

CAMPBELL UNIVERSITY
WIGGINS SCHOOL OF LAW

**A PREFACE TO THE PHILOSOPHY OF LEGAL
INFORMATION**

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Forthcoming (Fall 2017) in 20 SMU Sci & Tech. L. Rev.

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INTRODUCTION

It is not trivial that law exists as binary information. It would be difficult to find any significant administrative regulation, legislative act, court precedent, or treatise that has not been converted from semantic into a digital form.¹ And, it does not sit passively stored as bits: law is transmitted through the internet and manipulated as electronic data.² It is analyzed as numeric data by computers that can monitor and anticipate its evolution. Although the transformation from printed words to the binary code of computers has been occurring for some time, its significance is not well understood by legal philosophers, even though philosophers in other areas have been studying the digitalization of information.³ The reason for this lack of concern might be that, on the surface at least, representing law as binary information seems to do little to alter its nature. After all, law must be converted back into semantic information before it can be used by a human being, so the change to digital form may seem inconsequential.

Nonetheless, in common experience the law seems to be changing: it is becoming more voluminous, vastly more complex, and evolving much more rapidly than it has in the past. These are precisely developments that one might anticipate from information and communications technology

¹ Eighty-three percent of the respondents to a survey conducted by the American Bar Association's Legal Technology section reported that they turn first to online sources for their research. Only 11% still look first to printed materials. AM. BAR ASS'N, 2015 LEGAL TECHNOLOGY SURVEY REPORT, VOL. V: ONLINE RESEARCH viii (2015).

² Although the availability of online legal material is always expanding, it is difficult to estimate the scale of change beyond what can be suggested in anecdotal accounts. For example, Harvard Law School is currently digitalizing its entire collection of over 40 million pages of case law for public access. *Harvard Law School Launches "Caselaw Access" Project*, HARVARD LAW TODAY (Aug. 8, 2015), <http://today.law.harvard.edu/harvard-law-school-launches-caselaw-access-project-ravel-law/>.

³ Terrell Ward Bynum and James H. Moor, argue in the introduction to their 1998 book, *The Digital Phoenix: How Computers Are Changing Philosophy*:

Computing provides philosophy with ... a set of simple, but incredibly fertile notions—new and evolving subject matters, methods, and models for philosophical inquiry. Computing brings new opportunities and challenges to traditional philosophical activities [...] computing is changing the way philosophers understand foundational concepts in philosophy, such as mind, consciousness, experience, reasoning, knowledge, truth, ethics and creativity. This trend in philosophical inquiry that incorporates computing in terms of a subject matter, a method, or a model has been gaining momentum steadily.

Luciano Floridi, *Open Problems in the Philosophy of Information*, 35 METAPHILOSOPHY 554, 555 (2004) (quoting THE DIGITAL PHOENIX: HOW COMPUTERS ARE CHANGING PHILOSOPHY 1 (Terrell Ward Bynum & James H. Moor eds., 1998)).

(ICT). At least some commentators believe that something in the deep structure of law is changing.⁴ Information technologies have given rise to new concepts and new ways of thinking.⁵ New forms of empirical research have fruitfully modeled legal rules as complex dynamic systems.⁶ Various forms of artificial intelligence are gaining ground in the practice of law.⁷

⁴ Mireille Hildebrandt argues,

The deep structure of modern law has been built on the affordances of the printing press: on the linearity and sequential processing demands of written text, which evokes the need for interpretation, reflection and contestation. The study and practice of law have thus been focused on establishing the meaning of legal norms and their applicability to relevant human interactions, while establishing the meaning of human action in the light of the applicable legal norms. Data-driven agency builds on an entirely different grammar, its building blocks are information and behaviour, not meaning and action. We need to face the possibility that this will drain the life from the law, turning it into a handmaiden of governance (that fashionable term meaning anything to anybody), devouring the procedural kernel of the Rule of Law that enables people to stand up for their rights against big players, whether governmental or corporate or otherwise. In this article I will test the interface between law and data-driven agency by understanding law *in terms of* information, assuming that we cannot take for granted that law will interact with an artificially intelligent ICT infrastructure (ICTI) in the same way as it has interacted with written and printed text (our previous and current ICTI). By framing law *as* information, I hope to convince the reader that technological infrastructures matter, require our attention and must somehow be brought under the Rule of Law. This will not be business as usual, as it will require rethinking and redesigning the architecture of the Rule of Law.

Mireille Hildebrandt, *Law as Data in the Era of Data Driven Agency*, 79 THE MOD. L. REV. 1, 2 (2016).

⁵ The empirical study of law is the goal of the social sciences. For an overview of the social sciences theories of law see, Brian Z. Tamanaha, *An Analytical Map of Social Scientific Approaches to the Concept of Law*, 15 OXFORD J. OF LEGAL STUD., 501, 501-35 (1995). Some recent theories have sought to understand law through systems theory. Niklas Luhmann, for example, argues that law is best understood as a self-organizing adaptive system. NIKLAS LUHMANN, *LAW AS A SOCIAL SYSTEM* 464 (1993). In recent years, computational theoretic approaches to complexity are contributing to refined analysis of areas of law through quantitative models of complex adaptive systems. This has brought to law concepts such as self-organization, emergence, and chaos. An early but influential study of law's relation to the ICT is LAWRENCE LESSIG, *CODE AND OTHER LAWS OF CYBERSPACE 2.0* (2006).

⁶ See, e.g., J. B. Ruhl, *Complexity Theory as a Paradigm for the Dynamical Law-and-Society System: A Wake-Up Call for Legal Reductionism and the Modern Administrative State*, 45 DUKE L. J. 849 (1996); Jeffrey G. Miller, *Evolutionary Statutory Interpretation: Mr. Justice Scalia Meets Darwin*, 20 PACE L. REV. 409 (2000); Michael Bommarito & Daniel Katz, *A Mathematical Approach to the Study of the United States Code*, 389 PHYSICA A: STAT. MECHANICS AND ITS APPLICATIONS (2010).

⁷ Julie Sobowale, *How Artificial Intelligence is Transforming the Legal Profession*, ABA J.

These changes are topics that legal philosophers should be investigating. They should be asking questions such as: what are the consequences of these changes for the nature of law? How are they changing the role of law in the democracy? And, what is the role of the legal professional in this new era?

To approach these and similar questions, this essay examines a contemporary philosophy, the philosophy of information (PI) that argues that the new concepts of information developed in the twentieth century by philosophers and scientists hold the potential to transform the traditional fields of philosophical inquiry (especially metaphysics, epistemology, and ethics). It takes the work of Luciano Floridi to be an exemplar of this movement.⁸ Philosophers can learn from computer scientists and technologists, and they can also contribute to the responsible development of new information technologies by providing insights into the nature of representation, truth, consciousness, moral meaning, and political purpose.⁹ Information sciences hold the potential to challenge the fundamental assumptions about the nature of knowledge, philosophical anthropology, ethics, and politics.¹⁰ To investigate these interconnections between the philosophy and the information technology, is the goal of PI.¹¹

(Apr. 1, 2016, 12:10 AM) http://www.abajournal.com/magazine/article/how_artificial_intelligence_is_transforming_the_legal_profession.

⁸ Luciano Floridi, *Short Biography*, <http://www.philosophyofinformation.net/about/> (last visited Oct. 29, 2016).

⁹ Floridi's philosophy of information draws mostly from traditional Anglophone legal philosophy. There is also a related Continental form of speculative realist philosophy of information that draws from the thought of Giles Deleuze, Alain Badiou, and Bruno Latour.

¹⁰ Floridi explains,

I was drawn to what I later defined as the philosophy of information because, in the late eighties, I was looking for a conceptual framework in which psychologism, introspection, armchair speculations and all those linguistic (or perhaps one should say, Anglo-Saxon, or Indo-European) intuitions could be monitored, tamed and kept under tight control. I shared with Popper a desire for an "epistemology without the knowing subject", as the title of one of his papers declared. The sort of philosophy popular at the time smacked too much of bad metaphysics, a sort of betrayal of the purer and cleaner approach defended by Analytic as well as Neopositivist philosophy, which I admired so much (since then, I have somewhat repented and now I consider myself an ex-analytic philosopher). Since I was interested in epistemology and logic, the move from knowledge to information and from inferential to computational processes was almost natural.

Charles Ess, *Computer-mediated Communication and Human-Computer Interaction*, in *THE BLACKWELL GUIDE TO THE PHILOSOPHY OF COMPUTING AND INFORMATION* 89 (Luciano Floridi ed., 2008).

¹¹ Hereinafter, PI refers to Floridi's project. For an overview of Floridi's project and critical commentaries, see *THE ROUTLEDGE HANDBOOK OF PHILOSOPHY OF INFORMATION*

Drawing from PI, this essay argues for a philosophy of *legal* information (PLI) dedicated to understanding the implications for the philosophy of law of the multitude of concepts of information that exist today. Philosophers like Floridi are enriching philosophical discourse by describing how new concepts of information alter human understanding,¹² and there is the potential for the philosophy of information to contribute to the development of legal philosophy as well.¹³ Conceiving of law in terms of different concepts of information opens new horizons for descriptive and normative jurisprudence.¹⁴ ICT has brought tremendous benefits, but it also poses dangers. By extending the abilities to know and manipulate the world, ICT has also greatly expanded the scope of human moral agency.¹⁵ This is of substantial importance since today moral, political, and legal dilemmas that were at the far edge of science fiction only a generation ago now seem close at hand. New approaches to legal philosophy are needed to respond to these changed conditions. PI suggests a new approach to legal theory that has resources for responding to the emerging issues of the ICT.

This essay is divided into three parts. Part I describes Floridi's account of the historical horizon of scientific advance as it influences human self-understanding (philosophical anthropology). He examines several historical moments that suggest how scientific advances revolutionized philosophical anthropology. The fourth of these developments was achieved in the twentieth century by Alan Turing, who showed that human beings are not the only creatures who can calculate, and Claude Shannon, who showed that information is a common physical phenomenon. These developments led to new theories of information and to new understandings of human nature (philosophical anthropologies). Part II describes PI. It suggests how PI can reinvigorate traditional philosophical questions, particularly in the areas of ontology, epistemology, and

(Luciano Floridi, ed. 2016); Gordana Dodig Crnkovi & Wolfgang Hofkirchner, *Floridi's "Open Problems in Information", Ten Years Later*, 2 INFORMATION 327 (2011); Charles Ess, *Luciano Floridi's Philosophy of Information and Information Ethics: Critical Reflections and the State of the Art*, 10 ETHICS AND INFORMATION TECHNOLOGY 89 (2008). For a collection of critical essays, see LUCIANO FLORIDI'S PHILOSOPHY OF TECHNOLOGY: CRITICAL REFLECTIONS (Hilmi Demir, ed. 2012).

¹² For an overview of what Floridi call "onlife" see THE ONLIFE MANIFESTO: BEING HUMAN IN A HYPERCONNECTED ERA (Luciano Floridi, ed. 2015).

¹³ For an example of legal scholarship drawing from Floridi's philosophy, see Dan L. Burk, *Information Ethics and the Law of Data Representation*, 10 ETHIC AND INFORMATION TECHNOLOGY 135 (2008).

¹⁴ See *infra* pp. 40-47.

¹⁵ Floridi states, "The great opportunity offered by ICTs comes with a huge intellectual responsibility to understand them and take advantage of them in the right way." LUCIANO FLORIDI, *THE FOURTH REVOLUTION: HOW THE INFOSPHERE IS RESHAPING HUMAN REALITY* vii (2014).

philosophical ethics. Part III suggests how a philosophy of legal information might be applied to understand the new condition of law. It describes the essential descriptive claims of PLI, and it examines how PLI can contribute to normative jurisprudence.

PART I INFORMATION AND PHILOSOPHICAL ANTHROPOLOGY

Floridi argues that philosophy must be renewed to respond to the human self-awareness, which has been transformed by ICT. He makes this claim in *The Fourth Revolution, How the Infosphere is Reshaping Human Reality*,¹⁶ where he suggests that four advances in the history of science caused revolutionary shifts in philosophical anthropology.¹⁷ Science has incrementally transformed human self-understanding by decentering humans from the privileged places that they had naively imagined for themselves. In the current information age—the fourth revolution—human beings must come to terms with a new self-awareness in which they are a particular kind of information entity among many different kinds of entities that exist in an information environment called the “infosphere.”¹⁸

A. *The First Three Revolutions, Copernicus, Darwin and Freud*

Floridi identifies three prior developmental revolutions and a contemporary one. The first revolution is the assertion of heliocentrism by Nikolas Copernicus (1473-1543), which decentered human self-understanding as being the apex at the center of God’s creation by arguing that the sun, rather than the earth, was at the center of the universe.¹⁹ Floridi’s second and third revolutions occurred in the late nineteenth century: the second was caused by Charles Darwin’s *Origins of Species*,²⁰ which was published in 1859, and the third was due to the development of Sigmund Freud’s psychoanalysis.²¹ Darwin decentered human beings from the apex position among animals,²² by showing that animals, including humans, evolve through historical processes and have common origins.²³ He showed that human uniqueness does not lie in the creative source of the species, since all species evolve through a common set of physical

¹⁶ *Id.* at ix.

¹⁷ LUCIANO FLORIDI, INFORMATION: A VERY SHORT INTRODUCTION 8-9 (2010).

¹⁸ A concise description of the infosphere is stated in *id.* at 14-18.

¹⁹ *Id.* at 8-9.

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ *Id.*

processes and were less differentiated in earlier generations.²⁴ Human beings can no longer claim to possess a metaphysical essence that was superior to other creatures.²⁵ While traits, like being rational, might still distinguish humans from non-humans, rationality itself is not part of the metaphysical substance of the person as it had been viewed in pre-modern thought.²⁶ Freud discovered the unconscious mind and its influence on reason.²⁷ This discovery altered philosophical anthropology again, this time decentering human beings from the privileged position as being the only self-aware beings.²⁸ After the discovery of the unconscious, it was no longer possible to maintain the belief that human beings know themselves and consciously control their own actions.

B. The Fourth Revolution

The fourth revolution began with the discovery of the mathematical conceptions of computation by Alan Turing (1912-1954)²⁹ and the scientific theory of information advanced by Claude E. Shannon. (1916-2001).³⁰ These scientists and mathematicians revolutionized human self-understanding by showing, respectively, that humans are not the only

²⁴ *Id.*

²⁵ *Id.*

²⁶ The belief that rationality is intrinsic to the substance of the person was first asserted by Boethius in the essay on the nature of the divine personhood of the trinity. Boethius, *A Treatise Against Eutyches and Nestorius*, CHRISTIAN CLASSICS ETHEREAL LIBRARY (June 1, 2005), <http://www.ccel.org/ccel/boethius/tracts.iv.v.html>. For a discussion of how Darwin's theory of evolution overturned hylomorphic metaphysics, see DANIEL DENNETT, *DARWIN'S DANGEROUS IDEA: EVOLUTION AND THE MEANING OF LIFE* (1995).

²⁷ FLORIDI, *supra* note 17, at ix.

²⁸ *Id.*

²⁹ For biographical information on Alan Turing, see ANDREW HODGES, *ALAN TURING: THE ENIGMA* (2nd ed. 2014); B. JACK COPELAND, *TURING: PIONEER OF THE INFORMATION AGE* (2013).

³⁰ Although Floridi does not emphasize the role of Shannon, his work is essential to the project of PLI, since his theory of information is essential to the digitalization of legal information. For biographical information on Claude Shannon, see Siobhan Roberts, *Claude Shannon, the Father of the Information Age, Turns 1100100*, THE NEW YORKER (Apr. 30, 2016) <http://www.newyorker.com/tech/elements/claude-shannon-the-father-of-the-information-age-turns-1100100>; Graham P. Collins, *Claude E. Shannon, The Founder of Information Theory*, SCIENTIFIC AMERICAN (October 14, 2002) <https://www.scientificamerican.com/article/claude-e-shannon-founder/>; M. Mitchell Waldrop, *Claude Shannon: Reluctant Father of the Digital Age*, MIT TECHNOLOGY REV. (July 1, 2001) <https://www.technologyreview.com/s/401112/claude-shannon-reluctant-father-of-the-digital-age/>.

beings that are capable of computation and that information is a common physical phenomenon.

