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Title	Forgotten boundaries in law: on AI and neurotechnology
Authors	Deibel, Talya;Deibel, Eric
Publication date	2025
Original Citation	Deibel, T. and Deibel, E. (2025) 'Forgotten boundaries in law: on AI and neurotechnology', Law, Technology and Humans 7(1), pp. 96-106. https://doi.org/10.5204/lthj.3814
Type of publication	Article (peer-reviewed);journal-article
Link to publisher's version	10.5204/lthj.3814
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Download date	2026-10-31 01:24:02
Item downloaded from	https://hdl.handle.net/10468/18167



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Volume **7** (1) 2025 https://doi.org/10.5204/lthj.3814

Forgotten Boundaries in Law: On AI and Neurotechnology

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Abstract

This article focuses on the intersection of private law, science and technology studies (STS) and frontier technologies such as artificial intelligence (AI) and neurotechnology to demonstrate how myths and narratives shape sociotechnical developments. It examines how private law traditionally relies on the concept of the 'natural person', with clear boundaries between inner and outer realms – a myth that influences law and technology scholarship. The article first analyses different narratives applicable to AI and neurotechnology that challenge established legal concepts such as persons and things. Then, through narrative analysis, it demonstrates how private law has been transformed by, and simultaneously transforms, various technoscientific practices. The perspective deployed in this article aims to contribute to law and technology scholarship by introducing a comparative and pluralistic methodology that combines historical and comparative legal analysis with STS to understand the mutual shaping of law and technology.

***Keywords**:* AI; legal personhood; neurotechnology; private law; STS.

1. Introduction[1]

The modern understanding of private law is based on the myth of the natural person, narrated as if there are clear boundaries between the inner and outer realms. It is the sovereign individual of political theory conceived of a physical and spiritual being whose body is governed by a rational mind that is both hidden and private. Crucially, this myth is also integral to how technology is narrated, both historically and today.

Artificial intelligence (AI) and neurotechnology, which are often regarded as separate fields of research, are examples of this. While neurotechnology is associated primarily with healthcare, AI is frequently linked to robotics and computational methods. However, they have significant similarities. The development of AI technology draws inspiration from neuroscience;[2] similarly, neurotechnologies often involve brain–computer interfaces, which establish direct communication between human brains and technological devices, and as such incorporate AI and machine learning technology.[3] Moreover, neural data are often collected and analysed through AI-driven algorithms. Their convergence is also evident in how AI and neurotechnology symbolise the symbiotic relationship between human bodies and various technological practices, thereby reconstructing the narrative around legal personhood.

This is an illustration of a basic insight of science and technology studies (STS) from over half a century ago: science and technology shape and are shaped by society. Like law, the term 'society' does not refer to a singular category; rather, it should be understood in terms of a variety of technoscientific practices that are integral to the reproduction of society. The same holds

[1] This publication has emanated from research conducted as part of the Law and the Inner Self Project, funded by a Research Ireland Laureate (Consolidator) grant (2022/2628) and with the financial support of Science Foundation Ireland (SFI) at the ADAPT Research Centre for AI-Driven Digital Content Technology under grant number 13/RC/2016 P2.
[2] Pickering, The Cybernetic Brain; Hassabis, "Neuroscience-Inspired Artificial Intelligence."
[3] Latour, We Have Never Been Modern; Hayles, How We Became Posthuman.



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true for science and technology, which are understood in terms of specific settings and systems that shape the social as a reflection of society, its values, interests, power dynamics and other such sociological categories.[4]

This article therefore adopts this perspective to examine the powerful sociotechnical imaginaries that surround and permeate AI and neurotechnology. On the one hand, this involves analysing the role of narratives that challenge established legal concepts such as 'the person', 'the thing', 'privacy' and 'data'. On the other hand, the article focuses on AI and neurotechnology, exploring how these technologies are transformative in ways that require closer attention to private law theory. This brings the theoretical, methodological and political significance of legal history to the fore, especially in the context of emerging technologies, experimentation and STS more broadly. This perspective goes beyond the obvious point that law today has become increasingly invested in technoscientific practices and is shaped by them. It is equally important to recognise that private law has its own performativity – its ability to shape the social and the technological in its own image.

Specifically, the article refers to legal history as the field from which to approach efforts to regulate AI and neurotechnology. The STS perspective becomes critical as it aims to foreground a perspective on private law, with its 2000-year-old history dating back to Roman law.[5] This relationship between STS and private law is essential in an understanding of the integration of AI and neurotechnology into human bodies, minds and daily life. For instance, private law and its underlying principles are being reinforced, challenged and transformed in close relation to the narratives of hope and fear that are invoked in the context of AI and neurotechnology.

