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Review

Jackson, Davina, 2018. *Data Cities: How Satellites are Transforming Architecture and Design.* London, England: Lund Humphries. 176 pp. $ (hardback). ISBN 978-1-84822-274-8.

Reviewed by: Gregory Galford, *Virginia Tech*[GQ: 1]
DOI: 10.1177/0739456X211064353

The science connected to space impacts our lives in an ever-increasing way, and in her book, *Data Cities*, Davina Jackson links these changes to our buildings, both in the way we design them and in how we inhabit them. Building design relies on traditional methods of construction, but the author advocates a more aggressive approach to incorporating the changes that space science is having on other components of our lives. The beginning chapters introduce theoretical and technological concepts that serve as a foundation to this connection, while the middle chapters discuss particular concerns for architects and planners. The last chapters examine the ways that light and radio waves can be used to solve perplexing environmental issues. Chapters focus on themes of light and space, machines and matter, modeling, climatic feedback, place, structural dynamics, the data of cities, light art, space architecture, and how these themes will impact future building.

Chapter 1 begins with a discussion of how our world has changed through the use of building data obtained by satellites, and how that has impacted the way in which we use light in our buildings to define meaning and perception. Examples such the Blur project by architects Diller and Scofidio challenge our concept of an architectural experience, using a man-made cloud to define an architectural environment. The author discusses how early rocket and satellite technology informed future space exploration, and how that was relevant to visionary architects and engineers such as Buckminster Fuller. She suggests that architectural historian Siegfried Giedion bound time and space in their influence on architecture, while Einstein's work on the oscillation of light and speed was disregarded. Modernism embraced light as a way to enhance architecture, with continual twentieth-century technical advances. Digital computer technology in recent decades, when combined with emerging LED lighting, enabled new ways to see buildings through light. Three-dimensional (3D) video projection mapping, as shown in an example by design firm Asymptote, blurs the line of perception and has been used as a tool by a new generation of architects to investigate space and time with innovation, with artists projecting messages and images on buildings to provide new layers of meaning.

Machines that incorporate augmented and artificial intelligences are causing change within the various design disciplines. The author makes a connection in chapter 2 between historical autopiloting systems, our constant and growing use of GPS, and the drones that increasingly serve our needs. The 3D printing of homes, with its tremendous cost savings in automation, will soon compete with traditional stick-built construction methods. Light fidelity systems, which work as a system of LED lamps, can now transmit data and act as forms of surveillance. The interaction between buildings and lighting systems has now become more complex and has enabled our buildings to surveil us in many different ways.

The materials used in modeling and making are discussed in chapter 3. Sophisticated systems within buildings are connected to the systems used to design complex shapes, such as Frank Gehry's use of computer-aided three-dimensional interactive application (CATIA), a software developed for the airline industry and translated to building design. While building information modeling (BIM) is now common within most architectural offices, sophisticated data analysis systems are employed by larger design firms to incorporate information about environmental and urban situations into built solutions. The author discusses how parametric design software, often seen in special effects in the movie industry, has been adapted to effectively model designs. The book then focusses on the current generation of building designers and their ability to use these digital tools to produce form from non-Euclidian geometries.

In chapter 3, the author discusses how materials have evolved with the ability to be used in non-traditional ways. The properties of wood have always limited its use in larger construction projects, but new types of cross-lamination are producing structural members with increased strength and lower cost, resulting in its now being used in high-rise construction. Metal alloys now have heightened ductility which allows them to regain their shape after deformation and aluminum can now be made transparent to produce a material that is clear and bulletproof. Smart ceramics can contain added chemicals to enhance machine qualities, while lightweight aerogels can be used as insulation between glass panes.

The author also discusses robotic formation in chapter 3, and how that is changing the nature of construction through both additive and subtractive processes. The 3D printing

uses computer software to direct robotic machinery to build bands of concrete according to building plans, while computer numerical control (CNC) routers use computer software to remove and cut material by laser to produce precise forms. The two methods link digital design solutions to a digital construction process.

