DESIGN FOR NEXT

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Foreword

It is my great pleasure to preface these proceedings of the 12th European Academy of Design conference, hosted by the Faculty of Architecture at Sapienza University over three days of a very warm April in 2017. The location could not have been more suitable: the largest and oldest University in Europe with a strong reputation for high-level academic endeavour, on the edge of one of the most beautiful public parks in central Rome.

I would like to take this opportunity to express my gratitude to the joint Chairs of the conference, Professor Lorenzo Imbesi and Associate Professor Loredana Di Lucchio, who were ably supported by Conference Manager Angela Giambattista and Communication and Media Manager Viktor Malakuczi, and a whole team of dedicated student helpers too numerous to mention by name. Despite its complexity, the conference ran smoothly, and all concerned seemed to enjoy the experience.

Design for Next was one of the busiest EAD conferences to date, with 550 delegates attending over the three days. In total, 379 full papers were presented across nine parallel tracks, along with 22 poster presentations, and 8 workshop events. The six keynote speakers gave thought-provoking and inspirational presentations, and set the tone for in-depth academic debate centred on the forward-thinking topics forming the thematic strands of the conference.

The results of the event are collected here to form a lasting record of an amazing conference. The range of topics covered and the variety of issues debated is a wonder to behold. I hope they prove of interest and value to everyone.

Paul Atkinson

President of the European Academy of Design
Introduction: Designing a Design Conference

12th EAD - European Academy of Design Conference, Design for Next

“If others can see it as I have seen it, then it may be called a vision rather than a dream.”
W. Morris, News from Nowhere (1890)

It has been an honor to welcome the EAD community in the city of Rome in Italy, to host its 12th International Conference in 2017 at Sapienza University. The program fostered discussion among designers, academics and experts about the articulated scenario of contemporary design and its perspectives, with the intent to nurture diversity and interdisciplinarity.

‘Design for Next...’ is the title and topic where ‘Next’ implies the concept of proximity as well of destination, related to time and physical space. Contemporary shifts in society, technology and production are reframing design processes, approaches and tools. While the design community is questioning about the next stage of innovation, design is evolving as a wide open field with many applications and meanings. More than ever it is important to investigate through design research and practice in order to tackle the societal, technological and industrial challenges of the future.

Thanks to the contribution of professionals, educators and researchers we wanted to prompt reflection on the future fields of investigation in Design, as well to discover and to connect the spaces and the people who share common interests in Design research.

When the call for papers started, we launched two important questions: what is Design for Next? And what is the ‘Next’ focus of Design? We invited the authors to reflect on the different nature of Design for ‘Next’: Aesthetics, Education, Economy, Environment, Health, Industry, Society, Technology, Thinking... Each track focused around a keyword to engage and tackle the different fields of Design research and practice. Together, in this process, we have been drawing the big picture of Next Design.

The conference followed a long double blind peer review process with the support of 28 track chairs and beyond 100 reviewers selecting the ultimate research in design with scientific rigor, to end up with the following conference proceedings and a special issue of the Design Journal with a selection of the best papers. During the three days of the Conference, we reached an incredible number of attendees coming from any region in the world and presenting in nine parallel tracks. Academics, students, professionals, companies and industry engaged an interdisciplinary debate and developed the opportunity to share ideas and research experiences within the EAD Community with plenaries, workshops, roundtables, seminars, parallel sessions, poster sessions and of course activities for socializing and networking.

As well, eight international leading thinkers on Design acted as keynote speakers and introduced a range of different ways of approaching the next future. The plenary sessions were organized to have both contributions in design experimentation and practice, and at the same time a theoretical reflection to foster design thinking, also sharing global and local perspectives. Derrick De Kerckhove described his personal vision of next in the field of Design, society and technology; Maurizio Montalti (Officina Corpuscoli) displayed his exploration on the discipline of design, aiming to investigate and reflect upon contemporary culture, thereby creating new opportunities and visions for both the creative industry and a broader social spectrum; Gavin Munro presented how his practice (Full Grown) challenges the way we create products, as well as how we see the artifacts surrounding ourselves, often replacing the natural environment; Nicolas Nova (Geneva School of Art) shared his approach on reflecting on the next future, practicing research on the new media practices, design
fiction and speculative design as co-founder of ‘The Near Future Laboratory’, a research organization based in Europe and California; Anna Pellizzari (Executive Director at Material ConneXion Italia) is one of the most inspiring women in the Italian design scenario and she focused on the importance of innovative materials for the next design generation; Arturo Vittori (Architecture and Vision, Warka Water) displayed how merging innovative technology together with ancient tradition can result in projects on the edge between Art and Science addressing the most urgent needs of our society. Additionally, we hosted two special guests: Tonino Paris, who is the founder of the School of Design at Sapienza in Rome, and who introduced a concept of design related to the material culture of the places, and Ezio Manzini presented design for democracy as the next challenge for our community.

