HOW WE USE STORIES AND WHY THAT MATTERS

CULTURAL SCIENCE IN ACTION

JOHN HARTLEY

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(JEFFREY SCONCE, 2019: ix)

I. Cultural science

This is a book about knowledge, in which stories play a prominent role. But it's not about the difference between true stories and fiction or lies. Instead, it's about how culture makes knowledge. A previous volume, *Cultural Science: A Natural History of Demes, Stories, Knowledge and Innovation* (Hartley and Potts, 2014), is a precursor book to this one. It brought together cultural studies and evolutionary economics to argue that

- the evolutionary function of culture is to create and sustain groups;
- the cultural function of groups is to make knowledge and act accordingly, while inter-group competitive conflict is a productive force for newness and innovation; and
- knowledge is the 'currency' of both economics (growth) and politics (contestation).

How does that work? This book, *How We Use Stories and Why That Matters: Cultural Science in Action*, takes the 'thought experiment' of cultural science further, in a series of explorations of the cultural function of storytelling

in group-forming cultural systems. Together, the chapters that follow link agents (micro-scale), institutions (meso-scale) and systems (macro-scale) in a new 'model' of culture – with some new concepts, methods and ambitions for cultural studies – that acknowledges both culture's ancient provenance and its current global, digital dispersion. Where this model of culture differs from others is that it does not *confine* 'culture' to the past, to memory and to the transmission of embedded rules from one generation to the next (important though these are); it examines how culture mobilizes these resources to imagine possible futures, using stories – and the groups that make them – to stimulate disruption, innovation and change; and, with cultural science, it attempts to put the account on a systematic footing.

To accomplish its task the book draws from the social and natural sciences as well as the humanities. Specialized approaches to culture have tended to look inwards, seeing it as an autonomous or exceptional region. Cultural science looks outwards, seeking to integrate the insights gained in the arts and humanities with those from other spheres, especially the evolutionary sciences (including economics and bioscience) and complexity sciences (computational systems and networks).

What can each domain learn from the other?

- What is the role of fiction, imagination, creativity and novelty in economic and life systems?
- How does cultural conflict result in both the destruction and creation of knowledge?
- What is the agency of technology and artificial systems in human affairs?

In terms of approaches and method:

- Which scientific approaches can help us to explain planetary-scale and population-wide cultural processes and their dynamics under uncertain conditions?
- How can the methods already in use in specialist corners be synthesized towards a general model?
- How can such a model improve on individualistic, choice-theoretic and behavioural approaches?

Can we (the 'we' of scholarship) discover the extent to which culture is the *cause* of societal problems? Can understanding how it works become part of these problems' solution? If you are concerned about the economics or governance of *groups*, the negotiation and transmission of *identity*, the history and future of *communities*, the development of networked *knowledge*, or the role of social media in shaping the *creative economy*, then you have a place in the rich interdisciplinary ferment of cultural science. For a taste of cultural science work in progress, see this book's predecessor and

companion volume (Hartley and Potts, 2014); and *Cultural Science Journal* (https://culturalscience.org/), whose archives go back to 2008.

Rigour + vigour: Cultural science in action

In 1974, Raymond Williams – widely held to be a founding parent of cultural *studies* – called for a new approach to the study of culture. He wanted a discipline that was 'rigorous in method' but retained a 'vigorous and general humanity' (1974: 37). He wrote: 'The approach I want to describe is that of cultural studies, which is English for "cultural science".' Williams was translating the German term *Kulturwissenschaft*, associated with philosophy (Simmel, Cassirer), history and anthropology (Dilthey), sociology (Weber) and art history (Warburg, Gombrich) (Herrmann-Pillath, 2018). Thus, for Williams, the first theorist of 'British' cultural studies (Turner, 2003), cultural science came first. We can call this 'cultural science 1.0'.

