Chapter 8
Is Science an Ideology?

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Abstract The concept of ideology is central to understanding the many political, economic, social, and cultural processes that have taken place over the past two centuries in our societies. Yet the very concept of ideology remains a vague, openended, and much debated question. In this chapter I try to answer the question of whether science is a form of ideology or not from a philosophical point of view, taking a materialist approach. I begin by characterizing ideology as a complex, multifaceted concept. I then briefly discuss the material systems on which ideological movements operate, that is, societies and concrete human groups. I identify at least 11 different elements that seem to be present in most ideologies, and I compare these characteristics with those of contemporary science and technology. Although some superficial similarities can be identified, there are deep differences that make ideology completely different from science. With technology, however, the similarities are stronger. Ideologies are constantly evolving with technological advances, social changes, and even mere fashions. The current fragmentation of ideologies caused by the widespread use of new technologies and social networks has given rise to new phenomena of ideological diffusion that I think is very dangerous, especially for open societies. I discuss these processes in the context of the nature versus nurture debate, along with the question of whether we can get rid of ideologies.

8.1 Introduction

Ideology was ubiquitous throughout the twentieth century and still is today. Many millions of people have been killed in the name of ideologies. More millions have been imprisoned, persecuted, displaced, or tortured because of ideological conflicts.

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J. Pérez-Jara, Í. Ongay (eds.), *Beyond Nature and Nurture*, Synthese Library 497,
https://doi.org/10.1007/978-3-031-87715-5_8

The lifestyles of most people on this planet are determined or at least influenced by ideologies. Within the same society, families and friends are often divided by ideological differences. It seems almost impossible to understand today's world without some understanding of the many conflicting ideologies. And yet the concept of ideology itself remains woefully vague.

Entire libraries have been written on ideology and related topics. Most of these books examine specific ideologies, their history, characteristics, and impact on particular societies. Others compare different ideologies, or discuss conflicts between ideologies (or rather, conflicts between people and governments inspired by competing ideologies). Other books deal with the political, economic, and social aspects of ideologies. Some works map the world of contemporary ideologies, others rank them according to various criteria. Some of these books are written from a political perspective, others from an ideological perspective. Almost none discuss ideology from a philosophical perspective.

And yet, ideology is full of aspects that require philosophical investigation. A philosophical analysis of ideology is particularly appropriate because many ideologies are inspired by philosophical ideas. Others are inspired by scientific theories, and still others by pseudoscientific concepts.

The philosophy of ideology is more than a branch of political philosophy, for ideologies are not only political. They can also be biologist, economic, cultural, or even supernatural. Among the many philosophical questions that a philosophy of ideology can deal with, I mention the following:

- What is an ideology?
- What objects do ideologies deal with?
- How many kinds of ideology are there?
- Are ideologies testable?
- Do they evolve?
- What is the relationship between ideologies and society?
- Are there true ideologies?
- Is science some kind of ideology?
- Are we conditioned from our social environment to believe in some ideologies? Or are we, on the contrary, innately willing to accept some ideological attitudes?
- Do we need ideologies?

The variety of seemingly contradictory opinions that exist in the field of ideology studies makes a philosophical assessment desirable, one that can shed some new light on controversial issues and helps to dispel some of the vagueness that plagues the subject.

Let us consider, just as an example, the first question of our preliminary list above, the very basic issue of "what is an ideology?" Terry Eagleton (2007), for instance, offers a list of 16 competing meanings of the term 'ideology', collected from a wide variety of authors. Such a list, ranging from "a process of production of meanings, signs and values in social life" to "a socially necessary illusion" and "an action-oriented sets of beliefs", is far from exhaustive.

Certainly, not all definitions found in the literature are mutually compatible. Some point to only one specific aspect of ideologies. Others have a decidedly negative character. Still others are compatible with things that are certainly not ideologies (for example, we can imagine many sets of beliefs that are action-oriented but not ideological, such as those that guide a cook in preparing a particular menu).

Perhaps a better clue to the correct meaning of "ideology" can be obtained from the historical use of the word. The term seems to have been introduced by Antoine Destutt de Tracy (1754–1836). Following the spirit of the Enlightenment, soon after the French Revolution, he sought to found a general science of ideas. He tried to determine the process of forming ideas from observation and experience. But soon Napoleon and others began to use the word in a pejorative sense to describe a simplistic and idealized analysis of reality, totally divorced from facts, which tries to regulate people's lives with the excuse of improving them.

Marx introduced the word in social and political contexts with a different meaning in his classic work, written with Engels, *The German Ideology* (1976, originally written in 1846). Marx and Engels (1976) considered as ideological any set of political illusions produced by the social experiences of a class (briefly, according to Marx, a class in this context is a social group defined by its economic role, such as proprietors or workers). These illusions are used by the rulers, through the state, as an instrument of control and domination of the working class. Ideology, for Marx, was made up by the legal, political, religious, and philosophical principles proposed by the ruling classes with the aim of reinforcing the capitalist society. In other contexts, however, Marx also seems to conceive of ideology as a set of mental attitudes determined by the social environment. Thus, members of different classes are both directly and indirectly taught to think and behave in ways appropriate to their own class. With revolution and the suppression of classes, the ideology should disappear.

Lenin (1973, first published 1902), on the contrary, thought that a socialist ideology proper to the working classes was not only possible, but desirable. Such an ideology would help develop a working class consciousness and prevent this class from falling into trade unions. On the contrary, religion is an intentional creation of the ruling class for Lenin, a kind social tool whose purpose is to ensure the domination of the workers.

The Italian communist Antonio Gramsci (1891–1937) thought that ideology is consciously produced by intellectuals. Different ideologies conflict within the same society until one of them prevails. Engaging in the cultural war to achieve hegemony is the main task of the organic intellectual, that is, one closely connected with the class structure through some organization such as the communist party.

Karl Mannheim (1893–1947) realized that any social environment influences human thought, so a society with many different social groups and class environments will produce a multiplicity of ideologies. His "total" concept of ideology refers to the modes of thought and experience, the *Weltanschauung* or "worldview" of an age or group originating in a collective life situation.

Many social scientists and political analysts today use the term "ideology" in a purely descriptive way to refer to any discrete and relatively coherent system of

beliefs that inform the social and political actions of a human group in a given society. Contrary to the Marxist conception, this view is essentially neutral with respect to the value of ideologies (see, for example, Seliger, 1976). Others adopt a more normative sense of the word, referring to ideas or beliefs that are in some way misleading, illusory, or one-sided, and that serve the interests of specific groups. There is a negative connotation associated with saying that something is 'ideological' in this sense. The critical conception of ideology typically holds that ideology is a way of using meaning to establish and sustain relations of domination (Thompson, 1990).

Before attempting to refine these first approximations to the concept of ideology, it should be noted that ideologies, whether in their neutral or negative sense, are always associated with groups and social classes. Perhaps, then, a good way to begin our inquiry into the nature of ideologies is to clarify the concepts of society, social group, class, social stability, and the like. This is what the next section is devoted to.

8.2 Some Concepts of Sociology

I maintain that social systems are material[1] objects, composed of organisms and the artifacts they produce (Bunge, 1979; Romero, 2018). Because they are material, social systems can change. They can grow, develop, collapse, disappear, and so on. They also interact with other social systems and with other concrete objects. Let us be more specific about these terms.

A **general material system** is a composed entity, i.e. a thing that is formed by other things. It is characterized by its *composition*, *environment*, *structure*, and *mechanism* (Bunge, 1979, 2003; Romero, 2022a).

The composition of the system is the set of its parts. The environment is the collection of things that interact with the system. The structure is the set of relationships (bonds or links) between the different components or parts, as well as with external objects. The first set of relations forms the *endostructure*, the second the *exostructure*. The total structure is the union of the two. Finally, the mechanism of the system is the collection of all its internal processes (a process is a series of lawful changes).

A **social system** is a concrete system composed of animals that (1) share an environment, (2) interact, (3) cooperate in some aspects and compete in others.

If the predominant animals in the group are humans, the social system is called the *human social system*. There are many types of human social systems, ranging from families to armies and societies. They can be natural and spontaneous, like a tribe or nation, or artificial, like a multinational company or a cooperative enterprise.

