Artikuluak dio gaur egungo demokraziak ezin direla ulertu eredu lineal edo erredukzionisten bidez. Gizarte diferentziatu eta ziurgabeetan, kontrol tradizionalak huts egiten du. Merkatuaren edo autoerregulazio ebolutiboaren mugak kritikatu ondoren, konplexutasun-zientzian oinarritutako demokrazia konplexuaren teoria proposatzen du, emergentzia, ez-linealtasuna, adimen banatua eta ikaskuntzan oinarritutako gobernantza azpimarratuz, zilegitasuna eta erantzukizuna zainduz.

Giltza-Hitzak: Demokrazia. Konplexutasuna. Gobernantza. Ziurgabetasuna. Adimen kolektiboa. Teoria politikoa.

El artículo sostiene que las democracias contemporáneas no pueden comprenderse mediante modelos lineales o reduccionistas. En sociedades altamente diferenciadas e inciertas, el control tradicional fracasa. Tras criticar el mercado y la autorregulación evolutiva, propone una teoría de la democracia compleja basada en la ciencia de la complejidad, que destaca la emergencia, la no linealidad, la inteligencia distribuida y una gobernanza orientada al aprendizaje, preservando legitimidad y responsabilidad.

Palabras clave: Democracia. Complejidad. Gobernanza. Incertidumbre. Inteligencia colectiva. Teoría política.

L'article soutient que les démocraties contemporaines ne peuvent être comprises à partir de modèles linéaires ou réductionnistes. Dans des sociétés différenciées et incertaines, le contrôle traditionnel échoue. Après avoir critiqué le marché et l'autorégulation évolutive, il propose une théorie de la démocratie complexe fondée sur la science de la complexité, mettant l'accent sur l'émergence, la non-linéarité, l'intelligence distribuée et une gouvernance orientée vers l'apprentissage, préservant légitimité et responsabilité.

Mots-clés **:** Démocratie. Complexité. Gouvernance. Incertitude. Intelligence collective. Théorie politique.

Democracy and Complexity

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> "For every complex problem there is an answer that is clear, simple and wrong" (Henry Louis Mencken 1920, 158).
>
> "Trying to understand complex systems involves a certain modesty" (Paul Cilliers 2010, 8).

Governments are elected, people are not. This obvious fact is not always as clear in practice, because those who govern—whether in political society or organizations— often lament the fact that the beneficiaries of their efforts do not comprehend the difficulty of their task. In a parody of this situation, Bertolt Brecht imagines a government that, disappointed by the people it happened to serve, considered the possibility of dissolving it and electing a new one. People in power inevitably fall into the trap of believing that they should fulfil their mission *in spite of* the society they have before them. What irritates those in power, whether they are leading a society or an organization, is the laziness of those governed, the complexity of society, its refusal to submit to the imperatives of planning, its wilful unpredictability and, in the worst case, a suspicious proclivity for organizing. What is most real about this caricature is the strong contrast between the complexity of our societies and the simplifications that are imposed when it comes to the theory and praxis of organizations. If there is anything our institutions need, it is a more in-depth consideration of the complexity in which they are forced to act at the current moment. There is nothing surprising about the fact that simple governments tend to practice authoritarian or ineffective politics, that organizations that are not very intelligent tend to squander the knowledge of their parts and to protect themselves with systems of control that they end up having to surrender when they are faced with problems of governability.

1. The context of a debate

The euphoria of post-war Europe planification was replaced in the 1970s by a growing distrust of our collective capacity to govern the dynamic of social, technological and economic processes. This feeling of powerlessness was characterized as ungovernability or as problems of implementation, a capitulation that, paradoxically, was declared at a time that tried like none before it to take the initiative and control social dynamics. Around 1985, the conviction that our societies were ungovernable had become so consolidated that it seemed like that was the inevitable destiny of contemporary societies. The most frequently cited cause for it was the increasing powerlessness of politics when it comes to capitalist economies or organized private interests, to such an extent that, in the end, the welfare state was no longer feasible and was clearly ineffective as an interventionist state. This pessimism has not been quashed since the two proposals necessary for that to come about have not been formulated: a theory of social complexity and the corresponding conception of a government that is limited, effective and legitimate, suitable for that complexity. The current polarization between populism and technocracy reveals, precisely, a refusal to defend a synthesis between democracy and effectiveness.