This article argues that private law theory should be placed at the centre of how the narratives that surround these technologies (re-)imagine the legal and social order.[6] Narratives not only refer to storytelling; myths are potent – they create narratives and discourses and inform how words translate into actions. They carry an imperative character as they play an active role in the sociotechnical imaginaries that lead to the creation of material infrastructures.[7] This applies directly to law, particularly when its foundational categories are challenged. Myths become crucial in creating sociotechnical imaginaries, to deal with what is uncertain and nebulous from the standpoint of law while also providing guidance and pointing to plausible future directions.[8]

These narratives revolve around what the title refers to as 'forgotten boundaries'. These are not the rigid legal lines of modern law; rather, a historical understanding of contemporary law considers such lines to be a collection of boundary zones. These zones involve substantial commitments regarding the legal (boundary) work required to maintain established categories, transform them into frontier areas or otherwise redefine them. This implies that modern legal categories such as 'persons' and 'things' should be viewed as specific (boundary) objects that require constant management, surveillance and intervention.[9]

The dialogue with STS aims to contribute to comparative legal methodologies that are better equipped to address the normative challenges posed by AI and neurotechnology. This calls for methods inspired by STS, reflecting a broader context in which law and technology scholars adopt more pluralistic and critical perspectives, drawing from meta-disciplines such as sociology, philosophy and the history of science, technology and law.

2. On STS and Private Law

The starting point for this article is a basic tension between two classical positions from the early days of STS. The first refers to technological systems as integral to the reproduction of modern societies. This implies that science and technology are heavily shaped by a limited range of social groups, their interests and material practices, with a strong hold over ideas in today's liberal economy.[10] The second insight started out as a response to this perspective, pointing out that science and technology are not simply shaped by the hierarchies, influential interest groups and other types of powerful agents.

Accordingly, STS makes it impossible to approach technology as something that exists in isolation from what it means to be human, to be a person, to have authentic experiences, to possess, to be private, to be a subject and so on. This includes any approach that would see the law as the logical opposite of progress, framed as constantly falling behind, unable to keep up with

[4] Sismondo, "Introduction to Science and Technology Studies"; MacKenzie, "Social Shaping of Technology"; Klein, "The Social Construction of Technology."
[5] Ucaryilmaz Deibel, "Back to (for) the Future"; Ucaryilmaz Deibel, "Artificial Intelligence in Ancient Rome," 157ff.
[6] Jasanoff, Reframing Rights.
[7] Mosco, The Smart City.
[8] Torgersen, "Technology Assessment," 124.
[9] Gieryn, "Boundary-Work," 781; Bowker, Sorting Things Out; Tamminen, Recoding Life, 49.
[10] Winner, "Do Artefacts Have Politics?"

technological change, or about law as the steward of society, protecting it from technological transgressions, risks and harms that science and technology might end up inflicting on it.[11] After all, the same uneasy relation can be observed between law as a system and the difficulty of affirming its own basic categories in a technological world where complex relationships are involved in various new types of agency that come to characterize legal concepts such as 'the person', 'the thing', 'privacy' and 'data'.

This complexity is not incidental, with early STS seeing it as part of why technology is able to surprise us, to enable directions that could not be anticipated in advance, and as inescapably part of the authorization of types of agency at the centre of modern life.[12] Law is not different in its relation to technology, given its hold over any of its sharply drawn lines that begin to blur the boundaries between subjects and objects, inner and outer, body and information, person and property, and so on. Modern law is built on qualities tied to science and technology, such as the distinction between the organic and the artificial. In law, these categories form the basis of the modern distinction between personhood and property, natural personhood and IP.[13] In this regard, the STS perspective offers a framework that embraces hybrid categories and grey areas. It is not that the lines between established categories are being erased; rather, the perspective emphasises how modern dichotomies that have come to characterise law are often misunderstood when viewed through a myopic lens.