Among the activities, the conference featured the project ‘Design for Next Lazio’, which is an international project addressed to the local companies operating in Design. The initiative aimed to connect Business and Design in the Lazio Region directly involving Companies, Professionals, Associations and Schools of design. That’s why the project is realized in partnership with Sapienza University of Rome (Department of Planning, Design, Architectural Technology), ISIA Roma Design (Istituto Superiore per le Industrie Artistiche), IED (European Design Institute), QDU (Quasar Design University), RUFA (Rome University of Fine Arts), ADI (Territorial delegation of ADI Association for Industrial Design), OAPPCR (Ordine degli Architetti, Pianificatori, Paesaggisti, e Conservatori di Roma) and Italian Academy of Arts Fashion Design. The final goal of ‘Design for Net Lazio’ is to create a shared path of co-design to develop new industrial processes and products. Last step of the initiative was the exposition of all projects and the awarding of the best ones. The initiative has been coordinated by the Lazio Region and Lazio Innova, the regional agency for innovation supporting both enterprises and the local public authorities by providing services for startups and biz development, venture capital, internationalization services, financial and valorization of regional clusters and regional champions. Its task is to enhance Lazio as a Region of Innovation with an international dimension and promote technology transfer and the innovation-competitiveness-internationalization process, to enter the international value chain. In order to focus on strategic topics, the initiative has been taking into account three thematic areas which featured three roundtables, with the participation of experts, academics, professionals, companies and students: Industry 4.0, Design for Smart City and Cultural Heritage.

Again, we have been honored to welcome the 12th EAD conference at Sapienza University of Rome: our academic institution was founded in 1303 by Pope Boniface VIII in Rome, with its 115,000 students and 4,000 professors and researchers. It is one of the oldest universities in the world and the largest in Europe, a top performer in international university rankings thanks to the 63 Departments organized in 11 Faculties that drive high levels of excellence in several fields of knowledge. In particular, our Department, “Planning, Design, Technology of architecture (PDTa)”, manages the Research and the Didactic activities in the field of Design in Sapienza. The Conference was hosted in the historical venue of the Faculty of Architecture in Valle Giulia, located at the border of Villa Borghese, the greatest public park in the Centre of Rome.

Ultimately looking into the massive selection of papers in the proceedings, we believe the conference helped sharing and networking within our international design community, so giving a contribution to the progress of research and knowledge. We wish to nurture ‘Design for Next’ and then this book should envision where we are going.

Loredana Di Lucchio, Lorenzo Imbesi
Co-Chairs of the Conference
Keynote speakers

Nicolas Nova is an ethnographer and design researcher, working both as a Professor at the Geneva School of Arts and Design (HEAD – Genève) and as co-founder of The Near Future Laboratory, a research organization based in Europe and California. His work focuses on observing and documenting digital and new media practices, as well as creating design fictions, i.e. speculative designed objects exploring the experiences of near future. He holds a PhD in Human-Computer Interaction from the Swiss Institute of Technology (EPFL, Switzerland) and was previously a visiting scholar at Art Center College of Design (Pasadena), ENSCI - Les Ateliers (Paris) and Politecnico di Milano.

Maurizio Montalti. Strongly rooted in a collaborative, research-based and experimental approach, Maurizio Montalti’s work tends toward the exploration of the design discipline, aiming to investigate and reflect upon contemporary culture, thereby creating new opportunities and visions for both the creative industry and the broader social spectrum. Maurizio’s practice, “Officina Corpuscoli”, seeks to reveal unorthodox relationships among existing paradigms, aiming to promote the growth of critical thinking, through the development and materialisation of tangible alternatives. Maurizio holds a Master in Industrial Engineering from the University of Bologna (IT) as well as a Master in Conceptual Design in Context from the Design Academy Eindhoven (NL). His work has been widely shown in multiple museums, exhibitions and festivals, both nationally and internationally.

