Exploring the Intersection of Science and Art
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2022 PROJECT REPORT
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Scientific Advisory Committee

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Manoel Veiga, Visual Artist, São Paulo

I. Major Goals

The aim of this project is to unlock creative possibilities at the intersection of mathematical sciences and the visual arts. It will do so by fostering opportunities for collaborations among mathematicians, physicists, neuroscientists, cognitive scientists, and artists working in diverse media.

Activities such as seminars, workshops, and panel discussions will be developed around carefully formulated themes or questions and will be organized at leading interdisciplinary institutes utilizing a variety of platforms conducive to cross-disciplinary dialogues. As an important component, a series of pioneering exhibitions, and associated events, is envisioned to be curated in collaboration between art historians and scientists, featuring prominent international artists whose work engages mathematics or physics directly or indirectly.

II. Main Activities in 2022

Activities under this project were significantly delayed due to the pandemic. In December 2021, we assembled the Scientific Advisory Committe and organized its first meeting to begin detailed planning. The meeting, orginally planned as in-person in Cambridge, UK, was then moved to Edinburgh to be hosted by the International Centre for Mathematical Sciences (ICMS) at the Maxwell Foundation and House, but eventually had to be converted to a Zoom meeting because both the Newton Institute (INI) and ICMS closed due to the pandemic. Since then, the following major initatitives were undertaken or begun.

1. *Art and AI* exhibition

Conceived as an exhibition at the Newton Institute (and originally planned in connection with one of the past programmes) this initiative has been postponed a number of times since the Institute was either closed, or opened partially for much 2021 and in the first half of 2022. We are hoping to secure suitable dates at INI sometime in the first quarter of 2023.

The idea of the exhibition, and the planned accompanying events (a panel discussion and/or a day-long seminar), is to explore the opportunities and the challenges of the machine learning (artificial neural networks, ANN) assisted art-making processes. AI has been shown to produce remarkably convincing and seemingly innovative artworks, and has also been used to restore damaged parts of paintings and missing parts of music scores. Recent work suggests that ANNs can also mimic neural activity in the brain.

But these developments raise perplexing questions. Can a work created entirely by an AI algorithm be considered true art in the same way as a painting executed by an artist? And is computer-generated or algorithmically-enabled art inherently less original, daring, or autonomous, even if it appears novel, imaginative, or intriguing?

2. *Perception of Art* workshop

This interdisciplinary research workshop has now been planned in detail in collaboration with researchers at the University of Warsaw and Jagiellonian University in Kraków. The organizers are: Beata Bajno (artist); Paul Glendinning; Andrzej Herczyński; Romuald Janik (Jagiellonian University); Jacek Rogala, (University of Warsaw, principal organizer). Paul has contributed new ideas on mathematical phenomena underpinning aesthetic responses to art. The workshop will bring together about 30 physicists, mathematicians, neuroscientists, and computer scientists, and will consist of structured presentations and vigorous, informal debates.

We are hoping it will take place in the first half of 2023. *Institut Henri Poincaré* (IHP) in Paris has been suggested as an ideal venue assuming the workshop, and possibly a small accompanying exhibition, can be included in IHP's schedule for the coming months. In conjunction with the workshop, we are planning an in-person meeting of the Scientific Advisory Committee.

An internal mini-proposal for the workshop, including the list of potential participants, is attached (attachment A1). Please contact the organizers with any suggestions of themes to be included or participants to be invited.

3. *Art and Science: Contemporary Debates* seminar

This one-day seminar was organized in connection with a major retrospective exhibition, *Cartographies of Nonexistent Worlds*, of Manoel Veiga's paintings at the Museum of Contemporary Art of the University of São Paulo, Brazil (MAC USP). It was organized by Heloise Espada (Director of MAC), Andrzej Herczyński, and Manoel Veiga, and took place on November 26, 2022.

Manoel Veiga is a prominent contemporary Brazilian artist, whose painting technique engages directly fluid dynamical phenomena such as diffusion of miscible liquids and viscous fingering. A few of his works were included in the exhibition *Form of Art, Art of Form*, at the Newton Institute in 2017, organized during the *Growth, Form and Self-Organization* programme and curated by Barry Phipps.

The Seminar was well attended with a number of professors from the departments of mathematics and architecture of USP present, as well as artists and members of the art community in São Paulo. Simultaneous translation from English to Portuguese and vice versa was provided, and the four talks and panel discussions were recorded.

The exhibition itself is on view at MAC USP until 29 January, 2023. Further information can be accessed at http://www.mac.usp.br/mac/expos/2022/manoel-veiga/index.html .

Attached are the following related documents:

> Program of the Seminar in English (A2)
> Brochure of the exhibition in Portuguese (A3)

4. Development of website

In the fall of 2022, we retained the services of *Quinlan Art+Design* to create a website for the project. It has been launched on the WordPress platform and is in early stages of development, with many "place-savers' but already accessible. The website is located at the newly secured internet domain: https://art-math-science.net/.

We are hoping this website will eventually serve as the nexus of activities under this project (and perhaps even more broadly, as a go-to place for information about science-art initiatives). Suggestions for content, organization, and layout of the pages, as well as for the artwork to be including, are most welcome.

III. Further plans for 2023

In addition to *Art and AI* exhibition, and *Perception of Art* workshop (see above), we are working also on two addtional initiatives. The first is a workshop on space and scale in art. Paul Glendinning is taking the lead on this project, and has prepared a preliminary version of an internal (mini) proposal for the workshop, which he plans to distribute to all SAC members soon. Possible venues include the Newton Institute and the International Centre for Mathematical Sciences (Edinburgh).

The second initiative, still in early stages of development, concerns fluid dynamical aspects of (traditional) painting techniques. This has been an area of research interest of Andrzej Herczyński, and he is looking for partners in preparing and running a workshop on this theme, as well as in organizing the related exhibition. The ideal timing would perhaps be in the second half of 2023.

Finally, the organizers would welcome any ideas or suggestions of the projects we should undertake or support, and any partnership activities which should be developed under this program. In particular, we are looking for a few members of the SAC who would agree to help with further development of the webpages.