

A humble SciArt view on Quantum Alphabets

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For: School of Art, Design and Media
Nanyang Technological University (NTU); Singapore

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Quantum technology storyline

Quantum technology shows promising business opportunities and is expected to become a global economic driver soon. Groundbreaking new applications will change daily life and shape our society.

But quantum science is based on counterintuitive concepts and flies in the face of all human logic. Quantum realities can be expressed in mathematical equations but not fully translated into “understandable” language.

Therefore scientists and artists develop creative formats to fully access the quantum universe and its revolutionary applications.

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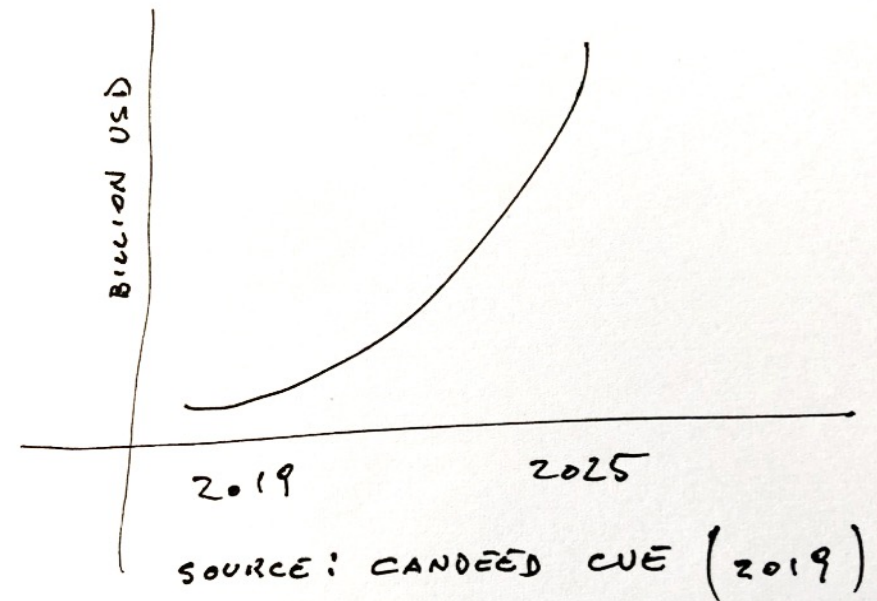
Quantum technology entangles with business

Quantum Computing Market Forecast
Artwork: Candeed Cue

Quantum Technology will provide revolutionary capacities in sectors like healthcare, aerospace, banking and financial markets, energy, trading systems, transport, agriculture defense and telecommunication.

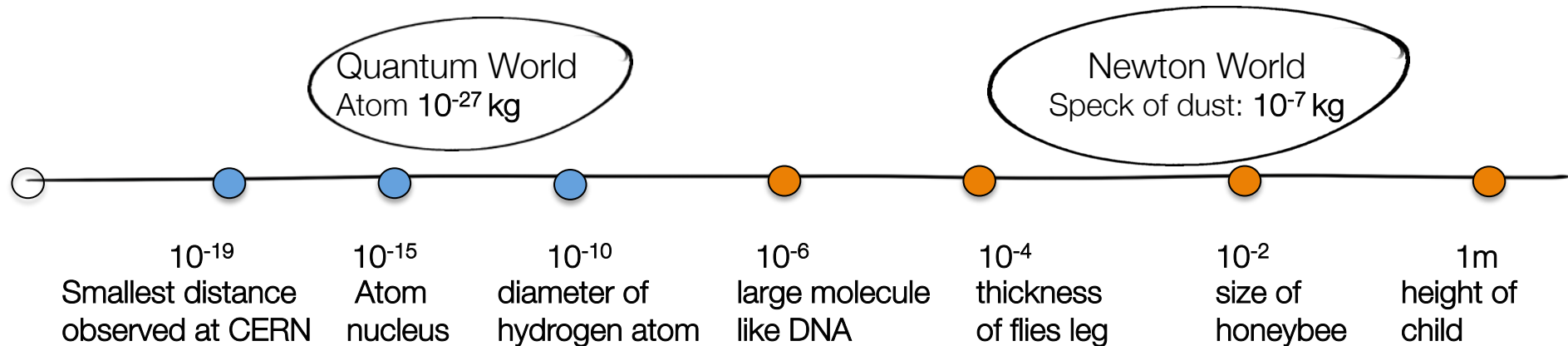
Where “big data” meets “real time applications” quantum technology will disrupt today’s markets.

