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Infrastructure and InfraReg: On Rousing the International Law 'Wizards of Is'

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Infrastructure and InfraReg: On Rousing the International Law 'Wizards of Is'

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Abstract: Physical, informational, and now digital infrastructure features throughout nation-state consolidation and imperial extension, in war preparedness and war logistics, in resource extraction and energy capture and transit, in each quantum step in economic globalisation, in mass migrations and religious missions, in the global scaling of finance and financialisation, the global digital economy, artificial intelligence and robots, in economic development strategies and China's vast Belt and Road Initiative. International law has largely aligned with these enterprises, and has seemed not effectively to address massive anthropocenic degradation, AI, new biotech, and the human and planetary consequences of extractive capitalism. Science and Technology Studies (STS), and work extending from Bruno Latour and Susan Leigh Star to governance-by-prototype and 'new materialism', has generated rich insights about infrastructure. These are being extended to 'infrastructure as regulation' (the InfraReg project). This paper explores implications for reinvigorating deliberative forward-planning international law projects to address technologically-driven transformation, that follow from 'thinking infrastructurally'.

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I. INTRODUCTION

Be 'the Wizards of Is' was the Cambridge international law scholar Philip Allott's memorable exhortation to what he described as academics of the thinking sort.[1] By this he did not mean a reinscription of *sein und sollen*, a social scientific view that the job is to discern how things are but not to say how they should be.[2] His meaning was, rather, that the world is of our own making, the human capacity to think defines the bounds of the possible, and the things we can push ourselves to construct in our consciousness become—by that act of construction—the world which is. Measured against this view of what the profession and vocation of academics should be, he regarded universities as falling spectacularly short. He lamented the advent of the efficient industrial-scale universities from the 19th century onward (in Prussia, then in the United States of America (US)), the separation of knowledge inquiry into separated faculties each moated and defended by its own territorial sea, the overbearing tyranny of metrics of publications and performance, and the obsessions of form represented by phenomena such as 'foot-and-note disease'. In striking the opening note of this *Cambridge International Law Journal* (*CILJ*) conference on new technology and international law at Cambridge University's Law Faculty, I will endeavor to keep Philip Allott's rousing call in mind. Many of us are working on broad framing ideas for international lawyers comprehending digital technology and digitisation as transformative social phenomena calling for some new thinking on the bounds of the possible. I am involved in a couple of those projects myself, on global data law and on global digital corporations. But today, I would like to talk a little about infrastructure, or more precisely, the idea of infrastructure as regulation, which may seem obscurantist but to me offers one useful and perhaps even foundational way of opening up thinking about international law and technology of all kinds.

For those of us whose contemplative life or practical profession is international law, experience daily recalls the insight of the English School of International Relations that international lawyers tend to be found somewhere on the *via media* between grand cosmopolitan theorising and hard-bitten realist practice, in an avocation that looks to bring some law to power and some power

[1] Philip Allott, 'Kant or Won't: Theory and Moral Responsibility (The BISA Lecture, December 1995)' (1997) 23 Review of International Studies 339.
[2] A description of such a view is given by Nicoletta Bersier Ladavac, 'Sein and Sollen, "Is" and "Ought" and the Problem of Normativity in Hans Kelsen' in Nicoletta Bersier Ladavac, Christoph Bezemek and Frederick Schauer (eds), *The Normative Force of the Factual* (Springer, 2019) 29.

to law. This position is often called Grotian.[3] At times of monumental change, quite orthodox doctrinal international lawyers may be moved to think big and boldly. Here in Cambridge, we might have thoughts among past Whewell professors of Lassa Oppenheim (1858–1919) toiling day and night during World War I—a tragedy of violence for his adopted Britain and his native Germany—to craft a whole new form of inter-state organisation for the future international society of the post-war.[4] Or Hersch Lauterpacht (1897–1960), working feverishly at the end of World War II to build a law and an epoch of human rights at a time when many he loved in his native Galicia had perished in the Nazi maelstrom.[5] Or in a time without such an imperative of crisis, James Crawford (1948-) seizing the short opening of the window after the Cold War to help promote juridification and judicialisation in the ILC Articles on State Responsibility and the Rome Statute of the International Criminal Court. Is the transformation in society and life being wrought by the ongoing layers of technological revolution so challenging and so profound for international law? We are all of us gathered here because we think it might be. How then to think in this transformation, and from it?

'Stay in your Lane'. One intuition for international lawyers grappling with technological transformations is not to swerve rashly into areas better left to others with more expertise or more apposite tools. Vaughan Lowe put this prudential counsel pithily: 'Lawyers have a contribution to make. They offer one way... But it is only one way among many. There are many times when it is much better to call upon a politician, or a priest, or a doctor, or a plumber'.[6] This is advice about practical intervention. Without doubt the design, maintenance, repair, and improvement of plumbing is in many cases best done by plumbers. Even in a reflective rather than practical mode, in which international law is averred as a lens for intellectual engagement and critique of aspects of the world, there may not be enough legal depth or coherence to enable profound reflection or critique in splintered sub-fields with technological denominations: international law and the printing press,[7]

[3] Hedley Bull, Benedict Kingsbury and Adam Roberts (eds), *Hugo Grotius and International Relations* (OUP, 1990).
[4] Lassa Oppenheim, *The League of Nations and its Problems* (Longman Green & Co, 1919).
[5] Hersch Lauterpacht, *An International Bill of the Rights of Man* (Columbia University Press, 1945).
[6] Vaughn Lowe, *International Law* (OUP, 2007) 290.
[7] The prominent place of the printing press in the literature on the profound and disruptive effects of new communications technologies is exemplified in Neil Postman, 'Address to New Tech 1998 Conference: Five Things We Need to Know About Technological Change' (Denver, Colorado, 27 March 1998), https://web.cs.ucdavis.edu/~rogaway/classes/188/materials/postman.pdf. His particular assertion there was that the mass production of bibles in vernacular editions helped the Reformation Protestants overcome the monopoly of literate scriptural expertise held by priests in the Catholic tradition.

or the steam engine, or the smart phone.[8] Yet we know that the 'technical' in technology is not independent of organisational forms, social relations and responses, economic structures and finance, or the networks of enabling or related or consequential technologies in which a particular technical practice is located. In their different composites these each are influenced by law/regulation and are generative of law/regulation.

