Volume **2** (1) 2020 https://doi.org/10.5204/lthj.v2i1.1473

What Have We Done? Technology and Responsibility

Richard Mohr
Social Research, Policy and Planning Pty Ltd

Abstract

The relationship between humans and the environment is becoming unsustainable. Technologies mediate this relationship. In turn, technology is a product of dense cultural phenomena, from research institutions to capitalism, from ethics to cosmology. This paper investigates the 'cosmotechnics' of technical interactions with the environment and explores the sources of these social, ethical and environmental problems. The disconnect between humans and nature is traced to the roots of Western culture, while alternative views have emerged within the West and through its awareness of other cultures.

Technology in the West betrays a titanic urge to overcome nature. Since all technologies mesh with their immediate and global environment, invention arises from the interaction between assemblages of humans, machines and the environment. All contribute incrementally to new developments, which are not conscious projects fulfilling specific intentions, but evolving scenarios.

Without any clear intentional drive determining technological developments—nor any clear distinction between intended and unintended consequences—the concept of intention has little probative value. Instead, we approach the ethical judgment of outcomes from the viewpoint of *responsibility*. The social milieu and its actors are to be held to account for the consequences, regardless of intentions.

The paper identifies a malaise arising when the products of labour are split from an awareness of agency. This alienation opens up a misrecognition basic to unsustainable technologies. It operates at three discernible levels: technology split from culture; technology split from ethics and values; and theory split from technological practice. Solutions are sought through overcoming each of these gaps.

***Keywords**:* Alienation; environment; epistemology; intention; responsibility; technology.

The Focus and Structure of the Paper

Humans are experiencing a crisis in our relationship with the natural world. Our impact on all other living systems, through climate change, land clearing and use of chemicals and plastics is, frankly, apocalyptic. Yet to speak in these binary terms of 'human' and 'natural' is fundamental to the problem. Having set ourselves so far apart from 'nature' we risk losing track of our biological interdependency with the planet's living systems and atmosphere. This paper inquires into the sources of our alienation from the environment, with the aim of preparing the ground for some tentative solutions.

A basic problem derives from our understanding of what it is to be human, one dominant species on a planet that teems with life. What is our relationship to other species? There are many ways to cut into this question. Monotheistic, and particularly Christian theologies have proposed a distinction between 'man and animal' based in the soul and in our relationship to God,

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which casts a long shadow over Western culture.[1] Anthropologists established a duality between nature and culture, which was subsequently questioned.[2] Our elaborate social, legal and technological systems exploit, explain and order the world around us.[3]

Technology is how humans deal with the world, producing and transporting food, creating shelter, communicating elaborate ideas, information and art, and making new machines to do these things. Basic to this study's subject matter is artefacts—things made by humans—from culture to machines. All these human products operate in assemblages of human and non-human actants to change the social and physical world. The study draws on Simondon to clarify that invention and technology always progress within particular milieus, from the immediate to the global.[4] We ignore them at our peril.

It then considers intention, which is not a predetermined and definite goal to which a blueprint of invention responds, but an evolving program of possibilities and capabilities. Since intentions are always vague and evolving, it is disingenuous to plead that some consequences were 'unintended'. Responsibility is a more adequate concept for evaluating consequences, having in view ignorance as well as negligence. Confusions of responsibility can result from misrecognition of agency, such as when human agency is confused with that of gods (as in Homer) or machines (science fiction). Alienation is a specific mechanism of this misrecognition, whereby our own human agency is confused with that of the artefacts themselves. This is seen in mechanisms of law, from symbols and records to algorithms, as well as technical objects and assemblages which can appear as non-human sources of our own products.

The conclusion offers some tentative solutions to the problems of alienation and the over-exploitation of natural resources. It proposes that ensembles of material technological or legal actors be seen as human, cultural phenomena to be maintained in balance with nature; that they be reconciled with ethical and cosmological values; and that we apply acute theoretical analysis to the interrelations of technology, law and their environments.

Humans and Others: Notes for a Comparative Ontology

At the heart of the relationship between human cultures and the material or natural world is the very question of how we distinguish between humans and non-humans. The binary Western distinction is by no means universally shared. In First Nations cosmologies, the very question itself would generally be unclear, if not absurd. Our concern with this boundary is conditioned by millennia of Judeo-Christian theology. As usual, this theology gives us some insight into the way thought and culture developed in the Christian West.

