

ALEXANDER GERNER

STRATA



***GEOPHILOSOPHICAL NOTES
ON SÉRGIO COSTA***



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“A book is a paper strata” Robert Smithson

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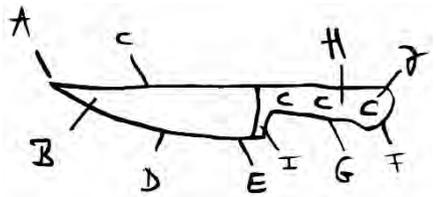
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(A) for Mariana
 B) who (C) makes me laugh (D-E) about
 >geophilosophical onions< (F)
 in their infinite-continuous (H-I) peel



→ „Gli domandai: – Non avete molto da arrotare, in questo paese?
 – Non molto di degno, – l’arrotino rispose. (...)
 – Non molto di degno, – disse. – Non molto che valga la pena. Non molto che faccia piacere.
 – Arroterete bene dei coltelli. Arroterete bene delle forbici, – dissi io.
 E l’arrotino: – Coltelli? Forbici? Credete che esistano ancora coltelli e forbici a questo mondo?
 E io: – Avevo idea di sì. Non esistono coltelli e forbici in questo paese?
 Scintillavano come bianco di coltelli gli occhi dell’arrotino, guardandomi,
 e dalla sua bocca spalancata nella faccia nera la voce scaturiva un po’ rauca,
 d’intonazione beffarda. – Né in questo paese, né in altri, – egli gridò. – Io giro
 per parecchi paesi, e sono quindici o ventimila le anime per le quali arrotò;
 pure non vedo mai coltelli, mai forbici.
 Dissi io: – Ma che vi danno da arrotare se non vedete mai coltelli, mai forbici?
 E l’arrotino: – Questo lo domando sempre loro. Che mi date da arrotare?
 Non mi date una spada? Non mi date un cannone? E li guardo in faccia, negli occhi,
 vedo che quanto mi danno non può chiamarsi nemmeno chiodo.
 Tacque, ora, smettendo anche di guardarmi; e si curvò sulla ruota, accelerò sul pedale,
 arrotò furiosamente in concentrazione per più di un minuto. Infinesse: – Fa piacere arrotare una
 vera lama.
 Voi potete lanciarla ed è dardo, potete impugnarla ed è pugnale. Ah, se tutti avessero sempre una
 vera lama!
 Chiesi io: – Perché? Pensate succederebbe qualcosa?
 – Oh, io avrei piacere ad arrotare sempre una vera lama! – l’arrotino rispose “
 Elio Vittorino (1966[1938-39]). *Conversazione in Sicilia*. Einaudi: Torino ←

¹ see: Hsu, Kuang-tai. (2009). "The path to Steno's synthesis on the animal origin of glossopetrae". *Memoirs*, 93; cf. Seifert, H. (1954). "Nicolaus Steno als Bahnbrecher der modernen Kristallographie". In: *Sudhoffs Archiv für die Geschichte der Medizin und der Naturwissenschaften* 38, 29-47; Hsu, Kuang-tai (1992). Nicolaus Steno and His Sources: The Legacy of the Medical and Chemical Traditions in His Early Geological Writings. Ph.D. Dissertation, University of Oklahoma; Herries Davies, G.L. (1995). "The Stenonian Revolution". In: G.Giglia, C. Maccagni, N. Morello (eds.) *Rocks, Fossils and History*, Florence: Edizioni Festina Lente, 45-49; Kardel, T. (1994). "Steno: Life, Science, Philosophy." *Acta Historica Scientiarum Naturalium et Medicinalium* 42, 1-159

