



COGSCI'19

Creativity+ Cognition+ Computation

24 - 27 JULY 2019 MONTREAL, CANADA

Invited Speakers

Elizabeth Churchill | Mary Lou Maher | Takeshi Okada

Co-Chairs

Ashok Goel | Colleen Seifert | Christian Freksa

Introduction

Dear Cognitive Science Colleagues,

Welcome to the 41st Annual Conference of the Cognitive Science Society in Montreal, Canada! Our meeting brings together some of the most innovative and exciting research in Cognitive Science today, and highlights the conference theme of *Creativity + Cognition + Computation*.

In addition to the Rumelhart Prize presentation by Michelene Chi and the Carvalho-Heineken Prize presentation by Nancy Kanwisher, the program features three plenary speakers: Elizabeth Churchill (Google Research), Mary Lou Maher (University of North Carolina), and Takeshi Okada (University of Tokyo). Further, the program includes the Jacobs Foundation Symposium, *How Curious? The Need for Exploration and Discovery*, as well as an invited symposium on *Creativity in the Arts* in addition to the Rumelhart Symposium on *Translation Research in STEM Learning* and the Glushko Ph.D. Dissertation Awards Symposium. These invited symposia and talks showcase the conference theme.

The program committee for CogSci 2019 received 1110 submissions, including 810 full papers, 256 member abstracts, 13 publication-based short papers, as well as 14 proposals for symposia, 10 for workshops, and 8 for tutorials. After a rigorous review process, the committee selected 202 papers for oral presentation and inclusion in the conference proceedings (25%), 306 papers for poster presentation and inclusion in the proceedings (38%), and 163 papers for poster presentation with inclusion of abstracts in the proceedings (20%). We also selected 204 submitted member abstracts and accepted another 19 abstracts from full paper submissions as invited member abstracts. In addition, we accepted 12 publication-based talks, 10 symposia, 7 workshops, and 4 tutorials to make for a very rich and inclusive program.

We hope that you enjoy the program this year as well as the beautiful city of Montreal!

Your Program Co-Chairs,
Ashok Goel (Georgia Institute of Technology, USA)
Colleen Seifert (University of Michigan, USA)
Christian Freksa (University of Bremen, Germany)

Acknowledgements

We are very grateful to everyone who contributed to the planning and organization of this year's Cognitive Science meeting, to all authors who submitted their contributions, and to all reviewers who generously donated their expertise and time to evaluate the submissions. We thank the members of the Program Committee who coordinated the reviews and made the tough decisions about submissions, and the members of the conference organizing subcommittees who showed initiative in completing their demanding tasks. These Organizing and Program Committee members are listed below.

We are especially grateful for the assistance of a number of individuals and groups critical to handling the many organizational aspects of the meeting. We thank Michael Frank, the Chair of the Cognitive Science Society, Anna Drummey, the Executive Officer of the Society, and the entire Governing Board of the Society, for their advice and support throughout the process. Lily Chang at *International Conference Services*, Jude Ross at *Podium Conferences*, and James Stewart at *Precision Conference Solutions* have been helpful, effective, and constant partners during the long process. Chuck Kailish and Timothy Rogers, two of the Co-Chairs of last year's conference, offered help whenever we needed them. Additional help included key contributions from Thomas Barkowsky for the reviewing process, Andrea Patalano for the awards organization, and Sungeun An for creating the conference poster.

Finally, we are grateful to the Cognitive Science Society and to the sponsors of this conference, including the Robert J. Glushko and Pamela Samuelson Foundation, the Jacobs Foundation, Facebook AI, DeepMind Technologies and the Weinberg Institute of Cognitive Science for their support.

Enjoy!

Ashok Goel, Colleen Seifert, and Christian Freksa
Co-Chairs, Cognitive Science 2019

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Why sociality affects creativity: lessons from autism

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Introduction

As human beings we are social. All of us had to be included in a group to survive; most of us highly desire to live and collaborate with others on a daily basis. In this paper we will try to show how our sociality (considered as the inclination to live and collaborate with other co-specifics) affects our creativity.

How sociality affects creativity

Creativity, in fact, means being yourself, seeing the world in a way that is different from that of others. Each time that we perceive the world, we collect or ignore some data, we focus on something and neglect something else. Each perception is a creative act and this is showed not only by the Kanizsa's triangle or other similar optic illusions, but even by our spontaneous impulse to build our reality. When we are in love, for example, we are more inclined to interpret the gestures of our object of love in the direction that we would like to be the real one. In this condition we could easily mistake a wink aimed at the expulsion of a hair from the other's eye with a wink towards us. The thirst makes us see the water even where it is not there. What we call reality is an interspecific bargaining of the meaning of a perception.

Our sociality can push us to creativity in many ways: inviting us to solve problems, providing new information, criticizing one of our acts of creation or even inviting us to brainstorm. Societies also often reward creativity. But the *eureka*, the act of creating a different way of thinking something will take place only if we are able to go beyond the conformity of our perceptions with those of others.

