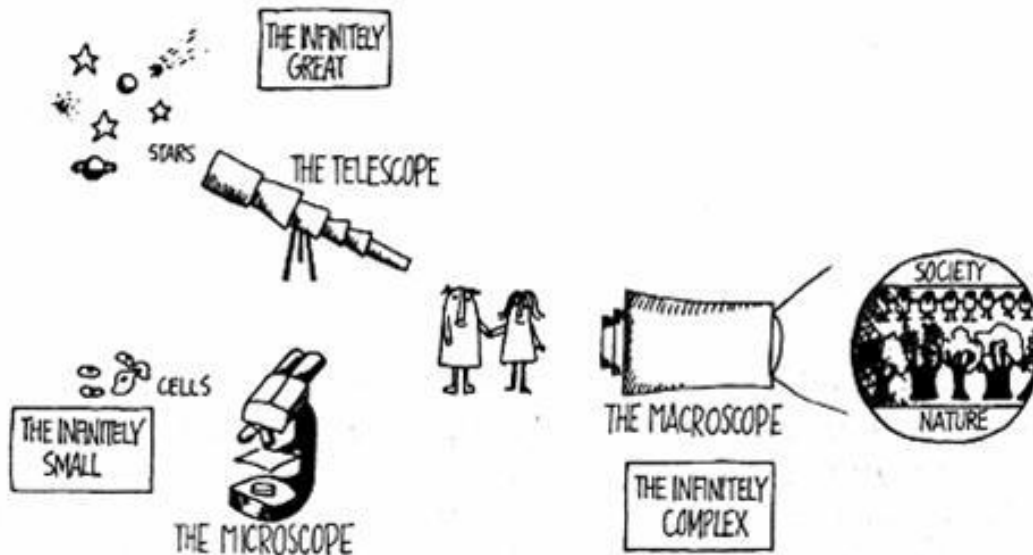


Joel de Rosnay: Das Makroskop - DVA, Stuttgart, 1977 [Gedanken-Apparat](#) – für Untersuchung von Zusammenhängen



Internet-Link

<http://pespmc1.vub.ac.be/macroscope>

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INTRODUCTION: THE MACROSCOPE

Microscope, telescope: these words evoke the great scientific penetrations of the infinitely small and the infinitely great. The microscope has permitted a dizzying plunge into the depths of living matter; it has made possible the discovery of the cell, microbes, and viruses; it has advanced the progress of biology and medicine. The telescope has opened the mind to the immensity of the cosmos; it has traced the path of the planets and the stars and has prepared men for the conquest of space.

Today we are confronted with another infinite: the infinitely complex. We are confounded by the number and variety of elements, of relationships, of interactions and combinations on which the functions of large systems depend. We are only the cells, or the cogs; we are put off by the interdependence and the dynamism of the systems, which transform them at the very moment we study them. We must be able to understand them better in order to guide them better. And this time we have no instrument to use. We have only our brain--our intelligence and our reason--to attack the immense complexity of life and society. True, the computer is an indispensable instrument, yet it is only a catalyst, nothing more than a much-needed tool.

We need, then, a new instrument. The microscope and the telescope have been valuable in gathering the scientific knowledge of the universe. Now a new tool is needed by all those who would try to understand and direct effectively their action in this world, whether they are responsible for major decisions in politics, in science, and in industry or are ordinary people as we are.

I shall call this instrument the *macroscope* (from *macro*, great, and *skopein*, to observe).

The macroscope is unlike other tools. It is a symbolic instrument made of a number of methods and techniques borrowed from very different disciplines. It would be useless to search for it in

laboratories and research centers, yet countless people use it today in the most varied fields. The macroscope can be considered the symbol of a new way of seeing, understanding, and acting (Fig. 1).

Let us use the macroscope to direct a new look at nature, society, and man and to try to identify new rules of education and action. In its field of vision organizations, events, and evolutions are illuminated by a totally different light. The macroscope filters details and amplifies that which links things together. It is not used to make things larger or smaller but to observe what is at once too great, too slow, and too complex for our eyes (human society, for example, is a gigantic organism that is totally invisible to us). Formerly, in trying to comprehend a complex system, we sought the simplest units that explained matter and life: the molecule, the atom, elementary particles. Today, in relation to society, we are the particles. This time our glance must be directed toward the systems which surround us in order to better understand them before they destroy us. The roles are reversed: it is no longer the biologist who observes a living cell through a microscope; it is the cell itself that observes in the macroscope the organism that shelters it.