Cultural studies has enjoyed a long period of expansion and social prominence, marked by politicization and bursts of controversy, which displayed plenty of vigour but not always rigour. The relation between scientists and cultural studies deteriorated after the so-called Sokal affair in 1996, which set science (truth claims about objects) against postmodernism (ethical claims about language use) (Lucy, 2016). The details of this case are widely published and discussed (Sokal and Bricmont, 1998; Derrida, 2005: 70–3; see also Wikipedia). It began with a hoax paper, submitted by a physicist, being published (in good faith) in a journal of postmodern theory (*Social Text*), and then being revealed (by the author) as a hoax. This was taken to be 'evidence' that postmodern theory is 'not just false, it is gibberish' (Sokal and Bricmont, 1998: 23), without due recognition of the research traditions, methods, protocols and ambitions of a discipline for which the author had only contempt (his book was called *Fashionable Nonsense*). Beyond the details and denunciations of the case itself, the divisive aggressiveness of the attack left a bitter taste and a continuing gulf between science (especially in the 'Anglo-Saxon' tradition of empirical realism) and cultural theory (especially in the tradition of Continental philosophy). It became a textbook case of adversarial distrust between 'we' and 'they' groups. Neither side learnt much from the other. When Alex Mesoudi (2011) published a knowledge tree of evolutionary approaches to culture, the arts and humanities branches were missing altogether. Cultural studies was fair game, not science.

More than twenty years later history was repeated, not as farce, exactly, and certainly not as serious scholarship, in the so-called 'Sokal squared' brouhaha of 2018–19 – another hoax prank directed against identity-based research publications and postmodernism, dubbed 'Grievance Studies' by the perpetrators, to the delight of conservative commentators (Fox News) – but as provoking fears among others that the only cause served by the

prank was that of racism.[1] The Sokal and 'Sokal Squared' affairs certainly demonstrated the importance of tribal allegiance and inter-group conflict in public colloquy, but it does a disservice to our understanding of knowledge to assert that truth and reason are all on one side, and the other side is merely contemptible. As David Banks put it in a thoughtful response on *Cyborgology*:

> Gender studies, fat studies, cultural studies, science and technology studies – they all have incisive criticisms of a wide array of disciplines that orbit the same idea that predicated their founding as fields of inquiry: that no one has a monopoly on truth. That science is, like all human endeavours, shot through with politics, prejudices, and cultural norms. This essential idea, that all knowledge is the result of human history, geography, and culture is much more than a splash of cold water on burning passions of ambitious scientists, although it is sometimes that and for good reason. The Cultural Turn – the name given to the moment in the 70s where the social situatedness of knowledge really began to be transformative – says that we can make better scientific breakthroughs, not less. This isn't a detour, it's the only way through that assures no one is left behind. (Banks, 2018)

In short, cultural science – like postmodernism – is part of scientific endeavour, dedicated to the improvement of knowledge, not its destruction. It's time to restart the conversation across disciplines, seeking to synthesize the best work. The particular effort of which this volume is a part commenced in 2008 under the title of 'cultural science' (version 2.0). With Carsten Herrmann-Pillath (2013), it seeks for culture a 'scientific approach that aims at establishing truthful propositions about reality' – and at finding ways for humans to *perform* themselves and their knowledge in the face of those facts (Herrmann-Pillath, 2018).

Cultural *science* is an evolutionary, complex-systems approach to culture. As such it operates on the dynamics of change ('evolutionary') and the formation and action of groups ('complex systems'), as well as on meaning, identity, relationships and power ('culture'). Within its scope is any analysis of meaning-formation and usage that is combined with social networks and institutions. It is interested in how knowledge is made, stored, distributed and contested among scalable populations, and how it is reproduced across time and space. Cultural science can be summarized as the study of how, utilizing evolved sense-making knowledge technologies (speech, writing, media, electronics and their organizational forms), human culture makes

[1]For the 'Sokal Squared' story and its aftermath, see: https://en.wikipedia.org/wiki/Grievance_Studies_affair; and https://www.chronicle.com/article/Proceedings-Start-Against/245431. For the fears of racism see: https://www.insidehighered.com/views/2018/10/30/sokal-squared-hoax-was-put-down-scholars-concerned-racial-issues-opinion.

groups, groups make knowledge, and innovation emerges from 'translation' within and between groups (Lotman, 1990), not simply from 'transmission' of information (Carey, 1989).

Re-reading the historical, anthropological and archaeological record, cultural science conjectures that culture is a primary causal force – ahead of both 'the economy' (forces of production) and 'politics' (organized settlement) – in human change over the *longue durée*. If so, then the conceptual framework for *communication* is in need of revision, not least because language came first, social organization and settlement (states and cities) a long time after. Communication is not a 'behaviour' of already-made individuals; it is a condition of existence for individuals. Culture is not a 'superstructure' whose causal determination lies elsewhere (in economics). Instead it is *constitutively prior* to production (economies) and settlement (polities), contrary to most developmental narratives.

At the same time, the concept of culture as used in the humanities is no longer fit for purpose. Cultural science is an attempt to reconceptualize it, based on what culture is *for*, as an evolved system. The received usage of 'culture' to refer to the works of elite artists (literature) or to the everyday practices of ordinary people (anthropology) does not address causal sequence and group formation in culture.

