Law as Part of a Wider Conversation: Experiences with STS (Science and Technology Studies)

Talya Deibel

A. Introduction

Law is sometimes seen as 'lagging behind' technology and innovation. When technological progress is quick, and bureaucracy is slow, legislative practices might fall behind the social and scientific realities.[1] On the one hand, law is criticised for being an 'unwanted constraint' on innovation and for disincentivising technological progress. On the other hand, some argue that law responds well to digital technology and hence becomes essential in fostering a responsible and fertile technoscientific development.[2] This culture clash of law and technology revolves around the balance between forward looking characteristics of science and the need to provide social justice and equity in contemporary societies.[3] This paper emphasizes the inevitability of inter and intra-disciplinary approaches in legal research on technology today and will suggest a possible approach to this culture clash.

One way to understand this delicate balance with more nuance is engaging with STS (science and technology studies). As a social science field, STS aims at analysing the intricate and complex relationship between knowledge, technology, and society. According to STS scholarship, the discussion of technology in its relation to modern society presents us with a plethora of legal questions. After all, technology affects and is affected by society, and this includes law. Examples include privacy, surveillance,

---

1 For more information and a detailed elaboration see Sheila Jasanoff, 'Making Order: Law and Science in Action' in Edward J Hackett et al (eds), The Handbook of Science and Technology Studies (MIT Press, 2007) 761–786; Emilie Cloatre and Martyn Pickersgill, 'Introduction' in Emilie Cloatre and Martyn Pickersgill (eds), Knowledge, Technology and Law (Routledge 2014) 1–14; Emilie Cloatre and Martyn Pickersgill, 'Sociology of Law and Science' in Jiří Přibáň (ed), Research Handbook on the Sociology of law (Edward Elgar 2020) 81–92.
2 Cloatre and Pickersgill, 81; Roger Brownsword and Karen Yeung (eds), Regulating Technologies: Legal Futures, Regulatory Frames and Technological Fixes (Hart 2008).
3 Cloatre and Pickersgill, 85.

smart contracts, the integration of the artificial agents into various parts of society, new biotechnological developments and so on.

Each example is indicative of how answering the many legal questions that are raised requires an understanding of how technological momentum impacts society and vice versa. Law requires a solid understanding of its interactions with different types of knowledge to address these questions. By contrast, legal scholars tend to treat science from a positivist perspective, often forgetting modern science is 'human doing'.[4] The pluralistic methodology that STS offers becomes crucial in analysing these intricacies.

STS focuses on object-subject relationships and hybridities between the human and non-human to address legal challenges brought by digital technology. According to STS scholarship, the object is never an object with respect to law. Rather, it refers to a multiplicity of subject-object relationships.[5] This includes different types of nature and different types of artefacts which perform different types of knowledge. Law's normativity acts only as a type of performance in a specific knowledge regime or types of order integral to different specializations. As a compromise, STS argues for an interdisciplinary and pluralistic methodology in creating a legal design that aims at fairness and justice in the cloudy atmosphere of technoscientific political futures.

This paper argues that a more nuanced engagement with STS and political theory becomes essential when dealing with questions that are dynamic, multi-faceted, and sensitive to contingency. To do this, it first introduces STS, then it discusses its relationship to law, and later comments on the role of inter and intra-disciplinarity in law. This is especially important considering private law has changed its character and adopted a more transformative and distributive role in society. An intellectually loaded view of STS helps us not to take law as an atemporal constant or something that is constantly re-invented. Rather, it reminds us that law is a social construct that is excavated from history each time new technologies require a new understanding and adjusted to the requirements of modernity and post-modernity.

---

4 Rex Gilliland, 'The Destiny of Technology: Modern Science and Human Freedom in the Later Heidegger' (2002) 18; Heidegger Studies, 115–128, 118.
5 Bruno Latour (tr. Catherine Porter) *Down to Earth: Politics in the New Climatic Regime* (Polity 2018).

