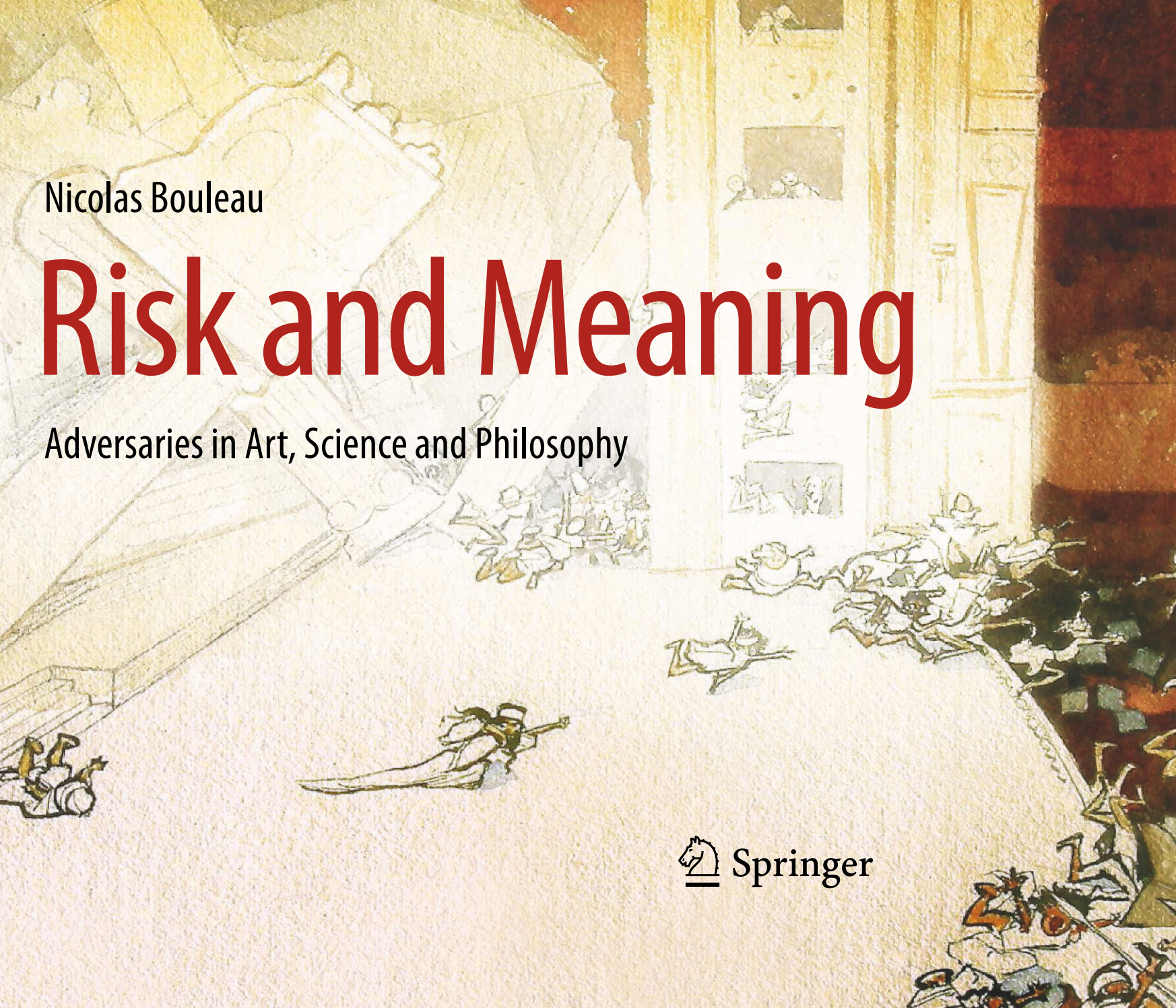

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# Risk and Meaning

## Adversaries in Art, Science and Philosophy

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## Adversaries in Art, Science and Philosophy

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Cover: «Le réveil de Samson ou la terreur des Philistins» watercolors by André Devambez (1867-1944), private collection, Paris. When the hair of Samson, cut by the lascivious Dalila, grew again, Samson recovered his strength and destroyed, as revenge, the temple of Gaza devoted to god Dagôn. He died under the debris together with the king of the Philistines and all the court. The story inspired Jean-Philippe Rameau who composed an opera on a libretto of Voltaire.

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*In the first instance, risk seems no more than a part of an essential calculus* [...] *This is risk in a world where much remains as 'given', as fate, including external nature and those forms of social life coordinated by tradition. As nature becomes permeated by industriatization and as tradition is dissolved, new type of incalculability emerge* [...] *managing risks which nobody really knows has become one of our main preoccupations* [...] *Many believe that in the age of risk there can be only one authority left, and that is science. But this is not only a complete misunderstanding of science, it is also a complete misunderstanding of the notion of risk.*

Ulrich Beck, *Politics of Risk Society,* Polity Press 1998.

