

Chapter 2

The Question: Do Humans Behave like Atoms?

The analogy, if any, between men and atoms is discussed to single out what can be the contribution from physics to the understanding of human behavior. The basic assumptions of the approach of sociophysics are formulated together with the methodology used to tackle a given problem taken from the social and political worlds [1, 2].

2.1 My Basic Philosophy

Once ethical questions and feasibility have been clarified, we can proceed in making our scheme for building a new approach to human behavior more precise, including the psychological, social, economic, and political aspects. It should be strongly stressed that the goal is not to substitute a physical view to all aspects of human life. As a first basic step, we aim to bring to light the very plausible existence of quantitative laws which govern human behavior. In a second step yet to come, sociophysics could turn into a quantitative science in order to discover the actual laws of social behavior in the same way that physics did so with the laws governing inert matter. It does not mean that the respective laws are identical. We are convinced that understanding the laws of human behavior can only be a benefit to human life and to humanity.

But as mentioned above, in order to avoid a dangerous misuse, it is necessary to emphasize my methodology before elaborating on my different studies of social phenomena. The same procedure will always be used whatever the problem investigated. Thus, hypotheses and associated weaknesses will be systematically and clearly stated to set the limits of the model and the corresponding relevance to reality.

Sociophysics does not claim to reach an exact description of a human group, but instead aims to shed new light on human phenomena, which are otherwise so complicated that any assumed truth is by nature misleading, and eventually wrong.

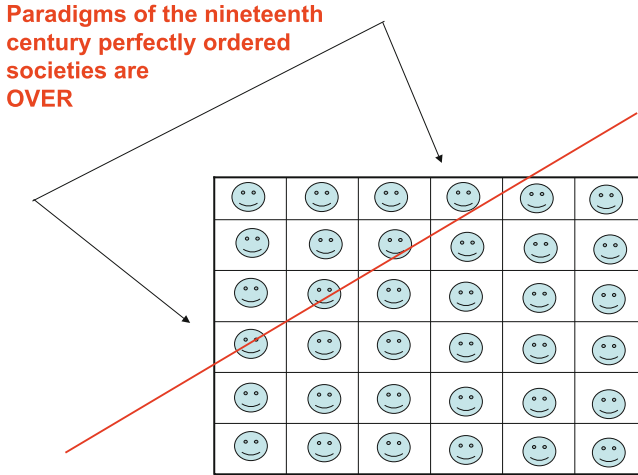


Fig. 2.1 Current paradigms of society belong to the physics of the nineteenth century

Behind the use of the word “physics” in our so-called “sociophysics” stands the way physics proceeds in seeking to understand the laws of inert matter, rather than the use of the laws of physics themselves. This particular way relies on the modeling “à la façon” of the physicist, the physicist’s way of modeling (Fig. 2.1).

At the core of our underlining philosophy is the view that facing such a complex and complicated world such as that of human societies, only an over simplified vision of it can indeed capture a substantial part of its essential features. The initial step is to constitute the first essential presuppositions and basic foundational assumptions of a science that has yet to be set out. This statement could sound like an epistemological contradiction, but only in appearance, as will be clear later in becoming acquainted with the physicist’s frame of mind (Fig. 2.2).

To proceed with this working hypothesis, the first main path to take is to create “artificial” worlds in which everything is controlled, i.e., in which all the ingredients are clearly defined, the laws of interactions are explicitly written and the range of variations of all the parameters are set, together with the definition of the eventual dynamics of evolution. Once all that is done, the associated collective properties can be studied to find out how “artificial” humans behave within the given “artificial” world.

Once this procedure has been carried out, we will proceed in checking out if some of the discovered features, which are active within our “artificial world,” could mimic some of the features of the real world we aim to capture. In case it does work, we will not jump to the conclusion that we have discovered some “social truth” but we will suggest that the mechanisms used to describe the “artificial world” may be very similar to the ones behind the corresponding real social feature.

We believe that it is from simplicity that theoretical complexities can appear in a way that allows subsequent understanding of the real and many complex

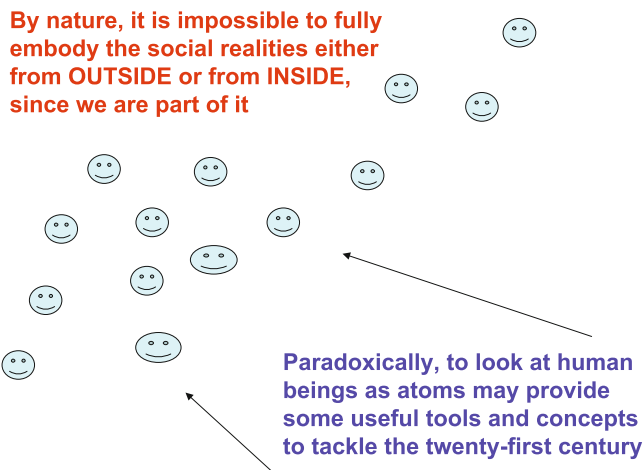


Fig. 2.2 Physics may provide useful novel paradigms to help us tackle the challenges of the twenty-first century

aspects of the social world. The permanent challenge is to build a model to perform calculations in order to obtain data and results, which in the second step can be compared to the real counterpart of the phenomenon, either via the setting up of experiments, as in physics, or via quantitatively observed trends from the social world. On this basis, the model is either validated or invalidated, with the awareness that we are building up a model by successive layers, each layer being an additional level of complexity to mimic the real system.

