Creativity & the Mind

Event Report

23 November 2016, London

Creativity means innovation and positive change, the inventing of new worlds out of sparks of genius. A creative mind is a mind that generates ideas and solutions likely to make a breakthrough at the societal level. Creative activity evokes chaos and order, allowing us to establish new paths and patterns.

What is the creative mind? Is creativity a feature of our attitude towards things, attentive and open? How does the physical, social and cultural environment enable creative activity, and how can the environment be structured to enhance it? Is creative agency, and intelligence, a prerogative of the individual?

The Human Mind Project teamed up with the brilliant Guerilla Science to create this one day event on Creativity & the Mind as part of the Being Human festival of the humanities 2016. We were joined by facilitators The People Speak, who invited participants to take part in a series of talks, group discussions and creative challenges, documented by a live artist in a series of illustrations.

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Dr Sofia Bonicalzi is a postdoctoral researcher currently based in the School of Advanced Study at the University of London, where she is part of the team of *The Human Mind Project*. A trained philosopher, and a Honorary Research Associate of the "Action & Body Group" at the Institute of Cognitive Neuroscience (UCL), she works on aspects of human voluntary actions, sense of agency, and responsibility, drawing on methods and insights from the humanities, as well as the psychological and brain sciences.

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This report from *The Human Mind Project* aims to draw out key themes from our event for future discussion and exploration. As well as providing a material resource that allows us to take discussion started at events forward, event reports form part of our Grand Challenges; an attempt to define the major intellectual challenges in understanding the nature and significance of the human mind.

Emotion, Memory & the Mind was a two day workshop jointly hosted by the *The Human Mind Project* and the Sackler Centre for Consciousness Science.

The notes on each talk provide a summary and reflection on key themes, with questions raised in discussion highlighted in the notes on each roundtable.

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Morning Session

State of the Art

Chair: **Barry Smith**, London
Opening Remarks: **Mattia Gallotti**, London

Computer Art & the Limitations of Current AI

Margaret Boden
Professor of Cognitive Science, University of Sussex

Creativity comes in different forms. One of them is combinational, the process of making unfamiliar combinations from familiar ideas. Picasso's collages are a classic example. You might think that nothing is easier for a computer; that Computer art should master the ability to create new combinations of old ideas. This might be true in some sense, argues Margaret Boden, but is it valuable at all? And how do current limitations of AI impact on and limit computer art? Overall creativity seems to require the creation of something new, surprising and valuable. With computer art you easily obtain something new and surprising. More rarely will you get something valuable.

In March 2016, Google's artificial intelligence program *AlphaGo* beat South Korean world Go champion Lee Sedol, winning with a 4-1 score. And many might remember that, a couple of decades ago, *Deep Blue* defeated chess legend Garry Kasparov. Nowadays Machine Learning makes headlines worldwide by implementing – with increased power – ideas that first came out about 30 years ago. No one would deny that such results are truly astonishingly and impressive, but visual computer art is challenging and hard to evaluate.

How is Machine Learning related to computer art? Deep learning is a branch of machine learning using multi-layered neural networks that attempt to model high level abstractions in data by finding specific patterns. Some suggested that the system could be used not only to find pre-existing structures in the data, but also to generate new compositions using images in databases. For example a computer can easily integrate a picture of your father with that of a dog, producing a new item. This would be new and surprising, but how do we assess its value?

The Cherry Picture (Kurt Schwitters, 1921) is a famous composition made of scraps and objects collected from Hannover, the artists' hometown. It is composed of many different, unrelated images. Some coloured cherries are clearly visible at the centre. However, the composition does not have anything to do with cherries (or with anything else): it is abstract. Picking twenty random images, a computer might do something similar. However, to produce something interesting, one must know what the important visual principles are. How could anyone put those principles in a program given that programmers themselves cannot predict its outputs or guide the system? For the moment, computers can combine interesting pictures, but this is probably different from what we would call an interesting collage. In the XVI century, Arcimboldo created portrait heads entirely made by fruits or vegetables. Subtle abilities – far from those of contemporary computers – of visual comparison are required to produce works of this value and quality.

Q&A

Q: What does it mean for a piece of art to be valuable?

Q: Are there ways of controlling Deep Learning processes in terms of output?

Q: There seems to be a contradiction between the conception of neural networks as black boxes and the insistence on the idea that we have to penetrate such obscurity. It might be possible that we don't need to teach those programmes linguistic descriptions. We rather have to feed the program with good examples.