# Risk and Meaning

# Entrance : Interpretation and Paradigms

2

When we try to understand our surroundings - places, systems, situations, behaviors - we interpret the stimuli we receive. Starting with a clue, shaped by our memories and our knowledge, we construct a narrative, linking together familiar forms, and an interpretation emerges… we understand, more or less. This complex process, never completely explicit, leaves a particular impression: there is meaning. It does not matter here if this meaning is right, if we have grasped the true significance of the situation; that is another question. But already there is a first great distinction between that which shouts at us and that which says nothing to us. When we do not understand, i.e., we do not recognize anything and cannot guess what is there, the stimuli do nothing to us. Just like certain times in school!

The guiding thread of this book is the confrontation between this presence of meaning and the possibility of chance, our ultimate goal being to shed light on our tendency to adhere to scientific representations.

Let's start with some well-known arguments of the epistemologist Thomas Kuhn, from which chance will be seen to play the role of a reactive agent in our philosophical experiments. Compared with classic epistemology - including the work of Karl Popper, who essentially aimed to give rules for what is and what is not in the field of science - *The Structure of Scientific Revolutions*[1] is a revolution in itself. It presents, in effect, a radically new vision of the processes of development and dissemination of scientific knowledge. Thomas Kuhn rejects, in an extremely convincing fashion, the neo-positivist philosophy based on correspondence rules (between scientific terms and experimental realities). He examines how there is meaning in science and its relation with scientific habits. In other words, he reveals the semantic and pragmatic dimension of the language used in these disciplines. His views are the basis of most contemporary epistemological work[2] . The criticism sometimes leveled against him, of having somewhat concealed his debt to Gaston Bachelard, is partially justified. Bachelard's remarkable psychological analyses of the relations between the symbolic and advances in physics may seem similar to Kuhn's ideas, but they rely on a universalist, almost positivist, viewpoint and do not make any sociological reference to the scientific community that shares these meanings, which is an essential point.

According to Kuhn himself, the term “paradigm” is responsible for the contradictory comments which gave rise to his book The Structure of Scientific Revolutions. A decade later, he clarified his thoughts[3]. His starting point is sociological: “A paradigm is what the members of a scientific community, and they alone, share. Conversely, it is their possession of a common paradigm that makes a scientific community out of a group of otherwise disparate men.” To escape this cir-

1. T. Kuhn, Univ. of Chicago Press, 1961.
2. In international scientific activity, one is met with a considerable number of Popperians. No matter the number of vociferous partisans, these researchers still do not know the contents of this philosophy. Moreover, the weaknesses of Popper’s epistemology does not interest them. What they want more than anything is that there exist a conclusive distinction between science and everything else. And yet, it’s exactly this point that weakens this philosophy.
3. «Second Thoughts on Paradigms» (1974), in *The Essential Tension*, Univ. of Chicago Press 1977.

cular reasoning, we could use the term “disciplinary matrix” to designate that which a scientific community shares, and the paradigms are the constituent elements of this. It may be about simple analogies or real ontological commitments[4]: In any case, it is about the field of meaning: an electrical circuit is seen as a stationary hydrodynamic system, a gas is thought of as a collection of microscopic billiard balls moving randomly, up to real metaphysical connections: the heat of a body is the kinetic energy of its constituent particles. In this way, we arrive from “disciplinary matrix” to the second meaning of “paradigms”: examples or generic cases. Their importance is central to understanding the theory, and the end-of-chapter exercises in scientific works are there to train students to extend these paradigms to new situations using the established theoretical language.

This is done, according to Kuhn, not by following correspondence rules, but by similarity. Solving an exercise most closely resembles a child's game where we have to find the silhouette of an animal or a face hidden in a picture of a forest or of clouds.

The child looks for shapes that are like those of animals or faces he knows. Once he has found them, they do not disappear into the background because the child's way of seeing has been changed [5].

Kuhn developed a very interesting argument to show that this approach is not based in quantitative criteria. The raw data of experience is not sensations, he notes, but the stimuli. And these, contrary to

4. This term became widespread in America after the major article «On What There Is» where Quine introduced ontological commitments (in *From a Logical Point of View* 1953).

5. In the same spirit, Gérard Fourez exposed Kuhnian epistemology in a rather judicious way by taking the analogy of the game to find a legend in a comic, which had the advantage of making understood the social anchorage of interpretive materials and the plurality of solutions. Cf. G. Fourez *La construction des sciences*, De Boeck 1988, p 105 *et seq*.

what Descartes thought, are not in a one-to-one correlation with sensations. The same drawing can be seen as a duck or a rabbit. “Though data are the minimal elements of our individual experience, they need be shared responses to a given stimulus only within the membership of a relatively homogeneous community, whether educational, scientific, or linguistic”. The introduction of quantitative criteria stops the plasticity of the system, but this plasticity is essential to the understanding of the new by the community that shares a paradigm[6].

