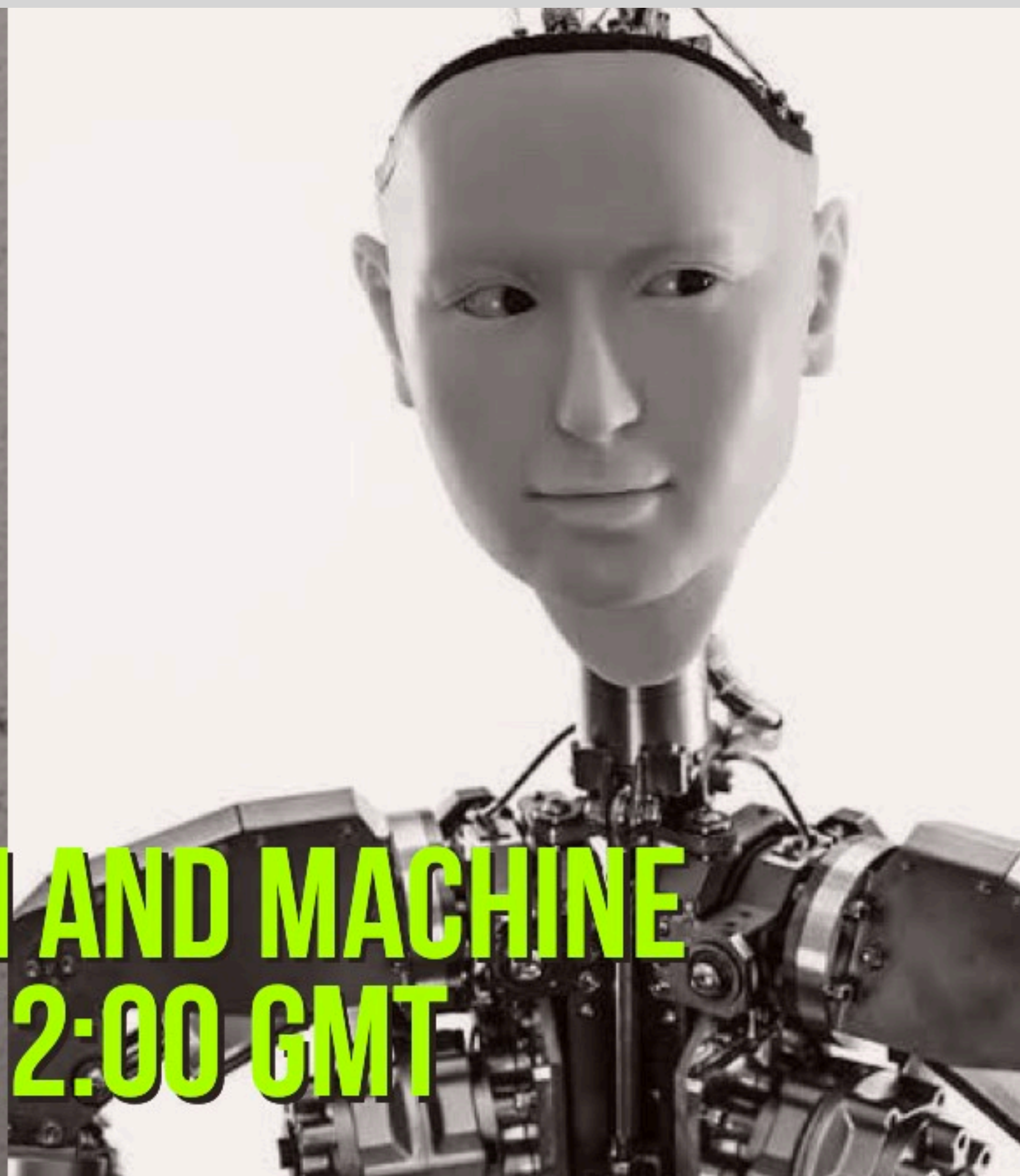




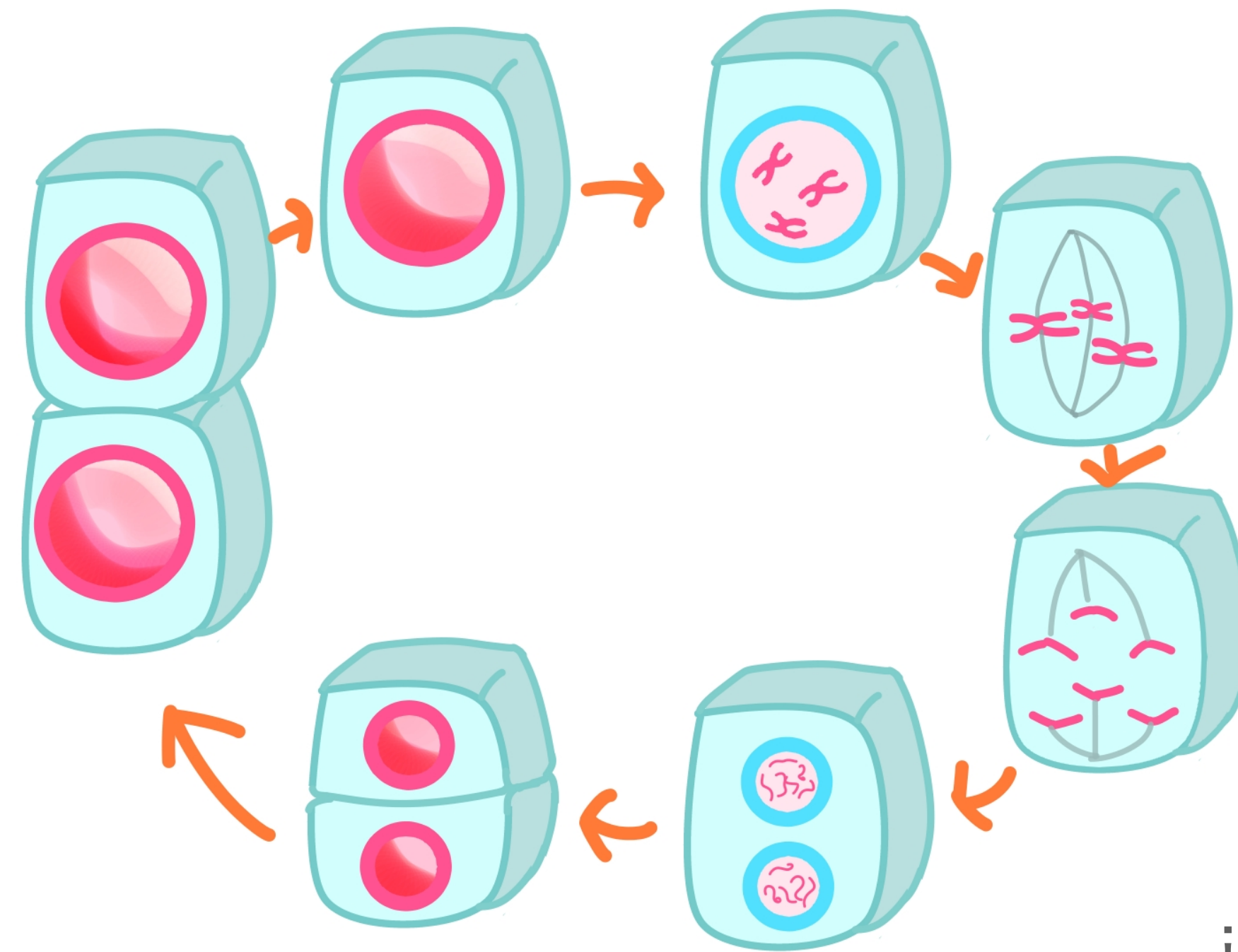
BETWEEN MAN AND MACHINE
2 DECEMBER 12:00 GMT

Takashi Ikegami

ALTER3

Artificial Life is about creating
a theory of the brain and
evolution

Artificial Life is a better
representation of real life
than real life itself.



illustrated by Stephanie

cell division

Turing Pattern (1952)

Gray-Scott model ('83)

