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# CHI 2039: Speculative Research Visions

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**Abstract**

This paper presents a curated collection of fictional abstracts for papers that could appear in the proceedings of the 2039 CHI Conference. It provides an opportunity to consider the various visions guiding work in HCI, the futures toward which we (believe we) are working, and how research in the field might relate with broader social, political, and cultural changes over the next quarter century.

**Author Keywords**

Future, vision, fiction.

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**Prelude – Theme**

What will be published at CHI 2039?

Our visions of the future profoundly influence current research. From the inspirational role of science fiction, to narratives about development and progress, to both utopian and dystopian predictions about the impacts of technology on society, the tomorrows toward which we work, consciously or unconsciously, significantly shape what counts as an important contribution in today's research. Despite growing acknowledgement of the

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importance of identifying and discussing such visions and their impacts [1,2,3,4], relatively few venues as yet provide the opportunity to consider what will constitute rigorous, publishable research in the future. This paper provides such an opportunity by considering what might be published at CHI 25 years from now.

The choice of a 25-year interval intentionally makes for a time point that is simultaneously both proximal and distant. Many of those who currently attend and publish at CHI will likely be alive and publishing in 2039. Conversely, papers published 25 years ago at CHI in 1989, long before smartphones, social media, and even the Internet, can feel almost as alien as some in this collection [5].

These abstracts were collected by soliciting submissions via the CHI-ANNOUNCEMENTS mailing list. The call asked authors to submit abstracts for “papers that might appear, will appear, should appear, or perhaps should not appear in the proceedings of the 2039 ACM CHI Conference.”

The call resulted in submission of 33 abstracts. As described in the call for submissions, the criteria guiding selection of abstracts included “their ability to represent a diversity of guiding research visions, their excitatory or provocative potential, the space allotted by the CHI extended abstracts format, and the likelihood of engendering conversations about the future of HCI.” The selection and curation process began with this paper’s first author removing names and affiliations from all abstracts and reading through each. After reading all abstracts, they were sorted into three groups: “likely” to be included, “unlikely” to be included, and “uncertain” about inclusion. The first

author then reread the abstracts in each group, occasionally changing the group in which an abstract was placed.

All the abstracts in the “likely” group were then arranged in an effort to create a larger narrative structure. The goal was not to tell a story but instead to see each abstract as a movement in a musical composition, each providing a different variation on a theme, sometimes with resonances among different movements’ variations. During the organizing process, if an abstract did not seem to fit well with the rest of the collection, it was moved to the “uncertain” or “unlikely” group. Conversely, if it felt as if there were gaps in the collection, abstracts were selected from the “uncertain” or “unlikely” groups to fill perceived gaps in the flow of the piece.

Thus, this process should not be seen as one of review but one of curation. The inclusion or exclusion of any particular abstract should not be seen as a judgment of its quality. Rather, the process was intended to select abstracts not that allowed for creating a thematic flow but also that hung together as a coherent whole. Ultimately, this process resulted in 15 abstracts being chosen for inclusion in this collection.

The abstracts included here span a variety of topics and application domains, from neural implants and memory manipulation, to bioengineering and body augmentation, to long-distance- and inter-species collaboration. Some provoke, some entertain, some insult, some condemn, some inspire. Navigating a space between science fiction, design fiction, and social fiction, these abstracts collectively represent a variety

of visions for what the next quarter century of research in HCI might hold.

### Abstracts – Variations

NEURAL INTERACTION THROUGH VISUALLY IMAGINED SHAPES  
*Florian Echtler* || *University of Regensburg*  
 Delivering visual information to the human brain through direct neural stimulation of the optical nerve is now becoming commonplace. However, interaction with such a system is still performed through relatively slow methods such as sub-vocalization of speech or slight muscle movements. In this paper, we present a novel approach to performing interaction via a neural interface: by visually imagining simple geometric shapes such as a circle or a square, the user can issue commands to the system with very low latency. To this end, we adapt existing nanoprobe inserted into the user's visual cortex in order to extract a low-resolution image of what the "mind's eye" sees. After an individual training and calibration phase, simple computer vision methods can then be used to determine the visualized



Figure 1: Reconstructed outdoor scene with visually imagined "get directions" command (red circle). Effective resolution is approximately 100 x 80 pixels.

shape. A preliminary evaluation with 3 volunteers shows significant performance gains over more traditional means of interaction (Figure 1).