From the 1950s to the 1970s, there are two types of non-political solutions for political problems, two ways, in the end, of surrendering before the difficulty of the task: market and evolution, which we could personify in Hayek (1948) and Luhmann (1969. 1984).

Trust in the marketplace—long before the triumph of neoliberalism—was justified by unquestionable evidence: the political government of societies does not have the capacity for collective action that should correspond to current levels of complexity. It is true that states are unable to provide effective control of their societies, and they compensate for it by making gestures without consequences. Still, any hope that the market could exercise these functions would be as hard to believe as the states' gestures of

sovereignty. The idea that consumers are more intelligent than voters, that the masses are wise in the marketplace but crazy in politics, that those who buy are clear-headed and those who vote are bewildered (Schumpeter 1942, 256. Surowiecki 2004) does not correspond to the fact that the new complexity affects citizens and organizations as much when they are agents of the economic system as when they are part of the political system (Caplan 2008). The economic system and the political system both manage the complexity of the environment in their own ways, but even though the economic system is more agile, that does not mean that it can see certain potential risks clearly or measure them correctly, nor is it empowered to replace the functions of a political system whose shortcomings are indisputable. With similar assumptions, the theory of "rational choice", for example, was developed. Its static conception of the interests of the actors falls short of a social complexity characterized by the fact that the actors do not always have the ability to identify their interests and those interests are not independent of the dynamic in which the actors find themselves. The challenge of political self-government, understood as the configuration of collective intelligence, is greater than the optimization of *homo economicus* from a purely aggregate approach.

The other large non-political contribution to the problem of the ungovernability of a complex society could be placed under the motto "evolution". That is how Luhmann formulated it: "evolution is all that is needed for survival" (1984, 645). The implicit message was that it was not possible to confront the dynamic of autonomous systems. Systems cannot converge because every one of them sees the environment, in other words, society, in a different fashion. Luhmann's idea of *autopoiesis* implies giving up the typical arrogance of the classical conceptions of government, which takes for granted the malleability and passivity of the objects of government and the effectiveness of interventions, but it has not led to a theory about how to recuperate that old ability to shape society in the current environment of social complexity. Lucidity and modesty have produced more confusion than illumination about the new possibilities. But it is also clear that evolution is not enough: the risks and the price of simple evolution are too high when we are talking about societies that themselves confront or produce particularly grave threats. The decision-making process in highly complex societies exceeds mere evolutionary learning through trial and error.

When we talk here about the collective ability to govern our societies, we are not abandoning ourselves to the transintentional knowledge of the markets nor the blind course of evolutionary mechanisms. But it is obvious that the vertical organization of state actors also fails to provide much help. The long list of State failures is as impressive as the catalogue of the sins of the marketplace. We will make no progress in the government of societies until we manage to deal with their complexity and, at the same time, design a type of governing that turns their limitations into government resources.

2. A democracy for a complex world

But in addition to what are not strictly speaking political "solutions" (of trust in the market or evolutionary adaptation), there have in recent years been interesting debates that have explored the possibility of finding specifically political proposals for the most frequently identified problems of governability. After the debate between Luhmann and Scharpf at the end of the 1980s and as a response to Luhmann's pessimism (*"Steuerungspessimismus")*, reflections about theories of political government were rekindled in the 1990s. In this sense, it is worth mentioning Helmut Willke (1992), Renate Mayntz (1997) and Fritz Scharpf (1999). The main concern of all of them is how to modify the political ability to govern in a society characterized by a complexity that stems from functional differentiation, globalization and the expansion of knowledge, always beginning from the standpoint that, as Mayntz puts it, "there is no objective criteria for the determination of the common good at the level of the whole society" (2002, 112). Even if there

were general agreement when it comes to passing judgment on a loss of sovereignty in this context, it is less clear whether it is possible and how to compensate that limitation through new instruments and government strategies.