Even in the Greek tradition there was no clear distinction between human and animal before Socrates. The pre-Socratics allowed for transmigration of an individual from one form or species to another (as seen in the antics of the gods). For them and for Pythagoras the human soul was no different from that of animals or plants.[5] Socrates introduced the dualism between humans and plants or animals, which was subsequently elaborated by Christian church fathers. Agamben traces the distinction of human from animal back to the Hebrew Bible, and sees it as a means for constructing what it is to be human: 'anthropogenesis'.[6] The issue remained live in tussles over heresy (e.g. Giordano Bruno), while St Francis of Assisi promoted the view that we could learn from the animals, who are more pure than humans. Descartes' well-known mind-body dualism, perhaps derived from traditional theology, drove a wedge between humans and animals, in addition to splitting humans within themselves. Even in the West, from La Fontaine, who lampooned Descartes in his fables, to the present there has been a progressive resurgence of the continuity thesis: 'what is true of the animal is true also of man'.[7]

Christian theology allocates a soul to humans but not to any non-human entities. Likewise, deep traditions of culture and law are based on and enforce this boundary between man and animal. For Agamben, 'This caesura passes first of all within man',[8]

[1] Agamben, The Open; Simondon, Deux leçons.
[2] MacCormack, Nature, Culture and Gender.
[3] Sklair, Organized Knowledge; Mesarovic, Mankind at the Turning Point; Contini, "ICT, Assemblages and Institutional Contexts".
[4] Simondon, Mode d'existence, 62-72.
[5] Simondon, Deux leçons, 30.
[6] Agamben, The Open, §17.
[7] Simondon, Deux leçons, 62.
[8] Agamben, The Open, §17.

expressed in the distinction between the subject of law and bare life. This split is what makes possible the barbarity of the concentration camp.

If animal existence can place certain humans, literally, beyond the pale of law, we must also explore the contrary move. Could animals, and indeed all of nature, be brought *within* the pale? We can observe tentative steps towards such a move at the heart of the Western legal and religious tradition, in Roman law and the Roman Church. There is a loophole in Roman-based Western law by which some non-humans can gain access to legal subjectivity. Legal personhood is available for corporations and is being explored as a means to incorporate natural entities such as rivers within the frame of Western law.[9] In religion, Pope Francis's encyclical *Laudato Si'* has referred back to the saint whose name he adopted and whom he quotes in the encyclical's title. There we find a continuity between nature, society, the poor and our own inner life.[10] '[I]f we talk about the relationship between human beings and things, the question arises as to the meaning and purpose of all human activity.'[11] That question is basic to this inquiry.

Useful comparisons can also be made with the ontologies of Indigenous cultures, as they become better known and more widely respected. Leroy Little Bear has pointed out that in Blackfoot thinking, all beings are animate, including not just trees but rocks.[12] Not only is every thing animate, but there can be communications between them and humans. This is also familiar from many Australian origin stories, where there was two way communication and even transmigration between the earthly and heavenly, the human and non-human, as we have also seen in Ancient Greek stories.[13] A key difference between these relationships and those in the West is that the latter no longer include intercourse with gods, plants or geography.

Technologies and Their Milieu

Technologies are central to the relationships between humans and our environment. On one hand, they are the means of converting natural resources to sustenance and other goods. On the other hand, technologies develop within the social and economic framework of human cultures. Hui has coined the term 'cosmotechnics' to highlight the relationship between particular cosmologies and technological regimes.[14] In the preceding section, ontologies of nature were seen to be a crucial part of these relationships. Here we inquire further into the nature of technology in its relations with the environment. The 'environment' can be understood both globally and, at the opposite end of the scale, in the immediate interactions between a tool or machine and the materials it uses and works upon. This immediate environment, or 'associated milieu', is seen by Simondon as 'the condition of existence of the technical object', that is to say, of the possibility of its invention.[15] How this affects invention and the parameters of technological development will be considered below.

Relations between technology and the environment are better known at the macro level, due to concerns with large scale environmental damage. The impact of pollution, carbon emissions, persistent materials and chemicals and the depletion of finite resources are central to the question of what has gone wrong in humans' relationship to the planet we live on. The notion of the 'Anthropocene' takes a long view of geological time and shows how that is now being telescoped by human activity. Then there is the competing term, 'Capitalocene' which expresses a long-held view that the compulsion to economic expansion is at the root of major environmental problems.[16] Other political and economic perspectives might emphasise one or another aspect of social activity and organisation. To more clearly analyse these processes we need to examine the fine grained relationships between humans and the material world ('environment'), as they are mediated through technology. Energy sources, new inventions, urban and regional development and land use, information and communication technology are all crucial to the current state of the world and our place in it.