B. The Epistemic Authority of Science and Law

STS is a social scientific approach to study nature, science, and technology. Typically, STS is seen as having started in the 1970s. Its literature is based on history of ideas, philosophy of science, and social constructivism.[6] STS interrogates how different types of scientific knowledge are created and how they shape society. STS also deals with the specificity of law. It investigates how scientific knowledge becomes an integral part of the infrastructure of governance and is sometimes shaped by law.[7] For example, biological knowledge helps law to decide what a human being is and hence, the state's duty to protect human rights.[8]

STS scholars started to be interested in law before law discovered STS.[9] STS found its way through legal research mostly via Law and Social Science (LSS) analyses.[10] The engagement with STS scholarship benefited from critical legal scholarship, especially the law and race scholarship and feminist legal theory. These areas share a common tradition as they draw on the interdependencies between power and society.[11] The critical perspective of STS includes questioning and scrutinizing scientific claims. For example, when analysing the regulatory framework of pharmaceuticals STS suggests

---

6 Cloatre and Pickersgill, 83.

7 Cloatre and Pickersgill, 81–83; Sheila Jasanoff, 'Law's Knowledge: Science for Justice in Legal Settings' (2005) 95 American Journal of Public Health, 49–58.

8 Benjamin J. Hurlbut, Sheila Jasanoff and Krishani Saha, 'Constitutionalism at the Nexus of Life and Law' (2020) 45(6) Science, Technology, & Human Values, 979–1000.

9 Simon A. Cole and Alyse Bertenthal, 'Science, Technology, Society, and Law' (2017) 13 Annual Review of Law and Social Science, 351–471, 355; Cloatre and Pickersgill, 83 ff.

10 For an LSS account on STS studies see Cole and Bertenthal; Cloatre and Pickersgill; Alain Pottage, 'Law Machines: Scale Models, Forensic Materiality, and the Making of Modern Patent Law' (2011) 41(5) Social Studies of Science, 621–643; Alain Pottage, 'The Materiality of What?' 2012 (39) Journal of Law and Society, 167–183; For a private law perspective see Günther Teubner, 'Rights of Non-humans? Electronic Agents and Animals as New Actors in Politics and Law' (2006) 33 Journal of Law and Society, 497–521; Günther Teubner (tr. Jacob Watson) 'Digital Personhood? The Status of Autonomous Software Agents in Private Law' (2018) Ancilla Iuris 107–149; Talya Ucaryilmaz Deibel, 'AI and the Dualism of Persona and Res in Roman Law' (2021) 12 (2) European Journal of Law and Technology; For a critical theory perspective see Johan Soderberg, *Free Software to Open Hardware: Critical Theory on the Frontiers of Hacking* (Gothenburg 2017); Eric Deibel, *Rousseau and the Future of Freedom: Science, Technology and the Nature of Authority* (Routledge 2023).

11 Cole and Bertenthal, 354.

questioning the relationship between a drug's approval, its effectiveness, and the interpretation of the data such as race, gender, class etc.[12]

STS scholarship focuses on 'symmetry' between the social and the scientific. According to STS, the social is always and already embedded in technology.[13] It is not only a question of how social systems are naturalized within the techno-scientific but also how norms are built on multiple dimensions of the natural. It is in that sense that new developments in technology challenge legal definitions: What is a human being? What is a gene? What is AI? What is an invention?

The implication, however, is that there are multiple versions of such symmetry. On the one hand, these questions revolve around other questions: How does society work economically? What are the accepted ethical behavioural norms? What are other social systems that penetrate law? On the other hand, the legal reality that lies behind it is not uniform either. It is composed of intertwined public and private interests that exist in national and global spheres. Such a view of co-existing normative orders is sometimes addressed by legal pluralism.[14] STS in this sense deepens the existing legal traditions in law as transhistorical regimes of knowledge.[15]

The pluralist methodology that STS offers is useful when dealing with the 'wild zones' of bio and cyber. There will be at least a minimal multiplicity of either when thinking through contemporary social and scientific systems and the realities that they touch upon. For example, there is an order to the knowledge that constitutes positive law and the same applies to the natural law tradition that revolves around universal values interacting with each other and reaching a compromise about what will prevail and when. This makes it rather a patchwork: A collage of legal statements focused on the object, namely what science and technology tell and how the normative system responds to it.