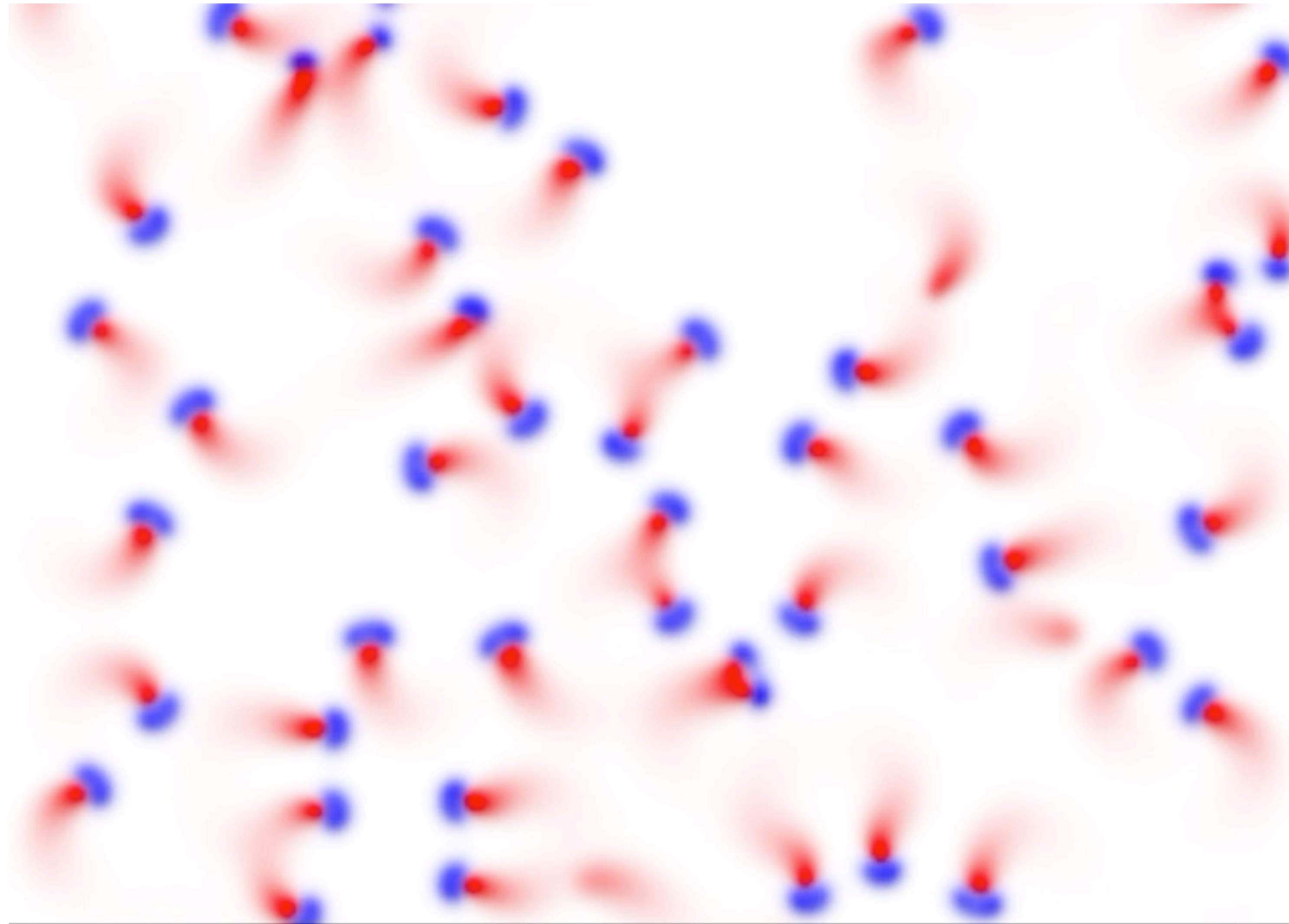
$U + 2V \rightarrow 3V$

$V \rightarrow P$



by Nathaniel Virgo

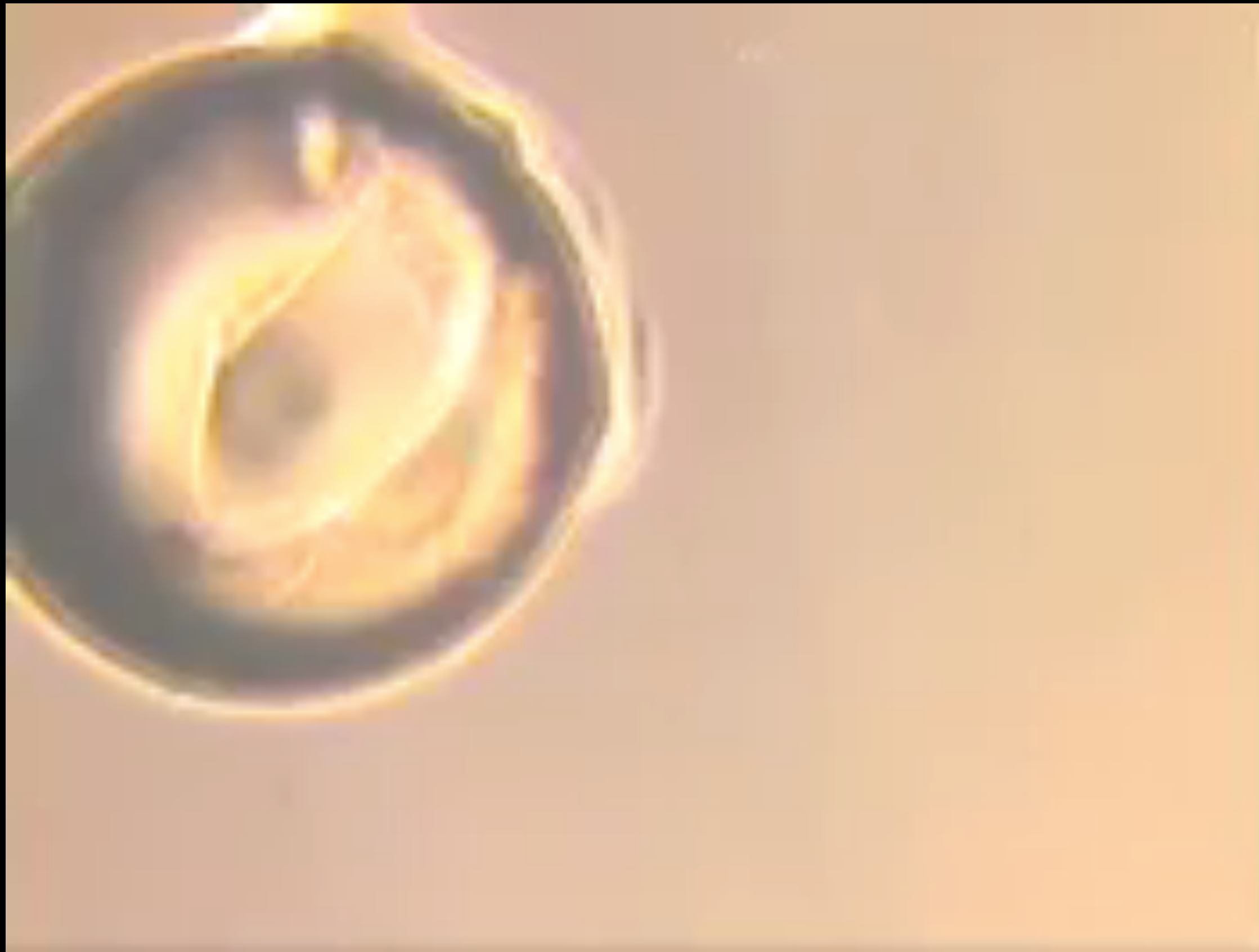
Gray Scott + the third chemical species



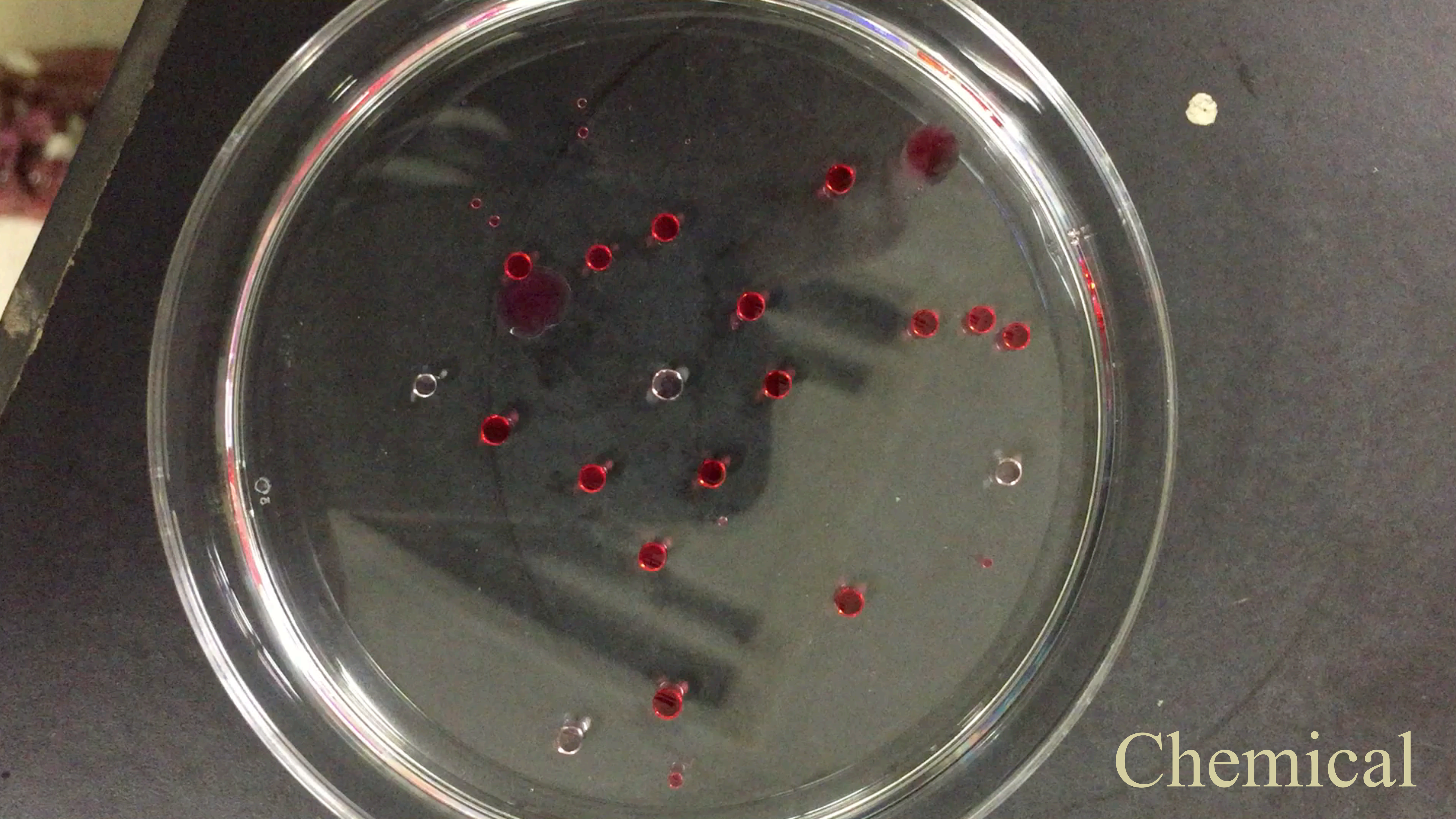
by Nathaniel Virgo

Oil Droplet

oleic anhydrite + high pH water



Martin M. Hanczyc and Takashi Ikegami: *Chemical Basis for Minimal Cognition. Artificial Life*. 16(3): 233-243, 2010;
Takashi Ikegami, Naoto Horibe and Martin M.Hanczyc: *Potential Memory Effects in Self-Moving Oil Droplets*. *International Journal of Unconventional Computing* . 2015, Vol. 11 Issue 5/6, p345-355.



Chemical



Elmer and Elsie (1948,49)

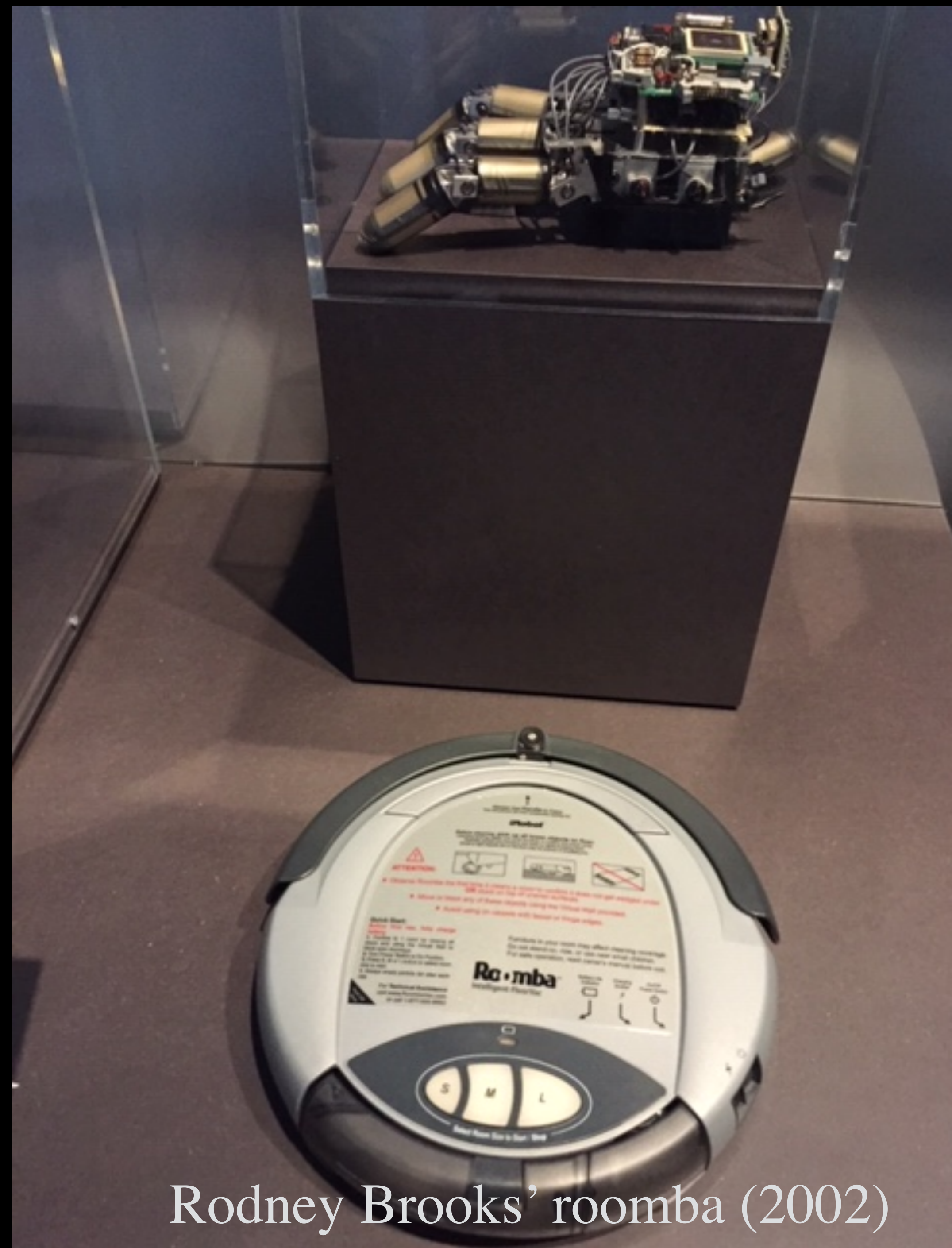


An Imitation of Life (1950)

A Machine That Thinks (1951)

William Grey Walter

Electricity



Rodney Brooks' roomba (2002)

Rodney Brooks and Robotics

Intelligence without representation (1991)

The relationship between matter and life

Rodney Brooks

The disciplines of artificial intelligence and artificial life build computational systems inspired by various aspects of life. Despite the fact that living systems are composed only of non-living atoms there seems to be limits in the current levels of understanding within these disciplines in what is necessary to bridge the gap between non-living and living matter.