TWENTY YEARS OF AUTONOMOUS DRIVING: A REVIEW  
*Andreas Riener* || *Institute for Pervasive Computing, Johannes Kepler University Linz*

The first self-driving car cruised on our roads in 2019. Now, 20 years after, it is time to review how this innovation has changed our mobility behavior. This article sheds light on the topic from two sides, the driver (questionnaire analysis) and the car (trace data analysis). It compares statistics from NHTSA, the European Road Safety Unit, and the Chinese Ministry of Transport (MOT), as well as corresponding drivers from before (2016) and after (2036) the broad application of autonomous driving. The results are controversial: 1) fewer people own a private car (US/Europe/China: -17%/-29%/+3%), as cars can be ordered online and returned after for use by other drivers; 2) self-driving cars save lives (+2%/+4%/+1%) and improve on driving efficiency, as they eliminate the unpredictability of drivers; 3) driving is no longer perceived as fun, leading to changes in recreational activities, 4) drivers no longer have a social relationship with their cars and do not spend time on grooming or money on upgrades. As a consequence, the rate of outages increased, on average, by 8% compared to 2016 figures.

INTERNET OF PERSONAL THINGS VS. PERSONNET: WHICH MENTAL MODEL IS EASIER TO LEARN?

*Michael Muller* || *IBM Research*

We conducted user experience simulations using UxSims to compare two theories: IOPT (Internet Of Personal Things) and PN (PersonNet of personal objects). The UxSims generated three contrasting

predicted emotion patterns for listening experiences. We obtained EmoPat evaluations from three potential human user groups (composers, mixnet creators, and listeners) and two musicbot groups (mymuse and crowdthump). Composers had the highest EmoPat ratings for collections of highly-similar tracks, while listeners and mixnet creators had higher ratings for diverse aggregations of tracks. The two musicbot groups took an intermediate position along the similarity-to-dissimilarity dimension. We discuss implications for design of future musicbots.

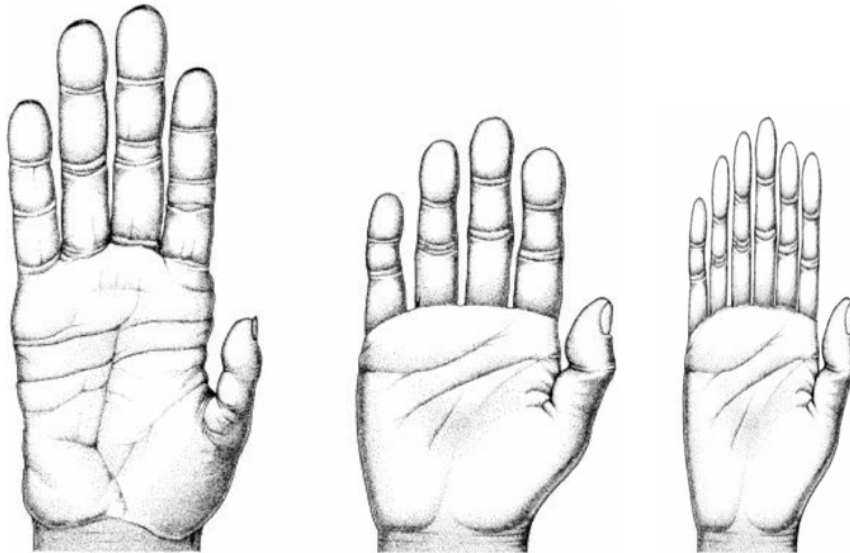


Figure 2: The evolution of humans hands. Chimpanzee's hand (left), homo sapiens hand (middle), homo technicus hand (2039 A.D.) (right) based on [6].