Quantum computing, “Quantum Internet”, Quantum Sensors and Quantum Simulation will take us into a post digital era.



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In the scientist's laboratory



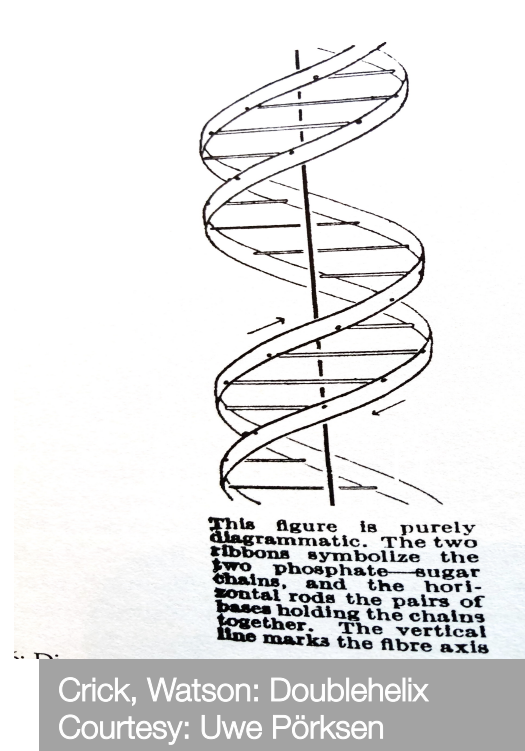
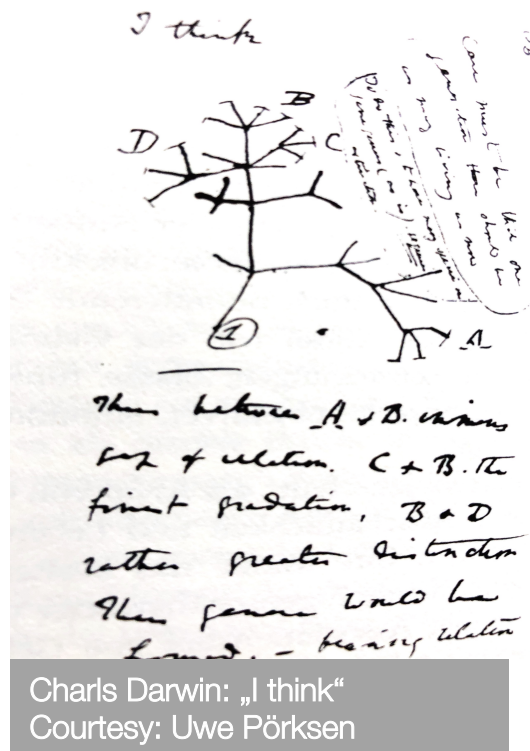
Newtonian and Quantum Scales
Source: Candeed Cue (2018)

In the Newtonian world of classical physics we feel comfortable when a bird is a bird, a dog is a dog and vegetables are healthy.

In the quantum world Heisenberg described: "We are in the situation of sailors, who ended up in a far away country ... with a very strange language. The only option is to carefully feel how to find one's way in the dark."

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In the scientist's laboratory



New paradigms ask for new languages. Metaphors are central to human conceptual thinking and communication. Metaphors put the known into an equation with the unknown

- Kepler's cosmic rotations with Rutherford's and Bohr's atom as a microscopic planet.

