



NETWORKS CELLS AND SILOS

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Gali Yalkarriwuy Gurruwiwi
Roger Kemp
Aaron Koblin
Hilarie Mais
Nick Mangan
Andrew McQualter
Jan Nelson
Kerrie Polinnes
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Sandra Selig
Bryan Spier
Masato Takasaka
Michelle Teran
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Kit Wise
Tjaduwa Woods

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NETWORKS (CELLS & SILOS)

Geraldine Barlow

Networks have become the enabling structures of cultural, economic and military power. Yet they remain largely invisible. How can the networked society be represented? And how can it be navigated, appropriated, reshaped in its turn?
Brian Holmes¹

In a world of vast, interconnected flows of information, we are joined to each other in a myriad of ways. Technology has transformed our capacity to relate different bodies of data and knowledge, yet the complex models generated by these processes remain subject to the consciousness of each individual. We live between the paradigms of network, cell and silo, potentially more connected to each other than we've ever been, yet perhaps also more isolated.

Both contemporary art and network science allow us to visualise a myriad of connective models. Through them we can explore network structures of radically different origins – naturally occurring or designed – including biological, cognitive, information, communication, economic, transport and social networks. Art works between the macro and the micro, the personal and the communal, cultural tradition and innovation. The exhibition *NETWORKS (cells & silos)* aims to offer a series of models of a larger abstracted and ever shifting whole. Art often operates at a distance from the literal representation of the world. This distance allows for the open play of metaphor and the framing of ambitious questions. We might ask: 'Can a deeper understanding of the patterns and dynamics within networks enable us to construct our world anew? Can a greater sensitivity to the recurring patterns and behaviours of networks enhance our capacity to balance the personal with the global, achieving a better quality of life for all humanity?'

Ilkurika 2010 by Tjaduwa Woods offers a richly suggestive membrane of both discrete and interconnected systems. Our eye picks out motifs that appear to share a familial resemblance scattered across the rippling, pulsating picture plane, as well as clearly interlinked 'communities'

of form. Change animates Woods' painting – multiple systems collide, abut and move about each other with the flux and dynamism of living cells under a microscope. *Ilkurika* operates as a rich field – or ecology – of metaphor. Woods hails from the Spinifex country, in the far south east of Western Australia. In this work she draws country, country and personal history together: waterholes, soaks and salt pans, as well as traditional stories, connect the creation and life stories of this place with its inhabitants and natural features.²

Humankind has always made an astonishing diversity of maps, of the sea, the stars and undiscovered continents, combining our physical movement through the world with our conceptual apprehension of our place in it. Equally, maps delineate the relationships we deem important. We map both space and time, bringing together narratives from our past with projections for the future. In his *Banumbirr*, or morning star poles, of 2007, Gali Yalkarriwuy Gurruwiwi shares with the wider world a traditional focal point of Yolgnu ceremony. The *Banumbirr* are made to trace the path of the morning star, welcome the new day and celebrate the connection between earth and sky. Nick Mangan also connects the celestial and the earthbound in his work *Colony* 2005, an amalgam of telecommunications tower, termite mound and weapons cache. Mangan presents a cellular model of society, locked into repeating patterns of construction and consumption, innovation and violence. Mangan alerts us to structural and formal similarities between what we might otherwise perceive to be separate systems.

Networks typically link multiple partially discrete but interconnected systems. Network theory is a rapidly evolving field that not only describes such characteristics, but is itself at the intersection of what might previously have been considered multiple discrete disciplines. Network theory is founded upon the mathematical solutions and models developed in graph theory, for instance the 'Königsberg Bridges' problem solved by the mathematician Leonhard Euler in 1736³. The people of Königsberg had long asked: can one navigate the seven bridges of the city without

crossing any bridge twice? Euler's reduction of this problem to an analysis of links and nodes, bridges and possible paths between them, solved the question as well as providing a conceptual model which became the basis for graph and network theory. A bridge or node with an odd number of links indicated that the node would need to be either a beginning or destination point, and hence there could be no more than two of these in order to traverse the city without doubling back.

