Women and Descriptive Geometry in Italian University

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This paper aims to analyse the women's contribution to the teaching of Descriptive Geometry in the Italian Faculty of Architecture and Engineering.

Starting from the analysis of current data collected by ministerial archives and by retrieving, back in time, further information, such as the sources of the Italian Association of Drawing Professors (Italian Drawing Union-UID), the paper proposes a diachronic reading that can illustrate, in general, the role of the teaching by women in the specific scientific-disciplinary field ICAR 17/Disegno. An area of interest in which many different cultures coexist. In particular, we draw attention to Descriptive Geometry, firstly highlighting—through appropriate graphs that re-elaborate the acquired data—the contribution, the position and the incidence of the female figure in the field.

Then, focusing on some key figures for the university teaching evolution of this discipline, we intend to honour those who have distinguished themselves, by leaving a mark both in the didactic and in the scientific field.

1 Introduction

In recent years, several studies have investigated, from different points of view, the link that exists between the problems typical of female identity and the difficulties of women in asserting their role in the professional sphere.

In this line arises the present essay, which is part of a wider interdisciplinary

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P. Magnaghi-Delfino et al. (eds.), *Faces of Geometry. From Agnesi to Mirzakhani*,
Lecture Notes in Networks and Systems 88,
https://doi.org/10.1007/978-3-030-29796-1_13

investigation project promoted by the OGEPO[1] Interdepartmental Research Centre of Salerno University. The project, titled *Gender and Professions. Contexts, Languages, Representations from The 14th Century to The Present*, intends to analyse the relationship between gender and professions, starting from those that still show strong stereotypes in roles, or significant differences in terms of career progression. Particular attention is paid, here, to the presence of women in the field of university career, with specific regard to the teaching of Descriptive Geometry in the Italian Faculties or Departments of Engineering and Architecture.

2 The Career Progression of Italian Academic Professors

The issue must certainly be placed within a broader context, since, despite the progress recorded in recent years, the female academic professors remains a minority. This situation generally affects the whole of Europe—excluding Finland, where there is perfect gender equality, or countries as Norway, United Kingdom, Portugal, Sweden, which almost achieve gender equality. In particular, analysing the Italian situation, the statistics obtaining from the MIUR database [5], from December 31st, 2011 to today, show a significant growth in the presence of women. In this time frame they increase by about a third: nevertheless the percentage of female teachers remains at around 37%, far from a hoped gender equality.

Yet, monitoring the progression of students, starting from school education and following them at the university and post-graduate level, the data would seem to lead to different results. In fact, considering all the academic courses without distinction, there is an average female presence of 56%. Moreover, are women 59% of the graduates, 51% of students enrolled in Ph.D. courses and 52% of those who achieve the Ph.D. title. By shifting attention from training to academic careers, there are encouraging data at the first step of fellowship researchers. Instead, the teaching staff highlights a gradual decrease in female presences, depending on the growth of the academic hierarchy (46% researchers, 36% associate professors, 21% full professors) [6, 7].

In this regard, it should be noted that the gender percentage in the student distribution, for each training level, varies in a very significant way depending on the disciplinary area (75% of female presence for ‘Human Sciences’, 31% ‘Engineering and Technology’). Also, in academic careers, the presence of women is very prevalent in ‘Humanities’, showing an inversion of tendency in technical-scientific areas [6, 7].

[1]The *Osservatorio per la diffusione degli studi di Genere e la cultura delle Pari Opportunità* (OGEPO), was established at the University of Salerno in 2011 and recognized as an Interdepartmental Research Centre since 2014. It deals with equal opportunities and gender studies, promoting interdisciplinary research and comparison on investigations and statistics related to gender, to equality and equal opportunities, to the presence of women in the history and society, as well as legal questions, historical, social, economic, political and cultural aspects, inherent to these issues. Director of the Centre and coordinator of the researches is Professor Marisa Pelizzari.

Considering the 'Graphic Representation' area we firstly premise that it includes a great variety of knowledge branches. Moreover, the Drawing disciplines are present in various courses of Architecture, Engineering, Design, but also of Literature or Psychology (Fig. 1).