Law and STS ask the same question: How do different types of normativities co-exist within and alongside those of the State?[16] The relationship

---

12 Cloatre and Pickersgill, 86.
13 Sheila Jasanoff, 'Ordering Knowledge, Ordering Society' in Sheila Jasanoff (ed), *States of Knowledge The Co-Production of Science and Social Order* (Routledge 2004) 13–45.
14 Bertram Turner and Melanie G. Wiber, 'Legal Pluralism and Science and Technology Studies: Exploring Sources of the Legal Pluriverse' (2023) 48(3) Science, Technology, & Human Values, 457–474, 458.
15 Cloatre and Pickersgill, 84.
16 Cloatre and Pickersgill, 81; Günther Teubner, 'How the Law Thinks: Towards a Constructivist Epistemology of Law' (1989) 23 Law & Society Review 727–758.

between STS and law crystallizes on the point where both science and law are seen as two major epistemic authorities.[17] If climate science says emissions are dangerously heating the Earth, countries have a duty to curb the emissions.[18] If contract law says parties have to behave according to good faith, the parties have a duty to disclose necessary information. These two major areas revolve around truth and facts. Not surprisingly, lawyers have been regarded as 'scientists' and the library as the 'lawyer's laboratory' in the confines of the university for a long time.[19] In Justinian's compilation, which is the first major and extensive private law codification of Europe, law was referred to as *scientia*. According to Romans, law was the science of just and unjust.[20]

Nonetheless, taking law as science has been challenged for several reasons. First, legal problems do not have clear solutions. They have 'reasonings' based on contestable judgements. Second, law revolves around values and seeks for justice as opposed to science which seeks for the 'objective truth'. These criticisms reduced law's relationship to science to criminology, legal admissibility of scientific evidence through falsification, or high-tech inventions and their superficial regulatory framework.[21]

A flat view on law and technology either assumes that scientific developments can be easily understood, digested, and regulated by law or law becomes a primary actor in determining innovation and technology.[22] Another major implication is that law creates its legal reasoning based on a naive assumption that there are clear objective facts and that unbiased scientific information can be created or obtained.[23] Interdisciplinarity and a meticulous engagement with STS show us that the relationship between law and technology is never that simple. Law has always been about scientific information and nature. Yet, it is lacking the deeper acknowledgement of a co-dependent relationship with science and technology, as well as criticizing its hubristic claim of true and non-messy objectivity.[24] Jasanoff uses the term *'co-production'* to refer to the interaction of scientific and legal knowledge, as they are in a constant and reciprocal state of producing

---

17 Jasanoff 2004.
18 Hurlbut, Jasanoff, and Saha, 982.
19 Cole and Bertenthal, 352; Christopher Columbus Langdell (1887, p. 124).
20 *Corpus Iuris Civilis*, Ins. I, 1.
21 See Daubert v. Merrell Dow Pharmaceuticals (1993).
22 Cloatre and Pickersgill, 82.
23 Cole and Bertenthal, 352, 353.
24 Cole and Bertenthal, 352.

each other.[25] Law and science, the two major epistemic authorities, co-exist and co-produce. They borrow from each other, they are translated and re-translated from each other, and they are built on each other in multiple ways.[26] However, even STS scholarship rarely challenges the old-fashioned contrast of lawyer v. scientist.

C. STS, Law, and Hybridities: The Subject-Object Dichotomy

Usually, STS understands law as a case study, one among many, to interrogate with questions regarding to science, technology, and society. To do this, it analyses different behavioural patterns and constituents of law which create ways of being, knowing, and doing. STS does not concern itself with the definition of law. The complex characteristics of the normativity of techno-material networks make defining law rather challenging.[27] Therefore, STS tends to take law within this complexity as an assemblage of different multi-layered overlapping networks which extend beyond institutional boundaries. Accordingly, the concepts which derive from the ontological substance of law such as the 'subject' and 'object' fail to define the contemporary society. STS aims to explore the subject-object dichotomy and the role of socio-technical hybrids within the ecology of law.

