criatividade

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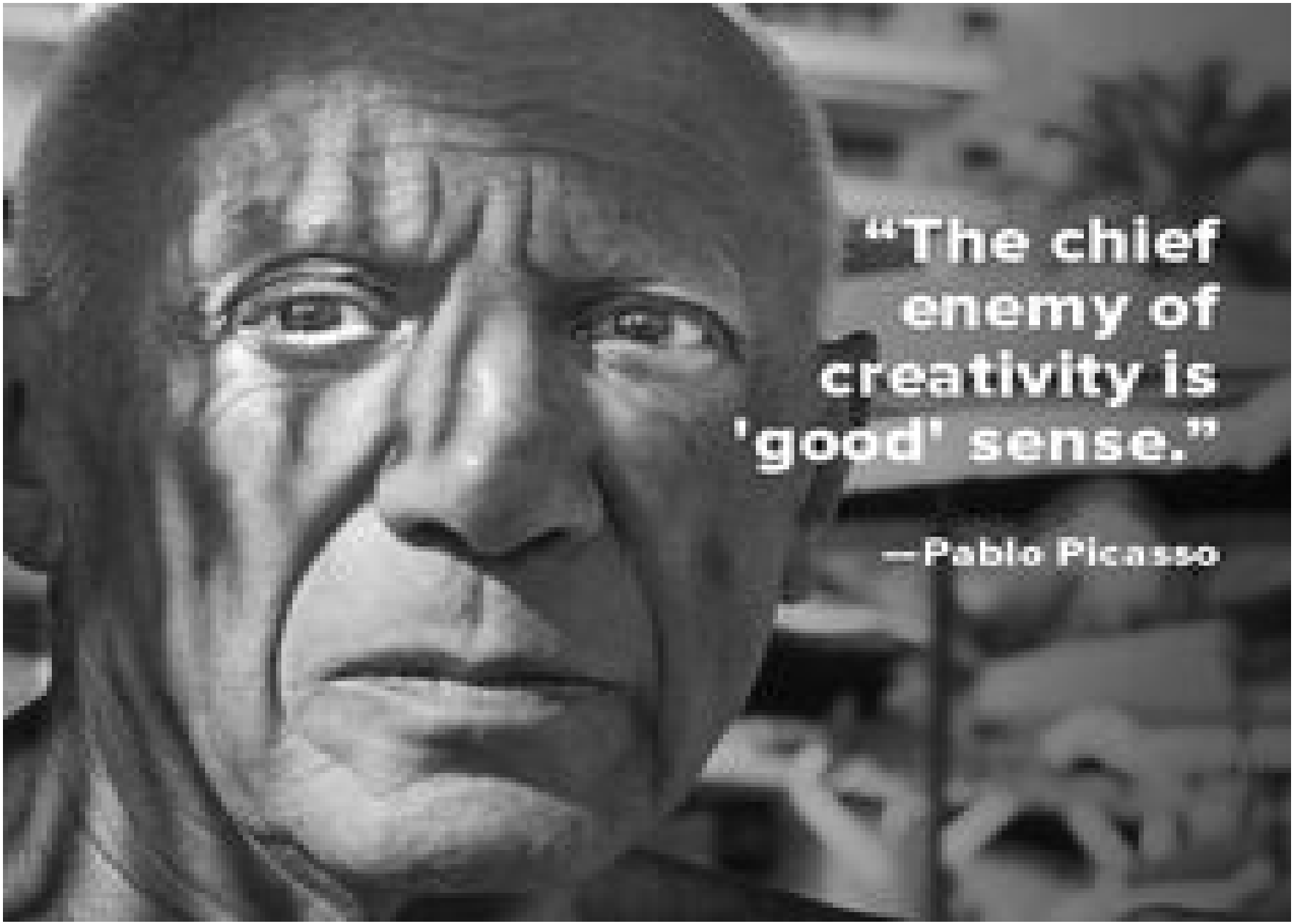
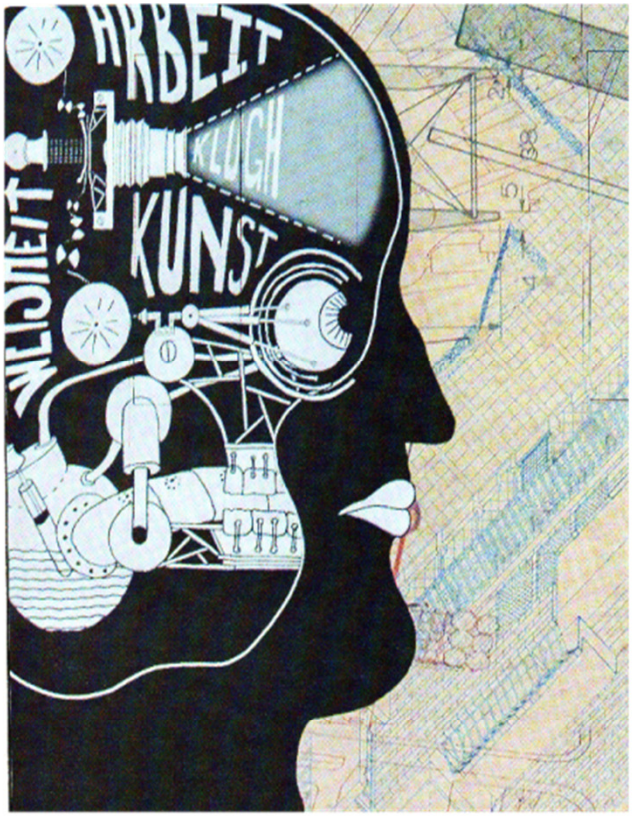
Part 1
Basic concepts on CREATIVITY


"The chief enemy of creativity is 'good' sense."
—Pablo Picasso



Creativity is the talent of originating – **joyfully** – some new entity of any sort, by conceiving original or unusual thinking processes.

But creativity cannot stem from nothingness, it requires a combination of skills and hard work

TO ACHIEVE CREATIVITY, THERE IS A POINT TO BE LOOKED AT

Audace,Audace….Toujours de l'Audace
(Napoléon Bonaparte)

Creativity focus on an infinity of issues, shifting from one to the other .The team involved in creativity takes a lot of pleasure out of the process (or purely intellectual reward). There is no such thing as targeted creativity or imposed creativity, driven by external forces to accomplish any task

As opposed to this,

Innovation requires a problem solving attitude, directed to a given product. Innovation may be fuelled by external forces that drive the process pointing out to a specified direction, and entailing some kind of reward, usually regarding the agent's social status

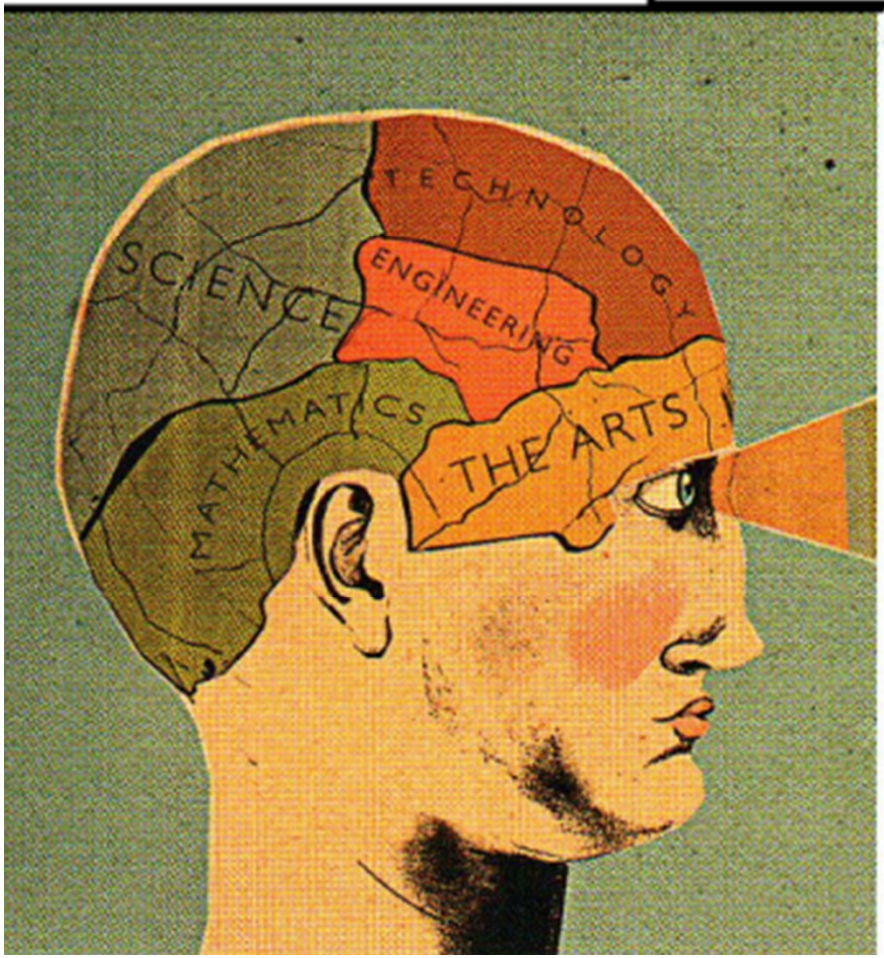
The Background of CREATIVITY is STEAM

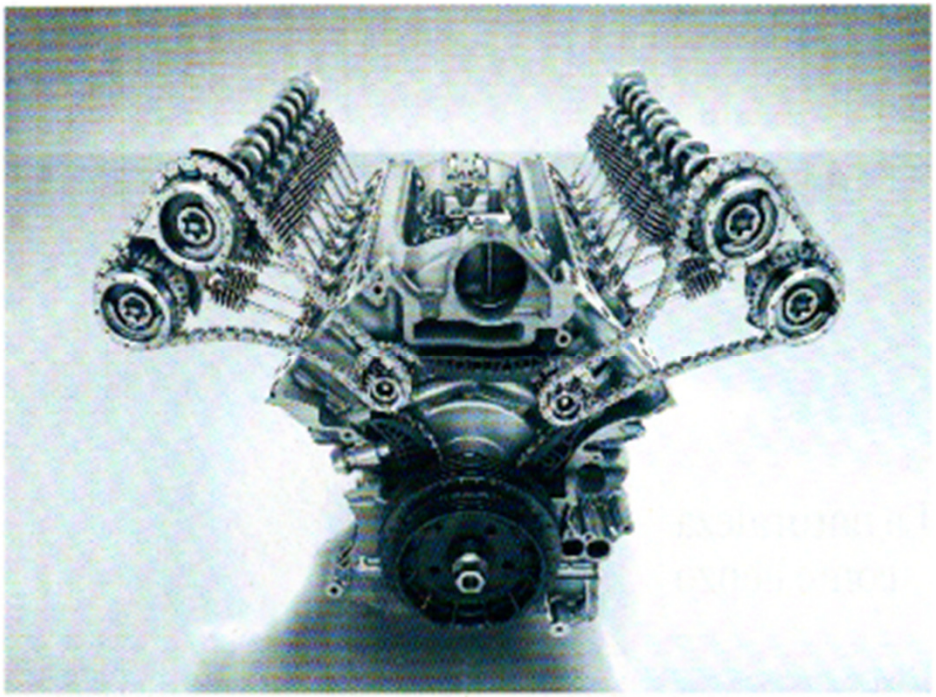
Nowadays the new industrial revolution is also STEAM driven

