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Mark Burry is a practising architect who has published and exhibited internationally on two main themes: putting theory into practice with regard to procuring ‘challenging’ architecture, and the life, work and theories of the architect Antoni Gaudí. He has been Senior Architect to the Sagrada Família Basilica Foundation since 1979, pioneering distant collaboration with his colleagues based on-site in Barcelona until late 2016. His recent publications include *Scripting Cultures* (John Wiley & Sons, 2011), *Prototyping for Architects* (Thames & Hudson, 2016) and the four-volume *Digital Architecture* (2020), part of the Routledge Critical Concepts in Architecture series.

He is the Founding Director of the Swinburne University of Technology’s Smart Cities Research Institute (SCRI) in Melbourne, Australia, an appointment he took up in May 2017. His role is to lead the development of a whole-of-university research approach to ‘urban futures’, helping ensure that our future cities anticipate and meet the needs of all – smart citizens participating in the development of smart cities. He is acutely aware that urban designers should focus on ensuring that today’s citizens, especially young people, are prioritised through providing them with a credible route to helping define the future urban environment they will grow old in: cities designed with people, not for people.

His principal research goal is to help develop and test a practical framework that supports the exploration of options for vibrant city living extending at least two generations into the future. New approaches to envisaging liveability scenarios realistically up to five decades forward are sought and trialled, with the aim of harnessing productively the ongoing technological disruption that we all know lies ahead. His second research goal is to develop and test creative means to learn of individual needs, preferences, and ideas for future cities through innovative social enquiry, by exploiting the ubiquity of smart devices and the Internet of Things (IoT).

He believes in the role of the university as supporting essential transdisciplinary urban design research into complex future-oriented transformations such as the ‘smart city’ (‘transdisciplinary’ here implies working across diverse disciplines on project-based research with at least one external partner drawn from practice, industry and/or local government). He contends that only a university can genuinely provide neutral ground for critical urban futures debate: whatever position individuals may have, the academic institution itself has none except for the pursuit of excellence under an umbrella of intellectual rigour.

In 2001 he founded the Spatial Information Architecture Laboratory (SIAL) at RMIT University in Melbourne before establishing the Design Research Institute (DRI) in 2008. He held an Australian Research Council-funded Federation Fellowship in ‘Complex Architecture and Convergent Design’ from 2007 to 2012. He joined the University of Melbourne in 2014 as Professor of Urban Futures in the Faculty of Architecture, Building and Planning where he helped develop its capacity to consolidate research in urban futures, drawing together and augmenting expertise in urban visualisation, analytics and policy.
Better to Make a Good Future than Predict a Bad One
This issue of peers into possible urban futures, placing the role of the designer and the rapidly digitalised city at the fore. Cities are constantly changing – only in recession are there no cranes on the urban skyline. Society is in constant flux too, and technological shifts cause social convulsions when, out of nowhere, forces such as digitalisation disrupt every familiar aspect of urban design, construction, and city management systems and services. Furthermore, digitalisation is having the same levels of disruption today as that endured by previous generations during the different phases of the Industrial Revolution, though perhaps more left-field, and less physically apparent. Digitalisation is not just challenging all that is familiar about urban life; it is introducing a whole set of opportunities in the right hands (or threats in the wrong hands) such as massive data capture on just about everything that happens, and on everything we do. Real-time urban analytics, transport systems optimised to be more efficient, enablement of the share economy, mass surveillance and targeted advertising are prime examples.

Envisaging and Envisioning Urban Futures

With the rapid digitalisation of everything, there is a tendency for thinking that big data and urban analytics are all so new that pre-digitalisation urban design milestones can be casually disregarded. Prominent pioneers who envisaged the future city (actively conceiving and foreseeing a desirable outcome) as well as envisioning the same (visualising a future outcome) did so without today's urban design computation tools and algorithms. Around the same time that Engineer Ildefons Cerdà produced his Teoría General de la Urbanización (General Theory of Urbanisation) in 1867 as an adjunct to his truly remarkable 1859 project for the extension of the medieval city of Barcelona into a modern metropolis without equal, English physician John Snow traced the source of the 1854 cholera epidemic in London using a novel technique. Both Cerdà and Snow used data as the precursor to their urban interventions: in Cerdà’s case the proposal for a healthy modern city was derived through urban analytics as an antidote for contemporary ills. His statistical proof of overcrowding leading to poor health was new knowledge at that time. Snow mapped sites of individual cholera fatalities; thereby using visualised data to zero-in on the source of the outbreak.