2.2 Telling the Truth About What Indeed Physics Is and What It Is Not

It is of importance to emphasize that contrary to the general belief, physics from the start, gave up the search for an absolute global and unique truth to describe inert matter. By “the start,” I am referring to the early origins of the modern scientific method set in the fifteenth and sixteenth centuries which are now used in physics. Man as a subjective body driven by beliefs was separated from the performing of an experiment, which was required to yield the same results independently of where and by whom it is conducted. The establishment of an independent theoretical corpus was a key to the development of science in parallel to the experimental checks of its predictions.

The genius of physics has been its success in separating various levels of the inert world in terms of energy and time scales such that it became possible to investigate the inside of each one, gaining in turn substantial insight to make solid

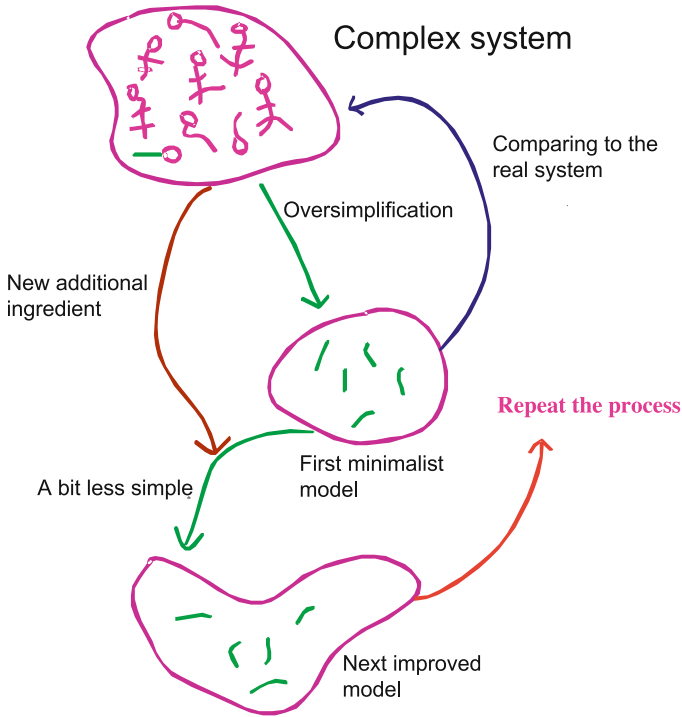


Fig. 2.3 The iterative path of physics-like modeling

predictions. Physics does not provide one single view of all aspects of inert matter. It discriminates between high energy physics, nuclear physics, atomic physics, condensed matter physics, astrophysics, cosmology, and more. While mastering aspects of each part of the underlying truth, the possibility of the full truth is de facto abandoned although some are still dreamt of, such as in achieving the so-called “grand unification” of the four forces.

This well proven and powerful operative mode articulates via the design of so called “toy models,” which are by nature extremely crude with respect to the reality they address. But indeed, although far removed from it, they have been capable of exhibiting nontrivial results which have been shown to be shared by the corresponding real world. Once, a “toy model” is defined, solved and validated, it becomes possible to enrich it with additional ingredients in order to narrow the gap with reality and cope with it in a more realistic way. It is this very “try and check” procedure which has led to the many breakthroughs accomplished in science (Fig. 2.3).

We can illustrate the method by considering some system built from hypothetical agents denoted XY3Wz, which could be identified with their different attributes as shown in Fig. 2.4. These agents evolve in assemblies. If we wished to study their

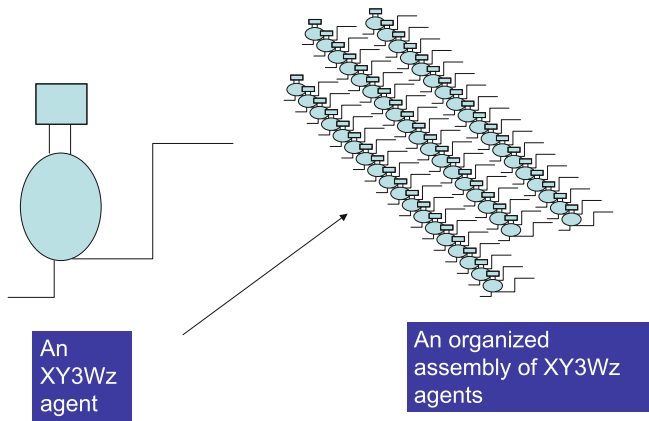


Fig. 2.4 A system constituted with hypothetical agents denoted XY3Wz

behavior, since they are too complicated to be solved at once, a physicist will start by greatly simplifying the object by selecting only one of the agent’s attributes.

Such a procedure could lead to several different options, each one focusing on one particular attribute. Three different possibilities are shown in Fig. 2.5. More are possible. The simplified agent can then be placed in an assembly whose properties are investigated. This shows why different models are often invented to describe the same problem.