Gavin Munro is an artist and designer from Matlock, Derbyshire. Gavin has lent his hand to a number of different skills, from furniture to houses, and everything in between. Inspired by a childhood experience with a bonsai tree, and constantly encouraged throughout his life, Gavin finally made growing furniture his full time profession. He now lives in Wirksworth, Derbyshire, with his loving wife Alice, and their full-time boss, Lina, the lurcher.

Arturo Vittori is an Italian Artist, Architect and a Designer. His work is internationally known for merging cutting edge technologies together with ancient traditions resulting in projects on the edge between Art and Science that answer our society’s most urgent needs. After graduating he gained experiences collaborating with Santiago Calatrava, Jean Nouvel, Future Systems, Anish Kapoor. He was Manager of Aircraft Cabin Design at Airbus and involved in Yachts and Cruisers design at Francis Design. Vittori, since 2002, is directing the research and design studio Architecture and Vision, Italy, he is also the CEO of the american NGO Warka Water Inc.

Derrick De Kerckhove (born 1944) is the author of The Skin of Culture and Connected Intelligence and Professor in the Department of French at the University of Toronto, Canada. He was the Director of the McLuhan Program in Culture and Technology from 1983 until 2008. In January 2007, he returned to Italy for the project and Fellowship “Riento dei cervelli”, in the Faculty of Sociology at the University of Naples Federico II where he teaches "Sociologia della cultura digitale" and "Marketing e nuovi media". He was invited to return to the Library of Congress for another engagement in the Spring of 2008. He is research supervisor for the PhD Planetary Collegium M-node directed by Francesco Monico. Since 2008 he oversees global art projects for Solstizio, co-founded by the artist Giuseppe Stampone.

Anna Pellizzari is the Executive Director at Material ConneXion Italia, is an expert on materials design, with more than 25 year of experience in the field. She has attended short courses at Domus Academy in Milan, Central St Martins of London, and the Fashion Institute of Technology in New York and worked in graphic design, textiles, design of materials, CMF. Her collaborations include several major brands in the sectors of sporting goods, automotive, interiors, packaging.
Sapienza University of Rome, which was founded in 1303 by Pope Boniface VIII in Rome, with its 115,000 students and 4,000 professors and researchers, is one of the oldest universities in the world and a top performer in international university rankings thanks to the 63 Departments organized in 11 Faculties that drive high levels of excellence in several fields of knowledge.

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The EAD was formed in 1994, to improve European-wide research collaboration and dissemination and to promote the publication and dissemination of design research.

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Anamorphosis and Contemporaneity

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Abstract: Today, anamorphoses are increasingly used in the field of Graphic & Architectural Design. The construction methods of anamorphoses have not changed since those theorized and used by the first treatise writers in 1600. A comparison between some of the existing procedures, based on the use of new technologies, and the theoretical concepts of the past shows that little or nothing has changed from a conceptual point of view. Those who make anamorphoses these days still follow, for example, the indications taken from Niceron’s studies, even though this task is made easier by the use of computers and video projectors. Some researchers have also developed software programs to facilitate the transformation/anamorphic deformation, although they did so mostly for their personal interest rather than to follow an input given by research bodies. The final objective of the study is to understand the possible further developments of anamorphoses in the field of Graphic & Architectural Design. In other words, the way reverse perspective is used, not only as a subject matter that is taught and explored at a theoretical and academic level, but as a living matter, with which one can have a dialogue to achieve those results that have always fascinated both researchers and the beneficiaries of the works inherited from the past up to our days.

Keywords: Anamorphosis, Graphic Design, 3d Modeling

1. Introduction

In Graphic & Architectural Design, anamorphoses are increasingly used with different implementing and representation methods; this is still a topic of interest in research, pretty much like personal reflections (think of the studies on perspective conducted by Erwin Panofsky (Panofsky, 1927) and Deio Gioseffi (Gioseffi, 1957) and the debate on spatial representation from the 1950s onwards) which can therefore find new opportunities in terms of research and development.