Consider, he says, a child visiting a zoo, where his father teaches him to recognize swans, geese and ducks. Phrases such as "all swans are white" may play a role in this process, but they are not essential. Instead, Johnny's education happens like this: his father points to a bird and says "Look, Johnny, it's a swan!" Soon afterwards, Johnny replies "Daddy another swan!" but he is then corrected "No, Johnny, that's a goose" etc. After a number of corrections, Johnny knows how to recognize swans, geese and ducks.

Birds which previously looked alike are now separated into three distinct categories.

Figure 1

Figure 2

6. The biologist Ludwig Fleck has recently resurfaced as the concept of ‘collective thought’ is central to his epistemology [L. Fleck, *Entstehung und Entwicklung einer wissenschaftlichen Tatsache* (1935), Suhrkamp 1980]. In fact, he makes it play a role appreciably different than in Kuhn’s theory. The consistence of scientific knowledge resides *in fine* for Fleck in the *law of maximum experience*, experience as one says a man is experienced. One could take the image of discussions from the core of a group of mountain guides, and here would be a collective thought: knowledge non-systematized by a theory, adapted to gathered observations, and critiqued for taking into consideration new cases. From this, Fleck draws rather original consequences prefiguring the concerns – rather than the methods – of *science studies*. Kuhn, who is also a physicist, places much more emphasis on interpretation, which is what interests us here.

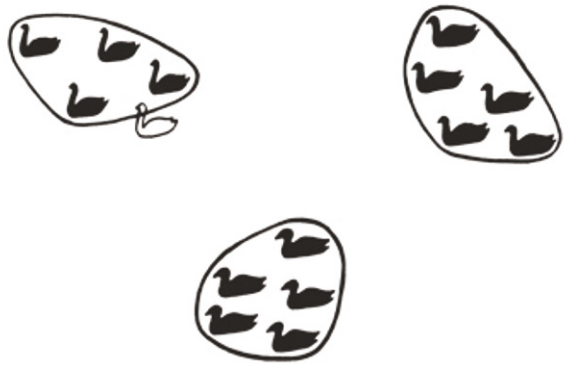


Figure 3

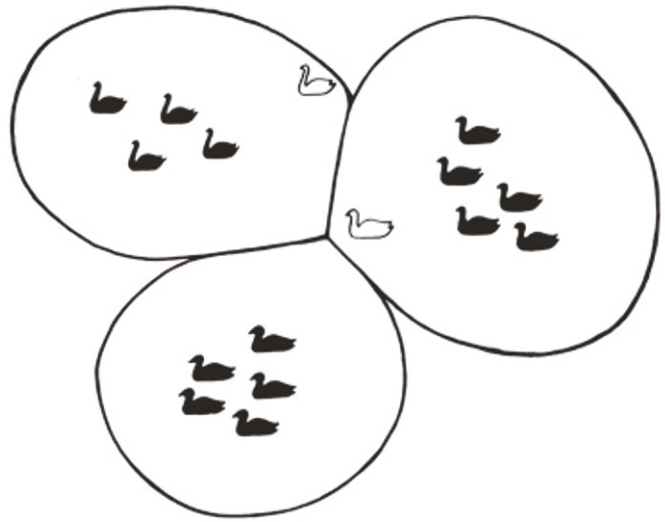


Figure 4

The separation criteria, though non-quantifiable, work well when he encounters fowl which clearly fit into one of the three groups, that is to say, if he stays in a community where swans, geese and ducks are common. In other words, he has learnt to attribute symbolic codes to nature without using rules or definitions and, in doing so, he has gained some knowledge of nature.

This process, combined with symbolic generalization and modeling, is, for Kuhn, an adequate reconstruction of scientific knowledge. He believes that "scientists assimilate

