

THE IDEAS' MACHINE.

**THE BIG SCIENCE IN SEARCH FOR YOUNG GENERATION
CONCEPTS ABOUT IMAGINATION IN PHYSICS. THE
EUROPEAN CERN – CMS CHALLENGE: “ARTS & SCIENCE
ACROSS ITALY “**

BRUNETTI Federico Alberto (IT)

Abstract. The debate about the possible interactions between Science disciplines and Artistic research has recently increased, not only as mere communication method to disseminate complex knowledge into widespread language, but with the aim to generate a matching between these two apparently opposite procedure that realize innovative representation of the world. Some of the most important international Institutions organized conferences, challenges and workshops to improve this bilateral understanding. The CERN (Geneve) promoted a digital Art residential programme named Art@CERN that gathered experts from every country to suggest and propose their experience. But even at high school educational level, several local experiences followed this master example.

The *CERN – CMS challenge “Arts & Science across Italy “* is part of the European CREATIONS project of Horizon 2020 and is organized by the Italian INFN (National Institute of Nuclear Physics) and the CMS Experiment of CERN in Geneva. The project is aimed at high school students of the third and fourth year of Milan, Florence, Padua / Venice and Naples, lasting two years (2017-2018) and has the aims to bring high school students closer to the world of Science and Research and in particular to the sub- nuclear. The first iconographical and modelling results of the national competition and best result selection has been exhibited in the Museo della Scienza e Tecnologia Leonardo da Vinci in Milan, and further selections are ongoing in other main town of Italy. A first survey of the different tendencies in interpretation of Science research proposed by young students is proposed in this manuscript.

Keywords: mathematics and visual arts, music, language, architecture, computer science applications, mathematics in vocational training and career education, computer science education

Mathematics Subject Classification: Primary 00A66; Secondary 97M80, 97M20, 00A05, 01A05; 97U99 51N05; 01A05

1 Big Science and knowledge legacy

The contemporary scientific research has developed its own investigation into fields and sizes of Nature that are by far to our own world and our imagination capabilities. In this research, three different contexts are called to interact in a highly articulated interplay: the abstract features of theoretical speculation, the avant-garde technical solutions adopted in the experiments carried out to test their hypotheses, and finally a huge amount of data to be examined as a result, to extract coherent or conflicting meaning respect to the theory.

The digital methodologies - themselves the result of this intrinsic capability to bond scientific discoveries with technological innovations - have powerfully extended and exponentially amplified observation capabilities and the data processing of information with more and more sensitive tools, and algorithms of an increasingly complexity. These contexts and methodologies have also made it possible and necessary to structure a sort of "large community" - called "Big Science" - where researchers, tools and data are shared to keep the ongoing investigations under uninterrupted multilateral matching. Indeed, this new scenario has made it possible to achieve new cognitive levels previously unimaginable, namely to investigate problems, case studies and environments completely inaccessible to human perception, both in terms of space (micro – macro ; ie: particles - Cosmos) that of time (ie the remote conditions of the origin of the universe, the stratifications of history, the infinitesimal partitions of time)

A "biological-social" condition of this new “augmented condition” undoubtedly concerns the temporal and inter-generational extension of current -and foreseeably future- research projects in the transmission of knowledge, that must not only retain their own acquired knowledge, but also knowing exactly handing down and communicating problems that have not yet been resolved. We can consider how, in the past, the techniques of writing and the libraries were up to the modernity, institutionally endowed with this task, even in different forms and in different societies

2 Naming, images, metaphors

Another not negligible aspect, both in the present and in the origins of modern science, concerns the visualization of data and, in broader terms, the use of images in scientific thought. [1]

In fact, both the graphical-visual representation, or the illustration, of the observable phenomena - either directly or by any instrument - (i.e. from the telescope to the microscope in the analogue era, and today to the digital technologies and through the sensing, amplification and visualization computation of the detected data) allow the use of images, even in broader terms - such as metaphorical or literary expressions - has found an important use in presenting conditions that science has met or hypothesized, but which do not yet have the most accurate description. "Black holes", "antimatter" or "dark matter" are now well-known literary images examples of "unknown lands" to which, in the meantime, we define our field of relative "incompetence" [2]. As we can guess these metaphoric images concern ambivalently both outreach packaged labels for communication destined to the general public debate around science, but also define as conjectures useful to speculate in first theoretical discussion, on which the disciplinary debate remains wide open, until better hypothesis. In this context, so briefly outlined, I would like to refer here to a cultural event of particular value that both educational and intergenerational, both in the iconic and metaphorical research

in the in the arduous task of "giving names to things". An extensive methodological debate explores the original ambivalence between purely quantitative interpretations of the data of experiments and theories, and the corresponding search for qualitative representations (drawing, images, metaphors,) for the understanding of the invisible phenomena of science ("vision")