My hypothesis is that this task is only realizable within a theory about complex democracy, from which we can formulate strategies for the government of contexts and explore the territory of what we could call an "indirect democracy". Political philosophy can improve enormously if we add some instruments of complexity to its analytical arsenal. It is not a question of contradicting the advice of Sunstein (2013) to make things simpler, but to view the inevitable presence of more actors and logics as an opportunity for democratisation. The articulation of greater complexity can and should be compatible with the necessity of making decision-making processes intelligible so the citizenry can also carry out the functions of oversight and control that are expected of them in a democracy. Neither is it merely a question of allowing the intervention of more interlocutors as the theory of deliberative democracy seems to advocate, as if all that were needed to improve our collective decisions were the inclusion of more citizens and more topics in the deliberative procedures. Habermas himself recognized at the beginning of the 1990s that democratic theory lacked that "realist" moment that would allow it to cope with social complexity, but his conception of discourse and deliberation did not offer, in my opinion, a space for handling that complexity (Habermas 1992, 350). For that, it was not necessary (or not only necessary) for there to be more deliberation, but other things as well.

A theory of complex democracy is inseparable from a reflection about the forms of government possible in a complex society. It is not so much a question of democratizing government as "governamentalizing" democracy. Of course, there is no democracy without *demos* (no matter that nowadays the people represent a porous, indeterminate and overlapping reality), but neither is there democracy without *cratos* (even if it is a limited, conditional and shared sovereignty). We are facing the true black box of contemporary democracy. As Pierre Rosanvallon laments, there is no democratic theory of governmental action. instead, there are theories about the democraticity of representation, in other words, theories about the relationship between those governing and those governed, but not about the action of governing, as if the democratic nature of government depended upon the person who exercises it and not so much on the way it is carried out, as if the democracy were the regime, rather than the government (2015, 187). That would explain the lack of theorisation about executive power, especially if we compare it with the large amount of reflection that legislative power has deserved, where democratic representativeness is visualized more directly.

The debate about ungovernability has lost strength in recent years, not because this problem has disappeared but because the government crisis has become the new normal. The neoliberal solution of the 1990s was deregulation and privatization, with which there was an attempt to free politics from a task that it could barely carry out. Among those who entrusted the solution for the crisis of governability to this resignation of politics and those who continued in their ritual affirmation of the supremacy of the political system, there was a refusal to investigate the possibilities of strengthening the capabilities of the government with other resources and procedures.

Respect for the growing complexity of the world should not mean renouncing attempts at political configuration. We must rethink the forms of government in the age of networks and organized complexity. The rustic forms of government that were appropriate for relatively simple societies should be more sophisticated and complex for the society of the twenty-first century. In the first place, we need to expand our conceptual schemas to include greater contingency, dynamism and insecurity. This would allow us to surpass the mechanistic and deterministic vision that conceives predictable regularities and causal effects because that conception prevents us from understanding the interrelationship, the co-evolution, the non-intentional consequences, the learning, the collapse, in other words, the ways in which agents in

complex environments interact. Our great challenge is to transform information into knowledge, anticipating risks, managing ignorance, acting with criteria of sustainability and consideration of the future. We need a change of paradigm in order to focus less on the individual properties of system components, emphasizing instead the collective behaviour and emerging properties that stem from their interactions.

There is a practical challenge that opens before us because a complexity understood in this way demands an improvement in our decision-making procedures and our strategic ability. We must learn to handle ourselves in scenarios of greater instability when it comes to building cities and systems of intelligent energy, the prevention of conflicts, struggles against climate change, the fight against poverty, financial instability, environmental degradation or crisis management. Dissatisfaction—whether for democratic reasons or inefficiency—with our political systems stems to a large extent from the contrast between old instruments and new realities. Many of our bad decisions, crises and failures of government have their origin in this conceptual and practical gap. The current increase in complexity demands a profound reconsideration of our conceptions of democracy and our practices of government.