Following Thorstein Veblen's (1898) provocation – 'Why is economics not an evolutionary science?' – cultural science poses the same question of cultural studies, over 100 years later. The evolutionary sciences do indeed theorize about culture, but a rather impoverished version of it, compared with the 'language arts' developed in the humanities over two centuries and more of continuous thought and argument. However, the lesson of economics is that it takes a long time – say, a century – to swing a discipline around towards an evolutionary approach, and only then by rethinking evolutionary theory (as is under way in evolutionary economics).[2] The need for a clearer understanding of *cultural causation* and its *dynamic change processes* has been made urgent by the rapid expansion of user-created content, creative industries and the maker movement. These phenomena clearly carry economic, business and political implications, but at the point of production they are all culture – about identity, relationships, meaning and power, using textual-discursive codes to communicate imaginative truths, fictions (and deceptions). How do such creative systems work at population and planetary scale?

The conceptual models inherited by cultural and media studies – structuralism, political economy, production/consumption – were not well-suited to understanding global dynamics and system-level change. Following the widespread adoption of computation and the internet, in addition to

[2]For a beginner's guide, see: https://medium.com/@brendanmarkeytowler/what-is-evolutionary-economics-ce1dc62b74c4 (and follow the links).

globalizing commercial popular culture, cultural studies needs new tools to understand

- competitive communication in and among self-organizing groups;
- the productive agency of myriad users of social networks (Hartley, Wen and Li, 2015); and
- the principles of social network markets (Potts et al., 2008).

Of course, many studies of social media now borrow, adapt or propose numerate methods to analyse user-created systems and 'big data'. But an overall conceptual framework is still a challenge for a branch of knowledge that has relied on in-close interpretation of unique artistic works and different 'language games',[3] analysis of situated groups and their textual-discursive activities in a wider context of power (Gibson, 2007). The agency of users could no longer be researched using received cultural methods (textual-discursive; ethnographic; critical) alone, but 'big data' analytics often seemed to miss the cultural component of scaled phenomena. How to bring meaning and mathematics into imaginative dialogue?

Cultural productivity

Long decades of observing monopoly industries in the press, broadcasting and commercial media entertainment habituated critical cultural analysts to the business model of production as a sphere radically separated from consumption. From the proprietor's perspective, it seems obvious that consumers are not 'productive' because they are the 'end-user' who *uses up* products without contributing anything new to the 'value chain'. Upon this production/consumption distinction, numerous other accretions began to stick, turning a description of an industrial process into a story about culture, building in invidious assumptions about the relations between social groups:

Production	Consumption
Active	Passive
Firms	Individuals
Creativity	Behaviour
Male	Female (etc.)

[3]In Lyotard's (1979) sense, see: https://plato.stanford.edu/entries/lyotard/.

The familiarity of these binaries, and their structural equivalence, do not make them real; listing them confirms their origin in ideology, not nature. To counter their widespread influence (e.g. through the taken-for-granted truisms of behavioural sciences and marketing), cultural studies needed a model of 'consumption' that includes the creative – and political – productivity of everyday users, makers and social networks in interactive, participatory and sense-making media. During the broadcast era, an overarching frame that could encompass both social scale and individual meaning-making proved elusive. Cultural science seeks to build that frame, in the context of the network era, where individual actions contribute to planetary effects, many of them destructive: welcome to the Anthropocene (Wark, 2016).

Cultural science focuses on culture's function and dynamics across whole populations, seeing culture as a long-run evolving system. At micro (agent), meso (institution) and macro (system) scale (Dopfer, Foster and Potts, 2004), culture has enabled humans as a whole

- to form trustworthy groups (and to spread these out across the globe);
- to store and transmit knowledge (under conditions of uncertainty and change); and
- to generate useable novelties (innovation) in self-creating, self-organizing systems and their mutual interactions.

It investigates

- how culture makes groups (we/they boundaries) organized around identity and meaning (language, codes, customs, rules);
- how groups make knowledge (shared among 'us' but secreted from 'them');
- how knowledge is boundary-marked, proclaiming universal application while displaying parochial aggressiveness towards outsiders;
- how meaning systems, from speech and story to elaborate institutional forms, both share and restrict the distribution and growth of knowledge among populations;
- how knowledge is 'translated' (Lotman, 1990) or 'copied' (Bentley, Earls and O'Brien, 2011) across groups, not 'transmitted' (Carey, 1989; 2000); and
- how interactions (clash, competition, cooperation) between groups result in new knowledge (innovation).