3 Relation Art - Science and Mathematics - Art

It is worthwhile briefly to dwell on a clarification - which alone would imply a much broader dissertation - in relation to the relationship between Art and Science (as the title of the competition chosen as a case study) and Mathematics - Art (as defined in the topic of this specific session of research in APLIMAT2018). The analogy and the differences between these two pairs of relationships may seem subtle, or merge into mere resemblance, but may underlie an interesting heterogeneity. On the one hand the binomial *Art - Science* can refer however to the objective datum of Nature and to the attempts of human intelligence engaged in the observation - direct or through the instrumental data - of the phenomena in the real world. On the other hand, the contiguity between *Mathematics - Art* deals with two conceptual universes, both originally abstract or intuitive, initially deriving (and only sometimes) the starting point from the real world, but moving forward and sublimating its elaborations towards a conceptual vision or a perceptive dimension.

In both cases, it seems evident that the disciplinary structure of the *logical-formal reasoning* remain essential at the basis of the theoretical or interpretative speculation, as for the artistic side it is fundamental the open the research to *intuitive, symbolic and creative solutions*.

One can easily understand in an experiential and subjective way - as is increasingly demonstrated by the researches of neuroscience - how the two *logical* and *creative* universes of human thought belong to two hemispheres - disciplinary and anatomical - specific and different, contiguous and synergistic. Both constitute the banks of knowledge of the world and of oneself at work: in the act of *observing, recognizing, naming and inventing* [3].

4 "Arts & Science across Italy". Context and format of the competition

The competition we are discussing as a case study is part of a broad research path with valid methodological and institutional references that legitimize its experimentation on a large scale: “*Art & Science across Italy is part of the European CREATIONS project of Horizon 2020 and is organized by the National Institute of Nuclear Physics and the CERN Experiment of CERN in Geneva. The project is aimed at high school students of the third and fourth year of Milan, Florence, Padua / Venice and Naples, and lasts for two years (2017-2018). The project aims to bring high school students closer to the world of Science and Research and in particular to the sub- nuclear. The project was conceived by Pierluigi Paolucci (INFN Napoli), Angelos Alexopoulos (CERN), Vincenzo Napolano (INFN Communication Manager), Michael Hoch (Vienna), who co-ordinate it with the heads of the four locations: D. Menasce (INFN Milano), S. Paoletti (INFN Florence), E. Vannuccini (INFN Florence), M. Fedi (INFN Florence) and M. Michelotto (INFN Padova).*” [4]

In fact, since some years at CERN has triggered a broad discussion of mutual awareness and interest in quality view of knowledge, so not limited to the visual arts, but just the chance to

try to understand and represent through every expression of the features arts invisible to reality that is the subject of scientific research. The Geneva-based research group ARTS@CERN [5] has developed a series of collaborations inviting professional artists, on proposals of their projects through an international call, thus inviting a period of research and residence in contact with scientists and their work. The characteristics of these residential research art projects are among the most varied and have this intent: *“Arts at CERN is the leading art and science programme, promoting the dialogue between artists and particle physics. It fosters the creation of new expert knowledge in the arts by extending artists’ practice in connection with fundamental research.”*¹ In fact both the characteristics of conceptual innovation and the digital modalities of the executive techniques have been a recurrent motive of the various experiences, all very interesting, until now realized. Evidently this kind of residential collaboration and interaction is very selective and highly experimental. The competition *“Arts & Science Across Italy”*, born as a specific initiative promoted by the CMS experiment, has chosen a different path of a broad base relationship and supported by a staff of experienced referents in some Italian cities in which INFN is present with researchers and some experimental research centers. Supported by an international team of experts in scientific communication, who organized presentation seminars, traveling exhibitions, visits to experiments, talks with scientists in schools. Just to define the activated concern we can summarize the ”project numbers”: 38 high schools with 108 classes and more than 3010 students from the cities of Milan, Venice, Padua, Florence and Naples. 140 hours in two years of school-work alternation. To date: 100 seminars, 40 visits to laboratories and city museums. 28 days of the exhibition *“The colors of the Higgs boson”* and 140 artistic compositions. There are 150 local winners, 30 national winners, 24 places for the master at CERN. The session that I followed personally closer was the one in Milan. In fact, the tour of the competition began from this city, with the support of some Milanese high schools (Artistic, Classical and scientific Lyceums) institutions such as Milan Bicocca University and Leonardo da Vinci Museum of Science and Technology.