Human projects work with material capacities and environmental constraints to produce new outcomes. The resulting assemblage of humans, other species, tools and natural resources is illustrated in Deleuze and Guattari's characterisation of the feudal system:

[9] Pelizzon, "Intergenerational Ecological Jurisprudence."
[10] Frances, Laudato Si', §10.
[11] Frances, Laudato Si', §125.
[12] Little Bear, 356,000 Ways "To Go", 19.
[13] Bates, "When they Take the Water."
[14] Hui, Question Concerning Technology, §8.
[15] Simondon, Mode d'existence, 70.
[16] Kunkel, "Capitalocene."

> We would have to consider the interminglings of bodies defining feudalism: the body of the earth and the social body; the body of the overlord, vassal, and serf; the body of the knight and the horse and their new relationship to the stirrup; the weapons and tools assuring a symbiosis of bodies—a whole machinic assemblage.[17]

This concept of assemblage opens up inquiry at the level of a matrix of interactions: between bodies, technology and the earth. The big socio-economic, political and environmental developments, whether feudalism or capitalism, can be understood in these terms, as Deleuze and Guattari suggest.

The current planetary disaster has grown out of a great many small steps, involving technologies, energy sources and human needs and bodies. Until the eighteenth century, work relied on wind, flowing water and human and animal sources of energy. The steam engine started the centuries of reliance on coal, followed by the century of oil fuelling jet, diesel and car engines. The next century may be that of photovoltaic and other forms of renewable energy. Each step in the development of these technologies has been a series of incremental steps and occasional leaps to new sources of energy. The first steam engines were used in coal mines (see below) and then created a massive new demand for coal as they powered everything from mills to trains to ships. Photovoltaic energy had modest beginnings until the improved mass production of solar panels and the current fall in the price of batteries. Similar trajectories could be discerned in regard to some of the other aspects of the current environmental situation: plastics, chemicals, and so on.

While the development of fossil fuel and plastics technologies has contributed to a planetary crisis, it will be helpful to analyse the micro-relations of some of the smaller steps that have led to that crisis. Conventional histories of these developments are dominated by the idea of 'invention': Watt invented the steam engine; Otto the internal combustion engine; someone else, plastics. This 'great man' approach to the history of technology masks the role of the devices themselves, of the Earth and its resources, as much as it does the roles played by thousands of other workers, thinkers and tinkerers. Human invention does not operate on a tabula rasa, nor is human agency the only driving force here. There are milieus of agency, capacity and potential, to use Simondon's terminology.[18] So to understand the nature of technological development in relation to associated milieus and the broader global environment we need to see invention as an organic and collaborative process.

Collaboration operates at all levels of culture and society, from education to state funding programs, venture capital, publishing and research institutions. Mazzucato has drawn attention to the role of the public and private sectors in researching, funding, trialling (with the errors) and implementing innovation. This collective innovation is 'evident in the technologies underpinning some of today's most ubiquitous products: the iPhone, for instance depends on publicly funded smartphone technology'. She gives other examples, from the Internet and SIRI (US Defence) to touchscreen displays (CIA), pharmaceuticals (health and medical research grants and institutes) as well as nuclear, solar and battery power and fracking technologies.[19] Simon estimated that four fifths of our intellectual and technological patrimony derives from 'being a member of an enormously productive social system, which has accumulated a vast store of physical capital, and an even larger store of intellectual capital … held by all of us'.[20]

The previous paragraph considers only the socially constructed and accumulated inputs to invention and innovation. We must also look to the environment, particularly the immediate milieu in which inventions develop. As noted above, steam engines fuelled by coal were first developed to pump water out of the coal mines themselves. Simpler examples can be found in older technologies: a hook made from the bone of the last fish caught will, given the right know-how, catch the next one. Modern machines can also use the materials at hand in intimate ways, as in Simondon's favourite example of the Guimbal turbine. This small generator uses the water that powers it to cool the components that are in friction: the faster it turns the more heat is generated, while more water flow effects greater cooling.[21]

Technological development, innovation and invention derive from this intricate web of social and environmental relationships. They operate in micro-environments as well as globally. Those social and technical processes cannot be encompassed by simple narratives of need – response – blueprint – invention – production. While an alternative approach opens up many lines of

[17] Deleuze, Thousand Plateaus, 89.
[18] Simondon, Mode d'existence, 81-8.
[19] Mazzucato, Value of Everything, 194.
[20] Herbert Simon, quoted Mazzucato, Value of Everything, 222.
[21] Simondon, Mode d'existence, 66-68.

inquiry, this paper focuses on the foundations of human responsibility. It will consider responsibility as it applies to technological development and human agency. But first it is necessary to deal with the notion of intention, since we so often hear that unfortunate impacts of technology resulted from 'unintended consequences'. The following sections will show that responsibility is more relevant than intention in the ethical evaluation of our dealings with technology and nature.