1. The Context of Early Twentieth Century Mathematical Logic

Before examining the concepts of computation and information that evolved in the twentieth century, it is useful to consider how logic and mathematics developed in the second half of the nineteenth century and early decades in the twentieth century. During this period, mathematics developed as the attempt to find its logical foundations, such that foundations of mathematical axioms could be proven to be logically necessary. The existence of such foundations had been presumed at least since Euclid's *Elements*.³¹ For Christian philosophers, there were two ways of gaining knowledge of the world—through faith in scripture and Christian tradition, and through natural reason (where natural meant reason unassisted by faith). They held faith and reason to be in harmony. This was a foundational claim for medieval Scholastic moral philosophy, which depended upon the mind's faculty to apprehend metaphysical essences of material beings, and thereby discern the transcendent moral good—an ideal in the mind of God (Eternal law)—as it participates in the material world.³² Some logicians, notably William of Ockham,³³ raised questions about whether the mind can know metaphysical essences through “natural” reason alone. Others viewed Euclid's geometry as confirming the power of natural reason to know and understand the intelligible world that their faith proclaimed.³⁴ Geometry, they argued, secured belief in the natural intelligible world. This argument endured for many centuries, even after the Enlightenment philosophers called into question the ability of faith to do so.

By the end of the nineteenth century, however, the foundations of Euclidian geometry fell into doubt because mathematicians realized that there were many axioms of Euclidian geometry which were not derived or derivable from Euclid's postulates.³⁵ This meant that, in effect, Euclid made guesses that seemed reasonable within the context of his times, but in fact were not logically necessary. That meant that there was no logical foundation for geometry, and that perhaps it rested on nothing more secure than the faith-claims of the medieval theologians. Many mathematicians and

³¹ EUCLID, *ELEMENTS* (Dana Densmore ed., Thomas L. Heath trans., 2002). *See also*, WILLIAM KNEALE & MARTHA KNEALE, *THE DEVELOPMENT OF LOGIC* (1984) 2-6.

³² *See*, AQUINAS, *SUMMA THEOLOGICA* 1.2.9. *See also*, KNEALE & KNEALE, *supra* note 31, at 239.

³³ KNEALE & KNEALE, *supra* note 31, at 239.

³⁴ *Id.* at 385.

³⁵ *Id.* at 386.

logicians believed that the entire system of Euclidian geometry was in need of revision to prove that it still could rest on the foundational bedrock of logical necessity.

One of the most influential mathematicians to undertake this revision of Euclid was David Hilbert, who in 1899 published *Grundlagen der Geometrie* (Foundations of Geometry).³⁶ This work contained Hilbert's attempt to re-found geometry on the basis of an entirely new set of axioms that could unite mathematics, logic, and set theory.³⁷ He "rebuilt mathematics by laying down principles which are sufficient to support the generally accepted doctrine..."³⁸ In his reformulation, these principles "did not give rise to contradiction,"³⁹ which had arisen in modern mathematics. In order to do this, he limited his theory to only those axioms whose existence is guaranteed by the axioms. His analysis result in a closed system of axioms that may not contradict one another, but the foundation of the system as such cannot be derived from within its own axioms. Thus, Euclidian geometry could be shown to be coherent, but not necessary, and the propositions of the Euclidian system cannot be translated to non-Euclidian geometry.⁴⁰

In the early twentieth century, many other mathematicians took up the challenge of grounding arithmetic on logically sound principles.⁴¹ Most famous among them was Alfred North Whitehead and Bertrand Russell. For Whitehead and Russell, the quest took the form of drafting a massive work, the *Principia Mathematica* (initially published in 1927),⁴² which sought to defend a theory of numbers with the logic of set theory, a field which still commands the attention and respect of philosophers of mathematics. Whitehead and Russell abandoned their project after completing three lengthy volumes that were comprised of over two thousand pages, many of which were entirely written in symbolic logic.

While Whitehead and Russell labored over their work, Hilbert attempted to show that each area of mathematics could be made to be logically consistent through a generalization of the approach he had used to analyze the axioms of Euclid. In 1923, he gave a lecture in which he discussed a set of twenty-three "open problems" that were calls for proofs that he believed a complete theory of mathematics required. These

³⁶ DAVID HILBERT, *THE FOUNDATIONS OF GEOMETRY* (Leo Unger trans., 1999). KNEALE & KNEALE, *supra* note 31, at 681-88.

³⁷ *Id.* at 683.

³⁸ *Id.* at 685.

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ *Id.* at 683.

⁴² *Id.* at 517; ALFRED NORTH WHITEHEAD AND BERTRAND RUSSELL, *PRINCIPIA MATHEMATICA* (2011).

questions are known as the “Hilbert Program.”⁴³ In 1928, a year after the initial publication of Whitehead and Russell’s *Principia*, Hilbert added to his Program what he called the *Entscheidungsproblem*, which would be taken up by Alan Turing.⁴⁴ In this open problem, Hilbert sought a proof for his belief that all mathematical calculations could be determined by a “decision procedure” (what today would be called an algorithm) that was determined within the logic of each field of mathematics.⁴⁵

In 1931, Kurt Gödel published a paper under the title, “*Über formal unentscheidbare Satze der “Principia Mathematica” und verwandter Systeme* (On Formally Undecidable Propositions of “*Principia Mathematica*” and Related Systems)⁴⁶ that had devastating consequences for Whitehead’s and Russell’s work. In it, Gödel demonstrated that systems of axioms, like the one that Whitehead and Russell developed, cannot be complete because some of the axioms will necessarily not be provable, and that the individual axioms of such a system of axioms cannot be proved to be consistent from within the system of axioms itself. The proof of the consistency of the axioms always relies on a referent outside of the system itself. Gödel’s thesis is known as the Incompleteness Theorems.⁴⁷ It undercut Whitehead and Russell and the entire Hilbert Program. Gödel’s influence on philosophy has been uneven. While some philosophers have argued that the Incompleteness Theorems demonstrates the marvelous power of the human mind to understand beyond reason,⁴⁸ the more common interpretation focuses on the need to recognize, in a Kantian sense, the limits that are intrinsic to the questions that one investigates.⁴⁹ This cautiousness about the limitations intrinsic to the question is an important theme for many later philosophers and computer scientists, including those who investigated Hilbert’s *Entscheidungsproblem*.

2. Alan Turing’s Theory of Computation

Turing was already a young pioneer of mathematics and computer

⁴³ See generally, Richard Zach, *Hilbert’s Program*, STAN. ENCYCLOPEDIA OF PHILOSOPHY (Jan. 6, 2016), <http://plato.stanford.edu/archives/spr2016/entries/hilbert-program/>.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ KURT GÖDEL, ON FORMALLY UNDECIDABLE PROPOSITIONS OF PRINCIPIA MATHEMATICA AND RELATED SYSTEMS (B. Meltzer trans., 1992).

⁴⁷ For a description of Godel’s proof, see KNEALE & KNEALE, *supra* note 31, at 712-24.

See also, Panu Raatikainen, *Gödel’s Incompleteness Theorems*, STAN. ENCYCLOPEDIA OF PHILOSOPHY (Nov. 11, 2013), <http://plato.stanford.edu/archives/spr2015/entries/goedel-incompleteness/>. See also, Juliette Kennedy, *Kurt Gödel*, STAN. ENCYCLOPEDIA OF PHILOSOPHY (Dec. 11, 2015), <http://plato.stanford.edu/archives/win2015/entries/goedel/>.

⁴⁸ Kneale & Kneale, *supra* note 31 at 724.

⁴⁹ *Id.*

science when he took up the problem where Gödel had left it. In 1937 he published an influential paper titled, “On Computable Numbers with an Application to the *Entscheidungsproblem*,”⁵⁰ in which he developed several ideas that became important for computer science. Of particular importance to him was the nature of algorithms. For Turing, the existence of algorithms suggested a metaphorical computational machine that could operate algorithmically. This was a breakthrough, since “Computers at the time since meant people who did computations, not machines...”⁵¹ A second step for Turing was to argue that these metaphorical computational machines could be described as a string of numbers, and that they would be capable of performing any calculation (thus solving the *Entscheidungsproblem*). His concept of a universal computational machine is a foundation for contemporary computer science. It is now described as the first statement of the Universal Turing machine.⁵² During his service as

⁵⁰ Alan Turing *On Computable Numbers with an Application to the Entscheidungsproblem*, in ALAN TURING, HIS WORK AND HIS IMPACT 16 (S. Berry Cooper & Jan van Leeuwen eds., 2013).

⁵¹ CHRIS BERNHARDT, TURING’S VISION: THE BIRTH OF COMPUTER SCIENCE 12 (2016).

⁵² Alan Turing wrote,

We may compare a man in the process of computing a real number to a machine which is only capable of a finite number of conditions q_1, q_2, \dots, q_R which will be called “m-configurations”. The machine is supplied with a “tape”, (the analogue of paper) running through it, and divided into sections (called “squares”) each capable of bearing a “symbol”. At any moment there is just one square, say the r -th, bearing the symbol $S(r)$ which is “in the machine”. We may call this square the “scanned square”. The symbol on the scanned square may be called the “scanned symbol”.

The “scanned symbol” is the only one of which the machine is, so to speak, “directly aware”. However, by altering its m-configuration the machine can effectively remember some of the symbols which it has “seen” (scanned) previously. The possible behaviour of the machine at any moment is determined by the m-configuration q_n and the scanned symbol $S(r)$. This pair $q_n, S(r)$ will be called the “configuration”: thus the configuration determines the possible behaviour of the machine. In some of the configurations in which the scanned square is blank (i.e. bears no symbol) the machine writes down a new symbol on the scanned square: in other configurations it erases the scanned symbol. The machine may also change the square which is being scanned, but only by shifting it one place to right or left. In addition to any of these operations the m-configuration may be changed. Some of the symbols written down {232} will form the sequence of figures which is the decimal of the real number which is being computed. The others are just rough notes to “assist the memory”. It will only be these rough notes which will be liable to erasure.

a cryptologist during World War II, Turing's ideas about calculation allowed British cryptographers to develop a computational device that assisted in breaking the German enigma code.⁵³

The conception of universal computation was a major contribution that Turing made to philosophy because it contained the basis for a new perspective on humanity. Universal computability suggested that human beings are not unique in having the ability to perform any operation that can be described by an algorithm. Turing's work on computability suggests that human beings must be viewed alongside other entities that perform computations.⁵⁴ This is a decentering of human beings from the pedestal of being the privileged creatures capable of computation. After Turing, human computation must be viewed alongside other natural computing systems. Even individual biological cells make computations,⁵⁵ and technological systems created by human beings can increasingly outperform human beings in a growing number of computational pursuits. Human calculators can no longer be assumed to be unique or supremely competent to perform any computation.

3. Claude E. Shannon's Information Theory

Although Floridi does not include Claude E. Shannon among his heroes

It is my contention that these operations include all those which are used in the computation of a number. The defense of this contention will be easier when the theory of the machines is familiar to the reader. In the next section I therefore proceed with the development of the theory and assume that it is understood what is meant by "machine", "tape", "scanned", etc.

Turing, *supra* note 50, at 16.

⁵³ See HODGES, *supra* note 29.

⁵⁴ Floridi writes,

[Computer scientists] have not only provided unprecedented epistemic and engineering powers over natural and artificial realities; by doing so they have also cast new light on who we are, how we are related to the world and hence how we understand ourselves. Today, we are slowly accepting the idea that we are not standalone and unique entities, but rather informationally embodied organisms (inforgs), mutually connected and embedded in an informational environment, the infosphere, which we share with both natural and artificial agents similar to us in many respects. Turing has changed our philosophical anthropology as much as Copernicus, Darwin and Freud. This has had a significant impact on what it means to do philosophy after Turing, the last point to which I wish to call the reader's attention

LUCIANO FLORIDI, *THE ETHICS OF INFORMATION* 14 (2013).

⁵⁵ For a discussion of the biological cell as computational system, see J. CRAIG VENTER, *LIFE AT THE SPEED OF LIGHT: FROM THE DOUBLE HELIX TO THE DAWN OF DIGITAL LIFE* 25-46 (2013).

of the information age, nonetheless, Shannon's theory of information was of vital importance. In the 1940s and 1950s, Bell Labs, the research entity of the telephone carrier, sought to grow by extending its service to more remote locations. To achieve this goal, it had to figure out a way to cope with noise introduced by the lengthening of transmission wires. Shannon viewed the problem as one of mathematical abstraction. Shannon's paper, "A Mathematical Theory of Communication," which appeared in the July and October 1948 issues of *The Bell System Technical Journal*,⁵⁶ describes the basis for the vast computation and communication systems that we enjoy today. Telephones were controlled by switches that could be in one of two states, open or closed. This binary condition Shannon called a "bit," which he described as the smallest unit of information. Bits, he argued, are what is transmitted through a channel and received at a distant location. The idea of sending a binary signal was not a new idea; in fact, the telegraph did just that. Shannon abstracted the idea of the bit of information from the digital binary embodiment of it. He posed the fundamental problem of communication as "that of reproducing at one point either exactly or approximately a message selected at another point..." And, that the "semantic aspects of communication are irrelevant to the engineering problem."⁵⁷ His achievement was to define information as a generalizable physical process that could be mathematically described apart from the semantic meaning that might be carried.

Shannon sought to understand the extraction of a signal (a stream of bits) from a noisy background (the long wires) as a problem for statistical analysis.⁵⁸ To achieve this statistical abstraction, he needed to separate the concept of "information" (the stream of bits) from the psychological concept that involves semantic meaning.⁵⁹ Shannon described information

⁵⁶ Claude Shannon, *The Mathematical Theory of Communication*, 27 BELL SYSTEM TECHNICAL J. 379 (1948) reprinted in CLAUDE SHANNON & WARREN WEAVER, *THE MATHEMATICAL THEORY OF COMMUNICATION* 29 (1963).

⁵⁷ SHANNON & WEAVER, *supra* note 56, at 1.

⁵⁸ Weaver writes,

The significant aspect is that the actual message is one selected from a set of possible messages. The system must be designed to operate for each possible selection, not just the one which will actually be chosen since this is unknown at the time of design.

Id.; See also JAMES GLEICK, *THE INFORMATION: A HISTORY, A THEORY, A FLOOD* 221-31 (2011).

⁵⁹ Weaver writes,

Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem."

SHANNON & WEAVER, *supra* note 56, at 1.

as a measurable phenomenon associated with the amount of uncertainty that a system could allow. Information, in Shannon's theory, is understood as adding certainty, or taking away uncertainty.⁶⁰ He described the reduction in the amount of uncertainty achieved by a reduction in information entropy.⁶¹ Although he used the term "entropy," he did not intend to suggest that information entropy is related to the second law of thermodynamics, which states that there is a natural tendency of any isolated system to degenerate into a more disordered state. Nonetheless, later research suggests that the mathematical description of information that Shannon developed might be related to physical systems, and it might suggest that information is a property of physical systems that can be expressed in terms of order and energy. Shannon's theory of information is a theory about the communication of information without meaning, which is to say it is about raw data.

C. The Infosphere

The revolution sparked by Turing and Shannon is still unfolding, but it too has decentered the person by showing that calculation is not a distinctly human ability and that information in Shannon's physical sense is abundant.⁶² One conclusion that Floridi suggests is that humans are information agents who interact with other information entities in an information environment that he calls the "infosphere."⁶³ Modern philosophers (Kant, for example) viewed human beings as individuals who grounded truth-claims in logical necessity. However, in the twentieth century, following the critiques of logic brought by Russell's student, Ludwig Wittgenstein's, and others's reliance on logical necessity no longer seemed possible. Philosophy made the "linguistic turn" which sought to locate the foundations of knowledge in the structures of intersubjectivity. Philosophers like Jürgen Habermas sought to ground their truth claims in the practically necessary structure of discourse.⁶⁴ Floridi's philosophy seeks

⁶⁰ For an introduction to information theory, see JAMES V. STONE, INFORMATION THEORY, A TUTORIAL INTRODUCTION (2015).

⁶¹ *Id.* at 31-38.

⁶² Floridi explains,

We need philosophy to grasp better the nature of information itself. We need philosophy to anticipate and steer the ethical impact of ITCs on us and on our environments. We need philosophy to improve the economic, social, and political dynamics of information.

FLORIDI, *supra* note 15, at ix.

⁶³ FLORIDI, *supra* note 17, at 14-18.

⁶⁴ Habermas' theory is intended to replace the Kantian epistemology that Habermas describes as a transcendental subjectivity. In the *First Critique*, Kant's method of

another turn—an information turn—where the foundations of knowledge are relations among information agents of various types. PI is a form of speculative realism in which each successive generation emerges into a pre-existing information environment that individuals come to know by interacting with the environment and by changing it. In other words, information is not simply a psychological event.; it is an ontological reality. This is the horizon of PI.

II. PHILOSOPHY OF INFORMATION

Part I shows how different scientific discoveries led to revolutions in human self-understanding, culminating with the discoveries of Alan Turing and Claude Shannon, which led to the contemporary “fourth revolution.” Part II turns to explicating Floridi’s philosophy of information (PI). It begins by describing the historical emergence of PI, followed by a simple definition, and then it examines the components of the definition. Next it discusses Levels of Abstraction (LoA), which is a principle method of PI. Finally, it discusses applications of PI to traditional philosophical questions: (1) ontology, (2) epistemology, and (3) ethics.

