BIO-POLICY: A QUANTITATIVE ANALYSIS OF THE BIO-ENVIRONMENT

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The exponential growth of human population and human activities in the relatively short span of human history has brought damaging changes to the condition of already complex ecosystems. The consequences of the progressive increase in biosphere damage are difficult to predict reliably or detect experimentally, especially if they are characterised by long-term constants. The problems that emerge in the pursuit of solutions concerning the relationship between further socio-economic development and the globally-finite bio-environment are characterised mainly by their diversity and their difficulty. They span disciplines, time and space. Major difficulties arise regarding their socio-political implications and the process of scientific measurement and prediction.

Today we realise that the socio-political problem is far more complex than was once thought. Different special interest groups, conflicting perceptions, regional and temporal inequalities, and urgency in decision-making often lead to unethical, incorrect or even criminal solutions to environmental problems.

Humanity does not assume now that co-existence with nature is the ideal way of life; most of our planet is more or less polluted. Bios equilibrium depends on interaction and establishing the links between the bio-environment and existing negative factors. The flow and transformation of matter and energy in the closed, but not isolated, global system of the earth must be maintained at a relatively constant energy level. We have to use everything in the world with extreme caution; participation in crime or genocide, in the name of change, means certain destruction and is a sin. The only remedy for such a sin is to denounce it publicly. We have to act together and make our solidarity certain. Otherwise, it will be very difficult to justify the definition of a "state of the earth" when taking into consideration selected data only.

The modern world makes the following assumption: killing is ideologically permissible. The media, by ignoring certain events and facts about the earth, make their selection of information (informing us, but not about everything) on the basis of "interesting" or "uninteresting," because they want to alter the picture of the world already created.

We know that many decisions are based strictly on scientific, theoretical models and that errors (especially systematic ones) connected with chemical measurement or models are frequently assumed to be unimportant, or at worst, temporary, by the general public. Such blind reliance on the quality of our models and data also leads to erroneous conclusions. In helping to reduce or remove the difference between the way nature works and the way humanity thinks, analytical scientists have a vital role to play. They have primary responsibility for:

- defining the Analytical Measurement Process (AMP) which explicitly links physico-chemical data with the technical information required by decision-makers (identification of pollution sources, the effects of dioxide production on climate, the effect of agricultural chemicals and supersonic aircraft on stratospheric ozone etc.)
- providing such data by Chemical Measurement Processes (CMP) of adequate sensitivity, precision and accuracy

Failure, either to link correctly (model) the environment or other external system with chemical observations, or to generate high-quality chemical data, can result in erroneous societal decisions or dangerous reliance on "theory."

Therefore, if we really want to find a solution to these new problems, it is important to appreciate the fact that a high quality of analysis is intrinsically linked to the quality of humanity's technological development, and at the same time to the quality of life itself, as influenced by anthropogenic environmental contamination. The nature of these technological and environmental effects is such that we need, in every phase, an interdisciplinary approach to their solution. The analytical scientist must be engaged in the measurement process, starting with problem definition and concluding with result-evaluation.

The overall AMP defines a system of problem representation, where the analyst must begin with the fundamental questions of analytical chemistry - why, what and how to analyse - and how to evaluate quantitatively the results and their implications, in a societal context. Wrongly defined environmental models and imperfect chemical fingerprints make this task the most important and the most difficult part of the effort to identify the critical environmental components and specify the chemical or physical quantities.

The CMP is extremely simple compared to the AMP, of which it is the central component. Society expects the CMP to be performed without error, but in fact all scientific results can be uncertain. The analyst, therefore, has a double responsibility; to establish and execute CMP's of the highest quality and to evaluate and report the results. It is worth considerable effort on the part of the analyst to construct his CMP free of,

or resistant to, bias blunders and imperfect models, as much as possible. The most likely route to success with a CMP is to pay attention to the critical links: sampling, sample preparation, measurement, data-evaluation and reporting. The most important attributes for high-accuracy analysis include procedure-validation through inter-comparisons, and the use of certified reference materials, specifically, control of the blank and careful attention to errors, as well as evaluation of the model structure. In this effort the central point, with regard to the detection of components and detection of unacceptable data or erroneous models, is hypothesis-testing.

Scientists know how difficult it is to stop uncontrolled reactions, once they have started. Intervention to stop, freeze, reduce or separate the hostile forces and/or uncontrolled reactions is generally a good idea, as long as they can be kept under control. Interventions that tend to freeze the situation can even increase the differences, at great cost and creating great uncertainty. Therefore, the selection of appropriate and globally-relevant models for the preservation of the existing relationships within the bio-environment is the most important, yet very difficult moral, ethical, and diplomatic problem.

Which criteria should be applied? Which concessions should be judged satisfactory for normalisation? How can destructive ambitions be influenced, in order to safeguard the bio-environment for future generations? Humanity must take all such decisions with extreme caution.

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