[1] The materialism I espouse is non-reductive, emergent, and systemic materialism (for further details, please see Romero, 2022a and Romero et al., 2022). It should not be confused with physicalism or other forms of eliminative materialism, nor with the so-called "new materialism" in the social sciences.

A **human society** (HS) is a human social system composed of four large subsystems: (1) biological, (2) economic, (3) political, and (4) cultural (Bunge, 2003).

The biological subsystem of a human society is composed by human beings (the dominant group) and the animals that depend on them; the structure is given by the biological relationships among all these individuals. The environment is formed by the territory and the ecosystem these people inhabit. The mechanisms are the biological processes experienced by the population.

The economic subsystem is composed of the economically active individuals (both producers and consumers) of society and the various means at their disposal. The corresponding structure is given by the relations of production, exchange and distribution of all kinds of goods among them. The environment includes the available material conditions, both internal and external. The mechanisms that operate in the subsystem are the economic processes of all kinds that occur in society.

The political subsystem is made up of those individuals who are dedicated to the management and control of common goods and activities related to the government and legislation of social actions. The corresponding structure consists of power, legal and administrative relations. The environment consists of the forces and conditions of power, both internal and external to society. The mechanisms are the actions of government and administration that take place, along with the reactions that these actions provoke from the rest of society.

Finally, the cultural subsystem is made up of the individuals who devote themselves to inventing, researching, teaching, discovering, planning, creating, representing, etc., as well as the various means at their disposal and the results of their work. The structure consists of the relationships between the various cultural actors and between them and the rest of the members of society. The environment is formed by the available material conditions, and the operating mechanisms are cultural processes of all kinds.

We can make now some postulates about social systems that seem plausible. For instance,

- Changes in a social system originate from (1) changes in its components, (2) changes in the links of its components, (3) interactions with the environment.
- Members of a social system cooperate in some respects and compete in others.
- A social system emerges if and only if its existence contributes to satisfying some needs or desires of at least one of its members.
- A social system disappears when the links among its components are dissolved.
- Changes in one subsystem of a society have impact on the other subsystems.

Regarding the latter postulate, I note that cultural changes, such as those initiated by new ideas, can affect the political and economic subsystems. These changes can be moderate or radical. Ideologies seem to operate in this sense, starting with certain groups of intellectuals and then extending to other parts of society.

A **social group** is a set of members of a society who have some common characteristics. For example, the group of the unemployed or the group of university

students. We must remember that groups are not social systems. A population is divided into groups in order to study it or implement action plans. For example, the group of people over the age of 65 will be the first to be vaccinated in the event of a pandemic. Although the individuals who make up the groups are material, the groups themselves are not. You can vaccinate people, not groups. Groups are said to be vaccinated only when most or all of the members of the group are vaccinated.

Human groups are concepts abstracted from real people and used to think about various types of social systems. This does not mean that the groups are not objective, because objectivity is granted by the specification of a clear and explicit criterion for the formation of groups. The group, being a concept, can be well constructed, if the criteria are justified in a given context, or poorly defined, if the formation rule is not clear (for example, the "group of young people", or the "group of poor people", if the terms 'young' and 'poor' are not carefully defined).

There can also be arbitrary and subjective groups. For instance, the group of my friends at any given moment depends on my subjective evaluation of friendship at that moment.

A ***concrete* social group** is not a set but a collection of interacting individuals. Contrary to the social group, it is not a theoretical construction, but a material system. Specific social groups can achieve goals that are beyond the reach of their individuals. Some examples are work crews, police squads, gangs, sports teams, research teams, armies, musical bands, and mobs.

A **social class** is a set defined by a predicate on individuals belonging to a society. The members of a social class are supposed to strongly determine or be determined in some aspects by members of another human group. This relation of partial control or dominance is defined by Bunge (1979) as:

Dominance Relationship An individual x dominates an individual y in the aspect A, $(x > Ay)$, if and only if x determines the behavior of y in the aspect A.

More generally, we can say that social dominance refers to relationships wherein the goals of one individual prevail over the goals of another individual in a systematic manner (e.g. Sidanius and Pratto, 1999, 2004)

Note that according to the nature of the aspect involved in the dominance relationship, we can distinguish political, economic, religious, etc. classes. All these classes are conceptual constructs, not concrete social groups. Real individuals may be included in a certain class at a given moment t_1, but then at another moment t_2 they may fail to satisfy the defining relation of membership. In such a case we can say that a process of *social mobility* has occurred. Social mobility can be either ascending, in which case the individual becomes less constrained, or descending, in which case it is the other way around.

Some remarks:

- Classes, like groups, are not material.
- If classes are not material, there can be no such thing as "class struggle". Struggles are always between material systems.

- Classes cannot be self-aware because they don't have brains and therefore don't think.
- The concept of class is useful for analyzing the structures of a society, but classes cannot cause anything because they have no causal power. All real change in a society must occur because the behavior of real individuals changes.
- Although classes are not systems, some members of a class can group together and form a system, and their actions can have an impact on society. For example, unions or churches can bring together many members of a class and cause social events.

Some of the considerations of sociological concepts offered above give us clues about what ideology is. If social systems are real, concrete entities, then they are capable of change. They can be changed by external forces, such as conflicts with other social systems, or by changes in the environment, such as climate change or sudden disasters. Or they can change because of epidemics or other health problems that affect at least part of the biological subsystem. But social systems, and societies in particular, can also be changed by the actions of some of the intentional agents that make up the population. These actions can take various forms: voting, working, legislating, even violent revolution. And the actions of individuals arise from their mental configurations, their values and ideals, so that any cultural framework capable of promoting some actions and inhibiting others can be used to induce changes in a society in a particular direction. Ideologies seem to do this: they seem to be instruments for creating or preventing social change.

8.3 Some Neutral Concepts of Ideology

Several authors have proposed definitions of ideology in line with what was outlined above. Let us review a few of them.

Hamilton (1987) made an extensive examination of the literature on the concept of ideology, which led him to identify at least 27 definitional attributes to the term. He pondered these alleged attributes to ascertain their utility and coherence as definitional criteria for ideology finally proposing the following tentative definition:

> An ideology is a system of collectively held normative and reputedly factual ideas and beliefs and attitudes advocating a particular pattern of social relationships and arrangements, and/or aimed at justifying a particular pattern of conduct, which its proponents seek to promote, realize, pursue or maintain.

He notes that "This definition is coherent and sufficiently broad, yet sufficiently circumscribed, to meet the requirements of empirical application and research. It indicates the kind of ideas and beliefs that comprise ideologies rather than making claims about their causes, functions, or anything else that may or may not be empirically true about such ideas and beliefs." (Hamilton, 1987, p. 38). We see that in a broad sense this definition is in the line we have suggested.

Another author that offers a very neat definition is Lyman Tower Sargent (2009) in his classic book *Contemporary Political Ideologies: A Comparative Analysis*.

> An ideology is a system of values and beliefs regarding the various institutions and processes of society that is accepted as fact or truth by a group of people. An ideology provides the believer with a picture of the world both as it is and as it should be, and, in doing so, it organizes the tremendous complexity of the world into something fairly simple and understandable.

Here the values are explicitly mentioned, as is the fact that the adopted set of beliefs is considered true. People who have an ideology are believers, according to Tower Sargent. And they have an image of the kind of society they want to implement. They also have, as a starting point, a picture of the world as it is now. That picture may be simplistic, inaccurate, or just plain wrong. It is the difference between these two images, what is thought to be and what is believed should be, that drives the believer into action, likely guided by the value system proposed by the ideology. Here we see a great danger: if the believer's images of the world, present and future, are wrong, or the values adopted are misleading, the result of his or her actions may clash with the facts, with disastrous consequences.

Roger Eatwell definition takes note that ideologies not only can be used to promote or enforce changes in a society, but also can serve to stabilize it (Eatwell, 1993):

> A political ideology is a relatively coherent set of empirical and normative beliefs and thoughts, focusing on the problems of human nature, the process of history, and socio-political arrangements. It is usually related to a program of more specific immediate and short-run concerns. Depending on its relationship to the dominant value structure, an ideology can act as either a stabilizing or a radical force.