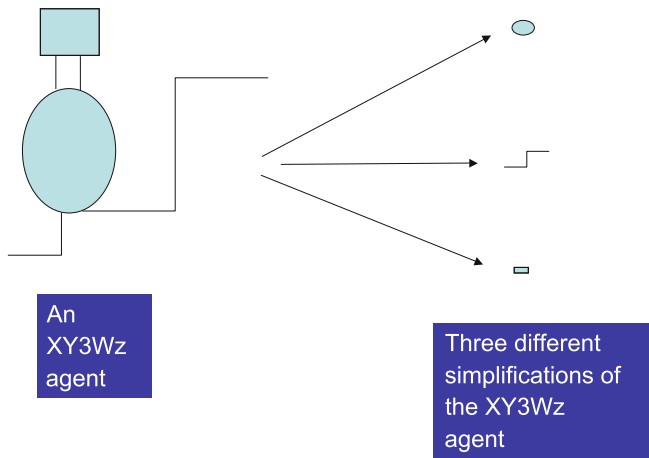


Fig. 2.5 The first step to model the XY3Wz problem is to simplify the attributes of the agent so as to obtain a simplified version of the XY3Wz agent. Three different versions are given. At this stage, they are all on the same footing, i.e., very far from the real agent

In the second step, the simplified XY3Wz agent is used to study an assembly, as in Fig. 2.6. The results obtained are then compared to the available data from the real system. Most of the time, a substantial gap is found between each model and the real system.

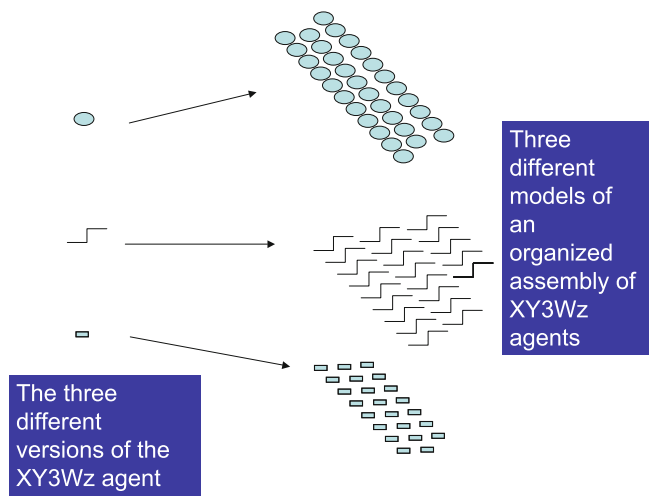


Fig. 2.6 Three different models of an assembly of the same XY3Wz system

On this basis an improved version of the agent is required. Usually, this step forward is achieved by adding one attribute to the simplified agent in order to obtain a more elaborate model. Figure 2.6 shows an example of adding one attribute to each one of the three simplified agents. The above process can be repeated, combining results from the different models so as to eventually reach a single model which is closer to reality (Fig. 2.7).

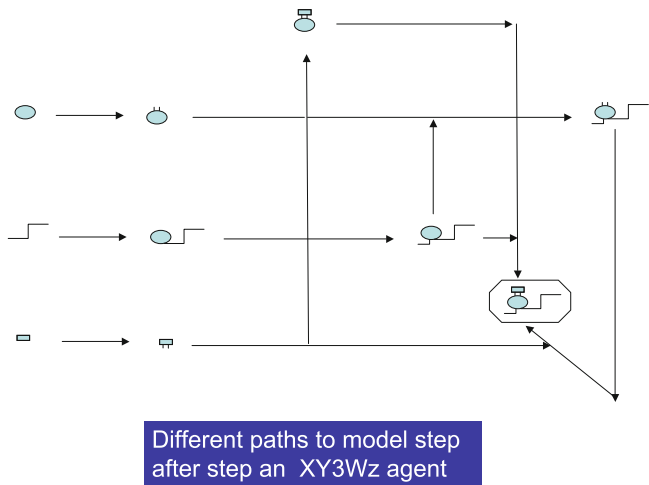


Fig. 2.7 One attribute is added to each one of the three simplified XY3Wz. Then crossing the various models, a solid one can eventually be obtained which includes all the attributes of the XY3Wz agent

2.3 Physics Does Not Care About Mathematical Rigor

At this stage, we need to emphasize one additional fundamental feature of the nature of physics. While the use of modeling in physics has been tremendously powerful in establishing the field as an exact hard science, capable of building concrete and efficient experimental devices, its power comes from the empirical use of mathematics to describe real phenomena. This means that it is not the mathematical rigor that prevails but the capability to reproduce particular properties using some mathematics. It is the exact opposite of what economists have been doing for decades, who have focused on the mathematical rigor of their model rather than their ability to reproduce real features.

Another essential characteristic of physics is that all the results obtained from the various models are aimed, sooner or later, at being tested against experimental data, even if it takes many years or decades or even centuries before being able to do so. Also, if an agreement between theory and experiment clearly validates a model, discrepancies are used not to invalidate the whole model but only part of the model's hypotheses. Physics is a so-called hard science but it balances between the hard reality and the rich possibilities of inexact mathematics. The net result of these "arrangements" taken with mathematical power has led to the building of a solid and extended core of understanding of the laws governing inert matter. This is why while discussing the "reality" of Asimov's psychohistory we emphasize that only a physicist could create it, not a mathematician.