² Steno later unfortunately abandoned his career as a medical anatomist and geologist/naturalist and became a catholic priest and bishop - even Leibniz at his time tried to convince him otherwise see: Waschkie, H.J. (1999). "Leibniz' geologische Forschungen im Harz". In: Herbert Breger & Friedrich Niewöhner (eds). *Leibniz in Niedersachsen*, Stuttgart, 187-212, cit. in: Bredekamp, H. (2004). *Die Fenster der Monate*. Gottfried Wilhelm Leibniz' Theater der Natur und Kunst. Berlin: Akademie Verlag, 116 - 128 cf.: For a more unifying view of geological scientist and man of religious faith e.g. see: Cioni, R. (1962). "Niels Stensen: Scientist-Bishop. Trans. By Genevieve Camera. New York: Kenedy & Sons

³ Kircher, A. (1665). *Mundus subterraneus* (...) 2 Vol, Amsterdam cit in Bredekamp 2004, 116, cf. Kelber, K-P. & Okrusch, M. (2002). "Athanasius Kircher retrospektiv: Pendelschläge geowissenschaftlicher Erkenntnis, In: H.Beinlich, H.-J. Vollrath, K. Wittstadt (eds.). *Wege zu Athanasius Kircher*, Dettelbach 119-134

[1]

From fossil shark teeth and geological strata to *beneath* the strata and *beyond* them

In the seventeenth century a long term controversy among naturalists about the status of stones or stone objects that looked like little tongues and had been called as "tongue stones" (*Glossopetrae*) was cleared in a scientific form for the first time. The Danish naturalist, anatomist and medical doctor as well as pioneer of paleontology and geology¹ Niels Stenson (Nicholas Steno² 1638-1686) was not the first to formulate that the curious "tongue stones"- or >glossopetrae< - were actually fossils of former real shark teeth and not artifacts (for example of a *creationist* "lussus naturae" evoked by a stoning juice ("succus petrificus") as conveyed by Kircher³ in his time) but Steno was the first to show in a novel way the solution to the riddle at hand, how solid bodies get inside other solid bodies, starting by the anatomical method of *dissection* and visual display of a dead shark. Steno gave way to a proof of the anatomical characteristics of a shark and how the form of a shark tooth could resemble these stones (see his paper of 1665 "The Head of a Shark Dissected"). This pushed Stenos ideas into a direction that is well described by Stephen Jay Gould:

→ "Posing a problem in startling and novel way is the virtual prerequisite of great science. Steno's genius lay in recognizing that a solution to the general problem of how solid bodies get inside other solids might provide a criterion for unraveling the earth's structure and history. But Steno did not formulate his problem by rational deduction from his armchair. As so often happens in a human world, he drifted toward it after an accidental



beginning.(...) In October 1666, during Newton's great year, or *annus mirabilis*, and a month after London burned, Steno received for study the head of a giant shark (...). In examining the teeth of his quarry, Steno recognized that he had accidentally bought into one of the major scientific debates of his age, the origin of *glossopetrae*, or tongue stones.(...) They are identical to the teeth of modern sharks in outward form and detailed structure and chemical composition - therefore they cannot be anything else but shark teeth (Even our antediluvian creationists today do not deny it). Yet the identity in form that makes us so certain led to another potential interpretation in Steno's time - for God, the author of all things, often created with striking similarity in different realms to display the order of his thoughts and the glorious harmony of his world.(...) After all, the *glossopetrae* came from rocks and rocks were created as we find them. If the tongue stones are shark's teeth, how did they get *inside rocks*?" (Gould 1981⁴, 20) ←

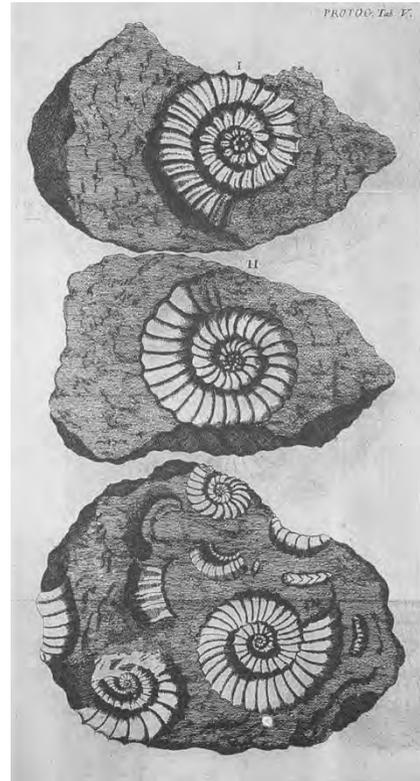
⁴ Gould, Stephen Jay (1981). "The Titular Bishop of Titiopolis. The posing of a problem in a novel way is a virtual prerequisite of great science". *Natural History* 90, 20-24



