a source of food, as a medium for transport and we relax on their beaches. The oceans are used as receptacles of sewage and rubbish and they furnish water for water-distillation plants. The oceans are huge and, up to a few decades ago, during the years prior to 1967, which I call the first phase, little attention was paid to whether or not these vast bodies of waters were being harmed. They were extensively misused as a convenient dumping place for ammunition, poisonous gas grenades and bombs and highly radioactive material which

included submarines nuclear reactors, chemical waste and toxic material from industry.

The marine biologist was interested only in the pristine environment that basic research addressed. Today, it is difficult to understand how negligent the scientific community was about problems that one could easily predict would multiply in the years to come. For many years, marine scientists were even an accomplice to this dumping, often recommending areas in the oceans which they thought would be suitable for this. Although a convention, on preventing oil pollution of the sea, had been signed in the late twenties, little was done to enforce the penalties. It was extremely difficult to get hold of the oil polluters, and even if they were caught, it was normally less expensive for the offenders to pay the fine than to stay for an extended period in harbour in order to clean up the oil spill.

Ornithologists were the first to complain about oil pollution killing birds on the coasts. Seventy years ago, the German biologist Weigold coined the term "Ölpest" for this. However, for many years ornithologists got little help or understanding from the general public. Getting feet oily on the beach was widely accepted, and jokes were widespread about the enthusiasm of nature-lovers and "old ladies in tennis shoes."

The year 1967 was a turning point in marine pollution assessment. It is reasonable to call this year the beginning of the second phase. It is when the first major tanker accident on the south-west coast of Great Britain occurred. It involved more than 100,000 tons of crude oil polluting the sea. A lot of hectic activity was accompanied by TV cameras, and newspaper and radio reporters. There was no existing way of dealing with such a catastrophe. An attempt to emulsify the oil drifting on the surface of the sea was made. It was treated with every method then available, even some of high toxicity. In an attempt to sink it to the sea bed, the oil was also treated with hydrophobic chalk. Attempts were made to burn some of the oil, and some beached oil was collected mechanically. Many thousands of people, mainly army personnel, were involved. Finally the tanker was bombed by the Royal Air Force and the oil in the ship and the surrounding water was set alight, much to the fascination of the general public.

The Royal Society for the Prevention of Cruelty to Animals was very active in cleaning birds covered in oil. However, in spite of intensive care and great financial expense, very few birds survived the treatment. Although, those that did survive, were later re-accepted by the population of healthy birds.

For the first time, intensive scientific work was used to determine the harm done by the pollution. However, these activities were often limited to counting dead birds. Mixtures used to emulsify the oil were also tested for toxicity to all forms of marine life.

After the pollution caused by the Torrey Canyon, each ensuing tanker accident commonly attracted many biologists. They documented their findings in voluminous reports which were beyond the capacity of most people to read, retain or assess. As a result, little effort was made to draw conclusions or to predict the effects of future oil spills.

In many countries, environmental issues became a major part of political discussion, and it became fashionable and progressive to criticise industry and the establishment, on the grounds of unsatisfactory environmental protection policies. Funds at that time were readily available and new positions were created. Many scientific and monitoring projects were initiated in order to investigate the effect of pollution. This led, in part, to a trivialisation of environmental science. It became obvious that the high level of activity engaged in to combat oil pollution, often did more harm to the environment than no activity at all, and it also became obvious that much of the scientists' activity was of little value to society.

Many false prophets drew apocalyptic pictures and gave useless recommendations. In his well-known and well respected book Ökologie, published in 1984, Remmert wrote: " We are protected against medical quacks by law. Nobody, however, protects us against ecological quacks, whose number and influence increases in a frightening way. Ecology is a biological science. Without a solid biological basis, planning for the environment, ecological advice and proposals for environmental protection can only be quackery - dangerous quackery, because simple and fast suggestions for resolutions seem to be so logical and are easily accepted."

In the third phase, the methods of combating oil pollution were much improved. More efficient emulsifiers with a lower toxicity were created. New spraying equipment, for use from ships and planes, was developed. New methods for the mechanical collection of oils drifting on the surface of waters such as skimmers were constructed. More and more twin-hulled ships were also constructed.

In many countries logistic organisations for combating oil pollution were formed. Millions of dollars were spent on ships and equipment. International co-operative agreements were signed for mutual assistance, in case of major oil spills. Science contributed in the following three fields:

- the investigation of the harm done to the environment by the oil, and how long it would take for the environment to recover and reach its original status
- the classification of different coastal regions, using a sensitivity-index system, devised by Gundlach and Hayes (This predicts the extent and duration of damage done to an ecosystem by oil pollution. The coastal regions of many countries are now mapped using this system, and these maps serve as a basis for different ways of combating oil pollution.)
- the identification of the source of the accident (Using a sophisticated gas chromatography/mass spectrometry combination, organic

chemists developed a method which identifies those who caused the accident. This now forms a basis for the enforcement of pollution prevention laws. [Dahlmann, 1984; International Maritime Organisation, 1986].)