The competition in question has been credited as an experience of participation in the kind of scientific work thanks to a specific agreement with INFN with MIUR (the Italian State Minister for Education University and Research) and local Schools and Institution , and therefore these activities have resulted as an integral part of the course for the classes of students who have participated in this title. Naturally, each interested student was authorized to participate, having previously identified their own reference teacher. This initiative has received particular momentum thanks also to the concomitance of a normative innovation of the teaching called *“School-Work Alternation”*, thanks to which the students are engaged to carry out an important part of their activities in the final three years (200 hours in three final years), carrying out collaborations in approaching professional methodologies with and from “external bodies” (i.e.: agency, authority, body, bureau, corporation, organization etc.).

In Italy, following the passionate and concerned activity of some pioneers of Physics Communication such as prof. Franco Fabbri and, since 2008, by the former INFN Press Office leader Romeo Bassoli (1954-2013), and nowadays by the full staff that here was formed, many activity have been developed: as the *Assimmetrie* monographic magazine, the

¹ Monica Bello, Head of Ars at Cern , followed by the **Cultural Advisory Board**: Andrea Bellini, Director of Centre d’Art Contemporain de Genève (CAC); Frédérick Bordry, Director of Accelerators and Technology CERN.; Bilge Demirköz, Associate Professor at Middle East Technical University (METU), Ankara.; Ariane Koek, founder and former Head of Arts at CERN.; Laurent Le Bon, President of Picasso Museum in Paris.; Charlotte Lindberg Warakaulle, Director for International Relations CERN.

science mass media press release related with ANSA, the AR multimedia interactive installation research group led by Vincenzo Napolano. [6]

5 "Arts & Science Across Italy". A methodological commentary on the lines of creative project

The Milanese experience began with a conference by Dario Menasce (INFN Milano Bicocca) at the Liceo Artistico di Brera with all the groups of students involved. The photographic exhibition of the INFN volume "*The rings of knowledge*" [7] was the background of this first communication and at the opening seminar day in which all the participants of the various Milan high schools were invited to the University of Milano Bicocca and to the survey of local experiments at Faculty of Physics. From this moment on, other similar presentation meetings have continued in the other high schools that have begun the researches and in-depth enquiries into the contents to be understood and visualized by the groups of students.

The results were scheduled to be able to converge in April 2017 in a selection and exhibition of all the participants at the Museum's large cloisters, where a bilingual conference was held between local authorities and CERN scientists. Here participated, as well as staff of the competition, the Rector of the University of Milano Bicocca prof. Cristina Messa, the Councilor for Education Dott.ssa Anna Scavuzzo (who mentioned her basic training in physics).

It is worth mentioning some interpretative trends that emerged from the works presented.