→ Diagram from: Steno, Nicolaus; *Elementorum Myologiae Specimen, seu Musculi descriptio Geometrica. Cui accedunt Canis Carchariae Dissectum Caput, et Dissectus Piscis Ex Canum Genere*. 1st edition, Ex Typographia sub signo Stellae, 1667. Quarto, large paper copy, pp. (viii), 123, and 7 plates (3 woodcut and folding, 4 engraved), other woodcut illustrations in the text.

“Who believes the opposite, was seduced by the fairytale {narratiunculis seducuntur}, that are ornamented within Kircher or Becher or other gullible {genus credulos} of this kind or vain writers {vanus scriptores} about miraculous games of nature and a formative force {de miris naturae lusibus et vi formatrice} magnificently illustrated with words.”⁷

⁷ Leibniz 1949,94, cit in: Bredekamp 2004, 121. My translation into English



↑ Nikolaus Seeländer, in: Leibniz⁸, Protogaea 1749, Tafel III, Tafel V.

Steno made relevant observations for the principles of geological stratification and sedimentation processes, with his gaze trained by observing anatomical bodies. Steno was assisted by his “Augenmerk” (Rheinberger⁹ 2005), that is: his experienced attentive habit of noting regular forms and recurrent morphological patterns in nature by a habitualized eye-gaze, training him for discoveries beyond the field of anatomy.

⁸ Leibniz, G. W. (1993[1749]). *Protogaea*, Toulouse: Presses Universitaires du Mirail. Cf. Bredekamp 2004, 121, Abb 56script.

⁹ Rheinberger, H.-J. (2005). “Augenmerk”. In: H.-J. Rheinberger. *Iterationen*. Berlin: Merve Verlag Berlin, 51-73



→ Title page of Nicolai Steno's *De Solido intra solidum naturaliter contento*, reproduced from the University Library Bologna cit. in Yamada¹⁰ 2006, 72

One of the moments in which Sérgio Costa's painting series >Strata< triggers in the attentive observer is exactly this: *the sharpening of one's experiential attention, the "Augenmerk" for having new discoveries in regular patterns of stratified rocks beyond the actual painting series, the attentional (sharpened) regard to "bite" into the strata, until they show fissures and cracks and start to de-stratify or re-stratify into something else "unthought" of before.*

The *Augenmerk* of Steno was molded by his categorical, taxonomic insights that he developed in his preliminary short dissertation of 1669 entitled "*De solido intra solidum naturaliter contento dissertationis prodromus,*" or: >Preliminary discourse to a dissertation on a solid body naturally contained within a solid< (see: Steno 1918)

¹⁰ Yamada, T. (2006). "Kircher and Steno on "geocosm," with a reassessment with the role of Gassendi's work". In: Gan Battista Vai & W. Glen E. Cadwell (eds). *The Origins of Geology in Italy*. Geological Society of America, special Paper 411, Boulder: GSA Books, 65pp. The complex view of the continuous formation of knowledge in geology from knowledge not only of direct observation of the earth and its phenomena but as well by "collateral knowledge" (Peirce) developed, for instance, by Stenos direct and indirect knowledge in anatomy in the 17th century - and additionally the debate and differentiation from the animistic earth theory of Kircher - is given by the Japanese scholar Yamada: "Examining the works of Athanasius Kircher and Nicolaus Steno allows similarities and differences to be drawn between their paying particular attention to the role of the French atomist Pierre Gassendi. With his friend Nicolas-Claude Fabri de Peirese, Gassendi had a significant impact on Kircher's career and his