Intention

A classic explanation of intention assumes we form the idea of a project and then execute it. I want to question that formula. A new device emerges out of the successes and failures of previous iterations, out of the capacities of the materials that make it, out of the properties and resources of its immediate environment (including humans) and other inputs that become mingled with the device itself, such as water, electricity, sunlight, information or hydrogen.[22] This is not to say that machines invent and construct themselves, without human intervention. But it does show that human action is only one of the inputs to invention and technological development. This is a far cry from the simple image of an inventor or engineer preparing a blueprint which is sent to a workshop from which the finished device emerges.

To accept that new devices or assemblages emerge out of the combined actions of humans and all these other actants challenges the idea of intention as well as of agency. We recognise intention where an actor knows what they do, and why. In other words, we can describe what we mean to achieve.[23] This implies (a) a projection of present ideas or states into the future and (b) the description of an action and its purposes.

I deal first with (b), the need to describe actions and purposes. The ascription of meaning to action was a basic building block of Weber's sociology.[24] Yet Merton responded that unanticipated consequences draw attention to the questionable link between purposive action and intention. *Post facto* descriptions of actions may be 'rationalisations' rather than descriptions of reasons or purposes for acting. Merton gives the example of a rider thrown from a horse explaining his action as, 'simply dismounting'.[25] Various forms of *post facto* justification can be rationalisations in the sense of delusion or bad faith. The focus here is particularly on those which hide behind the claim of 'unintended consequences'.

We need first to clarify that intention is not limited to actions that can be described in words. Anscombe gives the example of a cat stalking a bird: the cat, without language, obviously has intention.[26] This example also highlights the importance of projecting future events in formulating intentions. In this example the cat is projecting the direction the bird might move, and the possibility of eating it. So any intentional act, as a future projection, must consider foreseen and unforeseen events, including 'the continuing input of information about what we are doing, about changes in the environment, in terms of which we regulate and adjust our actions'.[27]

Just as the cat constantly takes account of the bird's action, so in any intentional task we are generally interacting with a complex environment of human, animate and inanimate actants. Water or other inanimate objects surely do not have intention (in Western thinking), even if they have a propensity for certain actions: e.g. to flow downhill to the lowest point. If environmental responses, including the actions of these inanimate actants, were entirely predictable, then human intention might have a good fit with future outcomes. Yet in the real world this is exceptional. Once a variety of actants, including human ones, interact, then outcomes become unpredictable and the original intentions increasingly irrelevant. The height of a dam wall might be planned with all sorts of variables in mind, yet the consequences of the ways these work in practice is far from certain: rainfall, upstream and downstream land use and surfaces, and turbulence,[28] all affect the human and ecological consequences. So, when human agency is mingled with other objects, intention might be described, but its fit with the future ((a) above) is challenged.

[22] Here I draw on Simondon's work on the evolution of technical reality (Mode d'existence, book 1 chapter 2).
[23] Anscombe, Intention.
[24] Weber, Theory of Social and Economic Organization, 96.
[25] Merton, "Unanticipated Consequences," 897.
[26] Anscombe, Intention, 86.
[27] Davidson, "Actions, Reasons and Causes," 52-3.
[28] Turbulence is a notoriously difficult scientific problem. In a speech a few years before his death the mathematician and physicist Horace Lamb quipped, '[W]hen I die and go to Heaven there are two matters on which I hope for enlightenment. One is quantum electrodynamics, and the other is the turbulent motion of fluids. And about the former I am really rather optimistic.' Mullin, "Turbulent Times for Fluids."

This leads me to emphasise the *ongoing* nature of tasks and projects. This entails a continual modification of intention in light of other information. Husserl called this continual adjustment 'protention'. In actual technical and environmental developments and interactions, the arrow of time does not shoot clean from project, through intention, to product; from present to future. There is a continual forming and reforming of action in the present, as various results emerge, and as humans adjust for them. Protentions are constantly formed in this continual process of actions, outcomes and adaptations. Protentions, Schutz explains, belong in the present: 'They pull the future, so to speak, continuously into our present.'[29]

Whether building a dam or inventing a new form of transport, the project is a continual process of projecting into the future and modifying our project in light of the capacities and responses of the materials, products and their immediate environment (Simondon's 'associated milieu'). New devices or techniques arise out of the interactions between humans and other actants, and not from some grand intention which is designed and then realised.