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In the scientist's laboratory

Niels Bohr, Werner Heisenberg and others performed experiments and had to express their findings in abstract language - mathematical equations. Their dilemma: In the new quantum world the language of classical physics simply does not work to fully understand the contradictory quantum concepts.

Reduced Planck constant, $\hbar/2\pi$

Mass of particle

Partial derivative of wave function (rate of change in dimension x)

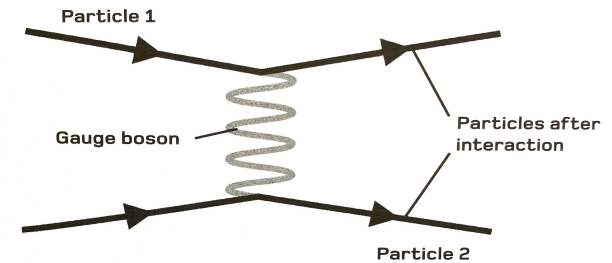
Potential energy of system

Total energy of system

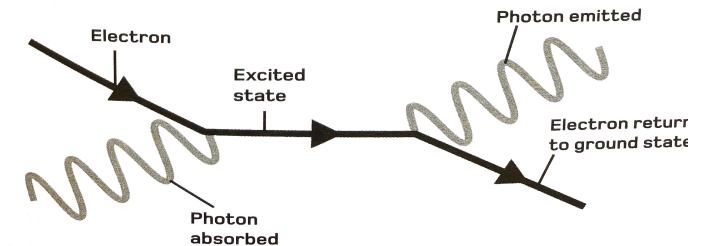
$$\frac{-\hbar^2}{2m} \frac{\partial^2 \Psi(x)}{\partial x^2} + U(x)\Psi(x) = E\Psi(x)$$

Erwin Schrödinger: Wave equation
Courtesy: Gemma Lavender

Simple interaction between fermions



Electron excitation



Richard Feynman: Feynman Diagrams
Courtesy: Gemma Lavender

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In the artist's studio

In the quantum universe a particle could be a wave and vice versa - time and space could merge into space-time.

Pablo Picasso: "A green parrot is also a green salad and a green parrot. Who only sees the parrot reduces his reality."

Picasso realized, that the geometry offers a new visual language to express the fourth dimension. He shows in two perspectives simultaneously full face and profile.

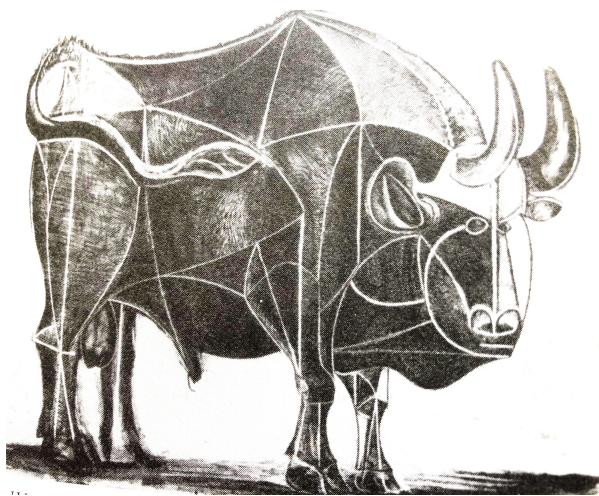


Pablo Picasso: Les Femmes d'Alger
Courtesy: MoMa; New York.