Thanks to the worldwide scientific communication in regard to some emblematic images - selected from the scientific iconography in the reconstruction of the data of the collisions significant for the candidate collisions - the three-dimensional diagrams for the search for the Higgs Boson have become, from enigmas for experts, as a sort of logos for the contemporaneity. Despite this widespread communication, so effective and for the general public, the attempt to imagine and represent the extreme conditions of the initial state of space-time re-generated in the experiments of the LHC has profoundly affected and influenced the imagination of the candidates works. In particular, as can be consulted in the web archive edited by D. Menasce, they can be found examples of different resulting "iconographic" solutions and trends, both in forms and in concepts and titles. Certainly some constructive aspects related to the phenomenal characteristics of the experiment machines have hit the imagination of young artists; moreover, the recurring representation of the central perspective has found a particular correspondence with the dynamic accentuation in the figures of the accelerator or of the detectors. But the most interesting works, both of the winners but also of several other participants, focus their attention on the innovative and further temporal space qualities opened by the search for new particles. The three dimensional and complex interpenetration of force fields and punctual elements has profoundly influenced young students towards new models open to the surrounding space to which they powerfully allude. These works that construct complex and asymmetrical, or essential and bipolar forms in the model, which seek to trigger into the observer a reflection on the usual mental models of space. Some works, by the apparent custom of box objects, suggest the impression of enigmatic situations related to the *external-internal dichotomy*, or the other equally crucial opposition between *visible and invisible*. Some authors allude to the *virtual quality of the images of science*, using both the suggestions of specular materials, and some video projection techniques or digital video. The *emblematic elements of the human figure* is sometimes included as a symbol of the observer becoming as a part of the nature that

investigates . Several compositions finally discuss the *fragmentation* as an argument of the work, deconstructing recognizable wellknown simple forms in small disintegrated universes. Finally, some authors defined their concepts in the attempt to construct *devices* that - through mechanisms or visual dynamics in digital elaboration even with limited technical means, could simulate the complexity of the unstable and probabilistic relationships of the quantum dimensions of the subnuclear worlds. Exceeding of stereotypes and models; Perspective as a subjective space-time device; Box as an enigma; Diagrams of fragmentation; Models and plasticity of the world of particles: these are synthetically the lines of research developed by these first brave young authors.

The experience of the "*Arts & Science Across Italy*" competition is so demonstrating a particular intellectual vitality of the young Italian generations regarding the themes of the conceptual visualization of the invisible. Invisible conceived not as a metaphysical category, but as a fertile environment in which the mental imagination of these not directly perceptible dimensions of reality can find -in the open mind of the researcher - images able to match the extreme and fundamental qualities of Nature. This method of imaginative involvement is evidently matching the interest of young people, and their willing tutors, far beyond the usual disciplinary interpretations. The definition suggested in the title of this paper: "Machine of Ideas" (derived from the physical definition of "Machine" as transformer of one form of energy into another) indicate precisely the process of intuitive and conceptual processing here so happily activated.

The question now perhaps concerns the reverse path: that is how and when the world of Big - Science can take advantage of these new intellectual resources so laboriously triggered.

6 Training and education in the millennials digital era

An emphasis must be made on the fundamental support of teachers and tutors concerned at every level of this training. In this epochal transition, after having gradually accompanied digital techniques between languages and intercommunication methods, they are also involved in the commitment to support the scenarios of innovations and discoveries that, thanks to these technologies, are making themselves available for research. But it is no longer only metaphorical to achieve some "dimensional scales" of space-time in which to "zoom in" new morphologies of Nature (in micro or macro), but having to challenge yourself with these mode of being of reality that *transcend our sensorial perception and empiric logic*, in order to introduce other categories, which were often struggle to define the language of commonly treated areas, otherwise relatively confined to scholars.

If our generation of adults - researchers, teachers, parents - has crossed the century-old threshold between analogue and digital. The new generation of "*millennials*" is already "*digital native*" and looks at the concepts and shapes of thinking of the XX th century as a classicism to be inspired, in the same way that they observes, Design object - perceived once as originally innovative – considering them today already as "vintage". Their perception of the continuous metamorphic innovation of digital technologies, and of the scientific exploration of Nature - in the era of the Higgs -, unfolds with aptitudes of a very open mental openness. At the same time they are surrounded to a hypertrophic quantity of information that risks to complicate every possible decision. But in such a complex scenario their ability to connect past and future, images and words - far beyond the humanistic / scientific schemas of scholastic disciplines - appears as though they were merging multiple data synaptically from information platform, leaving us amazed and admired. The precious and unrepeatable task of the adults that have the educational

and training role in accompanying the growth of these generations is at the fulcrum of a really challenging and fascinating intergenerational challenge.