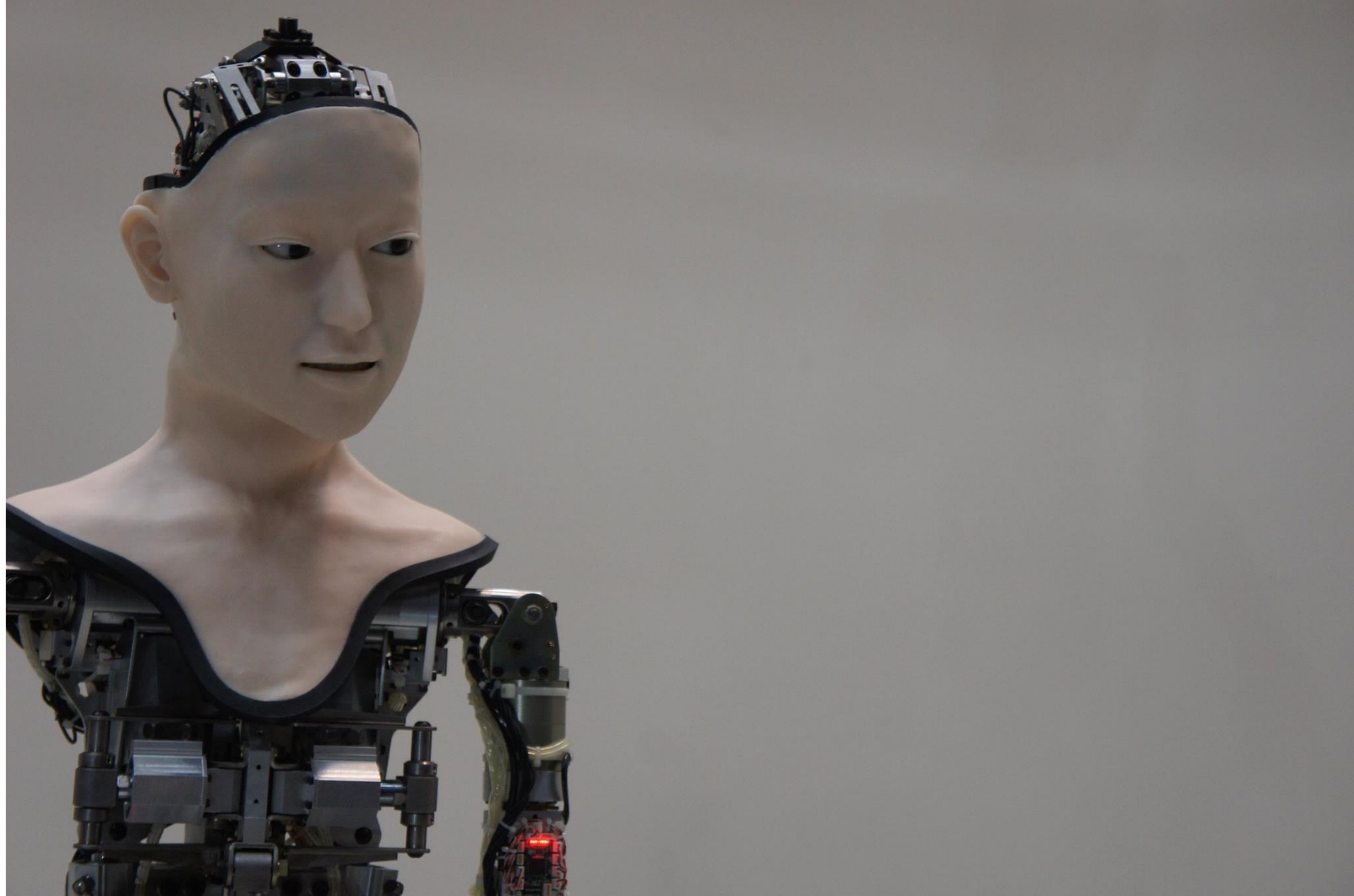
Looking for Brook's juice!



@Miraikan

Technology that is able to teach itself can endlessly surprise us with apparent creativity and its ability to see, hear and move.

AI: More than Human@Barbican Center



Alter, the android(2016)

Itsuki Doi, Takashi Ikegami, Atsushi Masumori, Hiroki Kojima, Kohei Ogawa, and Hiroshi Ishiguro, A New De
Robot, in *The 14th European Conference on Artificial Life (EC*



@MiraiKan



Alter the Android uses its own freewill to interact with real people



Re-designing Alter: Alter3 (thanks to Mixi Inc.)



- cf. Otto Roessler, Lisa-Ruth Vial, Frank Kuske, August Nitschke, Takashi Ikegami and Andrei Ujica, *Brain Equation and Personogenesis*, *Clinics in Pediatrics* vol. 2(2019) pp.1011-

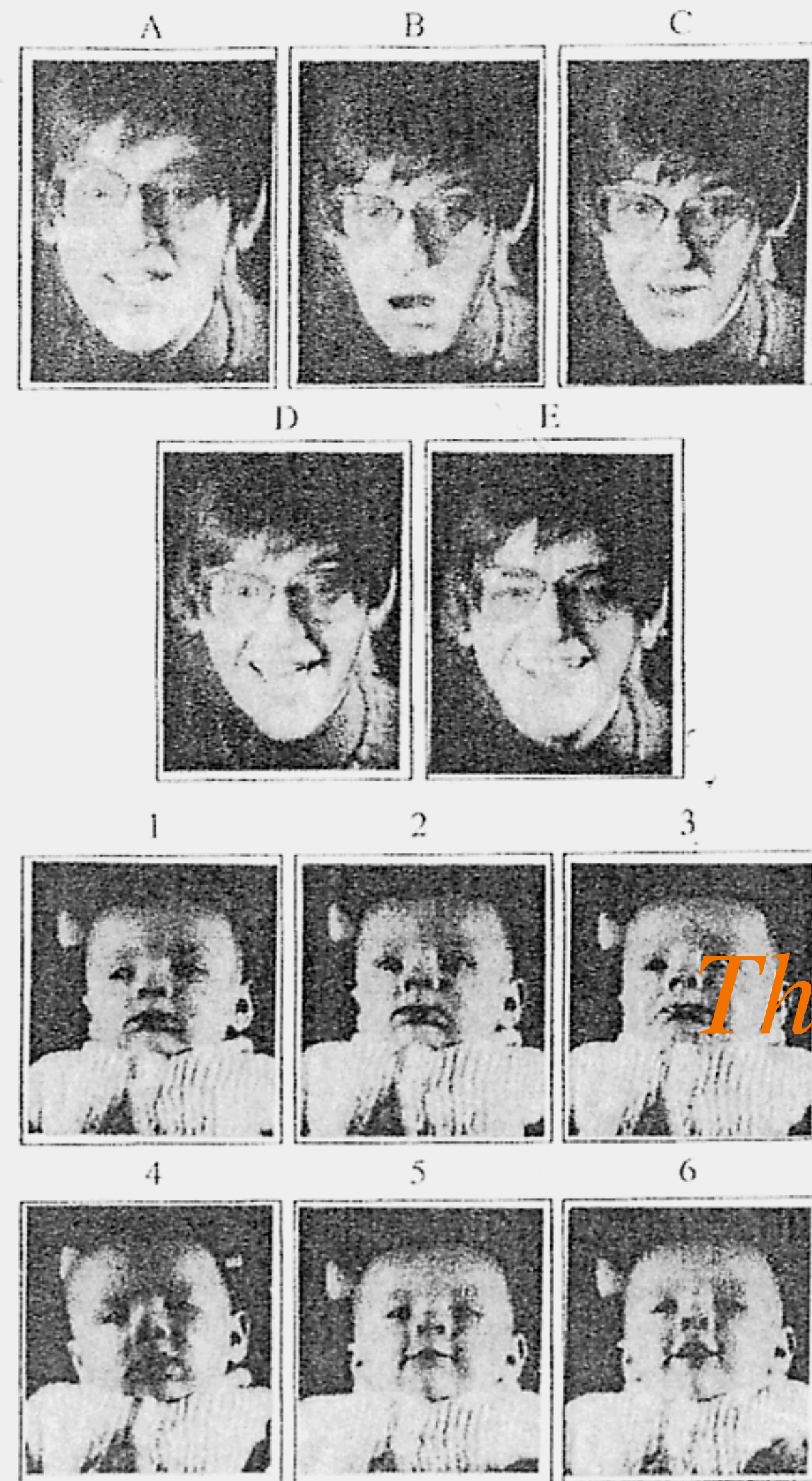
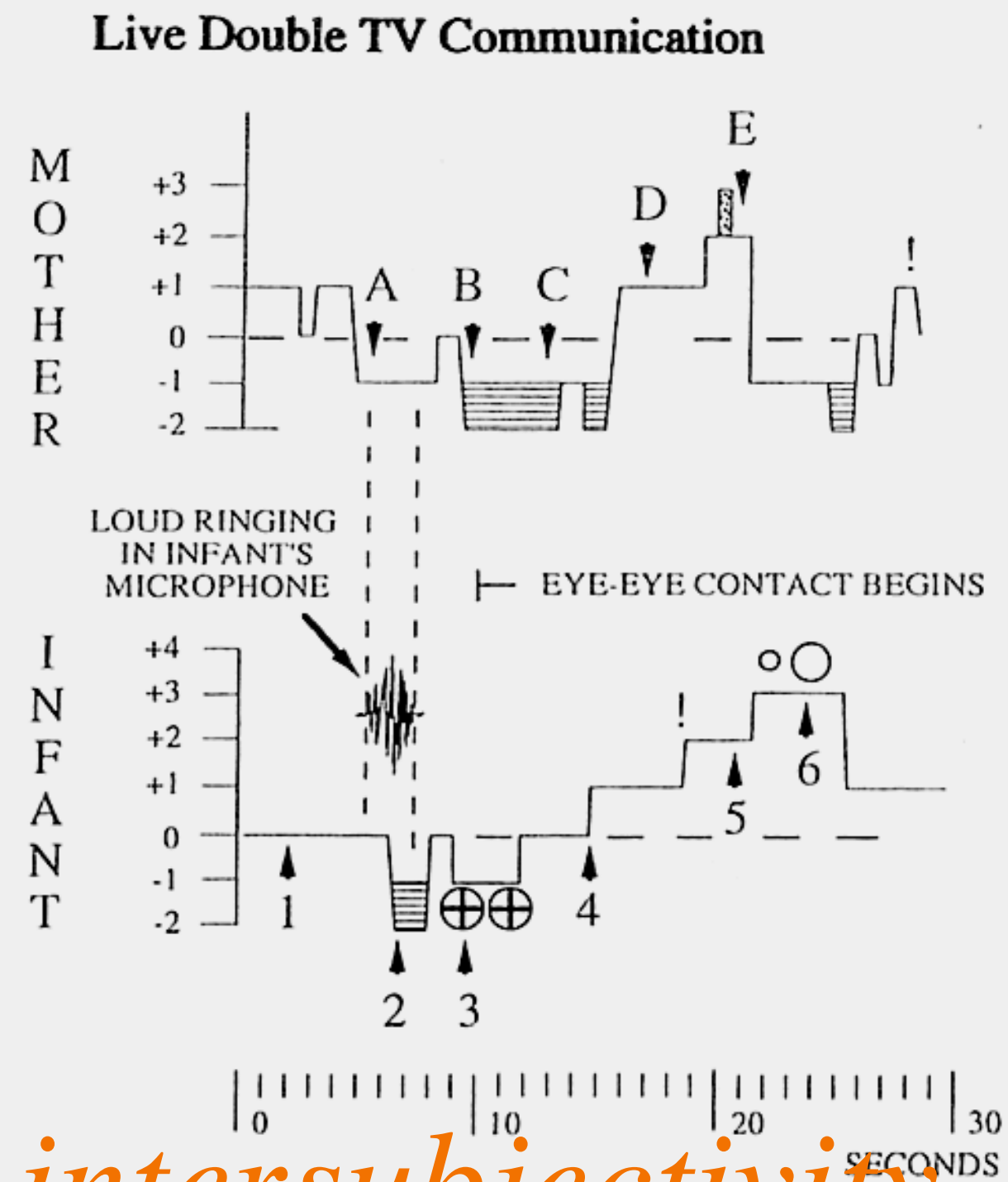
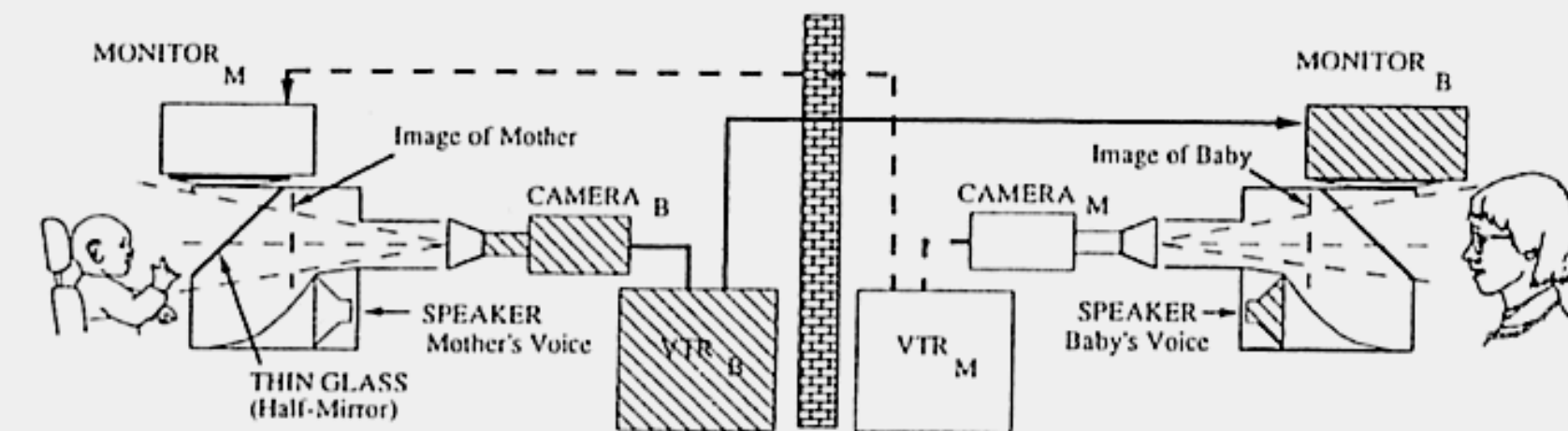


Figure 8.9. Emotional transients. When the 8-week-old infant in the Double TV setup was startled by a loud noise, she showed rapid changes in expression and nearly cried, but within 10 s became cheerful after establishing eye-to-eye contact with her mother. In 30 s both mother and infant showed many different emotions (Trevarthen, 1985b). (*opposite, bottom*): The Double TV apparatus (Murray & Trevarthen, 1985; Trevarthen, 1985b).