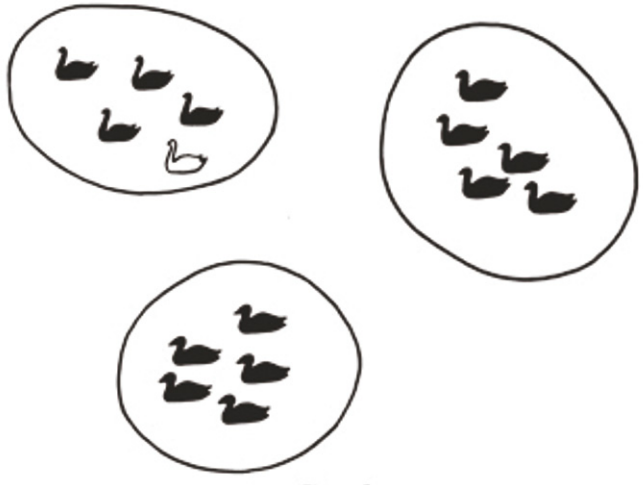


Figure 5

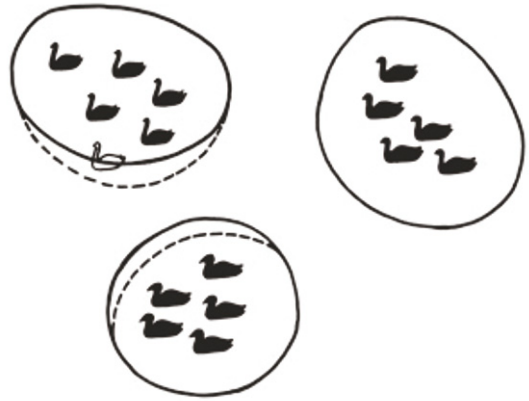
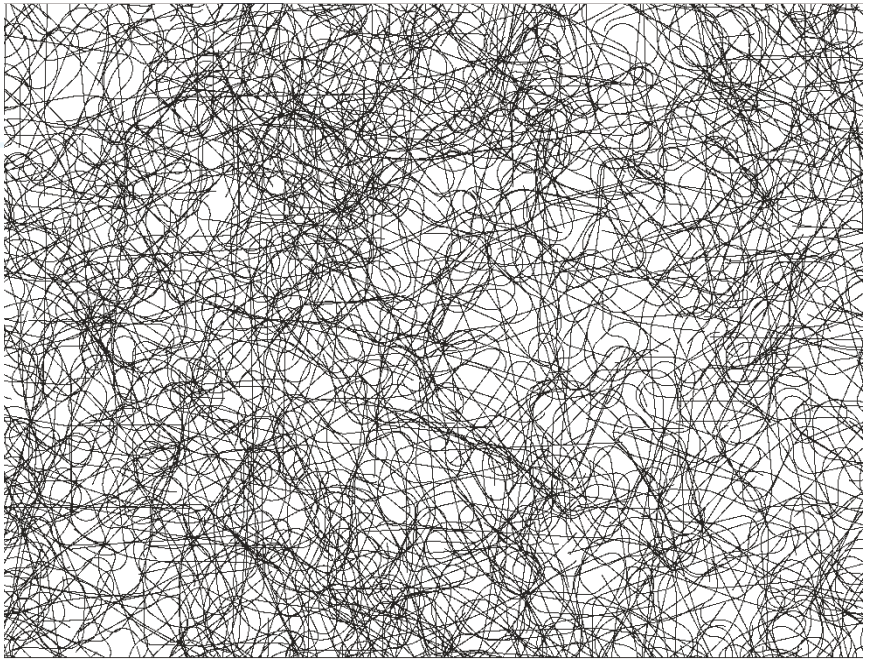
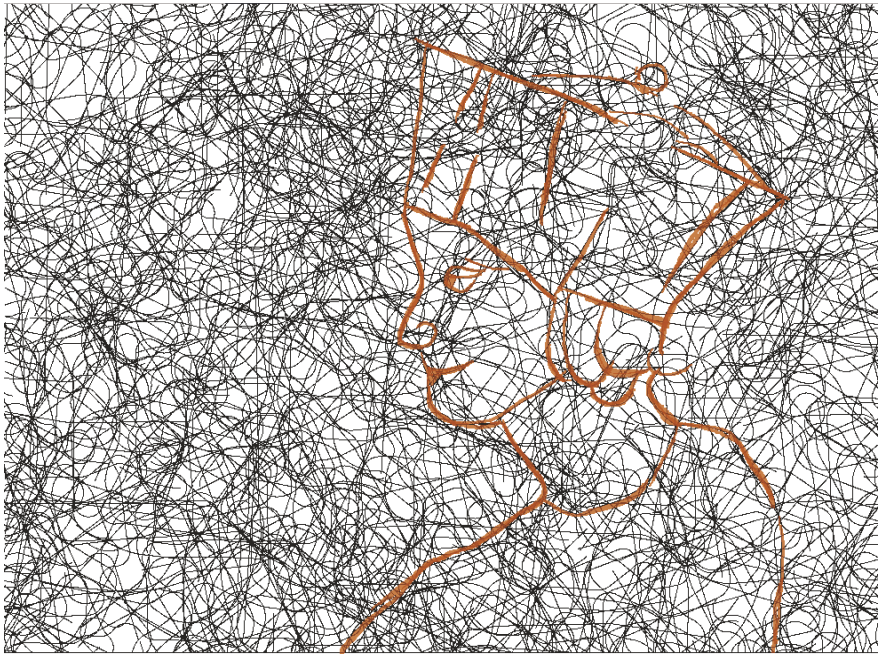
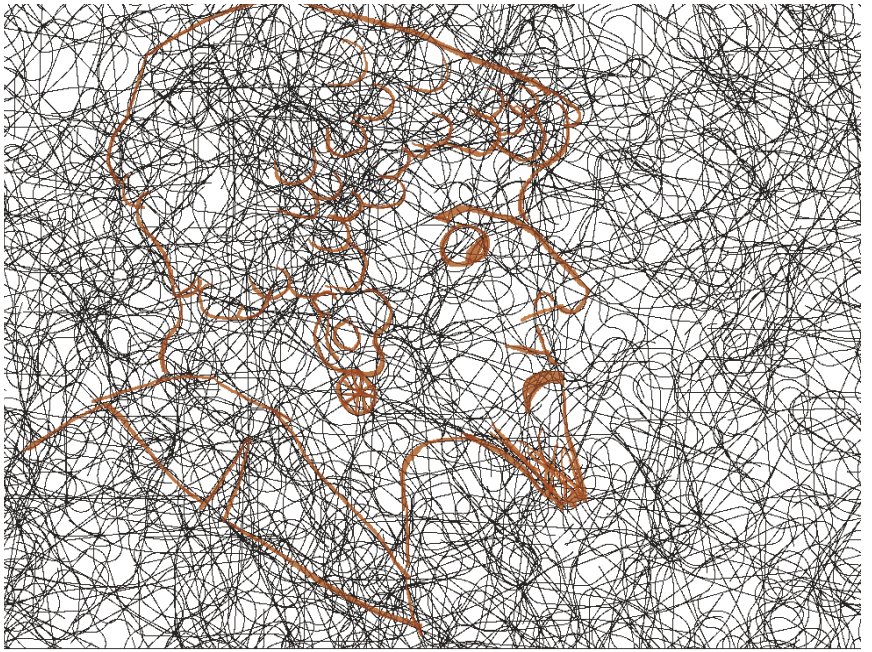