Chapter 4 discusses the ways in which current technology is enabling a new generation of designers to gather feedback on the immediate climate of a site. Architects have always incorporated the environmental characteristics of a site into their designs, but new analytical techniques are engendering more sensitive building design. The author cites quantum computing techniques that allow for computer modeling that provides feedback to building designers. She makes a linkage through post-war modern architecture to current modernists such as Ken Yeang in Singapore who are incorporating gardens throughout their high-rise skyscraper projects to encourage natural systems in office buildings, and to benefit human behaviors in response to immediate natural systems. The author also focusses on infrastructure as a means to incorporate new technology to address environmental building issues. International examples, such as the Amager Resource Center in Copenhagen by Bjarke Ingels Group (BIG), are shown as a way to bring sensitive ecological perspectives to urban infrastructure projects, such that they are a featured urban component rather than a hidden one.

Highlighted infrastructure projects such as these illustrate the bond between the current ability to build globally while respecting the unique cultural and environmental aspects of a site. The author uses theories of "critical regionalism" by Kenneth Frampton in chapter 5 discussing place and mobility to frame the issues for designers. Chapter 6 discusses the ways in which new modeling technologies have enabled architects to build new forms. A globalizing world also links everyone through the Internet and social media, but designers are responsible for constructing buildings and cities that reflect local climates and cultures and reinforce theorist Norberg-Schulz's view of a "genius loci" or sense of place (Norberg-Schulz, 2019), as realized through the design of "heterotopias" or designed environments occurring within an unlikely place inexisting urban spaces.

How data impact cities is the subject of a chapter 7. It begins with a discussion of Ebenezer Howard's diagram for the garden cities movement as a connection to the ways in which we are now using available data to improve cities and make them more intelligent. Urban planners increasingly make decisions based on the analysis of such data in how they plan our urban environments. Increasingly sophisticated mapping can show items such as energy usage and pedestrian movement and provides insight to policymakers and designers to improve the urban experience from basic services to entertainment. The author provides a multiplicity of examples that connect multi-media environments to architecture and cybernetics. The chapter concludes with a discussion of the next direction of "smart cities" and what that will mean for design. The author divides these cities within categories of established and emerging, with further categorizations reflecting their situation as a new world city, a hybrid one, or a global growth engine city.

Chapters 8 and 9 provide information regarding how new technologies in lighting have enabled artists to use urban landscapes as a backdrop for works that link the two. While light has always been used artistically, recent advances in LED technology, coupled with new data collection systems, expand opportunities. Cybernetic theories have been a historical influence in these areas, and now influence augmented and virtual reality usage in this arena, linking digital artists to data-supported digital media. Satellites act as the tool of these networks from space, sensing, and watching from above, producing new means of visualizing our environment. The author presents recent historical examples, such as the Biosphere-2 complex in Arizona, to work by NASA, to the recent Apple corporate headquarters designed by the British architect Norman Foster.

The author concludes the book with a discussion of "next scenarios" in chapter 10. She begins with a quote from futurist, Kevin Kelly from 2010 that connects "technology to a web of cameras circling the world providing us with information that challenges us to think, plan and design an environment that is larger than ourselves" (p. 141). She provides multiple examples where design is the engine to give form to solving some of the "wicked" problems that confront us globally from food production to transportation, proposing that the use of data to expand design will continue to grow.

The utility of this book for the planner lies in its ability to bring together a disparate accumulation of trends and issues related to advancements in technology to the world of design and planning. The author provides a history that builds an intellectual foundation to many of the environmental and social issues facing a world increasingly linked through globalization. This book serves both the graduate student and the professional who want to incorporate data and space technology into their lives as architects or designers. While at times, there are a surplus of examples which reduces comprehension of the text, overall this book provides a foundation to link the technology of space with all its current systems to the professional domains of design we inhabit. In doing so, it will help the planner or designer to effectively frame their problem as they search for solutions of grace and clarity.

Reference

Norberg-Schulz, C. 2019. "Genius Loci: Towards a Phenomenology of Architecture (1979)." In *Historic Cities: Issues in Urban Conservation*, vol. 8, 31. [AQ: 1]