Graph theory allows the analysis of a wide range of complex problems across vastly different fields. The patterns and behaviours it describes occur in the building blocks of our bodies, such as cells, proteins and neurons, as well as in the way we relate to each other and the infrastructures we build. These patterns and systems emerge independently again and again, without any 'spider at the centre of the web', designer or master controller.⁴

Whilst many patterns in nature follow classical forms such as that of the bell curve (the distribution of human height for example) networks tend to follow different patterns: most often being arranged according to power laws. A few nodes in a network will have a massive number of links or connections, effectively acting as enormous hubs, but most nodes will have relatively few connections. Numbers of sexual partners follow this pattern for example, with few people ever having thousands of partners, but these individuals being critical to the structure and behaviour of the system as a whole. Hubs have a powerful role in bringing each node into much closer connection with the others, creating small world networks. Rapidly growing networks display preferential attachment – a rich-get-richer, or fit-get-more-popular, behaviour that further supports the growth of hubs – nodes with a massive number of links.

We can read these patterns in evolution, human history and contemporary society; in the dominance and rise of certain national powers (for instance the USA and China); corporations (such as Microsoft); technologies (consider the

emergent effect of Apple 'Apps'); and the spread of viruses (such as HIV AIDS and the H1N1 or 'swine flu' strain of influenza). The recognition of such patterns has profound implications for epidemiology; the effective communication of ideas as we seek to combat challenges such as climate change; the achievement of more egalitarian societies with a greater distribution of wealth; as well as the preservation of diversity in species, languages and ideas.

Media theorist Sean Cubitt notes that 'increasing specialisation leads us away from a common speech towards increasingly fragmented dialects, each associated with an individual discipline, each surrounded by the rituals and enclosures of institutions, and the power of institutional discourses to create and define orders of truth.'⁵ Our contemporary world is a blend of separation and interconnection. Some separations have evolved for the health of the body, or the body politic; for instance that between political and legal systems. Other separations are unintended and can result in inefficiencies, alienation and violence. Network analysis allows us to build new maps of systems we may have taken for granted, to better understand what is important and what is destructive.

To map a network is a complex task. Networks exist at a myriad of different levels and may be composed of an equally complex array of components. The cell, for instance, has many guises, it is both a model of separation as well as a building block for connection. A small room can be a place of incarceration or a retreat for private thinking and self expression. In Natalie Bookchin's work *Mass Ornament* 2009 we are invited into the bedrooms and living rooms of an array of solo dancers, each of whom have captured and uploaded their personal performances onto YouTube. Bookchin choreographs the separate videos, synchronizing these once isolated performances into a coherent whole. Her work reveals in the connective living quality of the internet, where sudden peaks of popularity mark something as having 'gone viral'.

Michelle Teran also draws upon YouTube

built over time. Instructions are offered to scale the drawing to the space, as well as to decide upon the location of a series of key points, or nodes, from which each iteration of the drawing will find its own unique form. *Blue wall drawing #1* evolves from a series of 'laws' or principles established by the artist incorporating change, chance and the capacity of individuals to work together.

Visualising the links between us allows unexpected insights. Neuroscientist and neurologist Antonio Damasio states, 'when our minds avail themselves of multiple maps of every sensory variety and create a multiplex perspective on the universe external to the brain, we can respond to objects and events in that universe with greater precision. Moreover, once maps are committed to memory and can be brought back in imaginative recall, we are able to plan ahead and invent better responses.'⁶

Aaron Koblin's work *Flight patterns* 2010 is generated from flight path maps and data. Strand by strand, comet trail by comet trail, a map of the United States is drawn, the hubs of major airports glow most brightly. This work is drawn from actual data but is also an abstraction: equally suggestive of electrical activity in the body and brain. Chris Bond uses that supreme marker of electrical activity, the lightning bolt, in his *End painting* 2010. Here, the lightning runs into the creases of what is apparently an old book cover. The branching glow of the lightning bolt has a remarkable similarity to the form of the neuron, evoking the internal electrical systems through which our apprehension of the world mysteriously flickers and is encoded.