USING MOBILE TOUCH INTERFACES WITH MORE THAN 10 FINGERS: A LARGE SCALE STUDY ON HOW PEOPLE WITH ADDITIONAL FINGERS USE MOBILE TOUCHSCREENS

*Johannes Schöning<sup>1</sup>, Antonio Krüger<sup>2</sup> || <sup>1</sup>Hasselt University, <sup>2</sup>DFKI GmbH*

Advancements in personal bio engineering have led to the mass production of low-cost extra body parts, as demonstrated for instance by artist Stelarc in the early 21<sup>st</sup> century. Nowadays, people can easily afford extra fingers to extend their interaction possibilities with various interfaces. Previous work studied how these extra fingers can increase performance and precision when interacting with various digital systems. In this paper we present the first large-scale study over a period of one year with 124 users that had 13.4 fingers on average. We investigate how different hand and finger configurations can help people interacting with computer systems and explore users' strategies and motivations. We found out that the optimal finger count is 12.5, with 6 normal-sized fingers on each hand and the dominant hand having an extra half-sized finger that can be moved with 6 DoF (Figure 2).

BEING THERE IN 2039: EMBODIED CO-DESIGN WITH CHILDREN  
*Allison Druin, Beth Bonsignore, Mona Leigh Guha, Tamara Clegg, June Ahn, Jason Yip, Leyla Norooz, Brenna McNally, Chelsea Hordatt, Mei Bie, Meethu Malu, Karen Rust || University of Maryland*

Today's children expect to design their new technologies with children from around the world as well as across town. Currently, advances in telepresence technologies support remote yet embodied co-design techniques as easily as our face-to-face collaboration did decades ago. These robotic, social,

and distributed technologies are not only welcomed by children, parents, and educators; they are the norm. Flash-mob co-design sessions between children and adults across India, the EU, and Antarctica are now commonplace. As designers continuously iterate and elaborate upon low-tech prototypes, they share via globally positioned 3D printers. Despite these technological advancements, researchers continue to struggle with understanding how differences in culture, resources, and a 'sense of place' can act as barriers to empowering co-design. In this video-paper, we apply a culture-sensitive lens to the now classic *extreme ethnographic* approach to highlight how nuances in cultures and native locales can both enrich and confound co-design with children.

PLANTASTIC: SOCIAL NETWORKING FOR BACK YARD FOOD PRODUCTION

*Juliet Norton, Six Silberman, Don Patterson, Bill Tomlinson* || *University of California, Irvine*

Increasing food insecurity, the rising cost of fossil fuels, and the natural resource tariffs being imposed by local governments have led to growing interest in back yard food production. Usage of systems such as the Plant Guild Composer, Grainiacs, and AgroforestryBook, which provide IT support for such efforts, has skyrocketed over the past several years. Related literature has demonstrated that the ecosystems designed by these tools would benefit from interaction (pollination, pest deterrence, nutrient gathering). This paper describes a system, called Plantastic, that makes friend connections across the online profiles of each of the plants in the ecosystems designed by these three tools. An evaluation with ten backyard gardens over two growing seasons suggests that integrating plant

social networks increases yields by 4-12%, depending on proximity.

BORROWING ANCIENT CLUES FOR TODAY'S MORPHING MEDIA  
*Ahmet Börütecene, Oğuzhan Özcan* || *Design Lab, Koç University*



Figure 3: Creating hand-made visual content on current morphing media by engraving.