Not only are appeals to intention unreliable in this context, they are frequently disingenuous. This is seen in debates following the failure of Australia's largest river system, when in 2018 the Darling River stopped flowing for so long that millions of fish were killed. Anticipating an even worse summer in 2019, the National Resources Commission recommended tighter restrictions on irrigation pumping from the catchment. In response, politicians representing rural and farming constituencies warned that this measure 'would have a negligible impact on preventing fish kills and could have unintended consequences', such as farmers having to 'wait longer after the drought broke' before they could resume irrigating.[30] Leaving aside the questionable assumption that climate change is merely a drought waiting to break, we could ask what really are the unintended consequences here? Killing a riverine ecosystem or inhibiting irrigation? I mention this absurdity not to show that ecosystem death trumps irrigation needs (though that would surely be defensible): in this context it shows that the game of 'intention' is misleading and irrelevant.

Merton points out that to explain unanticipated outcomes in terms of ignorance is reducible to a claim that 'if we had known we would have known', and is thus, ultimately, tautological.[31] Ravetz notes the central place of ignorance in areas of policy requiring scientific inputs. Moving away from terms like 'intention' and 'truth', Ravetz suggests that 'motivation' and 'technique' are more relevant to success in policy development.[32] So I conclude this part of the argument with the observation that intention is so overrated as to be useless in the real world. If we could never really have fully worked out *intended* consequences, then it is a cop-out to say that some consequences–generally the inconvenient ones–were *unintended*.

Responsibility

Given the centrality of intention in criminal law, its rejection in the foregoing argument risks leaving a void in considerations of culpability. Here we can turn to some other legal and moral concepts to broaden the picture. Negligence and responsibility encompass a wider perspective from which to hold humans to account. Negligence can encompass those cases of ignorance in which we should have known, could have known, or simply should have exercised prudence in the face of the unknown:

> Failures of ignorance we can forgive. If the knowledge of the best thing to do in a given situation does not exist, we are happy to have people simply make their best effort. But if the knowledge exists and is not applied correctly, it is difficult not to be infuriated. … It is not for nothing that the philosophers gave these failures so unmerciful a name–ineptitude. Those on the receiving end use other words, like negligence or even heartlessness.[33]

Ultimately, the words we use will come down to judgements of responsibility, which can exist independently of intention. From ethics[34] to tort law,[35] responsibility must be accepted for actions whether or not they were intended to cause harm. Responsibility is a thick but unruly concept, open to a wide variety of interpretations. Those interpretations have been narrowed in certain legal contexts, notably the common law, where 'the courts have turned away from a notion of responsibility imposed by society to one grounded in free will and personal choice'.[36]

[29] Schutz, Collected Papers, 172.
[30] Loussikian, "Premier faces troubled waters," 10.
[31] Merton, "Unanticipated Consequences," 898 fn 10.
[32] Ravetz, "Useable Knowledge," 113.
[33] Gawande, Checklist Manifesto, 11-12.
[34] Levinas, "Ethics as First Philosophy."
[35] Perry, "Risk, Harm and Responsibility."
[36] Manderson, Proximity, 37-8.

In this interpretation, the individual is the author of responsibility. And yet the inputs to any action are multi-faceted and the consequences far-reaching. As pointed out above, these involve numerous human, technological and environmental actants. To build a dam requires a sophisticated range of engineering expertise, intergenerationally derived and applied by numerous groups or firms or individuals, together with large a workforce of humans and machines. They all work with the topography, the geology and materials available, which, like the water that is to be retained or directed by the dam, have their own qualities, propensities and capacities.

If that seems an example of extreme complexity, consider the simpler quotidian case of driving a car. The driver appears to be 'in charge' of a machine through the steering wheel, brakes and so on. Yet the machine has its own agency. This used to be most apparent when the car broke down, but is increasingly conspicuous in the array of dashboard lights and warning sounds, not to mention the randomly displayed reminders to pay attention to the road, rather than to the intelligent display console which demands attention, and often action to switch off the reminder. Car and driver entwine as an assemblage of control, informational interactions and movement. These exchanges of responsibility become more complex still with the advent of 'driverless cars'.