It is looking for causal sequence in cultural processes, when 'micro'-generated novelties (random variation) are adopted via 'meso'-institutions (selection) in 'macro'-systems (retention). For this, it uses a 'bioscience' (complex system) model, rather than the 'transmission' model that was borrowed

from physics (moving electrons along a wire), becoming entrenched in communication disciplines post-Second World War (Carey, 2000).

Rethinking user-creativity within large-scale social and technical systems entails linking language systems with industry systems, focusing on the growth/distribution of knowledge via 'translation' of meaning across boundaries (Lotman, 1990). Instead of confining cultural agency to the common distinction between culture (seen as critical) and enterprise (seen as exploitative), or as a struggle between the public sector and private interests (Oakley and O'Connor, 2015), cultural science focuses on

- groups organized as 'clubs', in the economic sense of that term (Buchanan, 1965; Sandler and Tschirhart, 1980; 1997);
- groups (including clusters of clubs), sharing knowledge via 'commons' (Hess and Ostrom, 2003; Allen and Potts, 2016; Hartley et al., 2019).

The shift from public/private to clubs/commons draws attention beyond individualism to the agency of groups and 'imagined communities' (Anderson, 1991), the Tocquevillian 'associations' that emerge and consolidate to support them and the communication media that coordinate them. Cultural science is an effort to discover how decentralized agency and self-organizing social systems (re)produce knowledge, by developing new (hybrid) methods for studying cultural systems and dynamics, combining

- 'in-close' attention to textual-discursive meaningfulness;
- 'big-data' analytics, including 'network effects' in knowledge-making systems; and
- attention to the governance of groups and their interactions in circumstances of uncertainty and conflict, both by technology (e.g. blockchain) and by socio-semiotic coordination (e.g. journalism).

Cultural science is an attempt at disciplinary modernization in the arts and humanities. In relation to policy, it seeks to shift culture, creativity, knowledge and research from 'market failure' or 'social welfare' (public) models to a model based on dynamics of groups:

- Purposeful enterprise or activist 'clubs'
- Multivalent, multi-user 'commons'

The main policy question – as yet rarely asked in policymaking circles – is: if 'culture makes groups and groups make knowledge', what are we doing to nurture excellent groups and open knowledge, while treading lightly on the planet and the environment?

The oeuvre is the artwork

This book is not a 'how to do it' scientific lab manual, nor is it a defence of 'culture as we know it'. Instead, it's an argument for a new kind of interdisciplinary cultural science that combines in-close, reflexive textual-discursive investigation, based on 'language games' in the global 'semiosphere', with 'big-data' analytics and visualization. Its 'method' is that of the humanities essay, in which I am trained, rather than computer science or bioscience, in which I am not; but it does seek to integrate those approaches with cultural approaches derived from my own disciplinary formation (literary cultural studies, critical communication studies, media studies, journalism and creative industries).

I have treated some of the topics covered in this book elsewhere; each chapter represents a foray into a different problematic; thus, numerous chapters have been published previously, in a form that has been revised here in order to develop a narrative arc across the work as a whole. I'm treating what might be called 'long-form' problems here: I worry and tug at particular items across different chapters and publications, in order to clarify what there is to worry about, and some terms, examples follow through from previous work. Self-citation is also a way of acknowledging a 'knowledge club' – I'm a serial co-author and editor, including in the 'companion' efforts of *Cultural Science Journal*, so 'my' citations invoke a now-sprawling cultural science gang. This book has emerged from that work; it represents the truism that 'the writing is the research' – what each topic amounts to emerges from considering it, in concert with others.

More important, and as Paul Frosh puts it so well in his book on digital media poetics (2019: 3), 'media are poetic forces; they bring forth worlds into presence, producing and revealing them'. Well, the same can be said for research about media; a book like this is also 'world-building', a term borrowed from production designer Alex McDowell, later a professor at the University of Southern California. McDowell has written:

> World Building is founded on three beliefs, namely that storytelling is the most powerful system for the advancement of human capability due to its ability to allow the human imagination to precede the realization of thought; that all stories emerge logically and intuitively from the worlds that create them; and that new technologies powerfully enable us to sculpt the imagination into existence.[4]

In the same way, extended thinking about the role of storytelling in 'sculpting the imagination into existence' is itself a form of world-building; the writing

[4]Source: http://worldbuilding.institute/about.

is the research, and the research is a participant in the world it describes. As a result, *the oeuvre is the artwork*. I'm trying to develop a coherent but flexible approach to popular culture and media, in which a cumulative body of conceptual, interpretative and polemical work is part of the explanatory apparatus, such that various parts refer to one another, while the whole is greater than its parts. The scattered items do have one overriding purpose, which is to bring culture into the mainstream of both scientific and public colloquy. Thus, it seems right to gather the discussion together under one roof in a 'poetics' of *media studies*.