In recent years, anamorphoses have been used and applied to Graphic Design. Many researchers have observed and documented the artistic experimentation by "3D Chalk Painters; among them, Kurt Wenner, Julian Beever, Manfred Stader, Edgar Muller, Eduardo Relero and Leon Keer; they also looked into certain types of anamorphic art made without drawings and paintings, as the "ephemeral...
garden” realized in the square of the town hall of Paris (Lazzaro et al., 2013), or the urban anamorphoses created by the Swiss artist Felice Varini (Di Paola et al., 2014) (Varini et al., 2004).

Some artistic experiences, as it happened in the past with the painting of the Ambassadors by Hans Holbein (1533), have created a movement of perspective investigators, focusing their attention on anamorphoses and their contemporary applications.

In Graphic & Architectural Design, anamorphic studies are still based on a theoretical/practical approach tied to the first treatise writers of ’600, on studies and ideas from the last 40 years, and on those who are now testing new computer-based techniques and technologies.

The first treatise writers studied the main aspects of perspective and thoroughly examined the theoretical and practical aspects of anamorphoses. They still represent an important reference with respect to theory. Among them, it is worth mentioning S. de Caus (de Caus, 1611), J.F. Niceron (Niceron, 1638) (Niceron, 1646), E. Maignan (Maignan, 1648) and A. Pozzo (Pozzo, 1693). Initially, anamorphosis was studied by exploring cross-sectional subject matters such as mathematics, physics, gnomonics and perspective itself. In particular, Donato Bramante, Andrea Pozzo and Emmanuel Maignan carried out in Italy some studies on perspective and anamorphosis which later became true cornerstones, frequently recalled in studies conducted in the subsequent centuries: Bramante, thanks to the clever use of perspective, in the church of Santa Maria in San Satiro in Milan, realized the perspective illusion of an apse in a space where, for architectural and dimensional reasons, the nave only ended with a transept (Fig. 1); Pozzo painted, in the church of St Ignatius of Loyola in Rome, a false dome ceiling on the flat ceiling of the Church (Fig. 2); Maignan realized a fresco on the life of S. Francesco di Paola, in a hallway of the convent of Trinità dei Monti in Rome.

Much later, coming to our days, thorough studies of anamorphosis, anamorphic works and treatise writers have been conducted in the last forty years by J. Baltrusaitis (1978), S. Naitza (1980), E. Battisti (1981), J. Elffers (Elffers et al., 1981), D. Toffanello (1996), R. Migliari (Migliari et al., 1999), A De Rosa (De Rosa et al., 2002), K. Andersen (2007).

Other investigators have analyzed the links between anamorphoses and other contemporary research areas, emphasizing 3D geometry, like D. Hansford (Hansford et al., 2007); others, like F. Di Paola (Di Paola et al., 2014), have described how digital techniques can simplify anamorphic applications even in the case of projections on complex surfaces and some contemporary artistic applications, like P. Di Lazzaro (Lazzaro et al., 2013).

In architecture, anamorphoses were used to realize special viewing effects or to solve problems like the impossibility to provide complex structures due to the lack of space or money; in our time, anamorphosis is mostly employed in Graphic & Architectural Design and related applications (visual graphic, exhibit design, advertising design, playful design).

This study aims at describing the state of the art and any possible theoretical and practical developments in this specific field.

As we will see, the construction methods of anamorphoses have not changed since those theorized and used by the first treatise writers in 1600. A comparison between some of the existing procedures, based on the use of new technologies, and the theoretical concepts of the past shows that little or nothing has changed from a conceptual point of view. Those who make anamorphoses
these days still follow, for example, the indications taken from Niceron’s studies, even though this task is made easier by the use of computers and video projectors.

Some researchers have also developed software programs to facilitate the transformation/anamorphic deformation, although they did so mostly for their personal interest rather than to follow an input given by research bodies.

