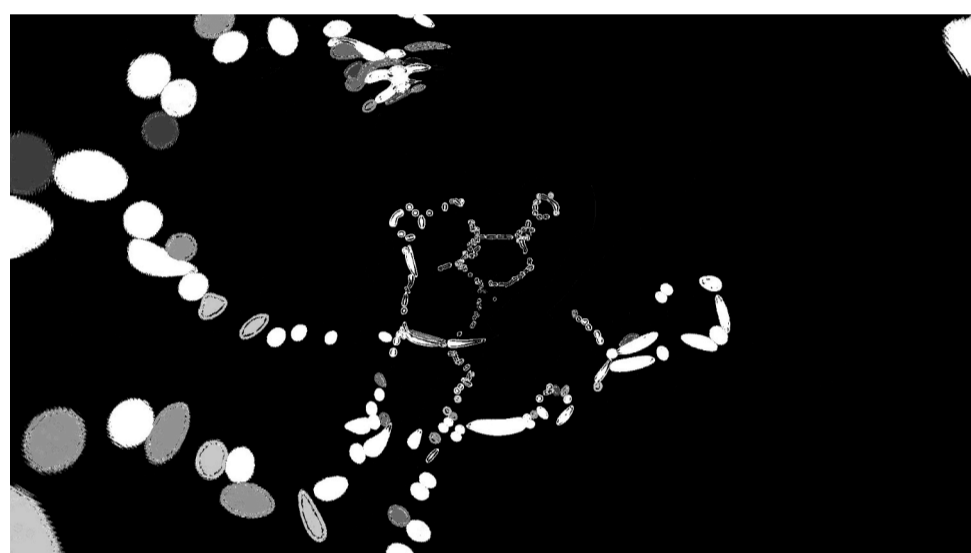
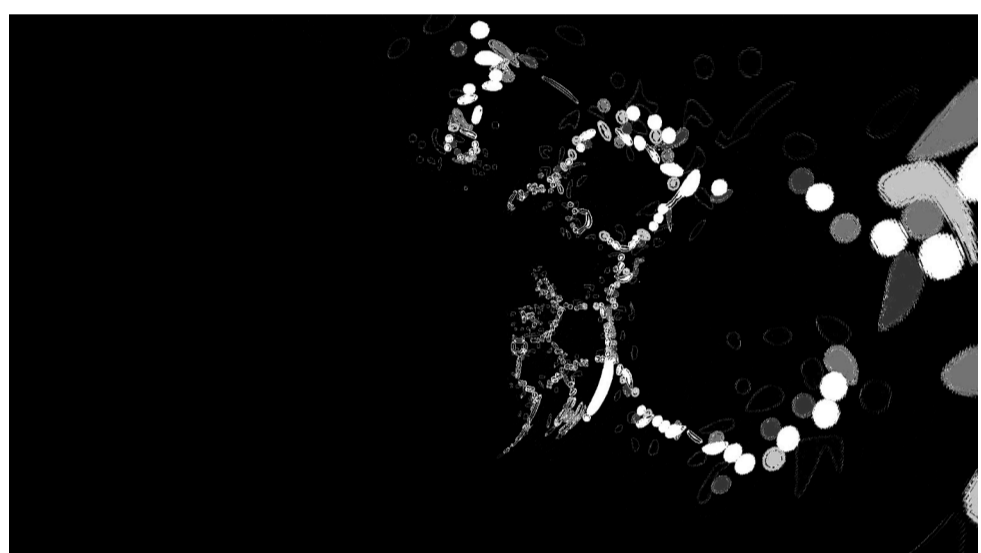
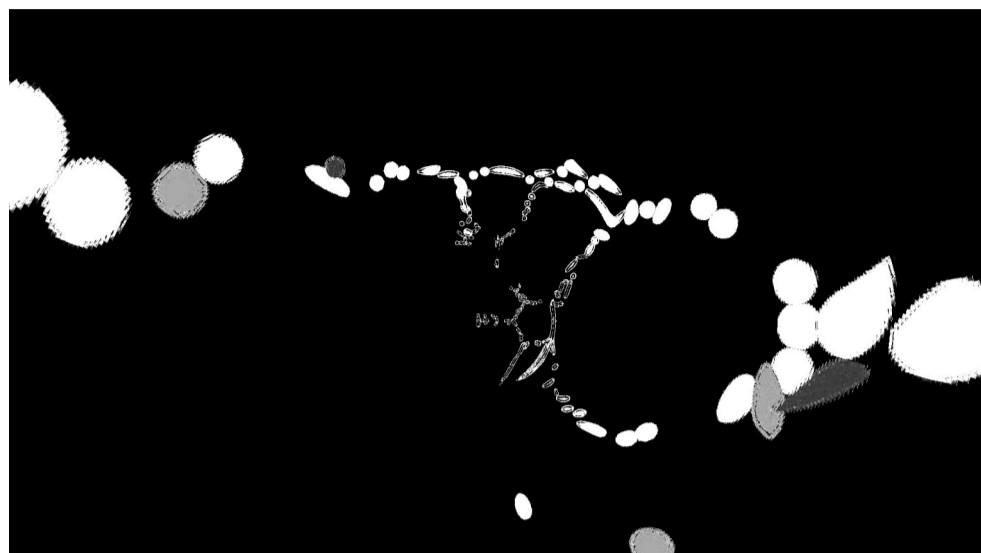