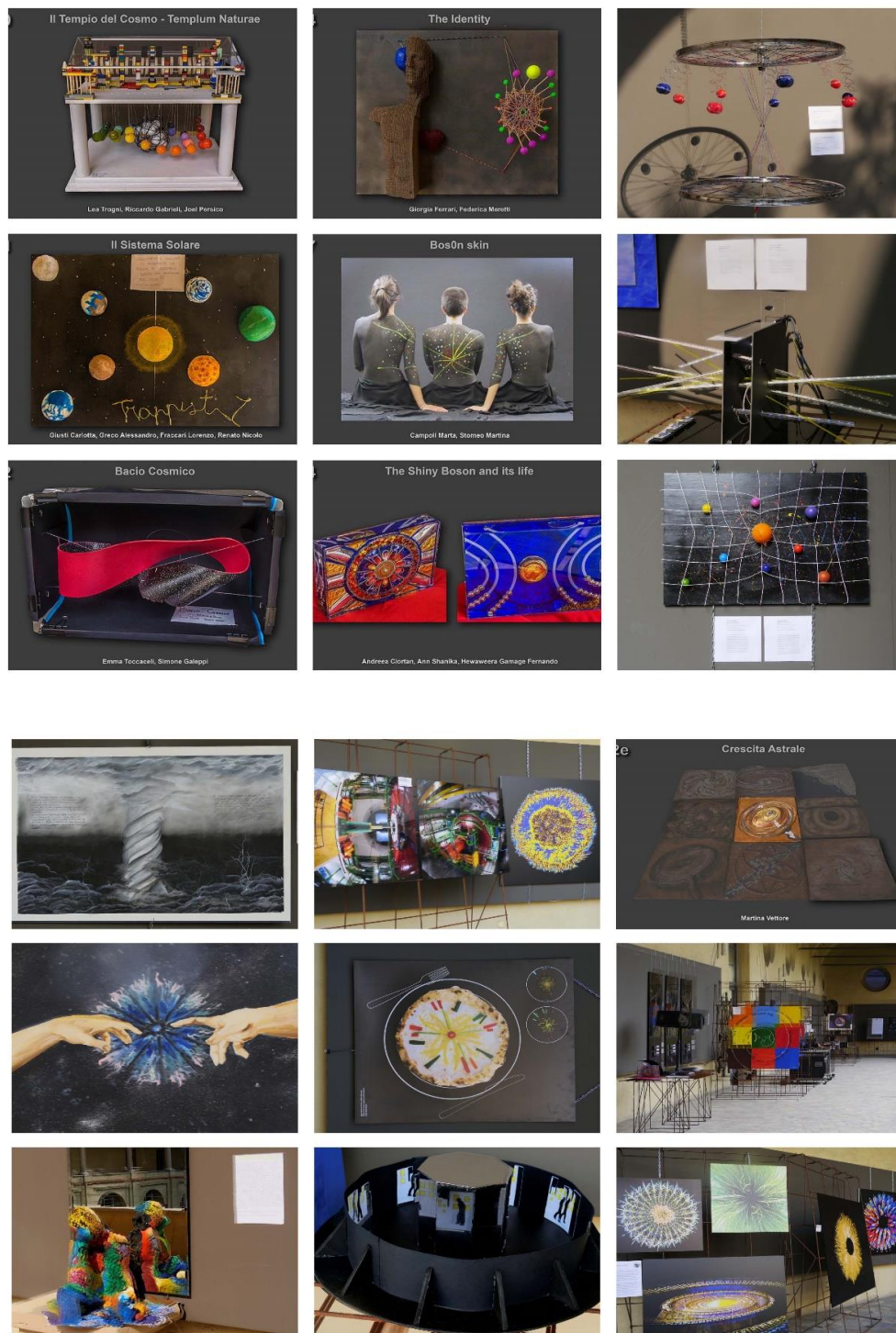


Fig. 1. Milano, 2017. Synthetic framing of works exhibited at Museo delle Scienza e della Tecnologia Leonardo da Vinci. Some of these pictures have been also taken by the author. A complete catalogue of works , titles and authors is available in the website created by Dario Menasce, (INFN Milano-Bicocca) Slide-show of the works of art exposed in Milano at the Museo Nazionale della Scienza e della Tecnologia Leonardo da Vinci in Milano. [8]