3. The epistemology of complexity

To elaborate a theory of complex democracy, we need to change the paradigm about politics that is characterized by the perspective of complexity inspired by social and ecological systems. This is my overarching goal. My starting point is the hypothesis that we have yet to draw all the consequences that can be deduced about the political world from the crisis of the classical scientific model and the way it has been surpassed in the research of complex systems. The current theory of complex systems offers an interdisciplinary point of view for the understanding and management of non-linear processes in nature and society. The theory of complexity is relevant because the density of the interactions that characterize a complex society has not been easily understood by traditional politics. That is why I intend for this project to be realized in dialogue with the natural sciences and their concepts, something that political philosophy has not done very extensively until now. In this way, it will help bridge the gap between the natural sciences and human sciences. The architects of democracy did this, when they transferred to politics the determinism, calculability and mechanical approach of the natural sciences, but since then, science has moved toward other paradigms and we have barely thought about the extent to which concepts such as non-linearity, emergence or self-organization may be useful when it comes to updating democratic thought. A consideration of the complexity expressed by the natural sciences, physics or biology, may provide us with some keys for moving toward a new politics of uncertainty, openness and collective learning.

If we want to work on the frontiers of science—in this case, of political philosophy—, we must set aside the tool box with which we are currently working and borrow the approaches of some of the other disciplines that have made spectacular transformations in recent years. At the same time, we must remember that merely transposing some instruments to other fields (mathematical modelling for understanding social behaviours or economic criteria to explain the usefulness of democracy, for example) does not tend to provide the expected results if we have not respected the nature and logic of what we are attempting to comprehend. Democracy is a subject for which we have to combine criteria of effectiveness and legitimacy, the judgement of experts and public opinion. We find its delicate complexity within this balance.

An appropriate investigation into complex systems requires us to abandon what are generally understood as scientific laws, in other words, laws that offer a general description of what is taking place and allow

us to account for the future as an application of those laws to a case whose starting conditions are known to us. We need to see these laws as emergent, in other words, they are not simultaneous interactions but a chain of causes that act throughout time. Furthermore, in any complex system in which human subjects act, their representations have a great impact on the systems of which they are a part. Expectations, feeling like they are part of something, being or failing to be recognized, relationships of confidence or suspicion are not distant from what is going on. these are the decisive elements that determine the end result of a process.

Complex problems are precisely the ones where even their formulation is challenging. They do not allow a clear definition or description. their difficulty sometimes resides in not being clearly differentiated from other problems with which they are connected. They are multidimensional and cannot be tackled in parts or according to specific priorities (Dörner 1989, 58). A system is complex when the number of its elements, their plurality, connections and interdependencies cannot be described completely.

The traditional instruments of the social sciences, including political philosophy, have been too static, appropriate for homogeneous societies, with a reduced number of actors and referring to a world in which time and space were not very significant (Miller / Page 2007, 5). From a methodological point of view, in order to give space to complexity, it is also necessary to multiply the points of view and develop a "polycentric approach" (Ostrom 2010), which could even be called a post-disciplinary focus. Complexity places into question the great divide between the natural and human sciences. it forces us to incorporate narratives as well as mathematics, not to determine which is better, but to understand the advantages and limitations of them both (Cilliers 2001, 137).

4. The new knowledges of complexity

The world is not determined, as we believed during the eighteenth and nineteenth centuries, which is precisely the age when our principal democratic categories were formed. In the twenty-first century, the world appears incalculable, unstable and indeterminate. The Newtonian model, with its linear and predictable dynamics, its causes and effects, was also the model that Adam Smith and Karl Marx used to design the functioning of liberal institutions and predict the crises of capitalism.

That world survives in many of our institutional practices, but it is no longer the world of innovative science. During the last quarter century, a certain number of terms (chaos, dynamic systems, emergence, bifurcation, self-organization, uncertainty…) converged in the concept of complexity in various scientific disciplines: in the natural sciences (thermodynamics of dissipative structures, dynamics of non-linear systems, chaos theory, fractals…), in psychology (Palo Alto University), in history (Annales School), in economics (Santa Fe Institute), in sociology (systems theory), in organizational theory (change management) or in anthropology (neurosciences)…