The final objective of the study is to understand the possible further developments of anamorphoses in the field of Graphic & Architectural Design. In other words, the way reverse perspective is used, not only as a theoretical subject that is taught and explored at a theoretical and academic level, but as a living matter, with which one can have a dialogue to achieve those results that have always fascinated both researchers and the beneficiaries of the works inherited from the past up to our days.
FIG. 1 - Donato Bramante, fake apse of the church of “Santa Maria presso San Satiro” in Milan, 1483. (Image by the author)
2. Construction of anamorphoses: past and present techniques

In Graphic & Architectural Design, the first and important prerequisite is the possibility to use representation tools embedded in the latest technologies (such as computers, 3D simulations and video projectors). Have these new tools generated new procedures to create anamorphoses? Or the construction principles of the geometric structure have remained unchanged?

The following paragraphs show that the geometrical structures of anamorphoses (thanks to the analogies between the anamorphic constructions suggested by the treatises of ‘600, with particular reference to the Niceron’s studies, and contemporary operational methodologies) are still based on the same theoretical and construction principles of the past with the addition of certain contemporary instruments.

The cases analyzed range from the transformation of a 2D representation to the realization of a 3D model:

1. use of photo editing (2D) applications to generate an anamorphic grid;
2. use of video projectors connected to a computer, with the addition of a photo-editing software (2D);
3. use of 3D modeling - construction and 3D simulation of the objects on which to perform the anamorphic projection.
4. These are contemporary tools resulting from new technologies:
5. anamorphosis software;
6. dynamism in anamorphoses.

3. The construction of the anamorphoses according to Niceron

One point perspective anamorphism (on a horizontal or vertical plane) was well described by J. F. Niceron in his treatise *La perspective curieuse ou magie artificielle des effets merveilleux*, published in Paris in 1638 (Niceron, 1638).

The second book of *La perspective curieuse ou magie artificielle des effets merveilleux*, second proposition, illustrates "the process to draw any sort of figure, image, or painting, in the same manner as the chair of the previous proposition, i.e. so that it is perfectly recognizable only if viewed from a certain point".

The process explains how to realize the anamorphoses of a square or rectangle, divided into many smaller squares, and then move, as in a magnification, any image through the use of a square mesh.

The method to obtain the anamorphoses of the figure inserted in the square is illustrated in Table XII (Fig. 3): "Draw a segment having the same size as the side of the square, then divide it into as many parts as the divisions of that side; start from these divisions to draw straight lines to the main point, that will be placed as far as the desired deformation; after choosing the point of distance, on the horizontal line, near the main point, join it with the opposite end of the segment from which you started. In this way, by drawing a parallel line to this segment, whenever this junction intersects one the straight lines leading to the main point, you will obtain the subdivisions, in depth, of the chessboard, and therefore its distorted image".

This proposition has three corollaries. The first relates to the examples in Table XIII (Fig. 4), where two faces are redrawn, distorted, inside these elongated quadrangles in such a way as to require a side view.
FIG. 3 - J.F. Niceron, *La perspective curieuse ou magie artificielle des effets merveilleux*, ed. Paris, 1638. Table XII.

FIG. 4 - J.F. Niceron, *La perspective curieuse ou magie artificielle des effets merveilleux*, Parigi, 1638. Table XIII.
In *Thaumaturgus opticus* (Niceron, 1646), Latin edition of 1646, an expanded version of the treatise with respect to *La perspective curieuse*, Niceron explained how some prospective machines operate; he illustrated a method where straight wires are employed to materialize visual rays and draw large anamorphic images as the one shown in Book Three of Emmanuel Maignan’s treatise (Maignan, 1648) (Fig. 5).

Methods similar to those described above are used to transfer scenic paintings created "flat" on curved surfaces (domes and vaults, for example). Yet, the observer perceives "natural" images regardless of the shape of the pictorial surface: for this purpose, we may use the projection of shadows through light sources, with the help of grids or pierced cardboards that are projected above highly tilted plans or other kinds of surfaces (Iurilli, 2014, p 47-48).

![FIG. 5 – Anamorphic structure by J.F. Niceron, Thaumaturgus Opticus (Tab. 33, Fig. LXVI and LXVII), Paris, 1646.](image)

### 4. The construction of anamorphoses in Graphic & Architectural Design

#### 4.1 Use of photo editing applications

Some procedures currently employed to create anamorphoses are conceptually and operationally very similar to the studies conducted by Niceron in *La perspective curieuse* and to the anamorphic structure described in Table 33 of *Thaumaturgus opticus* (Fig. 5).