With specific reference to the Drawing's academic teaching staff, in its totality, about 39% of professors, independently of the role,[2] are women: a value fully consistent with that national. However, it should be noted that about 66% of our female professors are affiliated in architectural departments; while about 30% are in engineering structures. This could influence the women percentage distribution at the various academic level since the female presence in Architecture courses is generally more substantial.[3]

Furthermore, with reference to the gender distribution trend, over the years, the considered time frame shows encouraging data, represented in the graphs. Considering all the professors, since 2001[4] there has been a gradual and constant convergence of the gender curves, with a minimum difference in the last 5 years (to date, women

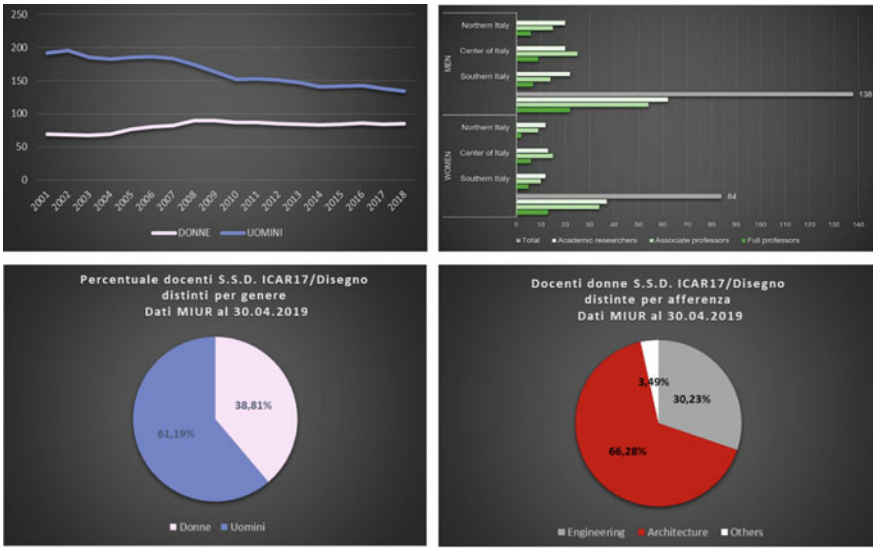

Fig. 1 Statistical data relating to the presence of female professors in the scientific disciplinary area of 'Drawing'. Above: Trend over the years (not distinguished by role) (left) and comparison between men and women professors (distinguished by role) (right). Below: Percentage of men and women professors (left) and Faculty/Department distribution (right)

[2]The percentage value shows a slight fluctuation, according to the academic role: the female full professors correspond to 39.47%, the associate professors correspond to 37.37%, while the academic researchers are 40.24% (MIUR data, as of 4 May 2019).

[3]The Architectural courses degrees placing themselves between the humanistic and technical areas, thus balancing the data referred to the purely engineering courses and bringing back on national average the overall area values.

[4]In that year the female presence is about 26% with 69 women out of 261.

professors correspond to 85 out of a total of 219). Disaggregating data in according to the academic role, the obtained graphs show a substantially similar trend over time.

Finally, an interesting observation concerns the presence of women in top management and institutional roles. Indeed, considering the *Glass Ceiling Index*, an international index that measures the gender equality at the top level of academic career, the Drawing area reveals a very strong parity in reaching the so-called grade A (that is the role of full professor).[5]

This positive result is confirmed if we analyze the female presence in institutional roles, with particular reference to the positions of Dean, which show how the women of the Drawing area have much relevance. In fact, out of 6 Faculty Deans, so far elected in the area of Drawing, 4 of which in Architecture and 2 in Engineering, 2 were women. That is a third of the total number.

The balance is even more interesting if we look at Architecture alone, in which there is an absolute gender equality. If we equate, to the role of Dean of Faculty, the Direction of the Departments that, since 2010, have replaced the Faculties, we register about 43% of female presences (3 women out of a total of 7), which even reaches 60% considering only Architecture (here the balance is reversed, becoming in fact 3 women out of a total of 5).

Still with reference to the scientific-disciplinary area of Drawing, a more detailed investigation was then conducted regarding Descriptive Geometry which, as already stated, is one of the possible fields of interest in research and teaching of the disciplines of representation in general.

To this end, in the definition of the statistical data useful for quantifying the incidence of female presence with respect to the teaching staff considered in its entirety, firstly all the teachers were identified who, in a specific or generic way, deal with Descriptive Geometry. The survey, which at this stage took into account the contents provided in all Italian courses of the Drawing's area, highlighted how Descriptive Geometry finds significant consideration within its scientific-disciplinary sphere, being taught—sometimes together with other contents[6]—by more than of 57% of Italian professors (with a distribution of male and female teachers equal to 35 and 22% respectively) (Figs. 2 and 3).