Law as characterised by dichotomies echoes the perspective of Bruno Latour, one of the key figures in STS. In the early 1990s, Latour pointed out that the modern world and its basic social order were organised around these types of dichotomies, each of which seeks to establish a separation of 'Nature' and 'Culture'. This separation, which he calls acts of purification, is being overwhelmed by the many types of 'hybridisation'. This refers to the experiment as a key dimension of modernity, authorising objects, things, artefacts, and products that blend the nature of science and technology with their authorization as integral to modern culture.[14] The result is a paradox: a commitment to modernity that denies its relation to the countless artefacts and types of knowledge that are produced in the confined spaces of experimentation, where science and technology are created as a special relation to nature, as natural history, as physics or mathematics, and as any other of the strong claims on what reality is like.[15]

In turn, the paradox applies to a lack of reflection on what exactly is 'modern' about the contemporary conception of legal personhood. For example, futuristic theories such as posthumanism and transhumanism refer primarily to conceptions of humanness that are modern, either coming from the eighteenth-century Enlightenment or nineteenth-century Kantianism.[16] The same applies to law to the extent that there is little interest in how and why contemporary protection of personhood initially flourished in Roman law. This is a topic that is well studied but remains within the disciplinary confines of legal history, with a lack of appreciation for how modern private law doctrines are based on legal remedies of antiquity. Accordingly, it is in Roman law that a different perspective can be found, as it represents the remarkable continuity and longevity of law and legal narratives, as opposed to pure memory, direct experience and observation echoed by the language of the scientific revolution and the experimental paradigm.[17]

On the one hand, this is a point about continuity. Contemporary legal tools have more than 2000 years of history, representing epistemic continuity in terms of the narrative structures of the legal and policy instruments on AI and neurotechnology. On the other hand, it should be clear that private law was recontextualised several times, including during the imperial era, the Byzantine period, medieval times and the *ius commune*. Each period had distinct political and technological characteristics that created a new legal reality. The Enlightenment and a strictly applied Cartesian perspective transformed the Romanist tradition. Yet, early modern and modern private law codifications did not decouple themselves from Roman antiquity.

A key example is today's narrative of the 'protection of personhood/personality interests' in European laws with respect to emerging technologies. For instance, in the civilian tradition, personality interests are protected through 'personality rights'. These are often seen as products of Kantian-inspired German legal scholarship; they refer to a bundle of rights that aim to protect legal interests associated with personhood.[18] This includes bodily integrity, mental/psychological integrity, privacy, identity, reputation, freedom, dignity, personal data and so on.[19] Consequently, the natural person is seen as a dual being. The

[11] Marx, "Technology"; Nye, Technology Matters, 1–15.
[12] Winner, "Artefacts," 121ff; Latour, "Give Me a Laboratory"; Hughes, The Social Construction, 75.
[13] Kurki, Personhood; van Beers, "Natural Persons"; Deibel, "Demarcation in Law."
[14] Latour, We Have Never Been Modern; Latour, Reassembling the Social.
[15] Latour, We Have Never Been Modern, 91ff
[16] Hayles, How We Became Posthuman, 84ff.
[17] Wootton, The Invention of Science.
[18] Resta, "Personnalité, Persönlichkeit, Personality," 214–215; Neethling, "Personality Rights," 220ff.
[19] Beyleveld, Human Dignity.

natural person is a legal fiction, which has a physical and psychological existence. It has an outer and an inner world. What this shows is the point made earlier: a perspective in which the modern person has an outer and an inner self.[20] Such an inner self is epistemologically closed and ontologically separated. It has unmanifested thoughts, emotions, desires, wills, ideas and memories. It is opaque and impenetrable. Even though it sits in the metaphysical realm, legal personhood is deeply connected with the idea of an inner self.[21]

On the one hand, this explains why modern laws provide strong protection, mainly because of the idea of the existence of an inner self. This protection implies making a pragmatic separation between the inner sphere (thoughts, feelings, emotions) and the body, as well as between personhood–property, subject–object and public–private. In the end, private law's approach to personhood crystallises in two key points. First, private law takes the natural person as a dual entity: a biological being with a body that ends with the epidermis and a mind that is an unreachable castle.[22] Second, private law takes personhood primarily as a legal fiction. Even though it is based on natural law, personhood refers to a legal category that undergoes stages of naturalisation and artificialisation.[23] Today, all human beings have personhood by virtue of being born.

On the other hand, modern conceptions of personhood, contracts and property stem from Roman law, where foundational categories were never completely stable. For instance, personhood as a legal category initially emerged in relation to property. In Roman antiquity, personhood was characterised by the capacity to own. Humans were legally treated as '*persona*' due to their capacity as proprietor, whereas slaves mostly fell under the legal category of '*res*' (things).[24] This illustrates how the narrative of property, market and competitiveness is deeply rooted in the private law theory.

Its implications include further examples, such as how legal questions around AI and neurotechnology concentrate on 'how to protect persons better'. This question has been at the centre of private law ever since its creation, as a social and political narrative. The point, however, remains the same: Roman antiquity retains a strong hold on the present, which carries over to a view of private law and its complex history as performative in the creation of visions of the future. Today, when we analyse AI and neurotechnology, we witness the same narrative patterns: the narrative of humanness accompanied by the narrative of ownership, performance, and competition. This includes how AI is often discussed in terms of concepts such as 'trust', 'responsibility' and 'efficiency'. These notions reflect the concept of legal personhood as a legal-philosophical concept that arose in Roman law through its relationship with what might be called frontier technologies of the era, such as military, navigation, commerce and production.