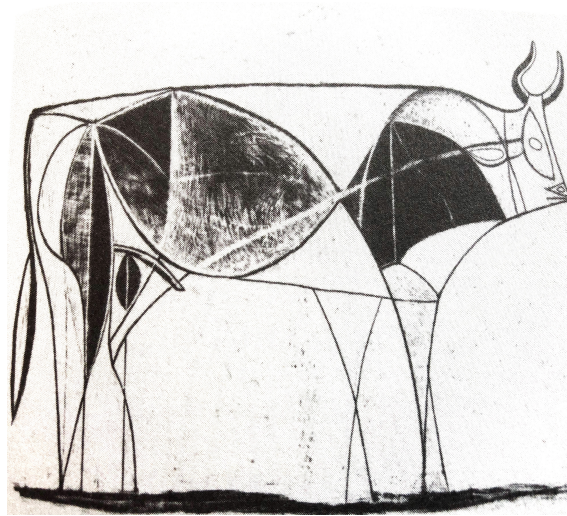
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In the artist's studio

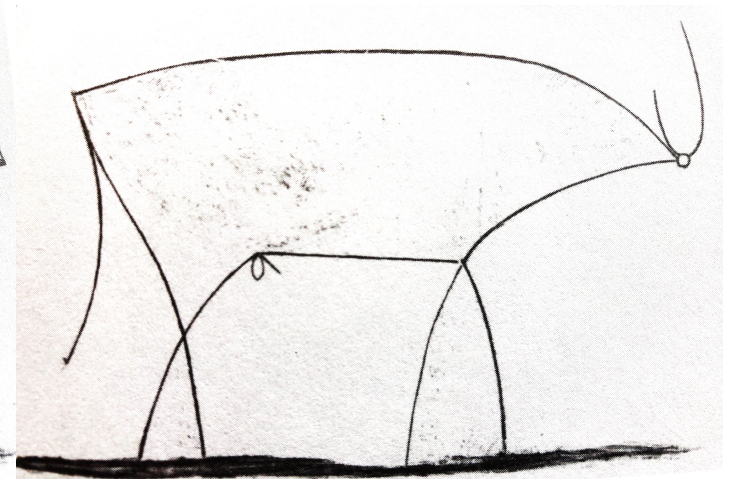
Picasso worked like a technologist. He performed experiments in cubism with objects beyond our perceptions. In an intensive experimental work period he extracted the essence of Minotaur.