Finally, I mention the influential definition offered by Michael Freeden (2003), which is restricted to political ideologies:

> A political ideology is a set of ideas, beliefs, opinions, and values that
>
> 1. exhibits a recurring pattern,
> 2. are held by significant groups,
> 3. compete over providing and controlling plans for public policy,
> 4. do so with the aim of justifying, contesting, or changing the social and political arrangements and processes of a political community.

Contrary to the classical Marxist vision, Freeden emphasizes that there can be several ideologies in the same society and that they compete to control public policies. It could be argued that total ideologies compete to impose the general worldview of the society that hosts them. Freeden also stresses the importance of language control in that fight:

> Ideologies compete over the control of political language as well as competing over plans for public policy; indeed, their competition over plans for public policy is primarily conducted through their competition over the control of political language.

We can extend Freeden's definition beyond the realm of politics in line with our previous characterization of a society as follows:

Definition An ideology is a body of ideas, beliefs, opinions, and values such that

1. exhibit a recurring pattern,
2. is held by the members of one or more social groups,
3. individuals in each group work together and compete with other groups to gain control of public policy plans,
4. they do so with the aim of justifying, contesting, or changing the state and direction of the biological, economic, socio-political, and cultural processes of a community.

In short, in a broad sense, an ideology is more or less a collection of beliefs and values, not necessarily true or coherent, held by a group of individuals in a human society and used as a tool to gain control over that society.

8.4 Essential Features of Any Specific Ideology

Although the definitions given above offer a broad characterization of the concept of ideology, we can still ask ourselves 'what characteristics are essential to call a certain body of beliefs ideology?' In order to clarify this, I propose to consider any specific ideology, political or not, as a multidimensional field of beliefs. We can represent such a field as a 11-dimensional conceptual space generated by the following basis (see Bunge, 1985 for a similar approach):

$$\mathcal{I} =< C, S, D, G, B, A, P, V, I, O, M > \tag{8.1}$$

where,

C is the community of believers (a subset of which are militants) in $\mathcal{I}$.
S is the society that hosts C, and on which the members of C act to modify it in some aspect.
D is the domain of objects, real or imagined, that are studied, revered, or manipulated by members of C.
G is the general worldview adopted by the members of C.
B is the background knowledge that members of C take for granted regarding the objects of their interest (for example, historical or economic facts).
A is the total set of statements about objects in D that members of C hold true. A subset A_{core} of this set A forms the central core of beliefs of the ideological field to which believers are unwilling to change without renouncing their ideology.
P is the problem or set of problems, conceptual or empirical, that the members of C face.
V is the value system shared by the members of C.
I is the set of ideals to which the members of C aspire.
O is the set of concrete objectives of the members of C with which they hope to realize the ideals I.

M are the methods that members of C adopt to achieve their objectives O.

I will now make a few remarks about this minimal characterization of ideology as a field of belief. First, I must say that it is a tentative scheme, and certainly open to improvement. There may be other essential features of ideology that escape our analysis. However, new elements can easily be added to our definition as additional dimensions, once they have been identified through comparative research on actual ideologies. The different components of the expression (8.1) can be interpreted as discrete sets, the elements of which will depend on the specific ideology. The first set, C, has as elements the members of a community of believers in the ideology. I use the word 'community' and not just 'group' because some interaction is expected between people who have the same ideology, especially between those who are militants, that is, those who care about spreading the ideology.

People who have an ideology will only exist in a society in which they try to act. Hence the dimension S. Different types of societies will have different ideologies. The action of the individuals of C on S is possible because, as we have seen, a society is a material entity that exists in space and time and is capable of evolution. It is this evolution that the members of C wish to control or at least influence.

The scope of an ideology is given by the domain D of objects that concern the believers. If these objects are social or political, the ideology will be sociopolitical. But, as we will discuss in the next section, it can be broader or narrower domains.

People who hold an ideology will share a worldview, or at least elements common to several worldviews, however simple. This will give their beliefs the minimum coherence necessary for argument, or at least for propaganda. For example, adherents of an ideology may view the world as a material system in which human beings are free to act, or they may believe that God created the world and we must act according to his designs, or that human beings are inherently evil and therefore must be controlled and regulated down to the minutest detail if they are to live in society without killing each other, etc. Of course, the worldview could be much more sophisticated, informed by science and technology.

If the adherents of an ideology want to change some aspect of society, they must have, or pretend to have, some knowledge of the relevant aspects in order to devise a course of action. For example, an economist who is ideologically identified with a left-wing ideology may think he or she knows that inflation is always caused by speculative behavior on the part of manufacturers, merchants, and distributors of goods. Then, given the right power, he or she might try to impose and enforce price controls in supermarkets and other stores. Another liberal economist might think that his colleague's actions are nonsense because the government's practice of having the central bank print money to finance public spending is the main cause of inflation. So, for the second economist, reducing the deficit and stopping printing money are the first steps to suppressing inflation. Without some knowledge or presumed knowledge of the causes of inflation, there is nothing to be done in either case. If the position of economists is ideologically oriented, and their decisions and choices are based on ideas belonging to the hard core A_{core} of beliefs of their respective ideologies, it will be very difficult, if not impossible, for them to change

their minds in the face of evidence of failure and take a different course of action. If there were not a hard and irreducible core of ideas that are not negotiable, we would not be talking about ideology, we would be talking about economics. It is easy to find examples that extend the existence of a core of canonical truths to all kinds of ideologies.

Every ideology faces problems that it claims to solve. Problems of power, job opportunities, gender issues, freedom, etc. The extent of these problems depends on the nature of the ideology and the characteristics of the society. To solve them, members of C rely on their background knowledge B and a set of methods M that are considered acceptable and effective. They are also guided by their values V and ideals I. Values may be part of an elaborate axiology or simply a set of morals, depending on the sophistication of the ideological field. Ideals are conceptual models in which various values are exemplified. The purpose of ideals is to facilitate the visualization of goals and to motivate action. The ideal itself is not a goal that we can hope to achieve, but it serves to push our struggle in a direction that can lead us to our goals. Therefore, all ideologies contain problems, methods, values, and ideals. They are the driving forces and self-imposed constraints necessary to achieve goals. The latter are also essential: people guided by ideologies are goal-oriented. Everything else is a means to achieve the changes they want to implement. Perhaps the shortest way to characterize a particular ideology is to list its core beliefs and goals.

8.5 Types of Ideologies

From the characterization of ideology offered in the previous section, we see that what makes an ideological field different from other fields of activity in human societies is that ideology is based on beliefs and adopts specific arrangements of values and methods with the ultimate goal of achieving some influence on the evolution of a society or a concrete social group. Depending on the scope of the ideology, that is, according to its domain D, we can differentiate different types of ideologies (see also Bunge, 1985 and Freeden, 2003).

- **Macro-ideologies**: they are concerned with all or several of the subsystems of the society. Examples: liberalism, socialism, totalitarianism, etc.
- **Micro-ideologies**: they refer only to a limited class of issues within the society. Examples: nationalism, pacifism, feminism, gender ideology, etc.
- **Super-ideologies**: they refer to all areas of human existence, not only social ones. Examples: Catholicism, Islamism, Marxism (in some of its various forms), etc.

If an ideology of any kind does not change in the face of evidence adverse to it, we say that this ideology is a *fundamentalism*. Many religious, political, and cultural ideologies fall into this class.

8.6 Science vs Ideology

We arrive now to the central question of this chapter: is science just another ideology? Many people seem to think so. I strongly disagree. But before discussing the relationship between science and ideology, it is useful to characterize science. I will use an approach similar to the one I used earlier for the concept of ideology. I will first offer a general outline and then a multidimensional analysis. Science is the result of highly complex human activity, and any simple attempt to define it by a single salient characteristic tends to degenerate into a mere caricature.

Science is the result of a systematic human effort to gain true knowledge about the world. It is not the only way to gain human knowledge; we can learn many things just by observing, practicing, reading, etc. Science differs from these and other ways of acquiring knowledge in that it is systematic and its results are subject to a variety of controls. It is also a progressive activity in the sense that scientific knowledge increases with research. There are several indicators of scientific progress, including improvements in the ability to predict events and increases in human ability to manipulate the environment (through science-based technology).