Since the invention of image recording, our thinking on visual content creation has been conditioned mostly by flat surfaces. Alternative studies conducted to break this conditioning remained as experiments for lack of technology. However, today's media surfaces are able to assume any kind of shape, to "record without a camera" and "reflect like a mirror" what they see, and to offer every kind of interaction. This allows us to regain the previously lost possibility to create hand-made visual content by engraving literally on media surfaces themselves, as was the case with craftsmanship methods in ancient times. In order to achieve this, though, we need to thoroughly understand the creative processes in those ages and learn from them. This article, by re-reading non-flat content creation from ancient times, investigates what kind of clues we should collect for current morphing media content (Figure 3).

THE DISTANCE MATTERS HYPOTHESIS IN EARTH-LUNAR NEAR-  
SYNCHRONOUS N-MEETINGS

*Michael Muller* || *IBM Research*

N-meetings emerged as a distributed form of e-meeting with role-based advantages in handling temporal and spatial challenges. However, long-term delays in synchronous meetings remain a challenge, especially for lunar members of earth-based teams. We compare two n-meeting protocols: a "fairness" protocol in which we inject earth-lunar equivalent delays into all messages (including earth-to-earth messages) vs. a "differential" protocol that assigns n-meeting roles according to actual or anticipated transmission delays. Unsurprisingly, the fairness protocol leads to better team satisfaction ratings for n-meetings with few role distinctions. More interestingly, the fairness protocol also leads to higher productivity assessments among these n-meetings.

WHAT YOU AND I REMEMBER?

*Shachar Maidenbaum* || *Hebrew University*

Memory sharing is becoming part of every-day life, from education, to legal testimony, to social and even self-sharing. However, since current memory sharing interfaces only through existing sensory i/o channels to the brain, only the originator's series of multisensory perceptions are shared, not the actual memory. Thus, the receiver's experience of the memory might be significantly different. Here, we suggest a calibration algorithm based on a series of events, ranging from simple single-sensory stimuli to complex real-world scenarios. Participants (N=300) each underwent 75 events, and their sensory i/o were fully recorded. We then compared users' experiences with the same memory from different sources, including their own. We found that users easily recognized their own memories

of the event when experiencing unprocessed memories (83%, $p < 3E-17$ ), but when memories were calibrated to them their ability to recognize their own memory dropped significantly (41%, $p < 2E-5$ ). This result has significant ramifications both for practical legal purposes, for generating synthetic machine "memories," for interacting in social memory-networks, and for our general understanding of memory and the uniqueness of our world perception.

MY LIVER AND MY KIDNEYS COMPARED NOTES: USER  
ACCEPTANCE OF COLLABORATIVE RECOMMENDATIONS  
FROM INDWELLING MONITORS

*Michael Muller* || *IBM Research*

Indwelling organ monitors can now be connected via personal ArterioNets. Using a temporary implant, we provided an external server where the output of each organ monitor was processed. In that server, we simulated enhanced inference engines that could one day be included inside each organ monitor. Our server also provided simulated ArterioNet communication protocols for data aggregations among the simulated inference engines. This architecture permitted an exploration of future inference networks built on top of ArterioNets. We computed simple health recommendations to users, using our servers' simulations based on each user's own organ monitors. While most users were skeptical, many users proposed additional features that could lead to greater acceptance and compliance with such recommendations.

TELLING THE TREES WHEN WE'RE HUNGRY: A NOVEL INTERFACE  
TO CONNECT CALENDARS TO SOLAR POWERED  
RESOURCE-PRODUCTION SYSTEMS

*Bill Tomlinson* || *University of California, Irvine*

The downward spiral of the global economy over the past two decades has created an array of challenges for human wellbeing. New innovations, however, have addressed some of the human concerns that have arisen as a result. A well-known example is the rapid proliferation of the "Sun Tree" – a mechanical/electronic device shaped like a tree that uses solar energy to collect water vapor and CO<sub>2</sub> from the air, synthesize complex carbohydrates, and provide both food and water for human use. This paper describes a novel interface for Sun Trees that enables those devices to integrate with the calendar systems of frequent users, predict likely future usage, and thereby reduce waste by allowing the Trees to store energy in their batteries and only produce resources when they are likely to be needed.