Working definition for "creativity"

Creativity is a very heterogeneous concept. Here we will consider "creativity" as the ability to generate multiple solutions to a problem.

This definition encompasses in the same category the divergent thinking, insights and artistic creativity¹.

¹ This last can be seen as the essay of the artist to resolve the problem of representing his subjects.

Creativity in autism

Autism is a neurodevelopmental disorder characterized by persistent deficits in social communication and interaction and restricted and repetitive patterns of behaviour, interests or activities (APA 2013). Among the numerous consequences of the disorder, there are the lack of spontaneous symbolic play (Jarrold et al. 1993); anomalies in imagination (Low et al. 2009); difficulties to understand metaphors (Hobson 2012; Rumbad & Annaz 2010); very poor dreamlike activity (Daoust et al. 2007). For these reasons, subjects with autism are frequently considered less creative than subjects without autism. I.e. Craig and Baron Cohen (1999) described autistic creativity as a reality-based creativity and opposed it to the imaginative creativity of people without autism (Craig & Baron Cohen 1999).

The artistic productions of some savants with autism are famous for their proximity to reality – i.e. Stephen Wiltshire's productions, or Nadia's drawings (Selfe 2011). However a lot of other productions of autistic subjects show that the disorder doesn't affect the imaginative creativity: see i.e. Tammet (2008) or fig.1, which is a drawing made a 7 years autistic child.



Figure 1

Moreover, also among those who show the reality-based style of creativity described Craig & Baron Cohen (1999), subjects frequently solve problems in non-conformist ways. I.e., Temple Grandin managed to solve a major technical problem in the slaughtering of cows thanks to her style of thought which is indeed

based on a reality-based form of creativity that is impossible to artlessly catch for people without autism (Grandin 1995).

As we will try to show in the full paper, the lacking of social affordances in subjects with autism greatly enhance their creativity, making their professional or artistic contribution very original for many fields of studies.

Subjects with autism, in fact, can think and imagine things in different ways than that of the most part of the population because they are less subject to perceptive and psychological biases linked to human sociality. I.e. their ability to make physical causation inference is superior than that of the most part of the population; on the contrary

emotional and intentional inferences are more difficult for subjects with autism than for the rest of the population (Pennisi 2016).

Why not all subjects with autism are creative?

Unfortunately, neurodevelopmental disorders are frequently associated with a low IQ. Below a certain IQ, it is rarely possible to express one's creativity in a way that is comprehensible to others. Some talents sometimes manage to emerge, such as in the case of Nadia (Selfe 2011), but normally too low intellectual quotients do not allow the expression of the creativity of one's own creativity.

For all those subjects with autism who have an average or above average IQ, creativity is probably hidden where we are not used to looking for it. The absence of social motivation (Chevallier et al. 2012) turns into the habit of not asking others to help solve their problems and not to receive requests for help in solving problems. But in a world where the rules of sociability are a far-off buzz, the need to solve everyday problems requires the use of creativity. I.e., a child with autism who wants to open a door handle too high for him could easily take the adult's hand next to him and use it as a tool to open the door, rather than explicitly asking for help. Certainly this is a not very conventional way of "using" the adult's arm. Italian journalist Gianluca Nicoletti, father of a boy with autism (Tommaso), tells how his son, interested in not losing his favorite cassette during a move, was able to find a way to identify the right tape in a mountain of identical boxes (Nicoletti 2015). Nobody knows exactly what strategy the boy used, but certainly it hides an attitude to think and perceive the mountain of boxes in a totally different way from the rest of the family. An ordinary child would have simply asked the mother to remember for him and she would have drawn something on the outside of the box.

The point is that creativity is always linked to something pre-existing. It is likely that, in the eyes of people without autism, many tactics used by individuals with autism are creative, whereas for Tommaso, the ability to locate the cassette in the box was not an act of creativity, but just the result of having followed his normal flow of thought, which simply has characteristics different from that of most of the population.

We all have a creative mind, but the pressure of sociability pushes us to inhibit part of our potential in order to better understand others and be better integrated into social groups.

In the full paper we will try to prove our hypothesis by providing a wider analysis of numerous case studies.

Conclusions

The study of autistic cognition is a precious source of information on the usual functioning of human cognition. In fact, it shows the link between attitude to sociality and all the rest of cognitive processes. Autistic cognition teaches us

that creativity is not an empyrean concept and that we are always creative with respect to something else.

Creativity with respect to the usual ways of thinking is the active effort to alter our usual flow of thought in order to solve a problem that we are not able to solve with previously used methods. Creativity with respect to society, on the other hand, is a style of thought that deviates from the one that is accepted by the rest of the group. In most people the two things often coincide; but at any moment we have the possibility of exerting an active effort to get rid of a habit of thought and to create one that has not yet been explored yet.

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