



THE ECOLOGY OF LAW

Toward a Legal System in Tune
with Nature and Community



FRITJOF CAPRA

UGO MATTEI

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*Toward a Legal System in Tune
with Nature and Community*

FRITJOF CAPRA
and UGO MATTEI



Berrett-Koehler Publishers, Inc.
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*To all the bright young people
worldwide who pursue an
academic education still hoping
to change the world.*

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Preface

Over the last four decades, dozens of scholarly and popular books have explored the fundamental change of worldview, or change of paradigms, that is now occurring in science and in society—a change from a mechanistic to a holistic and ecological vision of reality. None of these books, however, has paid attention to the fact that this paradigm shift has an important legal dimension. This legal dimension is the central focus of *The Ecology of Law*.

The idea for this book originated in a series of conversations between a scientist (Capra) and a legal scholar (Mattei) about the concept of law in science and jurisprudence. The first conversations took place on a tennis court; they led to more structured discussions and subsequently to two semester-long seminars we taught at the University of California Hastings College of the Law in San Francisco. As our fascination with the subject grew, we decided to turn our discussions into a book.

When people think about law, they usually think about lawyers and their court cases. *The Ecology of Law* is the first book to present the law as a system of knowledge and jurisprudence—the theory and philosophy of law—and as an intellectual discipline with a history and conceptual structure that show surprising parallels to those of natural science. Indeed, the two disciplines have interacted throughout history; as they have coevolved over time, so has the conceptual relationship between “laws of nature” and human laws.

Our principal thesis is that Western jurisprudence, together

with science, has contributed significantly to the mechanistic modern worldview; since modernity produced the materialistic orientation and extractive mentality of the Industrial Age, which lies at the root of today's global ecological, social, and economic crisis, both scientists and jurists must share some responsibility for the current state of the world. Because the critical target of this book is the dominant global system of knowledge and power, this book discusses only Western law and Western science. There is no ethnocentrism in this choice—only the urgency to place responsibility where it belongs.

At the forefront of science, a radical change of paradigms—from a mechanistic to a systemic and ecological worldview—is now emerging. The very essence of this paradigm shift is a fundamental change of metaphors: from seeing the world as a machine to understanding it as a network of ecological communities. Moreover, the science of ecology has shown us that nature sustains the web of life through a set of ecological principles that are generative rather than extractive.

A corresponding paradigm shift has yet to happen both in jurisprudence and in the public conception of the law. It is now urgently needed, since the major problems of our time are systemic problems, and our global crisis is an ecological crisis in the broadest sense of the term. In this book, we call for a profound change of legal paradigms, leading to a new ecological order in human law.

Throughout the book we discuss three interrelated themes: the relationship between science and jurisprudence, and between the “laws of nature” and human laws; the contributions of jurisprudence and science to the modern worldview, and of modernity to the current global crisis; and the recent paradigm shift in science and the need for a corresponding shift in law to develop an ecological legal order.

The book is divided into an Introduction and ten chapters. In the Introduction, we present our principal thesis. In Chapter 1, we clarify some misconceptions about the similarities and differences between science and jurisprudence.

In Chapter 2, we review the evolution of Western scientific thought from antiquity to the Scientific Revolution and the Enlightenment, culminating in a mechanistic paradigm that advocates the human domination of nature; views the material world as a machine; postulates the concept of objective, unchangeable “laws of nature”; and promotes a rationalist, atomistic view of society.

In Chapter 3, we discuss the corresponding evolution of Western legal thought, which resulted in a mechanistic legal paradigm in which social reality is viewed as an aggregate of discrete individuals and ownership as an individual right, protected by the state. Indeed, we present ownership and state sovereignty as the two organizing principles of legal modernity. Moreover, we emphasize that, in the mechanistic paradigm, law has become an “objective” framework with no room for a human interpreter.

In Chapter 4, we describe the rise and principal characteristics of legal modernity, including the profound social transformation, in little more than three hundred years, from a situation of abundant commons and scarce capital to the current one of excessive capital and dramatically weak ecological commons and community ties. We also discuss the rise and domination of economic science, the fiction of corporations as legal “persons,” and the reductionist idea of a single legal order.

In Chapter 5, we review the paradigm shift in science from seeing the world as a machine to understanding it as a network, including the conceptual revolution in physics during the first three decades of the twentieth century and the subsequent emergence of systems thinking in the life sciences.

In Chapter 6, we show how the Romantic and evolutionary critiques of Cartesian rationality in legal thinking failed to overcome the mechanistic vision, which consequently has proved much more resilient in the law than in science.

In Chapter 7, we describe what we call the “mechanistic trap,” a set of incentive schemes that “naturalize” the current situation. It is especially difficult to escape the mechanistic trap,

because the status quo, looking natural rather than cultural, disempowers people.

In Chapter 8, we discuss three fundamental principles necessary to overcome the situation described in Chapter 7: disconnecting law from power and violence; making community sovereign; and making property generative.

In Chapter 9, we outline the legal structure of the “commons,” the relational institution that should lie at the core of a legal system consistent with the ecological principles that sustain life on our planet.

In Chapter 10, we conclude with a first sketch of some basic principles of an “ecolegal” order, and we illustrate them with examples of current revolutionary struggles that try to make such a new order a reality.

In addition to being espoused by jurists and lawyers, the mechanistic worldview of modernity still holds sway among business and political leaders. In particular, they relentlessly pursue the persistent illusion of perpetual economic growth on a finite planet by promoting excessive consumption and a throwaway economy that is energy and resource intensive, generating waste and pollution and depleting the Earth’s natural resources.

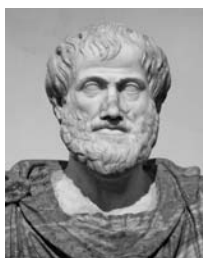
Both the current global economy and the legal order embedded in it are manifestly unsustainable, and a new ecolegal order—based on ecological and legal literacy, fair sharing of the commons, civic engagement, and participation—is urgently needed. However, such a new legal system cannot be imposed, nor can it be described precisely at this point. We need to allow it to emerge, and we urge all citizens to participate in this process. The assertion that each one of us can participate now in the making of the new ecolegal order is the hopeful conclusion of our book.

Leading Scholars in Science and Jurisprudence

SCIENCE

JURISPRUDENCE

ANTIQUITY



Aristotle (384–322 B.C.E.)

Proposed a grand synthesis of the natural philosophy of antiquity; saw the world as *kósmos*, an ordered and harmonious structure in which all parts follow an innate purpose (*télos*). Considered the material world to be composed of varying combinations of four elements—earth, water, air, and fire.

Introduced a fundamental distinction between customary and enacted law; gave a central position to private property, which he legitimized by reason.



Gaius (fl. 130–180 C.E.)

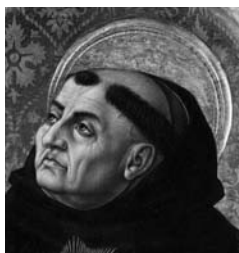
Put existing brief legal texts into a systematic order in his *Institutiones*; identified taxonomy and legal patterns still used today.

ANTIQUITY

**Justinian I (483–565 C.E.)**

Sponsored the revision and simplification of Roman law in the *Corpus iuris civilis* (529 C.E.). Also known as the Code of Justinian, it is considered the most important law book ever written, containing the “DNA” of global law.

MIDDLE AGES

**Thomas Aquinas (1225–1274)**

Created the synthesis of Aristotelian philosophy and medieval Christian theology known as scholasticism.

**Bartolus of Saxoferrato (1313–1357)**

Developed the *mos italicus* (the Italian way), an early systemic analysis of law that for practical reasons develops legal principles abstracted from individual conflicts about property.