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[5]The Glass Index analyses the following ratio:

$$\text{GCI} = \frac{(\text{Women Grade ABC})/(\text{Women \& Men Grade ABC})}{(\text{Women Grade A})/(\text{Women \& Men Grade A})}$$

Particularly, according to the obtained value, the index evaluates the gender equality at the top level of careers, as specified below:

$\text{GCI} = 1$ No gender difference in reaching grade A

$\text{GCI} < 1$ Over representation of women at grade A

$\text{GCI} > 1$ Under representation of women at grade A

Referring to the scientific area of Drawing, this is the result:

$\text{GCI of Drawing Area} = (85/219)/(15/38) = 0.388/0.395 = 0.98.$

[6]Generally, Architecture courses include specific classes in Descriptive Geometry, together with other generic Drawing classes, while the Engineering courses mainly involve wider courses, in which however specific issues of Descriptive Geometry are addressed.

	Totale Docenti	Impegno specifico su GD (didattica specifica e ricerca) %	Ordinari		Associati		Ricercatori	
Donne	19	30,16%	5	45,45%	8	22,22%	6	37,50%
Uomini	44	69,84%	6	54,55%	28	77,78%	10	62,50%
	63	100,00%	11	100,00%	36	100,00%	16	100,00%
	Totale Docenti	Impegno complessivo su GD (generico e specifico) %	Ordinari		Associati		Ricercatori	
Donne	49	39,20%	11	57,89%	24	35,29%	14	36,84%
Uomini	76	60,80%	8	42,11%	44	64,71%	24	63,16%
	125	100,00%	19	100,00%	68	100,00%	38	100,00%

Fig. 2 Statistical data relating to the presence of the teaching of Descriptive Geometry in Italy

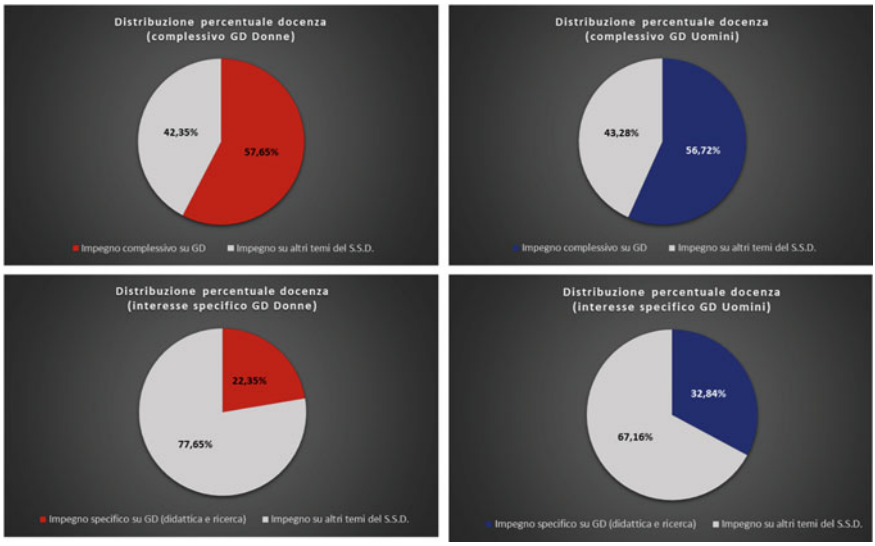

Fig. 3 Percentage distribution, by gender, of academic professors involved in Descriptive Geometry. Above: values related to "generic" female (left) and male (right) professors. Below: values relating to "specific" professors only

If, instead, we analyse only the "specific" professors, that is, those who particularly teach Descriptive Geometry or who, although "generic" professors, do research in this particular field of the scientific-disciplinary area, the percentages are reduced quite clearly: of all teaching staff, only 28% deal specifically with Descriptive Geometry, with a certain gender difference that shows a 20% presence of men compared to 8% of women.

And again, if we evaluate the percentage of professors of the same gender—that is, by disaggregating the data for the male or female category only—it emerges that while on the overall data ("generic" and "specific" teaching) there is a substantial congruence of values with respect to the average calculated on the entire Drawing's professors staff (for both subgroups the professors of Descriptive Geometry is attributable to approximately 43% of the total), with reference to only specific teaching and to research interests, the professors involved in Descriptive Geometry stand at 33% for men and 22% for women (Fig. 3).