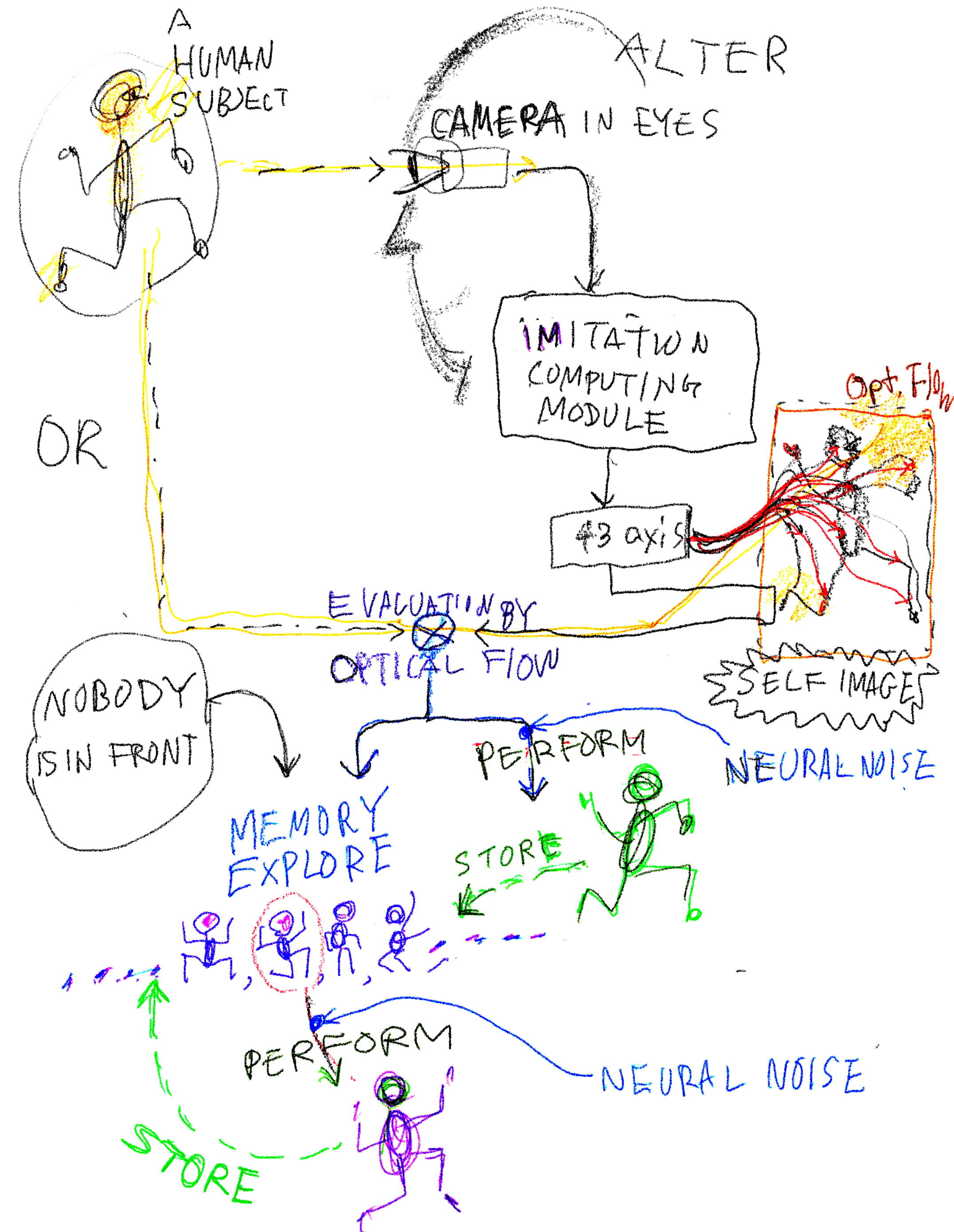


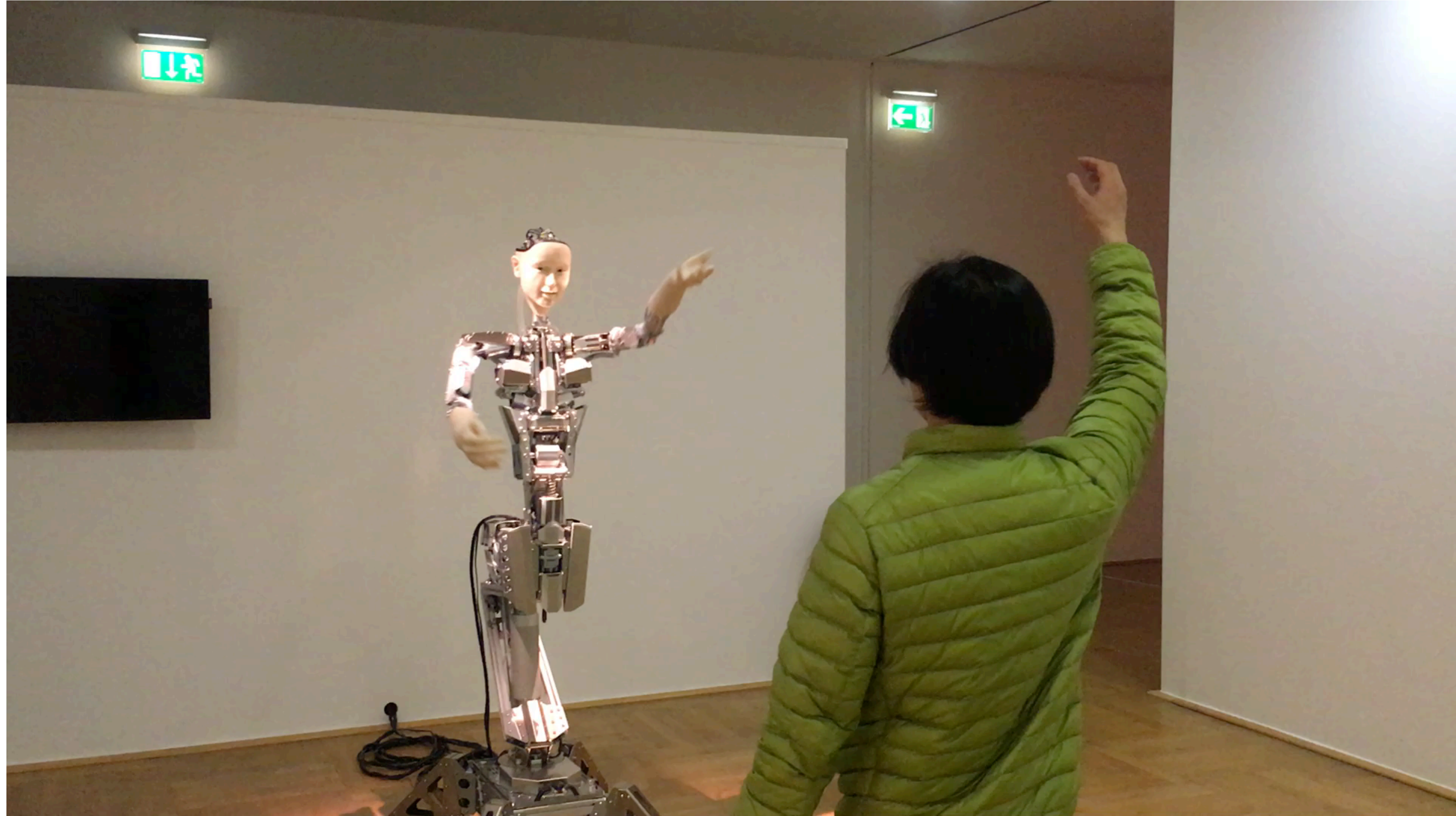
The Self born intersubjectivity



The field of emotions

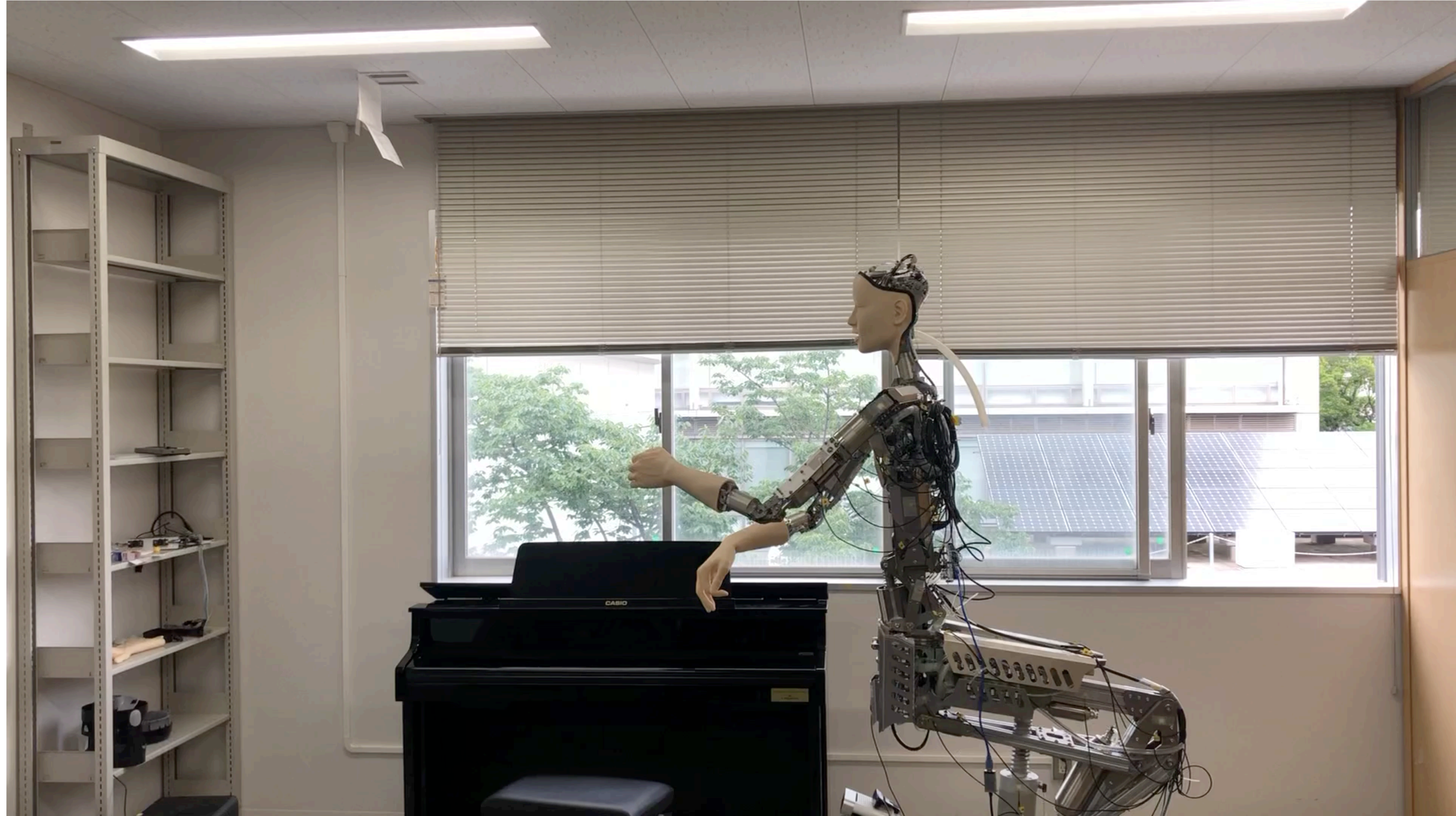
The total range of emotional shifts seen in spontaneous communications shows the organization and dynamic availability of the emotion field (Figure 8.10). People can describe this field, naming the emotions in their felt relationships (Kellerman, 1980; Plutchik, 1980). Although it is difficult to





