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ARCHITECTURAL DESIGN AS EDUCATIONAL STRATEGY “GEOMETRY ORIENTED”

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University geometric education is by tradition considered as a preparatory training in the field of architecture, engineering, and design. Students are normally taught about Geometry (and Graphics) at the beginning of their curricula, and subsequently involved in the use of them in the project activities. Descriptive Geometry is the basic subject matter at the beginning of the training in the abovementioned fields.

Sometimes, after these early educational stages, Descriptive Geometry is integrated in the architectural design workshops, where the teacher works side by side with the leading teacher of the workshop on specific projects, but in any case Descriptive Geometry itself is perceived as belonging to the *fundamentals* of education, and with the advent of CAD systems, and Computer Graphics in general, it has almost disappeared from the courses listed on the University programs.

This contribution is about an elective course titled *Geometrical Complements of Graphic Representation*, proposed and taught by the author at the Politecnico di Milano since the Academic year 2010/2011, where targeted design tasks are used as ‘picklocks’ for getting also advanced students from the master programs interested in Descriptive Geometry.

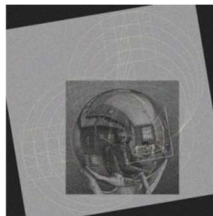


Fig. 1 Projective investigation on *Hand with Reflecting Sphere* by M. C. Escher (1935). Graphic Pattern by the student Alessandro Bianchi (2010). Graphic composition by the author [4].

The various editions of the course, summarized in the webpage of the School of Architecture Urban Planning Construction Engineering of the Politecnico di Milano [4], have been

focusing on various design topics, strongly geometrically oriented, in order to motivate students to *use* Geometry *while* carrying out the design process, that is, in the body of the project activity.

The design tasks have been selected in accordance with educational focuses on specific geometrical topics and issues, also aiming at emphasizing the benefits of a stronger connection between geometrical culture and geometrical applications.

Two educational experiences have shown as particularly interesting.

In 2013/14, inspired by experimental spaces like the Ames' room, classic masterpieces like Sint Satiro's Church in Milano by Donato Bramante, Palazzo Spada in Rome by Francesco Borromini, and treatises like those from Palladio and Guidubaldo del Monte (XV and XVI centuries) to Wilhelm Fiedler (XIX century), illusionary spaces based on projective distortions (relief-perspective) have been designed by the students. Let us say, they translated the *geometry of sight* into the physical *geometry of space*.

In 2015/16, as well as in the current academic year, again inspired by architectural masterpieces and treatises, especially those of Philibert De l'Orme (XVI century), as well as referring to some present researches like those carried out by Philippe Bloch and his Research Group at the ETH of Zurich, the focus is on *stereotomy*, a basic chapter in the field of Architectural Geometry, and the design task is a *sphere based* cantilever roof for a *tram stop* at the Politecnico di Milano. Due to the key role played by the visual control of the design processes, in this case students are committed to generate *geometry of space* by using the *geometry of sight*.

Of course in both the cases the making of projects is not the main education goal but an educational strategy, to get Geometry more attractive for students, and to stimulate students to learn, practice, and sometimes rediscover (or discover) the power (and the beauty) of Geometry.

References:

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- [2] Kemp M: The Science of Art. Optical Themes in Western Art from Brunelleschi to Seurat. Yale University Press, New Haven and London, 1990.
- [3] Pottmann H, Asperl A, Hofer M, Kilian A: Architectural Geometry. Bentley Institute Press, Exton, 2007.
- [4] Web page of the course: <http://www.architettura.polimi.it/pspa/opzionali/geometrical-complements-of-graphic-representation/>