3 Searching Our Roots: The Ladies of Descriptive Geometry

If the quantitative data does not appear to be entirely satisfactory, shifting the attention to qualitative aspects and contents it is certain that the presence of the female gender in the teaching of Descriptive Geometry it's very significant.

In particular, turning to the recent past, many female figures have left a profound mark: some of them have held important institutional roles and prominent positions in the management of the university system, receiving for this also acknowledgments and lifetime achievement awards. But, regardless of this, it is clear that all of them have succeeded in making a cultural contribution of great value, often pursuing didactic and research paths already traced by their great masters, in other cases creating real "schools" (Fig. 4).

Considering, in this context, only the women who have achieved the role of full professor, and retracing a timeline that, from the pioneers of Descriptive Geometry leads to our days, first of all, must be included Anna Sgrosso Neapolitan by adoption and a pivotal figure in the teaching of Descriptive Geometry, still today a cultural and scientific reference point for many researchers. She graduated in Architecture in the immediate post-war period (1950), and then she worked at the University of Naples "Federico II" with Mario Giovanardi, one of the fathers of the Neapolitan School of Descriptive Geometry of the Faculty of Architecture. She was a volunteer assistant (until 1960), an in-charge assistant (until 1966) and then an ordinary assistant (until 1980), reaching the maximum level in the academic hierarchy in 1980, when she became an ordinary professor. From 1991 to 2002 he coordinated the Ph.D. of Drawing area at the University of Naples "Federico II" [4].

In 2005 she was awarded the *UID Certificate of Magister*, maximum recognition for the career, "Because of her tireless work of discovery and reinvention of

Fig. 4 Above: Anna Sgrosso (left), Rosa Penta (in the middle), Mariella Dell'Aquila (right). Below: Maria Teresa Bartoli (left), Maura Boffito (in the middle), Laura De Carlo (right)

descriptive geometry, for the generous dedication to teaching, for humanity and the confidentiality of her presence in the school".[7] And again, in 2017 it was awarded the *UID Gold Plaque* "[…] for the significant results achieved in research and teaching in the Representation area".

It's evident, in her scientific approach, the ability to synthesize the analytical rigor with an extraordinary graphic sensibility: by focusing precisely on the deep study of projective principles, the founding basis of this discipline, Anna Sgrosso gives new strength to Descriptive Geometry, revitalizing it and reorganizing "the traditional methods of representation in an unconventional way"[8] (Fig. 5).

She has divulged this discipline, embracing and reinterpreting it with great sensibility and a recognized originality. But above all giving a very personal imprint to the research methodology with which she operates, which becomes a distinctive and recognizable sign of the school of which she is the initiator [2, 3]. In particular, by the so-called "geometrical-structural" representation—one of her hallmarks—she proposes "an innovative interpretation of architecture, whether it is realized or drawn,

[7]Mention of *UID Certificate of Magister 2005* [1].

[8]Mention of *UID Gold Plaque 2017*.