A. The Meta-Theoretic Perspective of the Philosophy of Information

1. Background

Although there have been antecedents to PI, over the past two decades Floridi has refined those loose themes into a sophisticated theory.⁶⁵

transcendental argument looks to the self-evidently necessary noetic structures that provide the principles that are foundational for self-responsible, autonomous reason. Kant’s approach is subjective, in the sense that it seeks principles of validation within individual subjective self-awareness. Kant looks within individual subjectivity because he believes that since internal awareness is immediate, its structure is self-evident. And therefore he holds that subjectivity can be the basis for self-responsible philosophy.

Habermas rejects Kant’s approach because he believes that it cannot resolve fundamental *aporias* because it starts from a monological presumption that takes as given an isolated individual with a self-governing mind. For Habermas, this presupposition prevents subjective theories like Kant’s from grasping the contribution of intersubjectivity to the self and to reason. The self is constituted by interaction with others, for Habermas, and cognitive awareness is a function of interaction. Therefore, without intersubjectivity there is no possibility of reason. Habermas’ discourse theory attempts to describe the necessary and sufficient conditions for reason beginning from this presupposition of intersubjective. For a discussion of Habermas’ conception of intersubjectivity, see JÜRGEN HABERMAS, *POSTMETAPHYSICAL THINKING: PHILOSOPHICAL ESSAYS* 12-22 (1992).

⁶⁵ See Patrick Allo, *Putting Information First: Luciano Floridi and the Philosophy of Information*, in *PUTTING INFORMATION FIRST: LUCIANO FLORDI AND THE PHILOSOPHY OF*

In describing PI, Patrick Allo draws a useful analogy between it and the philosophy of probability. Both deal with a well-defined mathematical concept, “but are stuck with widely divergent and often incompatible interpretations: chances, frequencies, subjective probabilities, propensities in [the philosophy of probability],”⁶⁶ and an array of formal and informal definitions of information in PI. Moreover, the philosophy of probability applies to applications of formal methods of analysis and thus leads to fields of inquiry like Bayesian epistemology.⁶⁷ Similarly, PI is concerned with applications of information in computation and other forms of analysis.

A central claim of PI is that information is an ontological category, in the sense that any knowledge of being is informational.⁶⁸ In this respect, PI is a “relational ontology”. It traces its origins through representative figures like Gottfried Leibniz,⁶⁹ Charles Sanders Peirce⁷⁰ and Alfred North Whitehead.⁷¹ All three of these thinkers conceived of mathematical relationships as fundamental to philosophical inquiry. For Leibniz, his work, particularly in the *Monadology*, suggests a foundational ontology that is based on simple substances that he calls “monads” that are knowable through relation.⁷² Similarly, Peirce argues for a logic of semiotic

INFORMATION 1 (Patrick Allo ed., 2010).

⁶⁶ *Id.*

⁶⁷ As the Bayesian probability has become influential, questions about its foundational epistemological status have been investigated. The Stanford Encyclopedia of Philosophy defines it this way:

“Bayesian epistemology” became an epistemological movement in the 20th century, though its two main features can be traced back to the eponymous Reverend Thomas Bayes (c. 1701–61). Those two features are: (1) the introduction of a *formal apparatus* for inductive logic; (2) the introduction of a *pragmatic self-defeat test* (as illustrated by Dutch Book Arguments) for *epistemic* rationality as a way of extending the justification of the laws of deductive logic to include a justification for the laws of inductive logic. The formal apparatus itself has two main elements: the use of the laws of probability as coherence constraints on rational degrees of belief (or degrees of confidence) and the introduction of a rule of probabilistic inference, a rule or principle of *conditionalization*.

William Talbott, *Bayesian Epistemology*, STAN. ENCYCLOPEDIA OF PHILOSOPHY (Mar. 26, 2008), <http://plato.stanford.edu/entries/epistemology-bayesian/>.

⁶⁸ See, e.g., LUCIANO FLORIDI, *THE PHILOSOPHY OF INFORMATION* (2013) 20-21.

⁶⁹ For an introduction to Leibniz, see NICHOLAS JOLLEY, *LEIBNIZ* (2005). See also LEIBNIZ’S *MONADOLGY: A NEW TRANSLATION AND GUIDE* (Lloyd Strickland trans., 2014).

⁷⁰ For an introduction to Charles Sanders Peirce, see FERNANDO ZALAMEA, *PIERCE’S LOGIC OF CONTINUITY: A CONCEPTUAL AND MATHEMATICAL APPROACH* (2012).

⁷¹ For an introduction to Alfred North Whitehead, see DONALD SHELBORNE, *A KEY TO WHITEHEAD’S PROCESS AND REALITY* (1966).

⁷² *LEIBNIZ’S MONADOLGY*, *supra* note 69, at 39-50.

representation, where “thought-signs”⁷³ represent objectives of cognitive understanding. And, Whitehead describes what he calls the “event,” which is an actual entity that exists as a relation of becoming.⁷⁴ In each case, philosophy is speculative realism, where the conclusion adopted by modern philosophers as diverse as Kant and Rorty, that reality cannot be known, is bracketed in favor of investigating the philosophical implications of mathematical inquiry.

Whitehead and Russell played important roles in the historical development of PI. Whitehead influenced many significant thinkers for contemporary legal philosophy, including Willard Quine,⁷⁵ whose work is influential in contemporary American jurisprudence. Although Russell ceased to be actively engaged in philosophical discourse after the refutation of his work with Whitehead, his early work in epistemology developed into various theories of epistemological and ontological structural realisms.⁷⁶

PI draws on this rich philosophical background but is not constrained by it. One of the goals of PI is to confront what Floridi calls the “Scholasticism” of contemporary philosophy. He refers to the unquestioned orthodoxies that are called into question by the new concepts of information. Scholasticism, “gradually fossilizes thought, reinforcing its fundamental character of immobility.”⁷⁷ The entrenchment of reified ideas “weakens its capacity for reaction to scientific, cultural, and historical inputs, divorces it from reality...”⁷⁸ Dogma needs to be challenged where it no longer serves to clarify and enlighten.

For example, PI challenges philosophers who view technology with scorn⁷⁹ that, at least in part, is the legacy of Martin Heidegger,⁸⁰ for whom

⁷³ See, e.g., GILES DELEUZE, *THE FOLD: LEIBNIZ AND THE BAROQUE* (Tom Conley trans., 1993).

⁷⁴ See Roberto Casati & Achille Varzi, *Events*, STAN. ENCYCLOPEDIA PHILOSOPHY (Oct. 18, 2015) <http://plato.stanford.edu/archives/win2015/entries/events/>.

⁷⁵ For a discussion of Whitehead’s influence on Quine, see Leemon McHenry, *Quine and Whitehead, Ontology and Methodology* and Willard van Orman Quine, *Response to Leemon McHenry*, in *PROCESS AND ANALYSIS: WHITEHEAD, HARTSHORNE, AND THE ANALYTIC TRADITION* 157, 171 (George W. Shields ed., 2012).

⁷⁶ For background on Russell’s epistemology see, BERTRAND RUSSELL, *THE PROBLEMS OF PHILOSOPHY* (2012). See also, L. R. Russell, L.S. Stebbing, & A.E. Heath, *Symposium: Materialism in the Light of Modern Scientific Thought*, 8 *THE PROCEEDING OF THE ARISTOTELIAN SOCIETY, SUPPLEMENT* (1928), 130-42 (describing Whitehead’s and Russell’s contribution to early structural realism); and G. Maxwell, *Scientific Methodology and the Causal Theory of Perception*, *PROBLEMS IN PHILOSOPHY OF SCIENCE* 148-60 (Imre Lakatos & Alan Musgrave eds., 1968) (discussing Russell and Poincaré).

⁷⁷ FLORIDI, *supra* note 68, at 11.

⁷⁸ *Id.*

⁷⁹ Floridi writes,

It will become normal to consider the world as part of the infosphere, not so much in the dystopian sense expressed by the *Matrix*-like scenario,

technology was a pathology of modernity. He believed that technology reduces the human experience of moral meaning because it forces an abstract and removed attitude in which one is not connected bodily to the world.⁸¹ Heidegger believed that technology creates a sort of virtual existence in which the moral meaning of experiences (like the cry of a hungry child) are lost in abstract concepts and compress space and time. We might have more knowledge of the facts of human suffering, but far less experience of it. Heidegger argued that technology obscures moral meaning and creates the conditions for repressive cultural forms. Floridi's philosophy of information is not intrinsically negative, but also it is far from being morally triumphalist. For him, technology brings about creative moments in which new ontological possibilities are achieved.⁸² It brings forth opportunities for liberation or oppression, and calls for ethical assessment and responsible action. Some technological advances expand the cognitive reach of human beings. They bring about more complex and nuanced speculative and practical philosophy

Two synergistic interpretations of philosophy guide this approach. On one interpretation, philosophers are "conceptual engineers," whose principle task is to clarify muddled concepts and create new grammar and syntax to fill in the gaps that arise in new cultural experiences. On this account, which Floridi calls "analytic," philosophy is closely tied to culture. When the context and conditions of society change, often as a result of new technology, new questions arise and old answers sometimes fail to satisfy. Philosophers help to bring about Kuhnian "paradigm shifts"⁸³ by clarifying concepts, sharpening questions, and creating new concepts to help to better frame issues for cultural discourse.⁸⁴ The other interpretation is

where the 'real reality' is still as hard as the metal of the machines that inhabit it; but in evolutionary, hybrid sense represented by an environment such as New Port City, the fictional, post-cybernetic metropolis of *Ghost in the Shell*.

FLORIDI, *supra* note 17, at 17.

⁸⁰ See Martin Heidegger, *The Question Concerning Technology*, in BREMEN AND FREIBURG LECTURES: INSIGHT INTO THAT WHICH IS AND BASIC PRINCIPLES OF THINKING (Andrew J. Mitchell trans., 2012).

⁸¹ Floridi writes,

We have begun to see ourselves as inforgs not through some transformation in our bodies but, more seriously and realistically through the reontologization of our environment and of ourselves. It is our world and our metaphysical interpretation of it that is changing.

FLORIDI, *supra* note 54, at 15.

⁸² *Id.*

⁸³ See Alexander Bird, *Thomas Kuhn*, STAN. ENCYCLOPEDIA PHILOSOPHY (Aug. 11, 2011), <http://plato.stanford.edu/archives/fall2013/entries/thomas-kuhn/>.

⁸⁴ Thomas Nickles, *Scientific Revolutions*, STAN. ENCYCLOPEDIA PHILOSOPHY (Oct. 15,

metaphysical: it holds that philosophy does not “interact much with the culture in which it develops.”⁸⁵ He has in mind a cynical critique that he associates with Wittgenstein and some of the logical positivists, which holds that philosophers create the problems that they seek to solve.⁸⁶ For analytic philosophers, the goal of conceptual analysis is intended to eradicate philosophical problems by showing that they are simply matters of confusion about grammar and syntax.⁸⁷ Both of these interpretations are realist in the sense that they rest on a presumption that there is an intelligible world that philosophers can investigate.⁸⁸ They deny Kant’s claim that phenomena do not give knowledge of *noumena* (things in themselves).⁸⁹ While accepting that medieval philosophy was a naïve realism, PI seeks a new way forward for philosophy that incorporates the new understanding of information into epistemology and ontology.⁹⁰

In discussing this sweeping vision, Floridi makes use of a metaphor of humanity as demiurge. He refers to the demiurge, who appears as a

2013), <http://plato.stanford.edu/entries/scientific-revolutions/>.

⁸⁵ FLORIDI, *supra* note 68, at 19.

⁸⁶ *Id.*

⁸⁷ For a discussion of the distinction between analytic and synthetic philosophy, see George Rey, *The Analytic/Synthetic Distinction*, STAN. ENCYCLOPEDIA PHILOSOPHY (Oct. 26, 2015), <http://plato.stanford.edu/archives/win2015/entries/analytic-synthetic/>.

⁸⁸ This realist orientation aligns Floridi with the recent revival of interest in speculative realism inspired by the French philosopher, Giles Deleuze. Both take mathematical relations to be foundational and both look to understand how selective repetition allows for ontological realism and a new approach to understanding creativity in the age of digitalized production, where objects are no longer individuated by unique traits. This conception of creativity is foundational for the ethics of PI.

⁸⁹ Grier writes,

Throughout the Analytic Kant elaborates on this general view, noting that the transcendental employment of the understanding, which aims towards knowledge of things independently of experience (and thus knowledge of “noumena”), is illicit. It is in this connection that Kant states, famously, in the Analytic, that “...the proud name of ontology, which presumes to offer synthetic *a priori* cognitions of things in general... must give way to the more modest title of a transcendental analytic”. Filling this out, Kant suggests that to take ourselves to have unmediated intellectual access to objects (to have “non-sensible” knowledge) correlates with the assumption that there are non-sensible objects that we can know. To assume this, however, is to conflate “phenomena” (or appearances) with “noumena” (or things in themselves). The failure to draw the distinction between appearances and things in themselves is the hallmark of all those pernicious systems of thought that stand under the title of “transcendental realism.” Kant’s transcendental idealism is the remedy for these. (citations omitted).

Michelle Grier, *Kant’s Critique of Metaphysics*, STAN. ENCYCLOPEDIA PHILOSOPHY (Apr. 10, 2012), <http://plato.stanford.edu/archives/sum2012/entries/kant-metaphysics/>.

⁹⁰ FLORIDI, *supra* note 68, at 19-20.

character in the “useful myth” that Socrates describes in the *Timeaus*.⁹¹ Floridi views the “history of contemporary philosophy” as

the emergence from the demiurgic Ego, which overcomes the death of god by gradually accepting its metaphysical destiny of fully replacing god as the creator and steward of reality, and hence the ultimate source of meaning and responsibility.⁹²

Since this confidence in an intelligible universe no longer rests on the firm foundation of dogmatic conviction, it was up to the philosophers to defend it, but they have failed to do so.⁹³ They sought instead to outsource the responsibility by turning to the natural sciences. But, this turn to naturalism itself is increasingly a turn to information, as the sciences look to information theory to recast their disciplines in order to take advantage of the extension of cognition made possible by ICT. And, this informational turn suggests that the boundaries between mind and world are not as sharp as the early modern philosophers had supposed.⁹⁴

The demiurge of the *Timeaus* now works on the fabric of information to bring about a new human self-understanding.⁹⁵ That demiurge is computational—it exists where computation leads to the transformation of human self-understanding into new ontological forms.⁹⁶ In the infosphere, this happens at a level familiar to the natural sciences when a nanotechnology engineer creates a new material, when a cellular biologist creates a new species of bacteria, or when a computer engineer creates a quantum computer. But, it also happens when an investment banker creates a new instrument that directs capital into a globalized commodity, when a group of radicals is united into a terrorist network, or when a regulatory regime creates a new network of lobbyists.⁹⁷ Floridi refers to the human agent in the infosphere with the neologism, “inforg,” a blending of “information” and “cyborg” to indicate that the abilities normally thought of as human have been extended through ICT into the information ontology.⁹⁸ PI, therefore, is a form of modest epistemological realism,⁹⁹ in the sense

⁹¹ *Id.* at 22-23.

⁹² *Id.* at 23.

⁹³ *Id.*

⁹⁴ *Id.* at 25.

⁹⁵ This is summarized in FLORIDI, *supra* note 15, at 59-86.

⁹⁶ Floridi writes, “In light of the fourth revolution, we see ourselves as information organisms among others.” *Id.* at 98.

⁹⁷ Floridi uses the phrase “political apoptosis” to describe “the gradual and natural process of renovation of sovereign states as they develop into information societies.” *Id.* at 169.

⁹⁸ FLORIDI, *supra* note 17, at 9-10, 96-98.

⁹⁹ Floridi writes,

PI can ... be presented as the study of the informational activities that

that it accepts that questions about epistemology can be re-characterized in terms of informational structures.¹⁰⁰ Human beings are information agents who struggle to understand the world into which they awaken through informational relations.¹⁰¹

2. The Definition of Philosophy of Information

With this background in mind, Floridi defines PI in the following passage:

The philosophy of information (PI) is the philosophical field concerned with (a) the critical investigation of the conceptual nature and basic principles of information, including its dynamic, utilization, and sciences; and (b) the elaboration and application of information-theoretic computational methodologies to philosophical problems.¹⁰²

This definition has two parts. The first part is concerned with understanding the nature of the concept “information.” In the contemporary context, information is used to refer to many phenomena that are semantic, computational, physical, and biological. Is there a common definition a family resemblance? What are the implications for traditional philosophical problems? What opportunities exist to offer better solutions? The second part of the definition of PI refers to the methodological implications of information science for philosophy. What improvements to philosophical inquiry are suggested by the new conceptualizations of information?