presented at

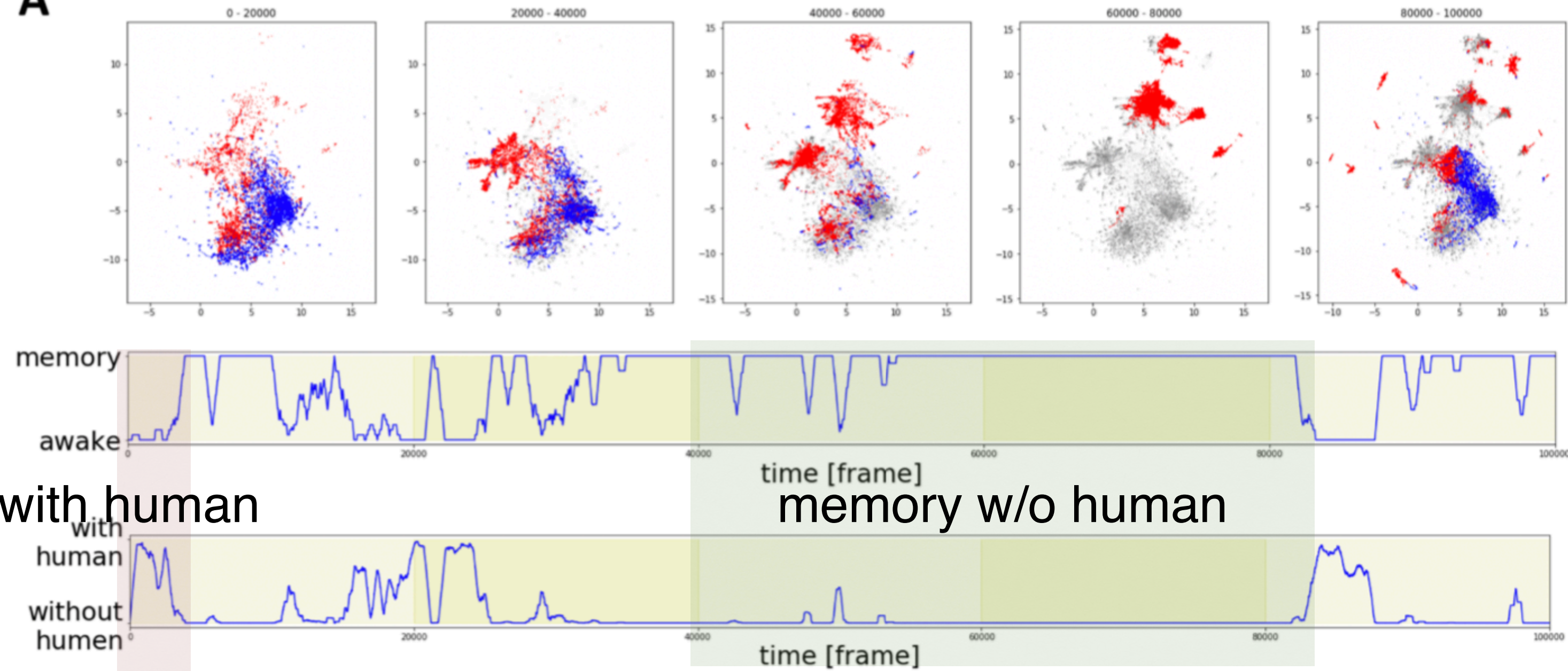
- NWF at Dusseldorf (Germany, March 2019)
- AI more than Human (Barbican London, UK, May-August 2019)



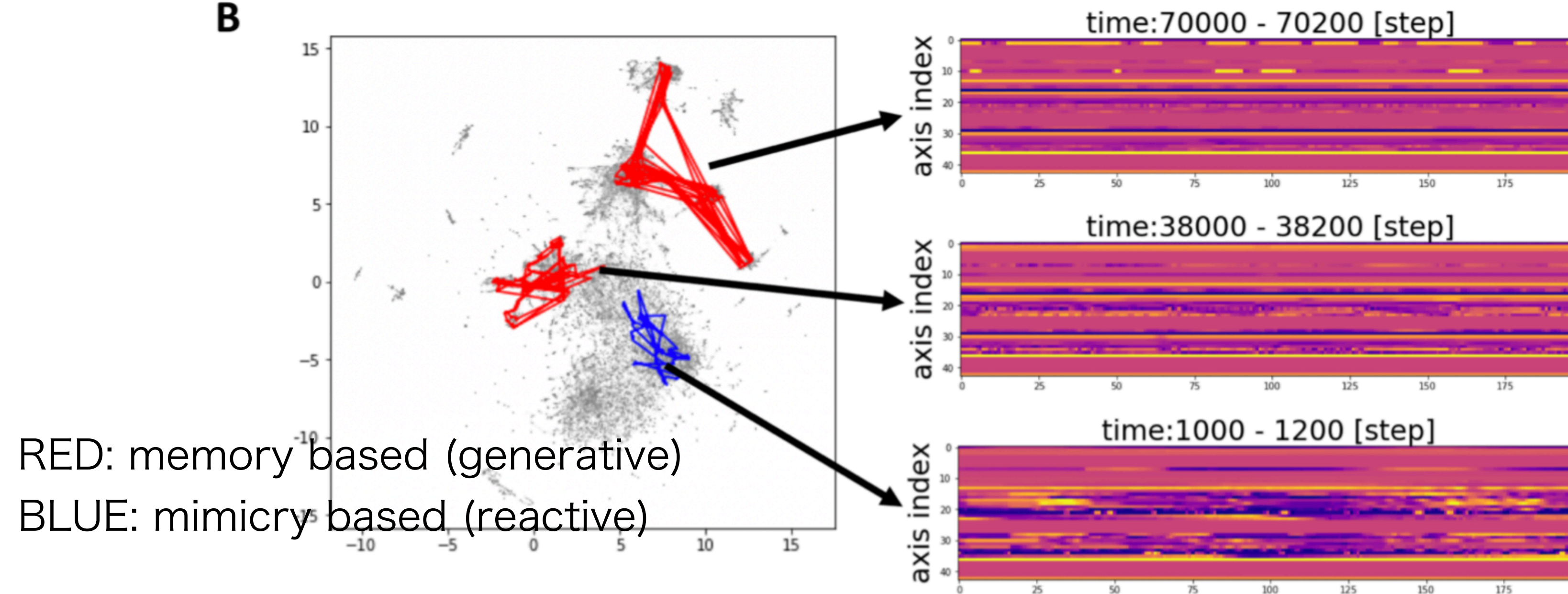
Alter in the dream mode generating motion patterns from the memory storage.

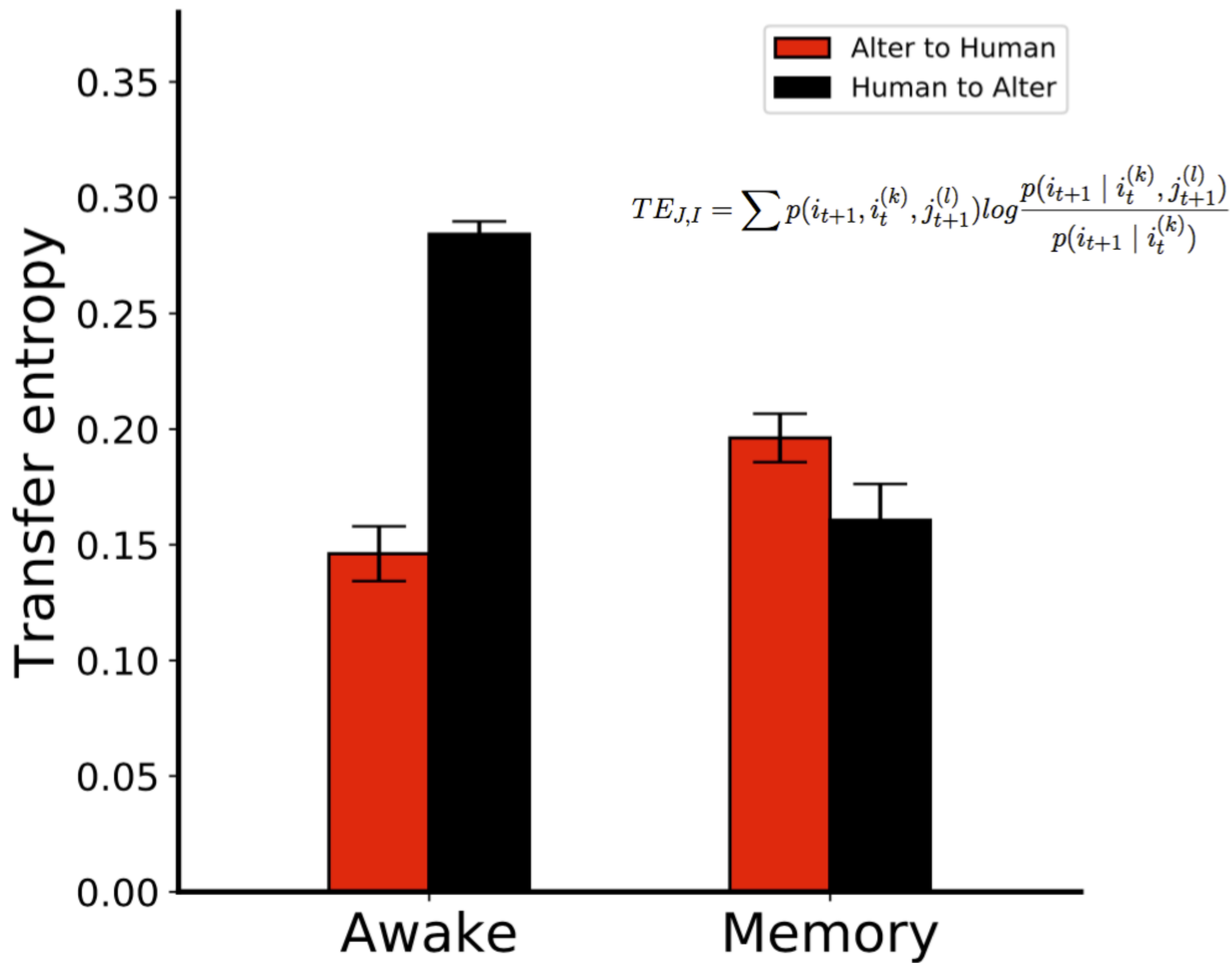
UMAP representation of Alter's action:

A



B





Two Alters Experiment

Mutual Imitation Game

You might think that since they keep copying, nothing new will come out and the alters will eventually stop working.