Figure 6







Games where the forms are prexisting and the child simply needs to find them are less amusing and less interesting than those where the drawings are random and the child needs to properly exercise his imagination. Here random lines have been thrown on the page. One can see plenty of things in them. The epistemologist Gérard Fourez believes that this process is at the heart of scientific creation. *La construction des Sciences*, De Boeck 1988, and *Apprivoiser l'épistémologie*, De Boeck 2004.

and store knowledge in shared examples" and rejects the philosophical idea that describes science as qualifying representations by precise criteria.

Whether these criteria are very strict (fig 3) or very broad (fig 4), they have strict implications for any new creatures not yet examined. More vague criteria (fig. 5) are surely a wiser choice for understanding new types of bird.
But a process of readjustment is necessary, determined by the new bird that has appeared (fig. 6). Kuhn emphasizes this essential plasticity in the practice of science.

This process isn't limited only to physics; it is present in all the sciences and, more generally, in all representations that are candidates for scientific validation, be they intellectual intuitions, or artistic creations, illuminating, moving, or entertaining. The question we address, and which we will develop in a range of areas, was apparently first posed in a precise way by Cournot in the nineteenth century. It concerns the relation and interaction between chance and these representations. What leads us to think that an observed or perceived structure is a property relying on scientific principles, rather than a contingent configuration appearing by chance? For example, Bode's law, which gives a simple formula for the orbits of the planets[7], is considered an amusing find, while climate change models, based on complicated equations from physics and economics, and giving relatively uncertain results, are considered to be completely scientific by the community of international experts.

We can also approach the question from another angle. The idea that chance can produce something meaningful strikes us as completely paradoxical, yet we often talk of "pure, dumb luck". We will investigate examples where the realm of chance encroaches on the meaningful. That then puts us in a critical situation. The presence of meaning leads us suspect the unexpected. There is conflict, and curiously, our judgment in these cases is far from balanced; we have a

7. A law also declared by Titius-Bode, $r=0.4$ for Mercury, $r=0.4+0.3\times2^{n-2}$ for the planets following the number n, counting n=5 for the asteroid belt between Mars and Jupiter.

clear preference for meaning. As we will see in Chapter X, even the great linguist Ferdinand de Saussure couldn't make head nor tail of it.