If the 'technical' of technologies is largely for the plumber or the biophysicist or the software engineer, lawyers can and do study or influence the legal and organisational dimensions of, and the legal implications of, the technical, as they are embedded in and shaped by societies and cross-border legal and societal and economic connections. In reverse, law is itself a social production, in which the 'technical' of technology may also act. Science and Technology Studies (STS) frames some of these relations. Within STS, the idea from Actor-Network Theory (ANT) that non-human actants must be studied in their integration with the human actants in a particular body of practice[9]—a laboratory with its physical test-tubes or gels and its personnel engaged in scientific research and academic papers production, for example[10]—has opened a technology research agenda for international law beyond law-and-society or law-and-economics. This is manifest in excellent work on actants such as 'legal opinions' or 'rule of law' in the work of legal counsel of international organisations,[11] and on the impact of new communications or document-editing technologies on

[8] Frank H Easterbrook, 'Cyberspace and the Law of the Horse' (1996) University of Chicago Legal Forum 207; Lawrence Lessig, 'The Law of The Horse: What Cyberlaw Might Teach' (1999) 113 Harvard Law Review 501.

[9] Bruno Latour, *Reassembling the Social. An Introduction to Actor-Network Theory* (OUP, 2005.) A normative-critical perspective on ANT is Steve Fuller, 'Why Science Studies Has Never Been Critical of Science: Some Recent Lessons on How to Be a Helpful Nuisance and a Harmless Radical' (2000) 30 Philosophy of Social Science 5.

[10] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Harvard University Press, 1987). As Andrew Pickering observed: 'This actor-network analysis flew in the face of technological and social determinist perspectives (technological change causes and determines social change, or vice versa). More profoundly, it transcended the dualist understandings that underpin such determinisms, understandings that posit a clean and principled split between the human and the nonhuman and construct independent accounts of each—as, for example, the natural sciences seek to grasp the material world as it exists independently of human beings, or the social sciences seek to speak of a pure realm of the social'. Andrew Pickering, 'We Have Never Been Modern' (Review) (1994) 1 Modernism/Modernity 257.

[11] Dimitri Van Den Meerssche, 'The World Bank's Lawyers: An Inquiry into the Life of Law as Institutional Practice' (PhD thesis, European University Institute 2019).

diplomacy.[12] It has been one of the influences in innovative studies on the anthropology of bureaucracy,[13] and on implication of the 'new materialism' in legal scholarship.[14]

Work in STS, ANT, and humanities scholarship has tended to challenge divides between 'science/society, technology/science, macro/micro, economics/research, humans/non-humans, and rational/irrational'.[15] Efforts to transcend deep separations between human and non-human,[16] life and non-life,[17] earth systems and humanity,[18] have pushed against some commitments or assumptions on which various international law categories and doctrines have become encrusted.[19] Rethinking of categories and doctrines has seeped into some places and spaces of doctrinal and institutional international law; but for the most part it has been a seepage rather than an inundation. International law scholarship has been more broadly marked, however, by social science projects in recent decades to bridge the fissure between ideas of nature and ideas of human society.

Bruno Latour diagnosed the sharp (and in his view, pernicious in proportion to its sharpness) distinction between nature and society as the enduring result of formations in

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[12] On the impact of new shared-document and file-editing systems on routine diplomatic negotiations within the EU, see Rebecca Adler-Nissen and Alena Drieschova, 'Track-Change Diplomacy: Technology, Affordances, and the Practice of International Negotiations' (2019) International Studies Quarterly 531. A modern classic is Cornelia Vismann, *Files: Law and Media Technology* (Stanford University Press, 2008). See also Markus Krajewski, *Paper Machines: About Cards & Catalogs, 1548-1929* (MIT Press, 2011).

[13] Nayanika Mathur, *Paper Tiger - Law, Bureaucracy and the Developmental State in Himalayan India* (CUP, 2015).

[14] Reflections on some of the literature are in Hyo Yoon Kang, 'Law's Materiality' in Andreas Philippopoulos-Mihalopoulos (ed), *Routledge Handbook of Law and Theory* (Routledge, 2019) 453; Hyo Yoon Kang and Sara Kendall, 'Legal Materiality' in Simon Stern, Maksymilian Del Mar and Bernadette Meyler (eds), *The Oxford Handbook of Law and Humanities* (OUP, 2019); Christopher Tomlins, 'Materialism and Legal Historiography, From Bachelard to Benjamin', in Stern, Del Mar, and Meyler *The Oxford Handbook of Law and Humanities.*

[15] Bruno Latour, 'Technology is Society Made Durable' in John Law (ed), *A Sociology of Monsters: Essays on Power, Technology, and Domination* (Routledge, 1991) 103, 130.

[16] Kate Soper, *What is Nature? Culture, Politics and the Non-Human* (Blackwell, 1995).

[17] Elizabeth Povinelli, *Geontologies: A Requiem for Late Liberalism* (Duke University Press, 2016).

[18] William Connolly, *Facing the Planetary: Entangled Humanism and the Politics of Swarming* (Duke University Press, 2017) 175ff; Bruno Latour, 'Is Geo-logy the New Umbrella for All the Sciences? Hints for a Neo-Humboldtian University' (Cornell University, 25th October 2016) at www.bruno-latour.fr/sites/default/files/150-CORNELL-2016-.pdf.

[19] Anne Peters, 'Global Animal Law: What It Is and Why We Need It' (2016) Transnational Environmental Law 9; Anne Peters (ed), 'Symposium on Global Animal Law' (2017) 111 AJIL Unbound 252–281, 395–424; Gabriel Eckstein, 'Of Rivers, Deities, and Legal Persons – A New Approach to Managing Freshwater Resources?' (Global Water Forum, 3 September 2018) at www.globalwaterforum.org/2018/09/03/of-rivers-deities-and-legal-persons-a-new-approach-to-managing-freshwater-resources, concluding a series on 'Are Rivers Legally People?'. Peter Szigeti of the University of Alberta in Canada has begun a project 'to substitute the (horizontal, large-scale, rectangular and linear) logic of territorial thought with the (vertical and horizontal, molecular-scale, circular) logic of biogeochemical cycles'. Peter Szigeti, 'Towards a Law of Biogeochemical Cycles' (Presentation Outline, 31 October 2017).

seventeenth century Western thought.[20] The condensed genealogy Latour gave was neatly summarised by Andrew Pickering in this way[21]:

> We need, says Latour, to think about the 'modern constitution' bequeathed to us in the seventeenth century by people like Robert Boyle and Thomas Hobbes. Boyle and his friends in the Royal Society invented a way of speaking about nature that was (ostensibly at least) independent of the speaker; this was the origin of modern experimental science. Hobbes, at the other pole, found a way of theorizing social and political order in terms of distinctively human conflicts and agreements, independent of material circumstances. Boyle and Hobbes, then, jointly constructed the program for purifying the discourses of nature and society—expunging from each the traces of the other—that, for Latour, is definitive of modernity.