Romanticism & Situated Creativity

Berys Gaut

Professor of Philosophy, University of St Andrews

Berys Gaut suggests that in mythologizing the portrait of the artist as someone standing in isolation, Romanticism depicted the creative process as occurring in the creator's head. In a letter once assumed to be authentic, Mozart described his compositional method, propagating the conception of art as the working of an inscrutable inner inspiration. The letter is now widely thought to be a forgery, fraudulently written and published by one of Mozart's biographers. Indeed, the author of the letter, Friedrich Rochlitz, played an active role in the construction of the myths surrounding the Austrian composer's life and work. According to more reliable sources, Mozart's method was quite different: the composer worked with the keyboard, writing fragments, sketches and drafts before finalising musical pieces.[1]

The romantic idea of creativity has proved to be extremely resistant and influential beyond the romantic era. Famously Collingwood defended the idea that the material aspects of producing a piece of art do not have much to do with creativity itself.[2] What is objectified in paint or stone is an idea that is already complete in the artist's head. In other words, the creative process terminates even before the real process of making art begins. There are few cases in which this might be actually true. Notoriously, people other than the artist himself usually executed Soll LeWitt's wall drawings.

However, following contemporary *Situated Cognition Theory*, this is unlikely to be a fair representation of how creativity works in general. Not only do the material aspects of creating a piece of art fundamentally depend on the relationship with the external world, but creativity itself may be shaped by external conditions and circumstances: the boundaries of cognition extend beyond those of individual organisms. Moreover, according to *Embedded Cognition*, cognitive activity exploits the structures present in the social and natural environment. Routinely, cognising agents create such structures in order to enable or enhance cognition itself.[3]

As a matter of fact, the romantic conception of creativity is unsupported by scientific evidence about how the creative process unfolds. But how does the creative process rely on environmental factors? In a classic

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[1] Konrad, U. (2006), Compositional method, in Cliff Eisen and Simon P. Keefe, *The Cambridge Mozart Encyclopedia*. Cambridge: Cambridge University Press, 100-108.

[2] Collingwood, R.G. (1938), *The principle of Art*, Clarendon Press.

[3] Robbins, P., & Aydede, M. (2008), *The Cambridge Handbook of Situated Cognition*, Cambridge University Press.

paper focussed on the distinction between imagery and perception, Chambers and Reisberg investigated if mental images could be ambiguous[4]. In particular, after being exposed (for 5 seconds) to ambiguous pictures – like the rabbit-duck – subjects were required to reinterpret the mental images of those bistable figures. Unable to recognise the second object hidden in the figure during the exposure, participants were able to discover it once they had to draw it by themselves. Such result suggests that people can imagine only a duck or a rabbit but, in the drawing process, they are able to see more. The fact that artists tend to prepare sketches before completing real work can be seen as evidence of how creativity needs to be activated in the external world in order to to unfold.

The idea of 'incubation' as a pure inner moment, culminating in a sort of illumination, is nothing more than a myth. But why do people describe insights as moments of pure inner inspiration? In the thirties, Norman Maier designed an experiment showing how people tend to confabulate, inventing tales that help them to explain unknown behaviours[5]. Asked to explore different solutions to a specific problem, participants tended falsely to describe the process of finding a way out as a sudden flash of insight, apparently ignoring the role of the external cues provided by the experimenter. Overall people tend to confabulate, misidentifying the source of the information they use to solve a problem.[6]

In striking contrast with romantic myths, cognitive agents routinely structure the external environment in order to stimulate cognition and arouse the mind, creating tools for reinforcing intellectual abilities and working memory. We can find examples of this attitude throughout the history of Western culture, from Leonardo's written work[7] to Frank Gehry, who describes himself as a voyeur of his thoughts, but constantly working with drawings and models.[8] Similarly, inventive individuals like Steve Jobs or John Lasseter have stressed the importance of promoting creativity by designing stimulating working environments: Pixar Animation Studios (Emeryville, California) represents a clear example of such philosophy.

Q & A

Q: Beauty and elegance are essential to our appreciation of creativity. The experience of the viewer seems to be part of the definition of creativity itself. And there is evidence that regions of the brain engaged in the appreciation of aesthetic beauty are also involved in the recognition of elegant mathematical solutions.