Within my sociophysics approach, I am going to follow the same procedure, modeling social reality with an empirical use of mathematics, giving up rigorous aspects, in favor of the capability of being able to reproduce some particular phenomenon. Behind such an apparent lack of rigor lies the basic difference between mathematics and physics. The former focus is on proving the universality of a result, whereas the latter one aims at finding some minimum conditions which are able to reproduce a given observation.

However, at the current initial level of our novel approach, we are not yet dealing with what could constitute the associated experimental apparatus of sociophysics. We will first need to elaborate what could be the equivalent elements of the limited experiments performed in psychosociology before even considering larger scale experiments. Dealing with human beings is of course not the same as experimenting with some piece of inert matter.

At the same time, this ethical prudence can turn out to be dangerous in the final assessment of a social law derived from our models. This is why we should always be cautious about the findings from a model. At this point, we are not going to state definite laws, but instead, to set out a new framework of investigation in order to be able to gain a coherent and different view about social and political behavior. In a second step in developing our approach, the model predictions have to be checked against real experimental data to validate the coherence of a model's hypotheses.

A whole new framework could thus emerge and gradually be built through the intricate combination of theoretical experiments and real life. It is a long and

exciting adventure to be engaged in, because so far, we have only just scratched the surface of this new field. What we have done is already a huge and very ambitious epistemological step.

2.4 Implementing a Physics-like Approach Outside Physics

We can now start embracing our main topic, i.e., why physics should be used for tackling anything else outside of inert matter. At this stage, it is worth emphasizing that it is of interest to focus on one particular field, known as statistical physics. Indeed, thanks to its many achievements, the domain has already generated a lot of applications in many fields outside physics. However, the stakes are very different in respect to the applications in biology, economy, sociology, and politics (Fig. 2.8).

In a very schematic manner, we can say that in biology there exists no major current interest in theory per se. It is essentially an experimental science. In the case of an experiment being suggested, on the basis of physics-driven ideas, or anything else, it could be performed. If a new result is obtained, the inspiration from physics takes second place and is forgotten. On the contrary, if no result is obtained, the physics is also forgotten.

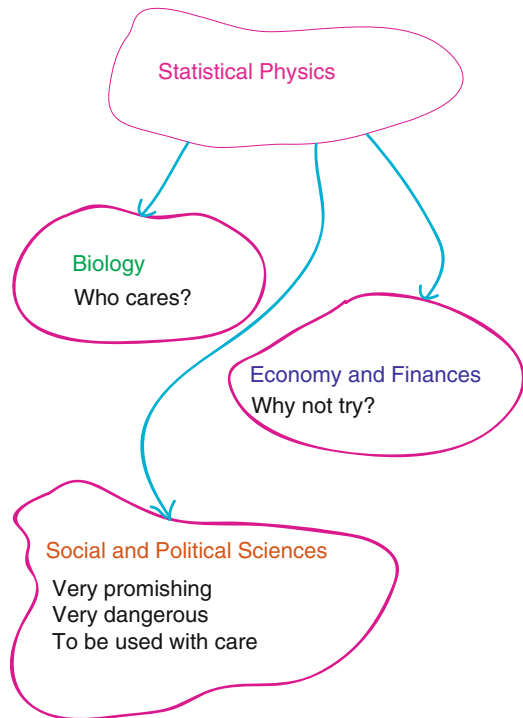


Fig. 2.8 Applications of statistical physics to biology, economics, social, and political sciences

With respect to economics, I would say, in a provocative manner, that nothing really works when confronted to economics data. In finance studies, a scheme derived from physics can be sometimes beneficial to certain types of investment. Many physicists have been hired in financial institutions for their general skills rather than for their use of physics. In particular, a field called “econophysics” has emerged and was developed in the late 1990s with hundreds of scientific papers published, focusing mainly on the analysis of financial data. I am inclined to say that, after serious hopes at the beginning, no solid achievement has been accomplished at all. Of course, as the recent 2008 financial crisis has shown, when inopportune use of abstract models leads to substantial losses, physicists will be blamed for some time to come. But as with biology, the intrusion of physics causes no decisive impact on the dynamics of the field.

Contrary to both biology and economics, the use of physics-based ideas, concepts and techniques dealing with human beings may turn out to be very delicate in the social sciences. This statement is particularly true for models which appear to be false. The major associated epistemological contradiction lies in the fact that because physics can contribute substantially to the social sciences, it can also lead to all kinds of serious misuses.

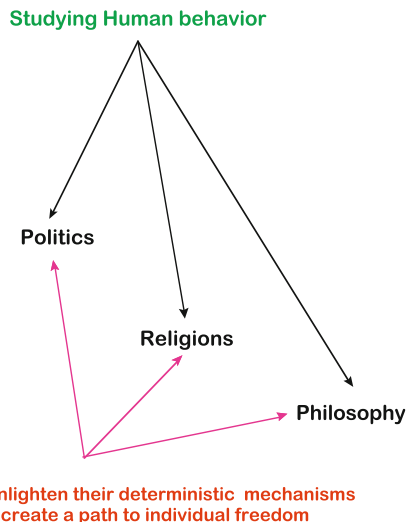
The above challenges are related to politics, philosophy, religion, and everything in which human beings are very involved. Convictions, beliefs, and prospects on what is or should be the social life and its organization could make the human cost of both errors and manipulation potentially very high. On this basis, nothing should be imposed in the name of physics. Physics can only shed new light on social phenomena but never substitute itself for the whole framework of the corresponding traditional views and knowledge of sociologists.