When an underlying law is suspected behind the data we gather, when we tend to believe that there is something there, a deep structure, a law; what is the nature of this tendency of ours? It is not quantifiable. Cournot insists on this point as much as Kuhn. It's to do with a belief, of a strange nature, which cannot be evaluated by a ratio of favorable cases to unfavorable cases. It is not a calculation of probabilities. Cournot, who excelled in mathematical probabilities, and who was one of the first to introduce mathematical modeling into economics, is emphatic on this point. It would be a huge mistake to introduce numbers here, which is why he introduced the term "philosophical probabilities" specially for this. They played a decisive role in his philosophy of science.

These are the philosophical probabilities we are going to clarify and penetrate. They have, as one might suspect, ancient roots, but the Ancients approached these questions through their own frames of reference, linked to their ideas of religion, although Cicero's fight against the oracles, soothsayers and haruspices (Etruscan diviners) also has a strong political resonance. But it is in the modern era, in Cournot's foundational text, that the problem of philosophical probabilities is proclaimed sufficiently clearly and precisely to be able to penetrate like a wedge into the cracks in a range of philosophical ideas. They are at the heart of the very topical question of chance, which is not simply about randomness and calculation of probabilities, because it is loaded with meaning - a difference in nature that a certain reductive conception of science tries, in vain, to erase. We will trace these philosophical probabilities through art and architecture, linguistics and literature. We will not be surprised, being living and thinking beings ourselves, to see them play a central role in biology, and in the controversies surrounding Jacques Monod's book-cum-manifesto. They weave, in that area, a network of links between philosophical and moral issues, asking us to step back from our cultural and social reference points. It is therefore down to anthropology to shed some light on these problems. As for psychoanalysis, these probabilities are certainly relevant when patients speak randomly and we wish to extract and understand the meanings. Finally it is by astronomy and physics that we return to our starting point - the motive of both Cournot and Kuhn - the epistemological question of the nature of scientific knowledge.

Detail of Rembrandt engraving.

# Cicero and Divination

The Sibyl predicting, Giovanni Paolo Pannini (1691-1765),
Nantes, musée des beaux-arts.

Before the modern concept of chance could take its place, bringing many interesting philosophical questions with it, the Ancients had to extricate themselves from the idea that all observed phenomena were either the result of need or of will (of gods, demi-gods or various divinities). Cicero played a decisive role in creating a place for the idea of an "unintentional accident", a primitive form of our modern notion of chance. In doing so he had to fight a degree of religiosity, which led to him disabusing the world, in a striking parallel with the consequences of scientific and technological developments today.

Cicero positioned himself against the oracles, a group that some Greeks and Romans were already beginning to question. On any occasion people would turn to the talent of the seers who know how to interpret particular configurations, birds, liver, etc, that ordinary mortals found banal and without meaning.

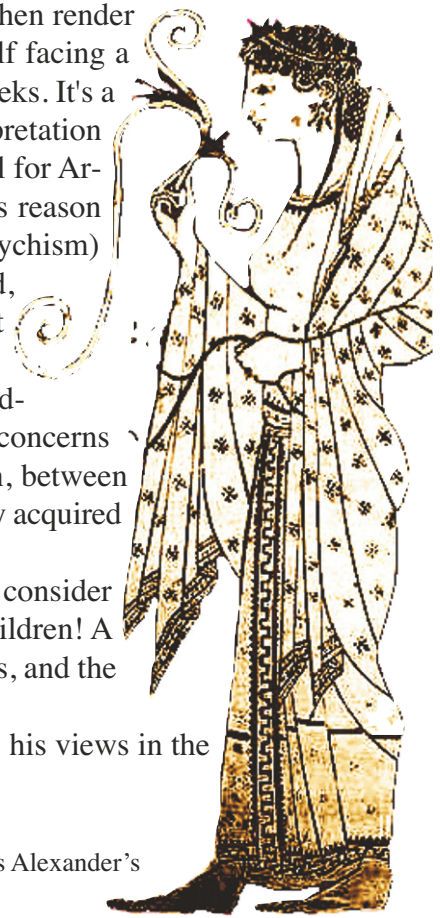
It is difficult for us, growing up with the Abrahamic religions, to truly grasp the intimate way that religious and civil life were intertwined in Greek civilization, or to think of earthly or abstract places, as places where divine powers operate."Every pantheon", wrote Jean-Pierre Vernant, "like that of the Greeks, supposes multiple gods, each one having his own functions, his reserved domains, his particular habits, his specific type of power [...] These multiple gods are in the world; they are part of it. They have not been created by the action of a unique God who, in so doing, marks his absolute transcendence in respect of a work where existence derives from, and depends entirely on, him. The gods are born of the world. [...] There is, then, the divine in the world, and the worldly in the divinities."[1]

The Ancients did not view the questions of chance and of meaning according to the same categories as we do. For them, *the main distinction was between that which is necessary and that which is willed*, between that which is spontaneous (*automaton*) and that which is intentional, willed by man or by the gods. In this respect, some wisdom is required if we are to express Aristotelian thought in today's terms. A simple translation is not enough. We need to immerse ourselves in different representations, interpretations and values. Aristotle's aim is not, as some have thought, to distinguish the three real categories of that which is necessary, that which is done for a particular goal, and that which is due to chance. Anglo-saxon editors have wisely preserved the Greek terms tychism and automaton without translating them as "chance" and "spontaneity"[2]. For Aristotle, nature had its purposes: "Things have a purpose from the moment they come into being, whether by the intelligence of man or by nature"[3]. He particularly wants to emphasize the class of phenomena where something

Aristotle, by Raphael, *School of Athens*, detail.