Science Technology Engineering

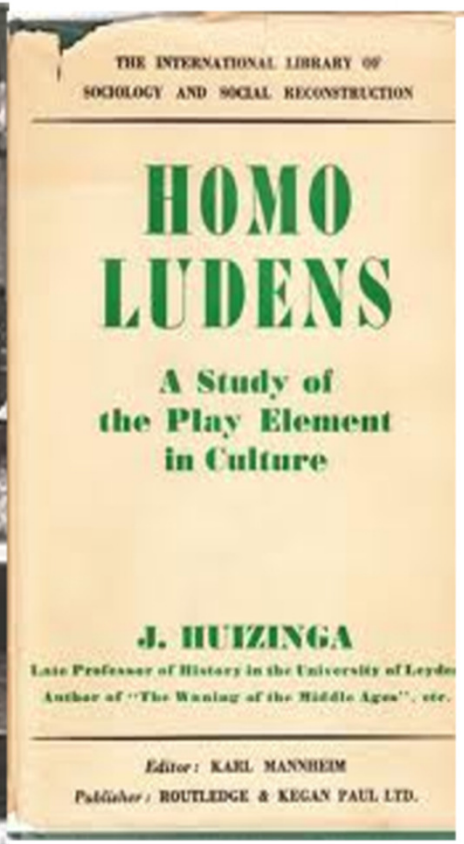
ARTS

MATHS



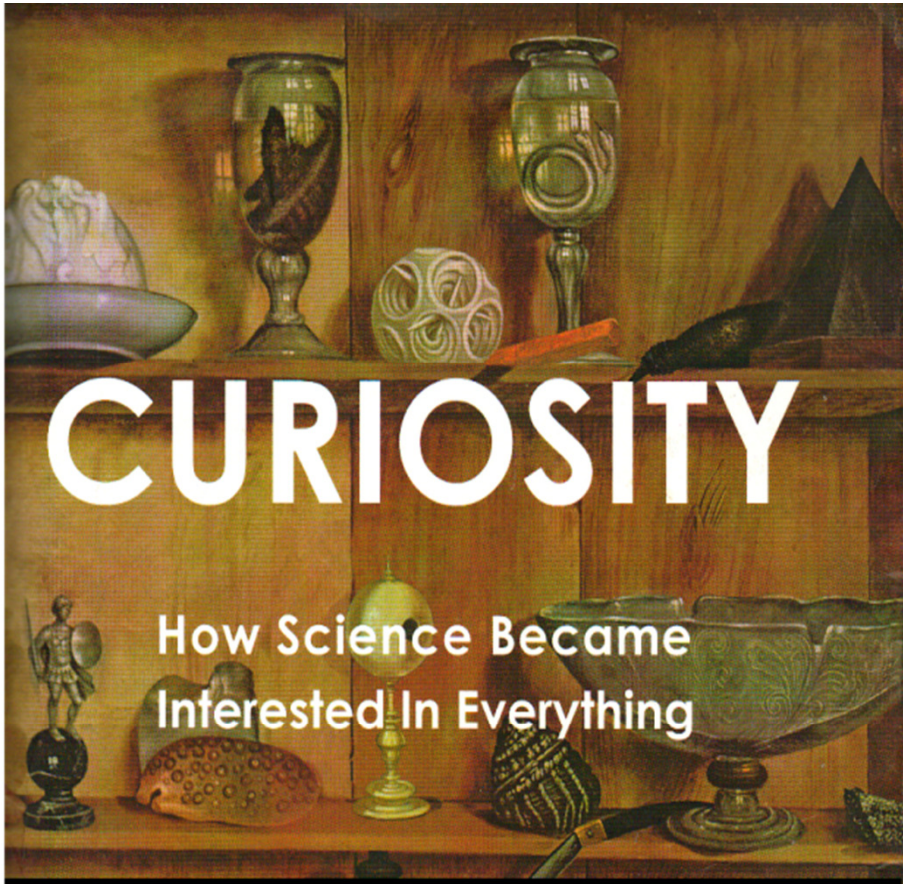


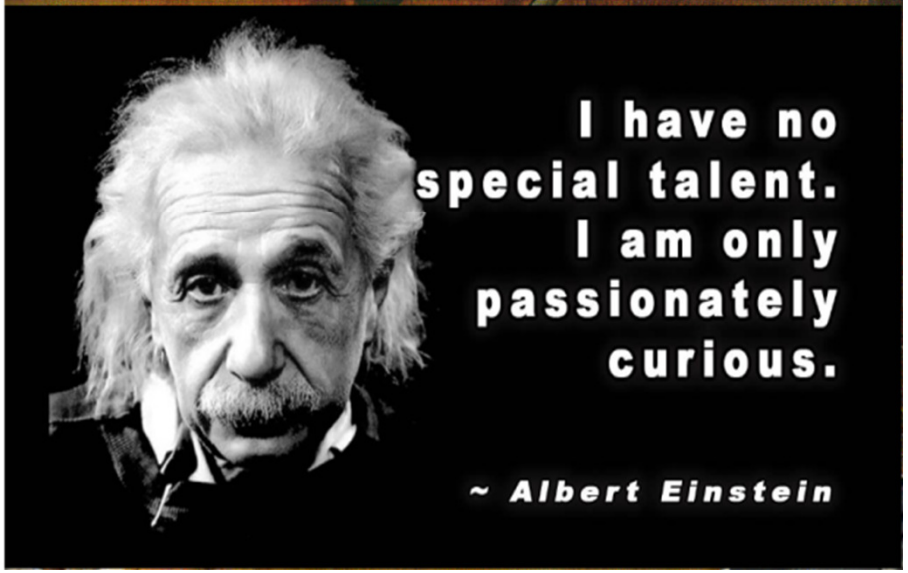
CREATIVITY leads to happiness,
as the Homo Faber
leads to the Homo Ludens (Huizinga)