Hence, sociophysics is a very exciting and promising field of research, but must always be dealt with care and much caution. To sum up the challenge, we could say that “to introduce formal rationality in human beliefs may produce irrationality in human behavior” establishing catastrophic paradigms that are totally artificial and false, although they could fit to some wrong representations of social reality (Fig. 2.9).

2.5 But Indeed, Do Humans Behave Like Atoms?

When dealing with social situations it is usually believed that one of the main difficulties arises from the rich variety of individual characteristics and features of the individuals involved. Along these lines, the richness of a group is expected to be an exponentially increasing function of its size, symbolized by the concept of “complexity” with its famous dogma “The whole is greater than the sum of its parts.” However, crowds, which contain large numbers of people, behave in some aspects like one “collective individual,” who in turn might well behave according to a simpler framework than that of a normal individual.

Fig. 2.9 Discovering the existence of deterministic behavior may be the key to individual freedom



This paradox suggests that within a group, the individual complexity should decrease in parallel to the appearance of a new individual monitored by the “collective dimension” of the group. In this context, it is of particular importance to discriminate between, on the one hand, the properties associated with purely individual characteristics, and on the other, those properties which result from the existence of a collectivity or social system. This is exactly why we are not suggesting using, for instance, atomic physics to describe individual properties. On the contrary, collective properties may obey universal features which are valid in many different fields.

And it so happens that the interplay between microscopic and macroscopic levels has been greatly studied in physics, a field which is very far from the social sciences. The field of statistical mechanics has been dealing with collective behavior in matter for more than 100 years with much success. However, only in the last few decades has the problem of collective phenomena been well understood. However, this achievement has been made only in the case of pure systems. Organic disorder and heterogeneous systems are still resisting full understanding although solid progress has been accomplished in recent decades with the framing of a series of new concepts and sophisticated tools but much more needs to be done. Out of equilibrium systems are only at the first stages of comprehension. Nevertheless, the modern theory of critical phenomena already represents a substantial qualitative leap toward the understanding of collective phenomena. Chaotic behavior represents another epistemological leap.

The modern theory of critical phenomena is based on the fundamental concepts of universality and irrelevant variables. These two concepts mean that different physical systems, for instance, a magnet and a liquid, behave in the same way when passing from one macroscopic state to another, although the physical properties

associated with the respective macroscopic states of a liquid and a magnet have nothing in common. Corresponding well-known examples are the magnet becoming a paramagnet and the liquid, a gas. The discovering of the concept of universality has been a major breakthrough in our understanding of the universe.

Accordingly, physical characteristics of systems, i.e., the form of microscopic interactions and their physical nature have no effect on the so-called critical behavior which produces the physical character of the transition from one state to another. Most of the microscopic properties turn out to be irrelevant for describing the macroscopic change, which in turn appears to be universal. By irrelevant, I mean that the microscopic properties have no effect on the process.

While the number of physical systems undergoing phase transitions is infinite, all associated phase transitions have been shown to be described in terms of a finite number of universality classes. Only a few parameters, such as the space dimensionality, determine which universality class the system belongs to. The abstract and general nature of the statistical physics framework makes it tempting to extend such notions to nonphysical systems, and in particular to social systems for which, in many cases, there exists an interplay between microscopic properties and macroscopic features.

2.6 Building Up an “Atom–Individual” Connection

Nevertheless, the fields of the physical sciences and the social sciences are a priori rather different, both in their nature and in their applications. In order to develop some common framework, it is useful to find out what appropriate assumptions need to be made about the relevant correspondences. The first immediate possibility is to put in parallel the atom and the individual. In physics, the atom defines the basic level of investigation. Afterward, the exploration can go, on the one hand, inside the atom toward elementary particles, and on the other, toward bulk matter by grouping atoms together. In the social sciences, starting from the single human individual also allows us to consider human beings in the “bulk” form, with the existence of societies, as well as the “infra” individual at the level of elementary cells or small groups.

Before implementing such an “atom–individual” connection, one is entitled to ask the following naive question: “what is common to an atom and a human being?” Without requiring much elaboration, the answer is, “nothing.” The same “nothing” also holds when comparing an atom to a country, a firm, a cell, a political party, a stock, a grain of sand, and many other entities. Such a negative assessment promptly raises a serious concern of what the book is all about. Why all these words for such a clear and precise hopeless conclusion?

Without throwing away our nice motivation to build up a new scientific approach to tackle human behavior, we need to go ahead and consider not the singular entity but its plurality. Accordingly, we reformulate the question. Instead of “what is common to an atom and a human being?” we ask: “what is common to an assembly

Fig. 2.10 What is common to a human being, a stock market, an atom, a party, a grain of sand?

What do they have in in common ?

A human



A stock
8.2331

An atom



A party



A grain of sand



of atoms and an assembly of human beings?.” That already is much more attractive and sounds like deserving of a positive answer. Unfortunately, after some thought and analysis, we need to go against what was expected, with again the same answer of, “nothing.” And again, this remains valid for an assembly of countries, firms, cells, political parties, stocks, sand grains, and many other groups of entities.

At this stage, it would be legitimate to get a bit annoyed and to start to complain about what seems to be a totally fake enterprise. However, the above fastidious search was aimed at shedding light on the fallacy of the immediate connections, one atom—one human being and many atoms—many human beings, which have to be dismissed from the start as philosophical traps.