In the fourth phase, the obvious fact that it is much better to prevent a tanker catastrophe or an oil accident, than to combat it, was realised. Much energy, effort and funds were expended in technical developments, which involved shipbuilding and nautical organisations.

The Load On Top procedure (LOT) has been well established for many years. It is practised by most tankers and involves the collection and separation of all the water used to wash out the individual compartments of the tankers. The collected oil is not pumped overboard but brought back "on top," to the refinery.

The construction of tankers has improved during recent years. In a modern tanker, there are now two walls between the cargo and the sea . This means that if there is an accident, there is still a chance that the oil will be retained within the ship.

The organisation of traffic-separation lanes in the coastal waters of the North Sea, which separate incoming from outgoing ships, has proved to be of great value. There is strict guidance, control and enforcement of the use of these lanes. Although the coasts of the Netherlands and Germany are among the most crowded areas of sea traffic in the world, up to now, no great oil accident has occurred in this region.

However, all the technical developments used to prevent pollution are only as good as the humans who use them. I call this the "human factor." Its recognition is the fifth phase in our sequence.

The German philosopher and sociologist, Max Weber, pointed out the importance of the human being in the development of industry. He used the comparison of a military fortress and said that the value of a fortress is as good as the soldiers who man and defend it. This also applies to the safety of ships. Many accidents have occurred, in spite of top-quality technical equipment, as a result of human failure. The strain on the captains of big ships, especially big tankers, to meet economic constraints while at the same time satisfying all the nautical and safety regulations, results in considerable mental stress. We know that top football and tennis players are given psychological help. I do not hear of the same efforts being expended to help ships' officers, but a mistake in handling a ship might have a worse effect than loosing a tennis match. It is much too simple to limit the responsibility for an accident to the tanker captain.

Many other areas of society are involved. The whole of society must be willing to accept responsibility. There are ship owners who register their ships in Panama or Liberia in order to save money on crews and the equipment of the ship. They might be forced to do so, to cope with merciless competition. Even if it is difficult to prove that ships registered in the countries mentioned have a higher accident rate, it is definitely a step in the wrong direction.

There are the decision-makers and port authorities who are responsible for the equipment for accepting old oil into harbour installations, as well as the price. Politicians make laws regarding the handling and the control of the oil market. The media are always seeking sensationalism. Often criticised, a free press is a basis of democracy and normally cannot be better than the society it serves. Unfortunately, most of the media are in favour of action; their prophecies are almost never checked and they are normally forgotten in a fortnight.

Then, there are the scientists. Their problem is that it is fairly easy for them to investigate extreme situations, at the point of greatest effect, but it is not justifiable to use such results to draw conclusions about the general effects on the sea. Such faulty interpretations of basically valid results, that is, generalising on the basis of a particularly extreme instance also occur in other fields of science not only in marine biology.

Another handicap for the marine biologist is the interpretation of long-term measurements in the sea. Extreme values, over a few years, can be interpreted as trends, but might in fact be a normal oscillation of those values. It is very easy to select and use data to make apocalyptic prophecies. It is also very easy to select and use data which show the opposite. The main problem is that when we have all the data and can be sure about the change and the destruction of nature, it may be too late. Scientific predictions have only a limited value. Nevertheless, the scientist has a great responsibility to continue working and be informed about man-made changes in nature.

This list of responsibilities could be made much longer. Every person who uses and destroys the gifts of nature, whether it be food or fuel, is involved and must understand his or her responsibilities. Each individual human being must, in an absolutely democratic manner and with great respect for life and high esteem for God's Creation, contribute to keeping the earth habitable, in the next millennium, for our children, our grandchildren and for generations to come.

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Professor Wilfried Gunkel's long career has included leading research expeditions to the Indian, Pacific, and Atlantic Oceans, as well as the Arctic and North Seas. Before his retirement in 1993, he was Director of the Biologische Anstalt Helgoland, Hamburg. He is also Professor at the University of Hamburg. His research fields include oil degradation by bacteria, the distribution and activity of marine bacteria and diseases of marine algae. His wide experience has encompassed numerous publications as well as membership of several international scientific journals' editorial boards. He has also been invited speaker at, or chairman of, many international congresses and symposia. In 1992 he organised the major International Symposium "The Challenge to Marine Biology in a Changing World" held on the island of Helgoland.