Latour's characterisation of this as being about modernity might reasonably be put to one side—although the genealogy of what people at different times have thought it means to be 'modern' brings to life a set of social referents that have actuated many human enterprises. Latour's own claim in any case was that we have never been modern. But the diagnosis of a separation with profound effects between nature and society has been an important preliminary for animation of projects to reintegrate nature and society or in some way to transcend the distinction—in thought, in empirical endeavors, and in communicative representation. With the closeting of natural law and the secular disavowal of divine law (these directions are now being reversed in some respects, but that is for another day), the broadly positivist approaches favored in international law have cleaved strongly to the society side of the society/nature divide, and have been mutually reinforcing with tendencies to characterise technology in the same way.[22]

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[20] Bruno Latour, *We Have Never Been Modern* (Harvard University Press, 1993). The approach and analysis in this book are contested on many dimensions, but its argument has had wide currency.

[21] Pickering, 'We Have Never Been Modern' 257.

[22] Embodied in the view that technology comprised human-made devices for working on and with nature. Exemplary of such a view are these remarks from Ian McNeil, 'Introduction' in Ian McNeil (ed), *An Encyclopedia of the History of Technology* (Routledge, 1990). 'Technology is all around us: we live in a world in which everything that exists can be classified as either a work of nature or a work of man. There is nothing else. We are concerned here with the works of man, which are based on technological and, to some extent, aesthetic factors…In our context, at least, science is the product of minds seeking to reveal the natural laws that govern the world in which we live and, beyond it, the laws that govern the universe. Technology, on the other hand, seeks to find practical ways to use scientific discoveries profitably, ways of turning scientific knowledge into utilitarian processes and devices'. Latour experimented with the idea that this separation of

Extensions of ANT or STS approaches to law have not been many and have not been easy. Bruno Latour's excursions into law in the institutional practices of the French Conseil d'Etat have been met with some scepticism among legal scholars convinced that law and its languages and determinations does not bear up so robustly as Latour perhaps assumes. In particular, much can be said against Latour's confidence in law's binaries,[23] and his proposition that 'everyone seems to agree that law has its own way of defining true and false, although everyone also agrees that such a way does not resemble what is needed for extending the scope of referential statements'.[24] Yet his faith in what the legal enterprise can be holds an attraction for many, as the different perils from collective faithlessness are felt by many people to be coming ever closer. Latour finds a blend of anchoring and piety in his explication:

> Even if this original way of the law is ridiculed for its formalism, belittled for its archaic dramaturgy, mocked for its wide use of imaginary solutions, it remains the case that it is always recognised that what holds legally, well, holds for good—in some fashion to be determined… In that sense, Law has been respected by the Moderns in a way that has never been the case for divinities, gods or fictions, whose dignity has been so thoroughly crushed that they have been taken as 'things in the head', that is for things which have no existence at all. By contrast, when confronted with law, Double-Click [DC], my nemesis, remains toothless.[25]

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technology from society was another misguided purport of the 'modernist settlement', but this seems to be a mismatch of scale -- the meso- or micro-scale at which technology is usually understood is not determined by and not commensurable with the macro scale at which the claim of modernity operates. Philip Brey, 'Theorizing Modernity and Technology' in Thomas J Misa, Philip Brey and Andrew Feenberg (eds), *Modernity and Technology* (MIT Press, 2003) 35. Or as Misa put it: 'It is in the details of technology, and not its macro-level abstractions, that one can escape the (various) traps that Heidegger, Ellul, Lyotard, Borgmann, and others have set for themselves'. Thomas J Misa, 'The Compelling Tangle of Modernity and Technology', in ibid 13. Latour also tried to use ANT methods to reintegrate the social and the technical through the speculation that technology plays the role of rendering unstable social relations durable (and stabilised relations are usually forms of domination. Bruno Latour, 'Technology is Society Made Durable' (1990) 38 Sociological Review 103, 130–131.

[23] Alain Pottage, 'The Materiality of What?' (2012) 39 Journal of Law and Society 167.

[24] Bruno Latour, 'The Strange Entanglement of Jurimorphs' in Kyle McGee (ed), *Latour and the Passage of Law* (Edingurgh University Press, 2015) 331, 332.

[25] ibid 332.

How and from where any sufficient law can be found or assembled and operated under conditions of globalisation, finance and extractive capitalism, freewheeling technology and digitisation, nationalism, and anti-institutionalism is the stunningly difficult problematique at present being confronted.

One view of law is of human-made rules and practices and institutions to regulate (enable, channel, control) humans in their experimenting with, and their inventing, deploying, financing, ownership, registration, licensing, transfer, and uses of, particular 'technologies'. An illustration can be adapted from the work of Bourdieusian sociologist Grégoire Mallard tracing a succession of such regulatory approaches in relation to 'counter-proliferation' controls on acquisition and development of nuclear weapons. This layered from 'safeguards' on use of traded nuclear technology and fissile materials in Euratom and the International Atomic Energy Agency (IAEA), to the Non-Proliferation Treaty and its distinctions between different classes of states, to special regimes for particular internationally-targeted countries, to controls on private conduct in transfers after the AQ Khan network become generally known, to targeted sanctions and fierce US nationally-driven globally-reaching controls on payments, finance, and trade in unrelated products.[26] Law presented in this Bourdieusian field could organise society, or structure the work of humans in relation to nature, or incentivise or regulate the production and use of technology in such processes—or it might be configured so as to accomplish none of those things.