One of the major theoretical approaches in STS scholarship is the Actor Network Theory (ANT), which is generally attributed to Bruno Latour.[28] According to Latour, it is not enough to understand science and its impact on society to understand science and technology. One should take all the elements in the network into account to have a grasp on the interrelated dynamics of law and innovation. Scientific communities, scientific methods, objects, patterns, symbols, and even social movements have agency in enacting science. This object-oriented ontology of Latour is sometimes referred to as 'science in action'.[29] This is as important in law as it is in science.

---

25 Jasanoff 2004, 37 ff.; Jasanoff 2007; Sheila Jasanoff (ed), *Reframing Rights: Bioconstitutionalism in the Genetic Ag.* (MIT Press 2011).
26 Jasanoff 2007.
27 Turner and Wiber, 459, 451, 468.
28 Bruno Latour, *Science in Action* (Harvard University Press 1987); Bruno Latour (tr. Catherine Porter) *We Have Never Been Modern* (Harvard University Press 1991); Bruno Latour, *Reassembling the Social: An Introduction to Actor Network Theory* (Oxford University Press 2007).

332

ANT rejects binary distinctions such as nature v. society, object v. subject, system v. network and so on. Rather, it revolves around the anti-dialectical premise that everything is object and subject at the same time and all the time. This is also applicable to their relationship and exists in multiple stages and in multiple conditions. The way we weave it together depends on the questions we ask, the problems we want to solve, and what we find during our research. In this regard, every interactional and communicative artefact in creating scientific knowledge is referred to as an *'actant'*. This means an object, subject, or their boundary itself have agency and active roles in the process of making science and law.

Today, private law poses important questions regarding the agency of the non-human actors or any other *actants* in the political and economic life. How should platforms be regulated in the world of hyperconnectivity? Will the AI technology result in a new type of slavery? Will online manipulation turn the autonomous agent into the *longa manus* of digital technology? How can we decide on responsibility and liability without necessarily understanding autonomy and freedom in the digital age?[30] Today, these legal questions regarding AI, smart contracts, and ubiquitous technology require us to shift our perspective from a subject oriented view to a more object-oriented ontology.[31] STS claims that objects should be evaluated and interpreted according to what they 'do' within a particular network. This is not only applicable to non-human participants in the legal scene but also to regulations, legal processes, or societal relationships through their existence and usage in law as 'socio-legal realities'.[32]

It is important to discuss how the modern overemphasis on the duality of subjects and objects prevents us from adding the necessary depth to today's flat ontologies existing in the relationship within the networks of control. On the one hand, adopting an STS approach helps to critically analyse the historical hold of the separation between the 'object' and 'subject' in law.

---

29 Pottage 2012; Cloatre and Pickersgill, 83.

30 Ucaryilmaz Deibel, Dualism, 2021.

31 Bruno Latour, 'Where are the Missing Masses? The Sociology of a Few Mundane Artefacts' in Weibe, Bijker and John Law (eds), Shaping Technology-Building Society: Studies in Sociotechnical Change (MIT Press 1992) 225–257; Günther Teubner, 'Substantive and Reflexive Elements in Modern Law' (1983) 17 Law and Society Review 239–286; Günther Teubner, 'Breaking the Frames: Economic Globalization and the Emergence of Lex Mercatoria' (2002) 5(2) European Journal of Social Theory, 199–217.