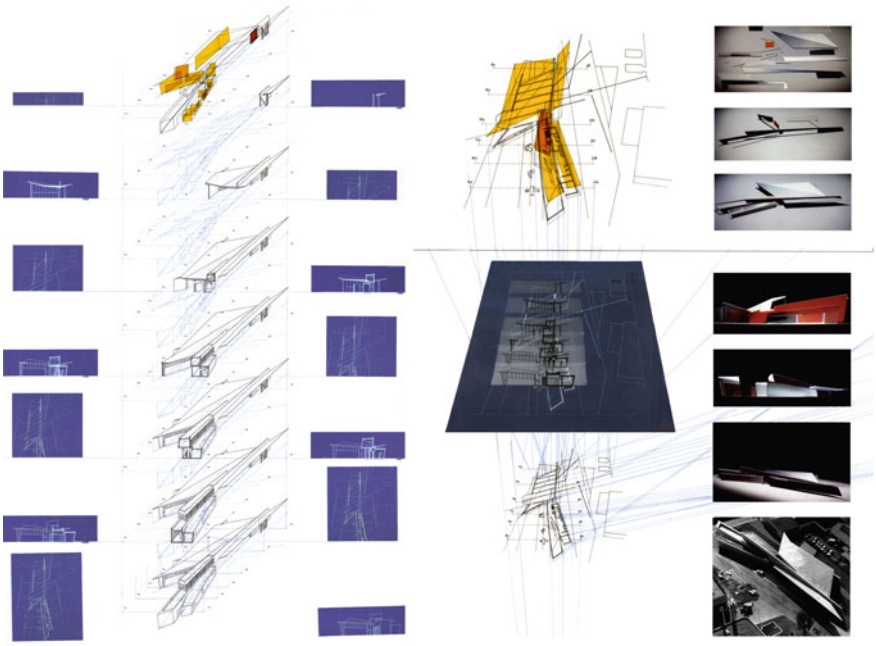

Fig. 5 The fire station of Zaha Hadid for the Vitra Campus, in Weil am Rhein. A so-called "geometrical-structural" representation by Barbara Messina (degree thesis. Title: Real space and virtual space: the architecture of Guarino Guarini and Zaha Hadid. Supervisor: Anna Sgrosso; Co-supervisor: Agostino De Rosa, July 1998)

of which it manages to provide the geometric structure as well as the configurative genesis of the spaces".[9]

Rosa Penta (who died in 2014) is still of Neapolitan education and belongs to the same generation. She graduates in Architecture in 1958 in Naples and, as Anna Sgrosso, immediately is part of the entourage of Mario Giovanardi, engaging in research and teaching of Descriptive Geometry. Initially she worked as a volunteer assistant (until 1963), later as an ordinary assistant and finally as academic professor. In 1986 she obtained the title of full professor. Her career continues, since 1991, in Aversa, at the Faculty of Architecture of the Second University of Naples,[10] of which she is co-founder and where she will be, firstly, Department Director and, from 1991 to 2004, coordinator of a Ph.D. specific of the Drawing area [9].

Her research, marked by the strong scientific rigor, proposes a graphic layout very close to that of Anna Sgrosso, addressing however more on the survey of architecture and the environment. The geometrical-descriptive approach, which precisely bases on the configurative and morphological interpretation of the artefacts, in fact, becomes

[9] See Footnote 8.

[10] The Second University of Naples (SUN) changed its name in November 2016: today it is known as University of Campania "Luigi Vanvitelli".

the indispensable premise for representing the architectural or urban built space, to which she dedicates most of her activity. Very interesting, for example, are the research projects she coordinated on the Neapolitan portals and staircases, or on some Neapolitan squares: in these examples, starting from the survey of the artefacts analysed, she succeeds in restoring the space compositional logic through a rigorous geometric representation (Fig. 6).

Pupil of Anna Sgrosso is, instead, Mariella Dell'Aquila: graduated in Architecture in 1971 at the University "Federico II" of Naples, she starts and continues her academic career here, first following her "master", as a collaborator and assistant, and then as a professor (associate since 1994 and full professor since 2000). In 2003, and until 2010, she took over from Anna Sgrosso in the coordination of the specific Ph.D. of the Drawing area.

Her didactic activity, always related to research, sees her engaged with great dedication on themes as the geometric representation—aimed at the correct interpretation of the reality investigated—or as the reading of drawn architectures of which, thanks to inverse perspective procedures, traces to backward the genesis of space, starting from the image. "Her studies, focusing on the survey and descriptive representation of architecture, never ignore the logical and deductive rigor of mathematics, incor-