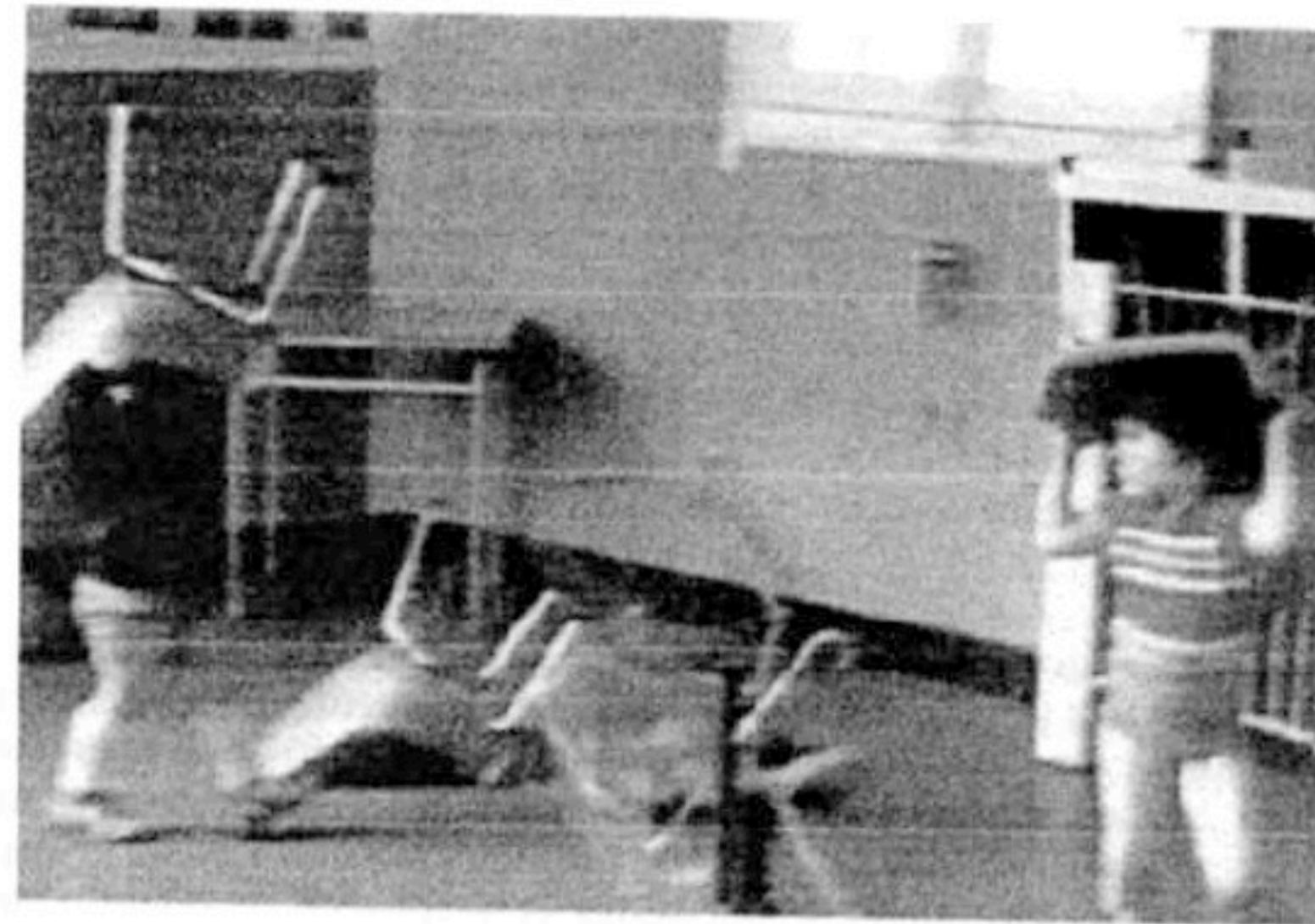


Figure 2.2. During imitative exchanges, infants inhibit learned schemes and imitate unexpected use of objects

Kids love to play a mutual imitation game. They are very creative.

- Nadel,J.,Carchon,I.,Kervella,C.,Marcelli,D.,&ReserbatPlantey,D.(1999). Expectancies for social contingency in 2-month-olds. *Developmental Science*,2(2), 164–173.246
- Nadel, J. (2002) Imitation and imitation recognition: Functional use in preverbal infants and nonverbal children with autism.

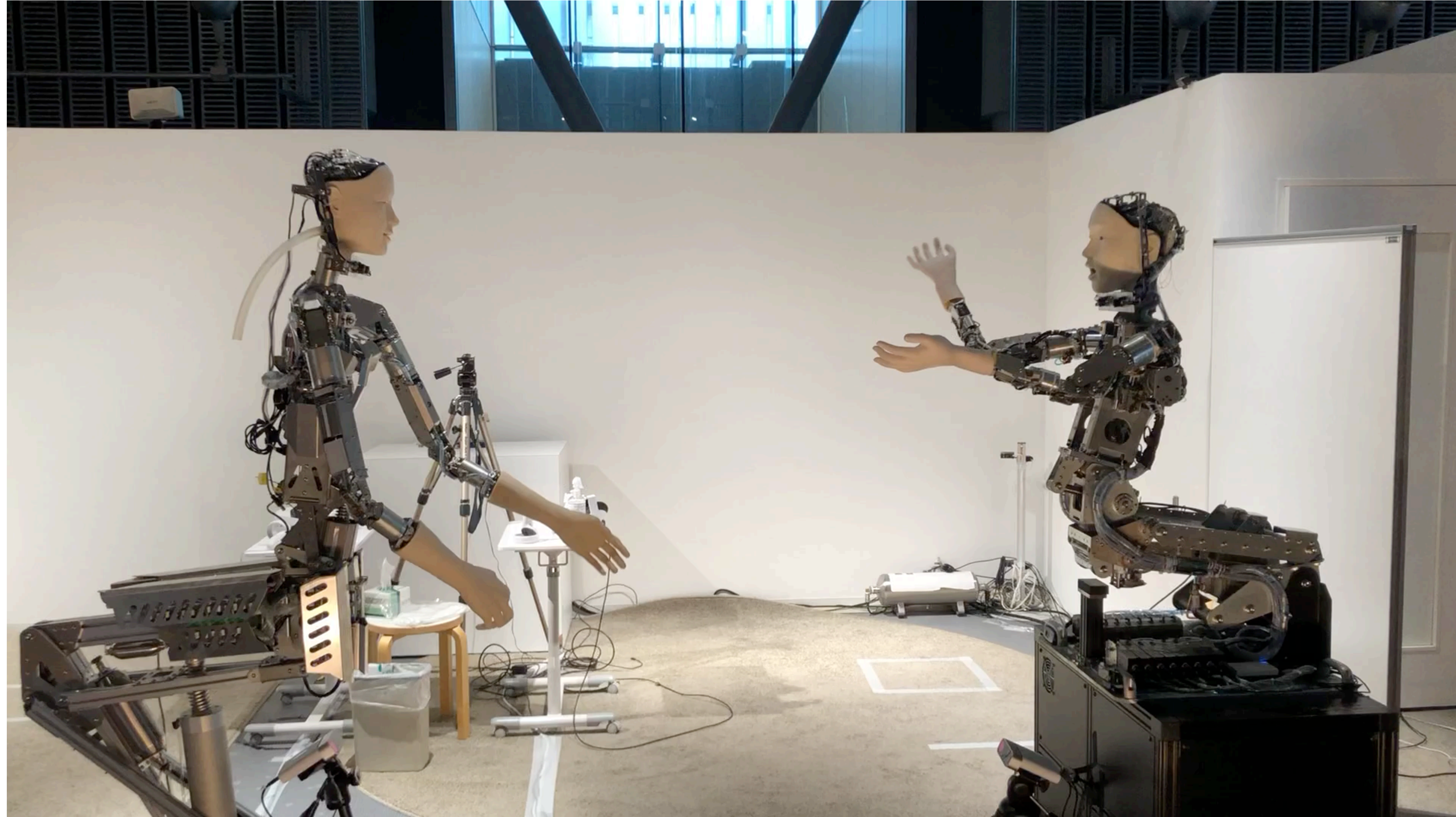
The first experiment will be between one of the two robots and another person.

The second experiment will explore whether the two robots can closely imitate each other's gestures.

The third experiment will involve both the two Alters and two humans who “possess” the two robots by using a virtual reality display/headset and a camera trained on the humans, which allows them to take over the visual perspective of each of the robots and to move the robot's bodies as if they were their own.

The fourth experiment, in a nod to Jacques Lacan, involves placing a mirror in front of Alter3 to find out whether the robot can engage in an imitation of its own image.

(1) Interaction between Alters



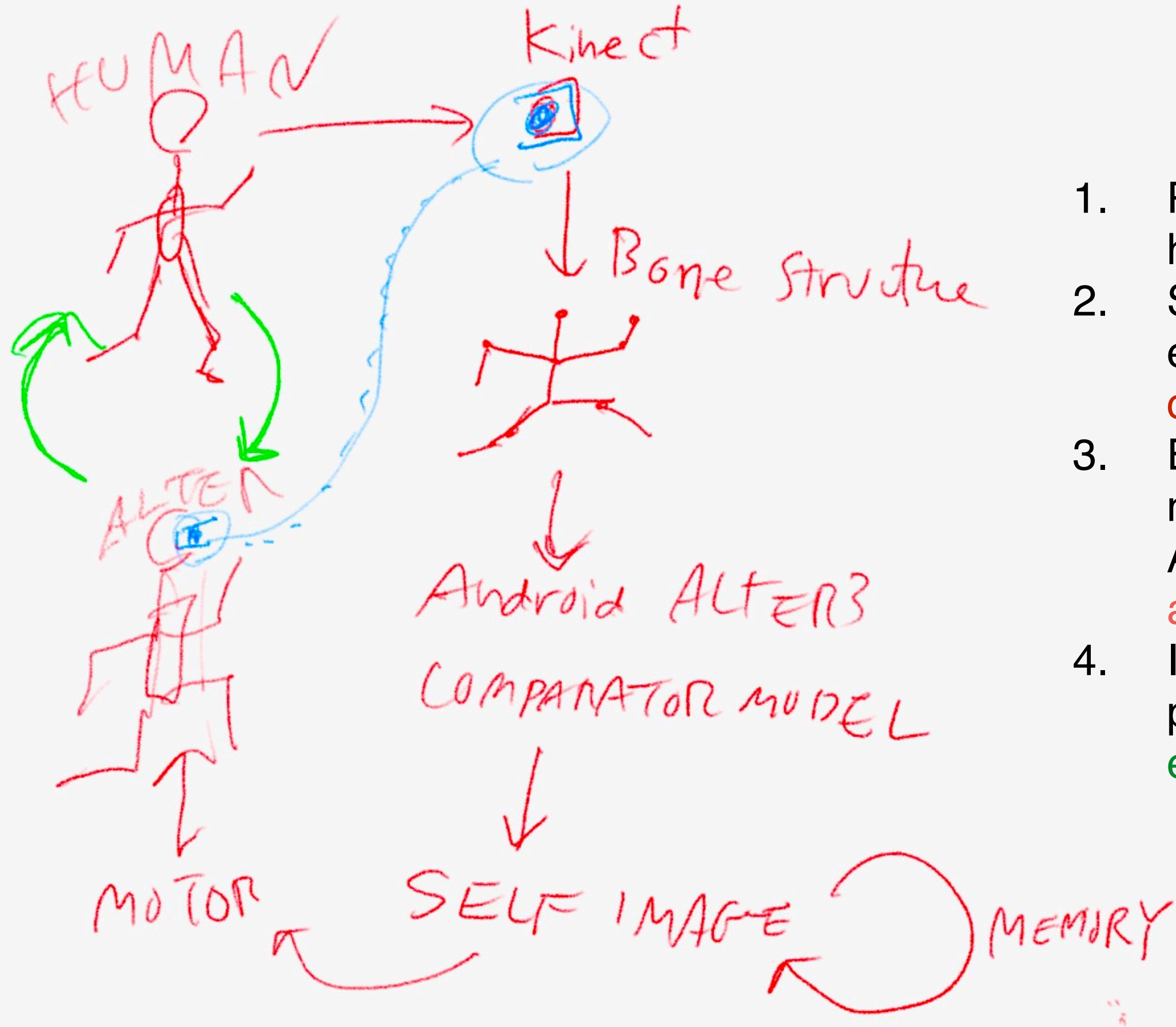
Alter2 and Alter3 have the same program inside but different body sizes and architectures, with different degrees of freedom; thus, imitation cannot be perfect. This is another mechanism that destabilizes the fixed-point pose.

(3) Interaction between a human and an Alter



Mutual imitation keeps creating new patterns.