A: Both for art and for mathematics what we call "value" is not merely aesthetic. In mathematics we consider not only the elegance of a solution but, more deeply, its truth.

Q: The Romantic definition of creativity tends to forget how much artists are inspired by other people's work.

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[4] Chambers, D. & Reisberg, D. (1985). Can mental images be ambiguous? *Journal of Experimental Psychology: Human Perception and Performance*, Vol 11(3): 317-328.

[5] Maier, N. (1931), Reasoning in humans. The solution of a problem and its appearance in consciousness. *Journal of comparative psychology* 12(2):181-194.

[6] Seifert, C. M., Meyer, D. E., Davidson, N., Patalano, A. L., & Yaniv, I. (1994). Demystification of cognitive insight: Opportunistic assimilation and the prepared-mind hypothesis. In R. Sternberg, & J. Davidson (Eds.), *The nature of insight*, Cambridge, MA: MIT Press, 65-124.

[7] Leonardo, Kemp, M. (2001), *Leonardo on Painting: An Anthology of Writings by Leonardo Da Vinci, with a Selection of Documents Relating to His Career as an Artist*, Yale University Press.

[8] Isenberg, B. (2009), *Conversations with Frank Gehry*, Alfred A. Knopf; Van Bruggen, C. (1997), Frank O. Gehry: Guggenheim Museum Bilbao, Solomon R Guggenheim Museum.

A: This is certainly true. Think again about Gehry: his work clearly embraces the history of architecture (Alvar Aalto) and painting (Robert Rauschenberg). However, even focusing only on the minimalist, non cultural, aspects of the creative process, we could realise how what seems to be inner and solipsistic is rather situated.

What's Stopping People from Projecting Notions of Creativity onto Software?

Simon Colton
Professor of Computational Creativity, Goldsmiths College, University of London.

A trained mathematician with expertise in computer science, Simon Colton presented his multiple projects surrounding the idea of building autonomously creative systems. One of his most impressive achievements is the Painting Fool, a computer program whose work has been exhibited in real and online galleries. Working with the Painting Fool, Colton aims to demonstrate that computer art is neither entirely abstract nor a sort of sophisticated version of *Photoshop*. As traditional art, computer art is also not necessarily instantaneous, requiring time and sequences of different processes. And computer art is not limited to painting: C-poems constitute an example of a literary creation developed by a machine. Computers may also generate music, videogames, or puzzles.

Despite the reference to some mainstay elements, including novelty, there are no univocal definitions of creativity, which is rather a continuously moving target and an endlessly disputed concept.[9] We may think of creativity as a secondary (humans do not have a specific organ for it), and *essentially contested* [10] quality of a program or a person, which is conveyed by declarative, illocutionary acts.

One of the reasons that we struggle in approaching the products of computer art is that we feel we are losing interpretability. When we read a poem, we tend to associate it with the author's real or plausible life and with his or her cultural background. We are compelled to project humanity into the author: we know stories about writers we are familiar with and we create tales about those we do not really know. How could we do the same when we are aware that the author is a computer? The difficulty in overcoming such a barrier might be behind the present crisis in computational creativity: our basic concept of creativity is rather human centric. But what could be interesting in computer art? Is producing a new form of entertainment enough, and is it a suitable goal for computational research? How could we engage in the philosophical debate about creativity starting from computer art? In the end, what, if anything, is holding people back from projecting creativity into a software?

Q & A

Q: Are we underestimating the creativity of the reader/interpreter in responding to computer art?

[9] Cambridge Handbook of Creativity.
[10] Gallie, W.B. (1955-56), Essentially Contested Concepts, *Proceedings of the Aristotelian Society*, New Series, Vol. 56: 167-198.

Q: When you read a poem, you tend to develop some form of empathy with the author. This is sometimes based on shared experience or on reminiscences from the history of poetry. As a reader, the experience you have when you read a poem composed by a computer program is likely to be really different.

A: It is not that difficult for a computer program to use historical/poetical references and even to detect emotions. A different question might be the one about authenticity.

Afternoon Session

Creativity in Action

Chair: **Mattia Gallotti**, London

How is attention related to creativity?