After a couple of centuries of essays and arguments about culture, now giving way to multiple myriads of data, we can begin to understand what culture is *for*. The next stage – cultural science 3.0, if you like – will emerge as this approach gets down to the detail of empirical studies. That's the work of many hands, over a prolonged period. I was in at the beginning of media and cultural studies and of the 'new humanities' in the 1970s, and know well that disciplinary change – from a 'turn' to a 'transformation' – can take a generation or more to take hold. It is impossible to predict how it will turn out, which is of course the best reason for getting started; the only certainty is that the new work will be completed by new hands – yours, for example?

II. Communicative causation and mediated subjectivity

A universe comes into being when a space is severed into two. A unity is defined. The description, invention and manipulation of unities is at the base of all scientific inquiry.

(HUMBERTO MATURANA AND FRANSISCO VARELA, 1980: 73)

Despite technological changes of unprecedented scale and acceleration, the big challenge for the communication/cultural/media/creative constellation of academic subjects is not technological; it is to understand and account for the sociocultural uses and impact of a medium as it operates in the world. This turns out in practice to be a compromise among contending forces. Analysis in both research and teaching must pick out a chain of *cause and effect* in the relations and interactions of very different phenomena, ranging from the micro-scale encounters of individual people and individual texts, through mid-level (or 'meso') institutions (firms, community organizations, activists and advocates), all the way up to the macro-level of the social and economic organization of high-tech and high-investment enterprises, government agencies and heterogeneous populations (citizens, the public, audiences, consumers), from different demographics in different countries, within an overall context of globalizing modernity (and its discontents).

Media studies commenced with this problem: How might mass communication (at societal scale, broadcast by powerful state/commercial entities) cause changes in the minds and behaviour of individuals – how will they vote, buy, riot? Can they be persuaded, deliberately or unwittingly, to make different choices, at sufficient scale to make a measurable institutional and societal difference? Early communication sciences presumed that 'mass media' exerted a behavioural effect on individuals, and that 'mass society' was both structured and changed by those media; all that remained for science was to measure the effects. However, after several generations of 'effects' studies, it is still not clear how causation works in this context (or if it does). Nevertheless, the presumption is now institutionalized: reproduced by the behavioural sciences in universities; nurtured in economics (most abstract of all the behavioural sciences), PR (public relations), advertising, marketing, HR (human resources), public policy, political persuasion and propaganda; and distributed by the very media under scrutiny. It necessarily infects news, current affairs and talk shows, not simply in partisan or biased coverage that coincides with a given interest, but also in the very stuff of news – stories about the behavioural effects of societal phenomena, and the evidence that shows these effects to be pathological.

Mention of 'stories' might have alerted the behaviourists to a quite different model of causation, but the field's investment in empirical science (measuring the effect of controlled stimuli) and instrumental knowledge (judged by its usefulness to industry, business and government as organized in the here and now) made them hostile to those branches of knowledge that traditionally dealt in stories. History, literary and religious studies, philosophy, linguistics and the arts – the humanities, in short – were amassing quite different bodies of evidence, largely made of text, discourse, story (more or less elaborate), in which the trick of analysis was to train oneself in 'astute reading', not to control the reading of others.

If you adopt the language of behavioural sciences, then stories disappear. Instead, you are faced with 'subjects' who are 'exposed' to media 'stimuli' in a controlled experimental situation where their 'responses' can be observed and measured. This is necessarily a 'reductive' science, because the variables are so many, but it is axiomatic that the individual subject under scrutiny stands for universal humanity, and that 'effects' are understood to be general and replicable. It soon becomes more important to reproduce the scientific method than to understand the story (a criticism more often levelled at economics than at psychology, but applicable to the social sciences in general). Without a properly derived and applied methodology, your observations are merely 'subjective'. Method constitutes the 'object' of study; it is therefore method (not any one finding) through which your observations may compel others, both 'upwards' (policymakers) and 'downwards' (individuals). The one participant never to suffer those effects is the analyst; the 'effect' is always on 'the other' – *them*.