Unlike other forms of knowledge acquisition, *science produces conceptual representations of the world that are articulated in theories and models* (Romero, 2018). A theory is a logically organized set of statements, endowed with a specific interpretation, that refer to objects of the same class. If we introduce a set of statements P, a set of semantic instructions to interpret them S, and a domain (reference class) R, then a theory is represented by the quadruple (Bunge, 1967; Romero, 2018):

$$T =< P, S, R, \vdash >, \tag{8.2}$$

where $\vdash$ is the logical entailment operation. So a theory is a context that is closed under deduction: every statement in a theory is either a premise or a deductive consequence of a set of premises. The premises are called axioms and the consequences are theorems.

Certainly, theories in the making are seldom presented in this way. It is the task of the philosophers of science to render them into such a format to investigate their structure, ontology, and deep meaning. The working scientists usually do not care about this.

Contrary to a popular belief, the theorems of a theory never can be directly tested (except for coherence). Any evaluation of a theory against empirical evidence must be implemented through individual statements produced through a *model*. Models are obtained from a number of theories $(T_1, T_2, \ldots, T_n)$ and sets of specific assumptions $(A_1, A_2, \ldots, A_m)$ that describe concrete situations. Symbolically,

$$(T_1 \wedge T_2 \wedge \ldots \wedge T_n) \cup (A_1 \wedge A_2 \wedge \ldots \wedge A_m) \vdash M. \tag{8.3}$$

The model represents a collection of processes occurring in a specific circumstance. When we go from general theories to models the reference class shrinks enormously.

General theories, unlike models, are not expected to make concrete predictions unless they are considerably enriched with special assumptions and data. We test the theories by *consistency analysis* (both internal and with the total network of theories) and by *empirical evaluation of models* obtained from the theories with specific assumptions and data on applications to individual cases. These evaluations are made by comparing predictions (statements) of models with data. An empirical datum is not a fact, but a proposition that informs about a fact and that is acquired with the help of empirical operations (experiments or observations). We always compare propositions with propositions, never propositions with facts. Since propositions are conceptual objects, they are loaded with theory. The fact itself, on the other hand, is independent of theory (Bunge, 1983; Romero, 2018).

It is very difficult to rule out a theory by the predictions of a model, because any observation or experiment involves many theories and assumptions about the specific situation to which the model is applied. Any of the theories or any of the ancillary data could be the cause of the lack of confirmation. Similarly, positive claims of confirmation of a theory should be treated with caution for the same reason: false positives can be caused by a variety of sources. That is why multiple independent tests are needed. We need to think about the validity of a given theory in a given domain across many models in quite different situations and with different experimental setups before we can draw conclusions about the validity of the theory in question.

We can apply a multidimensional approach to science, as we did with the concept of ideology. The result is always tentative and perfectible, but I think it takes into account most traits that are characteristic of scientific research. Science itself can be defined as a set of research fields where each research field R comprise the following items (Romero, 2018):

- C: A community of researchers specialized in the field R.
- S: A society that houses the activities of those individuals in C.
- D: A domain of material or conceptual objects to investigate and study in the field R.
- G: A general and basic philosophy shared by the members of C.
- F: Set of formal languages used by researchers in their field.
- B: A background of previous scientific knowledge.
- Q: A collection of problems of questions about the domain D.
- A: A collection of goals of the members of C with respect to D.
- M: A specific set of scientific methods, techniques, error analysis approaches, and heuristic recipes that are used to solve the problems in Q.
- E: An ethic common to the members of C and a set specific moral norms for the field R.

Then, a research field R is formally represented by:

$$R =< C, S, D, G, F, B, P, A, M, E > . \tag{8.4}$$

The elements of each component change over time, hence these components are sets only at a fixed moment, otherwise they are collections, not sets. The field of research evolves according to the evolution of its components. At a given instant, science can be defined as the set of all research fields at that instant:

$$\text{Sci} = \{R_1, R_2, \ldots, R_n\}. \tag{8.5}$$

This type of characterization is similar to that proposed by Bunge (1983), but I have included an ethic component that in my opinion is essential for any research activity.

Now, a few remarks. Many of the components of (8.4) are similar to those of our characterization of ideology. There are, however, important differences. Scientific research, the activity of the members of C, consists of discovering, posing, examining, and if possible solving problems. Not every problem is a scientific problem: scientific problems, Q are those that are posed against a scientific background, B, and are studied with scientific means, M, and with the primary objective of increasing our knowledge about the world and the mechanisms that operate in it (A).

The result of research is articulated in theories and models that intend to represent as correctly as possible some aspect of the world. Theories of basic sciences (a) are made up of hypotheses, including regularities (trends or laws) about classes of entities that are assumed to exist, (b) are capable of producing more or less accurate predictions based on specific models, and (c) contain no value judgments about reality or action programs aimed at changing it.

On the other hand, an ideology usually does not result from research (although some may be inspired by it) nor does it change with its results: up to now, ideologies have been fairly dogmatic beliefs and resistant to scientific innovations. An ideology can change but only in details. If an ideological "ism" were to radically change, it would cease to be that "ism."

Major changes in an ideology are usually introduced by some charismatic leader and resisted by other charismatic leaders, rather than being the consequence of rigorous investigation and admission of mistakes. The result is that ideologies, instead of progressing like the sciences, fragment. As an example, let us consider the many divisions of communism: Marxism, Marxism-Leninism, Stalinism, Maoism, Trotskyism, etc. The methodological component and the verifiable element are mostly absent from ideologies. The ideologues will apply, in many occasions, the ideological package prescribed for each case regardless of the situation, to later blame the failure on whatever is at hand at the time.

Several authors, in the last decades, have proposed that science is a form of ideology, since it would actually deal with power and domination. The attitude of considering science as ideology perhaps goes back to Heidegger's obscure analysis of technology (Heidegger, 1954, English translation 1977). According to Heidegger (1) technology "is not an instrument", it is a way of understanding the world; (2) technology "is not a human activity" but develops beyond human control; and (3) technology is "the greatest danger", risking seeing the world only through

technological thinking. There is a confusion here between science and technology on which I will talk about later.

The view of science as a form of power and an ideology is more clearly stated by Marcuse (1964, 1968). According to Marcuse, "domination perpetuates and extends itself not only through technology, but as technology, and the latter provides the great legitimation of the expanding political power which absorbs all spheres of culture." He adds, "science, by virtue of its own methods and concepts, has projected and promoted a universe in which the domination of nature has remained linked to the domination of man—a link which tends to be fatal to this universe as a whole. Nature, scientifically comprehended and mastered, reappears in the technical apparatus of production and destruction which sustains and improves the life of individuals while subordinating them to the masters of the apparatus. Thus, the rational hierarchy merges with the social one." The question for Marcuse is not whether technology has played any role in the promised emancipation of humanity. The question for him is simply whether technological advance leads to more repression and domination or not. He fears that "the very concept of technological reason is perhaps ideological". Since industrial technology facilitates the exploitation of the working class by the bourgeoisie, the instrumental manipulation of nature in the natural sciences is bound to be guided by bourgeois ideology. Science has become ideology.

According to Habermas, the central error in Marcuse's formulation of the problem is that he has retained a concept of ideology appropriate to an era long past (Habermas, 1970, see also 1971). For Marx, ideology was tied to a defined social class. Such a view is now untenable. Habermas thinks that classes have not disappeared in contemporary society, but have been irreversibly integrated. When Habermas calls for the abandonment of the critique of technology and science as ideology, he is not trying to imply that they are neutral; he recognizes that they have become forms of domination as well as emancipation from deprivation and hard work, so he sees them in an ambivalent light.

Other authors who challenge the neutrality of science and defend a science loaded with ideology are Thomas Kuhn,[2] Paul Feyerabend, and Bruno Latour. These well-known and widely debated views have many similarities with Foucault's thesis that the knowledge/power relationship becomes characteristic of modern society.

Proposals to identify science and ideology arise not only from the sociology of science, but also from the camp of ideology itself, especially from environmentalism and feminism.