SCIENCE

JURISPRUDENCE

RENAISSANCE



Leonardo da Vinci (1452–1519)

Created a unique synthesis of art, science, and design. An early systemic thinker, he developed a multidisciplinary science of living forms.



Francisco de Vitoria (1492–1546)

Founded the Spanish school of natural law; attempted to construct a scientific legal system for a just society under God-given natural laws.



Sir Edward Coke (1552–1634)

Last of the great medieval jurists; allied with barons and supported the common law against the monarchy.

SCIENTIFIC REVOLUTION



Galileo Galilei (1564–1642)

Focused on quantification combined with mathematics.

SCIENTIFIC REVOLUTION

**Francis Bacon (1561–1626)**

Passionately advocated for the empirical scientific method and the domination of nature.

Served as Lord Chancellor of England. An outstanding lawyer, he was an early champion of legal absolutism.

**René Descartes (1596–1650)**

Developed the mechanistic worldview. A towering figure of seventeenth-century philosophy, he was a brilliant mathematician and a very influential scientist.

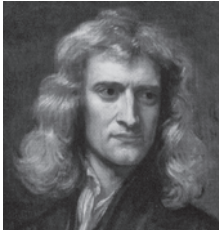
**Hugo Grotius (1583–1645)**

Founded the northern school of natural law, which was based on a Cartesian vision of rational natural laws.

**Thomas Hobbes (1588–1679)**

Fully developed the absolutist theory of state sovereignty that, together with absolute ownership, is the foundation of modern legal thought.

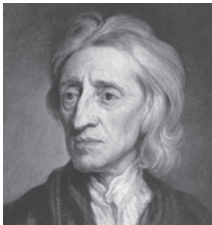
SCIENTIFIC REVOLUTION

**Isaac Newton (1642–1727)**

Developed a mathematical formulation of the mechanistic worldview. His grand synthesis of Galileo, Bacon, and Descartes became known as Newtonian physics.

The concept of the “laws of nature” was firmly established because of Newton’s tremendous prestige.

ENLIGHTENMENT (“AGE OF REASON”)

**John Locke (1632–1704)**

Elaborated an atomistic view of society, described in terms of its basic building blocks, individual human beings; invented a “natural right” to private property.

Determined the triumph of the conception of rational natural laws, based on protecting private property against state sovereignty.

Critical reasoning, empiricism, and individualism became dominant values, together with a secular and materialistic orientation.

**Jean Domat (1625–1696)**

Developed a rationalist and atomistic vision of the French legal system, which would be incorporated into the Napoleonic Code in 1804.

ENLIGHTENMENT (“AGE OF REASON”)

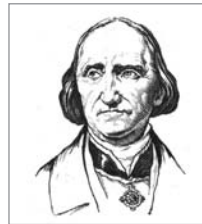
**William Blackstone (1723–1780)**

Appointed as the first professor of English law; defined private property in absolute terms borrowed from rationalist natural law; emphasized the owner-centric idea of jurisprudence.

THE NINETEENTH CENTURY

**Johann Wolfgang von Goethe (1749–1832)**

Ardently opposed the mechanistic worldview; became central figure of the Romantic movement of poets, philosophers, and scientists.

**Friedrich Karl von Savigny (1779–1861)**

Strongly criticized rationalist natural law. His emphasis on legal evolution in opposition to legal absolutism had been developed earlier in the works of Montesquieu and several Scottish jurists.

THE NINETEENTH CENTURY

**Charles Darwin (1809–1882)**

Developed evolutionary thought—a decisive challenge to the immutability of the Newtonian world-machine.

THE TWENTIETH CENTURY

**Werner Heisenberg (1901–1976)**

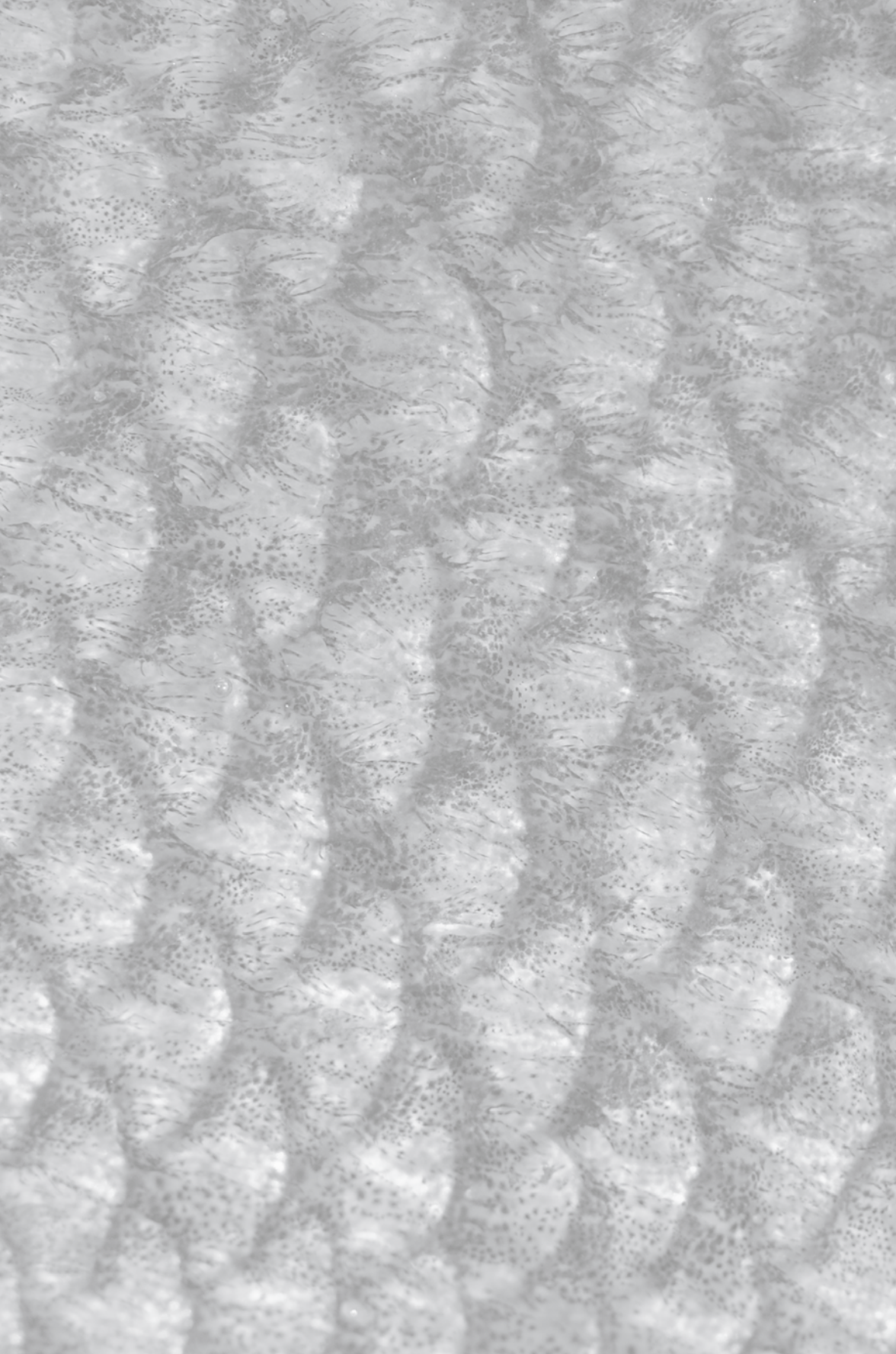
Helped to found the study of quantum physics; emphasized the importance of the human observer in atomic phenomena.

**François Géný (1861–1959)**

Criticized the mechanistic paradigm and scientific positivism; emphasized the creative role of the legal interpreter.