The contemporary world offers us powerful tools through which to model and visualise structures of all scales, from sub-atomic particles to the universe as a whole. Such maps and models can open the way to new insights and knowledge, but we must also be alert to how we read them. A compelling visual model or graph is no guarantee of insight but could be used for polemic, purely aesthetic, or anaesthetic effect. Heath Bunting maps the data sets or common

characteristics used to define individuals, and their place in, or against larger systems. Bunting's *Status project* 2006-2011 presents a series of beguiling graphs, webs and universes of associated data sets. They are revealing whilst also reaching a level of absurdity in attempting to relate radically different but interrelated information. *A terrorist* 2010 relates webs of data, such as religion, political identification and membership of a prohibited organisation, to key capacities, such as the ability to provide a current postal address. In a complex, globalised, atomised and data-rich world, we can endlessly stitch together disconnected data sets, but how do we make sense of the results?⁷

The conjunction of radically different systems of representation or belief can allow insight, perhaps suggesting the need for new kinds of bridging or connective tissue. The collision of features we might have perceived as discrete can also alert us to changes which might have occurred without us even realising it.

Kit Wise melds together images, found on the Internet, of different cities. *KTM SEA MOW RUH* 2005/2010 takes its title from airport abbreviation codes. Distinctive images from four very different locations and cultures are presented in the negative, dark areas turned to light, and then digitally meshed – or mashed – together. Under a solarised horizon, Wise's cityscapes – or culture-scapes – remove the gaps between the major city hubs of our globe, creating condensed images of multiple small worlds, as well as our larger world, as one. They describe a new world which is both eerie and beautiful.

The hope of harmony in the contemporary world lies to a great extent in a clearer understanding of the pluralities of human identity, and in the appreciation that they cut across each other and work against a sharp separation along one single hardened line of impenetrable division. [...] What we need, above all is a clear understanding of the importance of the freedom that we can have in the determining our priorities. And, related to that understanding, we need an

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appropriate recognition of the role and efficacy of a reasoned public voice – within nations and across the world.
Amartya Sen⁸

How well we connect and transform the multiple, personal, small worlds in which we live, with our shared larger world, may define our success in addressing the greatest challenges and opportunities of our day.

1 Brian Holmes, 'Network Maps, Energy Diagrams: Structure and Agency in the Global System', *Escape the Overcode: Activist art in the Control Society*, Van Abbemuseum, Eindhoven, 2009, p.47.
2 Scott Cane writes of the Spinifex people: 'A network of personal and communal associations forms the basis upon which the Spinifex people recognise this country as theirs as distinct from that of their neighbours. That recognition is enumerated through a constellation of sites related to an individual's birth, grandparents, brothers and sisters and Tjukurpa, which together give shape to a geographic area associated with their community.' *Pila Ngurra: The Spinifex People*, Fremantle Arts Centre Press, Fremantle, 2002, p.54.
3 See Albert-László Barabási, *Linked: The New Science of Networks*, Perseus Publishing, Cambridge, Massachusetts, 2006, for an overview of the development of network theory and its wider implications. Also, the documentary drawing significantly upon his work, *How Kevin Bacon Cured Cancer*, directed by Annamaria Talas and Simon Nashit, 2008 (winner of the 2009 Eureka prize for Science Journalism).
4 'Each time nature is ready to spin a new web [...] it creates a network whose fundamental structural features are those of dozens of other webs spun before. The robustness of the laws governing the emergence of complex networks is the explanation for the ubiquity of scale free topology, describing such diverse systems as the network behind language, the links between the proteins in the cell, sexual relationships between people, the wiring diagram in the cell, the Internet, Hollywood, the World Wide Web, the web of scientists linked by co-authorships, and the intricate collaborative web behind the economy.' Albert-László Barabási, *Linked: The New Science of Networks*, Perseus Publishing, Cambridge, Massachusetts, 2006, p.221.
5 Sean Cubitt, 'Mouse events in Java', <http://seancubitt.blogspot.com/>, Wednesday, October 6, 2010.
6 Holmes, op. cit., p.46.
7 Antonio Damasio, *Self comes to mind: Constructing the conscious brain*, Pantheon Books, New York, 2010, p.72
8 Amartya Sen, *Identity and Violence: The Illusion of Destiny*, Allen Lane / Penguin, London, 2006, pp. xiv - xvii

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Koji Ryui
Extended network towards the happy end of the universe 2007-2011
Installation view

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Chris Bond
Strike out at the end 2010

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Tjaduwa Woods
Kamanti 2009
Installation view

Chris Bond
End painting 2010

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