Through the analysis of matters like global warming, the probability of natural disasters, the complexity of life and health, the functioning of the brain, diseases and viruses, these sciences analyse highly complex systems. In all these cases, what is studied is how order is produced from that instability, but also chaos and destruction, from molecular systems to economic interdependencies. In general, all the sciences (with the possible exception of political science) are in agreement that the world is not a perfectly ordered system that is reducible to mathematical equations but is instead organic and algorithmic, more of a living organism than a mechanical one, in such a way that the social sciences are closer to the biological arena than the physical. The sciences are more procedural and less Newtonian than they used to be. This

is particularly noticeable in biology and in the computational sciences, but also even in mathematics, which is moving from differential equations and static results toward combinatorial reasoning and algorithmic thought (Chaitin 2012). Or let us consider economics, where there is greater consciousness of the demise of the neoclassical paradigm, in other words, the idea of perfect rationality, an economics of equilibrium where the actors have the necessary information, presided over by supposedly independent authorities who manage well-defined problems and appeal to an irrefutable objectivity (Arthur 2015). The economists from the Santa Fe Institute understand the economy as a system in which agents, who are not necessarily in equilibrium, continuously change their actions and strategies, thus creating a patchwork of behaviours to which they must continuously adapt.

The science of complexity is the study of patterns, structures and phenomena that emerge based on interactions between elements, whether they are particles, cells, agents or organizations. An analysis of complexity focuses on how change is spread through interconnected behaviours. Complex thought considers the dynamics of processes, their evolution, their histories, seeking the multiplicity of interactions between objects or actions that can be heterogeneous, in other words, the multiplicity of causes and regulations, as well as the emergence of new properties. Simon's well-known definition contemplates emergence as "a large number of parts that interact in a nonsimple way. In such systems the whole is more than the sum of the parts" (Simon 1969, 195). Emergence means that there are structures that obey the rules, but those rules are not deduced solely from the rules that control the parts that constitute them. There are many examples of this, such as the relationship between molecules and life, neurons and consciousness, social systems and society, economic actions and the markets. There is, at times, a great difference between micro-motives and macro-behaviour, to the point of even leading to "emergent perversity" (Miller / Page 2007, 229). Not only is it that the whole is greater than the sum of the parts, but it is very different than the sum of its parts (Anderson 1972). The non-linear dynamic of the financial markets and their tendency to produce bubbles and crises is more similar to physical turbulence than the calculability of Laplace. But it is also true that there can, in that unstable world, be an arrangement that is not the mere result of the aggregation of components as we can see, for example, with the biology of complex systems.

Unlike a complex system, the properties of a complicated system can be traced back to the sum or additive combination of its singular parts. The interaction between the components of a complex system, on the other hand, are "non-linear", in other words, extraordinarily sensitive both to the initial conditions and to the disturbances that take place at any phase of its development. And they react to those disturbances in a way that does not correspond to their intensity: a microscopic and local cause can provoke rapid processes of amplification and produce macroscopic and global effects that can radically modify the behaviour of the whole system. The discontinuity of the evolution of complex systems works in a similar fashion: they can change, over the course of time, in a sudden and unpredictable fashion. Their extreme sensitivity to disturbances can frequently make a single incident or a concrete chain of events intervene brusquely on the previous trajectory of the system, changing some possibilities and eliminating others. In this way, many of the characteristic properties of complex systems do not depend on conformity to specific inflexible laws, but would be "frozen accidents", contingent historical configurations.

The evolution of the global financial system is a good illustration of the emerging properties of a complex system that reveals general properties that exceed the properties of the specific systems or the intentions and strategies of the elements that compose it. After the collapse of the Bretton Woods system, political intelligence should have concentrated on the task of creating a global financial system that was more than the sum of the national financial systems. The risks associated with financial products that manage those individual actors can lead to new risks because of the interdependencies that are created with the corresponding strategies of coverage. Before the crisis of 2018, knowledge about those systemic risks was insufficient. more attention was paid to individual risks related to particular elements than those

associated with interactions between them. But now we find ourselves facing the typical case of the system determining its elements and not the other way around (Luhmann 1984, 43). During the financial crisis, we saw the extent to which the regulatory institutions had not developed the complexity needed to handle a transformation that would give the emerging system prominence over its component parts. The new emerging financial system has been developing properties of interdependence, contagion and its own risks that determine the behaviour of its elements. We must understand the system as a new reality and not as a mere aggregate of its component parts. The dense global interaction of many financial agents acquires systemic properties that were not found in their components. This configuration takes place at a time when the World Trade Organization has not yet managed to develop a system of global trade that adds systemic properties against the interests of the member states.