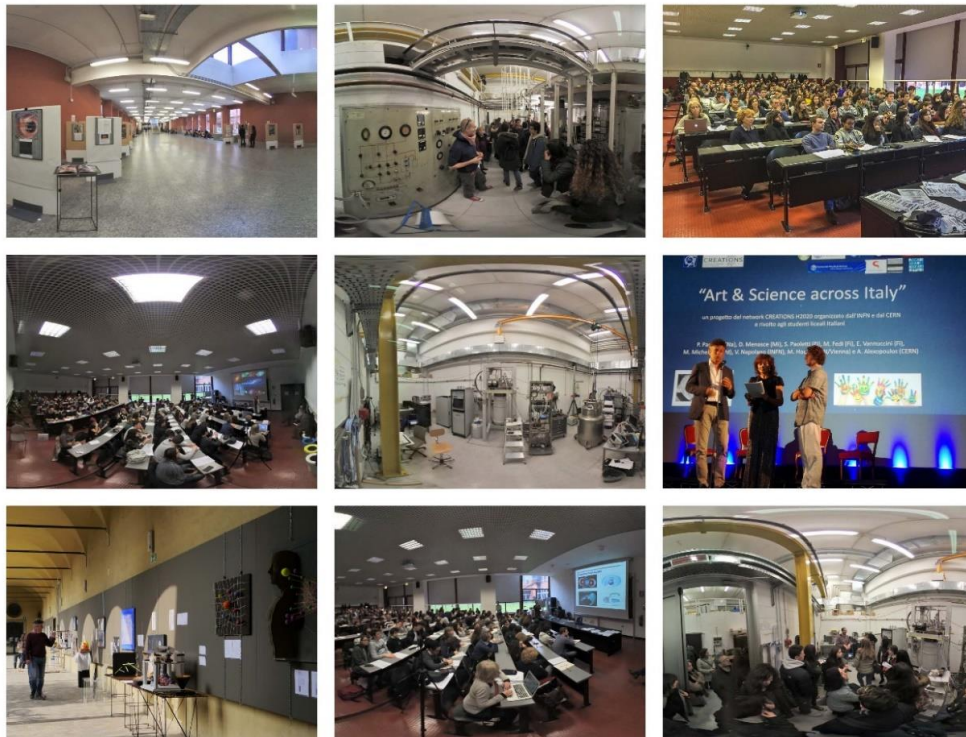


Fig. 2. Milano, Università degli Studi Bicocca: seminar and exhibition, INFN laboratory survey; Museo delle Scienza e della Tecnologia Leonardo da Vinci : prizegiving. Pictures and spherical views by the author.



Fig. 3. Posters and "icons" of the Milan events; Science Museum, Liceo di Brera, Higgs Boson's pizza. [9]

Their "soft-skills" are readily more up-to-date than the adults around them, and we hope that in a forthcoming hypothetical society 4.0 they will be able to re-invent regenerative and responsible professions that their parents might lose in the processes automation, in a relationship that is already defined as "bottom-up": i.e. where young people can be able to train adults using new technologies. Probably the most honest knowledge that we can share with them is to match the scenarios of the unpredictable, or exploring the multiple shapes of the unknown that is always in front of us. The "sense of beauty" - as a splendid film-documentary [10] - that has chosen the life of scientists at CERN as a case study - is also the ultimate meaning that moves the creativity of every research: that of the exact sciences as those of artistic research. The motto "already and not yet" can therefore represent both the interminable work of the sciences in the exploration of Nature - at all scales of its being - and the one of the Arts - in all its expressions - in giving shape to the invisible of the human thought.

7 Conclusions. Science & Arts: cross - science methodology experiences.

The human kind of our century is opened towards knowledge challenges the are extremely innovative and unpredictable. The intergenerational legacy in the self-styled developed world is very hard to assume in all its responsible consequences, and the questions opened by the science research are so wide that only a very concerned communication and educational work can give the chance to be able to follow, share and implement these results. Nature -with its still unknown qualities- patiently wait for our enquiry, but science and art seem to get close to the evidence of the reality through by different paths. A new learning approach, in respect of any specific disciplines, seems to emerge from this experience of didactic challenge –Italian based but essentially international -, gathering high level scientist, high school concerned students, interdisciplinary tasks teachers. The results of this extraordinary involving experiment between Science & Arts go beyond any effective participants work, and open a new evident possibility for the development in approaching to specific disciplines by cross - science methodology experiences.