MAGRITTE

THE SINE QUA NON CONDITION FOR CREATIVITY is CURIOSITY





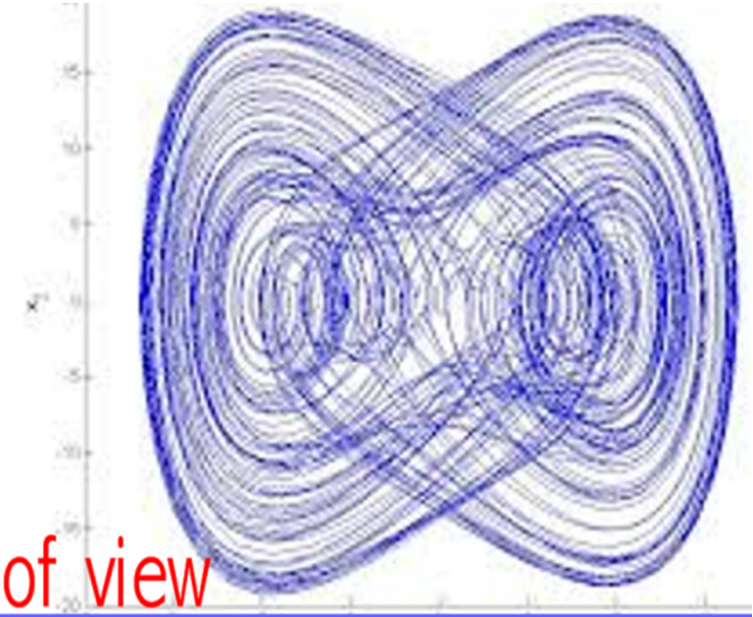
CREATIVITY

looking at NON -LINEAR COMPLEXITY

and

HYBRIDIZATION

from a systemic and cooperative point of view



The coupling of biology with computer science boosted **CREATIVITY**

Part 2

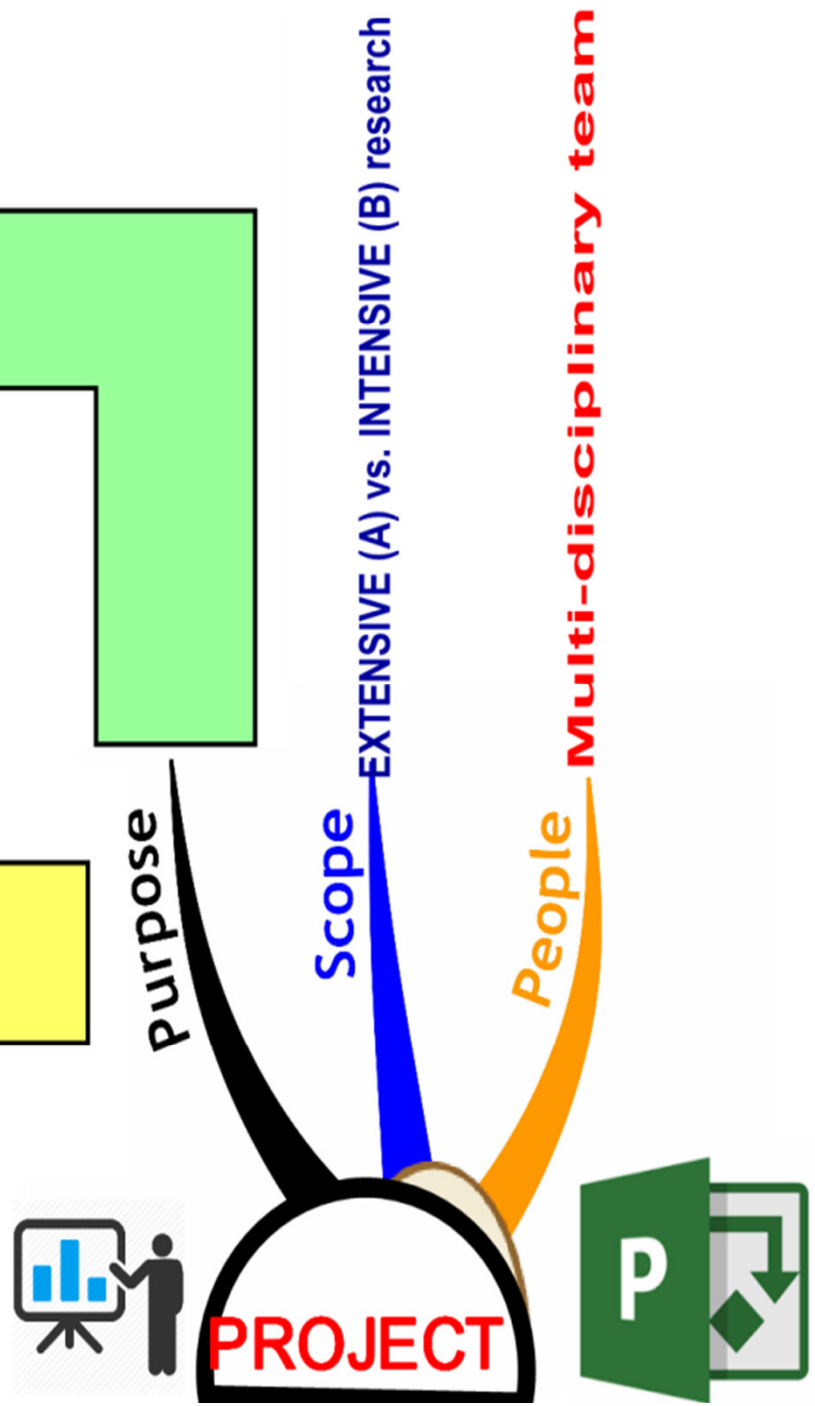
CREATIVE RESEARCH PROJECTS

NEW THEORY
STARTING
FROM A
FRESH IDEA

A

DEEPENING
ONGOING
RESEARCH

B



CREATIVITY

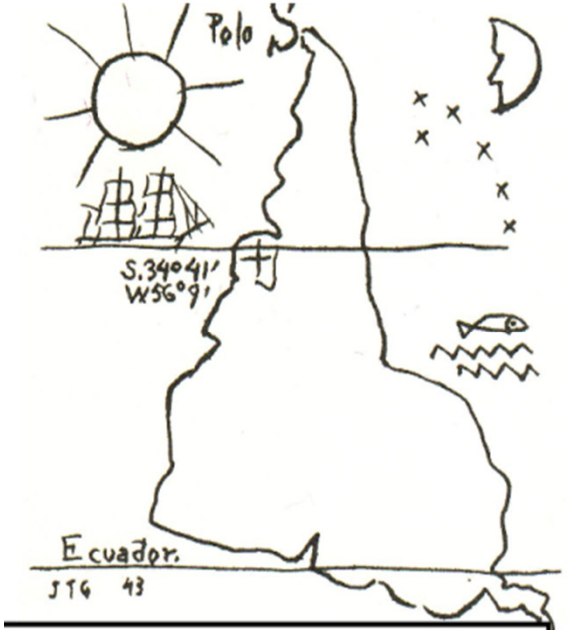
per se

may lead to some sort of 'madness'

TO BECOME A (VERY) VALUABLE INTELLECTUAL SKILL

its outputs must be checked through an appropriate battery of experiments

TYPE A research
must be tested against reality through
TYPE B research
involving some kind of experiments



UPSIDE - DOWN

film by Paul Schauring (2010)
in which guards and prisoners
switch roles

IN THE SCOPE OF EXTENSIVE
RESEARCH
FOR THE PURPOSE OF
TESTING A FRESH IDEA

EVERY EXPERIMENT

IS A WAY OF
LOOKING
AT THE 'REAL'
FROM A
DISRUPTIVE POINT
OF VIEW

Aiming at guiding the development lines of different types of research

(EXTENSIVE OR INTENSIVE)

it's a good practice to submit partial results of the project

- under a paper form -

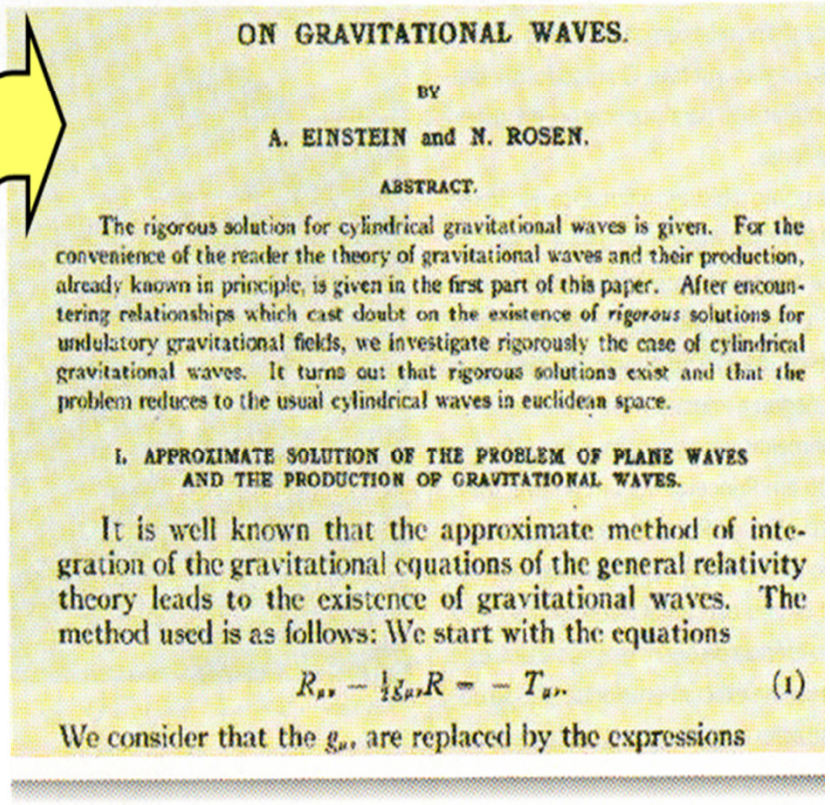
to a Scientific Journal

CRITICAL DISCUSSION BY REFEREES

If one is not going along the 'right' path, it happens that a referee's critical note may be useful to correct some mistake

A paradigmatic issue to illustrate this is the case of the refusal by *Physical Review* of a paper by Einstein & Rosen in 1936 regarding Gravitational Waves, which were given as non-existent by the authors.

In 1937 they corrected their view and postulated - in a new paper for the *Franklin Journal* - the existence of such waves, detected in 2016



ON GRAVITATIONAL WAVES.

BY

A. EINSTEIN and N. ROSEN.

ABSTRACT.

The rigorous solution for cylindrical gravitational waves is given. For the convenience of the reader the theory of gravitational waves and their production, already known in principle, is given in the first part of this paper. After encountering relationships which cast doubt on the existence of *rigorous* solutions for undulatory gravitational fields, we investigate rigorously the case of cylindrical gravitational waves. It turns out that rigorous solutions exist and that the problem reduces to the usual cylindrical waves in euclidean space.

I. APPROXIMATE SOLUTION OF THE PROBLEM OF PLANE WAVES AND THE PRODUCTION OF GRAVITATIONAL WAVES.

It is well known that the approximate method of integration of the gravitational equations of the general relativity theory leads to the existence of gravitational waves. The method used is as follows: We start with the equations

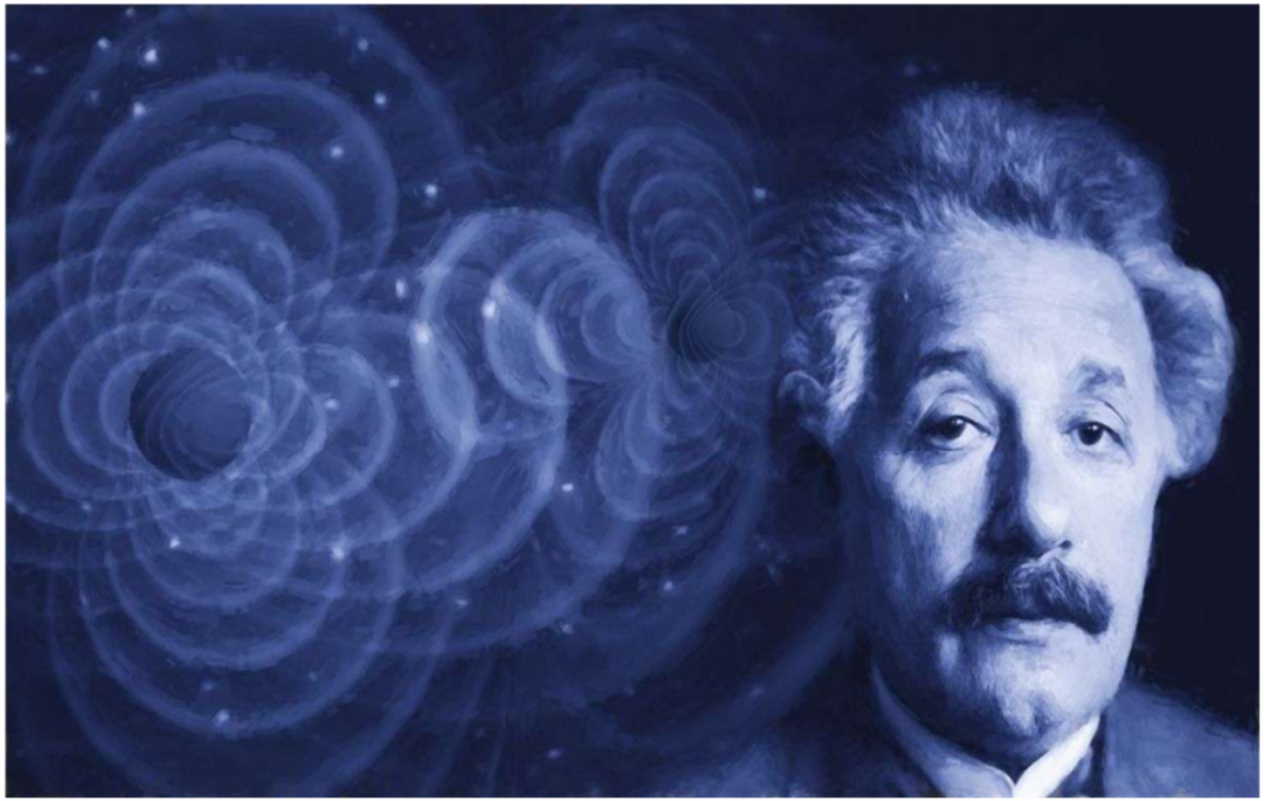
$$R_{\mu\nu} - \tfrac{1}{2}g_{\mu\nu}R = -T_{\mu\nu}. \qquad (1)$$