To investigate these questions, PI develops an informational Structural Realism (ISR) that is committed to a minimal ontological realism that posits the existence of structural objects, and a corresponding structural epistemology that maintains the possibility of knowledge of structural entities. It is a development of Structural Realism, a widely influential theory that is supported by many realist and anti-realist philosophers. It was developed by John Worrall in 1989.

make possible the construction, conceptualization, and semanticization and finally moral stewardship of reality, both natural and artificial, both physical and anthropological.”

FLORIDI, *supra* note 68, at 23.

¹⁰⁰ Floridi writes,

[The philosophy of information] will affect the overall way in which we address new and old philosophical problems, bringing about a substantial innovation in philosophy. They will represent the *information turn* in philosophy.

Id. at 17.

¹⁰¹ Floridi describes, “The self is seen as a complex informational system, made of consciousness activities, memories or narratives. From such a perspective, you are your own information.” FLORIDI, *supra* note 17, at 69.

¹⁰² *Id.* at 14.

3. Structural Realism

Structural Realism (SR) has a long intellectual history, but was developed in its most influential contemporary form by John Worrall in his important essay, “Structural Realism: The Best of Both Worlds.”¹⁰³ In this essay he attempted to respond to two conflicting views of scientific knowledge. One account is realist, in the sense that it holds that sciences gives knowledge of a world existing separately from the mind. On this account, when a scientific theory predicts the existence of a hidden entity (such as a fundamental atomic particle), that entity should be believed to exist. The most influential argument for the realist position is one developed by Hilary Putnam, who argued that only the existence of such entities can explain the success of science, absent some magical agent.¹⁰⁴ A contrasting anti-realist view holds that belief in hidden entities should be tentative or even suspended all together.¹⁰⁵ The most influential anti-realist argument is that scientific theories have a record of sweeping change that cannot be accounted for if the entities it proposes actually exist. Many philosophers, including Willard Quine, took this anti-realist view.

Worrall argued (using the change from Fresnel’s solid ether theory of light to Maxwell’s electromagnetic theory as an example) that we should not believe that scientific theories give knowledge of hidden entities, but neither should we believe with the anti-realists that they cannot.¹⁰⁶ On the Structural Realist account, we should commit to believing only to the structural or mathematical content of the theories. That is to say, scientific knowledge is knowledge of the formal structure among empirical observations.¹⁰⁷ These formal structures do not change across theory changes—for example, Fresnel’s equations fit into Maxwell’s theory. This approach does not rely on a magical agent to explain the success of the sciences; it only requires a minimal ontological and epistemological realism.¹⁰⁸ SR has had some influence, although it is far from being universally accepted.

¹⁰³ John Worrall, *Structural Realism: The Best of Both Worlds?* 43 *DIALECTICA* 99-124 (1983).

¹⁰⁴ *Id.* at 115.

¹⁰⁵ *Id.* at 101-102.

¹⁰⁶ *Id.* at 115-121.

¹⁰⁷ *Id.* at 122.

¹⁰⁸ Worrall writes,

On the structural realist view what Newton really discovered are the relationships between phenomena expressed in the mathematical equations of his theory, the theoretical terms of which should be understood as genuine primitives.

Id.

Floridi argues that despite its successes, SR does not adequately explain the nature of the structures to which it refers. As he puts it, “it leaves unspecified the nature of the *relata* in the structures.”¹⁰⁹ His conception of Informational Structural Realism (ISR) attempts to resolve this issue by claiming a minimal ontological commitment that Structural Realism recognizes, in favor of the existence of structural objects (that the *relata* are between existing entities) is incomplete. Awareness of *relata* and the relations among and between them is achieved through information of different types. This knowledge occurs at different levels of abstraction (LoA), which is a central feature of the methodology of PI, discussed below. Floridi defines ISR as follows:

Explanatorily, instrumentally and predictively successful models (especially, but not only, those propounded by scientific theories) a given LoA [Level of Abstraction] can be, in the best circumstances, increasingly informative about the relations that obtain between the (possibly sub-observable) informational objects that constitute the system under investigation (through the observable phenomena).¹¹⁰

The Level of Abstraction (LoA) is a key concept.¹¹¹ At the lowest levels, most proximate to the *relata*, the LoA mediates knowledge most directly. At higher LoA, knowledge is not directly knowable, but may still be “epistemologically interactable.” That is, it may be possible to draw out inferences about the structural *relata* at higher levels of abstraction.

4. Defining Information

Before turning to the LoA methodology, it is useful to elaborate further on the many roles that concepts of information play in many areas of academic inquiry. The new awareness of information that is associated with the ICT revolution is changing the way we understand ourselves and the world, and yet information itself is notoriously difficult to define and understand. Floridi begins his analysis by acknowledging that, not only do different philosophical accounts of information exist, but also there are different usages of “information” in other disciplines outside of philosophy (biology and physics are particularly influential).¹¹²

The existence of this multitude of meanings makes the concept difficult to define. Shannon described the issue this way:

¹⁰⁹ FLORIDI, *supra* note 17, at 341.

¹¹⁰ *Id.* at 361.

¹¹¹ LoA is discussed *infra* pp. 28-32.

¹¹² For an overview of the historical and contemporary concepts of information, see Pieter Adriaans, *Information*, STAN. ENCYCLOPEDIA PHILOSOPHY (July 12, 2013) <http://plato.stanford.edu/archives/fall2013/entries/information/>.

The word *information* had been given different meaning by various writers in the general field of information theory. It is likely that at least a number of these will prove sufficiently useful in certain applications to deserve further study and permanent recognition. It is hardly to be expected that a single concept of information would satisfactorily account for the numerous possible applications of this field.¹¹³

Floridi concludes that “[i]nformation is notoriously a polymorphic phenomenon and a polysemantic concept so . . . it can be associated with several explanations.”¹¹⁴

The concept is part of a fluid interconnected network of concepts that “emerge from the collective practices through the situated, changing, meaningful use of language of communities of users.”¹¹⁵ Floridi identifies six specific theoretical orientations towards information:

- The communications theory, which is the mathematical theory that was developed by Shannon and Weaver.
- The probabilistic theory developed by Bar-Hillel and Carnap, which describes semantic information in terms of a probabilistic “space” “and the inverse relation between the information in p and the probably of p .”
- The modal theory, which applies modal logic to examine a modal space. (“The information conveyed by p is the set of possible worlds excluded by p .”)
- The systemic approach, which defines information in terms of states, space, and consistency.
- The inferential approach which defines information by its dependence on valid inference relevant to the receiver.
- The semantic approach, which Floridi has endorsed. Information is defined as well-formed (fitting for the data space) and truthful data.¹¹⁶

This family of theories share in being concerned with the probability that uncertainty will be reduced by the reception of information. Thus, “information can be understood as a range of possibility (the opposite of uncertainty); as correlation (and thus structure), and . . . as code, as in DNA.”¹¹⁷ While some researchers still seek a unified theory of information

¹¹³ Floridi, *supra* note 3, at 560.

¹¹⁴ Luciano Floridi, *Semantic Conceptions of Information*, STAN. ENCYCLOPEDIA PHILOSOPHY (Aug. 4, 2016), <http://plato.stanford.edu/archives/fall2016/entries/information-semantic/>.

¹¹⁵ Crnkovic & Hofkirchner, *supra* note 11, at 30.

¹¹⁶ FLORIDI, *supra* note 68, at 31.

¹¹⁷ *Id.*

(UTI), progress has been slow to come. One of the most promising approaches involves complex systems theory.¹¹⁸

Under what Floridi calls¹¹⁹ the standard General Definition of Information (GDI),¹²⁰ semantic content is present if, and only if, (1) there is data (mathematical information); (2) the data is well-formed; and (3) the well-formed data are meaningful. Law in the ICT is semantic content under the GDI because it is data (mathematical information) that is well-formed in highly organized data structures, and it carries meaning that can be extracted by a system of interpreters, which includes computers and human beings.

ISR suggests that information is the medium through which knowledge is gained and communicated. This commitment requires an additional trait to the three of the GDI. That fourth trait is truth. Floridi argues that semantic information must be true. When a person turns to an information source it is to gain knowledge, often for use in guiding actions. For example, YouTube is an information source that many home owners turn to for home repairs. If someone watches a YouTube video on how to replace a toilet valve or how to grow potatoes, it is with the expectation that the semantic information provided in the video is true and accurate. Similarly, if someone turns to an online source for law or legal knowledge, the expectation is that the law is accurately reported. In either case, if the provided information is inaccurate there could be undesirable outcomes. Similarly, in the case of legal information, the consequences of inaccurate information could be quite severe. Floridi explores the claim that “well-formed and meaningful data do not yet qualify as semantic information because they need to be truthful as well.”¹²¹ This means that he explicitly excludes false information from his definition of semantic information.¹²² False information is not really information at all; it is pseudo-information.¹²³

Since ISR requires that truth must be an element of information, it is particularly concerned with failures of justification.¹²⁴ At least since the

¹¹⁸ See Crnkovic & Hofkirchner, *supra* note 11, at 332. This approach looks at information concepts as independent, but systemically coupled. It seeks to avoid reducing information to some common essence. Instead, it seeks ways to describe information as the term is used in coupled systems.

¹¹⁹ At least one philosopher of information disagrees that this is a generally accepted definition of semantic information. See Pieter Adriaans, *A Critical Analysis of Floridi's Theory of Semantic Information*, 23 KNOWLEDGE TECHNOLOGY AND POLICY 41, 49 (2010).

¹²⁰ See FLORIDI, *supra* note 68, at 83-84.

¹²¹ *Id.* at 82, 93-104.

¹²² *Id.* at 93-97.

¹²³ *Id.* at 97-104.

¹²⁴ *Id.* at 209-17.

early twentieth century, mainstream accounts of epistemology have had a three-fold structure: it has considered knowledge to be “justified true belief” (JTB).¹²⁵ This was once taken to be an unassailable definition, but in 1963 the American philosopher, Edmund Gettier, challenged the JTB approach in a short essay¹²⁶ by pointing out cases where one might have a justified belief that is not true. The Gettier cases are ones where a belief is justified and true, but not knowledge because it is true by chance.¹²⁷ This happens when one draws an inference from data that is justified but not true, for example where there is correlation in the data without causation. An inference might be true by chance but not true by causal necessity. This is the case in the old saying that a broken watch is correct twice a day. It happens to have the correct time on the occasion of the actual time corresponding to the displayed time. But, there is no causal connection between displayed and actual. The question of whether this kind of truth by coincidence can be reconciled with JTB is known as the Gettier problem.

Although there have been many attempts to solve the Gettier problem, Floridi believes that it is unsolvable within the structure of the JTB analysis.¹²⁸ The reason for this is that justification and falsification involve coordinating information and drawing inferences between the resources of truth and justification. Although earlier attempts have sought to rely on

¹²⁵ Here is statement of this common view of knowledge:

Belief. The person believes that p. This belief might be more or less confident. And it might — but it need not — be manifested in the person’s speech, such as by her saying that p or by her saying that she believes that p. All that is needed, strictly speaking, is for her belief to exist (while possessing at least the two further properties that are about to be listed).

Truth. The person’s belief that p needs to be true. If it is incorrect instead, then — no matter what else is good or useful about it — it is not knowledge. It would only be something else, something lesser. Admittedly, even when a belief is mistaken it can feel to the believer as if it is true. But in that circumstance the feeling would be mistaken; and so the belief would not be knowledge, no matter how much it might feel to the believer like knowledge.

Justification. The person’s belief that p needs to be well supported, such as by being based upon some good evidence or reasoning, or perhaps some other kind of rational justification. Otherwise, the belief, even if it is true, may as well be a lucky guess. It would be correct without being knowledge. It would only be something else, something lesser.

Stephen Hetherington, *Gettier Problems*, INTERNET ENCYCLOPEDIA PHILOSOPHY <http://www.iep.utm.edu/gettier/#H2> (last visited Oct. 29, 2016).

¹²⁶ Edmund Gettier, *Is Justified, True Belief Knowledge?*, 23 ANALYSIS 121 (1963).

¹²⁷ For a discussion of the Gettier problem, see Linda Zagzebski, *What is Knowledge*, in THE BLACKWELL GUIDE TO EPISTEMOLOGY 92-116 (John Greco & Ernest Sosa eds., 1999).

¹²⁸ FLORIDI, *supra* note 68, at 209-23.

logical necessity, a more modest approach is needed. Floridi develops a contextualist analysis showing that assessments of truth and justification require common contexts. Floridi concludes:

Since GP [Gettier Problem] is demonstrably unsolvable, it follows not only that the tripartite account [JTB] is logically inadequate as it is, but also that it is irretrievably so in principle. GP is not a mere anomaly, requiring the rectification of an otherwise stable and acceptable account of propositional knowledge. It is proof that the core of the approach needs to be abandoned. But what needs to be abandoned?¹²⁹

Floridi goes on to argue that it is necessary to distinguish among “knowing,” “believing,” and “being informed.” He asserts a contextualist theory that focuses on “being informed.” It is a naturalized theory that is non-psychological in the sense that he is not relying on any mysterious psychological process. Indeed, he believes that his theory would be capable of describing the knowledge states of artificial knowledge agents. The key concept is his call for a clarification of the logic of being informed, which is an aggregative process of gaining information, rather than a culmination or achievement of an isolated subjective mind.¹³⁰

5. The Dynamics of Information

To summarize the description of PI, Floridi holds that a revolution in human self-understanding is still developing from the far-reaching consequences of information and computer technologies.¹³¹ Although the full significance of this revolution are evolving, Floridi believes that it has already profoundly changed human self-understanding.¹³² In particular, against the metaphysical dichotomy of the Cartesian mind-body dualism, the information revolution emphasizes the systemic coupling that occurs among persons and between persons and their environment.¹³³ The human being is not an isolated physical mechanism, as with Hobbes’ conception of the automata. Human beings are better understood as information agents (inforgs).¹³⁴ Viewed in this way, humans are information agents among information agents, whose complex interactions and emergent behaviors taken together make up the information environment. Again, the human being is decentered. Turing started this revolution when he posited the

¹²⁹ *Id.* at 223.

¹³⁰ *Id.* at 243.

¹³¹ *See supra* pp. 6-14.

¹³² *See supra* p. 15.

¹³³ *See* FLORIDI, *supra* note 68, at 20-21.

¹³⁴ *See* FLORIDI, *supra* note 15, at 94-96.

possibility of computers who were not human beings. His concept of computation, and his ambitious vision for it, is continuing to revolutionize philosophical anthropology.¹³⁵

A significant implication of these claims is that human beings are becoming aware that information interacts in complex systems. Systems interact with each other within networks, typically without human direct intervention, and increasingly in ways that involve intelligent agents, whose workings are not fully open to human understanding. They create a new artificial environment in which human activity, including law, takes place. This is what Floridi means by the neologism, “infosphere.”¹³⁶

B. The Methodology of PI

1. Levels of Abstraction and Formal Methods of Verification

PI adopts the method of Levels of Abstraction (LoA) from a branch of computer science known as Formal Methods of Verification.¹³⁷ This is the study of formal, mathematical techniques that computer scientists use to prove that concrete code will fit the specifications of a computer. They are used to mathematically model the logic of the hardware circuits to predict whether a software program will function properly. These are not programming languages (they do not produce executable code). They convert computer behavior into the language of contemporary mathematics. There are many types of methods for formal analysis. Floridi has been influenced by two types that do not seek to identify every possible variable, *Z* and *VDM*.¹³⁸

LoA calls attention to the shared contextual levels that exist between systems of philosophical propositions.¹³⁹ Traditional distinctions among philosophical topics are examples of what Floridi calls “levelisms.” For example, epistemology is concerned with levels of observation or

¹³⁵ See *supra* p. 12.

¹³⁶ See THE ROUTLEDGE HANDBOOK, *supra* note 11, at 1-3.

¹³⁷ FLORIDI, *supra* note 68, at 52.

¹³⁸ *Z* is based on Zermelo-Frankel set theory. *VDM* is based on Vienna Development Method. For an introduction to formal methods, see Yuji Kukimoto, *Introduction to Formal Verification*, THE DONALD O. PEDERSON CENTER FOR ELECTRONIC SYSTEMS DESIGN (Feb. 6, 1996),

https://embedded.eecs.berkeley.edu/research/vis/doc/VisUser/vis_user/node4.html.

¹³⁹ Level of abstraction (LoA) is defined as:

a finite but not-empty set of observables. No order is assigned to the observables, which are expected to be the building blocks in a theory characterized by their very definition. As LoA is called discrete (respectively analogue) if and only if all its observables are discrete (respectively analogue); otherwise it is called hybrid.