Ecology's critique of science and technology asserts that ethical neutrality with respect to the results of scientific research is not justified. Green ideologues challenge the idea that any form of knowledge can be divorced from its consequences. If science has formed an alliance with the dominant forces that contribute to the destruction of the environment, then its neutral character is not such, and science

[2] At least in his classic book *The Structure of Scientific Revolutions*, University of Chicago Press, 1962. In later works he moderated his original views.

must be fought. Science, we are told, has become an ideological tool of those who exploit the planet for their own short-term gain.

Radical feminism sees science as a way of knowing burdened with presuppositions and permeated by the interests of male domination over women. Modern science is not objective, but a vehicle for Western masculine values (Mies and Shiva, 1993). The privilege of determining what counts as scientific knowledge and how it is used has been controlled by men and, for most of history, limited to men, so that science is a kind of male ideology.

Some of these observations miss the point by confusing science with ideology, or with the attitudes of individual scientists who hold ideological positions, or by confusing science with technology. When we compare our characterizations of science and ideology, we can see deep differences beyond the superficial similarities. It is true, however, that basic science involves values. As we have seen, each field of research is composed of individuals who share a certain ethic, and the ethic is based on a common axiology, a set of values accepted by the researchers. These values, however, are not universal; they refer to the research methods used to gain knowledge about the objects in the field of study. They imply things like the rejection and condemnation of plagiarism and fraud, working conditions in laboratories, proper citation behavior, and many other things. Of course, researchers themselves may have ideological positions on many issues, but such ideology should not pervade their work. Ideological content, when it infiltrates scientific results, is often detected and purged by the many checks and balances available to modern science.

The confusion of science and technology, so common among Heiddeger, Marcuse, and many postmodern critics, can be avoided by an adequate characterization of both activities. Technology is related to our ability to manipulate our environment. Not all technology is necessarily based on science. Technology predates science. Science-based technology can be characterized as a human activity that aims to design, develop, build, and control artifacts using knowledge gained through science (Romero, 2018). An artifact is something artificial that can be controlled and used for specific purposes. Artifacts are not just mechanical. They can be electronic, thermodynamic, biological, or cultural, depending on the proposed goals.[3] Science-based technology includes not only the many fields of engineering, but also medicine, didactics, normative epidemiology, economics, law, and all disciplines of social planning.

As we did with ideology and science, we can distinguish several components in a technological field T_i (Romero, 2018):

- C_i: A community of technologists.
- S: A society that welcomes those individuals in C_i.
- D_i: A set of material or conceptual things that T_i deals with.
- F_i: A set of formal theories used by the members of C_i.

[3] For "conceptual artifacts" see Romero (2018), pp. 94–96, and Romero (2022b).

- E_i: Set of scientific theories and data used by the members of C_i.
- P_i: A set of specific practical problems.
- A: The total technological knowledge available to those in C_i.
- O_i: A set of final technological goals.
- M_i: A specific set of norms and methodological instructions.
- V: A value system adopted by the members of C_i.

Each scientific technology is a science-informed activity aimed at solving practical problems. Although closely related to science through F_i and E_i, it differs radically from science in its methods and goals. There is, however, a strong virtuous link between basic science and scientific technology: scientific results motivate questions whose answers demand new technologies, and then the results and empirical explorations obtained with these new technologies make it possible to formulate new questions and problems. that cause a mutually reinforcing progress.

Technology is not without values. Technologists in any field have values regarding their rules of action in certain activities, such as animal experimentation, environmental contamination, or weapons production. In contrast to basic science, where the general ethical neutrality is clearer, discussions about values and ethical implications are possible and desirable in technology. Ideally, such debate should be rational and science-based, but it is often ideologically motivated.

The moral responsibility of technologists in their efforts to produce technological artifacts and solutions to the problems entrusted to them should not obscure the more important responsibility of politicians, bureaucrats, or executives who demand, finance, and decide on the use of the products of scientific technology, from vaccines to weapons (see Doorn and van de Poel, 2012 and references therein).

I conclude that more than science being a kind of ideology, ideology is a kind of social pseudo-technology.

8.7 Ideological Fashions and Packages

Why do we believe in ideologies? Ideologies offer a kind of chart or map of our social and political environment (Freeden, 2003). Ideologies give us mental representations that seem to guide us by means of identifiable patterns in the midst of what otherwise appears to be a mere chaos of events beyond our control. Ideologies offer us ways to make sense of what we experience in society. They promise security, a sense of belonging, purpose, and change for the future. More importantly, they help us organize our values and give us motivation to act.

Ideologies, however, do not objectively represent external reality. Diverse and sometimes conflicting ideologies compete for our attention, offering radically different versions of the social world. Often they are not even internally coherent or consistent with the scientific worldview. It is not surprising, then, that many people end up adopting ideological positions in various combinations, with no justification other than that these positions are popular in a particular time and place. Or perhaps

they simply follow a charismatic person who holds those views and expresses them in a way they can relate to. Or maybe it is simply because there is no other option and the world seems too strange, chaotic, and threatening otherwise.

On the other hand, the spread and diffusion of certain ideologies, as well as the decline of others, is a complex phenomenon that obeys a combination of causes and circumstances of an economic, social, and historical nature. Think, for example, of the decline of liberalism and the concomitant spread of totalitarianism in Europe and Asia in the first half of the twentieth century, and especially after the Great Depression. Or the spread of leftist ideologies in South America at the beginning of this century, coinciding with the rise in international commodity prices caused by the growth of China. The complex combination of external, internal, environmental, and psychological events necessary to bring about such sociopolitical changes is not yet fully understood. Fashion may not even be aware of some of these processes.

The universalization of the use of social networks at the beginning of this century facilitated the dissemination of simple ideas and combinations of ideological positions, forming ideological kits ready to be adopted by social groups with similar backgrounds. As mentioned by Pérez-Jara and Camprubí (2022): "These *packs* structure collective identities by gathering themes and narratives which lack internal logical connections between them. Moreover, what comes in each pack varies with the cultural landscapes." These ready-to-use ideological kits assembled for immediate gratification need not even be coherent. Pérez-Jara and Camprubí add:

> The specific contents of ideological packs thus depend on the historical and cultural conditions behind their construction and maintenance. And yet, once they are functioning, these menus provide a significant degree of predictability of a person's ideological nebula just by attending to one or a couple of isolated ideological items.

In Argentina, for example, most people who now identify themselves as leftists and progressives will also be nationalists, something unimaginable before the advent of Peronism, when socialists were internationalists (Sebreli, 2002). It is also very likely that the self-proclaimed progressive will support dictatorships such as those in Venezuela and Nicaragua and sympathize with the regimes in China and Iran, while strongly advocating the use of inclusive language and special legislation in favor of transgender people and other sexual minorities. Minorities that would be outlawed and persecuted in most of the countries with which these "progressives" ideologically identify. The lack of logical connection between these and other positions seems to go unnoticed or unimportant to whoever adopts the particular ideological package. Surprisingly, many of these people will assert the importance of science in society. Similarly, many self-identified liberals may support anti-abortion laws, be nationalistic, support the death penalty, or oppose gun control or vaccination. Similar ideological kits are popular in Brazil and other countries in the region. It seems clear that reason plays little or no role in the adoption of these ideological packages. It is the same lack of rational support that probably makes it possible for the believer to undergo a sudden "conversion" and change sides, something that is occasionally observed. Pérez-Jara and Camprubí (2022) remark:

> At a cultural level, social groups usually change opinion not because they are really convinced by the logical force of the arguments of their opposite enemies. Rather, there are other cultural factors at work, such as the changes of position of the public charismatic figures that those social groups have already bestowed legitimacy. But sacred cows can also be sacrificed and canceled if they step too far into fields which their audiences are convinced to be inherently evil or polluted.

One of the results of these attitudes is a marked polarization where each side considers the other the source of all evil. Another result is to facilitate the sudden emergence of new charismatic leaders who can embody with effective dramaturgy the basic ideological kit of preference in a specific social group (Alexander and Pérez-Jara, 2021).

8.8 Why People Believe in Ideology? Nature vs. Nurture

In the previous section, we mentioned how the cultural environment influences people's ideological choices. But that seems to be only part of the story. The source of ideological differences can also be traced in part to physiological, genetic, cognitive, and neural patterns.