32 Cole and Bertenthal, 363; Hunter 2015.

On the other hand, the rejection of dualisms and deparadoxification comes with the danger of paralysing STS scholarship. Its radical epistemological position risks that an analysis looks at what is on the surface without discussing the problem at a deeper level.[33]

When there is a legal case, the general application of subject-object distinction becomes arbitrary. Techno-legal phenomena can rarely be defined by science and most of the time law relies on arbitrary definitions.[34] To reach a higher level of interdisciplinarity, the distinction which has been semiotically translated into the legal realm because of some compromise should become part of the discussion. For example, analysing the boundary between 'nature' and 'invention' would be necessary to thoroughly discuss what is patentable.[35] In other words, we discuss the subject and object, namely invention and nature, based on previous ideas about what is a patent. After reaching this historical insight from a legal point of view the question transforms to another one: How should this distinction and the status of patent be understood in their relationship to the basic principles of law?

D. Inter-disciplinarity and Intra-disciplinarity within and outside of Law

STS takes law as a material practice which deals with a variety of heterogenous phenomena.[36] Law does so in a specific way so that the field sometimes comes to life as self-reproducing and self-referencing.[37] Law clarifies, trans-

---

33 Deibel 2023.
34 Deibel 2018; Cole and Bertenthal, 255.
35 For Instance, the 1980 Supreme Court decision *Diamond v. Chakrabarty* allowed patents on living organisms. Yet, in 2013 the US Supreme Court ruled that human genes are not patentable. This is an illustration that the cases should be understood based on relevant constitutional commitments of the era. Hurlbut, Jasanoff, and Saha, 986–989.
36 Bruno Latour*, La Fabrique du Droit* (La Découverte, 2002); Cole and Bertenthal, 360.
37 Luhmann's system theory takes law as a normatively closed, yet cognitively open, self-referential, and autopoietic social system. Niklas Luhmann, *Soziale Systeme* (Suhrkamp 1987); Niklas Luhmann, *Das Recht der Gesellschaft* (Suhrkamp 1993). Luhmann's theory of systems and Latour's ontology of networks are similar even though the referential process of law is considered underdeveloped in Latourian sociology. One major difference between Latour and Luhmann's accounts of law lies in the inclusion of the environment of communication in the definition of the system. According to Luhmann, such inclusion would make an exception to the rule

lates, and coheres.[38] This makes law a network of *actant*s where legality becomes the network's *modus* of existence.[39] It shows how *actants* are assembled.[40] This requires law to be reflexive and to recognize the limits of its own capacity. Such reflexivity is not only relevant for analysing the legal system itself. It is also crucial for scrutinizing the study of law and jurisprudence and it emphasizes the role of inter- and intra-disciplinary approaches.[41]

Certain fields of law are more reflective about law than others. This includes fields with inherently interdisciplinary characteristics such as philosophy of law, sociology of law, comparative law, legal history and so on. However, the practical questions regarding technology and innovation have been mostly dealt with by private law. On the one hand, private law decides whether smart contracts are really contracts, how to protect IP, what should be understood as 'privacy', or who will be liable for the damage caused by a self-driving car. On the other hand, all these topics have a very strong public dimension such as democracy, legitimacy, transparency, food, agriculture, health, etc. STS scholarship is often interested in underlying phenomena such as invention, discovery, authorship, autonomy, agency, or responsibility.[42] Engagement with other areas requires engagement with a basic scientific methodology, which is typically part of STS. Therefore, adopting an STS view does not only increase interdisciplinarity in law but also weaves private and public dimensions together.

---

of operational closure. However, Latour's ontology includes communication in the network. See Jörn Richert, 'Luhmann, Latour and Global Petroleum Governance' (2018) 22(2) European Journal of Social Theory 231–249; Irene van Oorschot and Willem Schinkel, 'The Legal Case File as Border Object: On Self-reference and Other-reference in Criminal Law' (2015) 43(4) Journal of Law and Society, 499–527, 507 ff. However, Turner and Wiber argue that any view of law as a closed system must be rejected as law is generated in many social spaces aside from legislatures. Turner and Wiber, 462. According to Jasanoff, lawyers see law as a closed system and therefore bring it into reality created by the expectation of law as a closed system because of co-producing. In this sense, law acts as a social system which operates within its 'environment' which does not present an ontological reality and can only be observed through self-referencing. Jasanoff 2004; Jasanoff 2005.