FLORIDI, *supra* note 68, at 52.

interpretation; ontology is concerned with levels of organization; methodology is concerned with levels of reducibility among theories. These levelisms are combined into an amalgamation in systematic philosophies.¹⁴⁰ The development of ICT has contributed a new concept, “simulation,” particularly in the field of artificial intelligence.¹⁴¹ This concept has to do with systems functioning correctly in the LoA that they are intended to address.¹⁴²

Floridi likens LoA to computer/user interfaces where the interface exists between the system of the computer and the system of the person.¹⁴³ They meet successfully only where there are shared frames of reference for the two systems. These shared frames can be presuppositions about the data exchanged between the systems. For example, to use a graphic user interface (GUI), the user must know what the icons mean. The icons are chosen because their meaning is obvious to the user.¹⁴⁴ The functionality of the GUI depends upon a shared set of assumptions about the conventions of the interface—a click will cause a file to open, the desktop is a workspace, etc. When the shared assumptions breakdown, the GUI is confusing to the user. LoA focuses on the conditions for functional outcomes in such systemic interactions.

A levels of abstraction is defined as “a finite but non-empty set of observables.”¹⁴⁵ An observable is a variable with a specified type,¹⁴⁶ and types of variable with values that can be assigned to the variable. An example that Floridi discusses at length is Gassendi’s *Fifth Set of Objections to Descartes’s Meditations*.¹⁴⁷ Imagine wine experts discussing wine. The observables of concern to a wine connoisseur will include factors like grape species, color, aroma, taste, and body. These are analogue variables with standard types. Connoisseurs have common terms for assessing shades of color and subtle differences in aroma, taste, and body. Wine merchants, however, have substantially different concerns in their set of observables: variables such as price, availability, future value, etc. Each of these sets of observable values define a level of abstraction.

The second step in determining the level of abstraction is modeling the relationship among the observables.¹⁴⁸ These models are called the behavior

¹⁴⁰ *Id.* at 47.

¹⁴¹ *Id.*

¹⁴² *Id.* at 48.

¹⁴³ *Id.* at 52.

¹⁴⁴ *Id.*

¹⁴⁵ *Id.* at 52.

¹⁴⁶ *Id.* at 48.

¹⁴⁷ *Id.* at 50.

¹⁴⁸ *Id.* at 52-53.

of the LoA.¹⁴⁹ They consist of a predicate whose free variables are observables of the LoA. Wine connoisseurs might, for example, state that wines made of a particular grape—let’s say a wine made from an Italian Piedmont grape like a sangiovese, which characteristically have a particular color, deep red purple and a particular pallet that is bold, full bodied, full of raspberries and pepper. Linking these observables together is termed a “behavior” of the LoA for wine connoisseurs. In the GUI example, a behavior might be the statement by a user that placing files in the trash can icon allows for their deletion. The formal statement of a behavior of a system is “a predicate whose free variables are observables at that LoA.”¹⁵⁰ The PI method involves stating these relationships in terms of sets using Z set theory.¹⁵¹

When two or more LoA are compared, a more complex set of relationships may be involved. Floridi looks to Z set theory (invented by Ernst Zermelo) to describe these relationships because Z applies a number of axioms that describe the relationships among sets and elements of sets.¹⁵² LoAs are sets of observables (of specific types), so the axioms of Z are immediately applicable to the definition of LoA.¹⁵³ It was intended by Zermelo to account for iterative sets, that is sets of sets. A particularly useful application of Zermelo’s axioms involves comparing iterative sets. For example, the set of observables that are elements of the wine connoisseur’s practice are themselves sets.¹⁵⁴ There is a set of observables for color, taste, terroir, etc. The wine merchant might have these terms and also price, shipping terms, ports, availability dates, etc. Two LoAs consist in two sets of hybrid observables that are distinct and yet may be overlapping (jointed) or one might be wholly contained in another (nested).¹⁵⁵ A

¹⁴⁹ *Id.* at 53.

¹⁵⁰ *Id.*

¹⁵¹ Readers familiar with the software copyright infringement cases might see a parallel to the three-prong Abstraction-Filtration-Comparison test (AFC) developed in *Computer Associates International, Inc. v. Altai Inc.*, 982 F.2d 693 (2nd Cir. 1992). This test is applied when a software copyright holder claims that another program infringes on its exclusive rights by being substantially similar to the copyright holder’s work. In *Computer Associates*, the Second Circuit asked district courts to review such as cases by “analytically dissecting” the software to determine whether the challenged work is substantially similar to the copyrighted work. *Id.* at 707. In the course of doing this dissection, the court will look to levels of abstraction. Although the procedure is similar, the court does not mean to refer to the formal methods of definition of LoA that Floridi discusses.

¹⁵² FLORIDI, *supra* note 68, at 52.

¹⁵³ *Id.*

¹⁵⁴ *Compare id.* at 50.

¹⁵⁵ Let $LoA(c)$ = the wine concessioner’s set of observables, and let $LoA(m)$ = the merchant’s set of observables. It is quite clear that there is also a third set: $LoA(c) \cup LoA(m)$.

novice wine enthusiast, for example, will have very basic terms for describing taste (sweet, tangy, tart, etc.). These terms are the observables of the LoA for the novice. But, the connoisseur can make many fine distinctions (“earthy with notes of tobacco and sage”). The novice terms are still used by the connoisseur, if only to refer to the finer distinctions. The novice’s LoA is said to be nested in the connoisseur’s LoA. It is lower in the hierarchy of abstraction because it has fewer details and cannot accommodate finer distinctions. This concept of hierarchy among LoAs describes a gradient of abstraction (GoA).¹⁵⁶ Two important forms of GoA are the disjointed GoA, where the LoAs contain no common observables, and the nested GoA, where the observables of one LoA are contained within another LoA. GoAs can be subtle, complex, and branching. (the above example of nesting is simple linear).

2. Application of LoA as Methodology

The analysis of levels of abstraction can be useful for philosophers. To illustrate his point, Floridi applies the LoA analysis to Kant’s discussion of the antinomies in *the Critique of Pure Reason*.¹⁵⁷ Kant identified four pairs of claims that he used in a defense of his transcendental idealism. He sought to show that if each of these pairs was taken to rely on a distinction among *noumena* (things in themselves) rather than phenomena (perceptions), the claims lead to absurdity. The four antinomies are:

First Antinomy of Time and Space

Thesis: the world is finite; it has a beginning in time and space.

Antithesis: the world is infinite; it has no beginning in time or space.

Second Antinomy of Atomism

Thesis: Every composite substance in the world is made up of simple parts, and nothing anywhere exists save the simple or what is composed of the simple.

Antithesis: No composite thing in the world is made up of simple parts, and there nowhere exists in the world anything simple

Third Antinomy of Spontaneity and Causal Determinism

Thesis: Causality in accordance with laws of nature is not the only causality from which the appearances of the world can, one and all, be derived. To explain these appearances it is necessary to assume that there is also another causality, that of Spontaneity.

Antithesis: There is no Spontaneity; everything in the world takes place solely in accordance with laws of nature.

The Fourth Antinomy of Necessary Being or Not

Thesis: There belongs to the world, either as its part or as its cause, a

¹⁵⁶ FLORIDI, *supra* note 68, at 54.

¹⁵⁷ *Id.* at 58-60.

being that is absolutely necessary.

Antithesis: An absolutely necessary being nowhere exists in the world, nor does it exist outside the world as its cause.¹⁵⁸

To illustrate the LoA method, consider the first antinomy, wherein Kant attempts to argue that both thesis and antithesis lead to absurdity. His argument is not for one side or the other, but against the questions themselves.¹⁵⁹ He believes that each of the questions in the pairs of the antinomies are unconstrained in the sense that they seek unconditional answers to fundamental problems. Floridi reads Kant as being concerned with levels of abstraction. He explains:

the attempt to strive for something unconditional is equivalent to the natural, yet profoundly mistaken, endeavor to analyze a system (the world itself for Kant, but it could also be a more limited domain) independently of any (specification of) the level of abstraction at which the analysis is being conducted, the questions are being posed and the answers are being offered, for a specified purpose. In other words, trying to overstep the limits set by the LoA leads to a conceptual jumble.¹⁶⁰

Kant treats his antinomies as two pairs: the first and second antinomy confuse space/time and continuity/discontinuity “as features of the system, rather than as constituted by the LoA.”¹⁶¹ Similarly, the remaining two antinomies, of freedom and of the necessity of a Creator, could be equally true or false. Floridi argues that the questions confuse features of the question with features of the system being questioned.¹⁶² One begins with an apprehension (a pre-linguistic intuition) of an absolute, such as the divine or freedom.¹⁶³ From this apprehension the question is put to the system of predicates that are used to describe the state of affairs: Does this divine exist? Is there freedom? But, the question might contain something of the apprehension, but the system of linguistic propositions does not. It is a reduction from actual experiences, and therefore lacks the detailed nuances of actual lived phenomena. This is the confusion that Kant and Floridi agree is commonplace and leads to the sort of naïve realism that animated the medieval scholastic philosophies.

This analysis of Kant’s antinomies hold three lessons: (1) that the LoA method is Kantian in nature, since it considers the grounds for the

¹⁵⁸ *Id.* at 58-59.

¹⁵⁹ *Id.* at 59.

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² *Id.*

¹⁶³ *Id.*

possibility of the analysis of a particular system; (2) it is anti-metaphysical (in the classical sense), because it views classical metaphysics as a naïve realism based on the conflation of traits in questions to traits in the system to which the question is put; and (3) it is a powerful tool for philosophers.¹⁶⁴

C. *The Ethics of the Philosophy of Information*

1. A New Beginning for Ethics

This section argues that information ethics (IE) proceeds from this new philosophical anthropological to develop an ethical theory that blends aspects of both of the two principle alternatives in Western philosophy virtue ethics of which Aristotle's *Nicomachean Ethics* is an exemplar, and the Kantian ethics.¹⁶⁵ These two theoretical orientations have been viewed as alternatives, because moral theorists "must choose between the basic commitments of the two theories."¹⁶⁶ IE has as its foundational claim the belief that, since the information revolution has decentered human beings from the privileged place that they once had in philosophy, going forward ethical theories must describe moral norms in terms of the construction of a flourishing information environment and must view human beings as information entities (inforgs) living among other information entities in that environment. In IE, moral rights and moral duties result from the dynamics of information flow in the context of an evolving information environment. IE is a sophisticated and nuanced—though admittedly provisional—early formulation in a complex and evolving field that suggests that moral theories today cannot be either virtue theories or Kantian theories, but must integrate the concerns and interests of each alternative.

2. IE's Relationship to Virtue Ethics

Floridi notes that the field of virtue ethics has gained interest in recent years in some areas—cyberspace ethics in particular—however, he does not believe that IE can be a form of virtue ethics.¹⁶⁷ Nonetheless, it does retain a "constructionist" theme, which is similar to traditional virtue axiology (theory of the moral good).

¹⁶⁴ *Id.* at 60.

¹⁶⁵ I am indebted to Franklin I. Gamwell for this analysis of moral theories. Gamwell is particularly useful for this analysis because he is a process theorist who is indebted to Whitehead. He argues for an "appropriation and integration" between Aristotelian ethics and Kantian ethics that bears some similarity to Floridi's IE. See FRANKLIN I. GAMWELL, *THE DIVINE GOOD: MODERN MORAL THEORY AND THE NECESSITY OF GOD* 19-60 (1990).

¹⁶⁶ *Id.* at 19.

¹⁶⁷ In jurisprudence, virtue ethics has maintained interest. See, e.g., Lawrence B. Solum, *Virtue Jurisprudence, A Virtue-Centered Model for Judging*, 4 *METAPHILOSOPHY* 178-213 (2003).

To understand this claim it is useful to reconstruct virtue ethics to identify the thematic elements of the Aristotelian exemplar that can be maintained as well as those aspects that must be disregarded. To begin, consider the modern recovery of virtue ethics that is sometimes attributed to Elizabeth Anscombe. In her influential essay, “Modern Moral Philosophy,” she argues that modern ethical theories are “legislative,” by which she means that they have only a minimal conception of the moral good. As she describes it, virtue ethics follows a pattern that was exemplified by Aristotle.¹⁶⁸ Anscombe contrasts modern ethics with virtue ethics by observing that in the modern form (she looks to Hume as the exemplar), by distinguishing between factual and moral propositions, the brute facts (what “is”) are difficult to relate to what “ought” to be. That is to say, modern moral philosophy lacks the means to connect brute facts to moral meaning. She writes:

In present-day philosophy, an explanation is required how an unjust man is a bad man, or an unjust action is a bad one; to give such an explanation belongs to ethics; but it cannot even be begun until we are equipped with a sound philosophy of psychology. For the proof that an unjust man is a bad man would require a positive account of justice as a ‘virtue’. This part of the subject matter of ethics is, however, completely close to us until we have an account of what type of characteristic a virtue is—a problem, not of ethics, but of conceptual analysis—and how it relates to the actions in which it is instanced: a matter which I think Aristotle did not succeed in really making clear. For this we need an account of at least of what a human action is at all, and how its description as doing such-and-such is affected by its motive and by the intentions in it; and for this an account of such concepts is required.¹⁶⁹

Her point is that in order for prescriptive terms like “should” or “ought” to have expressly *moral* meaning, some account of moral psychology is needed. And, whereas Aristotle had some resources for considering these issues, the Christianization of the term “moral” thematized a legislative obligation associated with the divine.¹⁷⁰

¹⁶⁸ G. E. M. Anscombe, *Modern Moral Philosophy*, in VIRTUE ETHICS 29-30 (Roger Crisp & Michael Slote eds., 1998).

¹⁶⁹ *Id.*

¹⁷⁰ Anscombe writes:

So, Hume discovered that situation in which the notion “obligation” survived, and the word “ought” was invested with that peculiar force having which it is said to be used in a “moral” sense, but in which the belief in divine law had long since been abandoned.... The situation, if I

The resources in Aristotle for approaching this question are related to his claim that “the intellect itself ... moves nothing, but only the intellect that aims at an end is practical.” (1139a36).¹⁷¹ Aristotle’s point here is that moral action cannot be identified independently of the desire that motivates it. This does not deny the importance of reason for Aristotle, who argues also that moral action must be in accord with a rational rule or principle. (1107a1)¹⁷² Some take this general description of moral life to mean that Aristotelian ethics is teleological. The argument is neatly summarized by Franklin I. Gamwell in this passage:

“[D]esire” may be formulated generally and without fundamental injustice to Aristotle in the following way: Desire is a living being’s positive relation to some future possibility, the appetite for or attachment to some future state of affairs or characteristic of existence, and can “move” an agent because this attachment affirms that the possibility should be realized. To say that the intellect itself moves nothing means that reason, in distinction from desire, is devoid of particular reference to past or future; reason involves an agent’s relation to forms or universals independently or abstracted from their exemplification in any temporally particular state of affairs. It is also to say that human action as such is identified by its telos. For desire implies a telos, that is, some state of affairs or existential characteristic to be pursued, and, conversely, a telos of human activity implies desire, that is, some positive relation to the future.¹⁷³

If Gamwell is correct in his reading of Aristotle, then the teleological character of his moral philosophy is an essential aspect of distinguishing between moral and non-moral. For Aristotle, “ethics seeks to identify a chief good” (1094a23) of human life, which are to be known through “first principles.” (1095a31), which he achieves through his conception of dialectic. (1095a17). Setting aside the details of that method, which has to do with the opinions of those who are considered to be moral (1095a17), Aristotle concludes that virtue consists in maximally expressing the

am right, was the interesting one of the survival of a concept outside of the framework of thought that made it a really intelligible one.

Id. at 31.

¹⁷¹ GAMWELL, *supra* note 159, at 20 (quoting COMPLETE WORKS OF ARISTOTLE, VOL. 2, at 1798 (Johnathan Barnes ed., 1995)).

¹⁷² “Excellence, then, is a state concerned with choice, lying in a mean relative to us, this being determined by reason and in the way in which a man of practical reason would determine it.” *Id.* (quoting COMPLETE WORKS, *supra* note 165, at 1748).

¹⁷³ GAMWELL, *supra* note 159, at 21.

distinctly human life, which “has a rational principle” (1098a3). Moral virtue for Aristotle thus means having the “state of character concerned with choice” (1106b36) guided by a rational desire.