Finally, the implication for the remainder of the analysis is not that we should always go back to antiquity and never move forward when we deal with a new technology. Indeed, the opposite is true: pushing the unstable dichotomies of law back by at least a millennium changes the perspective on the modern separation of Nature and Culture to which Latour points. Accordingly, an alternative approach becomes possible, whereby private law theory is at the centre of how we plan to deal with future technologies. We need to develop a deeper and broader narrative analysis of private law theory alongside those of contemporary technoscience, as a powerful normative framework through which law in its myopic form seeks to remain blind to its own long history.[25]

3. The Myth of Personhood

Myths are powerful. Sometimes they create stories in the form of decontextualised narratives. Sometimes they are aestheticism, and as such they become appealing as discourses. Sometimes they take the shape of marketing tools.[26] At other times, they imply narratives that provide explanations and interpretations for techno-legal concepts that are difficult to conceptualise. They reflect long-standing power relations, with certain narratives benefiting some actors and hindering others from pursuing their interests. This includes technology, with its dominant myth of having the power to influence destiny, illustrated in the case of the myth of personhood and how it influences and disrupts the narrative frameworks of AI and neurotechnology.[27]

For example, Barthes characterised myths in terms of 'neither/norism'. This refers to the pronouncements on the utopian potential and dystopian risks of technology, as well as the idea that personhood should be seen as categorically distinct from

[20] Regarding the idea of the inner self, see O'Callaghan, Law and the Inner Self Project.
[21] Deibel, "Demarcation Problems."
[22] Resta, "Personnalité, Persönlichkeit, Personality."
[23] van Beers, "The Obsolescence of Human Beings," 189.
[24] Ucaryilmaz Deibel, "Back to (for) the Future."
[25] Shapin, The Leviathan and the Airpump.
[26] Mosco, The Smart City, 171.
[27] Torgersen, "Technology Assessment," 127.

the object/machine exactly when it is on the verge of transforming social relations.[28] Myths show the world in specific ways, creating materialities, order and a relationship with the 'unknown'. This is today visible around the narratives of AI and neurotechnology, each of which is a narrative response to the myth of free and autonomous mental and physical integrity. The same applies to its legal version: the entity that is the bearer of rights and obligations, which can freely conclude contracts and whose identity and dignity entitle it to protection.

What matters about the narratives that surround technology is that they show the ability to shake this liberal myth by blurring the line between life and information, artificial and organic, and person and thing. The point is not only that this creates legal challenges as legal instruments start from the separation of such ontological categories encompassing binary concepts such as body–mind, person–property and public-private. Rather, legal history shows that the underlying values of the challenges to this mythology belong to the 'market'.[29] In other words, the person in European law can be seen as the subject of rights and obligations, primarily created by and for the market. The legal person was not any person; he was the white, rich, and male person who could have property rights and other rights *in rem.* This mythology of *persona* changed its external form with the human rights paradigm of the twentieth century. Yet, its foundational tie with ownership and power relations remained.

In other words, it never decoupled itself from the class, gender, and race asymmetries that belong to the deeper layers of western legal systems. That is to say, the myth of person reflects a tension with the concept of personhood of future and modernity. Modern laws are often built on ontological binary categories that are often presumed to be separate and distinct from each other to achieve a certain level of legal clarity. Law acts 'as if' the body is a different phenomenon than the mind. Law treats the public sphere 'as if' it is separate from the private. Law sees personality rights 'as if' they are clearly distinct from what we call property rights.[30]

In this context, the concept of 'myth', particularly in the works of Claude Lévi-Strauss and Roland Barthes, becomes informative when looking at personhood. According to Lévi-Strauss, myths can create collective ownership over the meaning of a concept. They have discursive power, and through this they bridge the gap between history and future.[31] Again, this applies to the myth of the 'integrated person' who is free, who has privacy, who has autonomy and a degree of control over writing their own narrative. The premise is that there is ontological privateness of the mental realm, operating as a key liberal foundation of the person as a bounded unique entity.[32] What the perspective of the myth also foregrounds is how myths rise and fall not because they are right or wrong, but because they are living or dead.[33]

The answer, therefore, is not a rejection of law and its dualisms (as myths); rather, it lies in a renewed interest in the nature of 'personhood' as mythical when considering its historical nuances and complexities. Its survival as a bounded unique form requires new legal scholarship, a new understanding of how to protect bodies, minds and the boundaries in between. It is in the boundary zones and crossings that different legal narratives resurface.

