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Discussion Paper

by

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on

Kenneth Mellanby's

ACID RAIN

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Discussion paper on ACID RAIN by Jacques Piccard

Reference : Kenneth Mellanby's paper

The so-called acid rains are difficult to interpret. Will they destroy the world forests, affecting the production of oxygen, destroying the delicate balance of the atmosphere composition ? Are they, on the contrary, one more of these environmental problems of which crowds are fond because they give the possibility to foresee the end of mankind for the next century ?

Really, nobody knows much about it and one of the main merits of Prof. Mellanby is to put the church back in the middle of the village admitting frankly that it is too early to make a precise diagnosis. If scientists would always have shown such modesty, not hesitating to say "I only believe ...", "it may seem that ...", etc., science would not have been slowed down by so many preconceived ideas and would probably have evoluted quite differently.

After having studied the paper prepared by Prof. Mellanby, I retain specially that there are two main types of acid rain.

The first one (primary acid rain) is caused "by the washout from the atmosphere by falling rain of substances as they are emitted in urban and industrial areas". I repeat, "as they are emitted in urban and industrial areas". Thus, they are often not even acid at all.

The second one (secondary acid rain) is produced "when the oxydes of sulphur and nitrogen have been transformed in the air to sulphuric and nitric acid, and when these are removed by rainout and washout". I repeat, "when the oxydes have been transformed in acid".

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As a consequence, primary acid rains are found close to the urban and industrial areas, whereas secondary acid rains are found only far away from the emission area. Incidentally, the latter are mainly carried away by 850 millibars winds (roughly at an altitude of 4'000 feet).

I also noted in Prof. Mellanby's paper that in the first case, the rain does not harm the plants or the buildings : the damage is caused directly by the gases, whereas in the second case, the gases are too dilute to be harmful.

I also wish to emphasize the following points :

1. production of acid depends on temperature, sunlight and various substances in the air, but according to a process which is so far almost totally unknown.

2. secondary acid rain is too dilute to have any direct phytotoxic effects; as a consequence, neither primary acid rain nor secondary acid rain seem in themselves very dangerous ...

3. important damages to plants are produced not by acid rain but often by dry deposition of sulfur dioxide before these chemicals fall to the soil washed by rain during the so-called "throughfall".

4. secondary acid rain, by cumulative effect, may contribute to acidity in fresh waters. This effect is higher when the rocks are granitic (with low calcium levels) than when the soil is rich in calcium. Thus, fish life can be affected quite obviously by air pollution.

5. if acid rains are not directly dangerous for the trees, they can be harmful for the roots if and when they arrive in the soil.

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6. the effect has often been exaggerated, just as it is exaggerated to believe that entire forests, like the Black Forest in Germany, are already dying. And nobody knows very well why some parts have been damaged (drought, cold, fungal disease, ozone, etc. are also possible explanations).

7. wrong measures have been taken to protect the forests (for instance in Germany) just because scientists do not know exactly what is happening.

In Europe, we have a severe problem of acid rain and politicians are often using it with relief and satisfaction in order to get rid of questions they cannot explain otherwise : acid rains are a convenient scapegoat.

Anyway, we discharge in the atmosphere of Western Europe more than 30 millions tons of sulfur every year from which :

50 % is coming from fuel
40 % from coal
10 % from other industrial sources

Incidentally, the full world natural chemical process, volcanoes activties, etc., produce only 10 % of the sulfur to be found in the atmosphere.

We discharge also in the atmosphere 2 to 3 millions tons of nitrogen per year from which :

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40 % is coming from private and
public transportation

and 30 % from power plants

Besides, 50 % of the chloridric acid found in the atmosphere is produced by the famous aerosols.

In Europe, one aspect of the problem is essentially political : if the big states are affected mainly by their own air pollution, the small states are affected essentially by the pollution of the big ones.

In Switzerland, even if we do not note big changes between 1955 and 1982 in rain PH, this PH has a medium level of 4.3 (with no air pollution, the PH would be approximately 5.6, meaning less acidity than what we have now).

In Switzerland also, we are preparing a precise inventory of the forest conditions, but it will not be ready before 1986. Anyway, we cannot yet blame acid rain for precise damage neither on forests nor on monuments (by stone corrosion). Instead, some lakes are becoming more and more acid meaning danger for fish life.

In Germany, officially, 8 % of the forests have been damaged by acid rain : but some scientists are contesting this figure.

Usually,it isalso believed that fog is more acid than most rains.

There are means to reduce by 80 % the production of SO_2 and by 50 % the production of NO_x in the processes of combustion; however, these means produce their own side-pollution. Washing the smokes can reduce by 80 % the SO_2 but it may increase the water pollution.

The main problem is first to understand the full process, then to

spend the money available in the best possible way, which has not been always the case.

Up to now, the best and only undisputable possibility to reduce air pollution is to reduce our use of fossile energy. Water power, solar energy, and wind can be used in specific cases. I can add waves, tides, ocean currents, geo/ocean thermic machines as well as for instance nuclear power. But there are secondary problems : for instance mass production of solar cells produces also side-pollutions. Moreover, what is the sense of producing more "clean" nuclear energy if we do not know what to do with the radio-active wastes ?

In the same sense, I can also add that we could very well destroy our civilisation just by producing too much heat energy, whatever is its source. Any kind of energy or heat production interfers directly on the global environment. In case of mass production, as in the case of nuclear fusion (if it is once developed), the result could be disastrous.

The future will very likely demonstrate that there is an incompatibility between man and artificial energy on earth, and between Homo Sapiens and nature. What was possible when only 1 billion people were living on earth, 150 years ago, may turn impossible for 5 or 10 billions people in the near future. Especially if their goal is only to consume more and more energy (while resting more and working less). They will only produce more heat, more CO_2, more acid rains, primary, secondary and possible one day tertiary, the green house effect will at the end make the polar ices melt and the sea level raise some 300 feet, destroying the biggest human agglomerations and the best agricultural areas, creating the worst human migrations ever thought ... and this will only be due to the fact that mankind is not yet intelligent enough to master man's even most beautiful inventions.

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