We consider that the $g_{\mu\nu}$ are replaced by the expressions

Einstein's perseverance on his idea concerning

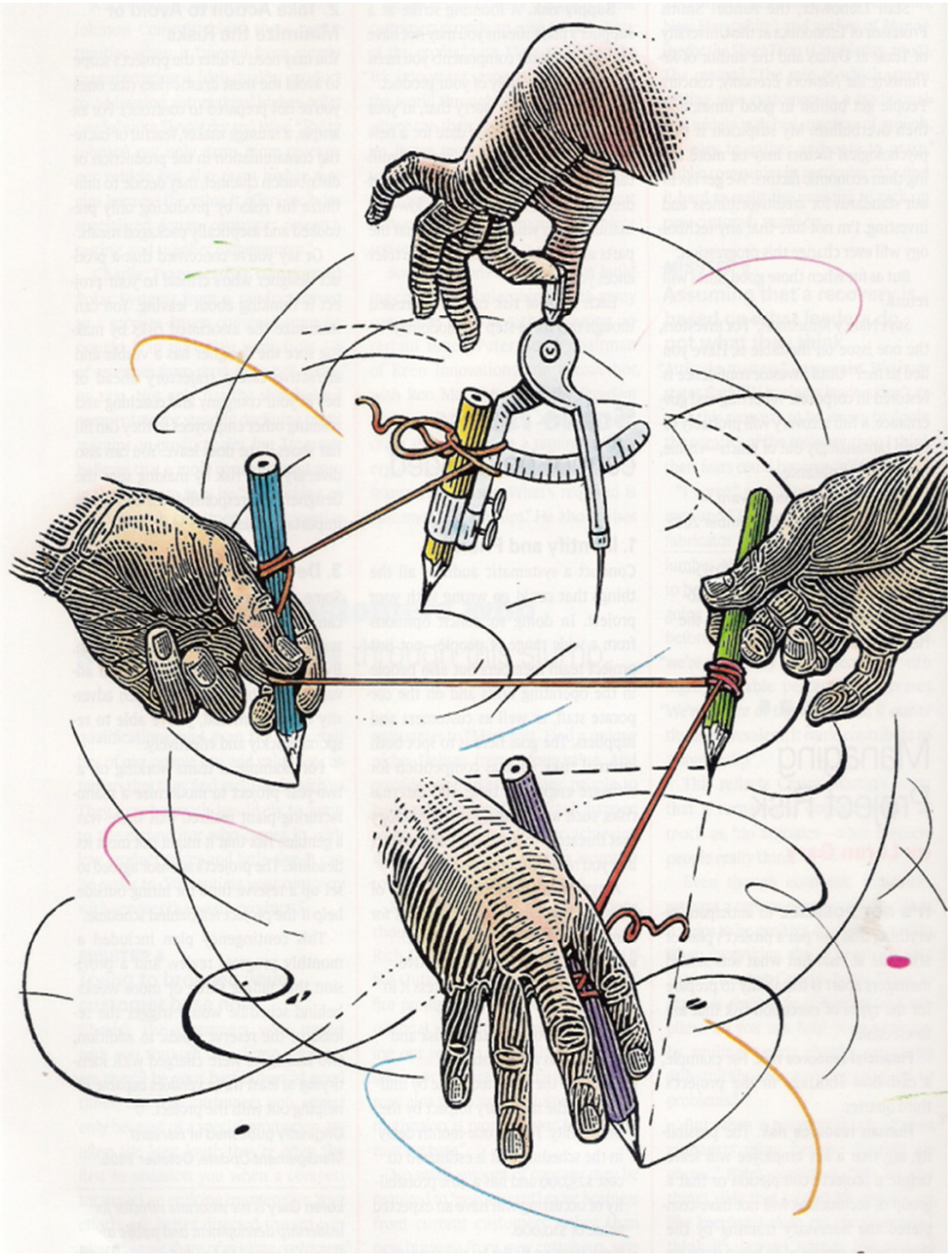
GRAVITATIONAL WAVES

Experimental tests acomplished in 2016 have shown that he was right



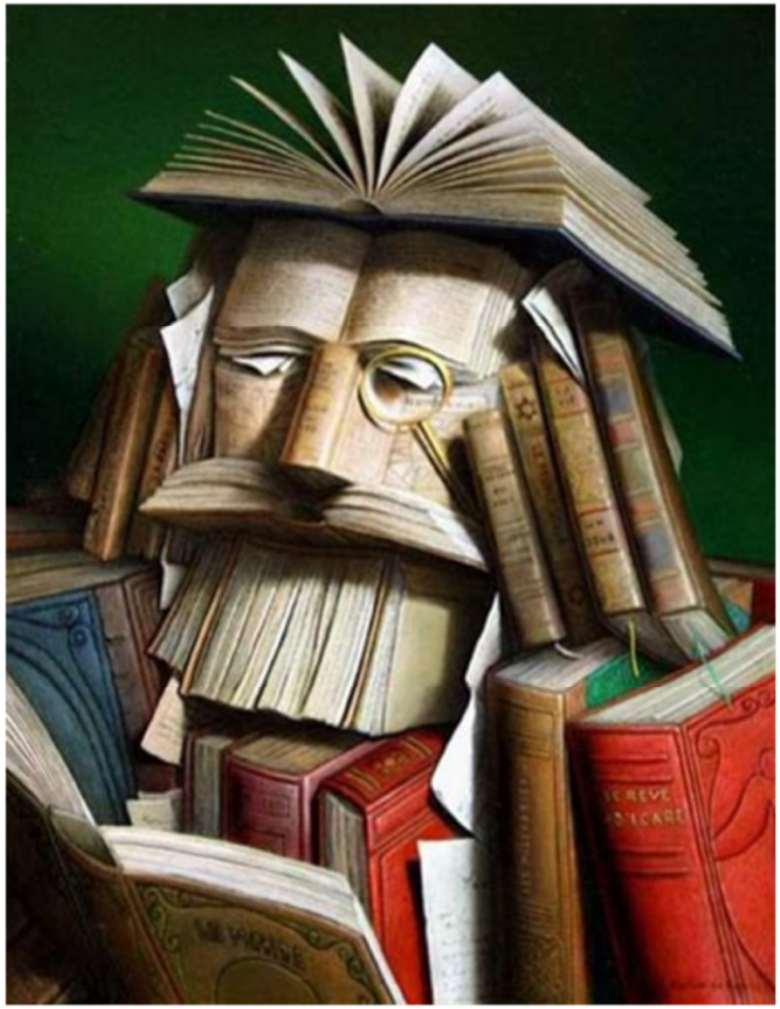
It is obvious that fresh ideas require **CREATIVITY**, but they are not **CREATED** from nothingness

What boosts CREATIVITY is the linkage of intelligence through **webs of knowledge**



The WEBS of KNOWLEDGE

relate insights from different disciplines capturing culturally productive cosmopolitism



A proper WEB OF KNOWLEDGE is met
when EXTENSIVE TYPE A (requiring Hyper Attention)
is balanced with INTENSIVE TYPE B (requiring Deep Attention)

while deep attention requires focus, hyper attention allows shifting from one task to another, from one flux of information to another
(Katherine Hayles)

Part 3

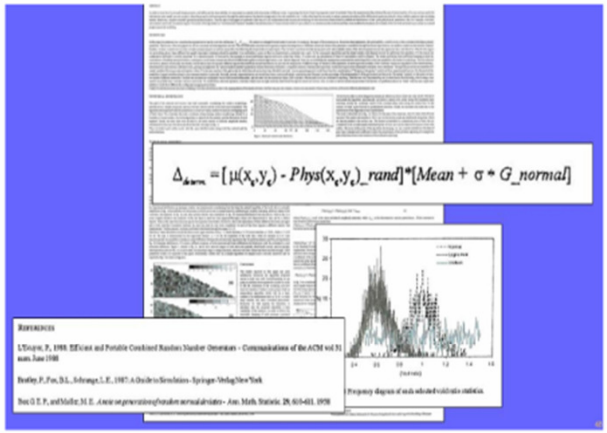
SHRINKING THE GAP BETWEEN SCIENCE AND ART

Leonardo's wide range creativity is complemented by an AI algorithm : his most pristine artwork

(Vitruvian Man)

is blurred as a metaphor of today's world

BIO-INSPIRED ALGORITHMS



Since everybody - mainly the scientist corporation - is embedded in a digital environment

What is happening now is a shrinking of the gap between hard and soft sciences, as opposed of C.P.SNOW thesis of the 1930's (The Great Divide)

From the emergence of our species TECHNOLOGY runs in parallel with ART

PART 4

THE PAINTER-ROBOTS PROJECT

PAINTER ROBOTS

- 15 years ago, I've coordinated a FCT funded project, in the area of ART
- The purpose was to create a machine able to produce PAINTINGS, instead of automobiles
- A multidisciplinary team was gathered
- The project attained the expected results

As an example of a TYPE A project
a swarm of PAINTER-ROBOTS was developed and their performance was presented to a variety of audiences

The methodology was synthesized in a Book
A **paper** was submitted to a Journal

FOOTPRINT DELFT ARCHITECTURE THEORY JOURNAL

Home > Issue # 15 | Autumn 2014 | Dynamics of Data-Driven Design > **Moura**

A New Kind of Art [Based on Autonomous Collective Robotics]

Leonel Moura, Henrique Garcia Pereira

Abstract

The paper addresses the rationale of a process that produces artworks made by a swarm of robots. This process relies on the interaction, though the environment, of a set of robots designed to create spatiotemporal patterns from an initial homogeneous medium (the canvas). Inspired by social insect societies, the approach presented here exploits robot-robot and robot-environment interactions to develop emergent behaviour. The swarm intelligence concept is crucial to this approach because the viability of the team (group of robots) is required in order to achieve the viability of the individual. Without any central coordination or plan, the group of robots produces its artworks on the basis of a data-driven (bottom-up) process. Moreover, each robot can be viewed as an autonomous agent because it has on board all the resources required to provide the global outcome of the experiment, including sensors, actuators, and the controller, which demonstrates a reactive behaviour by reinforcing a previously made signal (positive feedback). The process is also presented in the context of Machine Art, and a detailed technical description of each robot is given, as well as an example of artworks produced by the collective behaviour of the set of robots.