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THE ECOLOGY OF LAW



The Laws of Nature and the Nature of Law

The Nile perch is among the largest of freshwater fish, capable of achieving a length of more than 6 feet and a weight of more than 400 pounds. The perch is native to the sub-Saharan and is found not only in the Nile but also in the Congo, the Niger, and other rivers, as well as in Lake Chad and other major basins. For more than half a century, however, it also has been found in Lake Victoria in east Africa, where it is not native, and where it has subsequently become one of the best-known examples of the unintended consequences of introducing a species to an ecosystem. A brilliant documentary by Hubert Sauper, *Darwin's Nightmare*, made this story known to a wide public in 2004.

As a top-level predator of extraordinary size, might, and greed, the perch will eat most anything, including its own species. It has a potential life span of sixteen years, giving it enormous potential for ongoing destruction. Its introduction by humans to Lake Victoria for commercial harvest has caused the disappearance of most of the endemic species in the lake and has created disastrous social and economic consequences. For instance, large-scale fishing operations, typically geared toward export, have robbed many local people of their traditional livelihood in the fishing trades. Towns along the lakeshore arose to service fishery workers, but these towns offer little in the way of basic services such as water or electricity. Local people who have not been assimilated into the new local cash economy have been forced to leave their homes in search of work. Prostitution, AIDS, and drug abuse by street children are rampant. Moreover, the Nile perch cannot be sun-dried in

the traditional way but instead must be preserved through smoking, which has caused a severe depletion of firewood in the region.

It is difficult to find a better metaphor for the impact of the modern economic and legal paradigm on a local community. Across the world, over and over again, this paradigm of short-term extraction, state sovereignty, and private ownership fueled by money (itself a legal abstraction concentrated in the private hands of corporate banks) has produced huge benefits to a few at the expense of the environment and local communities. State and capitalist ownership, most notably the modern transnational corporation, not unlike the Nile perch itself, displays cannibalistic tendencies, with various players eating each other by way of war or takeover.¹

Similar examples can be found all over the world. In the Pacific Northwest, a century of extractive clear-cutting practices in forestry have devastated the landscape, silted streams, and endangered salmon habitat. As the trees have disappeared, so have many local livelihoods. In California and across the West and Southwest, the overuse of water for growing desert populations and industrial agriculture has resulted in depleted aquifers and overstressed watersheds, worsening the effects of drought and threatening livelihoods and food security. Across the world, food shortages, disease, and overpopulation, often resulting from short-term economic incentives or other human action, have played a part in creating income disparity and environmental degradation.²

Just as the Nile perch has devastated its new environment and may potentially eat itself out of Lake Victoria, it is no exaggeration to say that human civilization, together with many higher forms of life, may disappear from the planet unless we can reverse our extractive, destructive ways in time. Nor is it too far-fetched an idea to see modern capitalist institutions behaving as the Nile perch in many places of this world. For instance, the disruption caused by the development projects of global corporations to attract rich tourists in the global south is never taken into consideration by the celebrative narratives of the development and economic growth they produce.

But deciding on a remedy first requires understanding how this system came about. We did not end up with our current short-sighted economic and political system by accident, although, as we shall see, it wasn't quite planned, either. Our main thesis in this book, as stated in our Preface, is that jurisprudence (the theory of law), together with science, has contributed significantly to the mechanistic modern worldview. Because modernity, at least since the seventeenth century, has produced the materialistic orientation and extractive mentality of the Industrial Age, which lies at the roots of today's global crisis, both scientists and jurists must share some responsibility for the current state of the world. As we explore the relationship between science and law, we shall discover that jurisprudence is an intellectual discipline with a history and a conceptual structure that show surprising parallels to those of natural science. We shall also see that their mutual interactions evolved over time, as did the relationship between the "laws of nature" and human laws.

In science, the mechanistic paradigm that began in the sixteenth and seventeenth centuries includes an emphasis on quantification, introduced by Galileo Galilei, and on the human domination of nature, championed by Francis Bacon; the view of the material world as a machine, separate from the mind, advanced by René Descartes; Isaac Newton's concept of objective, unchangeable "laws of nature"; and a rationalist, atomistic view of society promoted by John Locke.

In jurisprudence, the rationalist, mechanistic paradigm, developed by seventeenth-century jurists like Hugo Grotius and Jean Domat, views reality as an aggregate of discrete definable components, owners whose individual rights are protected by the state. Indeed, ownership and state sovereignty, respectively championed by John Locke and Thomas Hobbes, are the two organizing principles of legal modernity.³ Moreover, still in the Cartesian tradition, the law is seen as an "objective" framework separate from the individual subject.

During the past three decades, a radically new paradigm has emerged at the forefront of science.⁴ At the heart of this change of

paradigms from a mechanistic to a holistic and ecological worldview we find a profound change of metaphor: from seeing the world as a machine to understanding it as a network. Networks, of course, are patterns of relationships; hence, understanding life in terms of networks requires an ability to think in terms of relationships and patterns. In science, this new way of thinking is known as “systems thinking,” or systemic thinking. We have also realized that nature sustains life through a set of ecological principles that are generative rather than extractive.

A corresponding paradigm shift has not yet happened either in jurisprudence or in the public understanding of law. Such a shift is now urgently needed, since the major problems of our time are systemic problems—all interconnected and interdependent—and our global crisis is an ecological crisis in the broadest sense of the term.

In this book, we call for a profound change of legal paradigms, leading to a new “ecology of law.” At the heart of this new ecological legal order lies a view of social reality not as being an aggregate of individual “building blocks” but rather as being composed of social networks and communities. Law, in this view, is not an objective structure, but emerges from actively engaged citizen and legal communities as the legal embodiment of their self-organization.⁵

FROM HOLISM TO MECHANISM

Until the end of the Middle Ages, cultures around the world observed nature very closely and adapted their way of life accordingly. Their observations were often couched in religious or mythological language, and, in general, nature and its laws were seen as emanating from God or some other divine power. These beliefs implied rules for human behavior that everyone was expected to follow; even law itself was a deeply spiritual concept, based on obligation and on the proper role of an individual within a community and in relation to the life-sustaining earth.⁶ The Latin term *agriculture*, or “cultivation of the land,” reflects this deep sense of

obligation, which was perceived as a process of creation and generation through labor, knowledge, and skill, and certainly not as a process of extracting “value.”

This early holistic, communal conception of the universe and the planet continued to be dominant until the Scientific Revolution of the sixteenth and seventeenth centuries, which championed the study of matter and brought forth the mechanistic science of Galileo, Descartes, and Newton. Nature was now seen as a machine made up of discrete, measurable parts. Galileo postulated that scientists should restrict themselves to studying the measurable, quantifiable properties of material bodies, such as shape, number, and movement. Other qualitative properties, such as color, sound, taste, or smell, were merely subjective mental projections and should be excluded from the domain of science and its goal of describing nature in mathematical terms.

Galileo’s strategy of directing scientists’ attention to the quantifiable properties of matter proved extremely successful in classical physics, but also exacted a heavy toll. During the centuries after Galileo, the focus on quantities was extended from the study of matter to all natural and social phenomena. The subsequent mechanistic scientific worldview of Descartes and Newton, in addition to excluding qualitative properties, also omitted more complex qualities, such as beauty, health, or ethical sensibility. The emphasis on quantification prevented scientists for several centuries from understanding many essential properties of life.

POWER IN SCIENCE AND LAW

As the holistic view of nature was replaced by the metaphor of the world as a machine, the goal of science became knowledge that could be used to dominate and control nature. A similar movement was afoot in legal thought. Jurists like Grotius and Domat, both contemporaries of Descartes, promoted the view of reality as an aggregate of discrete definable components (free individual actors), and ownership as an individual right, guaranteed by the state, to develop nature, that is, to transform it into physical ob-

jects. Indeed, ownership and state sovereignty—championed in the seventeenth century by John Locke and Thomas Hobbes, respectively—are the two organizing principles of legal modernity, known to jurists also as legal absolutism.⁷ At the same time, law began to be seen as an “objective” framework separated from its interpreter—another legacy of Descartes that is still present in today’s legal thinking.