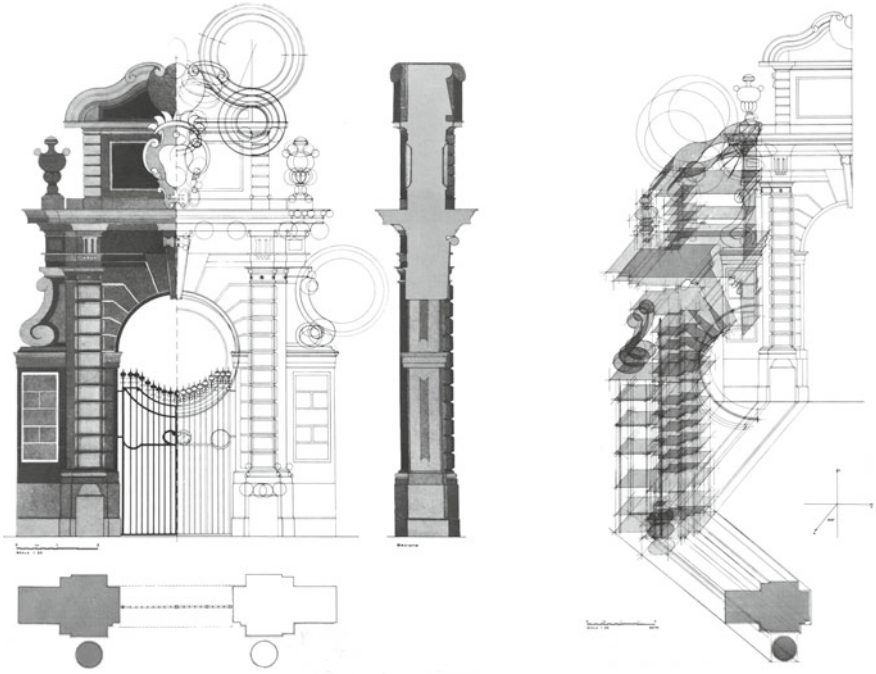

Fig. 6 Survey and representation, in orthographic and isometric projections, of the palazzo Cellamare portal, in Naples, with identification of geometric matrices (elaborated by the students of the course of "Disegno e Rilievo", a.y. 1987–1988, prof. Rosa Penta)

porated within the Science of Representation. In her teaching there is […] authentic respect for the mathematical character of the discipline, in a continuous fading of Science in Art and Art in Science"[11] (Fig. 7).

Instead, from the Florentine school is Maria Teresa Bartoli: she graduated in Architecture in Florence in 1971 working in the academic field first as an assistant and, since 1983, as a researcher; her career continues, always at the University of Florence, as associate professor (since 2000) and full professor (since 2002). From 2014 to 2016, she coordinates the Florentine Ph.D. in Architecture, which is linked to the National School of Ph.D. in *Scienza della Rappresentazione e dell'Ambiente*.

In the didactic field, she is involved as much on the Architecture Survey as on the Descriptive Geometry: this explains her propensity to integrate measure and form, proposing a "metrological" approach as the basis on which to set up more properly geometric surveys. She deals in particular with the Renaissance perspective. This allows her to analyse the space built on the basis of a rigorous theoretical apparatus, with the aim of identifying the symbolic forms underlying it. The numerous surveys, conducted with this approach on Florentine Gothic and Renaissance architecture, have allowed her to highlight new aspects of architectural and urban contexts investigated, rediscovering often hidden design intentions (Fig. 8).

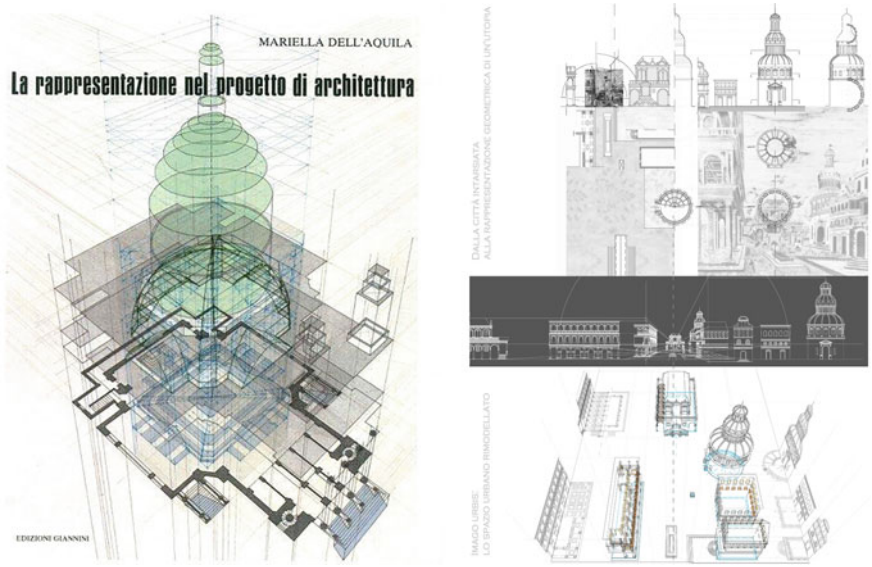

Fig. 7 Geometric approach to the representation of built and imaginary space. Left, the front cover of La rappresentazione del progetto in architettura. Right: reconstruction of a drawn urban space (by Stefano Chiarenza, Ph.D. thesis in "Survey and Representation of architecture and the environment". Title: Le città immaginarie: le tarsie lignee nella Certosa di S. Martino a Napoli, XV cycle, March 2003. Tutor: Mariella Dell'Aquila)

[11] See Pascariello [8, p. 7].