The scholarly-professional style and concepts of most international lawyers make for an uneasy embrace of projects to think integrally about nature and society and technology and law. I suggest that 'Infrastructure' is an idea which offers unusual promise for international lawyers interested in such projects. Most of this promise is still to be realised; but the number of scholars exploring its possibilities is fast increasing. By way of at least a slight stirring in response to Philip Allott's trumpet call (and in the mode of conjecture rather than epiphany), I will offer a few basic notes from my own initial exploring of infrastructure studies and thinking infrastructurally. I focus here on things international lawyers have to learn from infrastructure studies and thinking

[26] Grégoire Mallard, *Fallout: Nuclear Diplomacy in an Age of Global Fracture* (University of Chicago Press, 2014); Grégoire Mallard, 'Antagonistic Recursivities and Successive Cover-ups: The Case of Private Nuclear Proliferation' (2018) 69 British Journal of Sociology 1007; Grégoire Mallard, 'Governing Proliferation Finance: Multilateralism, Transgovernmentalism, and Hegemony in the Case of Sanctions against Iran' in Eric Brousseau, Jean-Michel Glachant and Jérôme Sgard (eds), *The Oxford Handbook of Institutions of International Economic Governance and Market Regulation* (OUP, 2019).

infrastructurally, but as a precursor to the responsibility in later work to consider what might international law in turn contribute to these fields.

II. Infra-Reg: Thinking Infrastructurally on Law, Rights and Regulation

'Infrastructure' is one of a cluster of technology-linked concepts that opens up promising paths for international lawyers thinking about technology and society. Other concepts closely related to 'infrastructure' include system, network, platform, and machine learning/artificial intelligence. Each of these terms has escaped the confines of any general-purpose definition, even as each continues to be used with some degree of precision or at least shared meaning in various communities of practice. As encompassing terms, each has an array of meanings that has expanded in an entropic way, with the degree of entropy a combined function of decades in use and freneticism of new development. Thinking with concepts in this area is necessarily a search for viable routes between the Scylla of excessive de-differentiation (where distinctions of basic importance are missed or covered over) and the Charybidis of continuous addition or excessive splintering (where the proliferation of concepts and pathways defeats unified thought). In this discussion, I will confine myself to infrastructure, and elaborate on these other related concepts only briefly to position 'infrastructure' in relation to robotics/AI, platforms, systems, and networks.

Perhaps a vestige or artifact of the inert railway bed as an original of 'infrastructure' is the sense that infrastructure is an enabler rather than an active agent: outside its own physical bounds, it enables rather than does. A contrast is readily drawn between ordinary parlance about infrastructure, and debates about whether some robots may have agency to the extent even that some kind of legal personality might sensibly be attributed to them. As the European Parliament put it: '[T]he more autonomous robots are, the less they can be considered to be simple tools in the hands of other actors (such as the manufacturer, the operator, the owner, the user, etc.)… ultimately, the autonomy of robots raises the question of their nature in the light of the existing legal categories or whether a new category should be created, with its own specific features and implications'.[27]

[27] European Parliament resolution of 16 February 2017 with Recommendations to the Commission on Civil Law Rules on Robotics [2017] (2015/2103(INL)) AB and AC. A paper seeking to position this debate in relation to questions of legal personhood for artificial international law entities ranging from the Bank for International Settlements, the International Tin Council, to the United Nations, and to natural entities such as the Ganges and Whanganui rivers, is Joanna Bryson, Mihailis Diamantis and Thomas Grant, 'Of, For, and By the People: The Legal Lacuna of Synthetic Persons' (2017) 25 Artificial Intelligence and Law 273. For the proposition that (hypothetical) incorporeal spontaneous intelligence entities with consciousness might be

The scholarship on platforms has (so far) positioned conceptual thinking about platforms somewhere in between old-style infrastructure and new era robotics. Platforms are programmable, more homogeneous (than infrastructure) in their core but with modular variable components, their interoperability comes more from application programming interfaces (APIs) than through industry standards, they are updated very frequently, the larger ones are private, profit-making, and fast-scaling, and in many countries they are regulated by tax, antitrust, consumer protection and intellectual property law, but not so much by the forms of regulatory law typically applied to major physical infrastructure or utilities.[28]

Scholarship on networks has many threads.[29] Some have been brought into explicit relation with ideas about infrastructure. One prominent account is of individual closed systems with central control (such as a local electricity generation company with only local distribution) which are eventually brought into coordinated/controlled networks enabling them to interoperate (for example, in a national power grid) with open and reconfigurable characteristics. This kind of network, with gateways and standards and major roles of users, is (by stipulation) an infrastructure, as would be a weaker but coordinated network of heterogeneous networks, like the internet.[30] This approach to infrastructure as composed in lots of parts made at different times, and more or less networked,[31] makes notable contributions in highlighting the roles of technology transfer, localised and user-led development, local social and organisational practices inflecting technologies and their reception, and gateways and standards. However this evolutionary framing is far from universal.

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more comparable to humans (and more meriting of legal personhood) than are AI entities with consciousness, see Jiahong Chen and Paul Burgess, 'The Boundaries of Legal Personhood: How Spontaneous Intelligence Can Problematise Differences Between Humans, Artificial Intelligence, Companies and Animals' (2019) 27 Artificial Intelligence and Law 73, 77. They indicate that '[t]he idea of spontaneity… relates to something akin to the terms of a Hayekian spontaneous order: something that arises from human action but not human design'.

[28] Christophe Plantin, Carl Lagoze, Paul N Edwards and Christian Sandvig, 'Infrastructure Studies Meet Platform Studies in the Age of Google and Facebook' (2016) 20 New Media & Society 293.

[29] Niklas Luhmann, *Social Systems* (Stanford University Press, 1995) is of particular importance in its focus on complexity and (self-)regulation of systems. See also Eugene Yates (ed), *Self-Organizing Systems: The Emergence of Order* (Plenum Press, 1997) and Scott Camazine et al (eds), *Self-Organization in Biological Systems* (Princeton University Press, 2001).

[30] Paul Edwards, Steven Jackson, Geoffrey Bowker, and Cory Knobel, 'Understanding Infrastructure: Dynamics, Tensions, and Design' (January 2007) Report of a Workshop on 'History and Theory of Infrastructure: Lessons for New Scientific Cyberinfrastructures' 12. This report is an excellent introduction to the entire field.