Instances of non-human actants implicated in disastrous outcomes can be found at the dawn of the Western tradition. Homer has Agamemnon in a deluded state of 'blind madness' when he slaughters a flock of sheep and their shepherds, thinking they are an army: 'Zeus took my wits away from me' he says. Nonetheless Agamemnon accepts responsibility, and recognises his obligation to pay compensation.[37] Williams points out that in Homer responsibility has deeper consequences than it does in modern law, 'but that is because we have a different conception of law – not, basically, a different conception of responsibility'.[38]

A poem by Longfellow picked up a theme that goes back to Sophocles when Prometheus says, 'Whom the gods would destroy they first make mad'. Prometheus, who stole fire from the gods (and gave it to humans), has been associated with technological striving[39] right down to the spaceship in the Ridley Scott movie of that name. Other contemporary science fiction works have technology in the role of non-human actants that drive humans to disastrous acts. The television series *Black Mirror* elaborates this theme in episode after episode. Its cynicism, as well as its realism, is anchored in the very fact that the technology is irresponsible. It can always be used for good or for evil: it simply has no particular moral compass at all. Yet always behind it is the danger that we cannot break away from it. We are made mad, with disastrous consequences. The protagonists are trapped in 'the game', whether through addiction, hedonism or insecurity. While Homer deals with the moral conundrums caused by the extraordinary powers of fickle gods, *Black Mirror* delves into the problems of responsibility related to the extraordinary powers of technology.[40] Here the role of the gods in making us mad is played by technology and its developers. We have stolen fire from the gods and mined fossil fuels to feed the flames.

Alienation

Madness or delusion is an extreme case of possession by external forces. In many fictitious depictions it affects individuals. As noted in some *Black Mirror* episodes, there may be an element of mass hysterical sociopathy in addiction to technologies. In the case of broader technological development as it impacts on the environment, we find a sense of normality, of business-as-usual, that belies the crises facing the planet. This section analyses human relations with technology to better understand the blockages to our awareness of consequences and inability to control them.

In science fiction or in the animistic world of Homer, human agency is but one factor in the way things turn out. Neither Homer nor a First Nations storyteller would doubt that nature, its spirits or gods can intervene in matters of concern to humans. Today we have built such powerful machines, with such far-reaching impacts, that we cannot be sure what forces are in play: natural, human or technological. Some of those machines are so intimately connected to our own thoughts, and so good at predicting

[37] Williams, Shame and Necessity, 52-53 (citing Iliad 19.137).
[38] Williams, Shame and Necessity, 65.
[39] Hui, Question Concerning Technology, §1.
[40] While the vagaries of gods or of technology may mask intention, they cannot mask responsibility. That falls to pernicious structural and legal arrangements which amount to the dispersal of responsibilities (Veitch, Law and Irresponsibility) and organized irresponsibility (Beck, World, Risk, Society).

our desires and decisions, that we sometimes can't tell where they come from. When an algorithm generates tailored advertisements, shopping tips, playlists or recommended movies, it is hard to distinguish our own agency and choices from those of the code or the advertiser or service provider. From consumption or travel to social policy, it sometimes seems we have forgotten what we intended, and we have difficulty discerning our own responsibility.

Blind spots of this sort can be attributed to various forms of misrecognition. Less dramatic than delusion, misrecognition clouds our understanding by masking the nature of aspects of our selves or our society. It is a phenomenon common to several key insights of modern critical thought, from Marxian ideology critique to Freudian repression. Alienation, the misrecognition of our own products as something external or alien to us, is the form of misrecognition most relevant to our products and technologies.

Alienation in this sense was first identified by Hegel as the misattribution of human will to physical objects. Hegel enumerates three aspects of the relation between human will and things: taking possession; use; and alienation ('the reflection of the will back from the thing into itself').[41] We may *take possession* of the materials needed to inscribe legal records (e.g. paper from trees or silicone chips from minerals). Then we *use* them to store legal data: statutes, case records etc. If those records are then seen to possess their own authority, independent of any human agency, then the things in themselves *reflect will* or *agency* as if it were their own, and not of human origin.[42] Alienation then blocks our recognition of human agency, so it is misrecognised as emanating from the thing to which it has been lent (such as a legal record).

The concept of alienation has had a long history since Hegel. Marx linked the strictly legal sense of alienation, as being dispossessed of property, with Hegel's more spiritual sense. Marx and Engels saw the appropriation of the worker's product as a process that 'alienates the individuality not only of people but also of things'.[43] It is the very fact of producing an object which is then alienated that turns the power of their labour against the worker.[44]

Simondon adapted Marxian alienation to explain the different relations of industrial workers and technicians. Industrial workers are alienated by the very finality of their product: having no aim but the result of their labour constitutes their alienation. This is contrasted with the technician, who is a partner with the machine, participating in the self-regulation of the human-machine ensemble, as a collaborative assemblage.[45] Almost presciently appreciating the impact of office machinery on work, Simondon notes that bankers are alienated in their relationships to the machine, as members of a 'new proletariat'. As machines incorporate more and more human knowledge, those technical workers who really can participate in a self-regulating relationship with the machine become fewer, while those who see nothing but the end result, the product of the machine, increase. This is a psychophysiological alienation, based in the corporeal and psychological relationship of human to machine.[46] As alienation, it deprives us of the capacity to see ourselves and our agency in our products.