There are other notable instances of urban analytics influencing urban design before the arrival of the computer. A relatively obscure example is mid-20th-century Melbourne, Australia. In 1946, Ernst Fooks published his seminal book X-Ray the City!, an impressive work diagnostically seeking

Ildefonso Cerdà, Plan for urban extension to Barcelona, Spain, 1859

Captured from the air in 2019, Cerdà’s extension to medieval Barcelona is shown as a triumph of creative pragmatism. His system, more than just a plan, was able to absorb the Gothic Quarter (top of the image), the outlying village of Gràcia (bottom), major thoroughfares such as Passeig de Gràcia (linking the two), and the ‘Diagonal’, all already in existence. How is it that a century of New World, African and Asian city planners have missed all the subtleties of Cerdà’s approach, which were fully documented as his General Theory of Urbanisation in 1867?
The failure of prescience. Architect and urban designer Ernst Fooks, an émigré to Australia just before the Second World War, X-rayed the rapidly growing city of Melbourne, prescribing a dose of polycentrism to ensure that no citizen would be distant from home, work, education, hospital or playground. His advice was not followed.

Such representations of the love of a city transcend big data. Pre-digital-era holistic aerial appraisal of Valencia without the advantage of drones and cameras, let alone a neighbouring mountain from which to construct this three-point perspective. The river, however, flooded regularly.

The triumph of vision in the face of adversity. In response to major floods, Valencia, Spain’s third city, completed the diversion of the River Turia in 1966. The conversion of the former riverbed to a 15-hectare (37-acre) urban park with trees, fountains and water features, and sports and cultural venues was completed in 1988, giving the city a unique linear park and unimpeded active transport avenue across the city.

The digitalised city needs to be designed: can the urban designer claim the conceit that this is naturally their task? If it is, how might they shape their role to facilitate the urban fabric’s optimal evolution and link it with corresponding societal transitions? The contributors to this issue are identified among those who should lead the design of the new or growing city, for which natural authorship has otherwise become a contested territory. For the urban designer the two-dimensionality of the planners’ city view and urban construct is as limiting as the engineers’ predilection to zero-in and straightforwardly solve problems. This contends that society needs a much broader professional brush than we have been used to applying in the past: if not a transdisciplinary team, then at least interdisciplinarily inclined urban design professionals who can reach across the gap between the rich philosophy and utter mundanity of urban existence. With their creative eyes they are surely the most capable of drawing out the best of all those involved in informing appropriately adaptive urban futures. The issue collates contributions from selected internally resourceful visionaries who meld the relevant sociology, geography, logistics and systems theory with the practical realities and challenges of sustainable material supply and its subsequent end-of-life disposal mobility, food and water security, energy supply and waste management. Crucially, these visionaries seek to ensure better urban futures with an assured civil and expanded convivial urban experience for all city dwellers.
Urban metastasis in southwest Melbourne, Australia, 2019

Melbourne is currently the developed world’s fastest-growing major city, but it is growing faster than any sensible urban future strategy can be devised, let alone enacted. Typical of any massively booming city in the New World, Africa, Asia or Latin America, prime agricultural land is rapaciously demoted to host urban sprawl.

This Δ contends that society needs a much broader professional brush than we have been used to applying in the past.

Room for single-unit houses and asphalt and not much more in low-density peri-urban Melbourne, 2019

The triumph of banality – are these the slums of the future? Melbourne is home to globally leading architectural practices, nearly all at arm’s length from positively influencing the suburban metastasis. Headless of generations of good advice, the suburbs lack any civic grace or presence, nor proximity to centres of work, a consequence of which is worsening congestion.
This $\Delta$ is intended to recontextualise urban futures as only one component of the barometer for improving urban life through design, and not the whole instrument. The *sine qua non* for the issue is an unabashed emphasis on technology-led analysis and option seeking, along with intelligent problem-solving. Given the rapid evolution of urban technologies, who are the architects riding the wave of the new possibilities for urban design? How do contemporary agencies find pathways to understanding the challenges and opportunities presented by evolving urban technology, and how does architecture engage with the other rapidly expanding pool of associated disciplines? And which are the schools of architecture and urban design already engaging with ‘radical urbanism’, if not smart cities? To tackle these questions, the issue comprises three loosely assembled subthemes: a theoretical foundation; some accounts of contemporary future-oriented activity; and speculations on future practice and education.