Photo editing applications allow to interpret in a similar manner the second proposition of *La perspective curieuse* by Niceron and the content of Tables XII (Fig. 3) and XIII (Fig. 4).
Given the ABCD grid and the abcd mesh (Fig. 6a), distorted according to the projection from point of view Y (with X projection in the reference plane α), you can distort the figure of a cube positioned in ABCD grid (Fig. 6b) using the application transformation tools. AD points first coincide with ad (Fig. 6c), then CB side coincides with the straight line containing cb (Fig. 6d). Using the "distortion" or "perspective" command, the ABCD grid is caused to coincide with abcd grid (Fig. 6e). The resulting anamorphic image (Fig. 6f), displayed from point of view Y (Fig. 6g), takes on the true, desired shape.

This procedure is used to define anamorphic images on vertical or horizontal planes, as in advertising panels in football or rugby stadiums or in Formula 1 circuits.

**FIG. 6** - Anamorphic grid realized with a photo editing software.
4.2 Use of video projectors

The use of projectors or video projectors placed in point of projection, constitutes a contemporary interpretation of what was described by Niceron in Tab. 33, Fig. LXVI, LXVI of *Thaumaturgus opticus* (Fig. 5).

With a high brightness projector, such as, for example, in Felice Varini’s works of art, a transparent film on which the monochrome image that you want to decompose in space is used: this is like an "anamorphosis obtained by spatial decomposition".

Projection point in Varini’s works is placed at eye-height (about 1.50 m) from the floor plane. The identification of the points of objects, arranged in space, on which to draw the anamorphic figure does not need the construction grid assumed by Niceron; thanks to technology, the lines of projection are replaced by the light rays of the projector itself and the shape of the figure is directly transferred on the surfaces on which it is projected.

The contours of the distorted image are marked with the use of tapes, brushes or markers directly on the spot, quite similarly to the character in figure LXVII, Tab. 33 of *Thaumaturgus opticus* (Fig. 5).

During the next step, the parts that make up the image to be displayed will be filled with colored paints (Fig. 7).
In the case of video projectors, such as, for example, in Ghigos Ideas’ exhibit design for the DOCVA archive design and fitting at the MAXXI museum in Rome (Fig. 8a), the above described procedure is slightly different. They used a video projector to realize the anamorphosis of the logo of the Documentation Center for Visual Arts, with the point of view placed at the entrance of the exhibit itself (Fig. 8b). A video projector connected to a computer, and a photo-retouch software, allow to project different colors, differently from the previously described procedure, so that you can handle polychrome pictures as well (Fig. 8c).

4.3 Use of 3D modeling

The three-dimensional modeling procedure allows an operating mode in which the construction, with reference to exhibit design, in the anamorphic apparatus may also occur in a place different from where it will be displayed.

The 3D simulation and construction of both objects, on which the anamorphic projection is made, and the anamorphosis itself are more controllable; editing and processing operations can be performed in real time. The virtual environment allows for a “preview” of both the expected result and the anamorphoses.

A convincing illustration of the procedure is the reconstruction of the 2014 exhibition ”The Observatoire des innovations” at the Muséè de la Cité des Sciences et de l’Industrie de la Villette in Paris.
Anamorphosis is created by spatial deconstruction on objects designed and arranged for a spatial reconstruction of a square from the point of view (Fig. 9). It is the evolution of the procedures described by Niceron, where technology allows for an improved control of shapes and desired results. The anamorphic apparatus described in Tab. 33 of *Thaumaturgus opticus* is created and verified in a virtual environment with the help of numerical control machines. The virtual image and assumptions are then put together on site.

*FIG. 9* - (a) Musée de la Cité des Sciences et de l’Industrie: point of view where the anamorphic deconstruction is reconstructed, Paris (2014). (b) Point of view of anamorphic reconstruction. (c) 3D reconstruction of objects on which the anamorphic image is broken down. (d-e) 3D reconstruction of objects making up the deconstructed space. (Images by the author)
5. Anamorphosis software

A projection procedure can be associated to a computer algorithm to process and distort an image. However, with few exceptions (like Anamorph Me! and "Simple Anamorphic Converter"), no specific software is available to facilitate the realization of anamorphoses; used softwares simply performs a 3D check of the final result of the spatial processing. This can be obtained, for example, with Grassopher (algorithmic modeling for Rhino) and Blender, or with other generic 3D modeling applications.