Pablo Picasso: 22.12. 1945
Courtesy: Irving Lavin; Picassos Stiere



Pablo Picasso: 2.1. 1946
Courtesy: Irving Lavin; Picassos Stiere

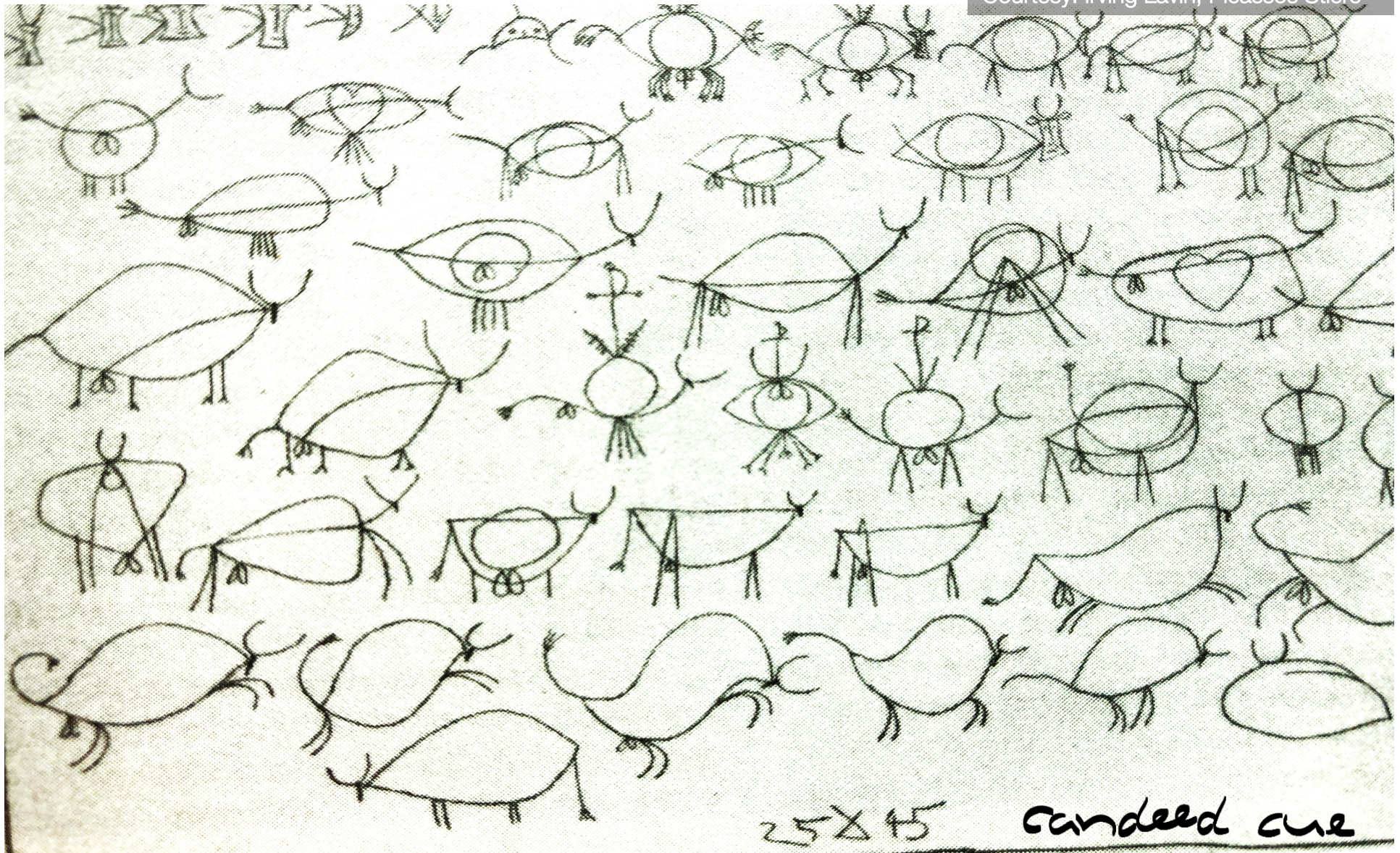


Pablo Picasso: 17.1. 1946
Courtesy: Irving Lavin; Picassos Stiere

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In the artist's studio

Pablo Picasso: 25.12. 1945
Courtesy: Irving Lavin; Picassos Stiere



In the artist's studio

Visual Alphabets
Courtesy: Wikipedia

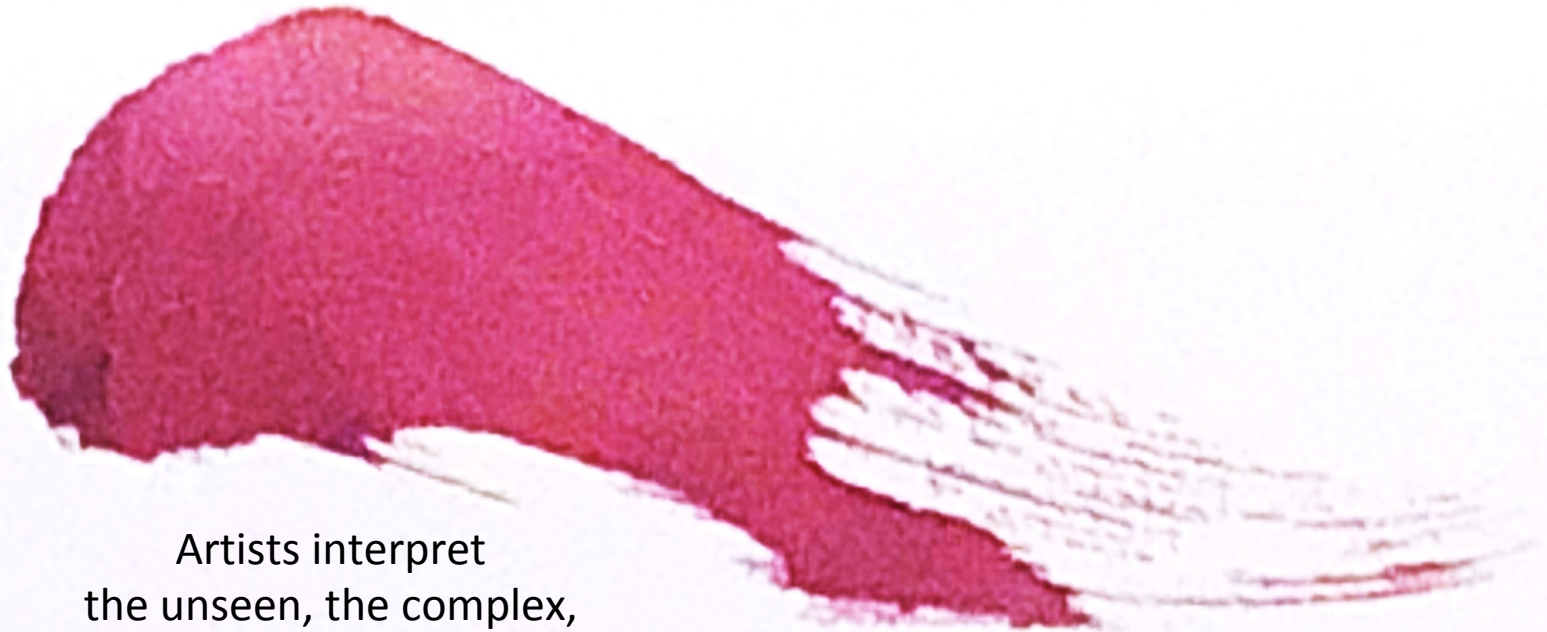


Artists utilize all human senses to interpret the unseen, the complex, the unimaginable, the counterintuitive and contradictions of our human logic. With one major concept at hand artists create an “alphabet” of verbal, visual, olfactory, haptic and sonic metaphors as a communicating language.

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In the artist's studio

Iconic Art
Courtesy: AKAKIKO Austria



Artists interpret
the unseen, the complex,
the unimaginable,
the counterintuitive.

The Art of **Sushi.**

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The Science- Art Equation

The scientific process is not only a simple collection of single observations like taking photos with a camera. In addition to hard evidence, facts and reproducible results scientists form hypothesis with intuition.

Art plays an important role to restructure thinking en route to a paradigm change. Artists cannot be relegated to subjectivity and imagination.