The global economic crisis cannot be explained based on undesirable individual conduct (as might be the case with Madoff's scams and other pyramid schemes carried out by single individuals), not because those types of behaviours were not immoral but because what turned them into systemic failures was the emerging global context. Let us consider another argument that points to individual behaviour as an explanation for the crisis: putting the blame on individual consumption. A housing bubble is a complex group, which has many causal references and diverse dimensions of responsibility, and barely allows a clear distinction between individual blame and systemic inevitabilities. It makes little sense to blame the subjects that are living "above their means" when the conditions of euphoria and leverage are provoked by the systemic interaction of many authors and institutions (weak governance, irrational competition, minimal protection from contagion effects, stimuli and procyclical incentives...).

In the age of globalization, the conditions in which human beings live are more complex and extensive. Chaos and self-organisation emerge according to the logic of complex dynamic systems, as much in nature as in society. It is the complexity that is investigated in the molecular systems of physics and chemistry, in the ecological systems of biology and in the neuronal networks of the brain, as well as in the economy and social sciences.

5. An Enlightenment of ignorance

An intelligent system that is to govern our current complex environment should manifest two fundamental experiences: first, that knowledge is more important than norms, and second, that we must, strictly speaking, manage ignorance, more than knowledge.

Let us begin with the need for cognitive abilities to govern. The government, understood as something more normative than cognitive, is too rigid, retrospective and slow to be effective in societies of complex and dynamic knowledge. In addition to the normative perspective for simple and stable groups, we need other resources connected to knowledge, such as expertise translated into rules, the ability to argue and convince or the possibility for collective learning. If the first Enlightenment revolved around the acquisition of knowledge for individual and social progress, the second Enlightenment should emphasize a broader level of learning, the intelligence of organizations and institutions and organized forms of collective intelligence. For organizations, building collective intelligence means that learning no longer takes place through simple evolution or adaptation. instead, it should be structured systematically in reflexive processes of the management of knowledge.

But, no matter how decisive the generation of knowledge, it is just as important to understand the function played by ignorance in a knowledge society, why ignorance is important for the acquisition and reproduction of knowledge or for the emergence and change of institutions. A knowledge society is a

society whose collective intelligence consists of prudently and rationally managing the ignorance in which we find ourselves obliged to act, in other words, when it comes down to it, a society of ignorance. We could formulate it in a less dramatic fashion by affirming that it is a society in which we have no choice but to learn to handle ourselves with incomplete knowledge. A fundamental aspect of collective ignorance is the question of "systemic ignorance" (Willke 2002, 29), when we refer to future social risks, to groups of actors, among whom too many events are related to too many other events, in such a way that the decision-making ability of individual actors is overwhelmed.

If at other times the dominant way to combat ignorance was to eliminate it, today we can assume that it is of an implacable nature, so we should understand it, tolerate it and even make use of it and consider it a resource (Smithson 1989. Wehling 2006). One example of this is the fact that, in a knowledge society, the risk of "confidence in other people's knowledge" has become a key issue (Krohn 2003, 99). Knowledge societies can be specifically characterized as societies that must learn to manage that ignorance.

The boundaries between knowledge and non-knowledge are neither unquestionable nor obvious nor stable. In many cases, questions about how much we can still know, what can no longer be known or what will never be known are still unanswered. This has nothing to do with typical Kantian humility about how little we know and how limited the scope of human knowledge is. It is less precise than Merton's "specified ignorance", which focuses on weak forms of ignorance, such as the ignorance that is assumed or feared, the ignorance of not knowing *what* we do not know or *the extent to which* we do not know.