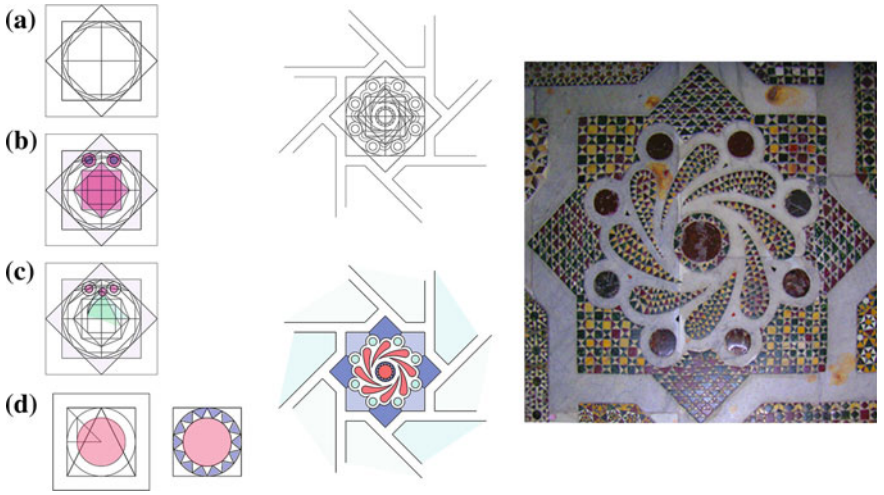

Fig. 8 Between research and didactics: the study of the graphic path that draws with continuity one of the flooring inlays of the Cathedral of Monreale (by Maria Teresa Bartoli)

An eclectic figure, for the multiplicity of her interdisciplinary interests, is that of Maura Boffito. Graduated in Architecture in Turin (1971) and in Philosophy in Genoa (1988), in 1975 she began her career as a contractor in the field of Drawing disciplines at the University of Genoa. In this university she went through the various academic stages, becoming a researcher in 1980, associate professor in 1992 and full professor in 2000. Since 1990 she has been specifically engaged in teaching Descriptive Geometry, carrying out her didactic activity mainly at the Faculty of Architecture of the Genoa University.[12]

Her fields of interest range from the survey of architecture to archival research, from the cataloguing of the Genoese artistic and iconographic heritage to the interpretation of painted architecture, from descriptive geometry to the history of representation, intertwining—with interdisciplinary approaches—geometrical-mathematical investigations with historical-critical-anthropological ones.

In 1997 she was awarded the UID Silver Plaque with the following motivation: "A new way of tackling the problems of the basics and applications of Descriptive Geometry, an original and fun way of presenting the didactics, a humanistic and scientific culture together, which traverses research and teaching, a set of results and answers, by the students, of exceptional interest […] Maura Boffito enriches […] her inner world and her didactics not only with a profound humanistic spirit, but also of a particular knowledge of the philosophy and rituals of the American Indian

[12] She also taught at the Faculties of Architecture in Milan and Mantua, at the Faculty of Engineering of Brescia and, in her University of origin, at the School of Specialization of Restoration of Monuments. Finally, again at the University of Genoa, she held important institutional roles, working within the Faculty of Architecture, as well as the Council and Board for the Degree in Architecture.

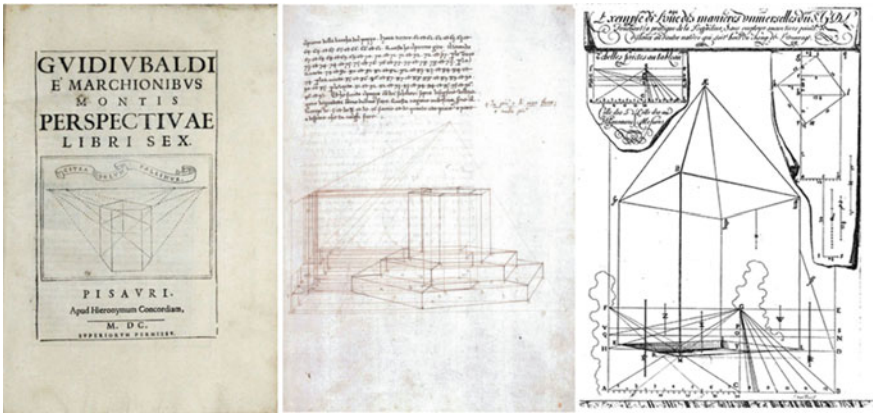

Fig. 9 Among the main interests of Maura Boffito is the treatises on issues related to descriptive geometry. Left: frontispiece of the Perspectivae libri sex by Guidobaldo del Monte (1600). In the middle: an inner page of the treatise De prospectiva pingendi by Piero della Francesca (1482 ca.). Right: inside page of the treatise Exemple de l'une des manieres universelles du S.G.D.L. touchant la pratique de la perspective by Girad Desargues (1636)

populations, thus widening, even more, the already broad field of her teaching"[13] (Fig. 9).