Once this is achieved, we can elaborate on climbing out of our despair in pursuing the discussion in order to discover the relevant path to implement the “atom—individual” connection. The right and powerful question is: “is there something in common with both processes of passing respectively from one atom to many atoms and from one human being to many human beings?” The answer becomes “yes, there is a lot.” This statement also holds true when going from one country, one firm, one cell, one political party, one stock, one grain, and any other entity toward many countries, firms, cells, political parties, stocks, grains, and other entities.

More precisely, the hypothesis behind the present approach is that these micro—macro mechanisms are universal and hold true beyond the true nature of the various entities involved. The above series of questions aim at clarifying which problems may be addressed and which are outside the scope of the approach. It is worth stressing that we are not claiming that our model will explain all aspects of human behavior. Like any modeling effort, it is appropriate only to a few classes of phenomena of social sciences and not to others (Figs. 2.10–2.18).

Fig. 2.11 What is common to a firm, a cell, a country, or whatever?

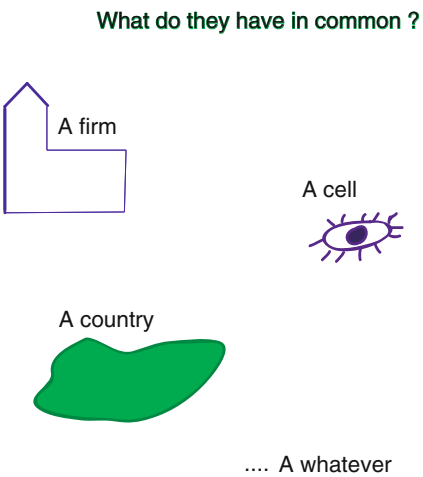


Fig. 2.12 Unfortunately or fortunately there is nothing in common between all the preceding items

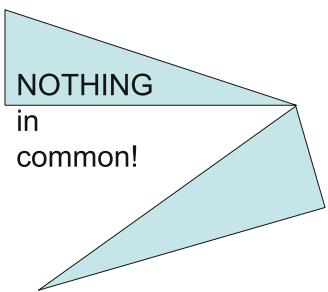


Fig. 2.13 What do a group of human beings, stocks and shares, atoms, and political parties have in common?

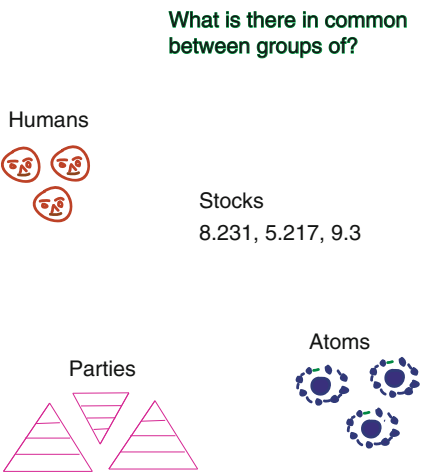


Fig. 2.14 What do a group of grains of sand, firms, countries, and cells have in common?

What is there in common between groups of?

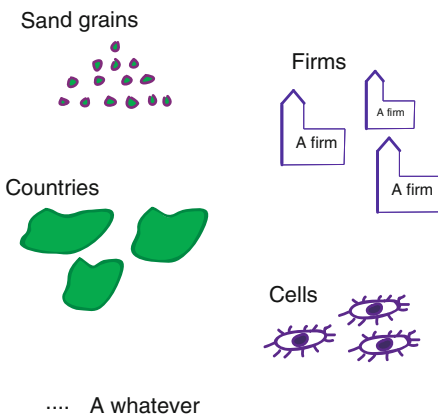
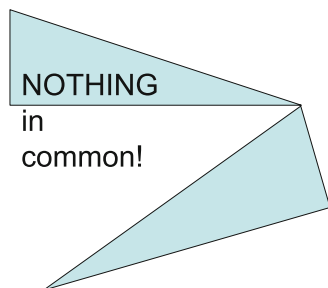


Fig. 2.15 As for previous series, unfortunately or fortunately there is nothing in common between all the preceding items



2.7 Our Bare Methodology

Having presented the focus of our philosophy and the appealing, but wrong paths, we have thus established a solid conviction about the well-founded basis of our approach, at least at an epistemological level. Ultimately, it will be the demonstration of the adequacy of our models in describing some part of the social world which eventually will turn our a priori toward making sense through intuitive statements into something that could resemble a hard science. At least, that is the challenge facing us.

Before proceeding with the core of sociophysics, it may be very useful to lay down our general strategy, which is grounded on a single methodology that is used throughout this book for all the social and political phenomena presented. We will start by picking out a single global phenomenon or some social practice occurring in society. This choice could result from our feeling that there exists some hidden paradox. It could also be driven from a legitimate character that no one would ever think of questioning. These choices are ours and many others could have been

Fig. 2.16 What is in common in going from a human being, a stock market, an atom, a political party, a grain of sand to a group of humans, stocks, atoms, political parties, sand grains?