Gamwell notes that there is a problem of circular logic (*cirrus in probando*) in Aristotle’s argument, since he defines virtue as “a state of character concerned with choice, lying in a mean, i.e., the mean relative to us, this being determined by a rational principle.” But, Gamwell notes, that the complete definition is as follows: “and by that principle by which the man of practical wisdom would determine it.” (1106b:36-1107a2). Gamwell suggests that “Virtuous activity is identified through appeal to the activity of virtuous people.”¹⁷⁴ He concludes, “In anticipation of the contrast with Kant, we may also express Aristotle’s appeal to virtuous people and activities by saying that the ground or principle of good action is not a priori.”¹⁷⁵ Aristotle thus denies that the grounds of moral reasoning has the legislative imperative that Kant finds in a priori reasoning and Anscombe likens to divine command. In the conclusion of her essay, she notes of the Aristotelian approach that “it can be seen that philosophically, there is a huge gap, at present unfillable as far as we are concerned...”¹⁷⁶ between the Aristotelian conception of virtue and modern. Modern philosophy rejects Aristotle’s appeal to opinion as logically flawed and his appeal to divine command as illiberal. Nonetheless, the gap “needs to be filled by an account of human nature, human action, the type of characteristic a virtue is, and above all of human flourishing.”¹⁷⁷ She notes that the concept of human flourishing “appears the most doubtful.”¹⁷⁸

IE takes its first principles from the account of epistemology described above. IE is similar in some respects to the description of Aristotelian ethics in as much as it views ethics as being concerned with achieving the moral good as a telos, although his conception of the telos is not rooted in a description of human desire. Floridi argues emphatically, however, that IE is not a form of virtue ethics as this has traditionally been understood because virtue ethics is “egopoetic,” meaning that it is concerned with human self-creation. That is to say, virtue has traditionally been described in terms of cultivating the self, which he terms “egopoetic.” He explains:

All brands of virtue ethics share the same agent-oriented kernel. This is not say that they are all subjectivist but rather, more precisely, that they are all concerned with the proper construction of the moral subject, be that a self-imposed task

¹⁷⁴ *Id.* at 26, 144.

¹⁷⁵ *Id.* at 27.

¹⁷⁶ Anscombe, *supra* note 162, at 43.

¹⁷⁷ *Id.* at 43-44.

¹⁷⁸ *Id.* at 44

or an educational goal of a second party, like parents, teachers, or society in general. To adopt another technical expression, virtue ethics is intrinsically “*egopoetic*.”¹⁷⁹

He refers to the construction of the moral self. The theme of the moral life as involving a “making” (*poesis*) of the self he refers to as “constructivism.” Floridi believes that PI cannot be a form of virtue ethics because by being *egopoetic*, it retains the outdated anthropocentric orientation that has been displaced by the information revolution.

He argues IE is not “*egopoetic*” because human beings have been displaced from the privileged place granted in traditional ethics. This claim he clarifies in this passage:

Because virtue ethics remains limited by its subject-oriented approach and the specific philosophical anthropology it presupposes, it cannot provide, by itself, a satisfactory ethics for a globalized world in general and for the information society in particular. If misapplied, it fosters ethical individualism, as the agent is more likely to mind only her own self-construction.¹⁸⁰

Thus, virtue ethics is no longer valid if it is understood as achieving a particular conception of *human* flourishing. IE seeks instead a conception of the moral virtue described in terms of the entire infosphere.¹⁸¹ The theme of construction (*poesis*) need not be abandoned, but only modified. He explains that, “the limits of virtue ethics should not lead to an overall rejection of any constructionist approach.”¹⁸² The construction of the self, while not irrelevant, is only an instance of the construction of the infosphere. In this respect, IE appears, at least initially, to endorse an *a posteriori* method that would appear to be at odds with the radical *a priori* claims of Kantian ethics. To understand this claim, let us next examine IE’s relationship to Kant.

3. IE’s Kantianism

Having distinguished IE from virtue ethics, Floridi describes IE as a modified Kantian ethics.¹⁸³ This is a complex and nuanced claim, however, since IE also rejects much of what is distinct to Kant. To understand Floridi’s claim, it is useful to begin with a brief review of Kant’s moral

¹⁷⁹ FLORIDI, *supra* note 54, at 164.

¹⁸⁰ *Id.* at 167.

¹⁸¹ Floridi writes, “The task is to formulate an ethical framework that can treat the infosphere as an environment worth moral attention and care for the human inforgs who inhabit it.” *Id.* at 18.

¹⁸² *Id.*

¹⁸³ *Id.* at 18 n.7.

philosophy. The foundational claim of which is Kant's assertion that rationality is the essentially human trait that he equates with the moral law.

Kant makes this claim directly in the opening sentence of the *Groundwork of the Metaphysics of Morals* when he writes, "It is impossible to conceive of anything in the world, or even out of it, which can be called good without qualification, except a *good will*."¹⁸⁴ For Kant, moral obligation is "one that one cannot reasonably choose not to have."¹⁸⁵ Which is to say, the moral law cannot rest on an *a posteriori* condition that a moral agent can reasonably deny. Kant rejects Aristotle and virtue ethics because such an *a posteriori* condition would result in only a hypothetical imperative. But, the moral law is a categorical imperative (unconditional and without qualification). Kant makes this point in a number of places, but notably in the *Second Critique* where he explains,

For reason to be legislative, it is required that reason need presuppose only itself because the rule is objectively and universally valid only when it holds without any contingent subjective conditions which differentiate one rational being from another.¹⁸⁶

Another dimension to this claim that is particularly important to Kant is that the moral law is radically nonteleological. By claiming that "*nothing* can be called good without qualification *except a good will*," Kant denies that a moral good can be identified by a telos that human beings ought to pursue. He makes this claim more explicitly: "The purpose which we may have in view of our actions, or their effects regarded as ends or springs of the will, cannot give to actions any unconditional moral worth."¹⁸⁷ And, this means that the moral law must be identified "without regard for any object of desire."¹⁸⁸ The moral law is a dictate of the *a priori* principles that Kant calls pure reason. The nonteleological character of Kantian ethics is an extension into the *Second Critique* of the critique of classical metaphysics in the *First Critique*, where he denied the possibility of knowing "things-in-themselves". He disregarded the naïve belief that perception reveals the metaphysical essences of beings (which includes their teleology) as being a transcendental illusion. The moral law is a constitutive choice that is always good, and therefore the freedom to choose the moral law is constitutive of the good. The moral law demands that every

¹⁸⁴ IMMANUEL KANT, *GROUNDWORK OF THE METAPHYSICS OF MORALS* 61 (H. J. Paton, trans., 3rd ed. 1956).

¹⁸⁵ GAMWELL, *supra* note 159, at 31.

¹⁸⁶ *Id.* at 32 (quoting IMMANUEL KANT, *THE CRITIQUE OF PRACTICAL REASON* 19 (Lewis White Black trans., 1956)).

¹⁸⁷ *Id.* at 38.

¹⁸⁸ *Id.* at 40.

moral agent respects the will of every rational agent. The most famous formulation of the Categorical Imperative exemplifies this conclusion: “act so as to treat humanity, whether in thine own person or in that of any other, in every case as an end withal, never as means only.”¹⁸⁹

Floridi begins his analysis of Kant by examining this passage from the *Groundwork of the Metaphysics of Morals*:

In the kingdom of ends, everything has either a price or a dignity. What has a price can be replaced by something else as its equivalent; what on the other hand is raised above all price and therefore admits of no equivalent has a dignity.¹⁹⁰

Floridi argues against Kant, claim that the categorical dichotomy between absolute moral value and instrumental value is too sharply drawn. He states two objections, “that different entities may have different degrees of relative value...”; And, “that life, biological organisms, or the absence of pain in sentient beings can all have a great deal of moral value and deserve a corresponding amount of respect.”¹⁹¹ He concludes that “Kant seems to unduly restrict the sense of ‘relative value’ to meaning only contingent worth depending on the agent’s interest.”¹⁹²

Floridi assigns this error to Kant because they disagree somewhat about epistemological commitments. Floridi accepts Kant’s denial of the possibility of knowledge of things-in-themselves, but he leaves open the possibility that informational relation is constitutive of knowledge. Thus, where Kant denies that the moral law can be known *a posteriori*, Floridi argues for a minimalist axiology that derives moral meaning from information and views moral knowledge as informational. He explains,

What, then, is the most general possible common set of attributes that characterize an entity as intrinsically valuable and an object of respect, without which an entity would rightly be considered intrinsically worthless (not just instrumentally useless or emotionally insignificant) or even positively unworthy and therefore rightly to be disrespected in itself? The least biased and most fundamental solution is to identify the minimal condition of the possibility of an entity’s least intrinsic worth with its nature as an information entity by adopting an information ontology.¹⁹³

For Floridi, an entity has moral worth because it is informational—an “Being an informational entity is the minimal condition of the possibly of

¹⁸⁹ *Id.* at 45.

¹⁹⁰ FLORIDI, *supra* note 54, at 114.

¹⁹¹ *Id.* at 115.

¹⁹² *Id.*

¹⁹³ *Id.* at 123.

having moral worth.”¹⁹⁴

Floridi also modifies Kant’s conception of the “good will”. As referenced above, Kant required reason to be *a priori*, which means for him that it presupposes nothing other than itself. Floridi, however, describes the good will as acting in accordance with reason and an attitude of moral concern for others. He writes,

Our Good Will is expected to exhibit a willingness to engage with the world for its own sake and an attentiveness to (that is, interest in, concern with, and compassion for,) its well-being.¹⁹⁵

It appears, then, that Floridi rejects Kant’s nonteleological commitment and offers in its place a desire—concern for the Other (conceived in terms of an informational entity). Thus, the person of good will is concerned (has a desire to care for) the well-being of other informational entities and also to care for the entire informational environment.

This slight modification of Kant’s conception of the good will allows Floridi to reconcile the Aristotelian and Kantian positions. IE is a “constructionist” ethics that has a weak teleological commitment. It is a naturalist axiology, in the sense that the conception of the good is derived through a naturalist epistemology. And, the role of desire in the moral life is adjudicated in favor of Aristotle: “reason alone moves nothing.” Desire in the form of a caring attitude is an essential commitment of the person of good will.

PART III. THE PHILOSOPHY OF LEGAL INFORMATION

A. The Descriptive Claims of PLI

PLI seeks an information-theoretic general description of law. “Information-theoretic” means that it seeks to understand the informational *relata* that the law embodies as well as the inputs and outputs of legal reasoning and legal action. A general description of law is one that is applicable to any legal system. It uses the LoA analysis as a method of investigating these relations, by paying close attention to the sets of observables that are engaged in legal argument and legal institutions. The following are some tentative general claims that a PLI might assert:

¹⁹⁴ *Id.*

¹⁹⁵ *Id.*

1. The Changed Context for Jurisprudence

ICT has brought rapid change to law in the last two decades. In 2000, Lawrence Lessig published his book, *Code: and Other Laws of Cyberspace*, which calls attention to the way digital information was shaping the law.¹⁹⁶ Lessig argued then that information technologies are competing with law, markets, and social norms to regulate of human behavior. Lessig focused his attention on the law of copyright, where the first impacts of the ICT were being felt. What followed has been described as a tidal wave of information. Researchers at Berkeley's School of Information Management estimated in 2003 that humanity had accumulated about 12 exobytes of data in the entire course of human history up to that point. According to a more recent study, the amount of data increased by five-fold (to 988 exobytes) in less than a decade. Today, the measure of total date exceeds 10 zetabytes (1,000 exabytes) and it continues to grow exponentially.¹⁹⁷ Processing power has had a similar exponential growth realizing a million-fold increase over the past forty years. It is not surprising that many observers see this transformation as a revolutionary change in the structure of society and self-understanding.¹⁹⁸

Law is becoming digital information, but jurisprudence was (and is) still predominately unaffected by the transformation. The processes of turning the semantic expression of law into the binary expression of the information society have been given little consideration by legal philosophers. Nonetheless, there is much for legal philosophers to consider. For example, a common application of ICT in law is the use of artificial intelligence in legal search. This is accomplished through a multitude of techniques, but two are worth considering here. An important technique involves constructing legal ontologies. Here, the word "ontology" refers to its usage in library science. An ontology is a deliberate attempt to structure information in a way that promotes effective searches. This is accomplished manually, but there is also a potential to use artificial intelligence to automate the process.

Artificial intelligence is also being used in legal analyses. Notably, AI is used in advanced methods for predictive analytics. A growing number of use-cases exist that demonstrate the power of ICT to reliably and

¹⁹⁶ LAWRENCE LESSIG, *CODE: AND OTHER LAWS OF CYBERSPACE* (2000).

¹⁹⁷ Kathleen Maclay, *Amount of New Information Doubled in Last Three Years, UC Berkeley Study Finds*, UC BERKELEY NEWS (Oct. 28, 2003), http://www.berkeley.edu/news/media/releases/2003/10/28_information.shtml

¹⁹⁸ *Id.*

accurately provide fine-grained quantitatively measured predictions about the outcomes of legal actions. Machine learning holds significant promise for furthering such analyses. The impact that these information structures are having on the nature and practice of law is at present difficult to determine. PLI could help bring clarity and guide responsible development. Similarly, Blockchain and related technologies are attempting to formalize many legal-related processes. These run from smart contracts—which are self-executing contractual exchanges—to proposals to develop a common code for all law-related text. Again, the precise impact that these developments might have on the nature of law and its function in a democratic polity bear scrutiny, and it seems quite likely that PLI can be useful in these analyses.

While little thought has been given to the nature of law as digital information, there are substantial questions to be explored, as Lessig's early work suggested. For example, what are the dynamics by which a series of bits express and create legal knowledge? (This would seem to be an essential question for building the legal "ontology"). What is the potential for, and what are the limits of, computational methodologies to perform legal reasoning? And, how might the digital representation of law help to investigate traditional questions in legal philosophy? For example, does the ability to data-mine enormous amounts of legal text constitute a new direction for legal realism? Does it pose new research agendas that merge complexity, social network theory, and legal process theory? And, what are the moral and political consequences of these new informational relations? These are philosophical questions that require an informational analysis to be answered.

2. Law is Relational

The information revolution has created a new horizon for legal philosophy. For nearly a century, the dominant methodology of Anglophone jurisprudence has been conceptual analysis, with a few notable exceptions. For example, Brian Leiter has argued for a naturalized jurisprudence that draws from Willard Quine's epistemological naturalism. This seems to be a necessary step for understanding the informational nature of law. Nonetheless, while Quine argued for a turn toward the exact sciences, he did not endorse an informational foundationalism. His work furthers the anti-foundationalism of Otto Neurath, who specifically rejected foundationalism.¹⁹⁹ For him, naturalism is the turn to the natural sciences which are viewed through a coherentist holist epistemology.

¹⁹⁹ For a discussion of Neurath and Quine, see James Ladyman, *Structural Realism*, STAN. ENCYCLOPEDIA OF PHILOSOPHY (Jan. 10, 2014), <https://plato.stanford.edu/entries/structural-realism/>.

Informational structural realism is an alternative path to a naturalizing jurisprudence that is rooted in an epistemology that has wider acceptance in the exact sciences. Through ISR, the nature of law can now be seen as containing evolving dynamic informational systems. This is a new horizon in which the assumptions of analytic jurisprudence should be re-examined. A significant part of this new horizon for philosophy is the shift towards Structural Realist epistemology. This shift portends a considerable change for legal theory. Through ISR, law can now be seen as containing dynamic bodies of information in an information environment with which it interacts. Given the new awareness that various types of information exist, law must be understood through the various understanding of information (including semantic *and* mathematical). Moreover, a robust informational theory of law should account for the ways that law is coupled to other information systems such as economics, political, religious, social and so on. PLI is a new methodological approach to legal theory, which attempts to describe the informational nature of law and its relation to other information systems. In particular, it is concerned with the significance for law of the ontological, epistemological, and ethical implications of the informational turn in philosophy that are described by Floridi and outlined above in Part II. PLI is the attempt to develop a general theory of law that is harmonized with the philosophy of information and capable of providing insights into the changed nature and context of law and legal institutions in the information revolution, which has profoundly changed the context for legal theories.

A basic claim of PLI, then, is that law determines and is determined by informational relation. Rather than focusing primarily on the boundaries between law and other related concepts, PLI focuses on thickly describing the relations between law and other closely allied informational structures. Like PI, it is open to a fundamental relational ontology, that views the foundational ontological principle in terms of relation. As noted above, this was a common claim among Leibniz, Pierce, Whitehead, Deleuze, and some contemporary speculative realists, who are antecedent to PI.²⁰⁰ As a legal theory PLI need not comment on this issue. To the extent that legal claims imply ontological and anthropological claims, they do so as consequences of the relational claims that are associated with the informational condition of law.

PLI holds that general legal theories must account for the informational relations. Thus, although PLI is open to the ontological claim of PI that speculates on the primacy of relation as a fundamental ontological category, PLI does not insist that relation is *the* fundamental ontological category,

²⁰⁰ See *supra* pp. 39-40.

although such a comprehensive relational ontology might be correct. PLI does not seek to endorse any fundamental ontological commitment. Whatever fundamental ontological categories might exist, PLI asserts the weak claim that all beings are relational in the sense that for human beings to be aware of or concerned about a being, it is through the relations that a being has to other beings and to persons. To the extent that they are of concern to legal philosophy, all beings have relation. Therefore, the informational turn seeks to understand law as informational relations across all genus of information.