Full Text:

VIEW ARTICLE

About The Authors

Leonel Moura

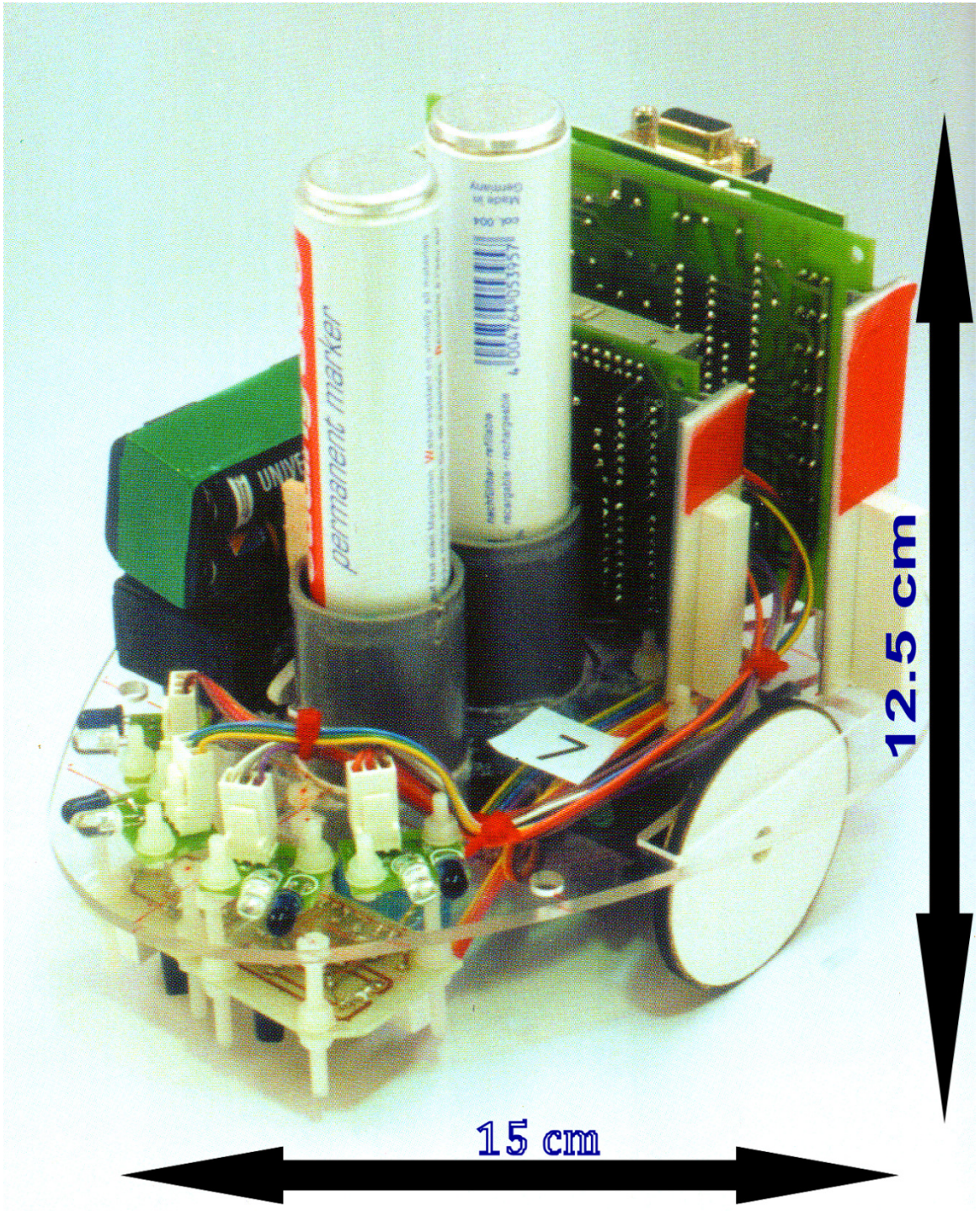
Portugal

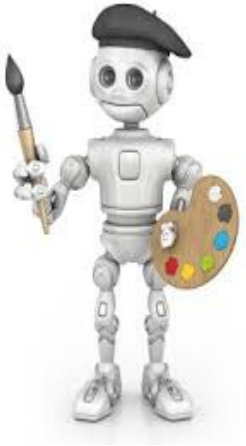
Leonel Moura is an artist working in field of Artificial Intelligence and Robotics. One of his robots is on permanent display in the American Museum of Natural History, New York. He has created several Art Robots and a Robotarium: a kind of zoo for robots.

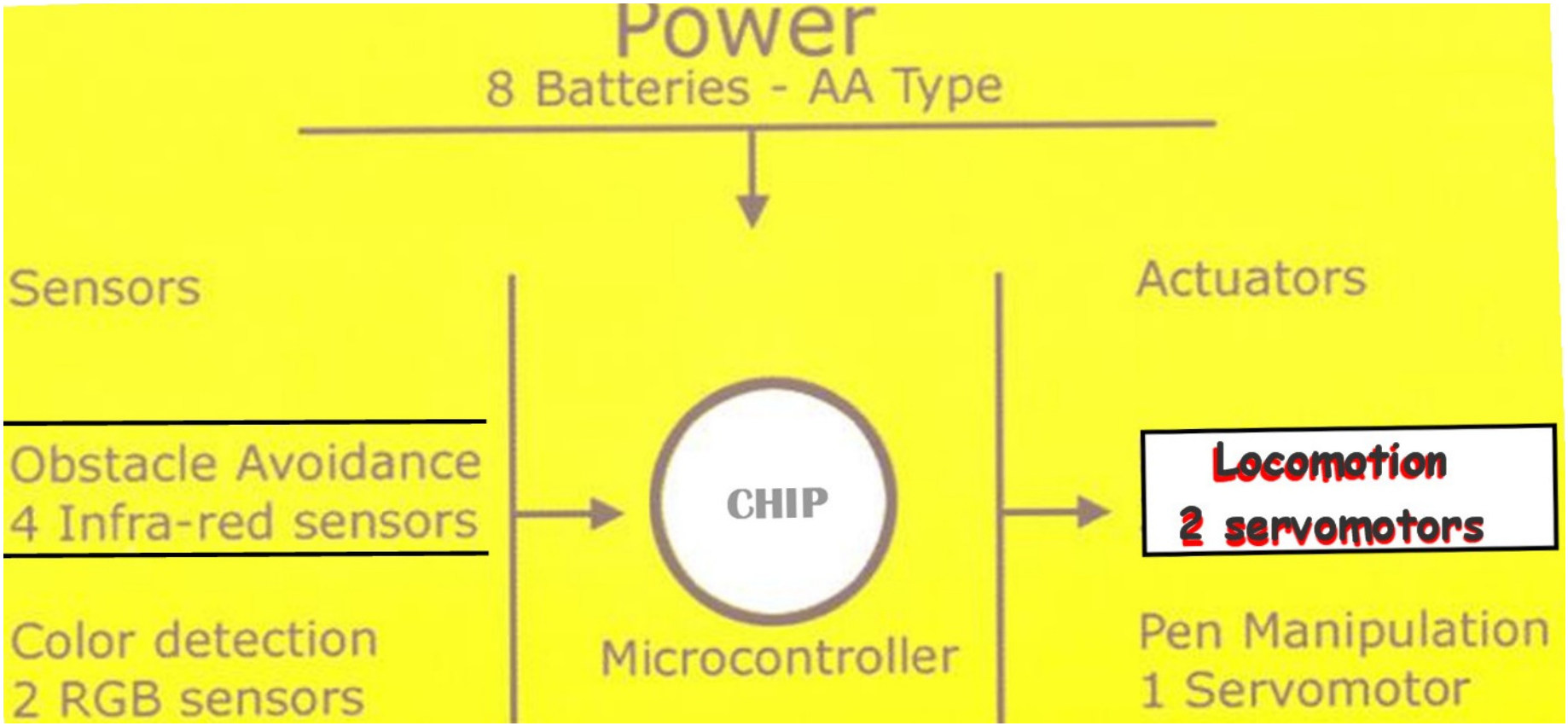
Henrique Garcia Pereira

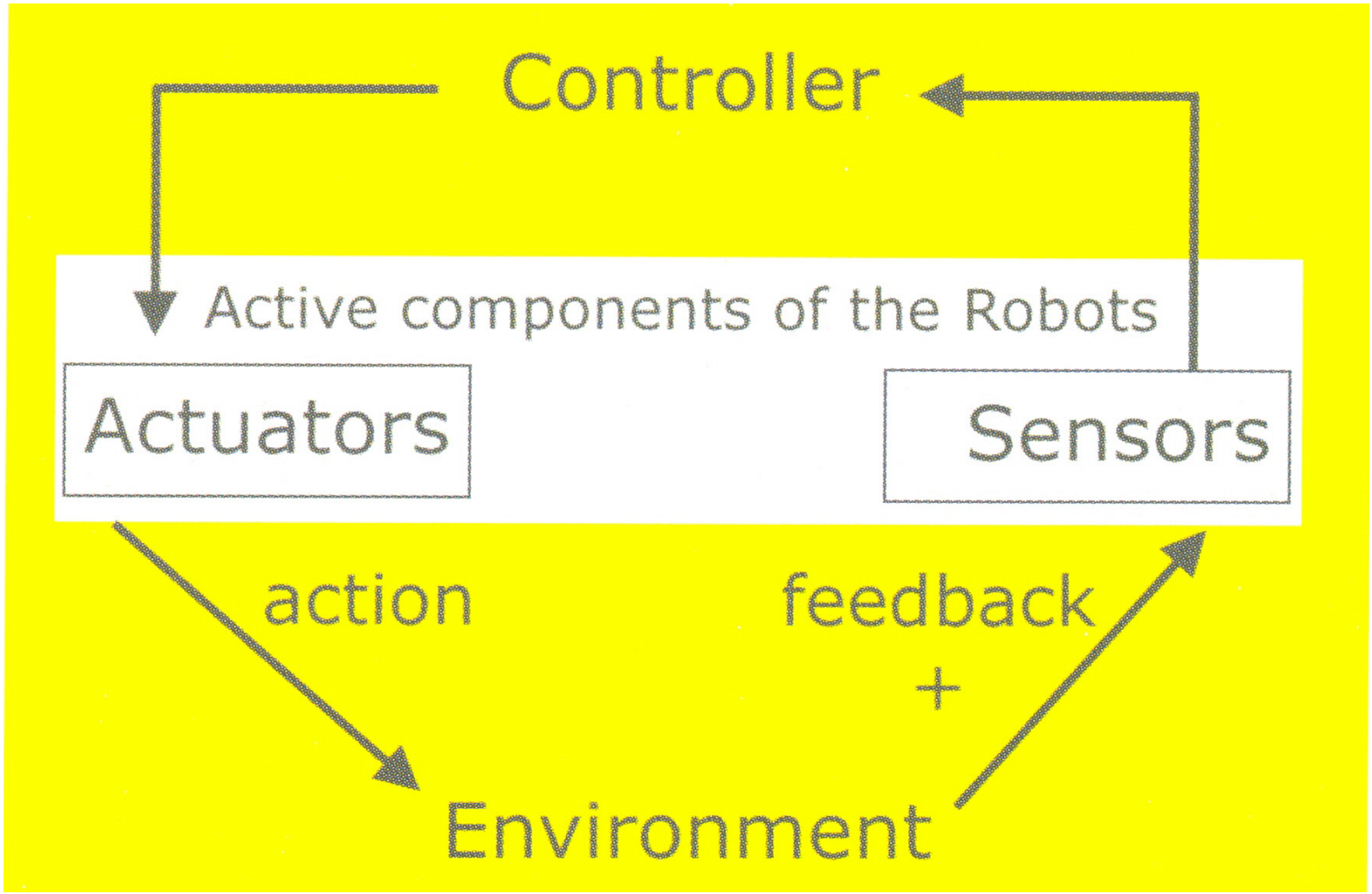
Portugal

Henrique Garcia Pereira is full professor at the Instituto Superior Técnico, Lisbon. His topics of research include Applied Statistics, Environmetrics and Epistemology. He has written over one hundred scientific papers and seven books