Twin studies consistently find that political orientation has a heritable component (Martin et al., 1986; Alford et al., 2005). More recent genetic studies show a statistically significant association between self-reported political ideology and the 7R variant of the dopamine D4 receptor (DRD4) gene (see Dawes and Fowler, 2009, Settle et al., 2010). These studies suggest that the gene creates a disposition, resulting in personality traits that lead an individual to seek cultural environments that, in turn, incline some people toward innovation and liberal ideologies and others toward conservatism.

In a much larger sample of 1771 Han Chinese university students in Singapore, Ebstein et al. (2015) observed a significant effect of association between the DRD4 exon III variable number of tandem repeats and ideological attitude. Subjects with two copies of the 4-repeat allele (4R/4R) were significantly more conservative. These results provide further evidence for a role of the DRD4 gene variants in contributing to individual differences in ideological attitude. Although these and other similar studies should be extended to larger and more diversified samples to achieve stronger statistical support, the preliminary results are extremely encouraging. In particular, transcultural studies are highly desirable to separate environmental effects, that might introduce some systematic biases. For a recent review see Méndez (2017).

Physiological responses also seem to trace the ideological dichotomy between liberals and conservatives. When exposed to negative images, for example, people with a leftist ideological orientation report a smaller increase in sympathetic nervous system activation, indicated by changes in electrodermal activity (Oxley et al., 2008). A strong relationship has also been observed between physiological responses to unpleasant images and conservatism (Dodd et al., 2012), in the sense

that people of this orientation are more sensitive to crude and repulsive visual stimuli.

Many of the correlations of physiological responses with ideological identifications have been corroborated at a deeper neurological level by functional analysis of brain activity using MRI (fMRI). Recently, Ahn et al. (2014) applied machine learning techniques to fMRI data to test the hypothesis that brain responses to emotionally evocative images predict broad ideological orientation. Disgusting images (for example, a mutilated body) generate neural responses that are highly predictive of the ideological group they belong to. Specifically, machine learning analysis enabled the identification of the subject's ideological orientation from whole-brain blood oxygen level distribution (BOLD) patterns during imaging exposure. The hemodynamic response of the conservative group had a steeper slope and a higher peak than that of the liberal group.

These results are independently supported by analysis of the correlations found in brain-injured patients (Nam et al., 2021). People with frontal lesions show a preponderance of more conservative (or less liberal) beliefs than those with or without anterior temporal lobe lesions. Additional studies predict ideology by extent of damage, yielding evidence that greater damage to the dorsolateral prefrontal cortex, but not to the amygdala, is associated with a higher incidence of conservatism. These last results suggest that emotional reactions are stronger in conservative people, reinforcing what was found by Ahn et al. (2014).

The general picture is also consistent with the neurophysiological studies carried out by Nam et al. (2018), who found that a larger bilateral amygdala volume is positively correlated with the tendency to believe that the existing social order is legitimate and desirable, that is, with a conservative position (see also Kanai et al., 2011, and Kim et al., 2020 for a functional connectivity analysis).

It is important to note that the studies cited above do not pertain to the political positions typically designated as "leftist" and "rightist". The former term is frequently employed to describe individuals who prioritize the collective over the individual, advocate for equality, support environmental protection, and promote expanded educational opportunities. This encompasses the provision of social safety nets for those who require them, among other measures. In contrast, those who identify themselves as "rightist" tend to espouse an individualistic worldview, wherein the individual is placed above the community. Additionally, they typically espouse a limited government approach, which they believe is conducive to individual freedom and personal property rights, as well as competition and other related concepts.

This political dichotomy between "left" and "right" has been correctly identified as a problematic concept by Lewis and Lewis (2023). They have proposed that the concept of fixed dichotomies, namely that there exists an inherent polarity between "left" and "right," and that individuals can be situated along a continuum between these two extremes, is a fallacious assumption. The assumption that the political left is more collectivist and the political right is more individualist has been challenged by sociological and historical findings. For example, Adolf Hitler is regarded as a collectivist, but he is usually labeled as an extreme right individual. Also, it is frequently assumed that those on the right wing of the political spectrum

espouse a belief in limited government. However, an examination of historical evidence suggests that this may not be the case. For example, Mussolini's political philosophy was defined by a robust centralization of power within the state, with the state itself becoming the primary object of collective action. Certainly, Mussolini and fascism are regarded as right-wing, as is militarism. Nevertheless, it could be argued that militarism is inherently communal in nature. One might also consider whether militarism is, in fact, statist and whether it is not indicative of a larger, more centralized government. From a political standpoint, the nuances are not as straightforward as they may appear.

The aforementioned neurological and genetic studies appear to indicate that there are fundamental human tendencies that influence how individuals respond to specific social circumstances. These tendencies appear to be shaped by genetic and unconscious neurological processes. Additionally, these tendencies manifest as a predisposition to make choices that are not necessarily aligned with the political stereotypes or semantic labels associated with a particular society or attitude, with the standard usage of left and right. Rather, the tendency seems to show a predisposition to better adapt to groups that embrace or reject change, novelty, order, and pluralism.

All these findings and others reported in the current literature (see Jost et al., 2014 and Krastev et al., 2016 for reviews) invite us to revise the traditional view that ideological positions are the product of rational, conscious, and socialized thought. The adoption of ideological stances seems to be, instead, more related to an emotional process intimately linked to complex neural dispositions. Neither a unique product of nature nor of nurture, ideology seems to emerge rather when our dispositions find the appropriate cultural and material conditions for their development.

8.9 Are Ideologies Necessary?

Our own time, since the early nineteenth century, has been called the "age of ideology" because of the ubiquity, prevalence, and importance of these belief systems (Watkins, 1964). The death or decline of ideologies, however, has often been claimed since the concept of ideology itself emerged at the end of the eighteenth century. After World War II, Aron (1955) and later Bell (1960) and Lipset (1960) formulated the "end of ideology" thesis. According to this thesis, as a result of the gigantic struggle of ideologies that took place in the middle of the twentieth century, a struggle that cost millions of lives, destroyed entire nations, and caused indescribable suffering, both right-wing and left-wing ideologies had been discredited. As a result, the power of ideologies to motivate and mobilize people would have been exhausted, at least in the West.

After the collapse of the Soviet Union, this thesis was further developed and modified by Fukuyama (2006), who argued that liberalism was the ultimate victor in the ideological wars of the twentieth century. Even in countries where a liberal

society had not yet been fully realized, liberalism would be seen as the only acceptable ideological view.

Not surprisingly, the end of ideology thesis has been widely contested (for an overview of the debates in this controversy, see Brick, 2013). Articles titled "The End of the End of Ideology" soon began to proliferate. Hodges (1967) and later Jost (2006) reviewed the evidence against the claim that ideologies are in decline and concluded that ideology is very much alive. Palmer (1994) suggests that ideologies change their tone and mode of operation rather than end.

As we have seen in Sect. 8.7, current ideological opinion, at least among large groups of people defined by common interests, similar cultural backgrounds, and connected by media and social networks, often emerges in the form of a variety of "ready-to-eat" menus or ideological packages. Because each package contains a set of positions that may not be logically related or even contradictory, its acceptance depends more on social interactions than on cognitive evaluation. The result is an atomization of the great conflicts of the past and an expansion of the ideological battlefield to include hitherto unsuspected issues. For example, refusing to wear a mask for sanitary reasons becomes an ideological statement because this act is perceived as part of an ideological package that defines a particular group. These associations can lead many people to make completely unreasonable decisions, decisions that affect their lives and the society in which they live, sometimes with catastrophic consequences.

Given that ideology can so easily evolve and change, driven by unprecedented technological change, fostered by our innate neural dispositions, can we hope to get rid of it in the future, at least its most damaging effects? Should ideology disappear, if possible, from our cultural landscape?