3. Law is Informational

A second foundational claim of PLI, then, is that the essence of law is information. Laws describe and structure informational relation. Any legal theory must come to terms with the ways that law determines how one information entity relates to another. H. L. A. Hart appears to acknowledge this in his foundational work, *The Concept of Law*²⁰¹ when he describes the work as an exercise in analytical jurisprudence that seeks to clarify the general framework for legal thought by distinguishing the social phenomenon of law from coercion and morality. Then, he adds,

[T]he book may be regarded as an essay in descriptive sociology; for the suggest that inquiries into the meanings of words merely throw light on words is false. Many important distinctions, which are not immediately obvious, between types of social situation or relationships may best be brought to light by an examination of the standard uses of the relevant expressions and of the way in which these depend on a social context, itself often left unstated. In the field of study it is particularly true that we may use, as Professor J. L. Austin said, 'a sharpened awareness of words to sharpen our perception of the phenomena.'²⁰²

Hart realized that a theory of law must include a description of the relations that instantiate legal reasoning, rules and institutions. He took conceptual analysis, the primary investigate tool of analytic philosophy, to be the instrument for such an evaluation. Today, however, the exclusive focus on law as semantic information is unwarranted given the new context of law wherein the relations between law and other types of information might occur in non-semantic forms. For example, legal information systems couple with financial information systems in market regulation.

Similarly, PLI must also be understood *viz.* the various forms of communitive legal theory that views law expressly as linguistic

²⁰¹ H.L.A. HART, *THE CONCEPT OF LAW* (1961).

²⁰² *Id.* at v.

communication.²⁰³ PLI includes this theoretical commitment, but extends it to include other forms of information and information processes. PLI, like PI, does not endorse a single definition of information, but instead looks to understand law through multiple conceptions of information. The scope of PLI includes the logico/linguistic structures that are examined in conceptual jurisprudence. But, it also considers law as other sorts of information that are non-linguistic. This includes the informational structures of the formal processes of law and legal reasoning. And, it includes law as mathematical information, which is its form in ICT.

The relation between the semantic and mathematical natures of law as it exists today have many overlooked dimensions, which PLI seeks to make explicit and investigate. Consider, for example, the relation between law and energy. A commonplace view of this relation might focus exclusively on how law regulates the production and consumption of electrical energy. In this commonplace understanding the *physis* and *techne* are separate. The nature of law has to do with its content as a means of social control. The common understanding views the content as separate from the artifact of law, which is the form in which it is stated whether that be in papyri scrolls or printed books or the patterns of electronic pulses that deliver content through the ICT. This is the commonplace understanding, but viewed from an informational perspective, the relation is more nuanced and complex. The content of law is semantic and the artifact of law as information entity

²⁰³ A note is needed regarding the relation between PLI and communicative legal theory, which has been put forward by Mark Greenberg, Andrei Marmor, Larry Alexander, Paul Campos, Steven Knapp, Scott Soames, and others. Greenberg describes the “general outlook of this view” as follows:

Legal texts are linguistic texts, so the meaning or content of a legal text is an instance of linguistic meaning generally. It therefore stands to reason that, in order to understand the meaning of an authoritative legal text or utterance, such as a statute or regulation, we should look to our best theories about language and communication. Those theories tell us that a text or utterance has linguistic content—call it *communicative content*—that may go well beyond the semantic context of the text.

Mark Greenberg, *Legislation as Communication? Legal Interpretation and the Study of Linguist Communication*, in PHILOSOPHICAL FOUNDATIONS OF LANGUAGE IN THE LAW 217 (Andrei Marmor & Scott Soames eds., 2013). Relatedly, Oliver Goodenough and Mark Flood have argued that the communicative content of legal documents should be scripted in a common markup language to promote computational analysis. See, Oliver R. Goodenough & Mark D. Flood, *Contract as Automation: The Computational Representation of Financial Agreements* (Office of Fin. Research, Working Paper No. 15-04, 2015) <https://ssrn.com/abstract=2648460>. The thesis advanced in this essay is more similar to Goodenough and Flood; however, it seeks to understand how law exists as information of different types. Whereas Goodenough and Flood are concerned with the practical implication of streamlining law in common information formats, PLI is concerned with understanding the various informational phenomena in which law is constituted.

is fundamentally tied to its nature as mathematical information. Semantic legal information effects, sometimes in surprising ways, physical and biological information environments. A trivial, yet insightful example, involves law's relationship to energy. A commonplace understanding might suggest that the content of law will have an effect on energy production and consumption, since both are regulated. Law as artifact, as mathematical information, seems to have only a trivial impact on energy consumption. It was, however, a conclusion of Claude Shannon's theory of information entropy that all information has an energy cost.²⁰⁴ This means that the storage and processing of information cannot be achieved without a base energy cost.²⁰⁵ This is true of all mathematical information however it is stored. Thus, it is a necessary conclusion of the contemporary understanding of types of information is that *law has an unavoidable minimum energy cost*, and if the total amount of information of a law can be stated, then the total minimum energy cost of it can be calculated. If informational demands of law, particularly the private law of contractual relations, were to become encrypted and distributed (as some blockchain enthusiasts suggest), then the energy demands might be overwhelming. Law as an artifact of mathematical information has an energy nature: even as it regulates the production and distribution of energy it consumes some of the energy it creates. This may at first seem a trivial concern, but it points to a feature of the law in relation to the environments it effects: law has an impact, both as semantic information and as mathematical information.

An awareness of the complex interplay of various types of information at work in legal systems was, perhaps, a goal of the American Legal Realists. It may well be that they were proto-legal information philosophers.²⁰⁶ Law not only exists in multiple informational forms; it is also coupled with multiple information systems. The distinction among information types blur as law becomes manipulated and analyzed by new forms of information entities and information agents. Legal search, legal prediction, various types of AI agents shape the outcomes of legal matters by manipulating the artifacts of law as mathematical information. PLI seeks to understand these relationships, to make them explicit, and to incorporate

²⁰⁴ For an introduction to information entropy, *see, e.g.*, STONE, *supra* note 60, at 31-44. For a discussion of the relation between information entropy and thermodynamic entropy, *see id.* at 180-82.

²⁰⁵ *Id.*

²⁰⁶ Brian Leiter argued as early as the late 1990's that American Legal Realists were proto-naturalists. BRIAN LEITER, NATURALIZING JURISPRUDENCE 36 (2007). The term "natural" refers here to the same meaning that Willard Quine used the term in his influential 1969 essay, "Epistemology Naturalized." WILLARD QUINE, *Epistemology Naturalized*, in ONTOLOGICAL RELATIVITY AND OTHER ESSAYS 69 (1969). A description of relationship between naturalized jurisprudence and PLI is an essential next step for PLI.

them into a general theory of law.

4. Law is not a Uniquely Human Phenomenon

Given the forgoing account of law, it should be clear that law in the information revolution cannot be viewed as simply a human phenomenon. Since it is relational, law extends to the relations that are not human. For example, an environmental regulation extends to and is in some sense coupled with the environment that is affected by the regulation. Market regulations extend to markets. International trade law extends to the systems of shipment, credit, insurance, etc., by which make possible the movements of goods across national boundaries. Viewed in this sense, law exists as relations among information entities. Some of the entities are information agents. Others are passive entities. Law creates and describes relations among and between information agents. At times, it incorporates complex dynamic systems that are coupled with other social systems. Information agents, seeking non-systemic goals, shape the structure of law.

Systems research suggests complex relationships among coupled social systems.²⁰⁷ Some of the features, such as emergence, self-organization, systemic coupling, and agent-based objects, are useful for developing computational models of law,²⁰⁸ particularly in areas where the law is thickly connected to a market or market analogues. Computational theories of complex adaptive systems are being developed, particularly in economics, and a promising direction for PLI is to evaluate the presuppositions of these computational models against the traditional philosophical approaches. For example, PLI considers the place of epistemological commitments of various measures of probability, in particular Bayesian analysis, since these methods of analysis are gaining ground in models of legal analysis that are being deployed in, for example, legal search engines, legal assistants, and predictive modeling of judicial behavior. PLI considers the relationship between these new computational models and traditional issues in legal philosophy. This is a developing area

²⁰⁷ A general introduction to complex dynamic systems can be found at JOHN H. MILLER & SCOTT E. PAGE, *COMPLEX ADAPTIVE SYSTEMS: AN INTRODUCTION TO COMPUTATIONAL MODELS OF SOCIAL LIFE* (2007). For a discussion of law as a complex dynamic system, see J. B. Ruhl, *Law's Complexity: A Primer*, 24 GA. ST. U. L.REV. 885-911 (2008); Gregory Todd Jones, *Dynamical Jurisprudence: Law as a Complex System* 24 GA. ST. U. L.REV. 873-83 (2008); Daniel M. Katz, Derek K. Stafford & Eric Provis, *Social Architecture, Judicial Peer Effects and the 'Evolution' of the Law: Toward a Positive Theory of Judicial Social Structure*, 24 GA. ST. U. L.REV. 977-1001 (2008).

²⁰⁸ For a discussion of quantitative approaches to law's complexity, see Bryon Holz, *Chaos Worth Having: Irreducible Complexity Pragmatic Jurisprudence*, 8 MINN. J.L. SCI. & TECHNOLOGY 303 (2007).

in legal scholarship today. While complex systems theory will no doubt be an important contributor to PLI, it is not reducible to systems theory.²⁰⁹

5. Law and the harmonization of *physis* and *techne*.

Another theme in PI is the harmonization of *physis* (nature) and *techne* (artifact). For Floridi, this means, “a sort of holistic environmentalism,” that “requires a change in our metaphysical perspective about the relationship between *physis* ... and *techne*...”²¹⁰ Because PI identifies the moral good in terms of informational environment, Floridi advocates for a view of the harmonization of *physis* and *techne* as promoting the integrity of the informational environment. Understood in this way, PLI seeks to avoid privileging the *physis* over *techne*. Today, with the blurring of boundaries between the multiple forms of legal information and with other types of information, which the ICT makes possible, the distinction between nature and artifact also blurs. And it will, most likely, continue to do so. In this context, the distinction between natural and made loses meaning. In the Anthropocene, humans have changed the earth into a monoculture for human flourishing, and are beckoning toward the planets. Soon, even human nature itself will become an object of human making.

The law must anticipate that human nature, culture and social systems are creatively interacting and changing in ways that cannot be anticipated by contemporary information agents. And, it must find the resources to respond responsibly to these changes. A threat posed by the changes that will come is that the liberation of the person will become an impossible goal in the face of a tyrannous wall of immanence that is indifferent to the liberation of those whom it is intended to serve. This is not to say that the ICT is literally a tyrant (as some have suggested is possible for the ICT). It is, instead, the claim that the ICT can alter conditions for the assumptions that underwrite democracies—assumptions about how democratic discourse works to liberate persons rather than enslave them. And, having so altered them, it may create communication structures that short circuit the foundational protections that are intended to insulate democracies from those who would otherwise rise to power, as political theorists since Plato have cautioned is a weakness of the democratic form.²¹¹

When law is understood as being composed of various types of

²⁰⁹ A similar note should be observed about the relationship between PLI and the field of Artificial Intelligence and Law. Floridi notes this, suggesting that the philosophy of AI was premature in the sense of having arrived before a clear sense of the nature of information had emerged. See FLORIDI, *supra* note 68, at 2-3.

²¹⁰ FLORIDI, *supra* note 17, at 119.

²¹¹ PLATO, *The Republic, Book VI*, in PLATO: THE COLLECTED DIALOGUES 710-47 (Edith Hamilton & Huntington Cairns eds., 1961).

information and a multitude of informational relations, its connection to the natural world is altered. Law is not separate from the physical and social worlds that it seeks to control. The separation between law as artifact (*techne*) and law as nature (*physis*) can only be harmonized by a clear recognition of the full spectrum of informational interactions. Legal philosophers should play a substantial role in critiquing the changes that the ICT is bringing to the rule of law and the possibilities for democracy in the coming ages. Questions about how the ICT might change the nature of law should not be left to market forces and engineering genius. Philosophers, trained in thinking about foundational questions of epistemology, ontology, ethics, and politics, who are able to grasp the concepts of the ICT sufficiently well as to understand the risks and opportunities they present, are information agents capable of thinking and acting responsibly to defend individual liberties and promote the general welfare of the information environment. PLI holds resources for this undertaking.

B. The Normative Claims of PLI

1. PLI's Analysis of Legal Positivism

To act responsibly as a moral agent requires moral knowledge. Moral reasoning is information intensive. A foundational claim for the ethics of information (EI) is the epistemological conclusion that Floridi reached in relation to the Gettier Problems.²¹² Part II describes Floridi's conclusion that these problems are illustrative of a shift required in the philosophy of information from the conventional formula of knowledge as justified true belief (JTB) to a formulation of knowledge as informed true belief. This shift is necessary because the computation/information revolution has shown that human beings are information systems that make use of available information to form beliefs about the world. The high bar of "justification" in conventional epistemology is rarely satisfied and impossible to absolutely satisfy.²¹³ Floridi's discussion suggests that the desire for logically necessary foundations for knowledge is a result of conflating levels of abstraction between the question and the field in which the question is sought, as he illustrates with his discussion of Kant's antinomies.²¹⁴ On this reading, moral knowledge is also informed true belief. Human beings as information agents seek to act purposefully for moral goals that are warranted by information but not justified as rationally necessary in most cases.

Given this conception of moral knowledge, PLI offers an alternative

²¹² FLORIDI, *supra* note 68, at 6-18.

²¹³ *Id.* at 18.

²¹⁴ *Id.* at 23-27.

perspective on the core claims of legal positivism, which holds that law and morality are dichotomously related.²¹⁵ An influential formulation of this claim was advanced by the English jurist John Austin²¹⁶ (1790-1859). Austin influentially formulated this statement of legal positivism:

The existence of law is one thing; its merit and demerit another. Whether it be or be not is one enquiry; whether it be or be not conformable to an assumed standard, is a different enquiry.²¹⁷

In its most basic form, then, legal positivism is the claim that law and morality are conceptually distinct and separate.²¹⁸ Although there are several claims that support the separation of law and moral norms, the core claim itself, known as the separability thesis, is the focus here.²¹⁹

A well-known development of the separability thesis occurred in the mid-twentieth century debate between H.L.A. Hart and Lon Fuller, which occurred in 1958.²²⁰ At the time, both Hart and Fuller were at the peak of their careers.²²¹ Hart's essay,²²² a defense of positivism, had been delivered as the Oliver Wendell Holmes Lecture while he visited at Harvard from his home institution, Oxford University. Fuller was the Carter Professor of General Jurisprudence at Harvard.²²³ Fuller demanded equal time to give defend his natural law perspective.²²⁴ The Harvard Law Review published the debate, which became an instant reference for understanding the distinction between Hart and Fuller.²²⁵

While the debate is complex and subtle, the aspect of it that is considered here is formulated by Hart in a footnote that lists the main principles of positivism. The focus here is one of these, which states.

(2) the contention that there is no necessary connection

²¹⁵ For an account of the fact/value dichotomy, see HILARY PUTNAM, *THE COLLAPSE OF THE FACT/VALUE DICHOTOMY* (2002).

²¹⁶ For biographical information on J. L. Austin, see Guy Longworth, *John Langshaw Austin*, STAN. ENCYCLOPEDIA PHILOSOPHY (June 16, 2015), <http://plato.stanford.edu/archives/sum2015/entries/austin-jl/>

²¹⁷ JOHN AUSTIN, *THE PROVINCE OF JURISPRUDENCE DETERMINED* 157 (W. Rumble ed., 1995).

²¹⁸ Kenneth Einar Himma, *Legal Positivism*, THE INTERNET ENCYCLOPEDIA PHILOSOPHY, <http://www.iep.utm.edu/legalpos/> (last visited Nov. 1, 2016).

²¹⁹ A complete analysis will wait for another essay, but since the goal here is to illustrate the potential of PLI, a limited analysis is warranted.

²²⁰ *The Hart-Fuller Debate at Fifty*, NYU LAW, <http://www.law.nyu.edu/conferences/hartfuller> (last visited Nov. 1, 2016).

²²¹ *Id.*

²²² *Id.*

²²³ *Id.*

²²⁴ *Id.*

²²⁵ *Id.*

between law and morals or law as it ought to be....²²⁶

For the purposes of this essay, this claim shall be referred to as the separability thesis. It is an essential claim for H. L. A. Hart's general theory of law, which means that he took this claim to be true of all legal systems. The rule states that the essential nature of law does not include a moral property, and therefore if an otherwise valid law lacks morality, it is law nonetheless. The claim does not deny that laws may have a moral trait, and therefore there may be an "intersection" of law and morality. That is to say, there may be an accidental relationship between law and morality, such that law may be influenced by morality and moral norms may be shaped by legal norms. But, there is no necessary relationship between them.

