



Call for Papers

Nexus 2010

Sunday 13-Tuesday 15 June 2010

Porto, Portugal

with the sponsorship of

Faculty of Architecture (FAUP)

and

Center of Mathematics (CMUP)/Faculty of Sciences (FCUP)

University of Porto

PRESENTATION

The VIII international, interdisciplinary Nexus conference for architecture and mathematics will take place 13-15 June 2010 in **Porto, Portugal**, hosted by the Faculty of Architecture (FAUP) and the Center of Mathematics (CMUP)/Faculty of Sciences (FCUP) of the University of Porto.

This is the eighth conference in the Nexus series, following those in **1996** (Fucecchio, Florence, Italy), **1998** (Mantua, Italy), **2000** (Ferrara, Italy), **2002** (Óbidos, Portugal), **2004** (Mexico City), **2006** (Genoa, Italy) and **2008** (San Diego, USA). The papers from the conference will be published in future issues of the *Nexus Network Journal*.

The Nexus conferences are dedicated to explorations of the relationships between architecture and mathematics, through a broad panorama of topics. In the past, these topics have included: symmetry in architecture, projective and descriptive geometry, soap bubbles and minimum surfaces, systems of proportions, geometry and urban design, the development of structural forms, the use of arithmetical, geometrical, and harmonic means, calculations of domes and arches, linear algebra and geometric forms, music theory and architecture, fractals in architecture, etc. Presentations have also included discussions of the work of individual architects, such as Alberti, Palladio, Frank Lloyd Wright; historical periods, such as Roman, Incan and Renaissance; the application of particular branches of mathematics to architectural design, such as geometry, topology and algebra.

CONFERENCE SESSIONS AND ROUND TABLES

Following a Call for Proposals for Sessions and Round Tables, the following six proposals were selected for inclusion in the conference:

Moderator	Session
Lionel March (UK)	Shape and Shape Grammars
José Calvo-López (Spain)	From Mediaeval Stonecutting to Projective Geometry: Formal, Social and Epistemological Shifts
Gonçalo Furtado (Portugal)	Architecture, Systems Research and Computational Sciences
Chris Beorkrem (USA)	Guerrilla Tactics of Digital Design
Kim Williams (Italy)	Miscellaneous (for papers that do not fall into one of the above categories)
Moderator	Round Table
Celestino Soddu (Italy)	Generative Architecture codeness
Alberto Sdegno (Italy)	The Geometric Construction of Morphology

A detailed description of the session and round table topics can be found on the pages that follow.

Before submitting a proposal, please read the following points carefully:

- Proposals for presentations at the conference should be sent directly to the session or round table moderator, who is responsible (along with the conference directors) for review and selection.
- Paper proposals will be evaluated in terms of pertinence to the topic and quality of the presentation. Papers that have been previously published or presented in public will not be considered. Papers presented at the conference will be published within as short a time as possible in the *Nexus Network Journal*, either as part of an issue dedicated to the Nexus 2010 conference, or as part of a special issue of the *Nexus Network Journal* dedicated to the session or round table topic.
- Submission of a proposal is not a guarantee of acceptance at the conference or of publication in the *Nexus Network Journal*. Acceptance is subject to the approval of the conference directors.
- Speakers chosen for the conference must cover their own travel expenses to the conference venue. There will be a minimal conference fee for speakers.

Session and round table moderators are responsible for:

- coordinating submissions and selecting presenters (subject to the approval of the conference directors);
- introducing the presenters and managing questions-and-answers and general discussion during the session or round table;
- writing a presentation about the session or round table that can serve as a "Letter from the Editor" in the *Nexus Network Journal*;
- possibly guest-editing a special issue of the *Nexus Network Journal* dedicated to the session.

SUBMISSION OF ABSTRACTS

- **Cover sheet.** Please include a cover sheet with the following information: name, title or profession and affiliation (if applicable), mailing address, e-mail address, title of proposed paper, a brief description of the proposed presentation;
- **ABSTRACT.** Abstracts in English, no more than 500 words (an A4 or 8 1/2 x 11 page);
- **Curriculum vitae.** No more than 1 page, including recent publications;
- Submissions are to be sent via e-mail to the individual session or round table moderator.