Ideologies undoubtedly are powerful forces that shape our societies. As Palmer (1994) says: "They are instrumental in recruiting the early enthusiasms of the more schooled and aware citizens, the intellectuals. They give rise to simplified slogans that encapsulate in a popularly attractive fashion the main concerns and thus recruit the greater numbers needed for effective political action. They catalyze the adoption of policies either to conserve or to change social, economic and political institutions." These are important social functions, instrumental in the mobilization of the different political, social, economic and cultural agents. Ideology has the power to motivate people to act, something that in the past could only be achieved through religion, force, or more rarely, reason. The problem is when the ideological body of beliefs is in disagreement with well-known facts, includes meaningless or incompatible propositions, or the value system is outdated or inconsistent with the proposed goals.

Ideological fanaticism can be mitigated by scientific and technical knowledge, which helps us to see the inconsistencies of thought and the incompatibility of belief with evidence (Lane, 1966). Education in the habits of critical thinking, on the other hand, makes it more difficult to accept ideological packages that are incoherent or lack clear meaning. Cognitive activity and learning can activate neural circuits that serve to inhibit dispositions that originate in less plastic subcortical architectures. I

don't know of any more powerful tools for destroying fanaticism and unreason than science and fact-based philosophy, with the cognitive habits they produce.

Ideology is not inevitable, though it is highly functional in gaining and maintaining power in modern technical societies. When it becomes dysfunctional, we must fight it. Our very existence may depend on it. In the past, and often in the present, this has often been done by violence. At least in open societies, the struggle should begin much earlier, trying not to get to the point where violence seems inevitable.

Is it possible to have a scientific ideology, i.e. an ideology with a body of beliefs that is informed by science and free of inconsistencies? Bunge (1985) thinks so. I doubt it. True science has nothing to do with beliefs. It is about research, conjecture, evidence, and testing. Science lacks the degree of conviction necessary to move the masses. And the values of science refer only to the researchers, how they relate to their methods and protocols, and how they interact with the society that hosts them. In this case, I think we should look to philosophy for help. A philosophy informed by the best science of the day. In political philosophy, in the philosophy of sociology, in axiology, and in ethics.

Perhaps the best thing to do is to finally put aside ideologies, if we can educate ourselves enough, and simply agree on our goals as a society, and then look for the optimal means to achieve them within each subsystem of society: political, economic, biological, and cultural.

A scientifically and philosophically informed policy will always be better than an ideologized one.

8.10 Summary and Conclusions

Ideology is an ill-defined concept that is sometimes used very loosely. In general, the term denotes a set of beliefs, values, methods, and goals that concrete human groups consider necessary, or at least desirable, to achieve lasting changes in various aspects of modern human societies. In this article I have identified at least 11 essential components or "dimensions" that are present in every ideology, that is, elements that must be manifested if a body of ideas is to be called an ideology.

To claim that there is an ideology, there must be a community of people who have produced, believe in, and are committed to the basic assumptions of the ideological corpus. These people should be in contact with a particular society that they are trying to change in some way. Different ideologies deal with different objects or referents of their discourse in each society. Certain groups of people, mobilized by ideals, try to change some aspect of a society. They can succeed because both the militants and society are material entities, and material things are capable of change. The tools they have at their disposal to achieve their goals and solve the problems that concern them are a variety of methods, some background knowledge, a set of values, a worldview, however sketchy, and a core of ideas that they consider inalienable. This core of ideas may or may not be informed by current science, and may or may not form a coherent body.

Ideology is created by human beings to affect other human beings in a society. Ideologies are not produced by social classes, because social classes are not material entities, but conceptual ones. Only human beings, concrete human groups and societies are material systems. And only material objects and systems can change their states and interact (see Romero, 2022a for an updated review of systemic materialism).

Ideologies can be divided into three broad groups according to the scope of action they seek: (1) macro-ideologies, (2) micro-ideologies, and (3) super-ideologies. The first group includes sociopolitical ideologies that seek to change or control societies through their major subsystems: political, economic, and cultural. If an ideology focuses on only one specific subsystem, it may be appropriate to call it an "intermediate ideology. The second group deals with a more limited range of issues, from nationalism to feminism. There are a large number of micro-ideologies in the world today. Finally, super-ideologies deal with every aspect of human life. They even offer an interpretation or intended insight into the entire universe. In this group we find religions that affect human affairs, such as Catholicism or Islam, as well as philosophically motivated macro-ideologies that adopt a metaphysical worldview, as seen in certain totalitarianisms.

In addition to these three main types of ideologies, we also find some ideologies that appeal to syncretism. They adopt a group of ideas from different ideologies depending on the circumstances in order to defend their goals. These ideologies, like conservatism and progressivism, are also very flexible in their methods and programs.

I have not considered capitalism and democracy to be ideologies because they are an economic system and a way of organizing governments. There are many ways to implement both, and none of these ways brings together the multiple dimensions that characterize ideologies. Likewise, populism and terrorism are not ideologies. They are methods of gaining and maintaining power.

Nor is science another kind of ideology. Despite some superficial similarities, there are profound differences. The goals of ideology are more like those of technology than those of science. And every ideological movement has at its core a set of beliefs and propositions that are non-negotiable. Science, on the other hand, is always in flux. All scientific assumptions and presuppositions are always considered provisional and open to revision. Values in science, moreover, concern only issues related to scientific practices and do not extend to the full range of human activity. Ultimately, science seeks true representations of the world, while ideologies seek to command, control, and direct certain kinds of human action to achieve certain human ends.

Ideology is highly mutable as technology advances. This is not surprising, since ideology seems to have emerged as a way of coping with the complications of modern industrial societies, where technology plays a fundamental role in determining social structure. With the advent of radio and television in the twentieth century, the major ideologies were widely disseminated, leading to major conflicts as the main contenders defended substantially opposite world views. In the twenty-first century, social networks have played a crucial role in the fragmentation and

simplification of ideologies, creating ideological packages or kits. These packages consist of combinations of slogans and simple maxims. Ideologies are developed by intellectuals, but ideological packages are produced by politicians and populists for quick use and consumption. The goal of these packages is to provide a ready-to-use guide that encourages behavior and justifies the opinions of their followers. The inconsistencies that these ideological packages often contain are reflected in the irrational behavior of those who adhere to them. One of the most alarming results of the massive proliferation of these ideological menus is the extreme political polarization observed in many societies. Such polarization has become the most powerful force against rational discussion and perhaps the greatest internal threat to open societies in this century.

Since its appearance on the political, social, and cultural landscape in the nineteenth century, ideology has been behind great confrontations and wars, social upheavals and riots, terror and totalitarian control, the destruction of goods and freedoms, the division of families and the separation of friends. But it has also been a source of great progress, advancing civil reforms, improving working conditions, resisting tyranny and oppression, defending the rights of minorities, promoting industrialization, and much more. Its ever-changing legacy remains controversial. Can we do better without ideologies? Perhaps. But in the meantime, we would do well to try to prevent the spread of incoherent and scientifically uninformed ideological packages by encouraging people to think for themselves, to be guided by science and reason, and to leave dogma and prejudice behind.

Our brains are wired to believe. We have innate predispositions that favor the attitudes that underlie the major ideological camps. And yet such predispositions work only under certain conditions that can be controlled. And even under such conditions, our brains are plastic enough to inhibit a wide range of primitive impulses. We must and we can, for the sake of our civilization.

Acknowledgments I thank Javier Pérez Jara for useful suggestions and stimulating comments, as well as for his invitation to contribute to this volume. I also thank Óscar Teixidó, Matt Suárez Holze, and especially Santiago Perez Bergliaffa for helpful remarks.

References

Ahn, W. Y., Kishida, K. T., Gu, X., Lohrenz, T., Harvey, A., Alford, J. R., Smith, K. B., Yaffe, G., Hibbing, J. R., Dayan, P., & Montague, P. R. (2014). Nonpolitical images evoke neural predictors of political ideology. *Current Biology, 24*(22), 2693–2699. https://doi.org/10.1016/j.cub.2014.09.050.

Alexander, J., & Pérez-Jara, J. (2021). Mito y rito en el corona-drama internacional. Jeffrey Alexander en diálogo con Javier Pérez Jara. In *Sociedad entre pandemias* (pp. 257–258). Fundación Gaspar Casal.

Alford, J., Funk, C., & Hibbing, J. (2005). Are political orientations genetically transmitted? *American Political Science Review, 99*(2), 153–167. https://doi.org/10.1017/S0003055405051579.