In the field of "Portable Devices", some smartphones and tablet apps have been developed, like "Imorph" or "AnamorPhoto" to provide minor anamorphic transformations; however, these apps are mostly used for entertainment purposes rather than to obtain significant results having a real interest or value in the field of perspective.

It is quite clear that researchers’ interest has not turned yet into the manufacture of special computer software and projection tools. The study of descriptive geometry and the development of its related research is currently explored by a limited group of investigators, in spite of the widespread interest in some of its specific applications, like anamorphosis.

6. Dynamic anamorphoses

"Dynamism in anamorphoses" is closely linked to the use of new techniques and technologies, and is the subject of research and applications in several, different areas:

- dynamic anamorphosis that adapts itself to the changing position of the observer so that wherever the observer moves, he sees the same undeformed image. This dynamic changing of the anamorphic deformation in concert with the movement of the observer requires from the system to track the 3D position of the observer’s eyes and the re-computation of the anamorphic deformation in real time (Rvnik et al. 2014. 46-62);
- dynamic anamorphosis that take into account the motion of objects, such as for example their rotation around an axis of revolution or the movement of the observer, moving around one or more objects, to obtain different anamorphic reconstructions.

The second case is increasingly common in advertising design (shorts and videoclips) where filmmakers focus on optical effects and anamorphic images.

The camera movement, along a pre-arranged path, allows the spatial reconstruction of a sequence of serial anamorphoses; they are part of the narrative path, for example, in the 2013 advertising campaign of Honda CR-V3 (Fig. 10 ), or Vodafone4 in New Zealand (2010), or the video for OK Go band in “The Writing’s On the Wall”5 (2014).

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2 In 2001, Philip Kent developed a free software, Anamorph Me!, that allows to carry out almost all traditional anamorphic transformations using perspective and mirrors.

Anamorph Me! (http://www.anamorphosis.com/software.html) can read images in the most common formats (e.g. JPEG, BMP) and carry out a range of anamorphic transformations on them - including oblique, cylindrical mirror and conical mirror.

Being the software an author’s independent project, it offers only limited image manipulation functions. For standard operations such as cropping, changing brightness, contrast and colors, and advanced printing, users need a professional image manipulation program.

3 https://www.youtube.com/watch?v=7PGXZ-oc2-g

4 https://www.youtube.com/watch?v=T4WfzwktCkC

5 https://www.youtube.com/watch?v=m86ae_e_ptU
7. Conclusions

While anamorphism was used in the past to hide certain messages in the painting (as in pictorial images or drawings) or to exploit illusory images in the absence of real architectural structures (walls, domes, depths of spaces in general) or it was just impossible to create them, today anamorphism is predominantly used in the field of Graphic & Architectural Design, Architecture and advertising for visual communication purposes (visual design, exhibit design, advertising design, etc.).

We have seen that the construction methodology has not changed compared, for example, to Niceron’s theories in the seventeenth century. Operating modes have changed, though: computer and video projectors simplify the geometrical construction and realization of anamorphoses.

Moreover, the new techniques allow to introduce the 4th dimension (kinematism). In fact, the possibility to view the space no longer only from a fixed point, thanks to the use of the cameras, as seen in the paragraph on "applications in advertising", allows to create "anamorphic paths" in which the shape and meaning of objects change as a function of the angle with which they are framed and then shot. The construction of the "anamorphic path", in this case, can be ruled only by computer procedures.

As to IT applications, there is still a lack of research defining specific anamorphism-generating software. The use of popular applications (photo editing or 3D modelling software) entails a sound knowledge of the rules of descriptive geometry and perspective. This is the reason why anamorphoses can only be realized by investigators with a proper scientific background in this field. As to the future, a joint interdisciplinary research effort between descriptive geometry experts and algorithm developers would be more than welcome. Such research could enable, for example, the implementation of open source software programs with new pull down menus for anamorphosis creation, like Blender.\(^6\)

\(^6\) Blender allow to customize pull down menu considered as an implementation of the system using Python scripts.
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