[31] ibid. See also Susan Leigh Star, 'The Ethnography of Infrastructure' (1999) 43 American Behavioral Scientist 377.

Indeed, many sophisticated participants in (or entrepreneurs of) networks profess doubt that a profound understanding of 'network' as a concept is yet available. Nonetheless it may be noted that 'network' as a metaphor tends to be represented as non-hierarchical; influence and importance may be registered in larger nodes and denser edges, but not in formal governance. By contrast, infrastructure imports an element of differentiation, stratification, and hierarchy. It involves some verticality in the separation of layers of administration, bureaucracy, rate-setting, adjudication, financing and so on—which is also consonant with the development of law and institutions.

Thinking infrastructurally typically entails understanding infrastructure not simply as a thing, but as a set of relations, processes, and imaginations. One well-established approach brings together in infrastructural thinking the technical (the designed and engineered physical and software elements), the social (the human and non-human actants in their intricate relations), and the organisational (the forms of entity, regulatory arrangements, financing, inspection, governance, etc). It is only possible to understand the processes of infrastructure, and the consequences or potential of any intervention in infrastructure, by fully exploring each of these and their joint interactions and effects. This combination opens an analytic window into the thickening of infrastructure, the development of hierarchies and routines and rationalities in these interactions, which capture power and hierarchy more comprehensively than traditional network-analysis theory, with its largely non-hierarchical models (in two or three dimensions).[32] Law may intervene in the technical, the social, and the organisational, and each of these may be embedded in a particular environment of legal forms and relations. Thomas Parke Hughes brought much of this to life in his classic study of urban electrification in several areas or Europe and the United States in the early years of the 20th century.

> Chicago and Berlin each had a centralized power and light system supplying the entire city from a handful of modern power stations; Greater London [in 1913] had sixty-five electrical utilities, seventy generating stations…forty-nine different types of supply systems, ten different frequencies, thirty-two voltage levels for transmission

[32] '[E]ven though an electric grid can be seen both as a network and as infrastructure, as a network it is defined by connections and pathways through which something circulates, while as infrastructure it is defined by its supportive relationship to other economic activities'. William J Rankin, 'Infrastructure and the International Governance of Economic Development, 1950–1965' in Jean-François Auger, Jan Jaap Bouma and Rolf Künneke (eds), *Internationalization of Infrastructures* (Delft University of Technology, 2009) 61, 62.

> and twenty-four for distribution, and about seventy different methods of charging and pricing.[33]

This was certainly part of the bill of particulars in demands in London in that period for consolidation and regulatory reform, with denunciations that boundaries for modern electricity service should not be derived from ancient boundaries allocating jurisdiction among ecclesiastical authorities—but Hughes' rich study draws a more complex picture of social and industrial patterns and transport services in which this fragmentation is more intelligible. A study by legal scholars of public-private partnership (P3) contracts for infrastructure construction in Canada chronicles the short life of the neo-liberal venture in reducing governmental rule-making about these contracts by moving to deal-by-deal negotiations to pay the private sector to take on contractual risks. Driven not only by bureaucratic and corporate preferences for precedent but also by the demands of globally active pension funds for stable risks and forty-year terms in order to have a predictable long-term return on the financing they provide, the neo-liberal deals label had become a mask for standard boilerplate contract terms and project formulation regardless of vast differences among the sites and engineering or social challenges.[34]

The term 'infrastructure' seems to have migrated into English-language writing in the last quarter of the nineteenth century from French railroad engineering parlance, to be joined by other locomotion-related transpositions from French such as garage and metro.[35] 'Infrastructure' was a category adopted in 1949 to refer to physical and communications facilities needed in the project of common West European defense, in part because its imprecision and elasticity diplomatically left open which items would be encompassed in multi-country cost-sharing amongst the severely cash-strapped participants, and the ensuing North Atlantic Treaty Organization (NATO) in 1951 promptly established an Infrastructure Committee which proved remarkably enduring.[36] The

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[33] Thomas Parke Hughes, *Networks of Power: Electrification in Western Society, 1880–1930* (Johns Hopkins Press, 1983) 227.
[34] Mariana Valverde, Fleur Johns and Jennifer Raso, 'Governing Infrastructure in the Age of the "Art of the Deal": Logics of Governance and Scales of Visibility' (2018) 41 PoLAR: Political and Legal Anthropology Review 118.
[35] Ashley Carse, 'Keyword: Infrastructure—How a Humble French Engineering Term Shaped the Modern World' in Penelope Harvey, Casper Bruun Jensen and Atsuro Morita (eds), *Infrastructures and Social Complexity: A Companion* (Routledge, 2016) 27.
[36] NATO Infrastructure Committee, 'Fifty Years of Infrastructure' (NATO, 2001) at www.nato.int/structur/intrastruc/50-years.pdf.

practice and philosophies of international development assistance after President Truman's 1949 avowal of this commitment veered quickly into an embrace of 'infrastructure', partly as a more tangible substitute for the economic terminology of social overhead capital—roads, education, etc.—which typically supplied a valuable return for the whole society and its individual enterprises but needed to be supplied publicly or collectively.[37] Under the influence of Cold War politics, infrastructure became a mainstay in project lending by the World Bank, and in the concessional funding the Bank began to disburse as a counter (in part) to the proposed Special United Nations Fund for Economic Development (SUNFED). Marxian terminology of superstructure and base also evolved, particularly under the influence of Louis Althusser, so that both material and immaterial elements of the base came at times to be called 'infrastructure'. The idea that intangible or non-material elements could equally be regarded as infrastructure became (neo-)liberal orthodoxy with the early-1990s turn in development policy and in World Bank practice to regard good governance and (national) institutions—and the 'infrastructure of markets'—as a vital determinant in development trajectories. Onto this was layered a strong interest in techniques and technologies for regulation in relation to (often newly corporatised or privatised) physical infrastructure,[38] and eventually also an interest in private standard-setting and regulation as itself infrastructural. This entire set of infrastructural agendas drove a demand for information, the deployment of informational and quantification technologies,[39] and a kind of informational infrastructure which itself engaged in regulatory governance and came to be invested (sometimes under the 'Big Data' moniker) with attributes reputed to meld practices of data, information, knowledge, and wisdom.[40] A shift to advanced digital infrastructure—engaging such sources as internet-of-things devices, sensors, biometric scans, satellite images, chemical trace detection, bank and money transfer anomalies, social media links and content analysis, telecommunications metadata, or vaccination records—and often

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[37] William J Rankin, 'Infrastructure and the International Governance of Economic Development, 1950–1965' in Jean-François Auger, Jan Jaap Bouma and Rolf Künneke (eds), *Internationalization of Infrastructures* (Delft University of Technology, 2009) 61.