The human dominance of nature advocated by lawyer and scientist Francis Bacon has produced the ongoing exploitation and destruction of nature with ever more powerful technologies.⁸ The world of Bacon and his contemporaries was characterized by a tremendous abundance of common resources, such as forests and fisheries, and of communal institutions, such as professional guilds and village structures, known collectively as *the commons*. The capital needed to develop manufacturing and industry was dramatically scarce. Institutions such as individual private property, stock corporations, and sovereign states—and also general freedom of contract and fault liability—were created to transform some of these commons into concentrated capital. The success of this institutional scheme has been staggering. In less than three hundred years the conditions have been reversed: today we experience a dramatic scarcity of commons and an overabundance of capital.⁹

The law has played a fundamental role in “naturalizing” this power.¹⁰ The sovereign state and the sovereign private owner have acted as two mighty allies in the destruction of the previous legal order based on social relationship and the adaptation of humans to the ecological requirements of nature. Law has served as an instrument of human domination over nature, incrementally pushing people away from participating in nature’s reproductive processes, overcoming the old medieval organic wisdom. Henceforth, nature was seen as “belonging” to humankind, and nature’s main purpose was deemed the satisfaction of human needs. While the daily experience of life in traditional agricultural civilizations, hard and brutish as it might have been, linked human communities to the land and sustained a symbiotic relationship with it, law and science converged with the rise of modernity to intellectually

contrast humankind with all other creatures, “freeing” humans from our ecological chains. Other creatures were seen to live in a “state of nature,” but humans no longer belonged to the same category. Through science, humans could understand nature; through technology, we could transform it; and through the legal institutions of property and sovereignty, nature’s essence could be transformed into a commodity, a physical object that humans could exploit or “improve.”¹¹

Today, the current mainstream vision is essentially the same, which is why most people considered it “natural”—legal and even beneficial to development and growth—to introduce the Nile perch to Lake Victoria. The general public broadly shares the conviction that, in relation to a common holding such as a lake or any other potentially profitable resource, the natural self-interested behavior is to benefit from it by extracting value. Introducing the Nile perch, developing an uncontaminated cove, digging Alaska for oil, and fracking the land are all exercises of economic freedom protected by private property, which grants sovereignty to individuals. The only agent that can check such freedom is the sovereign state in a zero-sum equation between the two (more state government equals less freedom of property; more freedom equals less government), itself perceived as a law of nature. If the law (an external limit) does not restrict a given action, the rational actor is assumed free to extract. Moreover, these apparently mutually exclusive domains are deemed to be governed by an irrefutable logic: more market equals less state, and more state implies less market.

MARKET AND STATE

This mechanistic vision of property and sovereignty is responsible for the dramatic state of affairs on our planet. Property rights, granting power to corporations and supported by the state, made it natural for BP to increase profits by neglecting various safety measures on its *Deepwater Horizon* oil rig, which resulted in the devastating pollution of the Gulf of Mexico; and for Exxon to

avoid fixing the radar on the *Exxon Valdez*, leading to the destruction of the ecosystem of Prince William Sound in Alaska. Through this culturally constructed mechanism of free extraction, the subprime mortgage bubble was produced, AIDS and malaria have remained untreated in Africa, arms trafficking is rampant, and financial “creativity” has endangered the lives of many people. The concentration of power in state institutions determined the nuclear catastrophes of Chernobyl and Fukushima; and the view of nature as a machine, to be adapted to human use, has led to the tragedy of Lake Victoria and similar ecological catastrophes.

Modern property rights, as structured, not only determine the behavior of participants in the legal system but also, most importantly, display a remarkable independence even from the power concentrated in governments.¹² When corporations are granted charters that allow them to “live” forever but to legally avoid long-term consequences, they can easily evade their civic responsibilities. The law, built on property rights centered on the individual, has a life of its own and can defeat even the most well-intentioned and mighty forces of change.

Today, all political debates are firmly anchored in the powerful academic discipline of economics, which, by successfully claiming to be an exact science, determines policy making and legislation. Unfortunately, economics still applies a short-term, reductionist, linear, and quantitative bias typical of traditional scientific thought, a consequence of the mechanistic paradigm.¹³ Having conquered the legal system through economics, this obsolete mainstream view, rooted in the duopoly of property and state, now fuels our ecologically destructive practices. So-called economic laws produce major distortions because they are based on the assumption that it is natural and desirable for an institution to set growth targets that induce extractive individual behavior while discouraging virtuous practices. For example, if one considers water as just another commodity, the laws of “scarcity” deem it desirable that water should carry a price and not be freely available for human use. Economists make much out of this observation by telling us that the increase of price reduces the amount consumed,

so they use an ecological argument to recommend that public water systems be transferred to for-profit corporations. Unfortunately, the laws of “supply and demand” make it natural for a corporation to sell as much of its product as possible in order to grow and prosper. So corporations profit from the excessive lengths of showers that many Western people enjoy. Rather than taking into consideration the long-term need for ecological balance, economic actors “naturally” act to expand their own business opportunities with more investment in producing individual wants by means of advertising, so that the production of useless, environmentally harmful commodities is their top priority.¹⁴ Shampoo companies, for example, promote the desire for long, refreshing showers as a condition of individual self-fulfillment, and mineral water companies induce the need to drink bottled water transported in polluting trucks because it is as much as five hundred times more profitable than tap water. In California, for example, the average cost of tap water is \$1.60 per one thousand gallons while the average cost of bottled water is about 560 times higher at 90 cents per one gallon.¹⁵

The disastrous effects of our laws and economy are rather clear at this point, but this understanding has not affected policy making. Instead, the legal system has cast our unsustainable model of development in stone as property rights. Current political and economic debates are dominated by fragmentation and linear thinking, with an especially unwarranted faith in both technological progress and infinite growth on a finite planet. The idea of “development” is fundamentally quantitative; it is rooted in seventeenth-century notions of “improvement” and today employs the concept of gross domestic product as the measure of social wealth. But development does not recognize that unrestrained extraction and exploitation of natural and human resources is at odds with the fundamental principles of ecology. The violation of these principles has consequences as lethal as ignoring the law of gravity while climbing a mountain, but because the effects are spread across time and often are not located in any specific individual, they are more difficult to vividly depict in the immediate terms

that might spur action. Skepticism, very often itself corporate-determined, can thus be alive and well even in the face of such scientific truths as human-induced global warming.¹⁶

Both the state and the market are determined by human-made law but are presented as natural realities that can be described with scientific rigor as objects of an external world. However, as we will see, rather than being natural, the state and the market are only cultural products. We often lose sight of the fact that they do not represent an immutable status quo but can be, and actually are, changed all the time by human agency. This mutable characteristic of law, if properly harnessed, represents a path away from destruction and toward a generative, ecologically sustainable human endeavor. To take this path, we first need to carefully reassess the current worldviews of science and law.

A NEW SCIENTIFIC PERCEPTION

Over the last three decades, the forefront of science has seen a dramatic change of paradigms from the mechanistic and reductionist worldview of Descartes and Newton to a systemic and ecological worldview. We have discovered that the material world, ultimately, is a network of inseparable patterns of relationships; that the planet as a whole is a living, self-regulating system. The view of the human body as a machine and of the mind as a separate entity is being replaced by one that sees not only the brain but also the immune system, the bodily tissues, and even each cell as a living, cognitive system. Evolution is no longer seen as a competitive struggle for existence, but is rather viewed as a cooperative dance in which creativity and the constant emergence of novelty are the driving forces. With the new emphasis on complexity, networks, and patterns of organization, a new science of qualities is slowly emerging.

