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LETTER FROM THE EDITOR

Architectus ingenio and *architectus verborum*

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Abstract
This "Letter from the Editors" begins with reflections on frameworks for research and development of architectural knowledge. Drawing on the both old and new ways of thinking, the editors show how two forms of knowledge—observational and propositional—have figured in the identification of two types of architects: *architectus ingenio*, the observer architect, and *architectus verborum,*"the architect of words". Both approaches to knowledge are found in these pages. This discussion is followed by an introduction to the papers that make up the second part of vol. 20, no. 2 (2018).

Keywords Architectus ingenio · Architectus verborum · Observational knowledge · Propositional knowledge

Epistemologists have argued that since the Renaissance there have been several distinct frameworks for research into architecture and for the associated development of architectural knowledge (Duffy and Hutton 1998). One of the earliest frameworks was essentially historical in nature, as it employed a range of techniques to understand the past (Saunders 1977). A second framework developed from the close investigation of physical properties and natural forces. This category could be described as being grounded in science and engineering. Over time, a third framework adopted the methods of psychology and the social sciences to focus on questions of human perception and wellbeing (Groat and Wang 2002). While all three frameworks—historical, scientific and psychological—have their own methods and standards, they share a common basis in two types of knowledge: observational and propositional.

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Observational knowledge is concerned with the rigorous recording or examination of a phenomenon or issue. Regardless of whether the observations relate to the measurement of historic ruins, the strength of materials or the proportion of people feeling discomfort in a space, these approaches are all founded in the process of documenting a phenomenon. However, just observing and recording something, however meticulously, does not in itself, develop new knowledge. The product of the observational process—the data, drawings or documents which record the phenomenon—must be synthesised, framed or positioned in such a way as to firstly make sense of it and secondly communicate its significance. Propositional knowledge is encapsulated in these processes of synthesis, formulation and dissemination.

This distinction between observational and propositional knowledge is emphasised by John Evelyn, the translator of Fréart de Chambray's seventeenth-century treatise *Parallele de l'Architecture Antique et de la Moderne*. Evelyn identifies four types of architects, two of whom are focussed on the pragmatic production of buildings. While of less relevance in the present context, Evelyn's pragmatic pairing are the *architectus sumptuarius*, being the patron or progenitor of the building, and the *architectus manuarius,* being the masons, master craftsmen and makers of the building. These two must work together to produce a building, as architecture requires both a client and a builder. Evelyn's second pairing are of more interest for architectural epistemologists as they must work together to produce architectural knowledge. The first of these, *architectus ingenio*, is the observer architect, who is a historian, scientist and humanist. *Architectus ingenio* must be "familiar with the history of architecture" and "skilled in geometry and drawing techniques" and possesses "knowledge of astronomy, law, medicine [and] optics" (Forty 2004: 11). The second is *architectus verborum*,"the architect of words", a person who is "skilled in the craft of language" and has the capacity to "talk about the work and interpret it to others" (Forty 2004: 11). These two, *architectus ingenio* and *architectus verborum*, can work independently, as dilettante scholar or architectural commentator and critic, but to develop new knowledge, they must work together, or their skills must be held by a fifth class of architect, the academic or researcher.

The papers in this volume 20, number 2 of the *Nexus Network Journal: Architecture and Mathematics*, all combine rigorous observation with the formulation of a valid position and the capacity to communicate this position: a "nexus" of *ingenio* and *verborum*.

Four of the articles in this issue concern Islamic architecture. The research of Emil Makovicky ("Vault Mosaics of the Kukeldash Madrasah, Bukhara, Uzbekistan") and Luc Lauwers ("Darb-e Imam Tessellations: A Mistake of 250 Years") present thoughtful considerations of pattern, symmetries and periodicity in order to understand the processes of design used by ancient masters of tiling. In "The Geometrical Regularization for Covering Irregular Bases with Karbandi", authors Amir Amjad Mohammadi, Maziar Asefi, Ahad Nejad Ebrahimi have analysed the traditional Persian elements known as *karbandi* in order to adapt and expand their use in contemporary architecture. Authors Ali Tokhmechian and Minou Gharebaglou have examined underlying compositional elements and structures in

order to identify affine characteristics of "Music, Architecture and Mathematics in Traditional Iranian Architecture".