Humans, Technology and Nature

As technical objects become more advanced, established and autonomous, they attain the status of 'technical individuals' that stand out against a field of inputs and environment, including humans.[47] For Latour's actor-network theory, this means that technical objects become co-agents with human actors.[48] Here too we need to understand the relationships of responsibility between humans and these co-actants. If we just see that we–humans and machines–are all in this together, working as networks on tasks, then this masks the human-machine interface. Even if we can recognise the nature and agency of the objects we interact with, responsibility is masked by alienation. In various processes, machines or nature might have the autonomy and driving force of actants. Yet responsibility is specific to humans. Whatever the input of nature or the machines, like the will of the inscrutable gods, it is only we humans who can, and must, accept responsibility for our collective actions.

[41] Hegel, Philosophy of Right, §53.
[42] For example, rows of bound law reports, seen in television reports behind lawyers and legislators, lend them an authority beyond their own human, physical presence.
[43] Marx, German Ideology, 230.
[44] Marx, Economic and Philosophic Manuscripts, 108.
[45] Simondon, Mode d'existence, 176.
[46] Simondon, Mode d'existence, 165.
[47] Simondon, Mode d'existence; Barthélémy, "Glossary."
[48] Latour, Reassembling.

The development of technology and its mediation between humans and the environment has grown out of countless piecemeal processes. None of these was formulated with particular intentions or grand designs: each grew from earlier and existing technologies, capacities and environmental opportunities. The result of these processes has been accelerating planetary degradation. Just as we did not 'intend' to change the climate, promote mass tourism and forced migration, or wipe out species, neither have we been able to fully perceive these outcomes, for good or ill, as the product of our own actions. If we misrecognise the human origins of technical outputs as natural phenomena[49], then we lack the most basic awareness required for accepting responsibility or seeking solutions.

Simondon summed up the end results of this technocratic alienation as the 'Faustian dream of an entire society', driven by all-conquering will:

> This conquering aggression has the character of a rape of nature. Man takes possession of the entrails of the earth, traverses and ploughs, crosses that which, up until now, had remained uncrossable. In this way technocracy has something of the sense of the violation of the sacred.[50]

As discussed earlier, the origins of this rapacious approach to nature and its resources can be found in a Western cosmology that splits humanity from other species, and its Promethean cosmotechnics of heroic technological conquest. The Western notion of *techné* has been associated with violence right up to Heidegger.[51] Any ways out of our current predicament must begin by seeking solutions to these problems.

Toward Solutions

This study has aimed to diagnose and suggest possible treatments for the legal, intellectual and ethical malaise that has led to the current blindness to consequences, abdication of responsibility and adversarial relationship to nature. This malaise originated from a narrow and heroic view of invention, as individualised intention. If we see technological innovation and invention as simply piecemeal aims that respond to circumscribed problems, we fail to identify broader responsibility. Technological evolution has too long been seen as just one heroic invention after another: man conquers nature by inventing a new machine! Unaware of its context, from associated milieu to the global total environment, we cannot recognise our collective agency and responsibility. The results of this malaise have been most pronounced since the rise of fossil fuel and chemical technology in the nineteenth century. However, as has been shown, the roots lie further back in the Western tradition.

Hui's concept of cosmotechnics has helped trace the links between technological consequences and a complex of ideas and approaches found in the Western tradition. Hui has identified three key lacunae or gaps in our ways of thinking about and doing technology which have contributed to our current alienation. First is the divide between culture and technics. Failing to recognise our own cosmotechnics, technology appears as an independent force, adrift from the other discourses and practices of our culture. This is a barrier to discussing and, consequently, directing technology. This is basic to another gap: that between technics and ethics or religion. Relegating technology to an independent realm deprives us of the ethical language and moral concepts to deal with it. The third gap falls between the theory and practice of technology.[52] Therefore technical work, separated from our theoretical understanding of it, is beyond the reach of our most powerful tools for knowing about it. This analysis suggests that any reconciliation with technology must address all three of these gaps, which are now considered in turn.

Culture/Technics

The operations of the ensembles of technology and human actors need to be recognised as cultural phenomena. The directions in which technologies progress, and how particular technics or potentialities are used, are deeply embedded in culture. From the nineteenth century onwards we can see the overwhelming impact of capitalism and the dominant episteme which binds individualised subjects blindly to technological objects:

[49] This is the last resort of climate change denial: yes, the climate is changing, but this is a natural phenomenon, unattributable to human actions.
[50] Simondon, Mode d'existence, 177.
[51] Hui, Question Concerning Technology, §8; Rorty, "Heidegger and the Atomic Bomb," 274-5
[52] Hui, Existence of Digital Objects, 35.