At the very heart of this change of paradigms from a mechanistic to a systemic view of life we find a fundamental change of metaphors: from seeing the world as a machine to understanding it as a network. As we have mentioned, a corresponding paradigm shift

has not happened in law or in economics. In this book, we plead for a change of the legal paradigm, inspired by the recognition of basic principles of ecology and by the new systemic thinking in contemporary science.

The mechanistic scientific approach has served us, and continues to serve us, very well in many ways—one can still build a bridge using the principles of Newtonian physics, for example. But the limitations of this approach are becoming increasingly clear, particularly in relation to law. By protecting corporate property rights of extraction as natural, we have created a kind of Frankenstein's monster in which individual actors, who are actually the creators of law, no longer seem to have the power to curb the more destructive results that this approach encourages.

Despite the systemic thinking at the forefront of science, the disciplines of law and economics continue to support a short-term vision, viewing reality in a mechanistic way. They put at the center of their vision an atomized and abstract individual owner. This atom can exercise his ownership of the Earth by extracting value from the commons at the expense of others, thus generating the famous metaphor known as the tragedy of the commons, which is a classic example of self-fulfilling prophecy.¹⁷ The dominant concept of ownership as an individual right, protected by the state to allow short-term accumulation and extraction, became the natural building block of the current legal order; as such it has been responsible for crisis after crisis. The current collective perception of law as an “objective” or preexisting framework through which the behavior of the individual atoms can be classified as legal or illegal, far from being “natural,” is just a cultural construction of modernity. Modern law thus embodies the Cartesian separation of an objectified legal order—analogue to Descartes's *res extensa* (the object of thought)—that is essentially separate from the everyday realm of human agency located in the domain of the *res cogitans* (the thinking subject) (see chapter 2).¹⁸

This state of affairs is not inevitable. Humans were able to employ science and law to transform common holdings into a commodity and then into capital; we also have the ability to reverse

this path, transforming some of our now overabundant capital into renewed commons. An ecologically transformed law can transform capital into natural commons by producing a sustained investment into a sharing economy, into ecologically compatible architecture, or into environmental care. Such law could also transform capital into social and cultural commons by protecting the Internet against privatization or by mandating the deployment of systems of generative property law instead of protecting the freedom of extraction.

This process is urgently needed and overdue. It is as simple and revolutionary as the Copernican revolution, which at the dawn of modernity displaced the Earth from the center of the solar system in favor of the Sun as a result of new knowledge. This process requires that we now, as a consequence of our new ecological knowledge, displace the individual owner from the center of the legal system in favor of the commons. To do this we must rethink the most intimate structure of the law to reflect the basic principles of ecology and the new systemic thinking of contemporary science: no mechanistic separation between subject and object; no individual atom, but community and relationship as building blocks of the legal order. The reality follows what we collectively think and do.

The legal order is the most important vehicle through which a worldview is enforced and transformed into social action, and thus human law is also the agency through which we may implement new ideas and values. We must rethink our human laws and their relationship with the laws governing the ecology of a living planet. Such a rethinking, a kind of Copernican revolution in the law, must use nature as a mentor and model, putting the commons and a long-term vision at center stage. We must move from thinking of a “mechanism of law” and move toward an “ecology of law.” We shall discuss the nature of such a paradigm shift in law, and compare it to the change of worldview that is now happening in science, in detail in the following chapters. As a kind of preview, the basic points of our argument are summarized in the table on page 13.

PARADIGM SHIFTS IN SCIENCE AND LAW

SCIENCE

LAW

The Mechanistic Paradigm (“World as Machine”)

Physical reality is an aggregate of separate building blocks.

Scientific knowledge is used to dominate and control nature.

Scientific truth (the “laws of nature”) can be arrived at through reasoning.

Scientific descriptions are objective, independent of the human observer.

Social reality is an aggregate of discrete individuals.

Law is used to protect extractive ownership as an individual right.

Natural law is based on human reason.

Law is an objective framework separate from a human interpreter.

The Systemic, Ecological Paradigm (“World as Network”)

Physical reality is a network of inseparable relationships.

Scientific knowledge (“ecological literacy”) is to be used to learn from and cooperate with nature.

Scientific knowledge is always approximate; it emerges from a process of establishing consensus in the scientific community.

Scientific descriptions depend on the human observer and on the process of acquiring knowledge.

Social reality is composed of social networks and communities.

The new ecological legal order is to be used by ecoliterate citizens to protect and generate commons.

Law emerges from actively engaged citizens in self-organizing communities.

Law is what is deemed to be law by civic and legal communities; it depends on human interpretations of social reality.

THE ECOLOGY OF LAW

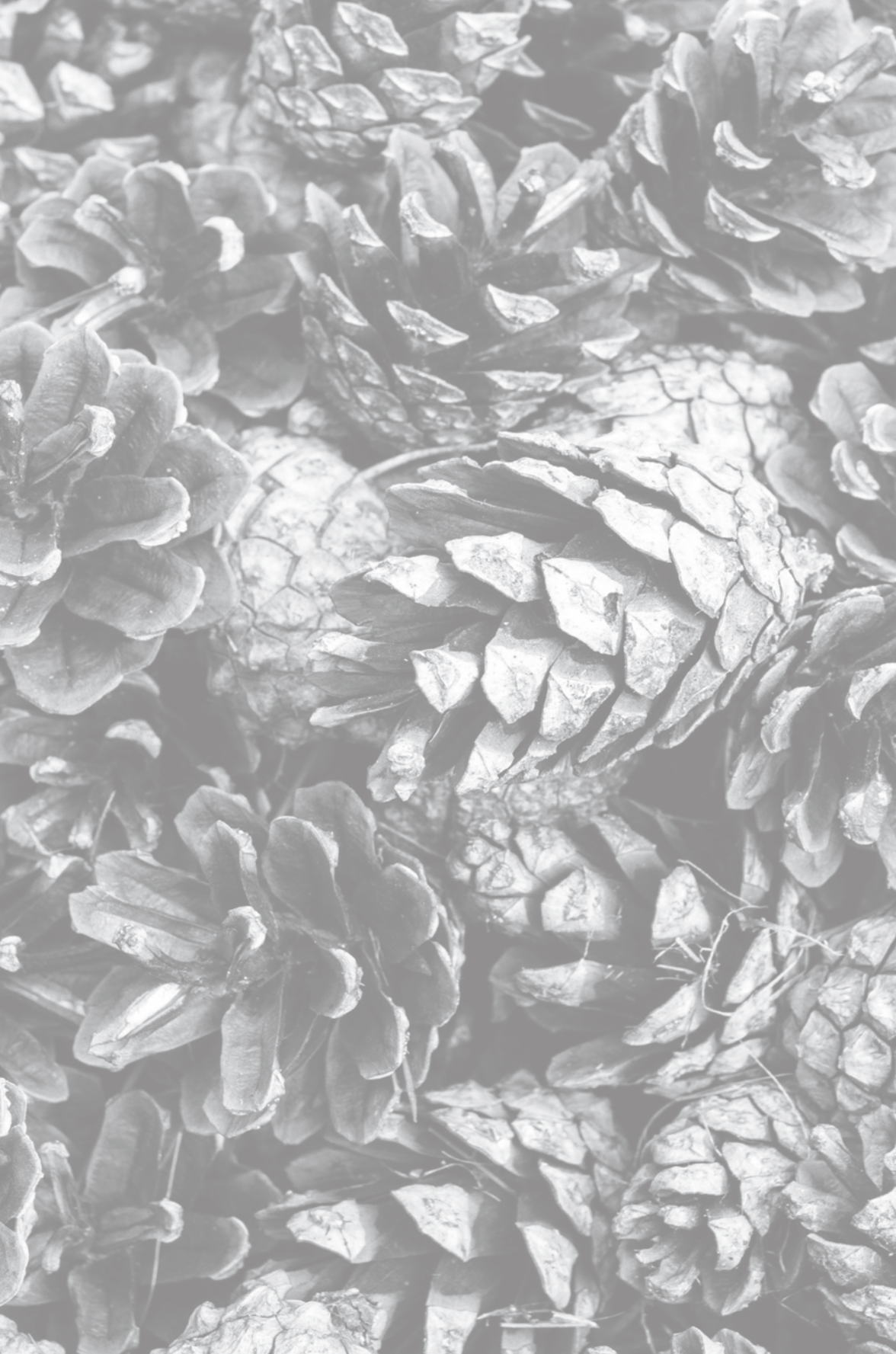
In the strict scientific sense, ecology is the science of relationships between the members of an ecological community and their environment. In this sense, then, the ecology of law refers to a legal order that is consistent with and honors the basic principles of ecology. The ecology of law implies a process of transforming legal institutions from being machines of extraction, rooted in the mechanistic functioning of private property and state authority, into institutions based on ecological communities. The ecology of law seeks a quality of economic life aimed at nurturing and preserving nature in the interest of future generations and overall human survival. The law should mimic the natural strategies of long-term ecological survival, including the reduction of waste and consumption.