[38] Navroz Dubash and Bronwen Morgan (eds), *The Rise of the Regulatory State of the South: Infrastructure and Development in Emerging Economies* (OUP, 2013); Megan Donaldson and Benedict Kingsbury, 'Ersatz Normativity or Public Law in Global Governance? The Hard Case of International Prescriptions for National Infrastructure Regulation' (2013) 14 Chicago Journal of International Law 1.

[39] Sally Engle Merry, *The Seductions of Quantification* (University of Chicago Press, 2015); Sally Engle Merry, Kevin Davis and Benedict Kingsbury (eds), *The Quiet Power of Indicators* (CUP, 2015); Kevin Davis, Angelina Fisher, Benedict Kingsbury and Sally Engle Merry (eds), *Governance by Indicators* (OUP, 2012).

[40] Bruno Strasser and Paul Edwards, 'Big Data is the Answer…But What Is the Question?' (2017) 32 Osiris 328.

involving contracts with private companies and to be processed by machine learning (ML)/artificial intelligence (AI) systems, is now in progress in international treaty organisations as in many other institutions Unsurprisingly, the international legal framework for much of this is at present scanty, woefully lagging, and in urgent need of construction.

When the Panama Canal was being designed at the turn of the twentieth century—before and after the contrived secession of Panama from Colombia—the route chosen entailed raising vessels well above sea level and dropping them down to sea level to exit on the other side, using locks. The topography meant this could only be accomplished using massive quantities of fresh water for each vessel transit. The jurisdiction of the canal authority thus was defined to include not only the filament zone of the canal and its channels, but also key highlands and streams of the watershed.[41] When drought occurs in the area, as happened in 2019, the use of water by local populations is radically curbed to keep the canal open.[42] Whatever might now have been the politics or law of water allocation in Panama, in an era of constitutionalism and Inter-American human rights institutions, the regulatory possibilities are heavily constrained by the infrastructure and the sustaining of choices made long ago and the follow-on logic of widening to maintain the canal's global trade role. When the powerful urban planner Robert Moses built New York's parkway roads to enable access between the crowded city and the suburbs and beaches of Long Island, he built numerous low overpasses, preventing passage by trucks, but also travel by buses on which lower-income people depended (including many members of minority groups). He thus accomplished by infrastructure what he could not have done by legal or administrative rulemaking.[43] And his choices made well before the civil rights movement's victories continue to influence access and behavior many decades later—the bridges would be prohibitively expensive to raise or remove. Nowadays digital platform companies exercise such opportunity-structuring powers with formal public oversight that probably does not exceed that which Robert Moses worked under. These infrastructural choices operate as regulation—but these regulators are often themselves only thinly or unevenly regulated. The idea of infrastructure-as-regulation ('infra-reg') is that infrastructure can (and often does) operate in some significant relation to law. In crude simplification, infrastructure

[41] Ashley Carse, *Beyond the Big Ditch: Politics, Ecology, and Infrastructure at the Panama* Canal (MIT Press, 2014.)
[42] Ashley Carse, 'Drought as an Infrastructural Event' (2016) 7 Limn at https://limn.it/articles/drought-as-infrastructural-event.
[43] Langdon Winner, 'Do Artifacts Have Politics?,' (1980) 109 Daedalus 121. What exactly Moses was motivated by in his choices, and how significant it really was for access in the long term, are much debated.

may be a means of implementing law, or of enabling law. It may be a substitute for law or displace law. It may be an obstacle to law or prevent law, or interact pathologically with law. It shapes juridical relations and imaginaries. Infrastructure may create dependencies, engender cooperation, or structure conflict.

Infrastructure features in most major accounts of histories of nation-state consolidation and imperial extension, in war preparedness and in war logistics and targeting or titanic fighting,[44] in resource extraction and in energy capture and transit,[45] in each quantum step in economic globalisation,[46] in mass migrations and religious missions, in the global scaling of finance and financialisation,[47] in the rapid scaling of global digital economy companies and trade,[48] in projections of power and economy into airspace and outer space, in the computer-system construction of AI and robots, and quite formally in the heterogeneous but vast Belt and Road (yidai yilu) Initiative announced by China's leader in 2013 and embodied in the PRC Constitution soon after.[49] International law has by and large tracked these initiatives, embracing and enabling most of them while in some cases providing a means to manage conflict and contestation and to coordinate competition and allocations of power and resource rights. As some of these infrastructurally-grounded and legally-enabled projects have come into question, struggling efforts are made to enunciate new international law with different collective governance, more far-reaching and participatory planning, and specific changes in some legalised understandings of contract, property, governance, public interests, and rights.[50] These efforts have some momentum for example in demands for a rethinking of the extractive and climate-modifying premises of economic growth in the anthropocene,[51] or in demands for reconsideration of massive data concentrations or of

[44] Deborah Cowen, *The Deadly Life of Logistics* (University of Minnesota Press, 2014).
[45] Timothy Mitchell, Pierre Charbonnier and Julien Vincent, 'Étudier les infrastructures pour ouvrir les boîtes noires politiques: Entretien avec Timothy Mitchell' (2018) 35 Tracés: Revue de sciences humaines 209.
[46] Richard Baldwin, *The Great Convergence* (Harvard University Press, 2016).
[47] Katharina Pistor, *The Code of Capital: How the Law Creates Wealth and Inequality* (Princeton University Press, 2018).
[48] Tung-Hui Hu, *A Prehistory of the Cloud* (MIT Press, 2015); Nicole Starosielski, *The Undersea Network* (Duke University Press, 2015).
[49] Jonathan Hillman, 'Influence and Infrastructure: The Strategic Stakes of Foreign Projects' (CSIS, January 2019); Julien Chaisse and Mitsuo Matsushita, 'China's 'Belt and Road' Initiative: Mapping the World Trade Normative and Strategic Implications' (2018) 52 Journal of World Trade 163.
[50] Kate Crawford and Vladan Joler, 'Anatomy of an AI System: The Amazon Echo as an Anatomical Map of Human Labor, Data and Planetary Resources' (2018) (with accompanying AI map) at https://anatomyof.ai/.
[51] Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (Verso, 2011).