Marinus van der Sluijs

#09



Stills from the Movie 'Kekulé's Dream' 2023

About the Theory

"Let us learn to dream, gentlemen, then perhaps we shall find the truth." – August Kekulé

Science, art and myth have chemistry

Science and art are opposites: one is a dispassionate quest for objective truth, the other deliberately stirs emotions. They differ in the ways they select, organise and use data. And yet they share a vital element: imaginative thinking. In science this is the catalyst behind the formulation of new testable hypotheses. In art it can be an end to itself.

Highly multivalent, mythology operates on multiple levels. Myths in their oldest settings often bore strong sociological and psychological connotations, setting paradigms for law, custom, morality and spirituality. They were artistic in terms of their creative narration and performative aspects. At the same time, though less well known, they were also protohistory and protoscience – the very first attempts to make sense of the past and how nature works. Naïve, inconsistent and selective, they were baby steps on the way towards a disciplined, coherent and open-ended cosmology.

Myth was art at the cradle of science. The Greek philosophers started from scratch with the tool of rational discourse, but hoary myths still provided the starting point for some of their cosmological theories. For example, when Thales identified water as the first and fundamental element, he was repurposing the old mythical motif of the primordial ocean. This process of myth inspiring scientists arguably continues to the present day, be it in a haphazard and often concealed fashion. The 'Big Bang' theory was the brainchild of Georges Lemaître, a Belgian Catholic priest and scientist. His references to the 'primeval atom' and 'cosmic egg' show that he was no stranger to the old mythical concept of a primeval particle from which the universe arose.

And what about chemistry? The alchemists persistently represented some stage in the *magnum opus* of gold-making by the emblem of the snake that eats its own tail – the *ouroboros*. This motif occurred in places as far apart as Amazonia and Japan, but the alchemists specifically drew on its Egyptian expression, which originated in solar symbolism and was much used in magic. And the circular serpent did not end its influence there. It also ushered in the birth of structural chemistry. Enter Kekulé.



Alchemy (al-Simawi)



Alchemy Barchusen



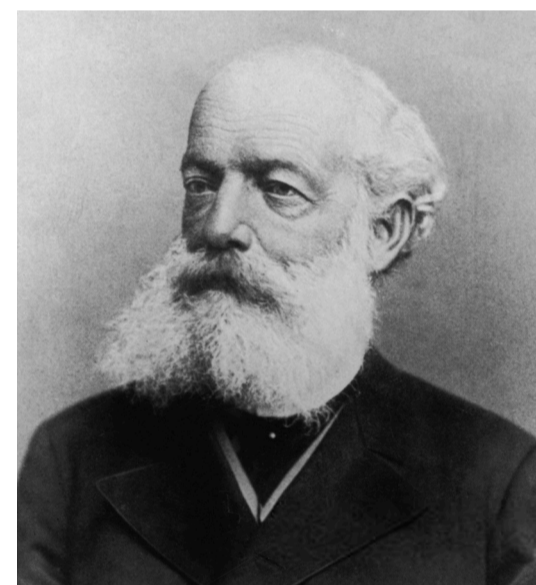
China



Arizona

Kekulé's dreams

In chemistry, the structural theory provides the framework for understanding the positioning and state of atoms within a molecule. Its chief architect was the German scientist Friedrich August Kekulé (1829-1896). He later revealed that the seeds had been sown with a daydream on a London omnibus:



"I fell into a reverie ..., and lo, the atoms were gamboling before my eyes! Whenever, hitherto, these diminutive beings had appeared to me, they had always been in motion; but up to that time I had never been able to discern the nature of their motion. Now, however, I saw how, frequently, two smaller atoms united to form a pair; how a larger one embraced the two smaller ones; how still larger ones kept hold of three or even four of the smaller; whilst the whole kept whirling in a giddy dance. I saw how the larger ones formed a chain, dragging the smaller ones after them but only at the ends of the chain. ... The cry of the conductor: 'Clapham Road', awakened me from my dreaming; but I spent a part of the night in putting on paper at least sketches of these dream forms."

One result was Kekulé's discovery that carbon atoms are tetravalent. Soon after, he deduced that they can bond with each other. These first successes opened the door for his most remembered contribution to science. Until then, all known types of atomic bonding involved open, linear arrangements. Benzene (C_6H_6) presented the enigma that it was highly unsaturated yet slow to react, counter to normal expectations. Kekulé figured out its molecular structure: a ring of six carbon atoms, with alternating single and double bonds, and a hydrogen atom attached to each carbon atom by a single bond. This realisation came to him through a second reverie:

"I turned my chair to the fire and dozed. Again the atoms were gamboling before my eyes. This time the smaller groups kept modestly in the background. My mental eye, rendered more acute by repeated visions of the kind, could now distinguish larger structures of manifold conformation: long rows, sometimes more closely fitted together all twining and twisting in snake-like motion. But look! What was that? One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke; and this time also I spent the rest of the night in working out the consequences of the hypothesis."

How did it happen?

Over time, Kekulé's dreams have elicited a wealth of diverse opinions. Had he been truly asleep or not? And what was the tail-biting snake he saw? A returning memory from past reading about the *ouroboros* without him recognising it as such (cryptomnesia)? An archetypal manifestation from the collective unconscious, as Jung claimed? Or was Kekulé's subconscious recycling something it had absorbed much more recently?

Half awake with eyes shut, the pioneer surely entered the *alpha-thēta* ($\alpha - \theta$) range of brainwave frequencies. Trance-like, this corresponds to the hypnagogic state or transition into sleep. A Jungian psychologist felt that the round snake was the archetype surfacing in that mental stage. Pareidolia might also play a part. This is the tendency to see false patterns in things seen. In that case, Kekulé should have observed something else that somehow *resembled* snakes. What could have set these wheels in motion?

In the eye of the beholder

The cavorting 'atoms' could be entoptic phenomena, which are visual effects produced within the eye, like 'floaters'. If Kekulé had had his eyes closed, he may in particular have seen phosphenes – light forms perceived while no light enters the eye. Only the obscure Joseph Aloysius Mast (1914-1993) seems to have suggested that, but it rings true. Phosphenes often make up the hallucinations in the early stages of trance. They are also a well-known hypnagogic effect.

Entoptics can even produce a circle, but no one so far linked this with the *ouroboros*. Was it by pareidolia that Kekulé's brain read the tail-biter into a phosphene circle? Or did the age-old symbol pop into his awareness as an afterthought, as soon as watching one 'snake' bend opened his eyes to the solution of the benzene problem?

One way or another, the *ouroboros* through this timely 'brainwave' consolidated the shift from alchemical pseudoscience to the pure science of structural chemistry.



Toba Batak (Sumatra)



Alchemy Maier



Alchemy (Byzantine)



Ireland

About Marinus van der Sluijs

Despite a degree in historical and comparative linguistics, my research centres on the history of cosmology, defined as all knowledge about the structure, workings and origins of the natural world. This includes the history of science as well as 'traditional cosmology' – prescientific conceptions of the world defined more by cultural tradition than direct observation and logic. Think myth and ritual. One long-term project concerns the mapping of cross-cultural motifs in creation myths. Such motifs are often strangely unexpected, like the lifting of the low sky or the removal of unwanted excess suns. I am producing a series on the origins of myth, of which two volumes have so far appeared. Also in the works is a monograph on the *ouroboros*.

Read the full text here: <https://mythopedia.info/Kekule--.pdf>



<https://mythopedia.info>