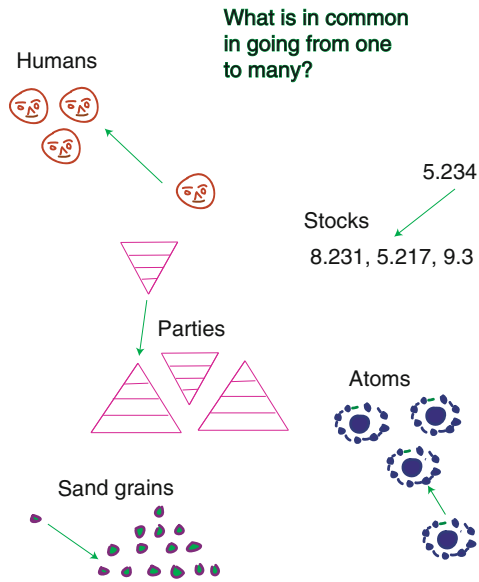
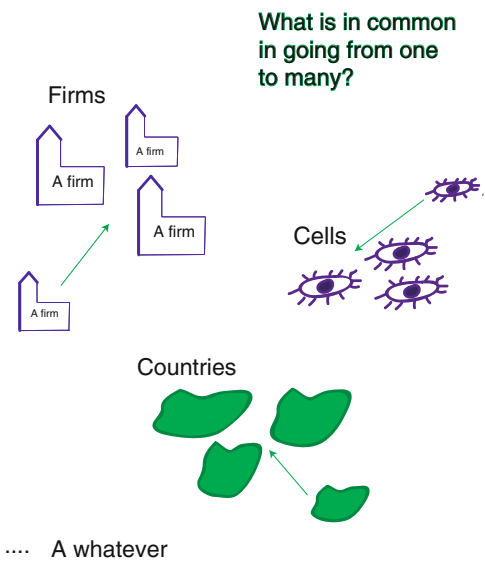


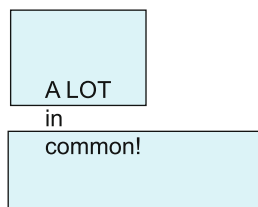
Fig. 2.17 What is in common in going from a firm, a cell, a country, or whatever to a group of firms, cells, countries, or whatever?



made instead. Through these choices, we aim at illustrating the powerful method of sociophysics rather than stating a series of absolute social laws.

For instance, we will study in detail the use of bottom-up majority rule voting in hierarchical structures (Chap. 7), and the holding of public debates on issues for which decisions are to be taken that have a large public support (Chap. 10).

Fig. 2.18 Contrary to the above previous series, still unfortunately or fortunately there is now a lot in common in going from one to many items



Once we have selected the phenomenon or the social practice of interest, we have to clearly identify the associated paradoxical features. For instance, picking up the study of democratic voting in bottom-up hierarchical structures, we emphasize the surprising stability of top leaderships against growing dissatisfaction from members at the bottom.

On this basis, although the phenomenon is usually very complex and involves a large number of different ingredients, we apply a brutal simplification by neglecting most of everything. We reduce the phenomenon to a minimum but always preserve a few basic essential features capable of producing some nontrivial dynamics, keeping in mind the goal of recovering the initial “bare paradox.” In the case of democratic bottom-up voting in hierarchical structures, the outcome is a strong dictatorial stability effect in favor of the current top leadership against an eventual massive bottom rejection.

The purpose of the “game” is first to check if the chosen mechanism can reproduce the corresponding selected paradox. For instance, can we stabilize a current leadership against an increasingly huge opposition from the base by a democratic procedure? How can repeating votes end up by democratically choosing to renew the current leadership although it is now rejected by the majority of people at the bottom of the hierarchy?

Once the toy model is working, the second goal is to establish a logical link between the artificial model and what could be the equivalent real mechanism underlying the political life of institutions and their failure to take into account at the top leadership the eventual changes that have occurred at the bottom of the organization.

Somehow, the purpose of the modeling is to create a virtual world from some basic interactions and to study all the associated properties. Once this elementary world is understood and its parameters controlled, we move on by pushing up its basic limits to embody more ingredients so as to make the overall model a bit more realistic.

We also need to check the robustness of the mechanism under small changes of the model parameters since we are looking for universal features. In the foundations of sociophysics stands the a priori claim that there exists some finite number of universal mechanisms behind the many different sorts of social behavior occurring in human societies. The study ends by outlining possible extensions of the range of applications of the model.

2.8 To Sum up

As stated in the preceding sections, we will always start by considering one salient paradoxical feature of a particular phenomenon which occurs in society. Although, it is often the result of a very complex situation, we will considerably reduce it down to its simplest form by neglecting many other ingredients, even when they are quite clearly active in the making of the feature. The goal is to undress the selected feature in order to extract some well-defined “pure paradox.” Indeed, the a priori claim that there exist a few universal mechanisms behind much social behavior occurring in human societies is at the very foundation of sociophysics.

On this basis, we set up the simplest possible model which can reproduce the selected social paradox using bare and precise mechanisms. The purpose of the “game” is first to check if this bare mechanism can underline the onset of the paradox. Once that is established, the second step seeks to establish a logical link to the supposed feature, in other words, to the real social or political property we started from. Nevertheless, it is worth stressing that it may well happen that the model will be eventually more relevant to another situation than the one from which it was initiated.