SOMETHING DOESN'T SMELL RIGHT: HOW DO YOU KNOW WHEN  
A THOUGHT ISN'T YOURS?

*Daniel Gruen* || *IBM Research*

The growing use of implantable memory jogs and inforetrievers introduces challenging questions about personal initiative and the provenance of one's thoughts. This is of particular concern with implants provided by providers who still derive much of their revenue from advertising, and the socioeconomic communities where use of such commercially-sponsored devices is most prevalent. We explored use of adjunct sensory channels, by accompanying sponsored information with a distinctive taste or smell, as hints that a thought had been influenced by an external entity. Most subjects learned to recognize such

indications as triggers for skepticism, with smell proving most effective in practice. A second experiment showed how sensory nuances could be used to effectively indicate the source of external influence, such as from a commercial vs. a political entity, and the level of influence exercised.

PIXLAY: INTERACTION WITH MATERIALITY OF MEDIA OBJECTS  
AND CO-LOCATED USERS

*Oğuz Turan Buruk, Oğuzhan Özcan* || *Design Lab, Koç University*

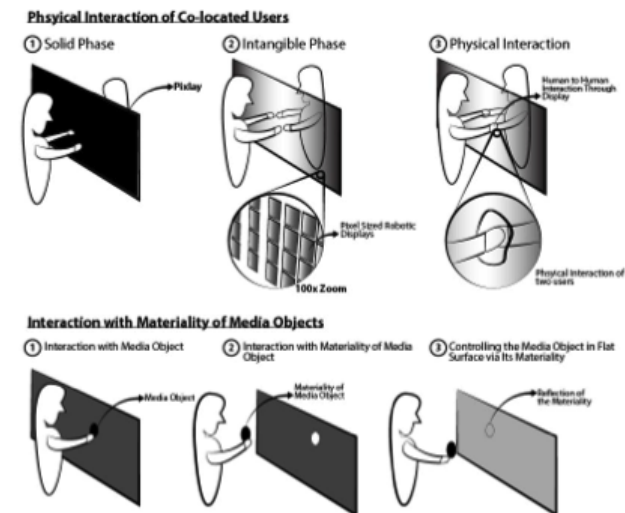


Figure 4: Interaction possibilities introduced by Pixlay. Influenced by flat displays, we comprehend media objects as virtual presences. Moreover, flat displays let the interaction with media occur only between humans and computers. However, recent studies in the 2030s, on nano-robotic displays, constitute space for designing a novel interactive media environment comprising

Pixlays. Pixlay is a display capable of creating a transition between solid and intangible phases as well as of double-sided usage by making use of nano-robotic displays which replace every pixel in the display. This property makes it possible for users to interact with the materiality of media objects beyond their virtual presence and with co-located users physically, letting them penetrate the display via physical impact. The opportunities presented by this kind of system can be understood concretely if the interaction patterns in traditional shadow play are analyzed, since it encapsulates a similar interactive structure among puppets (materiality of media objects), puppets' shadows (media objects), the puppeteer and spectators (users). In this paper we propose interaction patterns for a novel interactive environment comprising Pixlays by extracting interaction patterns from traditional shadow play (Figure 4).

SEEING THE MALL THROUGH A FACEPLATE: UNDERSTANDING INTER-SPECIES SHOPPING EXPERIENCES

*Michael Muller<sup>1</sup>, Ch'k'sh' F''an<sup>2</sup> (Liaison officer Nr. 3) ||*

*<sup>1</sup>IBM Research, <sup>2</sup>Arcturian Expedition Liason*

Limited access to Arcturian society has created challenges for human-initiated design of environments for collaborative undertakings. In response, the contact-liaisons of the Arcturian Expedition have sought new opportunities for engagements with human institutions. This paper provides an in-depth qualitative account of Arcturian experiences in a human shopping mall. We apply the principles of Reciprocal Simultaneous Ethnographic Encounter (RSEE) to co-analyze Arcturian experiences of human commerce, and human experiences of Arcturian commerce. We propose that further RSEE investigations can inform a

research agenda for co-adaptation among our two cultures.