38 Cole and Bertenthal, 361; Pottage 2012, 175.
39 Bruno Latour (tr. Catherine Porter) *An Inquiry into Modes of Existence: An Anthropology of the Moderns* (Harvard University Press, 2013).
40 Cole and Bertenthal, 360.
41 Cole and Bertenthal, 363.
42 Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (Random House 1994); Michel Foucault (tr. Alan Sheridan) *Discipline and Punish: The Birth of the Prison* (Random House 1995); Hurlbut, Jasanoff, and Saha.

Private law and public law have equally important and inter-connected roles in regulating technology. However, this traditional division does not match social reality for many reasons. Firstly, ethical behavioural standards in the public and private sphere have been historically translated and re-translated, often from each other. For instance, good faith is generally understood as a private law concept. However, its basic components, like proportionality or reasonableness, have been developed in private law through a constant interaction with public law.[43] These flexible standards are typically considered to be well-equipped to be used when dealing with nubilous legal questions regarding technology and innovation.

Secondly, the inter-dependent relationship of public and private law is particularly visible in transnational trade relations. Cosmopolitanism has been a major factor in the reconciliation of private and public aspects of law. This is more relevant today since globalism 'broke the frames' of the nation state and blurred the lines between public and private.[44] The intricate relationships between private and public authorities including different levels of regulations, whether they are law or proto law, have agency in shaping science and innovation.[45]

Thirdly, private law today assumes a transformative role in society. Societal challenges arising from globalization and digital technology highlight the public dimensions of traditional private law matters. Private law is no longer only about providing commutative justice between parties. It is also about social justice and equitable distribution of value. Transformative characteristics of private law manifest themselves in many areas including housing, climate litigation, IP in pharmaceutical industry, plant biodiversity, and human rights protection in the global value chains.[46] Addressing these issues requires having an intra- and interdisciplinary research agenda.

One can still question why such an interdisciplinary perspective would make 'law' function better. What are the benefits of engaging with STS in legal discussions? STS, as opposed to philosophers who are interested in the epistemology of science and what science ought to be, emphasizes the

---

43 Talya Ucaryilmaz Deibel, 'The Principle of Proportionality in Modern Ius Gentium' (2021) 36 Utrecht Journal of International and European Law, 14–32.

44 Günther Teubner, 'Global Bukowina: Legal Pluralism in the World Society' in Günther Teubner (ed), Global Law Without a State (Dartmouth 1996), 3–28.

45 Cloatre and Pickersgill, 87.

46 Talya Ucaryilmaz Deibel, 'Corporate Social Responsibility in the Legal Framework of Global Value Chains' (2021) 15(2) The Law and Development Review, 329–356.

importance of 'action' and the process of creating scientific knowledge.[47] Regulations, legal definitions, and legal patterns have major roles in translating scientific knowledge. What STS does is to take a case study, for example gene patenting, and to try to understand and to criticize it based on the subject-object distinction. An STS approach constantly puts legal categories and legal foundational concepts in rotation no matter what the case is. This helps us to better understand the epistemic role of law in technology and innovation.

On the one hand, contemplating the agency of law in science and technology is crucial considering that law needs to respond to science, technology, and social implications of them. Idealistically, this requires an interdisciplinary mindset. On the other hand, the legal system, on an opportunistic level, aims to reach more sensible conclusions with minimal effort. A straighter line between external ontological categories and legal norms and verdicts would make the legal answers widely supported, legitimate, and efficient. Constructing the rule system to respond to the 'reality' requires contemplating about the natural and the social. In other words, the interdisciplinary approach brings us to the question that Jasanoff asks: How can we design the legal framework as practical and as just as possible under conditions of scientific uncertainty?[48]