4. AI Narratives and Personhood

A legal narrative analysis that invokes the long history of private law theory shows that questions of responsibility, liability, and accountability are really questions of personhood. This is relevant in the context of how everyday narratives on AI switch back and forth between the language of moral philosophy and the market.

Clearly, there is no shortage of expert reports and strategy papers that frame AI as an inevitable development and as massively disruptive.[34] The frame that is invoked foregrounds competition and an urgent need to catch up, with its setting a geopolitical race that revolves around the capture of global markets. At the same time, AI is being presented as a technological fix to social issues, as a necessity for life quality and affluence. Each of these narratives, however, is still premised on the myth of 'personhood', invoking its history every time practical private law questions arise with questions of ethics revolving around

[28] Barthes, Mythologies, 81ff.
[29] du Plessis, Borkowski's Textbook; Schiavone, "Law, Slaves, and Markets."
[30] Deibel, "Demarcation Problems."
[31] Torgersen, "Technology Assessment," 119; Lévi-Strauss, "The Structural Study of Myth."
[32] Davies, Are Persons Property?, 7; van Beers, "The Changing Nature of Law's Natural Person," 189ff.
[33] Mosco, The Smart City, 172, 196.
[34] Bareis, "Talking AI into Being," 868–869.

about legal responsibility, commercial concerns pointing to liability issues and problems of accountability playing out as a combination of ethics and the market.[35]

The legal challenges of AI are not novel. For example, Lawrence Solum observed as much about AI in 1992.[36] More substantially, the various comments make an appeal to legal personhood. To be a 'subject of law' is, from a positivist perspective, a legal fiction. From a Kelsenian perspective, the human belongs to the realm of biology, whereas the person is a concept of jurisprudence.[37] In other words, the legal person is a human (natural legal person) or a non-human legal entity (juridical person/*persona ficta*) that is treated 'as a person'. Personhood essentially refers to a methodological tool – a fluctuating legal category as it historically depended on several social, economic, moral and technological criteria.

For instance, in both Roman law and the history of Anglo-American legal tradition, personhood emerged as '*status*'. In Rome, slaves, women and non-citizens were considered non-persons with 'human qualities'. This discussion has re-emerged in the context of AI and metaphors such as artificial 'intelligence' or machine 'learning'. These are perceived to create a new legal narrative wherein AI is seen as a human–thing hybrid.[38] AI reflects the human–machine nexus where the human characteristics are part of technical assemblages. We attribute characteristics to AI, making it anthropocentric on the premise that it will end up anthropocontrolled. An obvious example is how ChatGPT comes with a promise to be ethical and accountable alongside an openness to market relations. This combination reflects the behavioural standards developed in the long history of contract law.

One illustration is the standard of *'bonus vir'* (good man). The 'good man' is the origin of the honest citizen. He does not deceive and who does not act contrary to good faith.[39] Modern legal systems still evaluate events and responsibility according to *vir bonus* ideals.[40] Similarly, AI operates in the market with *'good faith'*. As such, it is honest, trustworthy and reasonable.[41] This rests on the myth of personhood as such behavioral standards were developed with respect to natural persons. In other words, these behavioral standards have their roots in human-centred ethics. Personhood as a legal category reflects being the bearer of rights and obligations. The legal person is the subject of law, who has certain rights, protections, privileges, duties, responsibilities and liabilities. The person is accountable and responsible for their own acts and actions. As such, the primary legal principle 'liability follows the wrongdoer' is anthropocentric by nature and has its roots in natural law and ethics.

Further examples can be found in national strategy papers. Germany promotes an AI imaginary along ethical lines, emphasizing participation, freedom and self-determination of citizens.[42] Similarly, France focuses on the humanist ethos of the AI while focusing on the importance of responsibility when it comes to its regulation.[43] The same examples can be considered on a larger scale by tracing them to Europe's AI Act and the Digital Services Act (DSA). These contribute to the same legal narrative, with the DSA seeking to create 'a safe, predictable and trusted online environment' while focusing on the liability of providers from harms to fundamental rights and broader societal risks. Article 25(1) chooses the word 'freedom' to emphasise the model person of law as a free and autonomous individual and highlights the provider's duty not to distort and impair their ability to make free decisions. Similarly, Article 5(1)(b) of the AI Act specifically prohibits practices that can exploit 'any of the vulnerabilities of a specific group' by causing personality harm.[44] Every time these instruments use words such as 'exploitation', 'vulnerability' or 'personality', they also form clouds of connotations as part of a narrative.