Measurement is a key element in two studies presented in this issue: one a measurement of space, the other a measurement of time. In "A Metrological Study of the Late Roman Fort of Umm al-Dabadib, Kharga Oasis (Egypt)", Corinna Rossi and Fausta Fiorillo use the modern technologies of 3D survey and modelling to determine the unit of measurement used to design and build a fortified compound in the fourth century A.D. Researchers Martín Perea-Álvarez de Eulate, Gloria Del Río-Cidoncha and Francisco Montes-Tubío have turned their attention to the problem of the accurate restoration of sundials, in "Reading Errors in Sundials with Incorrect Hour Lines: The Seventeenth-Century Sundial in Lerma".

Two contributions to this issue deal with much more modern works of architecture. In "The Rietveld-Schröeder House and the Fifth Element" Tomás García-Salgado begins his analysis of this modern masterpiece with Rietveld's original drawings before reconstructing the interior space with his own technique of modular perspective in order to reveal proportional relationships. In "Fractal-Based Computational Modeling and Shape Transition of a Hyperbolic Paraboloid Shell Structure", Iasef Md Rian and Mario Sassone apply a particular notion of fractal geometry to model a hyperbolic paraboloid (hypar) shell in order to generate a parametric model to create a domain of non-integer dimensions through which the surface passes, ultimately changing the structural behavior. The aim is to identify forms that are aesthetically pleasing as well as structurally optimal.

This issue contains two articles in the "Geometer's Angle" column. Sandra Lucente and Antonio Macchia present "A Zen Master, a Zen Monk, a Zen Mathematician", in which they consider problems of two sets of points in the plane in order to shed light on convexity, collinearity, incidence and betweenness. Michal Zamboj presents "Sections and Shadows of Four-Dimensional Objects", an extension of the discussion he began in NNJ volume 20 number 1 (Zamboj 2018).

This issue concludes with two Conference Reports. Maria João de Oliveira, Vasco Moreira Rato and Carla Leitão report on "KINE[SIS]TEM'17 From Nature to Architectural Matter", which took place in Lisbon, Portugal, 19–20 June 2017. Sujan Shrestha, in "Mathematics Art Music Architecture Education Culture" gives a lively report of the 2017 Bridges conference, held in Waterloo, Canada, 27–31 July 2017.

As we write this, our own twelfth edition in the conference series "Nexus: Relationships Between Architecture and Mathematics" is just a week away. A selection of the 43 papers presented at the conference will appear in future issues of the Nexus Network Journal, and we look forward to fascinating new findings by our community of *architectus ingenio* and *architectus verborum*.

References

Duffy, Francis and Les Hutton. 1998. *Architectural Knowledge*. New York: E & FN Spon.
Forty, Adrian. 2004. *Words and Buildings: A Vocabulary of Modern Architecture*. Thames and Hudson. London.
Groat, Linda and David Wang. 2002. *Architectural Research Methods*. New York: Wiley.
Saunders, David. 1977. *A Manual of Architectural History Research*. Sydney: Power Institute.
Zamboj, Michal (2018) Double Orthogonal Projection of Four-Dimensional Objects onto Two Perpendicular Three-Dimensional Spaces. *Nexus Network Journal* 20(1):267-281. https://doi.org/10.1007/s00004-017-0368-2.

Kim Williams received her degree of Architecture at the University of Newcastle, Australia. Michael has a PhD in architectural theory and history and a higher doctorate (DSc) in design mathematics and computing. He is co-editor-in-chief (with Kim Williams) of the *Nexus Network Journal: Architecture and Mathematics* (Springer) and a member of the Editorial Boards of *ARQ* (Cambridge) and *Architectural Theory Review* (Taylor & Francis). He is co-editor (with Kim Williams) of the landmark, two volume *Architecture and Mathematics from Antiquity to the Future* (Springer, 2015) and co-author (with Josephine Vaughan) of *The Fractal Dimension of Architecture* (Birkhäuser, 2016). His latest book, co-authored with Michael J. Dawes, *The Mathematics of the Modernist Villa*, has just been released (Birkhäuser, 2018).

Michael J. Ostwald is Professor of Architecture in Architectural Studies from the University of Texas in Austin. She became interested in mathematics and architecture while writing *Italian Pavements: Patterns in Space* (Houston: Anchorage Press, 1997) about the role of decorated pavements in the history of Italian architecture, and it has been her field of research ever since. She is the founder and director of the Nexus conferences for architecture and mathematics, and is the founder and co-editor-in-chief (with Michael Ostwald) of the *Nexus Network Journal*. Her research mainly regards historical treatises on architecture. She is currently at work on an English translation of Daniele Barbaro's 1567 edition of Vitruvius.