If you adopt the language of the humanities, then behaviour disappears. Instead, you are studying the play of difference among texts, discourses, representations, images, ideas, fantasies and fictions. There's no 'method' here beyond copious, continuing and comparative reading (including 'reading' the visual and performing arts, popular and elite). This may have a profound 'effect' on *you*, emancipating you into intellectual freedom, stimulating both curiosity and scepticism, emotional and critical responses, changing your subjectivity, identity and knowledge, inspiring your actions, aptitudes and ambitions.

It's easy to see that 'exposure' to an experimental stimulus is quite different from exposure to stories. The formation of consciousness, astute judgement, knowledge and self-control as part of an identity in action, in society, in history, is a cumulative and contextual process, where changes may be unobserved by the self even as they are realized in life. Equally, however, individual 'exposure' to media clearly has some effect on culture (meaning systems), society (groups) and persons (as a particular amalgam of selfhood, class, ethnicity, family, gender, sexuality, age, etc., plus variable taste and experience cultures), even if methodological individualism has been unable to identify a universal causal process.

This is why *cultural science* is needed. Neither fully behavioural-objective (modernist) nor fully textual-subjective (postmodernist) approaches work. Each needs the insights of the other. Each has something to offer the analyst. Each has some instrumental utility. This book is an attempt at 'conciliation' between the two. It uses the methods associated with the textual traditions of the humanities to argue the case for a science of culture.

However, because culture is as much story as behaviour, what counts as 'science' cannot simply be imported from some other context. Luckily, rethinking science is well under way in the sciences themselves. Systems, dynamics and genetics (inherited information) have come into their own in the biosciences and computational (information) sciences. 'Science and Technology in Society' is now a recognized disciplinary array in its own right, restoring context and the interplay of technology and power to the 'story' of science. The study of media, communication and culture is not exempt from these influences, but in my opinion each field has been slow to move beyond its own founding tendencies, whether these are grounded in the US tradition of behavioural science or in the European tradition of discursive humanities, especially now that both scholarship and media have broken beyond the transatlantic dyad. As they ooze across a globalized planet, they remain oil and water: they don't mix well, and each loses its efficacy in the presence of the other.

Nevertheless, media and communication are both personal and social, technological and political, behaviour and story, with multiple sources of causation in overlapping and interacting systems, from micro to macro scale.

Is it possible to combine cultural and scientific approaches and knowledge in such a way as to add value to both culture and science? The 'story so far' is not encouraging; let it be cautionary.

Transmission as causation?

To make sense of communication in the era of mass media, mass persuasion and the social transformations following mass production, it was to simplification via reductive science that the nascent field of communication turned, especially in the United States. Claude Shannon's (1948) model of physics-based linear communication – 'sender-message-receiver' – was adopted in the 1950s, resulting in the long tradition of studying print and broadcast media via the 'producer-text-audience' model.

This model was always deficient in one crucial respect: there was no compelling theory of causation *along* the 'value chain' of meaning. Just because goods shift through a production chain, from factory to distributor to retailer to consumer, it does not follow that what a manufacturer makes *causes* what a consumer makes of it. How much less likely is it that semiosis works this way? The physics model originated from a military imperative: How to optimize the chances of getting a 'message' (e.g. 'Go!' or 'No go!') through from 'sender' (command-and-control headquarters) to 'receiver' (front-line units) with minimum 'interference' (technical or hostile)? The imperative was to understand what might degrade a 'signal' as it progresses through various bits of apparatus and along interminable tangles of wire, such that the actions of individuals and systems alike matched the intentions of 'commanders'.

Reducing 'communication' to 'information signals converted to electrons' assumes linear or mechanical (Newtonian) force, with causation running from sender to receiver. In the case of electronic communication, a single sender can transmit the same message to many receivers. It is easy to see why such a command-and-control model was needed in the era of the Second World War. However, it is not quite so clear that the enthusiasm of the nascent communication sciences to adopt it in order to study 'mass' communication was well placed. After several generations of 'effects' research, there is still no agreement on whether or how that kind of causation works. Instead, producers' intentions are one thing, textual forms another; and audience or users' actions cannot be predicted from either of them, even though the idea that mass communication can cause behavioural effects has achieved the status of myth, so much so that 'violence in the Western media' has been blamed for criminal acts by people with no access to those media, for example, in China (McIntyre and Zhang, 2003).