Acknowledgements

The authors gratefully acknowledge the Scientific Grant Agency: Design Dept., Politecnico di Milano. -My gratitude is first for the team leader Pierlugi Paolucci and all staff, for the kind opportunity that they allow me to present their work in this first report, even during the public developing of the challenge. A special thanks is addressed to Dario Menasce, who lead the Milan events of the challenge and offered his expert and kind overview to this manuscript.

-This paper follows the friendly gratitude to Mauro Francaviglia that take care from the beginning, with accurate and eminent supervision and encouragement, to my interest in science communication and visual design of scientific iconography. With his rare and enthusiastic vision of dialogue between science and arts, he has been a rare mentor for me. Now, in an impossible direct colloque, we simply try to look to his original example, exploring the challenges of the present.

References

- [1] BRUNETTI, F., (Politecnico di Milano - Scuola del Design), *L'immaginario dell'invisibile. Iconografie della Fisica contemporanea tra macrocosmo e microcosmo: un caso di studio per il Design della comunicazione scientifica*. Pp. 250-254 In: *ComunicareFisica2012 Museo Regionale di Scienze Naturali, Torino*,. Frascati Physics Series - Italian Collection Collana: Scienza Aperta Vol. IV (2014) *ComunicareFisica2012*; Atti 4° Convegno "Comunicare Fisica e altre Scienze", Torino 2012. ISBN 978-88-86409780.
- BRUNETTI, F., *La visione scientifica e le immagini della ricerca*, in: Alberto Peruzzi (a cura di), *Pianeta Galileo 2011. Arti visive e nuove frontiere della cosmologia*, Atti del convegno, Accademia delle Arti e del Disegno, Firenze 3 novembre 2011, Consiglio Regionale della Toscana, Firenze, 2012, pp. 323-346. ISBN 978-88-89365-10-6.
- BRUNETTI, F., *Iconography of science representations ad visual concepts in the digital era; first outlines*. pp.119-123.; *Physics research as a project process. Aesthetics in science, representation and technology, design concepts from new Physics. A visual report from LHC - CERN* - pp.151-154 In: a cura Luigi Cocchiarella. *The Visual Language of Technique between Science and Art - Heritage and Expectations in Research and Teaching -The Visual Language of Technique*, Vol.1 - History and Epistemology. Proceedings, Politecnico di Milano 150° International conference: 6 Maggio 2013, Scuola di Architettura e Società del Politecnico di Milano ISBN 978-3-319-05350-9. Ed, Spinger 2014, ISBN 978-3-319-05340-0 ISBN 978-3-319-05341-7 (eBook); DOI 10.1007/978-3-319-05341-7 Library of Congress Control Number: 2014949295. In: *The visual language of technique, v.1 History and epistemology, The visual language of technique*, by Luigi Cochiarella, editor; ISBN 978-3-319-053257
- BRUNETTI, F., *La visione scientifica e le immagini della ricerca*; in A. Peruzzi (a cura di), *Pianeta Galileo 2011*, Consiglio regionale della Toscana, Firenze 2012 (pp.323-346). Conference Proceeding: Firenze 3 novembre 2011. "Arti visive e nuove frontiere della cosmologia", Accademia delle Arti e del Disegno. Firenze 2012, ISBN 978-88-89365-10-6.
- [2] BRUNETTI, F., "Disegno, Immagini e metafore nella comunicazione scientifica" in: *ComunicareFisica.07*. 2007.10.1-6 Trieste Conferenza-Workshop nazionale sulle tematiche e sulle metodologie della comunicazione della fisica e delle altre scienze. *Linguaggi e strumenti della comunicazione scientifica verso il pubblico*. Sponsor: I.N.F.N. Istituto Nazionale di Fisica Nucleare; Università di Trieste; ICTC International Centre for theoretical Physics, Sincrotrone Trieste S.C. p.a.; Università degli studi di Udine. in: *Proceedings*, FRASCATI PHYSICS SERIES Italian Collection – Scienza Aperta Volume II Atti 2° Convegno *Comunicare Fisica e altre Scienze a cura di* Francesco Longo e Erica Novacco, pp.63-64) www.ts.infn.it/eventi/ComunicareFisica/presentazioni/brunetti.pdf
- [3] <http://www.artescienzaeconoscenza.it/>
- [4] <https://web.infn.it/artandscience/index.php/en/>
- [5] <http://arts.cern/>
- [6] <http://home.infn.it/it/comunicazione>; <http://home.infn.it/it/editoria> ; <https://www.asimmetrie.it/> ; <http://home.infn.it/it/mostre/installaioni>
- [7] BRUNETTI, F., *Gli anelli del sapere. INFN x LHC. Il contributo italiano alla più grande ricerca sulla fisica delle particelle al CERN di Ginevra. The rings of knowledge. INFN x LHC The italian contribution to the world's largest particle physics research project at CERN*, Geneve (Istituto Nazionale di Fisica Nucleare/ CERN / Dept. Indaco Politecnico