These examples serve to illustrate how private law has been performative. Policy instruments and papers tend to discuss the same problems of liability and accountability gaps when dealing with AI. Yet, reality is complex and messy: agency, autonomy, and causality are not often easy to establish clearly or detect with accuracy. To address the complexities, Roman law developed several technical tools to overcome strictness of law and dual categories when dealing with questions of liability with respect to new technologies. A key example is the *'peculium'*, which was developed as a methodological tool to establish responsibility for 'non-persons'. This referred to specific funds granted to slaves so that they could have contractual responsibility. Similarly,

[35] See EU AI Act; European Commission Report from the Expert Group on Liability and New Technologies – New Technologies Formation 2019; European Commission, White Paper on Artificial Intelligence; European Commission, Adapting Non-Contractual Civil Liability Rules (AI Liability Directive).
[36] Solum, "Legal Personhood."
[37] Kurki, A Theory of Legal Personhood, 8; Kelsen, Pure Theory of Law, 94.
[38] Bareis, "Talking AI into Being," 857.
[39] Cardilli, Bona Fides, 12; Ucaryilmaz Deibel, Bona Fides.
[40] See Lord Macmillan in *Glasgow Corporation v Muir* [1943] AC 448, 457, Also see 'bon père de famille' in French law, and 'buon padre di famiglia' in Italian law.
[41] Ucaryilmaz Deibel, Bona Fides.
[42] Bareis, "Talking AI into Being," 871–873.
[43] Bareis, "Talking AI into Being," 871–873.
[44] O'Callaghan, "The Right to Freedom of Thought," 2ff.

Romans developed special instruments called '*noxal* actions' to establish extra-contractual liability arising from the actions of 'non-persons'. [45]

This again indicates the constitutive role of myths and narratives in private law, especially when dealing with techno-mediated relations such as contracts. In effect, today's legal instruments express ethical standards that were developed in Roman private law and later translated into human rights and international law, such as good faith, proportionality and reasonableness. Again, the DSA is illustrative, as it distinguishes between different types of risk and imposes on providers the duty to mitigate systemic risks through 'reasonable, proportionate and effective' mitigation measures. From a legal methodological perspective, national civil and contract laws already impose ethical duties that potentially address such risks. Therefore, the emphasis on proportionality, reasonableness and effectiveness is performative, not in terms of its legal effect, but primarily in terms of narrative creation.

Many more of these Roman mechanisms are still in effect, forming the substance to the ability of private law to provide practical legal answers to today's challenges. It is effectively Roman law that is mobilised to address the responsibility and accountability gaps that occur when non-subjects have the primary agency, compared with personhood and autonomy. The same applies to AI when seen as the embodiment of human-like values and qualities such as security, trustworthiness, openness and good faith. The underlying myth is 'personhood' and 'non-personhood', which never emerged in connection to any type of sentience, or cognition – indeed, quite the opposite is the case: the Western legal narrative of personhood and its related types of ethics came out of the Roman conceptions of 'market' and 'ownership'.[46]

5. Neurotechnology Narratives and Personhood

AI and neurotechnology are often narrated differently in legal scholarship. However, there are key similarities, including those that come out of the history of private law. For example, neurotechnologies record or alter brain activity. Common examples are functional magnetic resonance imaging (fMRI) technology, which records brain activity based on the hemodynamic response, and electroencephalogram (EEG), which measures the electrical activity of the brain. Moreover, they can also include AI and machine learning technology. One example is brain–computer interfaces (BCIs), which connect the brain to a computer, initially developed to treat neurodegenerative disorders. There are also neuroprostheses, sometimes referred as 'brain chips', which can be coupled with the central nervous system. The integration of machines into human bodies is not new, considering that insulin pumps and implanted pacemakers have been used as part of general medical practice for decades.[47] Yet, neurotechnologies are exemplary of the integration of the machine and the human on a deeper and more intimate level.