Now we are well into the digital age, but this too was first 'mapped' for military purposes, with Paul Baran's (1964) model of distributed as opposed

to command-and-control communications: the famous reticulated-network diagram that inaugurated the age of the internet.

Reticulated causation

It was only after the turn of the twenty-first century (around 2005) that the internet could handle video and global connectivity among users as well as producers. That accelerated a shift from 'enterprise-created' to 'user-created' content. Profound changes ensued, within and among all three of the links in the old model.

- The *production* industry was no longer dominated by Hollywood studios and New York finance. Digital technologies and online networks brought in new players, who soon expanded from Silicon Valley to global dominance.
- The *textual system* shifted from one where power and profit were concentrated in the production and transmission of text (in the press, movies and broadcasting) to one where it accrued to those coordinating traffic: YouTube, games and Twitter transformed textuality itself from *a work* (made by high-investment experts) to *a relationship* (among 'influencers' and 'followers'; celebrities and fans, P2P gamers).
- At the '*receiver*' end of the chain, the already-shaky or fuzzy distinction between producers (understood as industrial) and consumers (understood as domestic) was superseded by the concept of *the user*; an 'agent' that could be an individual or an enterprise, whether commercial or activist, community-based or corporate. Now, every consumer – including domestic amateurs – is *also* producer, publisher, journalist, author (etc.).

The line between enterprise and consumption, or between audience and citizenship, is blurred to the point where new models of causation are urgently needed. The solution will not be to *define* these media, especially not in relation to their legacy technical forms or to their relative newness, but to have another crack at solving the problem of *causation*. Here, we need to start with a different model of science. This one is not directly derived from reductive science – the fields, forces and linear causation of Newtonian mechanical sciences. Instead, it uses models of evolutionary and complex systems derived from the biosciences. Here, what matters is not the direction of electrons in a wire but the *relations* and *dynamics* among components in *systems*, the *rules* by which such systems maintain themselves in some sort of equilibrium (even as they adapt to external changes), and the *interactions* among neighbouring systems that produce 'newness' or innovation.

In brief, the humanities need to become not just 'digital' but evolutionary and complexity sciences. Studying human technosemiotic systems and their dynamics of change, rather than individual behaviour and expression, has a double consequence.

First, it requires analysis at scale. An 'evolving systems' approach requires the analyst to study populations (users), change (uncertainty, dynamics) and the emergence of 'newness', as it is called by Michael Hutter (2015), where 'novelty' is one thing (new inventions or ideas) but *newness* is another (innovation of whole systems), based not on the output of producers but on cultural uptake and adaptation by users.

The second consequence is that an evolving systems approach requires the analyst to move away from 'human exceptionalism', as if humans are the only species with attributes collected under the heading of 'humanities', including culture. And last, humans can be studied *naturalistically*, as an evolved, differentiated and complex but still natural component of the matter-energy universe that also includes other life forms (the biosphere), other material systems (the atmosphere, geosphere, etc.), and natural processes that do not require explanation by reference to what is presumed to happen uniquely in an abstracted, idealized, individual human brain.

Humanity as a relation

Strangely enough, it is only at this point – when humanity is understood as a relation not an essence – that the human impact on the environment and on other species within the biosphere can be understood, leading to a growing recognition that 'natural' systems such as the geosphere are increasingly explicable only if human agency (at species level) is taken into account. Here is where the idea of the Anthropocene Epoch is gaining recognition (Wark, 2016; n.d.). The Anthropocene is a period characterized by a human-made envelope around the planet, made of biogeochemical structures and strata that are produced or transformed by human action – cities, waste, industrially induced climate change, newly synthesized substances and elements from plastic to plutonium. There's even a date for the commencement of this epoch: 1965 (Turney, Palmer and Maslin, 2018).

Further, human *animality* can now be recognized, not only by understanding *Homo sapiens* as just one of the apes but also by recognizing continuities between some of humanity's most treasured attributes and those of other creatures, including sociality, communication, culture, cooperation and toolmaking. Such a move underlies an even more radical recognition, that consciousness, intelligence, moral choice and imaginative expression are not necessarily confined to humans at all: they may be shared by other species – and they may evolve among technologies (Artificial Intelligence, machine-learning, robots, cyborgs).