**Interactive urban flow installation, Singapore City Gallery, Singapore, 2019**

Home of urban future thinking, this clean and tidy city state has morphed into an exciting beacon of urban density enlivened by intense urban experience. Is Singapore’s Urban Redevelopment Agency, host to the Singapore City Gallery, a beacon of what happens when thinking about urban futures is unimpeded by the short-termism of Western democracy, and citizens are gifted with a comprehensive facility to X-ray their city?

**The Future Urban Condition: Much More than the ‘Smart City’**

What is so different about our time that pushes $\Delta$ to prognosticate on ‘urban futures’ today? The ‘smart city’ is already firmly established as a loose-fit cliché to encompass the role played by information and communication technologies (ICT) in making cities more user-friendly, sustainable and resilient for their citizens. In this issue, sensor-driven responsiveness leading to smart street lighting, smart parking, smart traffic management and so on is the least of it; as a label, the smart city masks a far more fundamental challenge in the field of urban design and, at the same time, a set of opportunities.

The digitalisation of society offers today’s urban designers new routes to speculating on how the future built environment might be, and its relationships to outlying rural hinterlands and the dwindling wilderness beyond. Such creative speculation is critically different to predicting the future. Through referencing our knowledge of the past and its historical interpretation, what can we read from this? And what can we read from today’s rapidly changing reality in order to be able to construct credible and plausible scenarios for achievable enhanced urban futures? What are the emerging tools and techniques that help us ensure future prosperity and its augmentation, not only sustainably, but also in a manner that corrects the environmental damage already caused?
How Might Others Learn from an Established Theoretical Basis?

The cyclical view of history determines that we are bound to repeat our mistakes, and in terms of the urban environment indeed we do: common examples are the bloated commercial malls built on the periphery to stimulate the local economy with the unintended consequence of exacerbating town-centre decimation, and adding extra lanes to urban freeways to relieve traffic congestion, but inevitably achieving the opposite. Will today’s emerging visualisation technologies allow principal stakeholders and end users alike to ‘see’ the potential ramifications of decisions directed at boosting possible futures in time to disrupt the cycle of repeated mistakes?

Contributions on this theme include Ferran Sagarra, who discusses the drive towards a more ‘socially attuned future’ (pp 14–19); Thomas Daniell, looking back at UNStudio’s pioneering contributions (pp 20–25); Thomas Kvan’s call for data-informed design theory (pp 26–31); Carlo Ratti’s drive for an urban philosophy (pp 32–7); Justyna Karakiewicz on transitioning to sustainability using complex adaptive systems (pp 38–43); Ed Parham, diving deep into the unknown unknowns (pp 44–51); and Bige Tunçer on data augmenting reality for better-informed urban design and planning (pp 52–9).

Contemporary Practice Predicated on Tackling the Future

Traditionally, data analysis has been the pursuit of new knowledge through seeking answers to known unknowns: relational sets of data are computationally plundered for the secrets that are invisibly contained within, inaccessible to even the trained eye. New algorithms and increased computational power and agility offer researchers entirely new possibilities: those that come from ‘inferencing’. As the research team at NASA faced when plunging into the depths of space for answers to questions they were not able to frame through not knowing what the questions were, multidisciplinary teams of urban futures analysts can now, for the first time, seek answers by computationally delving into the vast sets of interdisciplinary datasets that are emerging today: delving deeply into the unknown unknowns of urban future experience.

Weston Williamson + Partners, Anaklia Smart City (ASC), Georgia, 2019

Melding the existing with a visionary response to the need to grow through intelligently harnessing big data. This planned new smart city is positioned to become the premier hub of the Black Sea coast. The architects used computational methodologies to iterate design options parametrically, responding to layered datasets, and conceiving a series of distinct but complementary industry clusters connected by a sustainable urban infrastructure corridor.
Avoiding the Technology Trap

While intended to be neither positivistic nor pessimistic, this issue of *Society* is anything but utopian: it tackles future urban society’s differing ranges of expectations and realities – mostly tempered by increasing inequality. It proposes a range of multiple futures contingent on how effectively emerging technologies are embraced across the disciplines and professions. It does not purport to be comprehensive in any way; it is more a sampler.

The issue naturally falls under an ‘urban design’ umbrella, but it marries critical aspects of past and present understanding of the urban condition and its foundation with a view to concocting approaches to harness big data and rapidly emerging analytics and visualisation technologies affording glimpses of possible urban futures. For the established architect, engineer, planner and urban designer, there are some crucial insights to inform ways to transform these insular professional guilds. For the many students becoming part of a crowded space endlessly ‘parametrising’ this-and-that cool effect at the building scale, the issue encourages the scaling-up of their newfound skills from building-as-object to the city-as-system.