Laura De Carlo is from the Roman school: in 1970 she graduated in Architecture at the University of Rome "La Sapienza", where only a year later her academic career began. Here, over the time, she holds the various roles, until she became, in 2002, full professor for the scientific disciplinary are ICAR/17. From 2004 to 2010 she coordinated a Ph.D. specific to the area of Drawing of "Sapienza" University, which joined since 2005 of the National Ph.D. School in *Scienza della Rappresentazione e dell'Ambiente*.

In 2008 she promotes and implements, together with Riccardo Migliari, the '*LA-BO-RA-TO-RI-O nazionale per il rinnovamento della geometria descrittiva*', whose purpose is to develop researches aimed at the use of computer technologies as a tool with which to visualize, in new forms, the classic themes of descriptive and projective geometry [2].

Her research activity is focused on themes related to Descriptive Geometry, with the aim of combining current digital representation techniques with the scientific foundations of representation. In fact, she deals with applications specifically relevant to this field of research—for example aimed at *quadraturismo*, stereotomy, the morphogenesis of complex forms in architecture—as well as with analysis and reading of architecture conducted through the three-dimensional digital model, not leaving out the possibilities of multimedia communication offered by the new technological systems (Fig. 10).

[13] Mention of *UID Silver Plaque 1997*. See Cundari [1].

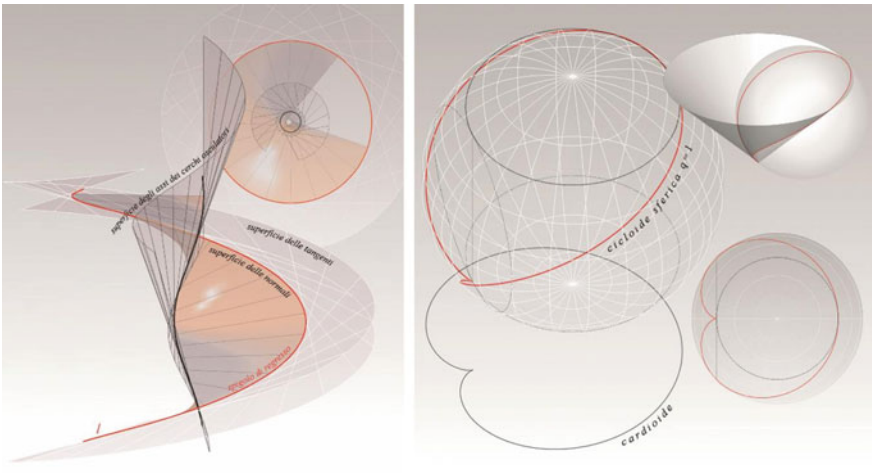

Fig. 10 Digital representation of complex surfaces, through forms and languages specific to infographic representation (by Laura De Carlo)

4 Conclusions

The short excursus, though not exhaustive, intends therefore to rediscover the cultural roots common to the many academic professors who are today dealing with Descriptive Geometry in Italy, and to highlight the female contribution given to this discipline.

A personal and authentic contribution, that of women professors, who, with great strength—even in historical moments not particularly easy for their career progression—have imposed themselves in the academic sphere. Their presence has enriched the didactics and the research by the sensitivity and passion that is typical of the female inner world, succeeding in merging, in all cases, scientific rigor and humanity in the relationship, first, with her own students.

Acknowledgements Several colleagues of the Drawing scientific-disciplinary are have contributed to providing useful data and information for this contribution. Cristina Càndito, University of Genoa, Alessandra Pagliano e Ines Pascariello, University of Naples "Federico II", Marta Salvatore, "Sapienza" University of Rome, Ornella Zerlenga, University of Campania "Luigi Vanvitelli". My heartfelt thanks go to them.
I am also grateful, for the availability shown, to Maria Teresa Bartoli and Maura Boffito, with whom I was able to speak directly, and Laura De Carlo, who provided me with the images and information relating to their profiles. Thanks again to Andrea Giordano for the valuable advice offered.
Finally, my thoughts go to Vito Cardone, who was able to direct my curiosity on this research topic.

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