Accordingly, the narrative of neurotechnology is much less about the digital, data and information, and more about bodily integrity, cognitive capacity and health.[48] This is not to say that this is a difference of substance. For example, the transhumanist vision that was inspired by speculative science fiction has long located the human mind in a data cloud.[49] Through neurotechnology, these concerns reached the legal sphere, due to the protection of brain data and, in a broader vision, personhood. One illustration of the narrative of neurotechnology is the changing meaning of data. The concerns around the protection of personal data resurface when neurotechnologies are migrating to the consumer sphere with their ability to reveal and store brain data. Moreover, neurotransplants would not only imply access to data but could also present the potential to manipulate the mind. The boundary between medical devices and recreational usage is already blurring and the same applies to question of employment, with employers gaining access to the brain data of employees for efficiency and safety reasons.[50]

The overlap is not surprising from the perspective that AI and neurotechnology share a history of science in relation to the cybernetic theory of the mid-twentieth century and the rise of the concept of 'information'. From this perspective, the narratives are entangled, with the main difference being that the digital in neurotechnology has always already been biological.[51] As such, the status of information is less visible than the need to optimise health and increase the lifespan and quality of life for patients

[45] Ucaryilmaz Deibel, "Back to (for) the Future," 21ff.
[46] Ucaryilmaz Deibel, "Back to (for) the Future"; Ucaryilmaz Deibel, "Artificial Intelligence in Ancient Rome"; Forrest, "The Ethics and Challenges."
[47] Quigley, "Integrating the Biological," 281.
[48] Farahany, Battle for Your Brain; Deibel, "Open Genetic Code," 3.
[49] Torgersen, "Technology Assessment," 128.
[50] Farahany, Battle for Your Brain.
[51] Pickering, The Cybernetic Brain.

with certain psychiatric and neurological conditions. In turn, the ability to intervene directly in the 'inner spheres' of humans corresponds to a narrative about the risks to human rights, such as cognitive liberty and mental integrity.[52]

The problem with these concerns is that the narrative will never address the underlying problem raised by private law. One example is how software and algorithms that are used in neurotechnology are protected through intellectual property rights. This is meant to determine which agent has economic and legal control over technology and innovation, but it thereby creates a plethora of entangled legal challenges, including contractual autonomy, exploitation and neuropiracy.[53] This creates the need to establish a functional way of mitigating technology risks as otherwise vulnerable groups are left open to exploitation. One example to be proposed is a specific version of Rawlsian ideas of fairness to be applied directly to the AI design in neurotechnology, informed by private law.[54]

To this end, the typical frame of reference in governance today has been ethical guidelines, informed by human rights discourse on inclusivity. For example, the legal scholarship has begun to advocate for 'neurorights'. The neurorights movement argues for legally establishing a new category, new 'human rights for the mind', to be able to protect the mental integrity and cognitive freedom of all human beings.[55] Yet, the charge – correctly – is that technology development is not inclusive, leaving out the interests and rights of a wide variety of stakeholders, such as non-binary individuals, immigrants, people with disabilities, individuals dealing with addiction, digitally illiterate people and so on. The ethical codes are also typically vague, which from the standpoint of private law means the underlying problems will remain, and the appeal to inclusivity is effectively another myth, operating like a Trojan horse for the neurotechnology companies to escape from regulation and potential legal tools designed to protect weaker and vulnerable parties in the market relations.[56]

The key point is that these solutions still revolve around the mind and the body in terms of their vulnerability to potential violations of personhood, such as surveillance, data breaches, hacking, exploitation and manipulation. These threats are addressed as human rights violations, but they are also infringements of bodily and mental integrity within tort law, as well as contractual violations of duties of good faith. New rights will not change the basic themes that are deeply rooted in the history of private law, and that are not reflected in how the legal challenges are addressed. For instance, data might be personal and protected by fundamental rights, yet the question remains and crystallizes around whether we want personhood as a legal category that is *extra commercium* – that by nature cannot be owned – or simply a *'res'* – a thing or asset.

Accordingly, no decisive answer can be given to how infringements might refer to the private realm of tort law and to contract law, as violations of personality rights, unfair use of personal data, exploitation in contractual relationships, surveillance and online manipulation. This call for neurorights and other special measures is useful to the extent that it recognises how the narratives surrounding neurotechnologies challenge modern boundaries between mind and body and remind us that they have always been fickle and context-dependent in law.

6. Discussion and Conclusion

AI and neurotechnology are not the only examples that challenge the standard conception of personhood in law. The same can be said of the discourse on the rights of nature and the animal rights movements.[57] However, the emphasis on technology encompasses cybernetics, genomics, the internet of things (IoT), big data and all the related state and corporate interests. This background implies that the legal narratives of AI and neurotechnology carry the weight of a much more heterogeneous web of ethical, political, economic, geographical, scientific and technical relations.