SELECTION PROCESS

In order to assure the highest academic quality, the selection process for papers for presentation at the conference is divided into two phases. The first phase is the review and selection of **ABSTRACTS**. Authors whose abstracts are selected will be asked to complete their research by the date in the schedule below. The completed research will undergo a final double-blind peer-review process in order to select the presentations for the conference. Research not selected for presentation at the Nexus 2010 conference will be considered for publication in the *Nexus Network Journal*.

CONFERENCE WORKING SCHEDULE

The schedule for submissions, selections, and the preparation of the final presentations is:

1 August 2009	Deadline for submission of abstracts
1 September 2009	Notification of acceptance of abstracts.
1 January 2010	Deadline for submission of research for presentation
1 February 2010	Notification of acceptance for conference presentation
13-15 June 2010	Nexus 2010 conference
31 December 2010	Deadline for submission of final papers for publication
2011	Publication of papers in the <i>Nexus Network Journal</i> vol. 13

If you would like to know more about the Nexus conferences, books or the *Nexus Network Journal*, or you have questions about the call for proposals, please don't hesitate to contact the conference organizers:

Conference Directors:

Kim Williams

Editor in Chief, *Nexus Network Journal*
kwb@kimwilliamsbooks.com

João Pedro Xavier

Faculty of Architecture (FAUP), University of Porto
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Center of Mathematics (CMUP)/Faculty of Sciences (FCUP),
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SESSION

SHAPE AND SHAPE GRAMMARS

In 2010, forty years will have passed since the idea of writing grammars for shapes in the visual arts and mechanical engineering design was broached by two former MIT students of Chomsky and Minsky. Initially the idea was modelled on Chomsky's notions as Stiny wrote his doctoral thesis in systems science at UCLA, and Gips his in computer science at Stanford. Both theses were subsequently published by Birkhäuser in their interdisciplinary series. At the same time, Lionel March and Philip Steadman published *The Geometry of Environment* at the invitation of the Royal Institute of British Architects. While a paper by Gips and Stiny was known to the British couple, it only became available as their own book was at the proof stage. However, shortly after, March became the founding editor of *Environment and Planning B* and among its earliest papers were papers by Stiny, Gips and Mitchell (lately Dean of Architecture, MIT). March and Stiny have enjoyed conversations over shape matters ever since. *E&PB*, now *Planning and Design*, continues to carry the main weight of theoretical developments and applications in shape grammars. The theoretical foundations of shape grammars were fundamentally re-examined in Stiny's *Shape - Talking about Seeing and Doing*, The MIT Press, 2006. This book clearly demonstrates that Chomsky's theories as they apply to words are irrelevant in the world of shapes. March and Stiny's most recent collaboration is 'Shape Grammars' a special issue of *Planning and Design* published for the SIGGRAPH 2008 conference. It is timely to devote a session to a review of the achievements and future of this subject in 2010.

Deadline for submissions of abstracts: 1 August 2009

Please send paper proposals and brief CVs to session moderator:

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SESSION

FROM MEDIAEVAL STONECUTTING TO PROJECTIVE GEOMETRY: FORMAL, SOCIAL AND EPISTEMOLOGICAL SHIFTS

Strictly speaking, there is no evidence for the use of orthogonal projection in Antiquity; of course, the depiction of objects lying on the same plane cannot be taken as a proof of the use of any kind of projection. By contrast, from 1200 on, orthogonal projection is used widely on the *Carnet of Villard de Honnecourt* and a fair number of Gothic architectural drawings. With the onset of the Renaissance in France and Spain, the construction of stone members poses complex geometrical problems, which were tackled by such authors as De L'Orme, Vandelvira or Derand. These texts use orthogonal projections as a central method, complemented by rotations, changes of projection plane and developments. By 1700, these practices were sophisticated and abstract enough to be grouped in a branch of knowledge known as stereotomy, that is, division of solids, encompassing projections, developments, angular measures and their application to stonecutting or tomotechnie. During the French Revolution, Monge, former Professor of the Theory of Stonecutting at the Engineering School of Mézières, built his *Descriptive Geometry* on the foundation of double orthogonal projection. A few years later, during the Napoleonic Wars, Poncelet, a pupil of Monge at the *École Polytechnique*, gave birth in the prison of Saratov to Projective Geometry, an abstract branch of mathematics that takes its cue from the properties of the figures that are left unchanged by projections. Thus, a common thread ties together mediaeval masons, Renaissance architects, enlightened engineers and 19th mathematicians and leads to the formation of an essential part of present-day science. However, this evolution is punctuated with strong mutations. First, the media of knowledge transmission transform themselves from the mediaeval personal notebook to the Renaissance treatise and the scientific monograph. Second, the social groups that control these forms of knowledge shift along the centuries from stonemasons to architects, to clerics such as Derand, Guarini or Tosca, to military engineers and finally to professional mathematicians. Third, the very nature of this branch of knowledge is affected by these formal and social shifts: starting as a purely empirical craft, it had taken the striking form of an experimental geometry at the early 17th century, but at this moment a significant break took place. On the occasion of a memorable duel with Curabelle, Desargues pointed out that the rightness of an arch should not be judged by masons, but rather by geometricians; that is, that abstract geometry lies on a superior plane than empirical validation by means of practical stonecutting. This gave the final blow to empirical geometry, although this line of thought extends as far as the 19th century, in the works of La Gournerie.

In connection with these issues, the session will be open to papers on the formal, social and epistemological shifts in stonecutting and stereotomy, in orthogonal projections and architectural drawing, and in descriptive and projective geometry, from the 13th to the 19th centuries. Examples of suitable topics include, but are not limited to: traits and shortcomings of orthogonal projections in Gothic architectural drawings; transformations of orthogonal projection between Gothic and Renaissance; exchanges between masons, architects, engineers and cartographers at the Early Modern period; French treatises versus Spanish manuscripts; empiricism and rationalism in Early Modern stonecutting; the Desargues-Curabelle duel and other similar clashes; the transition from stonecutting to stereotomy at the Enlightenment; the transition from stereotomy, artillery and other sciences to Descriptive Geometry; and the birth of Projective Geometry.

Deadline for submissions of abstracts: 1 August 2009

Please send paper proposals and brief CVs to session moderator:

José Calvo-López

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SESSION

ARCHITECTURE, SYSTEMS RESEARCH AND COMPUTATIONAL SCIENCES

This session is dedicated to exploring the exchanges between architecture and the fields of systems research and computational sciences, highlighting the relationships between architecture and mathematics. Systems research goes back to the war period, and it is concerned with 'organization' from an approach of complexity. The history of the field recalls an expansion of attention up to the level of the planet with the Club of Rome's systemic approach to the global problem (e.g. De Rosnay, 1978) but this dealing with issues of complexity was also paralleled by the acknowledgement of 'uncertainty'.

Systems research embraced a wide field of application; and, as Cybernetics, it became influential throughout the post-war period. There was, undoubtedly, a later 'backlash' against the latter; however, as Scott has mentioned, its concepts permeated such areas as AI, Systems and Emergence Sciences. (Scott, ca.1996) Moreover, a 'second-order cybernetics' arose around the 1970s, acknowledging the presence of the observer in Systems, and leading to theoretical developments such as 'Autopoiesis', 'Conversation Theory' etc. At the time, computation became ubiquitous, and its later connection with telecommunications led to cyberspace and to the Information Society in which we now live.