> By dividing the assemblage into subjects and objects, [dominant social sciences] empty the latter (nature, animal, machines, objects, signs, etc.) of all creativity, of the capacity to act and produce, which they assign only to individual subjects whose principal characteristic is being an 'owner'.[53]

A reassessment of technology in its full cultural context must be based in a critique of both subjectivity and our relations to the full range of 'objects' identified in this quote from Lazzarato, from nature to machines. The individualised, self interested and alienated subject of contemporary Western law and technology is always set over against the environmental and technical milieu. Land and waters are perceived in terms of a source of wealth or a threat to livelihood or survival. The cosmotechnic contrast between Indigenous relationships to rivers, such as the mighty Barka, and the continuing colonial settler approach to the depleted and dying Darling River (clearing land, pumping out water to irrigate cotton) is stark and embedded in culture. Badger Bates, Barkandji elder, artist and educator said this of his river:

> For the last five to eight years, we say the Barka's buka. That means the Darling River's dead. It stinks of the dead fish. It's rotten. … I say as a Barkandji person, reared on the river all my life: we don't want a pipeline from the Murray [River]. Our Natji, the rainbow serpent, doesn't live in a pipe. It's got to live in the water. We say that the old turtle or the yabby can jump up and walk away. But the fish can't. There are a lot of other little animals that live in there too that keep the river healthy. They can't walk away. To us, that's our family. We have to protect them. If we don't protect Natji, then it hurts us.[54]

Western culture and cosmotechnics are not those of First Nations, but can learn from them. What is culture but learning from forebears and passing on the lessons to coming generations? Only by recognising technologies as human products within their cultural context will we begin to redress the imbalance of humanity and nature.[55]

Technics/Ethics, Values or Religion

Religion, ethics and values are likewise embedded in culture. While technics is directly linked to values, this link has been misunderstood by positivist ideology and technocracy, from the nineteenth century to this day. Technocratic and positivist approaches have claimed that social or political decisions should be based on purely rational or scientific criteria, at the price of excluding ethical deliberation. It is even easier to short-circuit values in dealing with technologies when they are seen as having a life of their own, an imperative beyond the humans who made and work with them.

The idea that science can be an alternative to ethics is refuted by recognising the role of values even within the sciences. Brenner has pointed out that the choice between competing scientific theories is based on 'criteria [that] are not rules, but values. No one of our values has primacy, and there is no order that prescribes their application.'[56] Feminist and standpoint epistemologies have been at the forefront of returning scientific attention to values and social contexts.[57] Whatever the sources of those values, whether they are applied in science, technics or their social relations, they can and must be widely debated. Traditional or new religions, feminist or multicultural sources, or the traditions of First Nations all present opportunities to debate technologies' directions and goals, their consequences and responsibilities. Whatever their sources, these ethical and cosmological values must be integral to our understanding of technologies and the environment.

Theory/Practice

Before we can comprehend technology *in practice*, it is important to recognise the full range of technologies that *we practise*. In contemporary usage the term 'technology' has come to be applied chiefly to digital, or information and communication technologies. This misses the bulk of technologies that impact our lives and the planet, from kitchen utensils and techniques, old and new, to means of transport and manufacture. We need to pull back from the view of our hand-held device, to the processes, labour and materials that made it and the clothes we wear, to the building we are in, the physical infrastructure surrounding it and the ways we and all these products move around our city and around the world.

[53] Lazzarato, Signs and Machines, 35.
[54] Bates, "When they Take the Water."
[55] I revert here to the binary terms criticised earlier in the paper in explicit response to these adverse anthropogenic impacts.
[56] Brenner, Raison scientifique, 16.
[57] Alcoff, Feminist Epistemologies; Harding, "After the Neutrality Ideal."

We need all our powers of theoretical analysis to comprehend the complex operations and interrelations of technology, law and their environments. Rigorous theoretical and empirical work must be applied to technical practices if we are to overcome alienation and misrecognition of our relationships with technical objects, processes and the environment. It is a human responsibility to recognise the nature and agency of the physical and digital objects in everyday use, and their biological, technical and environmental milieus. This will enhance the recognition that they are human products, and hence that they can be understood 'from the inside' by us, their makers and users. Such a program of work can address all the gaps in our relationships with technology. It can lead to a more adequate understanding of humans as biological, technological and cultural creatures in a world that we have inherited, and that we continue to use and to cherish.

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