Ludwig Wittgenstein (1922): „The limits of my language are the limits of my mind.“ Artists and scientists expand the limits of classical physics languages and coin new concepts. Both go beyond limitations of human traditional logic.

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The Science- Art Equation

Quantum physicists rely on logical reasoning including an essential part of intuition and not to forget - curiosity.

Artists create their artwork on the three pillars: Logical reasoning with sophisticated artistic intuition and of course - curiosity.

3 THINK

$$SCI_{LR} \times SCI_{(I+C)} = ART_{LR} \times ART_{(I+C)}$$

WHERE LR IS LOGICAL REASONING
I IS INTUITION
C IS CURIOSITY

Artwork: Candeed Cue
Vienna; Austria

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Following the Science- Art Equation

The exercise: To meet in laboratories and art studios to exchange essential common talents: Logic reasoning, intuition, curiosity and social responsibility.

The message: There is no reason for artists playing in the periphery or in the backyard. Artists as well as scientists are playing center court.

The final “picture” for artists as well as scientists offered by Alice Major the Canadian poet: “Writing a poem is like picking a lock, poking a thin metal strip into a keyhole and maneuvering it, listening intently for the clicks that tell you, that you are in.”

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Candeed Cue injects science results into
mainstream culture and communicates
key technologies shaping society.

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