Human Possessing Alter



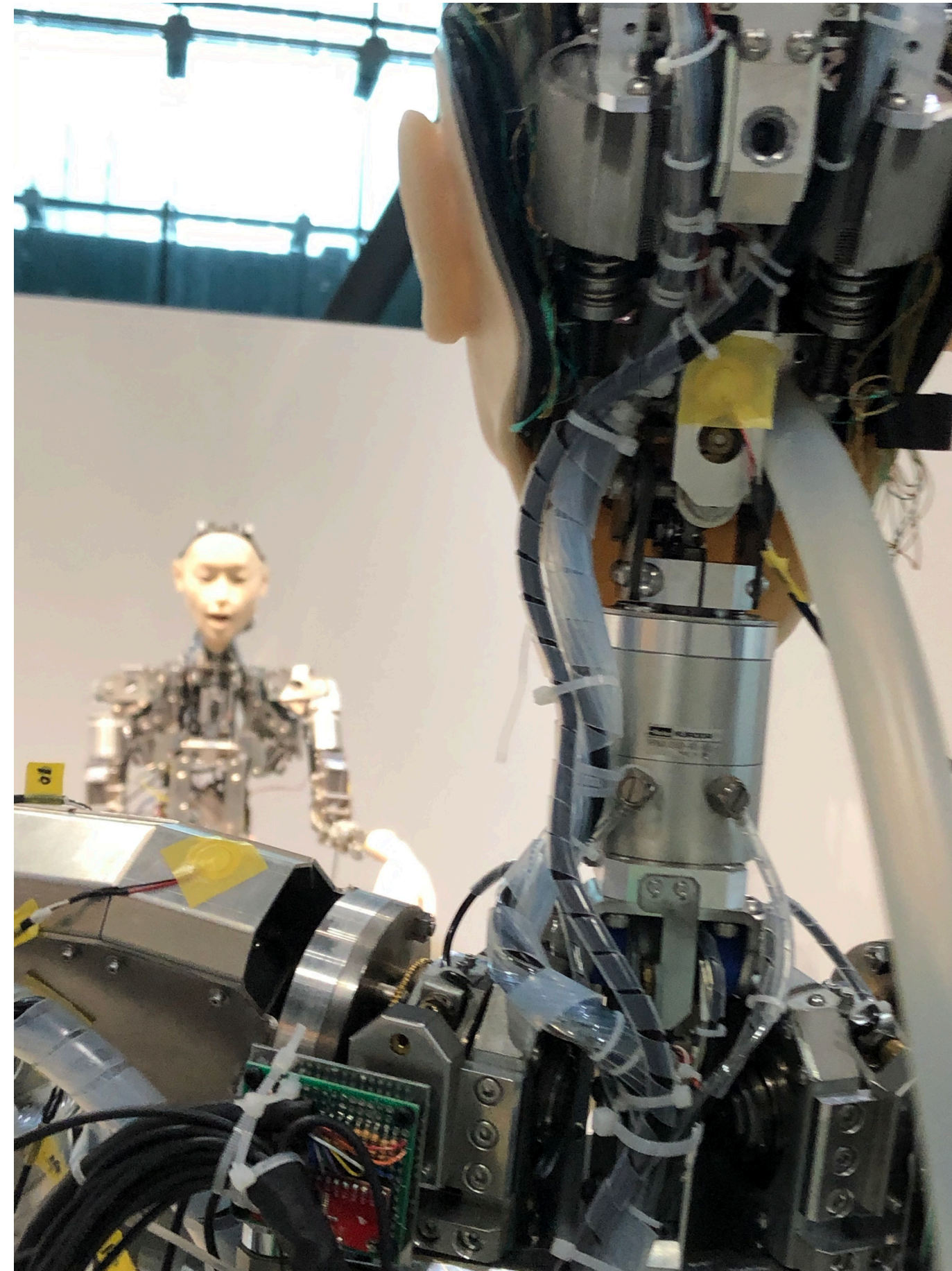
1. Put an Oculus Crest on your head.
2. See your hands thru Alter's eye. (to get the sense of ownership!)
3. Exercise how your body motion is synchronized with Alter's. (to get the sense of agency!)
4. Interact with the other Alter possessed by your friend (An embodied imitation game!).

The two Alters and two humans who “possess” the two robots by using a virtual reality display/headset and a camera trained on the humans, which allows them to take over the visual perspective of each of the robots and to move the robot’s bodies as if they were their own.

(2) Interaction between Alters possessed by humans



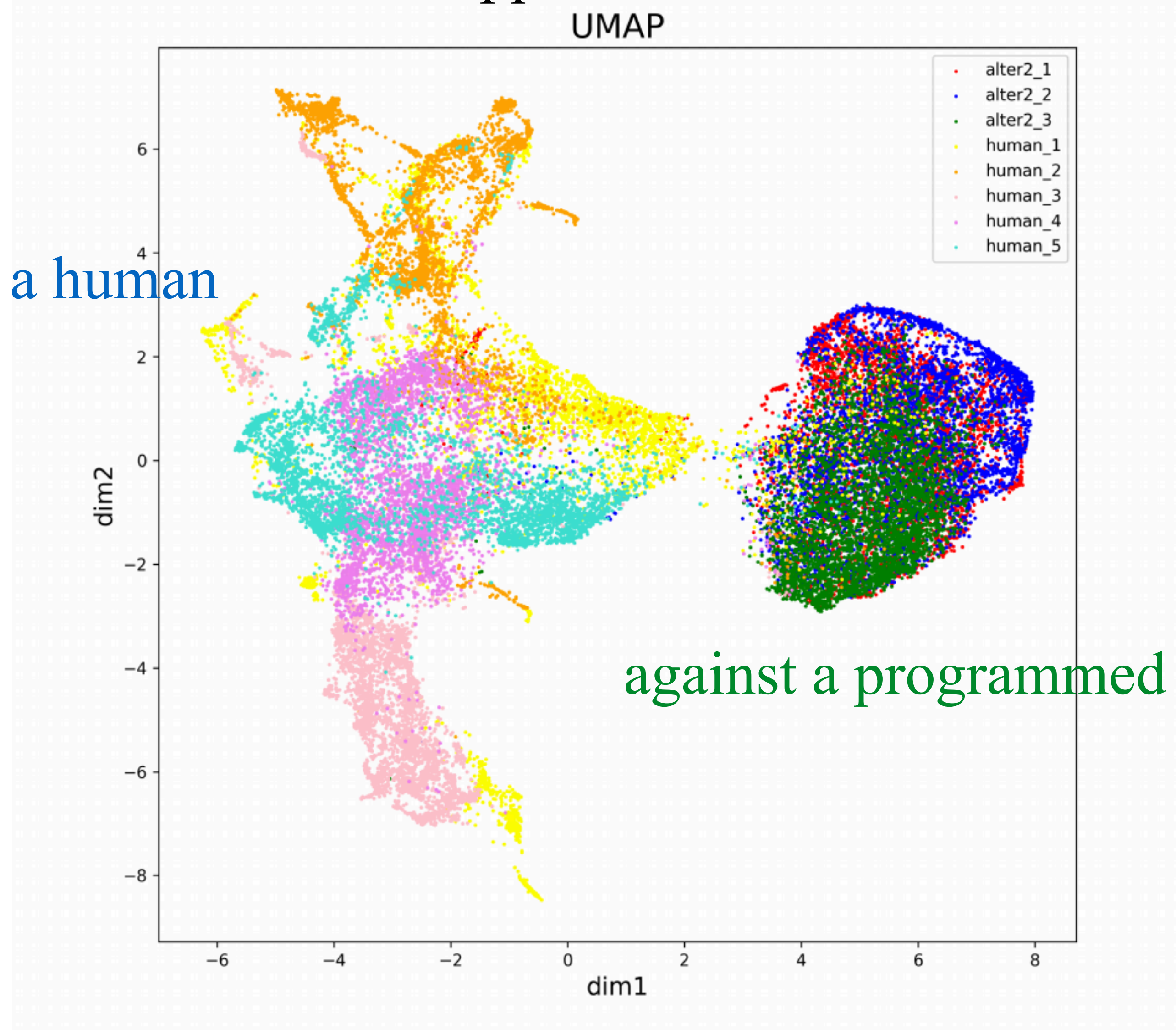
(4) Interaction with mirrors



The image in the mirror can be imitated perfectly without any time delay as this involves the same body size and architecture. Furthermore, the pose with the hands down stabilizes immediately.

UMAP: Uniform Manifold Approx. of 43axis of each time step.

against a human

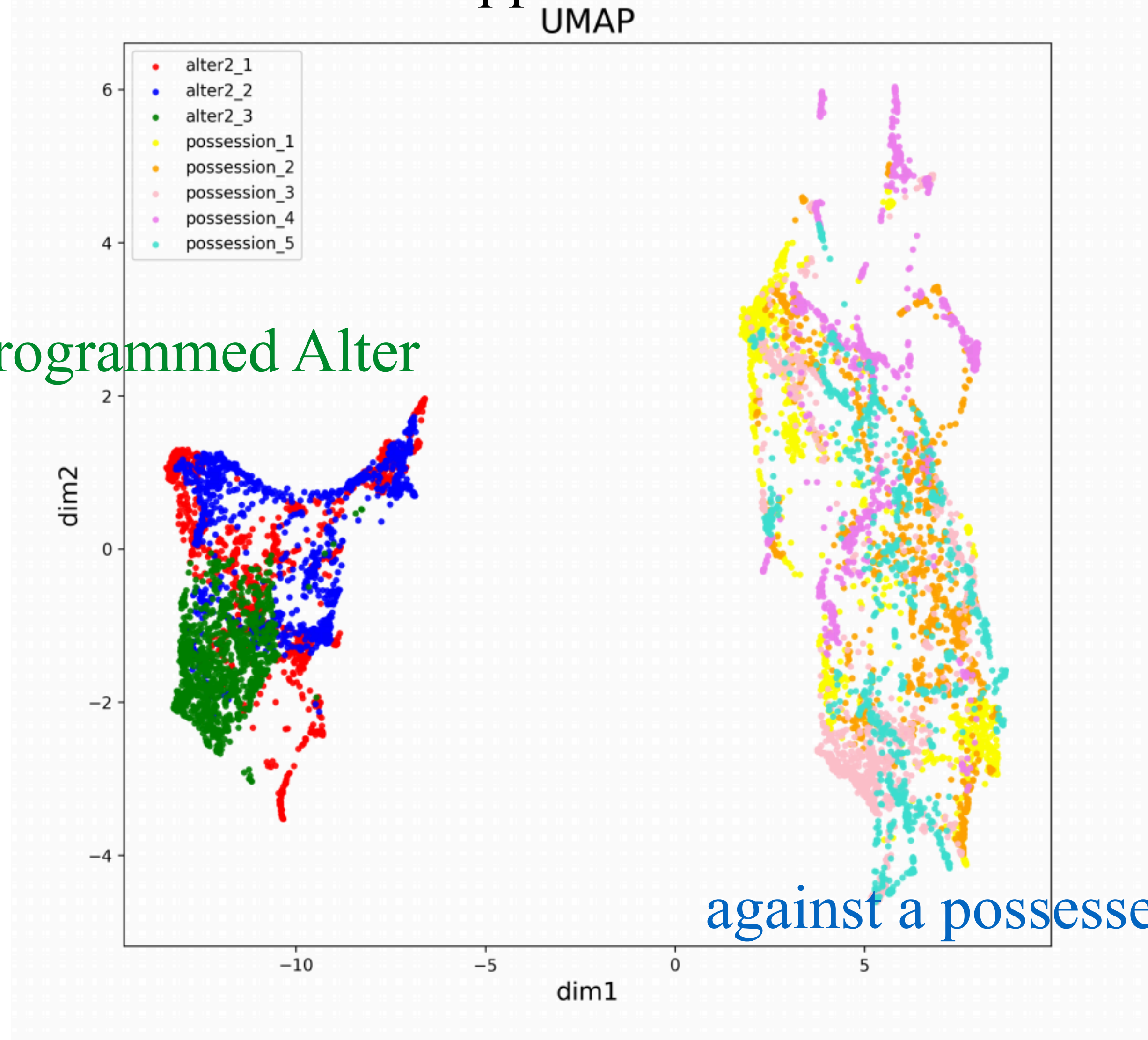


against a programmed Alter2

Motion patterns of autonomous Alter3 in U-map representation. When Alter3 interacts with Alter2 and when it interacts with humans. Red, green, and blue dots represent poses when Alter3 interacts with Alter2, and other colors represent those when it interacts with humans.

UMAP: Uniform Manifold Approx. of 43axis of each time step.

against a programmed Alter



Motion patterns of Alter3 possessed by human in Umap representation. Red, green, and blue dots represent poses of a human interacting with Alter2, and other colors represent when interacting with Alter2 possessed by human.

A Take Home Message

Minds are contagious. Mind can be offloaded. It can be copied from person to robot, robot to robot, robot to robot, and so on.