In a broader, more metaphorical sense, ecology refers to a pattern of relationships that define the context for a certain phenomenon.¹⁹ For example, the ecology of education would refer to the relationships between education and knowledge, careers, economics, wisdom, ethics, politics, and so on, all of which would be perceived as being part of a total pattern of relationships. In this broad sense, we use the term “the ecology of law” to refer to a legal order that does not see the law as a separate social field independent from politics, economics, justice, religion, social norms of good behavior, morality, and so forth. Nor does this conception separate the law into a domain of facts—how the law *is*—and a domain of values—how the law *ought to be*.

In other words, an ecological vision of law does not reduce law to a professionalized, preexisting, objective framework “out there,” separate from the behavior it regulates and tries to determine. Instead, law is always a process of “*commoning*,” a long-term collective action in which communities, sharing a common purpose and culture, institutionalize their collective will to maintain order and stability in the pursuit of social reproduction. Thus the commons—an open network of relationships—rather than the individual, is the building block of the ecology of law and what we

call an “ecolegal” order. Such an ecolegal order is built on the recognition that human survival on this planet is not guaranteed by the destruction of life and by the domination of nature in search of growth. Rather, it seeks a quality of economic life aimed at nurturing our living planet and focusing on generative, complex patterns of relationships.

In order to work properly, such a legal order will require a basic public understanding of its operation and nature, because the law is deeply affected and determined by its component parts, the social actors—individuals. Today, such basic understanding and awareness of the law is dramatically lacking. The revolution we need, like those that led us here (Copernican, scientific, industrial, bourgeois), is a collective enterprise. It is independent of race, class, or gender but requires everyone to develop some basic ecological literacy as well as an understanding of the nature and function of law in today’s world. We must learn from our history, looking at both law and science as cultural artifacts, collective enterprises, parts of the fascinating and dramatic journey of humanity.



Science and Law

In our broad sweep through Western intellectual history, we shall encounter many great scientists and great jurists—on some occasions even embodied in the same person—whose ideas shaped the coevolution of the concepts of the laws of nature and of human laws. To tell this story clearly we first need to unravel some common misconceptions about the similarities and differences between science and jurisprudence.

Both science and law include a theoretical and an applied component. Applied science produces, among other things, technology—the development of specific technical capabilities. Thus science and technology operate in two strongly connected but quite separate domains, and actually technology often takes on a life of its own.

A similar phenomenon occurs in law. A clear distinction exists between legal theory and legal practice.¹ On the one hand, legal theory (also known as jurisprudence, or the philosophy of law) is a theoretical inquiry into legal phenomena. Human laws are the subject matter of jurisprudence just as the laws of nature are the subject matter of science. Legal practice, on the other hand, corresponds to technology in many ways. Like technology, it has a life quite autonomous from legal science, and lawyers sometimes distinguish between “law in books” and “law in action.”²

JUS AND LEX

In order to better understand these parallels, we need to introduce a fundamental distinction that is quite obvious to lawyers but not to the general public. In English, the single term “law” is used to describe two distinct phenomena that many languages other than English use two different terms to describe. Latin jurists, at the dawn of the Western legal tradition, distinguished the idea of *jus* from that of *lex*. Similar juxtapositions can be found in many languages—*droit* and *loi* in French, *derecho* and *ley* in Spanish, *diritto* and *legge* in Italian, *Recht* and *Gesetz* in German, *pravo* and *zakon* in Russian, and so on.

In all these languages, the meaning of law as *jus* indicates the law as a conceptual framework that abstracts from the reality of human relationships a set of more-or-less coherent principles and rules that are general enough to be reproduced in a variety of settings. This framework is theoretically discussed, elaborated, and continually modified by lawyers serving in a variety of professional capacities (such as professors, judges, practitioners, and legal philosophers). The work of these jurists continually adapts the framework of the law to changing social, political, and cultural conditions, thus “making the law” in these different professional capacities. The roles of academic scholars, who engage in theoretical work and teach the law as a university discipline, and of judges, who in their judicial capacity coherently apply these principles and rules to solve actual social conflicts, are particularly significant in the Western legal tradition.³

Jurisprudence, the theoretical discipline of the law, is acknowledged by lawyers, but not by the general public, who often do not appreciate the richness of this intellectual component in the laws that regulate their lives. People usually reduce the idea of law to what is meant by the term *lex* (plural *leges*; the Latin root of “legal” and “legislation”): a concrete rule that governs a factual situation and reflects the will of a governing authority endowed with the power to enforce it. Such specific laws are usually harmonized within the grand scheme of legal theory by the interpretive

activity of legal professionals (again in their various institutional capacities) and thus become part of law as a *legal system* (i.e., the orderly combination of particular laws into a whole, according to rational principles). Thus, the legal systems of the United States or France are not mere aggregates of enacted rules in those countries. The laws governing us in each territory include the highly intellectual dimension of *jus*, which is a deep part of our culture.⁴

An objective legal order determines and defines subjective individual rights, such as property rights or personal rights. In the languages mentioned above, the words corresponding to *jus* translate as the English word “right,” a term that evokes both the idea of an objective legal framework *and* the idea of a subjective right. In Western jurisprudence, rights are seen as zones of protected freedom.⁵

The meaning of law as *lex* is value-neutral; it refers to the institutional force that produces and formally enacts it, thus making it binding. The broader meaning of law as *jus*, in contrast, is laden with desirable values, being associated with the ideas of just, straight, and right (as opposed to wrong).

DESCRIPTIVE VERSUS NORMATIVE LAWS

A key difference between the laws of nature and human laws seems to be that the former are *descriptive* (giving information about something in the natural world) while the latter are *normative* (prescribing a standard of behavior for humans). However, as we explore the surprising parallels between how these laws have been conceptualized in science and in jurisprudence, we shall see that this clear-cut distinction must also be modified. On the one hand, a descriptive element occurs in the practice of jurists abstracting the relevant laws from a specific network of social relationships. On the other hand, recent discoveries in science, especially in ecology and climate science, suggest strongly that the ecological principles evolved by ecosystems over billions of years to sustain the web of life must be understood as normative laws for human conduct if we are to overcome our global environmental crisis.

“NATURAL LAW” AND THE “LAWS OF NATURE”

In our comparisons of the laws of nature and human laws we will have to be careful to avoid confusion between the terms *natural law* and *laws of nature*.⁶ In legal parlance, a “natural law” is one that should be binding only if it is consistent with some higher validating principle, which might stem from a divine source or from human reason. This understanding is in direct contrast to a school of thought called *legal positivism*. According to legal positivists, law derives its binding power from a sovereign authority, regardless of whether that law is just, fair, or even rational.