There is much talk today of the importance of a "vision of the whole" and of an "effort to synthesize." These attitudes are judged necessary to solve the complex problems of the modern world. Unfortunately, our education has not prepared us for this. Look at the list of university disciplines; they divide nature into so many private properties, each carefully isolated from the others. More simply, recall the basic education you received in school: English, mathematics, science, history and geography, government, or modern language--so many fragmented worlds, the vestiges of a scattered knowledge.

Should one hold on to the "analytic method," which isolates elements and variables in order to examine them one by one? While the experts are isolating, analyzing, and discussing, the technological upheavals and the cultural revolution impose new adaptations on society. The growing gap in time between the perception of global problems and the arrival at major decisions makes our analytic methods appear even more inept.

Another approach, a complementary one, exists and will often be discussed in this book. This is (I shall explain the choice of the term) the systemic approach. This new approach is symbolized by the macroscope. It emphasizes a global approach to the problems or to the systems that one studies, and it concentrates on the play of interactions among their elements. What practical bearing does it have on resolving global problems? Can it help us to enlarge our vision of the world, to better transmit knowledge, to free new values and new rules that can motivate and support action? This book tries to answer these questions. It is intended to be practical. Its organization, its pedagogy, its message rest on three principles: to increase one's ability to see better, to correlate facts in order to *understand* better, and to identify situations so that one may *act* better.

The general organization of *The Macroscope* is in the image of the approach that it advocates and describes: my medium is also my message. This approach does not lend itself readily to conventional forms of communication. It has been necessary to "invent" even the organization of the book; to "invent" the means of communication that it intends to establish.

I have, therefore, turned my back on the classic organization of the "linear" book, in which ideas, developments, and chapters follow one another in sequential form. That is a corridorlike, tunnelloike

book, a one-way traffic in which one understands the end only when he has assimilated the facts given at the start.

I prefer the "intersecting" book to the linear book. You pick it up where you want; you pursue it according to your desires by following several simple and precise rules from the beginning. Thus, if you wish, you will be able to compose a book a la carte, one that corresponds as much as possible to your own interests and to what you hope to find in it. That is why the chapters and sections of *The Macroscope* are relatively independent modules, all of which play a part in leading toward the vision of the whole.

For those who prefer to be guided, I will describe the "logical" approach. The book has the structure of a double cone. In the beginning one approaches the structure and mechanisms common to many systems of nature; one observes.

In this way one approaches the summit of the first cone; the general method allows one to connect the systems--the systemic approach. Then one moves into the second cone, to the applications and the diverse propositions or suggestions that I submit for consideration (Fig. 2).

The first chapter, [*Through The Macroscope*](#), is essentially didactic but is presented in a way that I hope is original. Here I apply systemic principles in order to bring out the functioning of the principal systems of nature. It is also a primer for those who want to acquire rapidly the fundamentals of modern ecology, economics, and biology. From the ecosystem to our extraordinary universe, the stages of the voyage are: ecology and economics, the city and the organization, the organism and the cell.

The second chapter, [*The Systemic Revolution: A New Culture*](#), is an introduction to and a training in the new method of approach to complexity. The purpose of this chapter is to unveil the basic concept of "systems," to bring to light fundamental laws, general principles, and the properties that relate the principal systems of nature. This is the key to the book; it tells how to use the macroscope.

In the three chapters that follow, [*Energy and Survival*](#), [*Information and the Interactive Society*](#), [*Time and Evolution*](#), I shall try to apply the systemic approach to three fundamental fields of knowledge: energy, information, and time. These three chapters constitute the heart of the book because they illustrate its purpose. In fact energy, information, and time are the eternal elements on which all action depends--the sequence of all knowledge and meaning. To envisage their multiple implication at the physical, biological, social, and philosophical levels, I propose to use the macroscope.

The sixth chapter, [*Values and Education*](#), considers how the global vision (particularly the new generation's views on nature, society, and man) can set forth new values, outline tomorrow's education, and bring out the features of a new type of emerging society.

These are the traits that the conclusion, in the form of a scenario, will try to set forth.

The last chapters necessarily return to the first, for the first chapter tries to apply the principles of a new form of education. In fact the basic elements of the systemic education treated in the sixth chapter are the very principles that I put into practice in the beginning of the book. You may, if you like, begin this book at the end, with the [*Scenario for a World*](#). Or you can follow another route; if, for example, you are interested in biology and ecology, and if you know economics and business well enough, then read first the sections on the cell and the ecosystem. If you are familiar with

cybernetics and the systemic approach, then go directly to the sections on energy, information, evolution, and time.