Aron, R. (1955). The end of the ideological age?. *The opium of the intellectuals* (pp. 305–24). Trans. Terence Kilmartin. Norton (2nd ed., 1962).

Bell, D. (1960). *The end of ideology*. Free Press.
Brick, H. (2013). The end of ideology thesis. In M. Freeden, L. T. Sargent, & M. Stears (Eds.), *The Oxford handbook of political ideologies* (p. 90). Oxford University Press.
Bunge, M. (1967). *Foundations of physics*. Springer-Verlag.
Bunge, M. (1979). *Treatise on basic philosophy, Vol.4: Ontology II: A world of systems*. Kluwer.
Bunge, M. (1983). *Treatise on basic philosophy, Vol.6: Epistemology and methodology II: Understanding the world*. Kluwer.
Bunge, M. (1985). *Seudociencia e Ideología*. Alianza Editorial.
Bunge, M. (2003). *Emergence and convergence*. University of Toronto Press.
Dawes, C. T., & Fowler, J. H. (2009). Partisanship, voting, and the dopamine D2 receptor gene. *The Journal of Politics, 71*(3), 1157–1171.
Dodd, M. D., et al. (2012). The political left rolls with the good and the political right confronts the bad: Connecting physiology and cognition to preferences. *Philosophical Transactions of the Royal Society B: Biological Sciences, 367*, 640–649.
Doorn, N., & van de Poel, I. (2012). Editors' overview: Moral responsibility in technology and engineering. *Science and Engineering Ethics, 18*, 1–11. https://doi.org/10.1007/s11948-011-9285-z.
Eagleton, T. (2007). *Ideology: An introduction*. New and updated ed. Verso.
Eatwell, R. (1993). Ideologies: Approaches and trends. In R. Eatwell & A. Wright (Eds.), *Contemporary political ideologies*. Pinter Publishers.
Ebstein, R. P., Monakhov, M. V., Lu, Y., Jiang, Y., Lai, P. S., & Chew, S. H. (2015). Association between the dopamine D4 receptor gene exon III variable number of tandem repeats and political attitudes in female Han Chinese. *Proceedings of the Royal Society B, 282*, 20151360. https://doi.org/10.1098/rspb.2015.1360.
Freeden, M. (2003). *Ideology: A very short introduction*. Oxford University Press.
Fukuyama, F. (2006). *The end of history and the last man*. Free Press (Original work published 1992).
Habermas, J. (1970). Technology and science as 'ideology'. In *Toward a rational society*. Beacon Press.
Habermas, J. (1971). *Toward a rational society: Student protest, science and politics*. Heinemann.
Hamilton, M. B. (1987). The elements of the concept of ideology. *Political Studies, XXXV*, 18–38.
Heidegger, M. (1954). Die Frage nach der Technik. *Vorträge und Aufsätze*. Neske Verlag.
Hodges, D. C. (1967). The end of "The End of Ideology". *American Journal of Economics and Sociology, 26*, 135–146. https://doi.org/10.1111/j.1536-7150.1967.tb00996.x.
Jost, J. T. (2006). The end of the end of ideology. *American Psychologist, 61*(7), 651–670. https://doi.org/10.1037/0003-066X.61.7.651.
Jost, J. T., Nam, H. H., Amodio, D. M., & Van Bavel, J. J. (2014). Political neuroscience. *Political Psychology, 35*, 3–42. https://doi.org/10.1111/pops.12162.
Kanai, R., Feilden, T., Firth, C., & Rees, G. (2011). Political orientations are correlated with brain structure in young adults. *Current Biology, 21*, 677–680. https://doi.org/10.1016/j.cub.2011.03.017.
Kim, T., Hur, J. W., Kwak, S., et al. (2020). Intrinsic functional connectivity of blue and red brains: Neurobiological evidence of different stress resilience between political attitudes. *Scientific Reports, 10*, 15877. https://doi.org/10.1038/s41598-020-72980-x.
Krastev, S., McGuire, J. T., McNeney, D., Kable, J. W., Stolle, D., Gidengil, E., & Fellows, L. K. (2016). Do political and economic choices rely on common neural substrates? A systematic review of the emerging neuropolitics literature. *Frontiers in Psychology, 7*, 264. https://doi.org/10.3389/fpsyg.2016.00264.
Lane, R. E. (1966). The decline of politics and ideology in a knowledgeable society. *American Sociological Review, XXXI*, 649–662.
Lenin, V. I. (1973). *What is to be done?* Progress.
Lewis, V., & Lewis, H. (2023). *The myth of left and right: How the political spectrum misleads and harms America*. Oxford University Press.

Lipset, S. M. (1960). The end of ideology? In S. M. Lipset (Ed.), *Political man: The social bases of politics* (pp. 403–417). Doubleday.
Marcuse, H. (1964). *One dimensional man*. Beacon Press.
Marcuse, H. (1968). *Negations: Essays in critical theory*. Penguin Press.
Martin, N. G., et al. (1986). Transmission of social attitudes. *Proceedings of the National Academy of Sciences of the United States of America, 83*, 4364–4368.
Marx, K., & Engels, F. (1976). *The German ideology*. Vol. 5 of K. Marx & F. Engels, *Collected works* (50 vols.). International Publishers.
Méndez, M. F. (2017). *The Journal of Neuropsychiatry and Clinical Neurosciences, 29*(2), 86–94.
Mies, M., & Shiva, V. (1993). *Ecofeminism*. Fernwood Publications.
Nam, H. H., Jost, J. T., Kaggen, L., et al. (2018). Amygdala structure and the tendency to regard the social system as legitimate and desirable. *Nature Human Behaviour, 2*, 133–138. https://doi.org/10.1038/s41562-017-0248-5.
Nam, H. H., Jost, J. T., Meager, M. R., & Van Bavel, J. J. (2021). Toward a neuropsychology of political orientation: Exploring ideology in patients with frontal and midbrain lesions. *Philosophical Transactions of the Royal Society B, 376*, 20200137. https://doi.org/10.1098/rstb.2020.0137.
Oxley, D., et al. (2008). Political attitudes vary with physiological traits. *Science, 321*, 1667–1670.
Palmer, L. M. (1994). The end of the end of ideology. *History of European Ideas, 19*, 709–713. https://doi.org/10.1016/0191-6599(94)90054-X.
Pérez-Jara, J., & Camprubí, L. (2022). *Science and apocalypse in Bertrand Russell: A cultural sociology*. Lexington Books.
Romero, G. E. (2018). *Scientific philosophy*. Springer.
Romero, G. E. (2022a). Systemic materialism. In G. E. Romero, J. Pérez-Jara, & L. Camprubí (Eds.), *Contemporary materialism. Its ontology and epistemology* (pp. 79–107). Springer.
Romero, G. E. (2022b). Mathematics do not refer to material entities. In G. E. Romero, J. Pérez-Jara, & L. Camprubí (Eds.), *Contemporary materialism. Its ontology and epistemology* (pp. 324–327). Springer.
Romero, G. E., Pérez-Jara, J., & Camprubí, L. (Eds.). (2022). *Contemporary materialism. Its ontology and epistemology*. Springer.
Sebreli, J. J. (2002). *Crítica de las Ideas Políticas Argentinas*. Editorial Sudamericana.
Seliger, M. (1976). *Ideology and politics*. George Allen and Unwin.
Settle, J. E., et al. (2010). Friendships moderate an association between a dopamine gene variant and political ideology. *The Journal of Politics, 72*, 1189–1198.
Sidanius, J., & Pratto, F. (1999). *Social dominance: An intergroup theory of social hierarchy and oppression*. Cambridge University Press. ISBN 978-0-521-62290-5.
Sidanius, J., & Pratto, F. (2004). Social dominance theory: A new synthesis. In J. T. Jost (Ed.), *Political psychology: Key readings in political psychology*. Psychology Press.
Thompson, J. B. (1990). *Ideology and modern culture: Critical social theory in the era of mass communication*. Polity Press.
Tower Sargent, L. (2009). *Contemporary political ideologies: A comparative analysis* (14th ed.). Wadsworth.
Watkins, F. (1964). *The age of ideology - Political thought, 1750 to the present*. Prentice-Hall.