In this context, the STS perspective counterbalances narratives of 'breakthrough' and 'hype'. Both AI and neurotechnology are frequently portrayed as a 'revolution and turning point in world history'.[58] This stereotypical narrative is often presented by industry actors focusing on potential benefits to humanity. In parallel, legal scholarship tends towards a Cassandran narrative of disruption, wherein AI and neurotechnology are seen as threats to our inner and outer spheres. However, this Cassandran narrative also gives way to a techno-optimist vision of AI and neurotechnology, amplifying their potential Promethean

[52] Bublitz, "Cognitive Liberty," 6; Davies, Are Persons Property?, 158.
[53] Davies, Are Persons Property?, 158.
[54] Rawls, A Theory of Justice; Boyle, AI and the Future of Personhood, 84.
[55] Ienca, "Towards New Human Rights"; Ligthart, "Neurotechnology."
[56] Bareis, "Talking AI into Being," 857.
[57] Kurki, A Theory of Legal Personhood, 49ff.
[58] Bareis, "Talking AI into Being," 864.

character. The transformative character of these fields is emphasised: they enhance health, life quality and market efficiency. This often leads to agency being attributed to the technology itself, through its inevitable characteristics.

The sociotechnical imaginaries surrounding AI and neurotechnology serve as a prime example, both characterised by a strong rhetorical function that reduces the agency of law in the context of narratives about their promises and risks. STS reminds us that these networks are constantly performed, changing in accordance with the ongoing interaction between science, technology and society. This implies that certain narratives, such as how race, gender and power asymmetries have been intertwined with the myth of personhood, will likely disappear and be sidelined within the network. Consequently, the STS critique of modernist narratives becomes useful in the context of the history of private law. It provides a critical lens through which to approach the dualisms of modern law, so the fringes of 'technology as disruption' versus 'technology as saviour' can be addressed with insights gained from 2000 years of experience of the interaction between technology, law and politics.[59]

The construction of the legal person demonstrates how nature is actively separated from the social. In this sense, the argument of this article supports STS scholarship and its more nuanced understanding of progress narratives. Nonetheless, examining the history of private law shifts this perspective, showing that personhood is historically contingent and still shaped by class and gender. In this context, technoscience is marked by power imbalances that have developed over centuries. There is a long continuity within the European legal narrative, with private law constantly evolving as a creative field. This makes private law theories nearly timeless, yet in a constant state of change, contrasting with the typical emphasis in STS on memory and experience.

Indeed, private law existed long before society became modern. In ancient Rome, it was not necessarily the case that being a person was synonymous with being human, while subjectivity was tied to collective power constellations such as the master and the slave, forming one unit. What matters here is how private law has put alternative myths into play. These originate from outside the sphere of modern technoscience, including STS, which represents broader involvement with ethics, sociology and philosophy. The point is not only that the world of technology includes legal narratives that are constantly created, altered, challenged and transformed; rather, contracts or property are continuously invoked, and their history resurfaces with every creative legal remedy. There is a plethora of historical examples to mobilise, a rich repertoire of boundary crossings.

It is surely insufficient to criticise the dichotomization of person and thing as a relic of Cartesian philosophy. This echoes STS in pointing out how the object–subject and inner–outer distinctions are becoming ever more entangled, challenging foundational pillars in law. For this reason, the article finds the mythological significant. Myths *prima facie* belong to history, yet they are future oriented.[60] The power of the myths lies in their recurrence, and the best solution to myths is to mythify them.[61] Accordingly, STS and the history of private law can inform one another in support of alternative visions and narratives. There are starting points, such as Haraway's emancipated cyborg, a famous counter-narrative that was part of her feminist critique.[62] The challenge extends to legal personhood, which – while idealised – perpetuates gender, race and class asymmetries.

It is beyond the scope of this article to determine whether any appeal to intersectionality would be able to reach its mark in the context of AI and neurotechnology. Perhaps this is unlikely, given the argument that any emancipation is still premised on the modern narrative of personhood. Yet, the question remains: what new narratives could emerge from the underlying layers of history, providing inspiration for addressing legal questions around responsibility, privacy and personal data in the techno-mediated infrastructures? Perhaps this is a simple choice, moving away from the law as it currently stands, seeking to tame the many wild zones that exist beyond the boundaries in the brave new world. Alternatively, the law may embrace a more pluralistic, comparative and intellectually critical scholarship. This would greatly benefit other fields, including STS. What is needed is a critical study of private law that leverages its long duration and diversity of highly detailed settings, rulings and instruments. This is its greatest strength: its experience in dealing with forgotten boundaries that have existed throughout its long history, which can provide legal substance to many alternative myths and narratives that exist on the margins of the networks, whether of AI, neurotechnology or otherwise.

[59] Bareis, "Talking AI into Being," 859, 867, 871.
[60] Torgersen, "Technology Assessment," 119.
[61] Barthes, Mythologies, 134.
[62] Law, "STS as Method"; Haraway, A Cyborg Manifesto, 151.

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