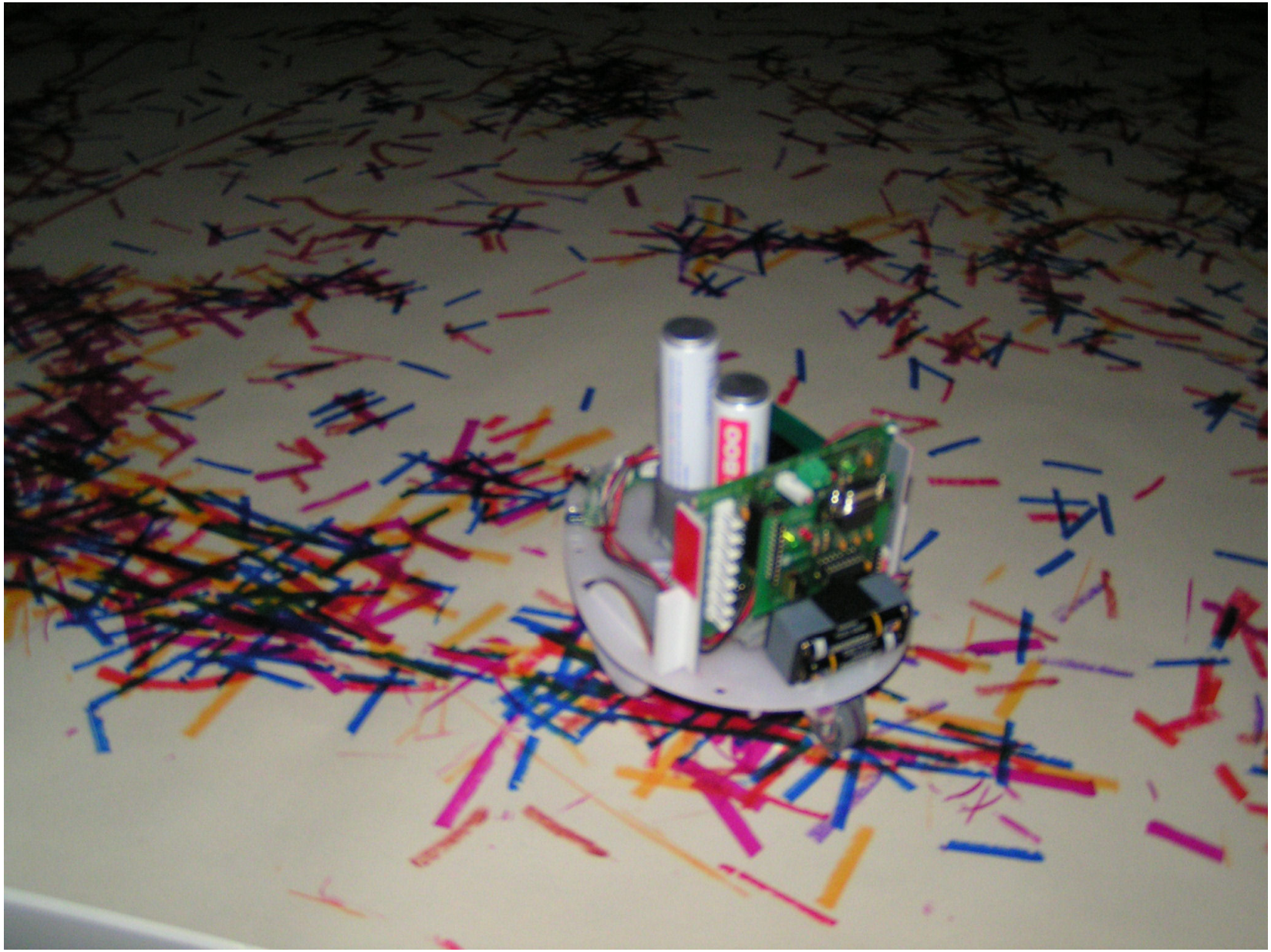

permanent marker
12.5 cm
15 cm

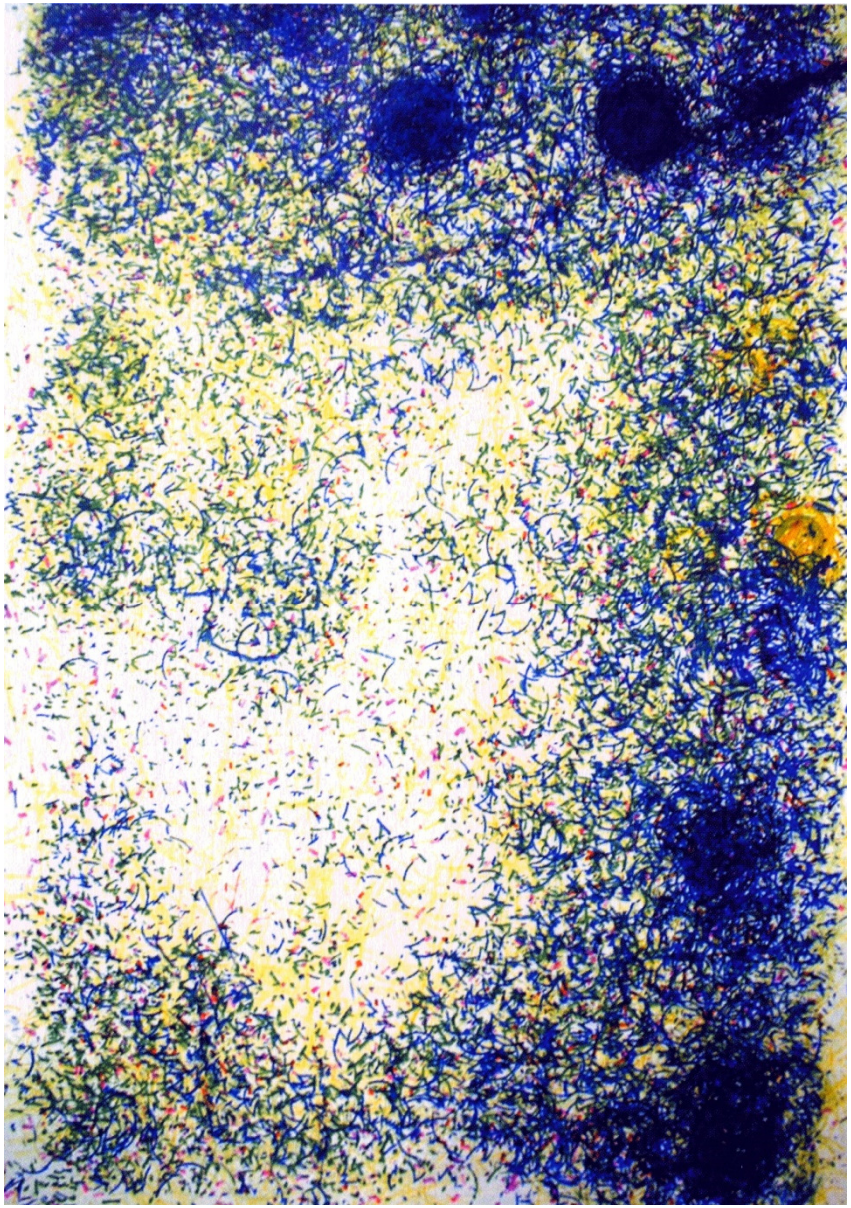


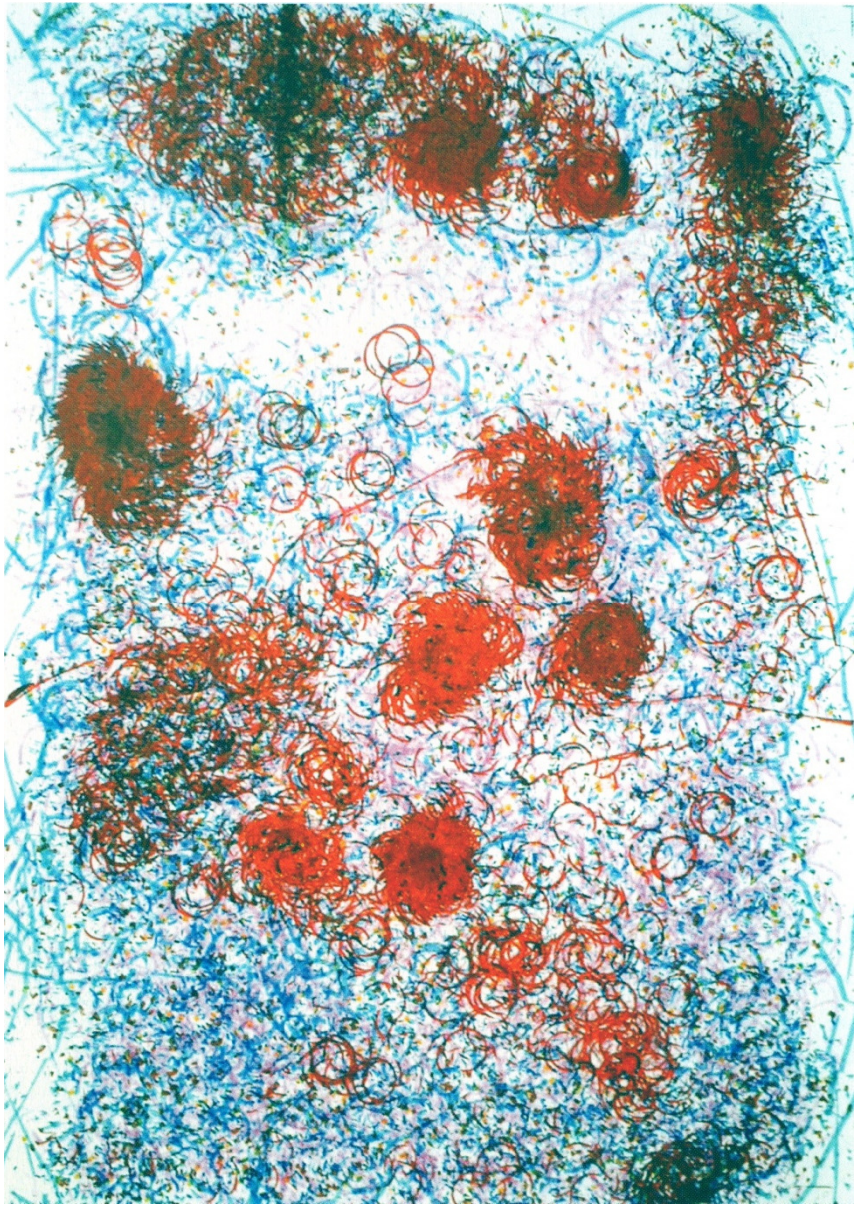

Power
8 Batteries - AA Type
Sensors
Obstacle Avoidance
4 Infra-red sensors
Color detection
2 RGB sensors
CHIP
Microcontroller
Actuators
Locomotion
2 servomotors
Pen Manipulation
1 Servomotor