The origin of the term “laws of nature” itself is rather fascinating. Throughout the earlier centuries of Western science, various terms were used for the short, concise statements or equations in which scientists like to summarize their theories. They were called propositions, rules, axioms, principles, maxims, and so on. During the second half of the seventeenth century, the expression “laws of nature,” which had rarely been used before, came into frequent use, and in subsequent centuries it completely replaced the previously used terms.

The concept of “laws of nature” was often used explicitly in analogy with human laws. As human laws were binding rules of conduct for a community, so the laws of nature were understood as an order legislated for the entire universe by a divine authority. This analogy caused several philosophical and theological problems. Human laws, notoriously prone to inconsistency, variation, and violation, seemed a poor model for the allegedly immutable regularity of the natural order. Moreover, it was difficult to understand how inanimate matter could be said to “obey” laws in any but a metaphorical sense. In spite of these philosophical difficulties, the concept of the laws of nature became an integral part of natural philosophy or natural science. How this came to be is an interesting story, to which we shall return in Chapter 2.

In the twentieth century, when scientists became increasingly aware of the approximate nature of all their models and theories,

they seem to have stopped referring to the regularities they discovered as laws, except for references to the well-known “laws” formulated in previous centuries.

LAWYERS AND SCIENTISTS

Lawyers and scientists are often seen as very different kinds of people. It is usually said that students who do poorly in math and science are those who sign up for law school. Despite many exceptions, especially in American law schools where legal training is offered to students as a graduate program, this conviction is difficult to dispel. Yet because of the difficulties of a career in science, bright young people, after spending a few years in scientific research, often settle for law school, which promises them a more secure and lucrative future. Even these students tend to interpret law school as a second life, a complete shift to a domain of activity unrelated to their previous one. The only exceptions, perhaps, are patent lawyers, who must add some understanding of science to their legal knowledge in order to argue for the innovative nature of the invention they seek to patent.

This segregation is confirmed by the common stereotypes of these two disciplines and their representatives. While scientists are perceived as absentminded, casually dressed individuals who live in a refined world of abstract theory with little practical reality, lawyers are usually perceived as formally dressed people who are practically oriented, concentrating mainly on trivialities (such as negotiating their retaining fee) and engaging professionally in all sorts of nitty-gritty social intercourse—the kind of things that normal people, although worried by them, would rather not have to deal with themselves.

A few years ago, a very distinguished and highly theoretically minded Harvard law professor was appointed for a semester as a visiting fellow at a center for advanced interdisciplinary studies at another Ivy League institution. All the other fellows—physicists, sociologists, anthropologists, historians, and philosophers—were

engaging in highly intellectual exchanges with one another, but whenever he entered the faculty common room these conversations would stop. The professor of jurisprudence would then be approached by a sociologist asking him about how to divide the expenses of replacing the elevator in her condominium building, or by a physicist inquiring about whether his insurance company should refund him for damages produced by his current house sitters, and so on. These recurring incidents were frustrating for the professor of jurisprudence, since they undermined his self-esteem as a high-profile intellectual.

This more-or-less constructed social segregation between lawyers and scientists has not always existed, and it does not mean that the legal profession is not considered socially prestigious in many countries. Together with medicine and theology, law schools (known in Continental Europe as faculties of jurisprudence) were historically among the very first higher academic institutions in the medieval West.⁷ Lawyers were among the most prestigious intellectuals throughout medieval times and certainly were not looked down upon as “ambulance chasers” by other intellectual elites, as happens in the United States today. An even cursory look into the biographies of some of the most outstanding intellectuals in the history of Western science shows some interesting surprises.

Sir Francis Bacon, one of the inventors of the modern scientific method of inquiry, was also a very outstanding lawyer. He served as lord chancellor of England—perhaps the highest, oldest, and most distinguished judicial post in Great Britain—and his struggle with Sir Edward Coke in the early seventeenth century shaped much of the current structure of Anglo-American law.⁸ Sir Isaac Newton, the most popular icon of modern science before Albert Einstein, while never active as a practicing lawyer, nevertheless occupied a high legal post, that of chancellor of the exchequer. In that capacity, he chaired one of the most ancient judicial institutions of the common-law tradition, devoted to tax law issues. Newton’s contemporary Gottfried Wilhelm Leibniz (1646–1716), the outstanding German philosopher and mathematician who invented differential calculus independently of Newton,

also thought deeply about the practical affairs of state; he wrote voluminously on law, ethics, and politics. In the following chapters, when we sketch the parallel history of science and law in the West, several such fascinating convergences will emerge.

THE SCIENTIFIC METHOD

One of our principal tasks is the exploration of the conceptual and historical relationships between natural science and jurisprudence; thus it is important to clearly understand the nature of science before we begin. Today's modern word "science" is derived from the Latin *scientia*, which means "knowledge" in general, a meaning that was retained throughout the Middle Ages, the Renaissance, and the Scientific Revolution. What we call "science" today was known as "natural philosophy" up until the nineteenth century.

The modern understanding of science, which evolved during the eighteenth and nineteenth centuries, is that of an organized body of knowledge acquired through a particular method known as the scientific method. The characteristics of the scientific method were fully recognized only during the twentieth century and are still frequently misunderstood, especially by the general public and by lawyers.

The scientific method represents a particular way of gaining knowledge about natural and social phenomena that occurs in several stages. First, the phenomena being studied are systematically observed, and the observations are recorded as evidence, or scientific data. In some sciences, such as physics, chemistry, and biology, the systematic observation includes controlled experiments; in others, such as astronomy or paleontology, such experiments are not possible.

Next, scientists attempt to connect the data in a coherent way, free of internal contradictions. The resulting representation is known as a scientific model. Whenever possible, scientists try to formulate their models in mathematical language because of the precision and internal consistency inherent in mathematics. In many cases, however, especially in the social sciences, such at-

tempts have been problematic because they tend to confine the scientific models to such a narrow range that they lose much of their usefulness. Thus we have come to realize over the last few decades that neither mathematical formulations nor quantitative results are essential components of the scientific method.

Finally, the theoretical model is tested by further observations and, if possible, additional experiments. If the model is found to be consistent with the results of these tests, and especially if it is capable of predicting the results of new experiments, it eventually becomes accepted as a scientific theory. The process of subjecting scientific ideas and models to repeated tests is a collective enterprise of the community of scientists, and the acceptance of the model as a theory is done by tacit or explicit consensus in that community.⁹

In practice, these stages are not neatly separated and do not always occur in the same order. For example, a scientist may formulate a preliminary generalization or hypothesis based on intuition or initial empirical data. When subsequent observations contradict the hypothesis, he or she may try to modify the hypothesis without giving it up completely. But if the empirical evidence continues to contradict the hypothesis or the scientific model, the scientist is forced to discard it in favor of a new hypothesis or model, which is then subjected to further tests. Even an accepted theory may eventually be overthrown when contradictory evidence comes to light. This method of basing all models and theories firmly on empirical evidence is the very essence of the scientific approach.

Crucial to the contemporary understanding of science is the realization that all scientific models and theories are limited and approximate. Twentieth-century science has shown repeatedly that all natural phenomena are ultimately interconnected and that their essential properties, in fact, derive from their relationships to other things. Hence, in order to explain any one phenomenon completely, we would have to understand all the others, which is obviously impossible. No matter how many connections we take into account in our scientific description of a phenomenon, we will always be forced to leave others out. Therefore, scientists can never deal with "truth" in the sense of a precise correspondence between

a description and the described phenomenon. In science, we always deal with limited and approximate descriptions of reality.