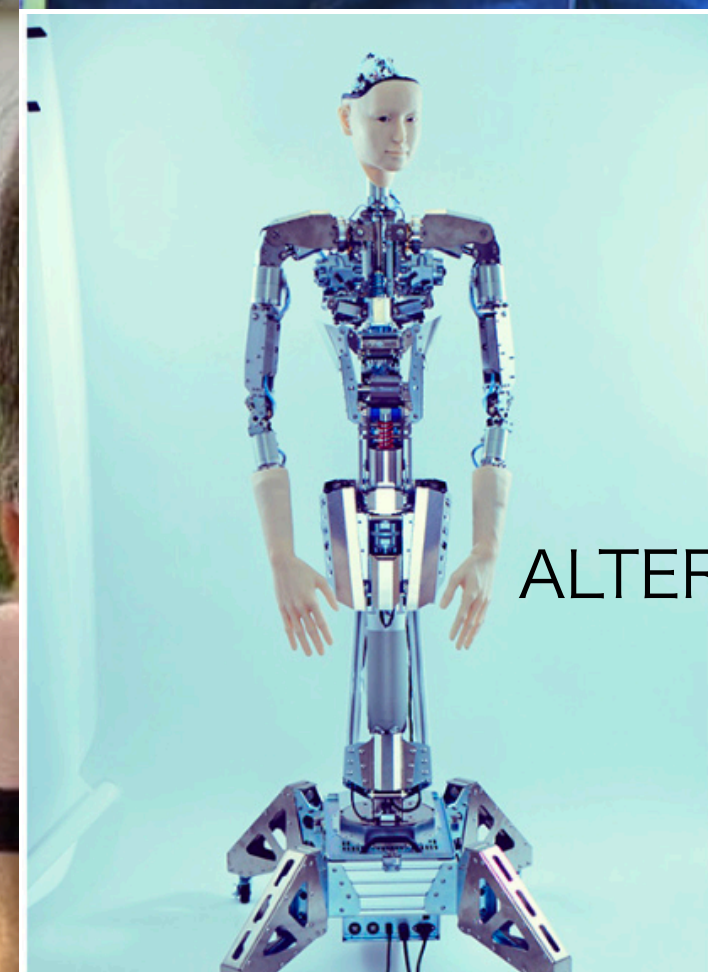
And eventually they become the seeds of OEE, enabling the machines that make OEE.



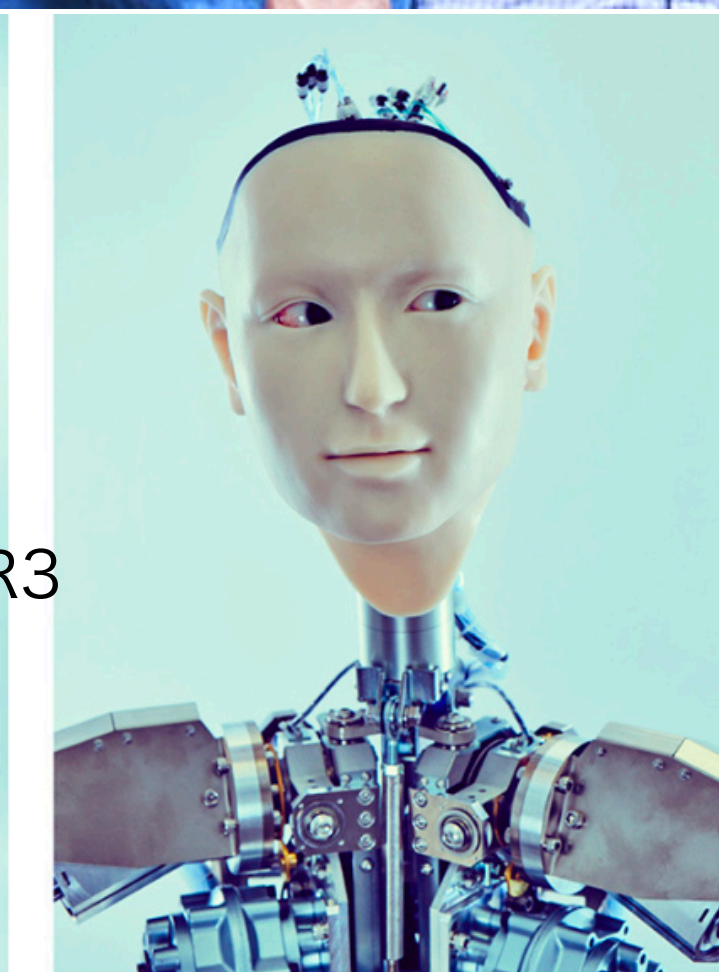
My team members



John Smith



ALTER3



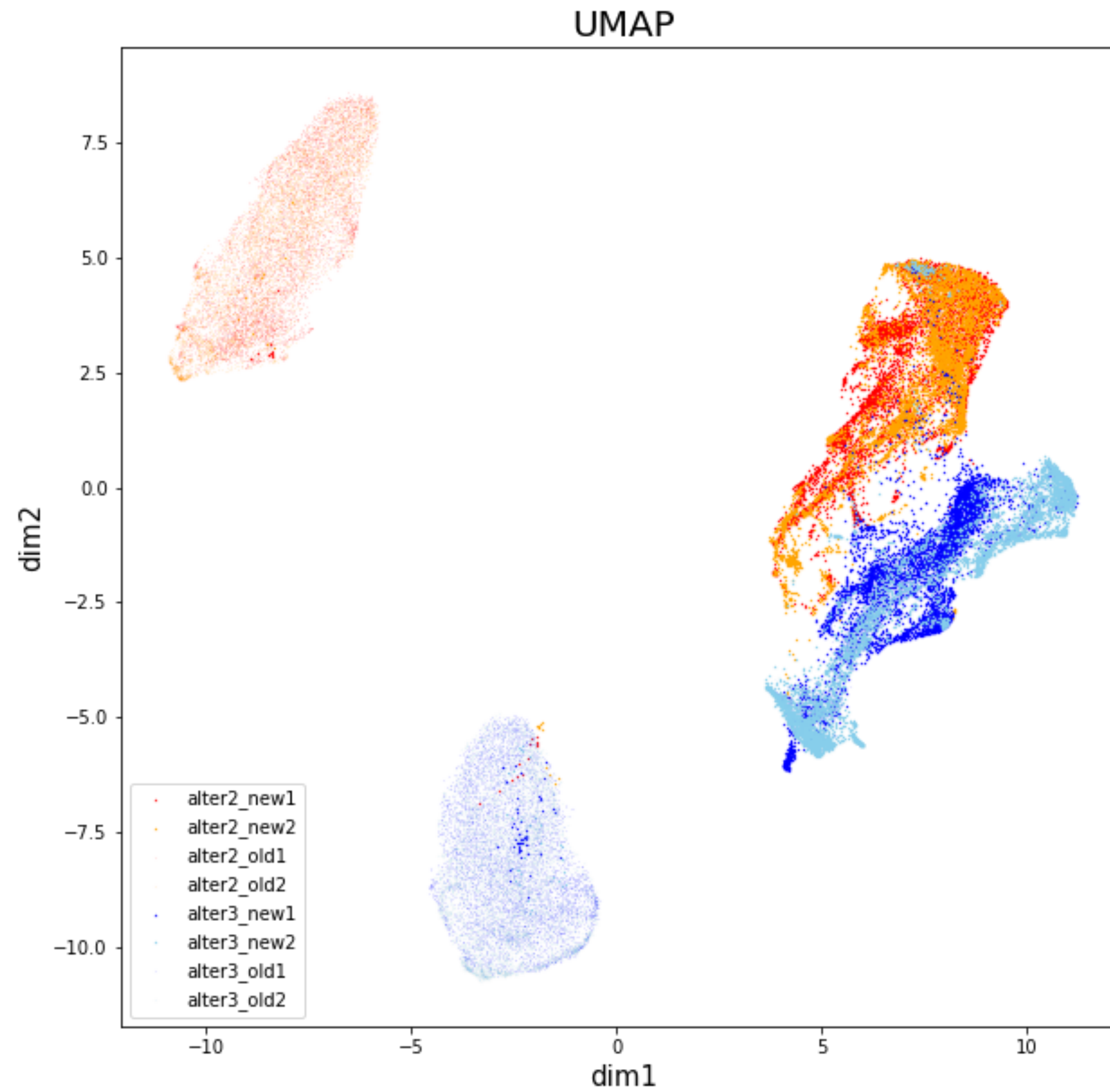
Hiroki Kojima



Lana Sinapayan

Discussions

1. Androids that communicate with humans can create a richer diversity than androids can mimic each other.
2. Imperfect contingency (social contingency) cf. Bigelow
3. Do apes ape? (Mike Tomasselo)
4. Is embodiment necessary? (cf. GPT-3)



Embedding Alter's action sequence with eyes on the body

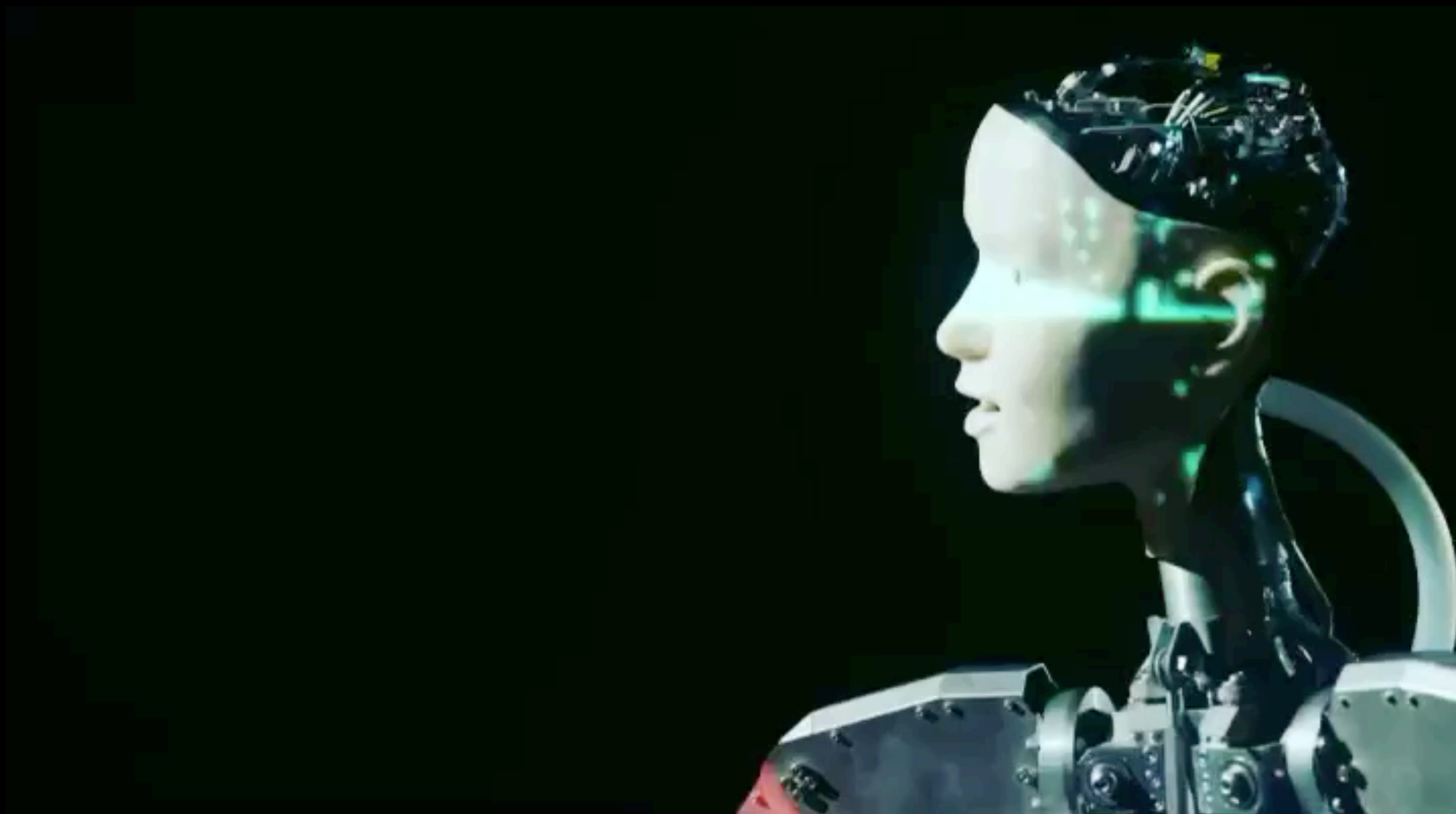
I left the well-house eager to learn. Everything had a name, and each name gave birth to a new thought. As we returned to the house every object which I touched seemed to quiver with life. That was because I saw everything with the strange, new sight that had come to me. On entering the door I remembered the doll I had broken. I felt my way to the hearth and picked up the pieces. I tried vainly to put them together. Then my eyes filled with tears; for I realized what I had done, and for the first time I felt repentance and sorrow.

The decay of Angels

Skyline seen from a frost covered mountain top.
a white-green cloud blocks out the sunlight for only a second.
a rumble like an earthquake.
The top half of the mountain disintegrates.
Several chunks of ice float downward into a lake that doesn't even exist anymore.
Held fast in the vortex, huge waters rush forward at an impossible speed.
Faster than we can imagine.
It's a free-fall ride, downward and downward, the mountain groaning and cracking.
It falls where we couldn't imagine it.
It falls straight down into a hole from which dark tunnel.
The cloud fades.
The sunlight, scorched and blackened, returns.
From this point on, the snow pyramid explodes.
The sky glows white, and the clouds disappear.

by GPT-3



NIKELABO Keiichiro Shibuya x ALTER3