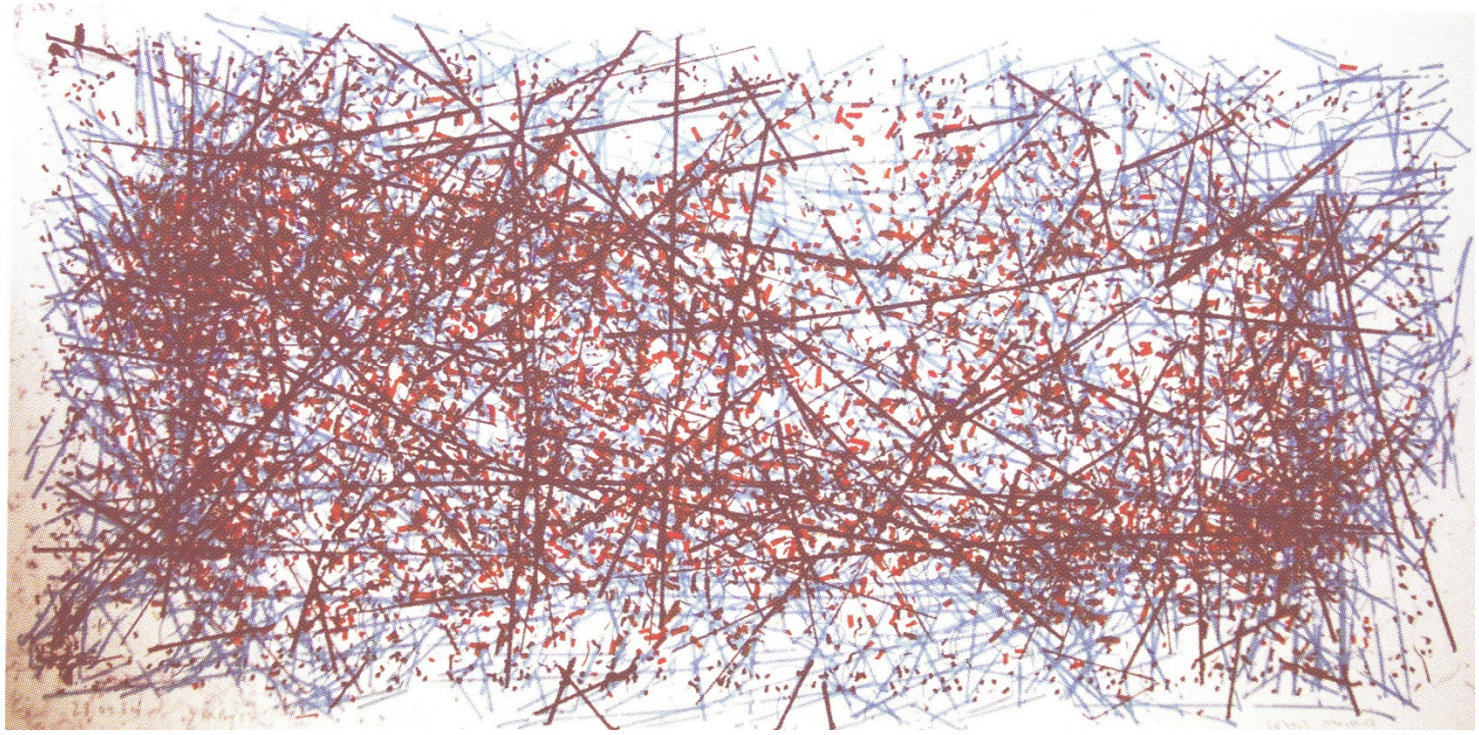

Controller
Active components of the Robots
Actuators
Sensors
action
feedback
+
Environment