'The individual' is itself a term derived from theology, where it signified the irreducible unit of divine *creation*, namely, a '*creature*' with a soul; something that couldn't be divided or shared so the individual was the 'unit' of creation. The shift from this individualistic approach to a systems approach means that this vestige of religiosity turns from first cause to an effect – input to output. Instead of human choice and rationality being the *cause* of action and behaviour, individuality itself, along with choices, actions, behaviour and the rest, turn out to be a product of planetary processes working at system scale and changing along evolutionary paths. You are a product – of systems, of evolution, of relations, and of adaptive dynamics within biological, cultural and technological environments not of your own making.

Evolutionary systems

Thinking about systems that nobody owns but everybody uses, which have become elaborate and adaptable over long periods, it is immediately apparent that there is another model of communication that was neglected throughout the broadcast era: language. Language is a human invention – language-in-general and all languages, from the most endangered Indigenous tongue to the Big 5 world languages (Mandarin, Spanish, English, Hindi, Arabic, in that order). It is an evolutionary-adaptive system and system of systems. It works at population level and it changes over time, well beyond the intentions, desires or control of any user. It is both *universal* (every society and speaker has it and each language signifies everything in its world) and *adversarial* (*our* language can be trusted; *theirs* is duplicitous). Indeed, separate languages may be a naturally evolved security system, functioning efficiently to identify 'we' groups and to unmask 'they' groups, when such things mattered in a different way from what confronts users now, in a globally connected but still divided world.

When trying to fathom how textual-cultural systems work at global scale despite local difference, I have found compelling and prescient the work of Yuri Lotman (1990), the Estonian-Russian semiotician. Of course there are many other theorists (see the references!); and I've been working intensively with evolutionary-economist Jason Potts to apply some of these insights to culture, media and communication (see our book *Cultural Science*), and with evolutionary economist, sinologist and philosopher Carsten Herrmann-Pillath on the creative economy and the 'technosphere'. Closer to home, our teams at Curtin University, and before that at the ARC Centre of Excellence for Creative Industries and Innovation at QUT, have found many new ways to explore the role of culture, groups, stories, knowledge and innovation in the digital, global, Anthropocene world, including Lucy Montgomery and Cameron Neylon's work on

the 'reasonable doubters' began to travel under a different flag from the 'behavioural scientists' (Bogost, 2019).

In the humanities rather than the social sciences, other models of subjectivity came into play, especially those associated with postmodernism, poststructuralism, Continental Philosophy, semiotics and cultural studies (Lucy, 2016). Here, the methodological individualism and behaviourism of the social sciences, yoked as they were to a Newtonian linear-force model of communicative causation, were never convincing. Instead, from structuralism onwards, there was a decentralized but increasingly compelling effort to understand culture from a systems perspective, and to introduce into human systems something that in physics had already superseded Newtonian mechanical forces, namely, relativity and 'quantum' causation, experienced in evolutionary affairs as probability rather than exactitude.

For many years, cultural studies was preoccupied with 'the subject' and 'subjectivity'; not so much that of an individual personality with behavioural agency and 'subjective' opinions, but rather subjectivity as a structurally distributed and decentred relational power system: the 'subject of modernity', or of ideology, or of many other socially constructed identities – class, race, ethnicity, gender, sexuality, age and ability. Systems that produce meanings also produce subjects (a position from which to observe); and this applies as much to the analyst as to the user, as both physics and linguistics discovered long ago. Ferdinand de Saussure pointed out in the 1910s that 'there is … not the slightest possibility of gaining insight or of defining a linguistic fact, without first adopting a point of view' (Saussure, 2006: 9). Everyone is a user, defined through their relations with others (including relations of power asymmetry) in the system and with other systems. There's no 'fact' of semiosis that doesn't proceed from, or in turn make, eco-social relations (Thibault, 1997: 153). Rules for creative productivity are encoded in semiosis itself, but semiosis only ever occurs in eco-social space and time, via 'technologies' ranging from natural language use (organized into poetics and rhetoric) to cultural forms like broadcasting, the press and publishing, but also literature, religion, law, and other human-made 'fictions' binding on groups (Harari, 2014), or even physical objects and places (roads, walls, cities as signifiers), within specific culture-bound meaning systems (Lotman, 1990).

Although this agenda has been prefigured, proclaimed and rehearsed in semiotic and cultural theory for many decades, its *productive* potential – as a system – has not been realized so readily, and its explanatory power has not been sufficiently 'imported' by other disciplines. The challenge now is to reorientate media studies to pick up the winds of change blowing from the biosciences (evolutionary processes), systems theory (information, computer and web sciences) and complexity theory (autopoiesis, populations of rules, borders, interactions/relations), in order to understand mediated communication as a dynamic cultural system, making meaning under

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