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***Dr. Biljana Jovic's doctoral dissertation is titled: 'Geometrical education in domain of visualisation and experimental design using virtual technology' is in the scientific field descriptive geometry and geometry of architectural form which has a dual character: scientific and artistic. In her work, she combines the approach of landscape architects as well as engineers, and an artistic approach to geometric principles to find beauty and expression
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BIO GEOMETRY DESIGN WORKSHOP

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Abstract

Creative platform Geometry workshop started in year 2012, (logo shown on Image 1 left and photo from Curious EU project) always included fantastic artists as collaborators working together with students so currently specially extended gratitude goes to the best artist in Serbia Dr. Art Milica Rakic. She is serving as Art Director of Geometry Workshop and constantly adding great additional value. Bio Geometry Design Workshop is using geometrical knowledge as a powerful tool with biology as a source of inspiration that leads to design that must be sustainable and eco-friendly in absolutely natural way.

Keywords: Biology, Geometry, Art, Bio-Design, Workshop



Image 1: Logo of the creative platform GEOMETRY WORKSHOP and photo by Tanja Drobnjak Curious project Bio-design

Introduction

Geometry Workshop was established in 2012 in cooperation with, at that time, student Miloš Tripković as a creative platform designed for students of Landscape architecture and horticulture as non-obligatory and non-gradable based on activities. Art and science overlapped and intertwined so that innovative methods and results gained were recognised as quite interesting in the domain of design inspired by biology – biological design or bio-design by using contemporary technology and great influence of art that must be always present. In that way, in accordance with sustainability goals, research results gained were obviously based on biological knowledge and geometry representing hard sciences but artist who collaborated in design procedure gave extremely strong contribution and without that artistic impact - conceptual bio design solutions that as results could not stand. This type of trans-disciplinary approach is shown in the 3D model of Natalie's Ramonda Pavilion results. For bio-inspiration, the plant species *Ramonda nathaliae* P. et P., is chosen as it is interesting not only because of cultural value for Serbia but also for its unusual traits of poikilohydry and its very limited range in Balkan. The shape of the flower is very simple and consistent, so designing final form can easily be extracted from one flower petal to start experimental generative modelling. Delicate flower petal is transformed into the Voronoi pattern, by using software tools, and a 3D model of the Natalie's Ramonda pavilion is created. http://admc2017.graphicscience.jp/finalist/10_index_detail.html

Asian Digital Modeling Contest 2017 make results and bio-geometrical approach in design quite obvious and clear. As one of 11 finalist on this competition there was an opportunity to show results, in addition to an interview with competition jury, an exhibition of 3D models printed were held at Tokyo University of

Technology (TUT) in Tokyo, Japan August 6.-8.2017, <http://admc2017.graphicscience.jp/>. Asian Forum of Graphic Science (AFGS) opened fantastic opportunity to contribute to Art and Science domain as Conference Committee member with possibility to be enriched by reviewing papers and chairing sessions during AFGS conferences (Image 2).



Image 2: AFGS 2023 Shenzhen, China, August 7.-10. 2023

BioDesign Curious project

Amazing experience was collaborating with University of Art in Belgrade by invitation that came from Laboratory of interactive art, Faculty of Drama Art to join the Curious EU project. Four countries participated: Belgium, Italy, Bulgaria and Serbia. CURIIOUS – Culture as Unique Resource to Inspire, Outreach & Understand Science <https://www.projectcurious.eu/> shows how through Augmented Lecture (AL)- theatre performance in “Vuk” theatre in Belgrade, Serbia (Image 3) technology played an important role.

Visitors participated through QR code answering questions before and after theatre performance. Also team collaborator – coauthor of performance Ivan Lusic Lik (architect and light designer) made fantastic video materials based on scientific work and based on images from paper published Artificial intelligence used for final video production. All was directed by absolutely amazing Iva Olujic (theatre performance director) Sound design was fantastically done by Aleksa Nikolic. So, our performance was selected to be played in English and recorded (accessible in open format on YouTube: <https://www.youtube.com/watch?v=EgHPvJZACJo>). One more time AL performed by invitation from the Center for *the Promotion of Science* in Serbia on OpenSciComm (Open Science Communication) International Conference in the Museum of Cinema Art (Yugoslav Film Archive November 22nd 2022 in Belgrade, Serbia). Based on published papers in this domain text for theatre performance was changed and questions for the public questioner were made in the simplest possible way.



Image 3: Photo by Tanja Drobnjak Augmented Lecture at theatre Vuk in Belgrade, Serbia

Augmented Lecture 'Biodesign' is presented in a way to be untestable to people 12 years old and started to be quite popular, hence, many students especially in master and PhD studies at the

University of Belgrade continue to research this domain under my mentoring/supervision.