biometrically-structured controls and facial recognition and other AI.[52] But the infrastructure-scale legal shifts have been very slight when compared to the scale of the issues involved. In particular, much more could be done in collective representation and governance of infrastructures old and new, in far-sighted and more participatory planning, in mapping out the routes of different paths before they are chosen and inexorable path dependence and regulatory effects set in, in viable financial and data planning, and in layering, networking, maintaining, repurposing, and decommissioning infrastructures with holistic values and justice considerations to the fore.[53]

The examples just given are of infrastructure enabling and organising flows. But infrastructure may also be designed to block or channel (the US–Mexico Border wall/fence/gaps,[54] or Hadrian's Wall), it may have the effect of constructing vulnerable chokepoints in local or global flows,[55] and all over the world public discussion of infrastructure is often about the non-designed obstructions, bottlenecks, overloading, and intermittencies of infrastructure.[56] The specialised literature on technological dynamics took up the military metaphor of reverse salient—the areas where the otherwise advancing front did not go forward, and perhaps receded, attracting intense competition, innovation, and perceptions of vulnerability.[57] Public policy and security studies deployed a category of 'critical infrastructure' and sub-categories such as 'critical digital infrastructure' to focus attention and in some cases regulatory effort. Conflicting priorities may impede the performance of infrastructure: plant engineers operating digital platforms for electric power generation and distribution may resist upgrades so as not to risk system stability, whereas the government and in-company cybersecurity professionals demand very frequent upgrades and patches to address new vulnerabilities to hackers and malware.[58] Some infrastructure goes unnoticed by ordinary users until it goes wrong; other infrastructure is conspicuous and presented to inspire

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52 Setha Low and Mark Maguire (eds), *Spaces of Security* (NYU Press, 2019).
53 Andrew Russell and Lee Vinsel, 'Hail the Maintainers' (Aeon, 7 April 2016) is the manifesto paper of an intellectual movement, 'The Maintainers', focused on the understated importance of the hum-drum work of maintenance in technology and infrastructure (maintenance as opposed to glamorous innovation—wryly characterised as 'the STS for the 1%').
54 Beth Simmons, 'Border Rules' (2019) 21 International Studies Review 256.
55 Ashley Carse, Jason Cons and Townsend Middleton (eds), *Limn Issue 10: Chokepoints* (Limn, 2018).
56 Caroline Melly, *Bottleneck: Moving, Building, and Belonging in an African City* (University of Chicago Press, 2017), on *embouteillage* in Dakar, Senegal.
57 Thomas Parke Hughes, 'Reverse Salients and Critical Problems' in *Networks of Power: Electrification in Western Society 1880–1930* (Johns Hopkins Press, 1983).
58 Aaron Clark-Ginsberg and Rebecca Slayton, 'Regulating Risks Within Complex Sociotechnical Systems: Evidence from Critical Infrastructure Cybersecurity Standards' (2019) 46 Science and Public Policy 339.

awe or admiration or promise and imagination for a brighter future. Infrastructure variously appeals to utilitarian and aesthetic sensibilities. Usually infrastructure is regarded as built rather than (simply) natural, although the two often blend. Of special importance is the futurity with which discussions of infrastructure are imbricated. Thinking infrastructurally involves (at times) thinking forward.

That infrastructure can alter the practical experience and political impact of time and of space has been apparent for millennia.[59] The celebration of this as new flow infrastructure comes into operation, familiar to almost every modern era, was memorably conveyed in a noted 1837 US judicial decision on railroads, in which Senator Maison lyrically opined:

> more than any other mode of conveyance, they tend to annihilate distance, bringing in effect places far distant near to each other; tending in their magic influence to the extension of personal acquaintance, the enlargement of business relations, and cementing more firmly the bond of fellowship and union between the inhabitants of the states.[60]

Even more ample was the 1844 comment of an excited correspondent on the first week of full operation of Samuel Morse's experimental new telegraph between Baltimore and Washington DC: 'Time and space has been completely annihilated'.[61] But the implications of infrastructure for time are not captured by its familiar motifs as a transport channel, a biopolitical project to produce human welfare but also surveil, control and discipline, or a symbol of the (modern) future being brought into the present. Taking examples from Bengaluru, and also the long-delayed Narita Airport near Tokyo, Akhil Gupta persuasively puts in question the temporality in which infrastructure is designed, constructed, and inaugurated at a ribbon-cutting by politicians. He accents instead the long-non-completed, the 'ruins' of perpetual construction and debris, and the ruins of obsolete infrastructure (sometimes repurposed). Non-achieved or uncompleted infrastructure is often linked

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[59] I do not mean here to blur the disanalogies between time and space. Among the key attributes of time are: extension, linearity, direction, and transience. Space shares only one of these attributes: extension. Antony Galton, 'Time Flies but Space Doesn't: Limits to the Spatialisation of Time' (2011) 43 Journal of Pragmatics 695.

[60] *Bloodgood v. Mohawk and Hudson Railroad Company*, 18 Wend. 9 (1837) 48 (Court for the Correction of Errors of New York). He added: 'Next to the moral lever power of the press, should be ranked the beneficial influence of railroads in their effects upon the vast and increasing business relations of the nation, and the promoting, sustaining and perpetuating the happiness, prosperity and liberty of the people'.