The ‘smart city’ technologies embraced are grounded on seeking opportunities rather than providing answers. They focus on diagnostically identifying future challenges, and reacting positively to them, principally the ongoing mass global migration to cities; the pressure to increase access to more affordable housing; ensuring a safe supply of clean water and fresh food; equity in access to essential services such as health and education; and transport infrastructure. Increasing levels of automation are used to increase, not diminish, work opportunities across both stable and growing urban populations offering a far more sophisticated response than just ‘problem solving’. The core postulation here contrasts an ‘urban futures’ approach to that of ‘city futures’. Whereas city futures is inclined to push for a predicted outcome derived from a prescribed set of sequential actions within a more or less scientific framework, an urban futures approach, conversely, is one of alternative envisaged ‘what if?’ scenarios competing against each other. Such scenarios are tested for viability using a wider range of discipline perspectives than we are used to working with. Rival scenarios can be deconstructed backwards to build a ‘how did we get there?’ model set of conditions and actions, leading to an assessment of relative viability.

Shajay Bhooshan and Alicia Nahmad Vazquez are among the contributors to this section of the issue who use game engines to construct social agency in our urban futures (pp 60–65). Dan Hill looks at practices oriented towards super-local participative urbanism (pp 108–11), and Vicente Guallart explores harnessing the power of the digital revolution to reinvent the urban ecology model (pp 72–5).

**Future Practice and Education**

The complexity of the datasets being accessed by designers requires a representational sophistication to assist in explaining the significance of the analysis of their discoveries to a wider circle. Emerging advances in visualisation afford multidimensional displays that blur the distinction between visualisation aiding discovery for the analyst (envisaging), and visualisation aiding comprehension for the end user (envisioning). In this latter case the end user is the designer who will enact scenarios based on the discoveries made by the analyst. There is still a vast gulf to be bridged between analyst and designer: analysts are not used to preparing discoveries as design inputs, and neither are designers trained to work with big data.

Contributors working in this field include Refik Anadol exploring synaesthetic architecture (pp 76–85); Shan He commandeering data-driven urbanism (pp 86–93); Wanyu He using AI for urban experimentation (pp 94–9); Philip Belesky designing between urban landscape and urban network (pp 100–107); and Dan Hill repositioning architecture for 21st-century challenges through transdisciplinary studios (pp 108–13). Jane Burry and Marcus White propose broadening urban design practice through looking at combining crucial aspects of architecture and planning education (pp 114–21), and Areti Markopoulou discusses urban design models drawn from collective intelligence (pp 122–7).
It seems remiss not to conclude with the topical and highly relevant thoughts of two leading economists: Robert J Gordon and Carl Benedikt Frey.

Robert J Gordon insightfully links the ‘shape’ of modern cities globally to a century of ‘Great Inventions’ – in particular electricitic light and power, sanitation, chemical and pharmaceutical manufacturing, the internal combustion engine, and modern communication – but he argues that overall growth is fundamentally declining. Frey’s recently published *The Technology Trap* (2019) identifies a condition where automated labour (principally robots) could lead to a new Luddite era, in which their introduction is forcefully resisted in reaction to their disruption to the status quo – the ‘technology trap’. Although Frey’s book concludes with a more-or-less optimistic message, its central proposition is one where society globally risks a repeat of the first Industrial Revolution. He recalls all the negative social and political consequences of industrial innovation and points out that it took three generations of workers before any worker could be shown to have benefitted financially from automation that defined the Industrial Revolution. Workers were finally released from occupational hazards and drudgery of factory life only after the publicised horrors forced parliamentary legislation to improve conditions including worker compensation. This is to say, only factory owners and investors profited from the first seven decades of industrialisation.

Is automation threatening the designer’s role? Like Gordon, Frey observes that growth is fundamentally declining, noting that ‘Only half of Americans born in 1980 are economically better off than their parents, compared to 90 percent of those born in 1940’. He concludes that technology is not necessarily driving society towards an inevitably brighter destiny; rather that we will increasingly face challenges in the domain of political economy, not technology. Dystopia does not necessarily beckon, however, and to paraphrase Isaac Asimov, this issue of attests that urban designers demonstrably have the unique ability to ‘make’ urban futures rather than ‘predict’ them.

Notes
1. Ildefonso Cerdà, Teoría general de la urbanización, y aplicación de sus principios y doctrinas a la reforma y ensanche de Barcelona, Imprenta Española (Madrid), 1867.