E. Recognizing Each Other's Existence: Harder Than It Seems

Reconciling STS and law is harder than it looks. STS takes scientific knowledge as a social phenomenon.[49] It takes science as unstable and unclear, and this places it in opposition to the positivist account embraced by law. According to STS scholarship, 'what is scientific?' is not an easy question to answer. This does not necessarily mean that scientific reality does not exist but rather that people who claim that reality exists constantly misrepresent reality. This is especially relevant in the age of post-truth where knowledge production is widened and democratized.[50] For example, it is foreseen that

---

47 Cole and Bertenthal, 353.
48 Sheila Jasanoff, 'Law's Knowledge: Science for Justice in Legal Settings' (2005) 91 American Journal of Public Health, 49–58.
49 This approach has caused famous 'science wars', as well as many other controversies within the field. For detailed information see Andrew Ross (ed), *Science Wars* (Duke University Press 1996).
50 Steve Fuller, *Post-Truth Knowledge is a Power Game* (Anthem 2018).

337

in a couple of years the volume of false data regarding climate science will exponentially increase.[51] This means that the legal normative framework will have to either draw on falsified data or try to expand and deepen its understanding of the relationship between science and authority if it is not to become an agent in the amplification of falsified data.[52]

Constructivism, namely believing that everything including nature and science is constructed, does not necessarily need to imply relativism. Recognizing that certain phenomena follow certain procedures which are outcomes of certain compromises does not necessarily disqualify the procedures. It does not mean that nothing exists *a priori* either. Rather, there might be a friction between what exists, what is seen, and what is done. This poses challenges when it is put in a language that does not prioritize the visibility of perspectives, ideological lenses, and conceptions of materiality. Law as a normative social system does not necessarily need to be based on essentialist ontological claims and a deeper discussion with STS helps to critically engage with law's normativity and its essentialism.

Similarly, STS sometimes ends up denying the epistemological contributions of law. For instance, STS scholarship does not consider underlying multiple legal theories if they do not clearly demonstrate their relevance in the case. In other words, STS acknowledges law if the legal argumentation sits on the heart of a discussion, for example about what a 'person' is, what 'AI' is, or what 'DNA' is. However, STS tends not to focus on legal analysis that is derived from deeper levels of the discussion that requires historical and comparative knowledge. Deeper dimensions of law rarely pop up in STS legal case studies. Consequently, there is a missing link with historical and comparative components which would potentially be relevant to better understand multiple realities of the case.

Law has already reached a compromise between different schools of jurisprudence. Its *longue durée* of negotiations between different regions, approaches, and spheres helped law to reach a certain level of stability which is sometimes not visible through an STS lens. This means that the relationship between STS and law might still lack the necessary rigour that is much needed to deepen the layers of scientific and social analysis. This does not make the existing dialogue between STS and law meaningless.

---

51 Steve Fuller, 'Shaken Not Stirred: The Name of the Game in the Post-Truth Condition' (2023) Critical Review, 1–18.

52 On the contrary, Steve Fuller sees this radical break as an emancipation and decentralization of scientific authority. This requires being sceptical towards organized versions of 'truth'. Fuller 2018.

338

Quite the opposite, it requires to be more nuanced about the challenges that sit in this interdisciplinarity. Adopting a mainstream constructivist approach in analysing technology makes it harder to deviate from the case studies to have a broader perspective.

Both the complexities and the benefits of this methodology demonstrate themselves when we consider cases situated at the boundary of law and society. So-called boundary objects belong to multiple universes.[53] For instance, plant biodiversity, gene patenting, artificial intelligence, transhumanism, or any other cases that are situated at the boundary of law and society cannot be merely taken as isolated examples anymore. The boundary objects are misunderstood when they are reduced to dualisms. Legal or illegal, subject or object, nature or invention are just basic dichotomies that both law and STS challenge in the digital era.

These boundary objects are also examples that should show how law has been negotiated to create the normative framework of technology. For example, the usage of embryos for research is heavily restricted in Germany and the adult stem cells are allowed to be imported if approved by the Central Ethics Commission for Stem Cell Research (ZES).[54] An STS approach on stem cell research should take the concept of *Rechtsstaat* as well as 'human dignity' as the constitutional basis of personhood in its complexities.[55] This requires a good command in ethics, critical theory, history, economics as well as international law, private law, and public law.