At an early date, systems research, cybernetics and computational sciences, went on to interfere in the fields of Art and Architecture. Early occurrences included the work of Schoffer, Pask, Jones, Alexander and Negroponte work, and they were fuelled by a desire to overcome the rigid architecture and planning of modernism, by representing the dynamics of time. Progressively, digital space and life also constituted an architectural challenge, at the levels of the city's building and design practice. The earliest approaches date back to the early 1990s, and advanced explorations were made by architects such as Novak (on 'Transvergence') and Frazer (on 'Evolutionary Architecture').

To a certain extent, the current digital architectural culture is rooted in cybernetics, and the systems approach enables a systemic focus of contemporary cities, and the ecological global problem. Today, Architecture's desire for a more evolving environment is leading to interest in the new sciences of Emergence and Complexity, which Jencks even associates to a 'New Paradigm in Architecture'. The session will consist of small presentations focusing important experiences related to architecture and mathematics. The main areas of interest are: systems research, second-order cybernetics, computational sciences, architectural morphogenesis and sustainability. (Presentation focused on topics such as complex systems, self-organization, emergence, topology, CAD-CAM, virtual environments and cyberspace, as well as on architects, designs and buildings which illustrate the relationship between architecture and mathematics will be welcome.) They are the roots sources of a future, effective built environment that could evolve.

Note: This text includes some excerpts of Gonçalo Furtado's article "Gordon Pask: Exchanges Between Cybernetics and Architecture and the Envisioning of the I.E. ('Informational Environment')", in: *Kybernetes*, V.38, N.7-8, 2009. I suggest a reading of it, as well as J.De Rosnay's 'History of Cybernetics and Systems Science', 1978 (and modified in 2000), in: F.Heylighen, C.Joslyn and V.Turchin (eds), *Principia Cybernetica Web*, Brussels (available at: <http://pespmc1.vub.ac.be/cybshist.html>) and B.Scott's "Obituary for Professor Gordon Pask", in: *The Independent*, London, 1996.

Deadline for submissions of abstracts: 1 August 2009

Please send paper proposals and brief CVs to session moderator:

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SESSION

GUERRILLA TACTICS OF DIGITAL DESIGN

As architects, our assumptions about the technology we use are leading us astray. We are being pulled unequivocally towards notions of efficiency (time and cost) and towards the idea that we are buying ourselves back into the business of design development. In reality we are not repossessing anything, but are simply passing the cost and time savings on to our consultants, contractors and clients. Building Information Modeling (BIM), digital fabrication and other technologies are rendering us, as architects, further obsolete and creating a world in which, we are even more likely to create another big box store or a second lot of condos, with only the requisite shift in material or articulation.

This session topic calls for papers describing alternative uses of new design technologies. How do our tools define our methods of production? To what extent can we claim that the objects of our design are our own or to what extent are they defined by the tools we use? How has technology fundamentally changed design expectations? As BIM, fabrication, and parametric modeling have become mainstream tools, we are forced to question the initial standards we have established for their evaluation. One way for questioning our expectations is to look alternative methods for their use. So much of the technology we use is defined and determined by manufacturers and the mega firms to whom they respond. Once technology has time to disseminate throughout the profession, others have the knowledge to question its use. The papers for this session could come from a myriad of research areas. One example might be the use of a parametric software program like Frank Gehry's software built upon CATIA, Digital Project. The underlying methods for developing parametric models within CATIA are built upon geometric organizations and relationships. These geometries can be used to model complex systems and skins as Gehry does or, just as simply, be used to design systems of simpler off-the-shelf components. Proposals could be proposed as alternative information models, which use mathematics and geometry to create algorithmic relationships between a material, its organizational patterns, and the objects built in characteristics. Rather than rely on manufacturers and software companies to define how we use parametric models, we can define for ourselves how these relationships ought to perform.

It has become evident that the use of new technology ought to be far more anarchistic and inventive. Though fabrication and parametric design has become synonymous with excess and flippant design, new software also comes with the ability to build in both unconventional and affordable ways. We must choose how to employ these tools or risk that our profession will become further removed from the new lexicon of our environment. This session could demonstrate the failings of the couture use of this technology and propose alternative methods for its use, using algorithmic models.