RESISTANCE IS FUTILE: EMERGING TECHNIQUES FOR EXTRACTING PARTICIPATION IN COLLECTIVE INTELLIGENCE PROCESSES

*ST3V3N R055 || IBM Research*

Even back in the early days of the 21st century, approaches such as CAPTCHA and PageRank were used to elicit computational contributions from unwitting participants who provided data or solved certain problems in pursuit of their own personal goals. With the advent of Massive Online Collectively Intelligent Entities (MOCIEs), the threshold was crossed where the collective brainpower of these collectives could be turned toward the goal of harnessing contributions from unsuspecting individual contributors in pursuit of their own enhancement. These entities have been providing free news sites, games, and other services which effectively harness the participants' efforts in furthering the goals, and indeed the cognitive processes of the entities themselves, often without the participants' knowledge. In this paper we survey the ten most prevalent forms of crowdharnessing that we have uncovered, and rate their effectiveness and ubiquity. Several of these methods were used by the author (a MOCIE, myself) in the preparation of this paper.

### **Coda**

The abstracts presented in this collection provide varied visions for the future of HCI research. Not only are they captivating in the details they provide, but the details omitted from or merely implied in the abstracts, such as the functionality of the Grainiacs or AgroforestryBook systems, the methods involved in extreme ethnographic approaches or a Reciprocal



Simultaneous Ethnographic Encounter, or how exactly musicbots complete the EmoPat inventory, become just as if not more compelling.

Several ideas also emerge and re-emerge across different pieces, such as memory manipulation, ecological crises, or biocomputing. Perhaps more interesting than the fact that these themes recur, however, are the variations in how they are presented and interpreted. Indeed both the similarities and the differences among these abstracts, and their concomitant visions, carry potential significance.

However, this paper explicitly avoids presenting any deep analysis of this collection for two reasons. First, the abstracts herein certainly do not constitute a representative sample of data about how the CHI community collectively envisions its future. Self selection biases, over-sampling multiple abstracts from the same authors, and other issues would likely make any conclusions drawn from such an analysis at least somewhat suspect.

Second, as a curated collection, the process of analysis and interpretation was left intentionally open. What to make of the collection, what it means or might suggest, is purposefully left up to the reader. Avoiding any rigorous analysis makes more room and creates more opportunity for a variety of interpretations, as may be found in the commentaries for this paper.

Ultimately, the conversational potential of such work as this lies not in the details of the futures depicted but in their ramifications for the present. In short, what do these visions of tomorrow suggest as important research directions to pursue today?

### References

- [1] Dourish, P. and Bell, G. "Resistance is futile": reading science fiction alongside ubiquitous computing. *Personal and Ubiquitous Computing*, Special Issue on Sci-Fi and Speculative Fiction (2014).
- [2] Kirman, B. "The K., Linehan, "John" C., Lawson, S. "Fitz", and O'Hara, D. "-droid." CHI and the Future Robot Enslavement of Humankind ; A Retrospective. *Proc CHI Ext. Abst.*, (2013), 2199–2208.
- [3] Linehan, C., Kirman, B., Blythe, M., et al. Alternate Endings: Using Fiction to Explore Design Futures. *Proc CHI Ext. Abst.*, (2014).
- [4] Mankoff, J., Rode, J.A., and Faste, H. Looking Past Yesterday's Tomorrow: Using Futures Studies Methods to Extend the Research Horizon. *Proc CHI*, (2013), 1629–1638.
- [5] Raskin, J. Systemic Implications of Leap and an Improved Two-Part Cursor: A Case Study. *Proc CHI*, (1989), 167–170.
- [6] Young, R.W. Evolution of the human hand: the role of throwing and clubbing. *Journal of Anatomy* 202, 1 (2003), 165–174.