Once everything in the dynamics of the model is controlled and understood, we move on with the possibility of pushing its basic limits, in order to embody more realistic ingredients. It is also of importance to check the robustness of the result with respect to the chosen bare mechanism, since in particular for social situations, the initial conditions are never exactly known. To grasp the phenomenon requires obtaining results which survive against small changes in the parameter settings.

At this level of our investigation, we do not address the question of the quantitative applications to the studied social phenomenon. We aim at defining some qualitative tendencies, which are hopefully present in real-life phenomena, but embodied and masked by some others. Although our models are quantitative in the sense that, using physical modeling and mathematical calculations, they yield precise numbers and figures, these numbers should not be taken too seriously by themselves. Only the associated qualitative description of the considered phenomenon is to be given serious thought to eventually deal with social realities. It is on this basis that we will never take too seriously the figures we get but on the contrary, we will focus seriously on the nature and the trends of the various dynamics obtained. The overall descriptions will be put forward.

It is also of central importance to stress the following observations. Firstly, the use of modeling in physics has been tremendously powerful in establishing the field as an exact hard science, capable of building concrete and efficient devices. Secondly, this power comes from the empirical uses of mathematics to describe real phenomena. It means that it is not the mathematical rigor which prevails but the capability of reproducing some particular property. Thirdly, and this point is essential, all the results obtained from the various models are aimed, sooner or later, at being tested against experimental data. Fourthly, discrepancies and agreements are used to validate or invalidate part or all of the model’s hypotheses. It is exactly

this backward and forward motion between theoretical and experimental research that has yielded an extended core of understanding for the laws governing inert matter.

Here, within our approach, we are modeling and empirically using mathematics to only proceed up to the first two points. We give up the rigorous demonstration of the model to favor its capability of reproducing some particular phenomenon. While mathematics focuses on proving the universality of a fact, physics aims at finding some minimum conditions, which are able to reproduce the fact. At the present level of our novel approach, we put aside any experimental apparatus. This fact can be dangerous in the final assessment of a social law derived from our models. This is why one should always be cautious about our findings. At the moment, we are not going to state real and definite laws, but instead to set out a new framework for developing a coherent and different view about social and political behavior. This is why our findings are always and systematically to be taken with caution.

The ongoing testing of a model's predictions of real experimental data to validate the model's hypotheses has to be left to the future whose proximity will be a function of our collective progress on the above level of research. In turn, an equivalence to the whole framework of physical laws that has to be constructed through the intricate combination of theoretical and experimental research has yet to be developed for sociophysics. This fact does not make the project any less ambitious.

Last, but not least, all of our modeling is based on both "naïve" assumptions of open minded people, with everyone having the same individual power and the existence of open and democratic social spaces. Clearly, although both these assumptions are false, they do not prevent an operative scheme from discovering the secrets of organized human behavior. Accounting for all the complexity of human differences is left to other fields of investigation of human behavior. In short, our general procedure is articulated around the following steps:

1. Choose a particular phenomenon
2. Single out one salient paradoxical feature
3. Define the phenomenon quantitatively down to its simplest form
4. Calculate the inherent "paradox"
5. Find a logical link to a real-life counterpart
6. Push the limits of the model
7. Enumerate possible extensions

Our general guide is illustrated in Fig. 2.19.

At the core of our fundamental strategy stands the somewhat provocative hypothesis that the conditions for sociophysics are: *"Although you may have to accept drastic simplifications and crude hypotheses in order to start a wrong model, later, this could develop into an operative tool with predictions, which in turn may have a good chance of being true."* We can add our founding statement in Fig. 2.20.

Fig. 2.19 Our constant methodology in seven distinct steps

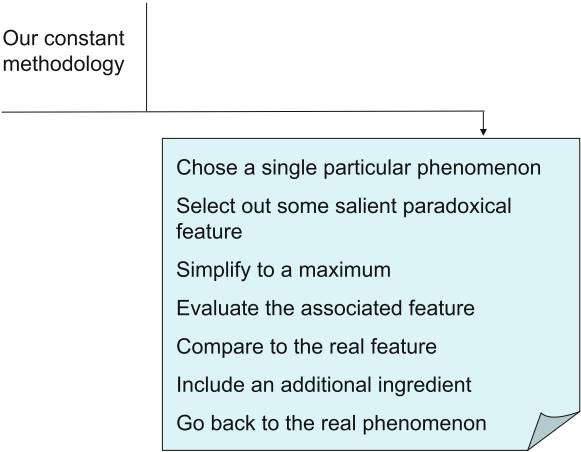
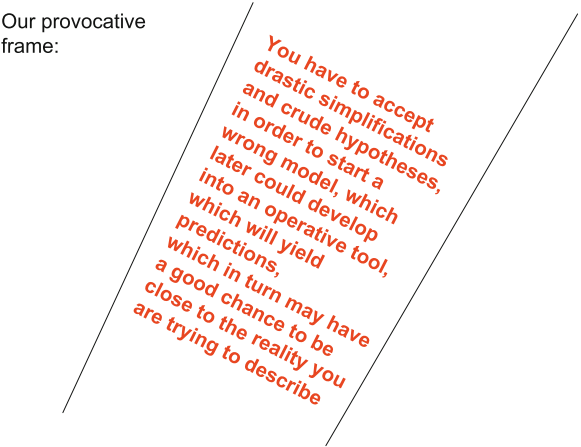


Fig. 2.20 Our provocative, yet very constructive assessment



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