Deadline for submissions of abstracts: 1 August 2009

Please send paper proposals and brief CVs to session moderator:

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SESSION

MISCELLANEOUS

The Nexus conferences for architecture and mathematics have always taken the broadest possible view of this interdisciplinary nexus. Pertinent to our on-going discussions are studies of geometry, proportions, symbolism, studies of design techniques of individual architects, and studies of architecture and mathematics in individual monuments, historical periods, cultures, or geographical regions. Especially encouraged are studies concerning non-Western architecture and mathematics, and studies on teaching mathematics to architects.

Deadline for submissions of abstracts: 1 August 2009

Please send paper proposals and brief CVs to session moderator:

Kim Williams

Kim Williams Books

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ROUND TABLE

GENERATIVE ARCHITECTURE CODENESS. CONTRAPPUNTO GENERATOR OF RESONANCE SPECIES

The Generative advanced approach to Architectural Design defines the possibility to create an architectural identity by designing a set of mathematical transformation codes. We can identify a possible set of transformation rules, like an Artificial DNA, that we can use for generating complex architectural and urban systems able to fit architectural well-defined aims, by following peculiar identities. Referring to the Renaissance, where art, poetry, mathematics, music and architecture were deeply integrated, the round table will try to connect different points of view in the common denominator of the time of contrappunto for defining possible sites of investigations, able to perform species, in various phases from simple to complex, until a possible codeness. Contrappunto is a historical tool used in music, capable of connecting in resonance the sounds in contrast, using harmonic structures. The discussion is focused in how to perform species of resonance, generated by different disciplines and usable in architecture design of our time. Mainly the math codeness, performed as a musical score, can effort the historical identity of architectures, cities and also visionary spaces of Art. This is deeply connected to Nexus community.

Deadline for submissions of abstracts: 1 August 2009

Please send proposals and brief CVs to round table moderator:

Celestino Soddu

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Chair of Generative Art annual conferences

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ROUND TABLE

THE GEOMETRIC CONSTRUCTION OF MORPHOLOGY

The large diffusion of free-form software in recent years gives designers the possibility to create complex morphology in a very interactive way, although frequently without having an idea about the geometrical origins of the form they are generating.

In the past it was very difficult to work in a similar way, due to the strict procedure that allowed to transform every sketch and every drawing into a building. As new technology has resolved a lot of problems about the fabrication, there are many questions about the correctness to use a form without the consciousness of it.

The aim of this session is to discuss the lack of theoretical information by the users of new technology and the great possibility to work with complex forms for young architects, given by sophisticated software of elaboration.

A useful comparison between old and new methods to generate forms could show the differences in the work of the architect. Some examples could explain this transformation better. In fact, if we analyze some well-known designs, for example by Le Corbusier, we have the opportunity to study the genesis of the form of these architectures, understanding the strict relationships between the morphology and the architectural space.

Thinking, for example, about the 'squared spiral' of the Museum of Unlimited Growth - a new conception of the Archimede's curve, derived conceptually from the logarithmical one - or the Golden Section, declined with some variations into a lot of projects (and, above all, in the study for the Modulor), we can find many theoretical studies on this subject.

Some other projects are even more complex and more interesting: such as the hyperboloid of the Parliament building in Chandigarh, which idea was derived from some factory towers seen by the architect from the airplane, flying near the Indian town, or the series of quadric surfaces – hyperbolic paraboloids, sectioned at a certain level – that generated the whole structure of the Philips Pavilion, realized in 1958 for the Brussels Expo, and designed with the help of his assistant, engineer Iannis Xenakis.

The round table wants to focus on researches that study the use of geometrical and mathematical rules in analogical architectures, to understand the procedures that allow not only the generation of form but also the construction of the building.

Digital technology could offer a very useful way to explore and communicate the method in order to add some theoretical information to simple manual operations.

Deadline for submissions of abstracts: 1 August 2009

Please send paper proposals and brief CVs to round table moderator:

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