Workshops and series of lectures in India 2019

Cumulus Association 2019's grant at Rovaniemi Conference in Finland opened up a new horizon for extended activities around the world. First step was India, a great experience where Bio-Geometry workshop with series of lectures and an exhibition at the end was arranged at the ARCH College of Design and Business from 16th September to 3rd October 2019 and were successfully conducted.

Besides combining knowledge of biology, geometry and art to design, on this special occasion to work abroad on sites in local cultures played one of the crucial roles that was also included and was visible in the final artwork produced during the workshop. Fantastic opportunity to cooperate with talented, hardworking and smart students from India where they have been encouraged to show and include cultural values which were highlighted and shown in their final results in the on-campus exhibition.



Image 4: India experience at ARCH College of Design and Business

Workshops and invited lectures in China

China's experience involves great conditions for the workshops, especially with high level of technology involved, really gave strong support for an optimistic future. Students showed fantastic enthusiasm in team work. Pedagogical approach, 'learning by doing' method was applied, so we visited green areas and students took photos and drew freehand sketches based on that they started to use hi-tech for geometrical modelling and visualisation. It is stressed out that we are actually co-creating with nature and recreating with technology all the time. Results gained in very a friendly and a supportive atmosphere were amazing and definitely exceeded expectations in very positive ways. During lectures and discussions it was great to hear how new and original ideas were coming along and how big possibilities were inspired by nature but by adding additional original cultural values innovative ideas were created.



Image 5: Bio geometry and Bio graphics in China

Dealing with bio-geometry and bio-graphics highlighted the aim to gain bio-designed conceptual solutions here dedicated to open space area accessible for public use, all in sustainable eco-friendly way. Delivering lectures and accomplishing workshops in prestigious Universities in China like: CAFA, WUT, BIGC, HIFA, 869 Design school, Gengdan University of Technology in Beijing –

Academy of Design opens for us additional inspiration for future work in a hi-tech eco-friendly way.

Conclusion

At early stage activities of creative platform Geometry workshops were conducted at the University of Belgrade, Faculty of Forestry, Department of Landscape Architecture and Horticulture since students have by curriculum obligatory teaching courses quite fine knowledge of biology, geometry and graphics. This combination of knowledge opened up quite a solid base to start to combine this knowledge and start to explore appropriate available software to design elements for public use in open public spaces. Conditions for work are still quite modest here but luckily completely eco-friendly. Showings in public, starting with making pure and simple geometrical models created by students and following with making minimalistic geometrical photos that are exhibited in the faculty spaces from 2012 to events like Belgrade Photo Month 2016,2017,2018 and Triennale of expanded media 2016 and 2019 organized by Serbian Association of Fine Arts.

As one of plenary speaker at EU Culture Capital 2023 city Veszprém in Hungary on Conference gave great possibility to explain process of collaborating with 6 fantastic female artists from Serbia: Anica Vučetić, Nina Todorović, Šejma Fere, Nataša Teofilović, Milica Rakić and Marica Radojčić (1943-2018). <https://symmetry-hu.com/index.php/2023/03/03/folk-architecture-vernacular-architecture-from-the-traditions-to-the-future/> Through the plenary presentation titled: CREATIVITY VIA ART AND SCIENCE: GEOMETRY WORKSHOP story about Geometry workshop as a creative platform, is briefly presented. The workshop started in 2012, and was primarily designed for students of all levels at the Department of Landscape Architecture and Horticulture, Faculty of

Forestry, University of Belgrade but also opened to the public at the Museum of Science and Technology in Belgrade Serbia where nowadays most of the collaboration activities is going on.
<https://www.youtube.com/watch?v=iI86bAC5bgo>

Designing bio-design workshop including bio-geometry and bs within creative platform Geometry workshop could not be possible without great input and help from fantastic famous contemporary artists. Thanks to art director of Geometry workshop Dr. Art Milica Rakic, future is bright and still growing giving always something new in a very sensitive, delicate and emotional way.



Artwork: Dr. Art Milica Rakic, art director of creative platform Geometry workshop

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References

Jovic. B. S. (2023). CREATIVITY VIA ART AND SCIENCE, Folk / Vernacular Architecture: From the Traditions to the Future Internat. Conference of the Committee for Folk Architecture, HAS co-organ. by the Research Inst. of Art Theory and Methodology, HAA EU Culture Capital 2023 Veszprém - Taliándörögd - Badacsony, Hungary, 27-31 August 2023 Special issue of the journal "Symmetry: Art and Science", 2023/1-4

Jović, B. S., Liik, I. L., Olujić, I. (2022). BIODESIGN; AL – Augmented Lecture, Theatre "Vuk"; 14.11.2022. International Art and Science project Curious 2022; University of Arts, Faculty of Drama Arts, Laboratory for Interactive Arts, Belgrade, Serbia

Jović, B. S., Liik, I. L., Olujić, I. (2022). BIODESIGN; AL – Augmented Lecture, Invited by Center for the Promotion of Science – AL on International Conference "OpenSciComm", Belgrade, Serbia, Museum of Yugoslav Film Archive 24.11.2022. International Art and Science project Curious 2022; University of Arts, Faculty of Drama Arts, Laboratory for Interactive Arts, Belgrade, Serbia.