Especially the boundary objects that push the agenda in social, legal, and technological terms contribute to the development of deeper discussions between law and STS. Because the stakes are high the need to engage with different social and scientific systems and different spheres of law becomes necessary. This is not solely visible in societally important practical

---

53 Susan L. Star, 'The Structure of Ill-structured Solutions: Boundary Objects and Heterogeneous Distributed Problem Solving' in Les Gasser & Michael Huhns (eds), *Distributed Artificial Intelligence* (Morgan Kaufmann, 1989) 37–54; Susan L. Star, 'This is Not a Boundary Object: Reflections on the Origin of a Concept' 35 (2010) Science, Technology, & Human Values, 601–617; Thomas F. Gieryn, 'Boundary Work and the Demarcation of Science From Non-Science: Strains and Interests in Professional Ideologies of Scientists' 48 (6) (1983) American Sociological Review, 781–795; Eric Deibel and Sakari Tamminen, *Recoding Life: Information and the Biopolitical* (Routledge, 2018) 48.

54 For the Embryo Protection Act (Embryonenschutzgesetz - ESchG) see https://www.gesetze-im-internet.de/eschg/BJNR027460990.html. For the Stem Cell Act (Stammzellgesetz) see https://www.gesetze-im-internet.de/stzg/index.html/ (11.07.2023).

55 Hurlbut, Jasanoff, and Saha, 986–989; Jasanoff 2004, 16.

cases but also relevant for niche areas which require to steer the direction away from the mainstream route such as open-source seeds or democratic mail systems which revolve around basic values such as freedom and democracy.[56] A meticulous engagement between STS and law is challenging yet especially rewarding for boundary cases as it helps law to be critically responsive to technology and innovation.

F. Conclusion

STS is a useful tool to analyse how the natural and the social interact with each other. It also demonstrates how the public and the private should be interpreted relatively to each other when dealing with digital technology and innovation. It is practical as it permits us to address the plethora of contemporary issues within a single interdisciplinary approach.

Paying attention to the dynamics of the scientific knowledge production and having a thick view of the details is necessary for the cross-fertilization of law and technology. However, both law and STS are sometimes in denial of their relationship to history, comparative studies, and political philosophy. Analysing techno-scientific legal questions requires 'comparative law' to put the 'comparative' back in the game and develop a methodology to analyse law from a perspective in which law is one of many other things. Nonetheless, this requires willingness and not to wait for external experts to do it for us. STS should be in the legal scholar's tool kit to overcome the lack of inter- and intra-disciplinarity.

STS focuses on the empirical questions regarding the relationship of technology and innovation to society and this comes with a risk of putting the theoretical foundations of the legal questions on a secondary spot. STS argues that it is symmetrical between science and society yet over the years it has shifted more to the science and technology part and less and less to the society and their interaction. Law with its rich history, sociology, and philosophical traditions can provide a fertile area for STS scholarship. In addition, a deepened engagement with political theory and history would help legal scholars to better understand how existing legal institutions need

---

56 Eric Deibel, 'Open Sesame: Open Source Seeds and Crops' in Fabien Girard and Christine Frison (eds), The Commons Plant Breeding and Agricultural Research (Routledge 2018), 74–88.

340

to be finetuned, given the various new challenges.[57] In that sense, such parallelism between law and STS is another hint that these two areas can substantively contribute to each other if they do not lack the theoretical rigour and are open to become more reflective.

Acknowledging the complexities of the dialogue between technology and law is important to reach a fruitful and meaningful understanding of interdisciplinarity. To establish a better relationship between technology, innovation, and law it is necessary to form a triangle: Law, STS, and their philosophical theoretical foundations. This would facilitate creating a fair, ethical, and sustainable legal design for today's digital society.

---

57 Ucaryilmaz Deibel, Proportionality, 2021.