In his lecture, Hart attempted to defend this claim from the criticism that although morality may not be necessary for any particular law, the legal system as a whole must demand a moral foundation.²²⁷ This argument is advanced by Bentham and Austin.²²⁸ Against this criticism, Hart concedes that there is a moral necessity borne of the need for pre-moral goods, such

²²⁶ HART, *supra* note 195, at 602 n.25. Hart's positivism is "inclusive" in the sense that it allows for some moral/legal overlap. A more formally exclusive separation between law and moral norms is advanced by Joseph Raz. See, JOSEPH RAZ, *THE AUTHORITY OF LAW: ESSAYS ON LAW AND MORALITY* (1979). Raz writes:

The law on a question is settled when legally binding sources provide its solution. In such cases judges are typically said to apply the law, and since it is source-based, its application involves technical, legal skills in reasoning from those sources and does not call for moral acumen. If a legal question is not answered by standards deriving from legal sources then it lacks a legal answer—the law on such questions is unsettled. In deciding such cases courts inevitably break new (legal) ground and their decision develops the law.... Naturally, their decisions in such cases rely at least partly on moral and other extra-legal considerations

Id. 49-50.

²²⁷ Leslie Green explains,

Of course, by this Hart didn't mean anything as silly as the idea that law and morality should be kept separate (as if the separation of law and morals were like the separation of church and state.) Morality sets ideals for law, and law should live up to them. Nor did he mean that law and morality are separated. We see their union everywhere.... To pacify the literal-minded, Hart might have entitled his Lecture, "Positivism and the Separability of Law and Morals." That captures well his idea that "there is no necessary connection between law and morals or law as it is and law as it ought to be." (citations omitted).

Leslie Green, *Positivism and the Inseparability of Law and Morals*, 83 N.Y.U. L. REV. 1035-36 (2008)

²²⁸ See H. L. A. Hart, *Positivism and the Separation Law and Morals*, 71 HARV. L. REV. 594-600 (1958).

as safety, nourishment, and other goods.²²⁹ Law provides for these with rules that protect against murder, bodily harm, theft, and so on. This is what Hart would later call the minimum content of the natural law.²³⁰ He also concedes that there are basic norms within law that have moral origins.²³¹ For example, the basic duty of fairness that requires that like cases be treated alike. This fundamental legal principle holds a sense of moral rectitude, and therefore represents an overlap between the moral and the legal. Fuller agreed that law has a moral overlap, but for him the overlap is substantially broader.²³² Hart's two concessions commit him only to the claim that the overlap of law and morality plays a role in the formation of law. Immoral law may result from the minimal moral overlap. In Fuller's broader view, the inner morality of law is reciprocal with an external

²²⁹ Hart writes,

They [the Utilitarians] certainly accepted many of the things that might be called "the intersection of law and morals." First, they never denied that, as a matter of historical fact, the development of legal systems had been powerfully influenced by moral opinion, and, conversely, that moral standards had been profoundly influenced by law, so that the content of many legal rules mirrored moral rules or principles. It is not in fact always easy to trace this historical causal connection, but Bentham was certainly ready to admit its existence; so too Austin spoke of the "frequent coincidence" of positive law and morality and attributed the confusion of what law is with what law ought to be to this very fact.

Id. at 598-99.

²³⁰ See Green, *supra* note 221, at 1046.

²³¹ Green explains,

[T]he relationships between necessary and contingent truths often contribute to our interest in the necessary ones. Every legal system necessarily contains power-conferring norms that play an important role in explaining how law governs its own creation. But power-conferring norms are also important because they provide facilities to certain agents on certain terms, such as the powers to legislate or appropriate. They therefore have a contingent relation to the distribution of social power within a society, a matter of the first importance in legal and political theory.

Id. at 1043.

²³² Fuller explains,

Law, as something deserving loyalty, must represent a human achievement; it cannot be a simple fiat of power or a repetitive pattern discernable in the behavior of state officials. The respect we owe to human laws must surely be something different from the respect we accord to the law of gravitation. If laws, even bad laws, have a claim to our respect, then law must represent some general direction of human effort that we can understand and describe, and that we can approve in principle even at the moment when it seems to us to miss its mark.

Lon L. Fuller, *Positivism and Fidelity to Law: A Reply to Professor Hart*, 71 HARV. L. REV. 630, 632 (1958).

morality that is foundational for the authority of law.²³³

The example of the “Grudge Informer”²³⁴ illustrates the difference between the two. The case concerns the legal status of an unjust law.²³⁵ The informer in the case was a German wife who wanted to get rid of her soldier husband when he returned from the Eastern Front.²³⁶ When they were alone together, he made statements that were critical of the war and of Adolf Hitler. Such statements were proscribed by German law and punishable by death. She turned him in, and he was sentenced to die, but the sentence was not carried out. Nonetheless, he was imprisoned, freeing her from the burden of an unwanted marriage. After the war, she was tried for wrongfully imprisoning her husband. Hart argued that she had committed no illegal act, since the Nazi law clearly required her to act as she did. Punishment of the wife by a post-war court should apply an *ex post facto* law.²³⁷ Fuller argued that the Nazi law was invalid because it had quite clearly violated the morality of a valid law.²³⁸ He believed that gross violations of the inner morality of the law can invalidate the law, and this was clearly the case with the grudge informer. For Fuller, the inner morality of the law requires a greater overlap between law and morality.

Using the LoA method, PLI focuses on the shared observable types of information. Viewed this way, the Grudge Informer illustrates that the difference between Hart and Fuller can be described in terms of sets of observables. For Hart, the observables are the positive statement of the law and the minimal content of natural law. These are observed as the objective text of the law criminalizing statements critical of Hitler, and the equal application of the law to all. This can be summarized:

²³³ This is a claim that Hart develops more fully in *The Concept of Law*. He explains, The difference may seem slight between the analysis of a statement of obligation as a prediction, or assessment of the chances, of hostile reaction to deviation, and our own contention that though this statement presupposes a background in which deviations from rules are generally met by hostile reactions, yet its characteristic use is not to predict this but to say that a person’s case falls under such a rule. In fact, however, this difference is not a slight one. Indeed, until its importance is grasped, we cannot properly understand the whole distinctive style of human thought, speech, and action which is involved in the existence of rules and which constitutes the normative structure of society.

HART, *supra* note 195, at 88.

²³⁴ For a discussion of the Grudge Informer, see David Dyzenhaus, *The Grudge Case Revisited*, 83 N.Y.U. L. REV. 1000-03 (2008).

²³⁵ The Grudge Case refers to a case identified by the German legal scholar, Gustav Radbruch, that Fuller describes to illustrate what he takes to be the moral content of law. See Fuller, *supra* note 226, at 648-57.

²³⁶ *Id.* at 652-53.

²³⁷ *Id.* at 655.

²³⁸ *Id.* at 656.

Hart = {law, moral norms for legitimating law}

Hart's observables are derived from his analysis of the concepts of law and moral norms.

Fuller's observables include Hart's and extend beyond them. He too looks to the positive statement of the law. He develops conception of morality, which is broader than Hart's in *The Morality of Law*,²³⁹ Fuller describes morality in teleological and deontological perspectives (that he calls, respectively, the morality of aspiration and the morality of duty). Like Floridi, he sought to integrate the teleological and deontological ethics, but for Fuller the integration occurs in the balancing of the functional consequences of the ethical styles.²⁴⁰ Fuller explains that the morality of law is discerned from experience.

Fuller = {law, moral aspiration, moral duty}

Since Fuller's observables include, legal rules and moral principles, Fuller's set of social norms is broader than Hart's and inclusive of Hart's propositional analysis. In Floridi's terms, there exists gradient of abstraction (GoA) between Fuller and Hart, such that Hart's set of observable data types is nested within Fuller's.

This analysis suggests that the objects of analyses in Fuller and Hart occur at different levels of abstraction. Hart analyzes the concept of law in order to state the function of law viz. propositional statements of moral norms.²⁴¹ The meaning of primary legal rules is set within the context of language that is common within the entirety of the primary rules, and supplemented by other principles as needed according to procedures described in secondary rules.²⁴² Hart's LoA is specified by the limited scope of his inquiry. His question is limited and precise, and his observed moral norms are limited to moral legitimation of legal procedures. Fuller, however, sought an absolute answer to the question, what is the moral meaning of law? That is to say, Fuller sought an unconditional answer to the fundamental question of moral meaning. In this sense, a comparison can be made to Floridi's analysis of Kant's antinomies. Fuller's inquiry

²³⁹ LON L. FULLER, *THE MORALITY OF LAW* (1969).

²⁴⁰ *Id.* at 29-30.

²⁴¹ See *supra* notes 215-19 and accompanying text.

²⁴² For an introduction to Hart's distinction between primary and secondary rules, see Lawrence Solum, *Legal Theory Lexicon 039: Primary and Secondary Rules*, LEGAL THEORY LEXICON (Aug. 28, 2016)

http://lsolum.typepad.com/legal_theory_lexicon/2004/06/legal_theory_le_2.html.

oversteps the limits of Hart's propositional analysis by looking for evidence in contrasting types of moral claims. In the Hart/Fuller debate, a conceptual jumble results from the aporetic relationship between their LoA.

2. PLI's Normative Claim

Viewed within the background assumptions of PI, several interrelated points stand out. First, the encounter between law and morality occurs within the infosphere where information agents seek to operate successfully in a pre-existing social environment. Inforgs exist in a pre-existing infosphere that includes legal and social rules. Distinguishing between the two is of some value to them, but negotiating among other people is critical to their success. To operate effectively, a human being must synthesize different types of social information to anticipate social reaction.

Second, analysis of how this synthesis occurs in the individual is critical to understanding the nature of law in relationship to morals, and yet it is not the focus of either Hart or Fuller. Hart's set of observables is limited to law, since he is focused on the analysis of boundaries of the concept of law. Fuller's concern is broader. He sought to develop a theoretical account of the moral context in which law functions. Both Hart and Fuller pursue their analysis with similar methods of conceptual analysis. Neither Hart nor Fuller are concerned with the details of the way that an individual gains information about law and ethics or the ways in which information about social and legal rules shape the agency of the individual.

Third, PLI suggests that greater attention needs to be paid to systems of theories for analysis of precisely how the primary and secondary rules interact with each other and with other social norms. Hart's account of the interaction between moral norms and law is reductive and blunt. Given that the development of social systems theories were written, it seems likely that a more nuanced account could be developed that took account of the various concepts of information. It seems likely that the relationships, particularly the indirect relationships between changes in moral norms and changes in primary rules might benefit from computational complexity theories. Advanced computational systems today have allowed for new relational patterns to be discerned.

Of particular concern is the science of complex systems, which has developed computational techniques that assist in developing new models of systemic interactions.²⁴³ While traditional analysis has assumed relatively static and homogenous situations, computational techniques allow for models of complex adaptive systems where systems are presumed to be

²⁴³ For an introduction to the mechanisms of complex adaptive systems, *see* JOHN H. HOLLAND, *SIGNALS AND BOUNDARIES: BUILDING BLOCKS FOR COMPLEX ADAPTIVE SYSTEMS* (2014).

dynamic interaction. The application of these models to legal systems have met with some support and some resistance, but as Ruhl explains, theoretical understanding of the law might benefit from embracing it.

One might accept the presence of invisible hands throughout social presence invisible throughout life and the value of using complex adaptive systems theory to understand them better, but nonetheless resist applying complex adaptive systems theory to legal systems on the ground that the law is where humans write the rules for other social systems. But this misses two fundamentals. First, the legal system, as a source of rules for regulating other social systems, should take into account how account those systems operate. If one wishes to regulate a complex adaptive social system, one ought to think like a complex adaptive social complex social system. Second, law, as in the collection of rules and regulations, is collection the product of the legal system, a collection of people and institutions. Law, in this sense, is simply an emergent property of the emergent legal system the same way prices are an emergent property of markets.²⁴⁴

The new awareness of information that Floridi advances might further the investigation of whether and how law operates as a complex adaptive system, coupled with other social systems.

PLI is therefore a normative jurisprudence. Robin West describes revitalized normative jurisprudence that “centralizes, rather than marginalizes, the concept of the individual, common, social, and legal good and the varying accounts of human nature that might inform such understandings.”²⁴⁵ Critically, West prescribes a reconsideration of conceptions of human nature (philosophical anthropology) in determining how to develop a progressive normative jurisprudence that is capable of addressing social need.²⁴⁶ PLI rejects the anthropocentrism in West’s proposal, but nonetheless it does develop a progressive normative jurisprudence that considers the moral good sought by law in the context of the overall quality of the information environment. It promotes legal rules and institutional structures that are conducive to effective information agents in a richly varied information environment.

CONCLUSION

This essay is a preface to PLI. It is intended to introduce the field and describe some features of it in broad outline. It is not a detailed study,

²⁴⁴ Ruhl, *supra* note 6, at 897.

²⁴⁵ ROBIN WEST, *NORMATIVE JURISPRUDENCE: AN INTRODUCTION* 10 (2011).

²⁴⁶ *Id.*

and it has skirted the edges of complex, technical issues in the hopes of stimulating interest among a diverse audience of legal philosophers, legal scholars, computer scientists, and others with an interest in the interface of law and information technology. Since it suggests and leaves open many questions, it is the author's hope that it will provoke writing in the field.

The contemporary era of vast amounts of data and immense networked computational power radically affects society by changing nearly every aspect of human life and self-understanding. Not only is it reordering political power structures at every level, but it is also changing the conditions for understanding the place of human beings in the world. Basic philosophical categories need to be rethought and new forms of knowledge must be acknowledged. This is changing the basic assumptions of philosophy. It is against this background of massive change that the nature of law must be rethought as well.

Today, an information theory of law is needed that seeks to understand law in its contemporary form as digital information, existing within the context of a revolution in human self-understanding. It suggests new insights into traditional questions in legal philosophy and raises new agendas for exploration. Law has been evolving along with changes in the way that it has been recorded, distributed, analyzed, and authorized. It has moved toward an increased democratic rule of law as information technologies have made the delivery of legal information more widely accessible. This movement was also accompanied by developments in logic that have made the contemporary computational age possible. The information age is upon us. It requires a fundamental shift in thinking that decenters the human by showing computation and information to be common features of natural systems. Viewed in this new light, law is not a determinate order waiting to be discovered by a wholly-formed individual mind, as it had been understood by natural law theory. Nor is it simply the command of the sovereign, as Austin imagined. And, it is not an amoral social system.

PI holds that human minds emerge into a world that already exists and which is already populated by other minds. It is a world where information is everywhere, pooled in reservoirs that give the world organization and intelligibility. The mind interacts with and is shaped by information about the world, even as it shapes it. Law is information too. It gives structure and organization to culture, even while it is being shaped by it. Law carries cultural understanding of the world, and yet it is also constitutive of that understanding. A philosophy of legal information investigates the nature and moral meaning of law as information, seeking to be responsible for the legal system in all its aspects. Not only legislatures and judges need to take on the responsibility for the legal system. Lawyers and law professors do

too, of course, but also legal technology developers, investors, and enthusiasts. The part of the infosphere that is populated by legal information entities exceeds the boundaries of Hart's description of law, and yet in the contemporary ethos, the most significant agents might soon be non-human intelligences shaping legal search, predicting legal outcomes, and reifying fluid human relations in fixed distributed ledgers and registries. Whether these new technologies liberate or enslave the societies in which they are deployed will depend on the care and wisdom of those who design and implement them. Philosophers can and should take on these issues by asking how these new questions meet the traditional topics of philosophical enquiry. This is relevant in speculative areas, such as metaphysics and epistemology, but even more so in the areas of practical reason: ethics and political theory.

Legal philosophy integrates the speculative and the practical. It investigates the nature of law as such, but it also seeks to understand the relation between the positive statement of law and the moral legitimization of it. There is change all around: the positive nature of law is evolving into a system of data mediated by technology; and human self-understanding is evolving as we become aware of the reality of our existence as information agents. Legal philosophy needs to acknowledge these developments and take on the challenges of the new setting. PLI is not a triumphal system that solves all issues. Far from it. Philosophical reasoning is always limited by the limits of human awareness and the fragile and conditional nature of logical analysis. Nonetheless, it suggests a way ahead for legal philosophy, which is urgently needed in the rapidly changing legal field. To quote Alan Turing, "We can only see a short distance ahead, but we can see plenty there that needs to be done."²⁴⁷

²⁴⁷ Alan Turing, *Computer Machinery and Intelligence*, 49 MIND 433, 460 (1950).