Jović, B.S., Dragica D., Petković, O., Gajanić, O. D. (2021). BIODESIGN IN ARCHITECTURE, LANDSCAPE ARCHITECTURE AND FASHION, Revista Brasileira de Expressão Gráfica, Vol. 9, No. 2, 2021, ISSN 2318-7492

Jović, B., Čučaković, A., Mitić, A., Golubović Ćurguz, V., Chemarum, B (2021):Urban installations as 3d models inspired by sketch of Nandi flame, SMARTART Second International Conference of the Faculty of Applied Arts in Belgrade ART AND SCIENCE APPLIED: EXPERIENCE AND VISION, Belgrade, 23–25 September, 2021. Conference Proceedings266-284, ISBN 978-86-80245-45-4

Jovic, B., Cucakovic, A., Markovic, M., Cvijic, K. (2021) Biomimetic Approach to Parametric Flower Modeling. Part of the Advances in Intelligent Systems and Computing book series. In L.-Y. Cheng (Ed.): AISC, volume 1296. 244–251, <https://link.springer.com/book/10.1007/978-3-030-63403-2> under exclusive license to Springer Nature Switzerland, ISBN 978-3-030-63402-5 ISBN 978-3-030-63403-2 (eBook) DOI: 10.1007/978-3-030-63403-2_22

Jović, B., Mitić, A. (2020). Exploration of nature-based biomimetic approach in landscape architectural design: parametric study of candelabra model design. Visual Computing for Industry, Biomedicine and Art 3:25, VICO-D-20-00017R1. Springer, DOI: 10.1186/s42492-020-00060-y

Jovic, B., Cucakovic, A., Obratov-Petković, D., Ždímalová, M., Komnenov, M. (2020). Transposition of Biomimetical Principles into Generative Design: Example of the Species *Campanula patula* L. Book Title: Faces of Geometry, The Author(s), under exclusive license to Springer Nature Switzerland AG 2021 P. Magnaghi-Delfino et al. (eds.), Faces of Geometry, Lecture Notes in Networks and Systems 172, DOI: 10.1007/978-3-030-63702-6_11

Jovic B. Takashi O. Sato N. (2018). Research on an effect of providing user interaction for graphic education, 18th International Conference on Geometry and Graphics (ICGG 2018), 3–7 August, 2018, Milano, Italy <https://www.springer.com/us/book/9783319955872>

Čučaković A., Jović B. (2017). The Advantages of Using Digital 3D Animation in Geometrical Education SAJ_2017_9_ Serbian

Architectural Journal, UDC:514.18 004.925.8 371.333 pp. 65-82

Aleksandar Čučaković, Biljana Jović, Mirjana Komnenov. (2016).Biomimetic Geometry Approach to Generative Design, Periodica Polytechnica Architecture, Volume Vol. 47, No. 2 (2016), 70-74. paper 10082, DOI: 10.3311/PPar.10082, Creative Commons Attribution.

Selected projects:

2015-2016, Ministry of Culture, Serbia (initiator and co-author of two projects dealing with Contemporary Art collection on the Faculty of Forestry)

2021 and 2022, Ministry of Culture, Serbia (author of two projects - Contemporary Art collection on the Faculty of Forestry)

2022 Bio-design; AL – Augmented Lecture, at Theatre “Vuk”; performed on 14.11.2022. and on International Conference “OpenSciComm”, Belgrade, Serbia, Museum of Yugoslav film archive; performed on 24.11.2022. International Art and Science project Curious 2022; University of Arts, Faculty of Drama Arts, Laboratory for Interactive Arts, Belgrade, Serbia (co-authors: Ivan Lušić Liik and Iva Olujić)

Biljana S. Jovic: author of bilingual reviewed Catalogues for two exhibitions (2017, 2021):

Beyond Geometry at the Student Cultural Center (2017) ISBN 978-86-7299-264-9, COBISS.SR-ID 245809676

Selected invited lectures for students of Department of Landscape Architecture and Horticulture, Landscape architectural graphics at the Faculty of Forestry, University of Belgrade (2021) at the Faculty of Forestry, University of Belgrade 12.5. - 22.6.2021. ISBN 978-86-7299-329-5, COBISS.SR-ID 43170569