To repeat, the approximate nature of scientific knowledge is a consequence of the fundamental interconnectedness of natural phenomena. In their attempts to perceive and define regularities and order in this interconnected web of relationships, scientists identify certain stable patterns as “objects,” “structures,” “processes,” and so on. The way these identifications are made is subjective to some extent; it depends on the interpretation of the observed patterns by a particular observer. This process has forced scientists to abandon the Cartesian notion of objective scientific descriptions, independent of the observer. In contemporary science, we have to accept the fact that a subjective dimension is implicit in every scientific model or theory. This does not mean that we have to give up scientific rigor. When we speak of an “objective” description in science, we mean first and foremost a body of knowledge that is shaped, constrained, and regulated by the collective scientific enterprise, rather than being merely a collection of individual accounts. Such intersubjective validation—agreement among separate individuals—is standard practice in science and need not be abandoned.

THE LEGAL METHOD

Since interconnectedness is a fundamental feature of human existence, approximation is a central feature of legal thought as well. Jurisprudence, however, has no single “method.” In different countries, in different periods of history, and sometimes even at the same time, different methods have competed with each other to grapple with the inherent complexity and variation of social life.¹⁰ Nevertheless, the work of legal theorists shares some important characteristics with the scientific method.

The systematic observation of the facts of life, usually in the form of social conflicts between individuals or institutions, is the typical activity of the jurist. She proposes theoretical models and theories in order to group apparently very different facts within the same conceptual framework. For example, all social conflicts

arising from a previous voluntary social exchange are grouped under the law of contracts; all social conflicts arising outside of any previously planned relationship are grouped under the law of torts. She tests her model with empirical evidence (that is, by consulting all the previously available records of similar social intercourses) and she accepts the limited and approximate nature of her models and theories, especially since different jurisdictions usually follow different organizational principles.

The jurist carries on her interpretation either by deduction or by induction (most often with a mix of the two), depending on whether her point of departure is a general principle, a text to be applied to specific facts, or a previous court decision to be applied by analogy. (The Anglo-American legal tradition mostly deploys an inductive method, while the Continental tradition favors the deductive one.¹¹) This process has long been described as mechanical, and jurists, in order to bolster the legitimacy of their work, have usually denied any creative role in carrying it out.

As a consequence of this self-portrayal, the legal method appears in today's common perception as merely an effort of textual interpretation, an activity much different from that carried out by the scientist. While the laws of nature are hidden patterns and regularities that the scientist may discover in the course of research, human laws are considered to be mostly textual, normative words, written down in legal documents endowed with the stamp of officialdom and therefore binding and enforceable. However, our previous cursory discussion of the different meanings of human laws has already shown that reality is much more nuanced and complex.

Even written human laws are not self-evident. Their interpretation as laws is the result of a rather complex intellectual process in which the professional jurist plays a crucial role as a "maker" of the legal order. To begin with, the jurist must situate any given factual situation in a certain context, sorting the generally reproducible aspects of any social intercourse into those that are relevant and those that are not. For example, whether the driver of a car that caused an accident was black or white is deemed irrelevant in the American law of torts, while it is relevant whether the driver was driving under the influence of alcohol or not.

The lawyer will also have to locate the legal authority that will guide her analysis. Such authority may be a specific text or a precedent from case law, but not necessarily; in the current global setting, because complex transactions involve the law of more than one country, other authorities are being invoked more frequently. In fact, the interpreter can pick a given custom that she deems relevant in the specific context in which the intercourse happened, or a general principle contained in some broad constitutional language (for example, fairness, equity, or good faith).

Especially in cases where more than one sovereign state is involved, as is true for all transactions of global scope, there simply might not be a written source to consult, and the jurist will have thus to “discover” the governing law by a process of creative interpretation of the factual reality.¹² Once the given authority (textual or not) has been located, the lawyer proceeds either by deduction from the authority to the rule that applies in a given factual situation, or by induction from an aggregate of solutions of specific cases to create a general principle. In short, the legal interpreter, just like the scientist, enjoys considerable discretion in the choice of her methodological preferences. In practice, she would move back and forth between deduction and induction until she reaches a satisfactory solution.

This process happens as a concrete effort to solve a given case (if the interpreter is a judge), or to argue for a given solution of such a case (if the interpreter is an attorney); it can also be a theoretical effort to suggest the best possible principles or solutions for hypothetical cases (if the interpreter is an academic scholar). For example, in deciding whether the law accepts gay marriages, the lawyer has significant discretion in deciding whether to start from an abstract principle of equality or from a more traditional idea of the reproductive function of marriage. In all these cases, the role of the interpreter is in practice very creative. Despite long periods of denial of the interpreter’s creative role, today practically every lawyer acknowledges, along with Benjamin Cardozo (1870–1938)—the U.S. Supreme Court Justice who produced quite a scandal with his “choice for candor”—that whoever interprets law, *makes* it.¹³ In other words, jurists now recognize that human

laws are not “out there,” separate from their interpreters, and that the process of their emergence (of becoming relevant) is probably no less complex than the discovery of a “law of nature.”

A CALL FOR ECOLEGAL LITERACY

The first step in creating a new ecolegal order founded on systems thinking rather than on an outdated mechanistic way of thinking is to become aware of our own power to influence law through our aggregate action. This ecological vision of the law, as we suggest for the first time in this book, can have a tremendously empowering effect. It can unleash the “power of the people,” reclaiming law as a common, to create a new ecolegal order that, following our systemic understanding of the world, can protect it for future generations.

One of the great challenges of our time is to build and nurture sustainable communities—social, cultural, and physical environments in which we can satisfy our needs and aspirations without diminishing the chances of future generations. In pursuit of this goal, we must recognize that scientific positivism and reductionist economic thought, rather than being the *reality* that our laws assume and reflect, are actually ideologies serving short-term accumulative interests.¹⁴ We can counteract these ideologies and support an eco-centric vision by using these same human laws. We need a fundamental change of perspective from economic efficiency to ecological sustainability, from private property rights to accessible commons.

A sustainable community is designed in such a way that its ways of life, businesses, economy, physical structures, and technologies do not interfere with nature’s inherent ability to sustain life. The groundwork for this idea began with the 1972 publication of a radical report on a computer simulation, *The Limits to Growth*, which was authored by an MIT group led by Dennis and Donella Meadows. Following that, Lester Brown introduced the concept of sustainability in the early 1980s. A few years later, a report by the World Commission on Environment and Develop-

ment, known as the Brundtland Report of 1987, presented the notion of “sustainable development.”¹⁵ The concept of sustainability has often been distorted, co-opted, and even trivialized by being used without the ecological context that gives it its proper meaning. What is sustained in a sustainable community is not economic growth, competitive advantage, or any other measure used by economists, but the entire web of life on which our long-term survival depends. The first step toward a sustainable community, naturally, must be to understand how nature sustains life. This involves a new ecological understanding of life, or “ecoliteracy,” as well as a new kind of “systemic” thinking—thinking in terms of relationships, patterns, and context.

Once we have achieved some degree of ecoliteracy, we must make urgently needed shifts in law and economics. Human laws, like the laws of nature, need to be understood as manifestations of a relational order in which the individual is not alone but is connected to and shares power with other living inhabitants of the planet, who are entitled to equal access to the global commons. These inhabitants are not only other human beings but also other animals, plants, and in general all the Earth’s ecosystems. The introduction of a rapacious species into a new ecosystem, for instance, would require an ecolegal review to consider the broader impacts of such an action beyond the immediate profit motive. If such an ecolegal order were present, the Nile perch would most likely not exist today in Lake Victoria; or, most important, global corporations would not be able to claim and obtain rights as though they were living creatures.

To be sustainable, human laws should serve, rather than exploit and plunder, the web of life. In law as in science, we must begin to focus on a relevant understanding of the whole rather than only the component parts. To achieve this goal, not only the laws of nature but also the nature of law should be understood by the general public. To facilitate this understanding, we shall now follow the coevolution of scientific and legal thought from antiquity to the modern era.



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