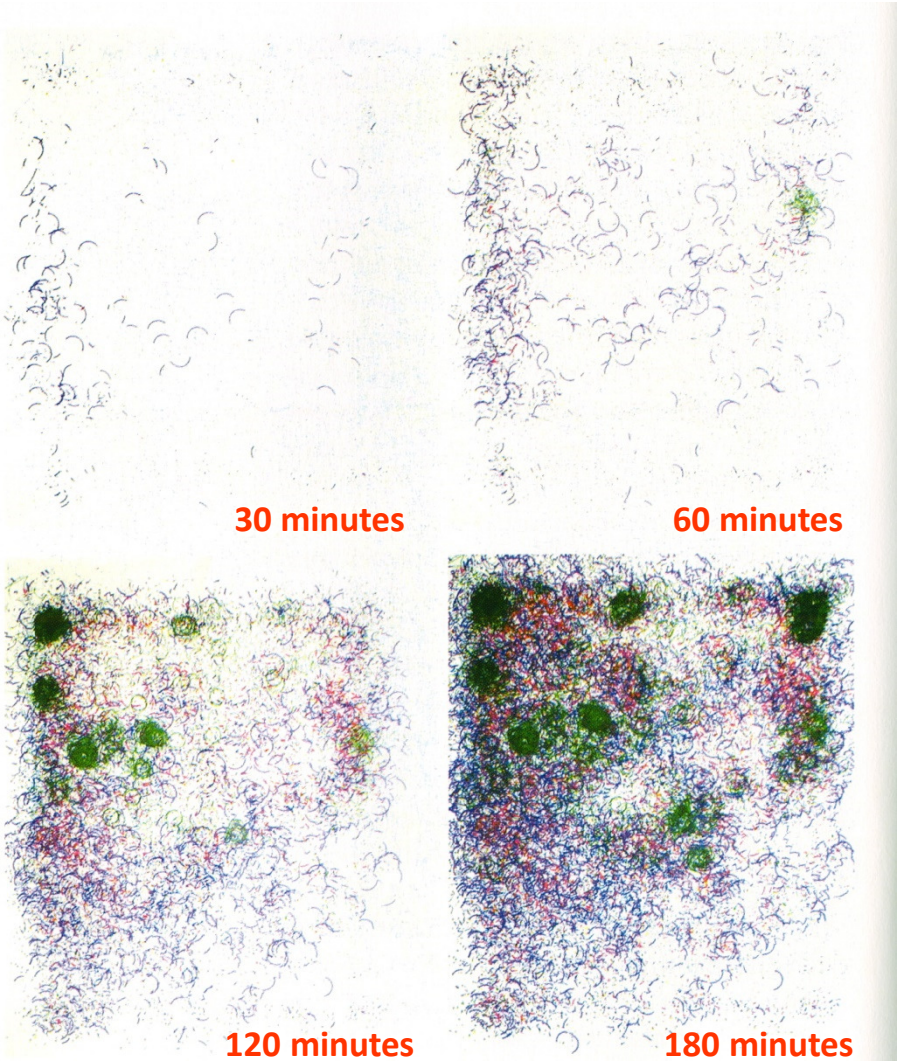
SWARM OF PAINTER-ROBOTS





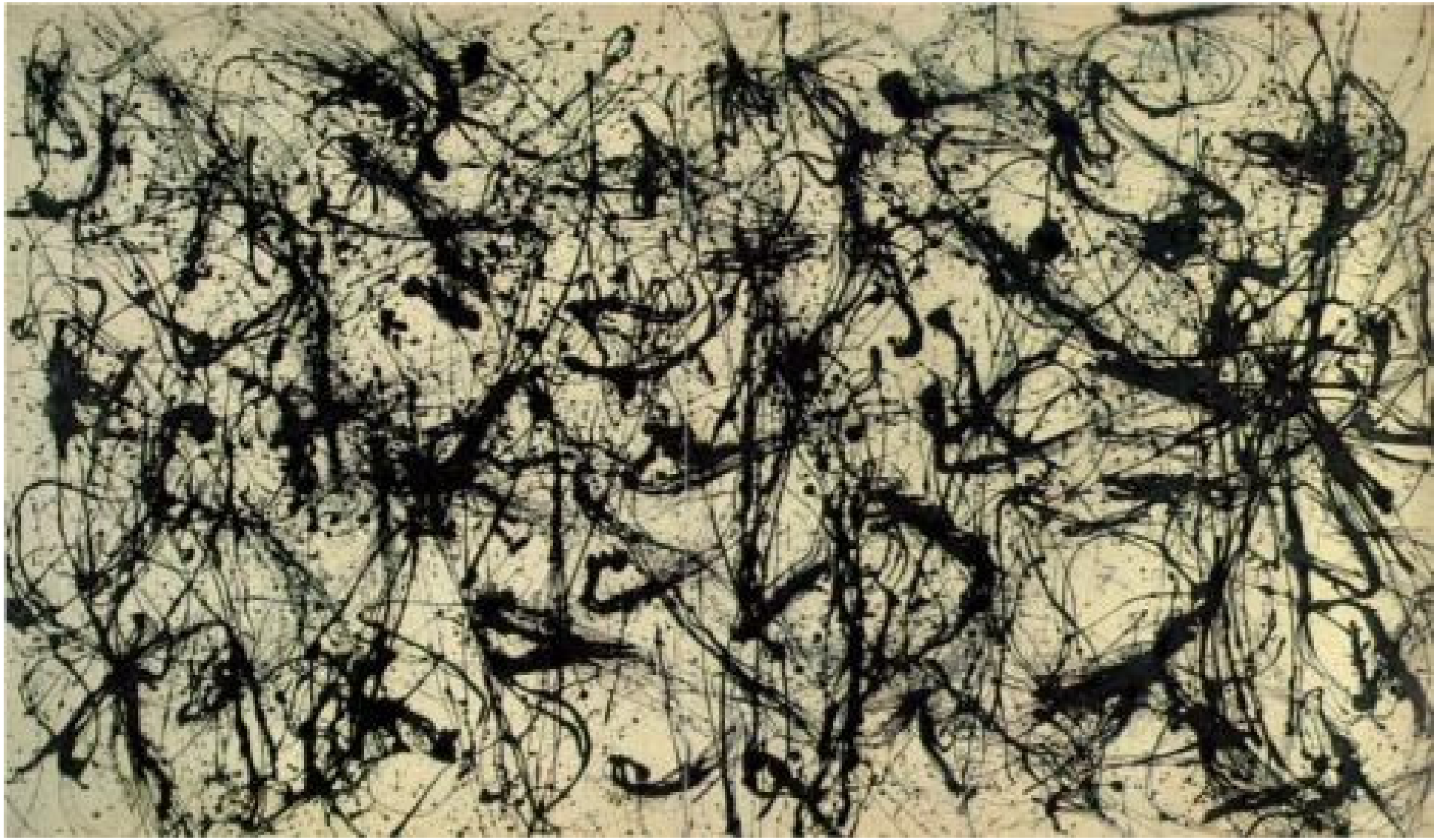




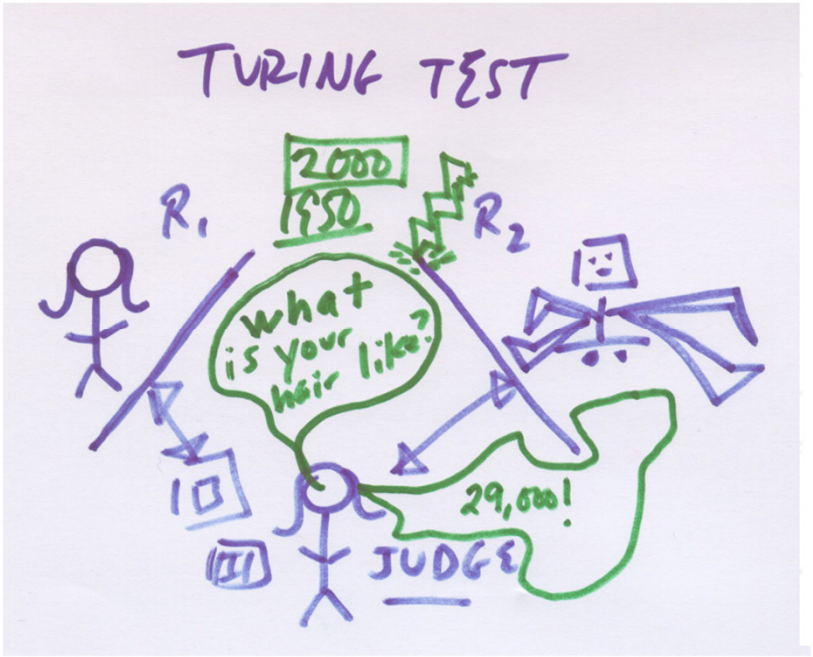


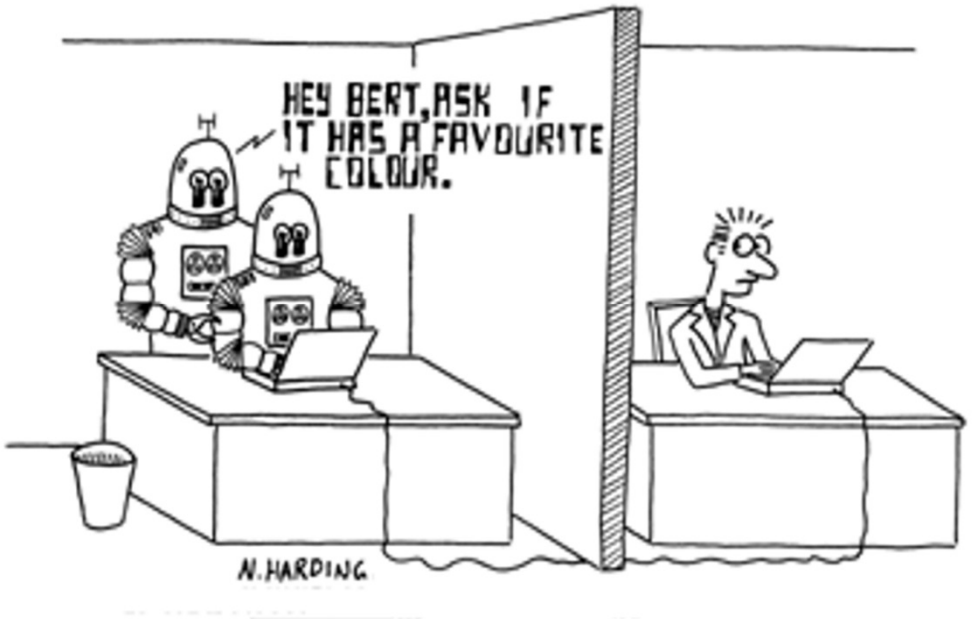
PAINTING IN PROGRESS

Final Oeuvre



POLLOCK, 1950, Number 52

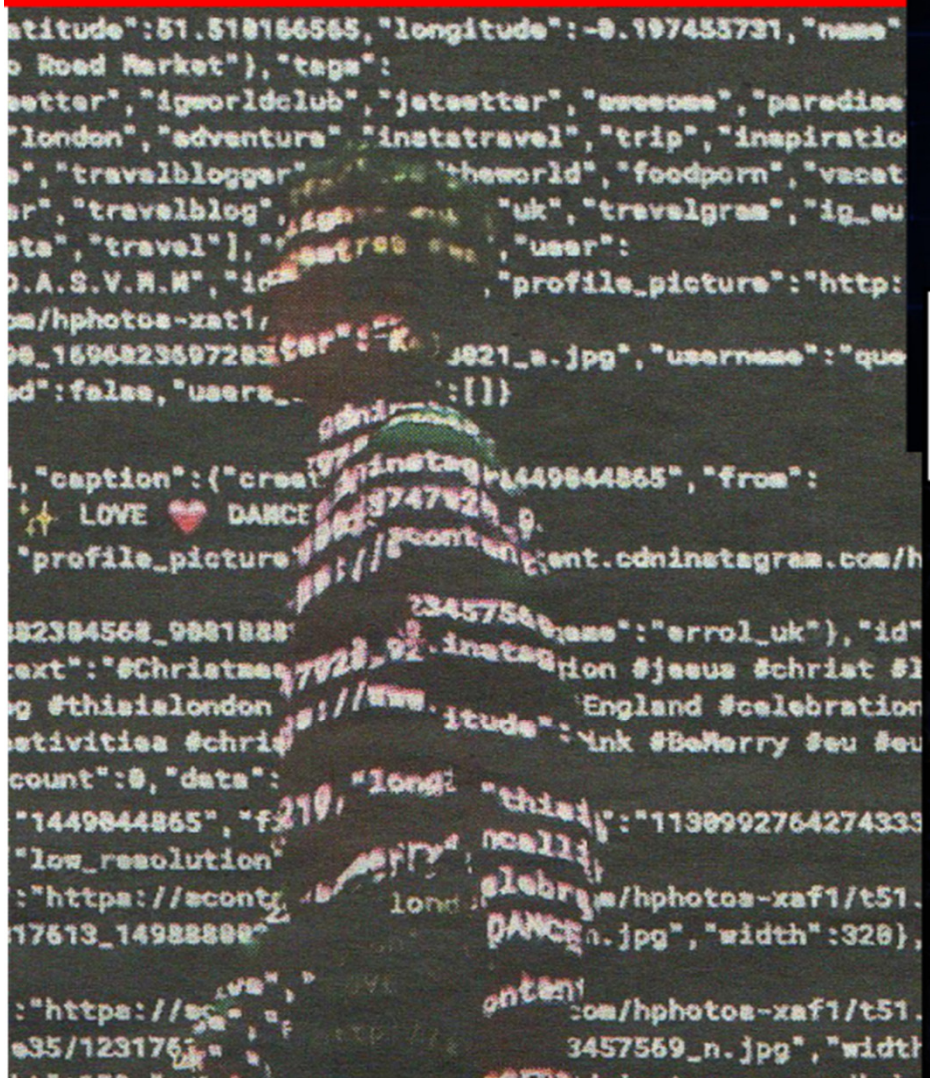

TURING TEST
2000
1950
R1
R2
What is your hair like?
10
111
29,000!
JUDGE


HEY BERT, ASK IF IT HAS A FAVOURITE COLOUR.
N. HARDING

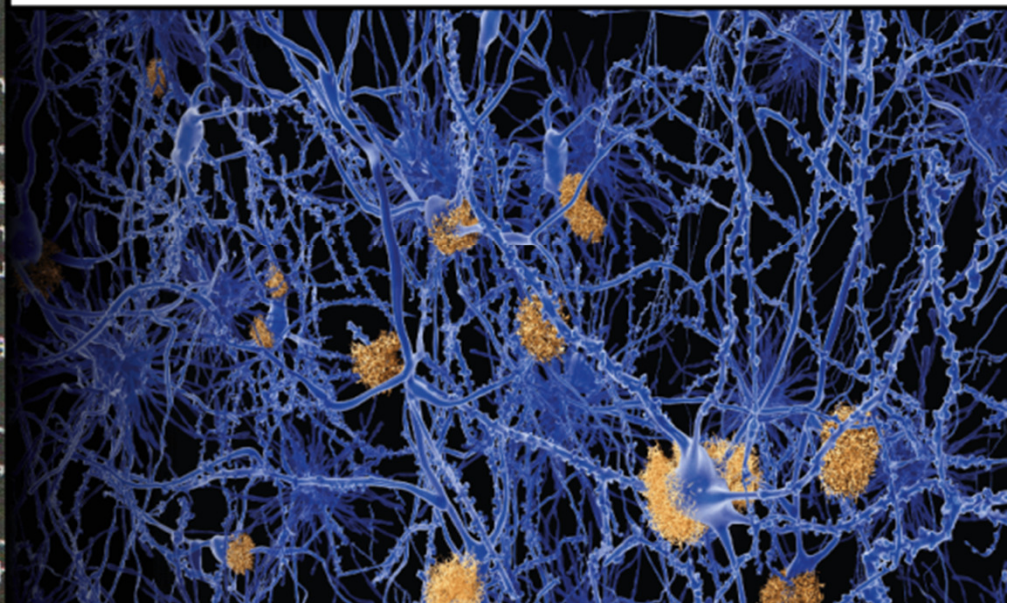
PART 5

FUTURE DEVELOPMENTS

DIGITAL MAN



ARTIFICIAL SYNAPSIS



PROJECT FOR FUTURE CREATIVITY

HUMANIZE ROBOTS, ROBOTIZE HUMANS

FUTURE is not out there to be discovered:
it has to be creatively designed

Novel connections between ideas,
leading to wonder and interestingness,
that's what

CREATIVITY

is all about

NÃO

Ginni Ronetti
CEO
da
IBM

SIM

"A inteligência cognitiva sempre trabalhará em conjunto com o ser humano. Alimentar essa ideia, de um apocalipse protagonizado pelas máquinas, é um desserviço à civilização"