di Milano / ed. Abitare Segesta RCS Mediagroup) Milano 2009; ISBN 978-88-8611-693- thematic essays in the volume: BRUNETTI F. *LHC between science and architecture*, pp.12-13. *Physics as design. Beauty, representation, vision*. pp.28-37 *Drawing, images, metaphores in scientific communication*, pp.42-43.

- [8] <https://dariomenasce.wixsite.com/artandscience>;
<http://www.museoscienza.org/news/dettaglio.asp?idnotizia=1070>
<https://web.infn.it/artandscience/index.php/en/>
- [9] <https://web.infn.it/artandscience/index.php/en/gruppi-di-lavoro/87-news/122-primo-incontro-con-gli-studenti-a-milano>
<http://www.liceoartisticodibrera.com/wp-content/uploads/2017/02/Gli-anelli-del-sapere.pdf>
<http://home.infn.it/it/comunicazione/news/1914-arriva-al-cern-la-pizza-del-bosone-di-higgs>
- [10] *Il senso della bellezza*, writtend and directed by: Valerio Jalongo, Photography : Alessandro Pesci, Leandro Monti ; post-production: Massimo Fiocchi , Original Musics: Maria Bonzanigo, Carlo Crivelli – by Orchestra della Svizzera Italiana directed by Kevin Griffiths, Sound: Christophe Giovannoni, Masaki Hatsui, Producers : Tiziana Soudani, Silvana Bezzola Rigolini, M. Letizia Mancini,: Camilo Cienfuegos per La Frontera Video & Film; Tina Boillat; Amka Films, RSI Radiotelevisione Svizzera SRG SSR, Aemeuropa International with Rai Cinema; Distribution: Officine UBU

References – event and report Web sources:

<https://web.infn.it/artandscience/index.php/en/>
<http://www.na.infn.it/it/7-notizie/390-presentazione-del-progetto-art-science-across-italy>
Milano, Museo della Scienza e dalle Tecnologia Leonardo da Vinci . 12.04 – 1.05 2017.
<https://web.infn.it/artandscience/index.php/en/milano-aprile-2017>
<https://web.infn.it/artandscience/index.php/en/milano-aprile-2018>
<https://dariomenasce.wixsite.com/artandscience>
Venezia. Palazzo del Casinò di Venezia Lido dal 4 -12. 07 2017:
<https://www.facebook.com/artandscienceacrossitaly/videos/1365665633555127/>
Napoli 18 ottobre 2017:
<https://www.gazzettadinapoli.it/istruzione/universita/art-science-across-italy-lunedì-20-alla-federico-ii/>
<https://web.infn.it/artandscience/index.php/en/87-news/168-giornata-formativa-di-napoli-materiale>
<https://agenda.infn.it/contributionListDisplay.py?confId=14132>
<https://agenda.infn.it/conferenceTimeTable.py?confId=14132#20171018>
(<http://home.infn.it/it/mostre/archivio-mostre/1329-il-dono-della-massa>).

Padova Università 23 novembre 2017:
<https://www.facebook.com/artandscienceacrossitaly/?ref=bookmarks>
<http://home.infn.it/it/news-3/news-uffcom/2660-art-science-across-italy-i-vincitori-della-tappa-padovana>

Current Address:

Brunetti Federico Alberto, Dott. Arch. PhD.

Politecnico di Milano Dept. of Design – School of Design

Visiting professor: Elementi di Percezione Visiva - Laboratorio di elementi visivi del progetto

Via Durando 38/a, 20133 Milano, Italy

E-mail: federico.brunetti@polimi.it

www.federico.brunetti.it; www.sciencecommunicationdesign.eu