Aura Satz
Artist, Reader in Fine Arts (Sound and Moving Image), Royal College of Art

An artist carrying out theoretical research at the Royal College of Art, Aura Satz presented emblematic pieces of her work, introducing the audience to her multi-faceted universe of film, sound, performance and sculpture. Satz is interested in how perception and sensory disorientation might be modulated, but her work is also strongly grounded in historical research, with a focus on lesser-known figures (women in particular) and on their relationship with science, light and sound. In presenting her work, Satz focussed on *Oramics: Atalantis Anew* (2011), a film-homage to musician Daphne Oram, the pioneer of British Electronic Music and co-founder of the BBC Radiophonic workshop in 1958. The film is a brief encounter with Oram's invention, the Oramics Machine, a now obsolete drawn sound technique recently restored by the Science Museum, in London. Originally used to compose electronic music, Oram's machine worked as a pioneering synthesiser with graphical elements controlling and sequencing the audio parameters: a visionary anticipation of the present combination between art, computer science, and technology. Satz's movie brings Oram's invention back to life "enabling the visualisation of the drawn sound material, re-interpreting and translating it into new filmic sequences".

A different project is devoted to Hedy Lamarr's "Secret Communications System", invented by the famous Austrian actress and Hollywood star to help combat the Nazis in World War II. Patented by Lamarr and by composer George Antheil in 1941, the system was first implemented years later, when it was employed on naval ships during the Cuban Missile Crisis. Partially inspired by Antheil's unsuccessful attempt to synchronise 24 pianolas for his *avant-garde* creation "Ballet Mechanique", the invention involved frequency hopping, a method for manipulating radio frequencies at irregular intervals between transmission and reception, thus creating an unbreakable code to prevent messages from being intercepted by enemies. Despite the importance of her invention for subsequent telecommunication systems, during her lifetime Lamarr obtained very little recognition of her talent. Satz's *Impulsive Synchronisation* (2013) rediscovered Lamarr's forgotten invention. Impulsive Synchronisation is a film and technically complex sound installation he work consisting of a scrolling screen in constant motion. Not by chance, the movie projected onto the scrolling screen is an extract from a romantic comedy ('Come Live with Me', released the same year Lamarr and Antheil submitted the patent for their invention) starring Lamarr as an Austrian clandestine who metaphorically uses a flashlight to attract the mate as lightening bugs do.

Group discussions

The audience was divided into three group and invited to participate in multiple discussions with the speakers around selected themes.

Interacting with the audience, Berys Gaut focussed on the role that the external environment might play in shaping individual creativity (Discussion topic: *how does the environment enable creative activity?*). Margaret Boden and Simon Colton investigated with participants how the limitations of current AI might impact on the development of computer of art (Discussion topic: c*omputer art, the limitations of current AI; exploring software and creativity*). Exploring her personal experience as an artist, Aura Satz discussed the relation between attention and creativity (Discussion topic: *How is attention related to creativity?*)

Roundtable: The Future of Research on Creativity

Chaired by Colin Blakemore
Professor of Neuroscience and Philosophy; Project Leader, *The Human Mind Project*, School of Advanced Study, University of London

All events of The Human Mind Project conclude with an Open Roundtable on the Future of Research. Discussion involves speakers, chairs and the public, and aims to draw out of the workshop key issues for the future of interdisciplinary research. Topics raised in the discussion form part of our Grand Challenges, an open consultation aiming to identify key questions facing new research on the mind.

Do we really need creativity? Or is it just a form of confusion? What is creativity? Do we need a definition of it? According to Margaret Boden we need a definition of creativity in order to understand it. However, as always happens with interesting concepts, we can only give definitions that remain problematic and encounter a number of counterexamples. Every discussion about the concept itself is likely to be never ending, but creativity is a driving force for progress in society – commented Simon Colton. Is what we gain from progress generally rooted on creativity?

Creativity might be more likely a mind-set, Aura Satz suggested: the focus should be on the products of such creative process. Berys Gaut notes that part of the definition of creativity is how you produce items: you have to specify something about the process to say what is art or what is creative. In this sense, an example is offered by Glenn Gould, a music genius who was able to offer a precise formulation of what the creative process is about, comments Mattia Gallotti (Project Manager, *The Human Mind Project*). And creativity itself depends on the social context, not only on what happens to the individual.

Do we have a definition of art? How inclusive is such definition likely to be? Are video games a form of art? How important is improvisation for creativity? Can a software be expressive when it plays a piece of music? In music, is creativity connected to the emotionality of the performers or only about the music that the performer produces? Are computers only tools for creative individuals or are they intrinsically creative? To what extent is conformism of the majority of people essential for the outcomes of individual creative processes to be accepted?

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