1. J.-P. Vernant, *Mythe et religion dans la Grèce ancienne*, Seuil 1990.
2. Cf. P.H. Wicksteed, F.M. Cornford, *Aristotle Physics Books I-IV*, Harvard Univ. Press 2005.
3. *Physics*, Book II Chap. V.

unforeseen happens as a result of pursuing a known goal. In this situation fortuitous spontaneity (automaton) has intervened. At the heart of this category Aristotle wants to set apart those situations that arise from the will of a sentient being endowed with free-will. That subset is the domain of tychism, an idea which one could then render perhaps as "fortune". *Tychism* concerns the case where someone *pursuing a goal* finds himself facing a situation that is either favorable or unfavorable to him, which is unrelated to the objective he seeks. It's a notion somewhere in between an actual or practical idea such as "opportunity", and an interpretation such as "loved by the gods" or "born under a good sign". The presence of a purpose is essential for Aristotle. Particularly important is this phrase from Book II, Chapter VI of *Physics*: "It's for this reason that neither the inanimate being, nor the brute, nor even the child, leave anything to chance (tychism) because they have no free and considered preference in their actions". In other words, the child, being governed by forces larger than him, be they the will of gods, of men, or natural, does not encounter chance, because it is not pursuing an autonomous object.[4]

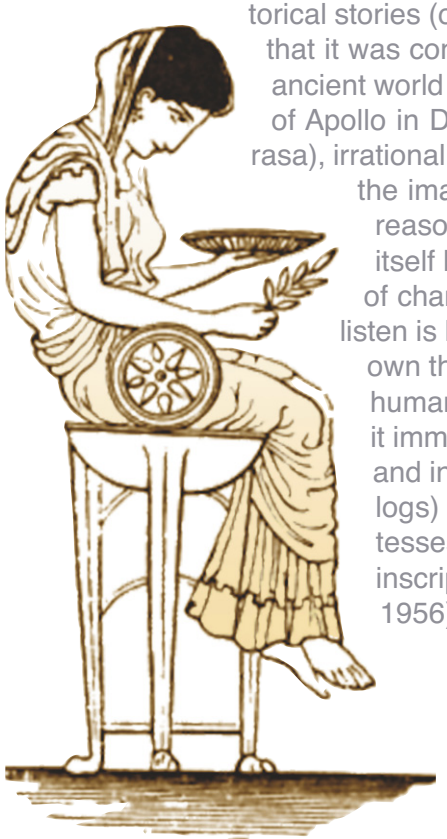


The conflict that Cicero brought up, being different and not having been specifically addressed by Aristotle, should truly be credited as an invention of Cicero. In Aristotelian terms, it concerns the boundary or the overlap between tychism and that which has no tychism in the automaton, between the cases where circumstances make sense and the cases of pure fortune. The question has already acquired a more modern flavour.

We see that Cicero's question leads us ultimately to the problem of knowing if one should consider the gods - who govern, or at least reign over, nature - as beings endowed with free will or as children! A difficult question indeed, especially, if one accepts Homer's testimony that the gods of Olympus, and the local divinities, often show humour, stubbornness and mischievousness.

In his work *Concerning Divination*, written during the first century B.C., Cicero outlines his views in the

4. The same dilemma appears in Plutarch‘s speech “On the fortune or virtue of Alexander” where he demonstrates Alexander’s successes are not due to fortune, but to his philosophical conduct in all things.



The Delphic oracle, mentioned by mythical epics (of Homer and Euripides) and by historical stories (of Herodotus, Diodore, Eusèbe, Pausanias, Plutarch), was so famous that it was consulted for important decisions by people and cities from all over the ancient world well into the Roman period. Plutarch (46-126 B.C.), who was a priest of Apollo in Delphes, wrote “The divinatory trance similar to a clean slate (tabula rasa), irrational and indeterminate of its own fate, but apt to receiving the fantasies of the imagination and premonitions, grasped the future without being able to reason the moment when it detached from the present. It is put outside of itself by the combination and the disposition of the body which is in a state of change, which we call enthusiasm.” “The god who uses a prophetess to listen is like the sun which uses the moon for sight, it shows and manifests its own thoughts, only it shows them all mixed up through a mortal body and a human soul which cannot remain at rest, nor offer itself to he who renders it immobile and appeased, but even more perplexing, as a swell, in contact and in touch with the movements and passions which are in it” (Pythic Dialogs) Of the innumerable responses provided by the successive prophetesses of Delphes, only 615 are known by means of ancient authors and inscriptions (H. W. Parke, D. E. W. Wormell, The Delphic Oracle, Oxford 1956). They are often skillfully written in verse.