I should also like to "spread" a new form of communication throughout this book. *The Macroscope* is not a book that intends to popularize difficult scientific concepts, even though the first part, with its numerous illustrations, presents complicated subjects in a simple manner. The popularizing book concentrates on a given field of knowledge and tries to present it in a language accessible to everyone. To grasp a general concept that draws on several disciplines, to succeed in a personal synthesis of scientific, economic, and sociological facts, is often difficult. It is also difficult to unify a "mosaic" of views made popular by different approaches and different languages. The popular books allow the reader to be led by the author, the reader depending on the author to "take him by the hand" and help him over the difficult passages.

I am anxious for a new form of dialogue. Rather than supply portions of pure knowledge, I should like to stimulate inventive thought--the imagination. I prefer to make you use your capacities for reflection, intuition, and synthesis. To be sure, such a participation demands an effort; yet I am convinced that that is a form of communication that truly fulfils the mind.

The method used here is that of the enrichment of concepts. Consequently I give few definitions. The definition seems to me to be an easy solution, and I do not want to communicate by ready-made slogans, by conceptual "kits" ready to be assembled. To enrich and clarify a difficult concept one must return to the concept several times, now reviewing it in a different light, now placing it in a new context.

This particular form of dialogue necessarily implies--especially in the first part of the book--a new language of communication. The transmission of pure knowledge in neat little packages is often used in traditional analytical instruction. Yet one must also evoke and retranslate relationships between disciplines, movement, complexity, interdependence. One must depend on intuition, on creative thought, and (why not?) on subjective thought. Along with traditional discourse and verbal explanation, I believe in the virtues of diagrams, illustrations, models, analogies, and metaphors. Of course everyone knows that diagrams are "always false," that generalizations are "hasty," that models are "simplistic," that metaphors are "easy," and that analogies are "dangerous." In order to communicate idea and thinking in the most diverse fields, I have used the entire arsenal at my disposal; I leave it to you to make use of the guardrails of thought in the awkward spots.

I realize the danger of my enterprise. This book is ambitious because it touches on biology, ecology, economics, information systems, education, sociology, and even philosophy. If I have been naive enough to write it, it is because I believe that we express well only what we have lived.

A few years ago, in writing a little book on modern biology, I chose the global view of man who observes in "the interior of himself" the fantastic universe of the cell. It was then necessary to write the sequel, man looking "beyond himself" at the macrolife in which he is integrated and of which he is the element: business, the city, economics, the ecosystem. Man has lacked the tool with which to study the macrolife--the macroscope--and he will learn to use it only after a period of training. That training is what I will try to offer here.

This book may also appear to be superficial; in touching on all subjects, it may seem only to skim the principal subjects. It is not a study in depth of biology, economics, or ecology. It appears to pass over

the problems posed by energy, communication, participation, acceleration, and evolution. It tries to reflect on knowledge and its limits. It outlines the main feature of a new education and an emerging society. Yet once again my approach is different. You can see many things by looking down on the continents from a satellite; is that a superficial view? I think not; first, because details invisible on land now appear, then, above all, because this vision of the world poses new questions and suggests further studies.

The specialist's book approaches in detail a small number of sectors cut arbitrarily from a greater whole. Talking about economy, he may dwell on inflation. Talking of the body, he may concentrate on the brain. Talking of business, he may put marketing before all else. This book, on the contrary, attempts to return all the principal elements to the system in which they belong and to consider them each in relation to the others.

This is no longer the method of the "generalist." I think that one should be careful of generalists; they often remain in the realm of ideas and do not attack the reality of facts. On the contrary, we need the help of specialists who have learned, through experience and exposure to other disciplines, to look beyond and to communicate. Should we call them "synthesizing" specialists? I don't know, but *The Macroscope* has been written with that perspective in mind.

Finally, I must say that I mistrust almost instinctively universal models that claim to contain everything and unitary theories that claim to explain everything. True, they correspond to that natural tendency of the human mind that wants to bring together, to rearrange, to unite. But it is just because they are so satisfying to read that they can be dangerous. A model of the world can lead to the worst intransigence: one sorts-- and eliminates--everything that does not fit in this model. A unitary theory can lead to the worst smugness: why bother to hunt, to criticize to invent? I reject every closed and sterile representation. The models I propose are only points of departure for reflection; in no case are they points of arrival. These models should be confronted with reality and especially with risk; they must be attacked, destroyed, and rebuilt. For they can only evolve in confrontation with and stimulus from the outside world--and this means action. It is through an incessant round trip between representation and action that a conceptual model will evolve. In this sense the macroscopic vision and the systemic approach, which are the web of the book, will be utilized in education and in action.