The appeal to "unknown unknowns", that are beyond the scientifically established hypotheses of risks, has become a powerful and controversial argument in social debates on new research and technologies. Of course, it is still important to expand the range of expectation and relevance so as to distinguish the areas of non-knowledge that we had not seen until now and to begin discovering "unknown unknowns". But this goal should not make us slip into the fantasy of believing that the problem of unknown unknowns can be resolved in a traditional manner, such as making it completely disappear through more and better knowledge. Even when the relevance of unknown unknowns has been explicitly acknowledged, we still do not know *what* is not known and *whether* anything that is unknown is crucial. Knowledge societies have to accept the idea that they always need to face the issue of unknown unknowns. they will never be in a position of knowing whether or the extent to which the "unknown unknowns" they necessarily face are relevant.

From this point forward, our biggest dilemmas will revolve around "decision-making under ignorance" (Collingridge 1980). Making decisions under ignorance requires new forms of justification, legitimation and observation of consequences. How can we protect ourselves from threats against which, by definition, we do not know what to do? And how can we do justice to the plurality of the perceptions of non-knowledge if we do not know the scope and relevance of what we do not know? How much non-knowledge can we afford without unleashing uncontrollable threats? What ignorance should we consider relevant and how much can we ignore as harmless? What particular balance of control and chance is acceptable in terms of responsibility? Regarding what we do not know, is it a carte blanche for taking action or, conversely, a warning that maximum precautions should be in place?

These are the profound reasons for which a democracy of knowledge is not governed by expert systems but by the integration of those expert systems into larger government procedures, which necessarily include decisions in areas where ignorance is unyielding. Our principal democratic controversies revolve around determining precisely what ignorance we can accept, how we can reduce ignorance through precautionary measures or the risks we would be wise to assume. We are faced with the challenge of learning to manage the uncertainties that can never be completely eliminated, transforming them into

calculable risks and learning possibilities. Societies today must develop not only the ability to solve problems but also the ability to react appropriately to the unexpected.

If the first Enlightenment aspired to clarity and exactitude, the second must grapple with unmeasurability, inexactitude and uncertainty. The first Enlightenment assumed that the aggregation of rational components would present no problem. we can now see that the convergence of the parts (of individual interests and the interdependence of systems) too often gives way to an irrational totality. bits of knowledge do not accumulate but lead to confusion. interests do not aggregate but neutralize each other. the increase of information does not increase transparency but the opacity of the whole. decisions, even when individually rational, produce inevitable chains of events. What theory and praxis of government responds to this new constellation? The government of intelligent systems could be an appropriate denomination for this new challenge.

6. What the sciences can teach politics

We know the physical universe better than the social and economic world. This contrast is due to the difficulty of the subject matter, without a doubt, but also to the fact that many of our political systems and their actors operate with concepts that presuppose an order of causality, functionalism, reductionism, predictability and determinism that only made sense with the science of two hundred years ago. While the notion of complex systems is relatively new in the social sciences, the natural scientists have studied it for the last few decades. There has been a lot of work on natural complexity and very little on the politics of complexity. There are some advances in specific areas of the social sciences and their corresponding policies (from epidemiology to traffic), but the political theory of complex systems still needs to be developed (Coleman / Kupers 2014, 58). The purpose of this book is precisely to enrich the way in which the social sciences focus the democratic government from this systemic perspective, elaborating a political philosophy in agreement with an epistemology of complexity.

What could we learn from how nature organizes itself? What teachings can we absorb for our action and decision-making in a democracy through the observation of the complex? Politics can take into consideration not only the concepts that arise from the arena of the social sciences, but also from the natural sciences and mathematics. There has always been an aspiration to apply the methods of the natural sciences to the human and social world, a world that always made sense and was carried out according to its own expectations. If at other times, this application promised exactitude, it now invites us to introduce the perspective of complexity and, with it, to develop criteria for the processing of political problems with greater indeterminacy and uncertainty.

Politics must function on the edge between competence and inability when it comes to handling the information, uncertainties and risks connected to the future impact of its decisions. The first requirement is cognitive. We must move from a model of government based on the convincing force of the evidence (whether it represents scientific objectivity, provable effectiveness or the deliberative strength of the best argument) to a model in which there is nothing but clues and risks. Most approaches—whether objectivist, pragmatic technocratic or deliberationist—fail to make room for the complexity that arises out of the fact that our decisions are generally not based on undisputed facts. Thus, in spite of the quality of the processes for elaborating information, systems for indicating effectiveness or procedures for participation, we must grapple with a degree of uncertainty in any decision. Neither evidence nor successful rhetoric will make superfluous the ideological elements, the wagers and risk assessment that continue weighing on our decisions even if the work of the experts and the process of collective deliberation has been very intense.