[61] *Baltimore Sun* (31 May 1844). Quoted in Rebecca Rosen, 'Time and Space Has Been Completely Annihilated: Tech Writing from an Earlier Era' *The Atlantic* (14 February 2012).

to underlying property rights (legal or protesting prevention of expropriation) or to finance problems; and 'law reform' in many countries has been about overcoming these.[62] In the same way, infrastructural space may be corridors, enclaves, subterranean, celestial: quite frequently not aligned with other political or juridical spaces,[63] and indeed these may be overlain on infrastructural space in perplexing ways.[64]

III. **Conclusion**

International law can itself be thought about as infrastructure. But it is an infrastructure that has come to seem somewhat maladapted for the demands and the weight technological changes have put on it. For international lawyers among whom the 1990s North Atlantic era was a high-water mark of international institution-building, juridification, international and national judicialisation, and increasingly sophisticated modalities for compliance, enforcement, and new norm-generation, the after-times can seem more beleaguered than promising.[65] Many of those projects have stalled, in some respects the directions of momentum have reversed, many prominent political leaders assert values or engage in practices that contradict these embraced in the rhetoric of 1990s liberalism, and international lawyers of that stripe have come to feel more marginal in many places. A different concern, however, is that the matters and materials of traditional international law seem to be a smaller and smaller kernel (albeit still utterly fundamental to ordering) of what is important in the present trajectories of extractive capitalism and technological transformation. To put it a bit starkly: in proportional terms, the domain of international law might seem to be shrinking. For the lugubrious nostalgist, the quietist, or even the cheery but judicious counsel of 'stay in your lane', this is simply an aspect of the universe to live with. If traditional international law and its techniques has little or nothing very apposite to say about ecological calamity, tech-enabled weaponised abuse of humanity and dignity, skewed distribution, human cloning, gene editing, gene drives, artificial intelligence, robotics, or even big-tech corporations and newer space activities, the lawyers might have nothing to do but cast an anxious glance toward the natural scientists or the plumbers or the

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[62] Akhil Gupta, 'The Future in Ruins: Thoughts on the Temporality of Infrastructure' in Nikhil Anand, Akhil Gupta and Hannah Appel (eds), *The Promise of Infrastructure* (Duke University Press, 2018) 62.
[63] Shannon Mattern, 'Scaffolding, Hard and Soft: Critical and Generative Infrastructures', in Jentery Sayers (ed), *Routledge Companion to Media Studies and Digital Humanities* (Routledge, 2018) 318.
[64] This is a major theme in China Mieville, *The City and the City* (Ballantine, 2009). See also Deborah Cowen, 'The City and The City (and the City): Infrastructure in the Breach' *Society + Space* (October 2017).
[65] Benedict Kingsbury, 'Frontiers of Global Administrative Law in the 2020s' in Jason Varuhas and Shona Wilson Stark (eds), *The Frontiers of Public Law* (Hart, 2019).

geneticists or the data scientists and hope they can do more. A different path, however, has been scrabbled in the post-1990s. Lawyers have come to work with risk management as much as constraint, deals as much as rules, nudges as much as sanctions, affordances as much as fundamental rights, the urban as much as the state,[66] affect and style as much as reason, uneven tempos and oddly-layered spaces as much as traditional legal time and space, experimental governance as much as rigid specifications, prototypes as much as plans. Fleur Johns has charted the last of these shifts in her illuminating study of digitally-enabled innovation which pursues the implementation of new pathways through prototypes rather than the high modernist planning that James C Scott sought to pinion. The prototypes are diffused 'through incremental adoption and repetitive use rather than through reasoned persuasion'.[67] This style—which does not have the structured forms of new governance experimentalism—displaces ordinary legal expectations of agency, responsibility, and durability. The struggles of law and institutional action to address the tempo and style of prototypes cast a reverse light. I propose that this light be used to illuminate a path back to two characteristics which, while much derided, and often rightly, were also hallmarks of some of the better contributions made by the traditional international law of earlier eras—what might in optimistic mode be described as the endowment of international law. These characteristics from the better part of the endowment, which might be reinvigorated, are a slower tempo allowing for deliberation (but by publics, not simply by governments and experts), and far-sighted planning. The rise of ML/AI seems for now to move in entirely the opposite direction—but the time for a humanly capacious and politically imaginative contrariwise turn, even while fully engaging these technologies and infrastructures, is now arriving.[68]

Planning and thinking for the future is perhaps the element of 'modernity' which is most conspicuously gone from current politics and discourse.[69] Helping to restore some organised futurity and collective planning to desperately evanescent political time is perhaps among the biggest and most plausible contributions international law mindsets might be adapted to make. Lawyers are

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[66] Luis Eslava, *Local Space, Global Life* (CUP, 2015).
[67] Fleur Johns, 'From Planning to Prototypes: New Ways of Seeing Like a State' (2019) 82 Modern Law Review 1, 21.
[68] This point owes much to ideas of Eyal Benvenisti and Joseph Weiler. The apposite forms of regulation—and the structuring of moments for public deliberation—must be tailored to the technology, and to its speed of change and rate of scaling.
[69] I owe this point, and many other thoughts, to Andrew Hurrell. My thanks also to Salle Engle Merry, Angelina Fisher, Fleur Johns, Nahuel Maisley, Paul Mertenskoetter, Thomas Streinz, and collaborators in NYU's IILJ InfraReg Project and in the NYU Guarini Global Law and Tech initiative.

somewhat conditioned to processes of *ex post* or real time determinations in which the materials of the past, or already established, condition thinking about the matters of the present. Even counter-hegemonic projects in their daily work are more often about extricating the present from the past, or reimagining or dismantling or compensating for some part of the past and its effects which are experienced as oppressive or unjust. Oddly fatalistic strands in contemporary European thought on the left and on the right seem content to tear down existing institutions (deemed to be monuments to failed projects of elite rule or technocracy or self-government destruction or market regulation or cultural dilution), and to hope that something better will grow in the ruins, or that a moment of refounding will reassert the national or popular constitutive power, or that technology-enabled markets will flourish without much of the politics-blocking regulation earlier Hayekians had believed was essential. Yet creative ideas and mass forces favoring renewed and remade institutionalism and legal governance are also strong if not yet very much unified in their vision and articulation. These are the waves which seem likely to lift contemporary legal projects in much the same way as the forward-looking legal projects of earlier eras were lifted. This does not in any way mean that the next-generation legal projects will all be normatively attractive or even well-conceived. The functions and roles of critique, contestation, and straight-out leadership and courage will be as vital now as ever.

This is a time when it seems necessary not only to change academic formations and knowledge bases and outlooks and demographics in our field, but also to add concepts to it. With venerable concepts and refurbished concepts and some new concepts, we can employ them as we think anew, to see what we might contribute (as well as what we might not contribute). This is the kind of project today's conference undertakes, and I join wholeheartedly in its spirit and its struggles.