form of a dialogue with his brother Quintus, a Stoic who defends the good based on the words of the haruspices, sibyls and soothsayers. Quintus says

> *But what? You ask, Carneades, do you, why these things so happen, or by what rules they may be understood? I confess that I do not know, but that they do so fall out I assert that you yourself see. 'Mere accidents,' you say. Now, really, is that so? Can anything be an 'accident' which bears upon itself every mark of truth? Four dice are cast and a Venus throw[5] results — that is chance; but do you think it would be chance, too, if in one hundred casts you made one hundred Venus throws?* [Quid quaeris, Carneades, cur haec ita fiant aut qua arte perspici possint ? Nescire me fateor, euenire autem te ipsum dico uidere. Casu, inquis. Itane uero ? Quicquam potest casu esse factum, quod omnes habet in se numeros ueritatis ? Quattuor tali iacti casu Venerium efficiunt ; num etiam centum Venerios, si quadrigentos talos ieceris, casu futuros putas ?]

Haruspices (Etruscan diviners) divining from the entrails of a cow. Relief from the Trajan Forum (Louvre).

Quintus's point is in the same vein as a discussion that is popular even today. It consists simply in marvelling at the fact that certain rare events actually occur here and there. We want an explanation as to why the rare can actually happen, that things outside the habitual routine do occur. As with horoscopes, astrology and fortune-telling, there is no other argument than to repeat *ad libitum* the fact that rare things happen in order to make the necessity of an explanation felt. The questions the Ancients asked themselves recall fundamental investigations which modern science has made us used to by offering obvious responses, such as the notion of cause. What deserves an explanation? That which is exceptional, because what is ordinary is already taken into account by current language: that animals move and reproduce is contained within the concept of animal; we'd call it "analytic" to use the eighteenth century term. Well-constructed language does not require any explanation for the habitual while, conversely, an explanation is certainly required for the unexpected. He continues:

5. A 'Venus' is when each of the four dice land with a different number on its face.

> *It is possible for paints flung at random on a canvas to form the outlines of a face; but do you imagine that an accidental scattering of pigments could produce the beautiful portrait of Venus of Cos*[6] *? Suppose that a hog should form the letter 'A' on the ground with its snout; is that a reason for believing that it would write out Ennius's poem* The Andromache*? «Carneades used to have a story that once in the Chian quarries, when a stone was split open, there appeared the head of the infant god Pan; I grant that the figure may have borne some resemblance to the god, but assuredly the resemblance was not such that you could ascribe the work to a Scopas. For it is undeniably true that no perfect imitation of a thing was ever made by chance.* [Adspersa temere pigmenta in tabula oris liniamenta efficere possunt ; num etiam Veneris Coae pulchritudinem effici posse adspersione fortuita putas ? Sus rostro si humi A litteram impresserit, num propterea suspicari poteris Andromacham Enni ab ea posse describi ? Fingebat Carneades in Chiorum lapicidinis saxo diffisso caput exstitisse Panisci ; credo, aliquam non dissimilem figuram, sed certe non talem, ut eam factam a Scopa diceres. Sic enim se profecto res habet, ut numquam perfecte ueritatem casus imitetur.]

Cicero replied with the few arguments available in that era. He tried to show that the reality of the world is in itself quite varied and that it naturally engenders events which seem exceptional to us by the attention we bring to them.

> *Again, when certain other events occurred as they had been foretold by diviners and I attributed the coincidence to chance, you talked a long time about chance. You said, for example, 'For a Venus throw to result from one cast of the four dice might be due to chance; but if a hundred Venus throws resulted from one hundred casts this could not be due to chance.' In the first place, I do not know why it could not; but I do not contest the point, for you are full of the same sort of examples — like that about the scattering of the paints and that one about the hog's snout, and you had many other examples besides. You also mentioned that myth from Carneades about the head of Pan — as if the likeness could not have been the result of chance! And as if every block of marble did not necessarily have within it heads worthy of Praxiteles!*

Cicero was in the difficult position of having to show that Quintus's need for an explanation was unfounded. He obviously could not say that rare events are frequent, so he resorted to the natural fecundity of circumstance. Finally, he found a

6. This was a painting by Apelles and one of the greatest of antiquity. It was later brought to Rome by Augustus.