When it comes to managing complexity, the problem is that, as the Austrian zoologist Rupert Riedl noted, human beings have left the industrial era with a prehistoric brain, in other words, genetically programmed to think linearly, in isolated causal chains and with a tendency to seek easily identifiable causes for complex problems (Riedl 1978/79). We tend to be excessively forgiving toward good intentions (or ambitious political ideologies, unconditional values, charismatic leadership...), even when they have had disastrous consequences throughout history, as if we did not know that the worst thing about those who have good intentions is that they tend to eschew the preventions that should be adopted when they want to achieve their objectives. At the same time, we are too susceptible to blaming collective catastrophes on personal responsibility, even though conspiratorial thinking ends up explaining very little and constitutes an insufficient basis for the configuration of something like collective responsibility.

Complex systems, with their changing and multi-contextual contexts, resist being understood and managed based on a simplifying approach. Changeability means that information, knowledge and interests are never in a state of perfect harmony, which leads to continual processes of synchronization and desynchronization, accelerations and deadlocks. Given these circumstances, the principal criteria of good government is the ability to make a decision when overwhelmed with contingencies. With all these new factors, strategies for action must be reconsidered. Simply acting according to the previous script becomes less reasonable when the number of situations that are unprecedented increases. Governing today means doing so in situations of limited rationality, with interdependencies that are difficult to identify, in the midst of instabilities and catastrophic fluctuations. We need to get to know the dynamics of those interactions to gain the ability to handle the corresponding social complexities.

It is this changeability that forces us to develop a special sensitivity to discover and govern instabilities and crises. In order to manage complexity, we must pay more attention to tendencies than to the current scope of a problem. Only in this way will we be able to overcome the difficulties that those who think in excessively simple frameworks of cause and effect have when they need to manage time, handle exponential developments or take into consideration secondary effects and long-term realities.

The fundamental teaching of complex and non-linear thought for politics is that we are not in societies in which every action leads to a sure and predictable result, which means that any interventional project will need to learn to function with strategies that are more thoughtful and subtle, managing growing uncertainty around the efficacy of interventions (Rothstein 1998, 74). Even the regulation and treatment of risks originate their own risk. Any intervention in a system with its own dynamic—whether it is a psychological structure, an organization or society itself—is problematic because the more complex a system, the less transparent it is for those who observe it or intervene from the outside and even for those within it. When those who plan intentionally do not know or control the habitual conditions of the environment, the plan fails, the planned direction is modified or secondary effects appear that devalue the project (Mayntz 2009, 130). One of the fundamental experiences of human action is that intervening in a process also implies irritating other areas of reality that, in turn, function with other laws, logics and conditions: credit is facilitated and bubbles are formed. if politics does not resolve problems, judges will end up intervening and if justice is politicized, it loses the legitimacy that stems from its impartiality. excessive control of the sub-social systems in which we expect great innovation (such as in science or art) has as a result an inhibition of creativity... This explains the failure of many policies, such as the legislative initiatives that either do not resolve the problem they were meant to solve or do solve it at the same time as they generate another one, or the persistent tendency of politics to become a meaningless gesture, to postpone urgent problems and revolve around the immediate present. But it also reveals how difficult and limited the task is.

What makes politics so complicated in a context of complexity is that its ends cannot be specified a priori. No one—not the individual nor the government—knows the ends ahead of time. they are developed endogenously and emerge to the extent to which the system evolves. The objective of government consists precisely in creating an environment in which society can reflect about what it wants for itself.

Politics is not merely an intentional act. It is a type of action that is carried out in the midst of emerging phenomena, unforeseeable dynamics, barely identifiable externalities and movements of self-organization. And just in case that were not enough, we must keep in mind that what one wants does not always coincide with what one believes one wants or says one wants. The world of intentions is the world of Newtonian mechanics. the world of action in contexts of interdependence, sense and complexity is a post-Newtonian world, and its political philosophy is still incomplete.

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