thinking, and his work was read and noted by Steno in his student years in Copenhagen. Later, in the 1667 treatise *Canis*, Steno also appraised Gassendi's idea on the origin of stones. Kircher's experiences of vulcanism and earthquakes, gained during his expedition into southern Italy in 1637-1638, let him to formulate his theory of Earth in the early 1940s, when his *Magnes* was to be published. Completion about his theorizing about Earth was delayed, however, until publication of *Mundus subterraneus* (1665), in which he developed his concept of the "geocosm". Steno probably met Kircher in 1666, and they are known to have corresponded on theological topics. In his *Prodromus* (1669), Steno criticized Kircher's idea of the

"organic" growth of mountains. Steno adopted Descartes' idea of "collapse tectonics" and the formation of strata. Kircher's influence on Steno should not be neglected, however, given Steno's substantial excerpts from Kircher's *Magnes* in his manuscript. In fact, although Steno rejected the idea of plastic force in his *Prodromus*, he may as well have used Kircher's idea on magnetism to explain the growth of mineral crystals. Thus, given the usual wide acceptance of Cartesian influence on Steno, the historiography of geosciences may be appropriately and usefully revised by considering the role of the works such figures as Gassendi and Kircher." Yamada 2006, 65

Steno in the *Prodromus* proposed principles of the formation of strata that are still relevant for stratigraphy, paleontology and archeology today.

Concerning this *first view of strata as archives of captured nature*, Steno inferred that a real animal body (tooth) had existed before the actually found "tongue stone". The fossil of the shark tooth had thus been formed by no miraculous act of creation (or nature as an artist) of a metaphysical entity, nor had it fallen from the stars of the sky as Greek thinkers had believed, but was formed by a natural earthly geological process of actual sedimentary accumulation and inclusion of the animal body part inside the body of the sediment stone layer at the bottom of the sea. The strata containing fossils had been formed-according to Steno- by *aqueous deposits*. By assuming that these "tongue-like" bodies finally did *not just convey similarities to shark teeth* but were actual petrified remains of ancient shark teeth, found on land in Tuscany, he inferred that they had been formed originally by means of horizontal sedimentary deposition on a former seafloor. Therefore the ancient shark tooth preceded the dug up petrified stone formed by sedimentation of strata in time, and all this happened parallel to the horizon. This is today referred to as the principle of *>original horizontality<* that sedimentary rock strata form in horizontal positions in which layers of sediment are originally deposited horizontally under the action of gravity, so that the younger the layer is, the more up it appears.

→ "As regards form, it is certain that the time when any given stratum was being produced its lower surface, as also its lateral surfaces, correspond to the surfaces of the lower substance and lateral substances, but that the upper surface was parallel to the horizon, so far as possible; and that all strata, therefore except the lowest, were bounded by two planes parallel to the horizon. Hence it follows that strata either perpendicular to the horizon or inclined toward it, were at one time parallel to the horizon." (Steno 1916[1669], 230) cit in: Sengör, A. & Sakinç, M. (2001). "Structural Rocks: Stratigraphic Implications. In: U.Briegel & W.Xiao(eds). Paradoxes in Geology. Amsterdam: Elsevier, 131-228 here: 147 ←

The basic *principle of horizontality of stratification* also gives us a second insight on strata: strata are always relating to two planes parallel to the horizon, with exception to the *lowest strata*.

A difference is already introduced by Steno between the lowest stratum that we could call a *singular plane facing the non-stratified* on one facie and the stratified on the other as well as the parallel strata bounded always by a pair of planes. Steno assumed that any deviations from horizontality had been subjected to disturbances in the earth's crust. The discontinuities between strata or inside a stratum, the appearing of cracks, breaks and fissures - that for Steno had all been caused by the influence of fire or water- show temporal leaps or lags and spatial shifts of the horizontal stone layers. (*If we would see habits and consciousness as such stratifying horizontality that builds layers, then attention would be the non-stratified that break up fissures inside the plane of horizontality*).

▪

Steno is the first to explore **geological Stratification principles**:

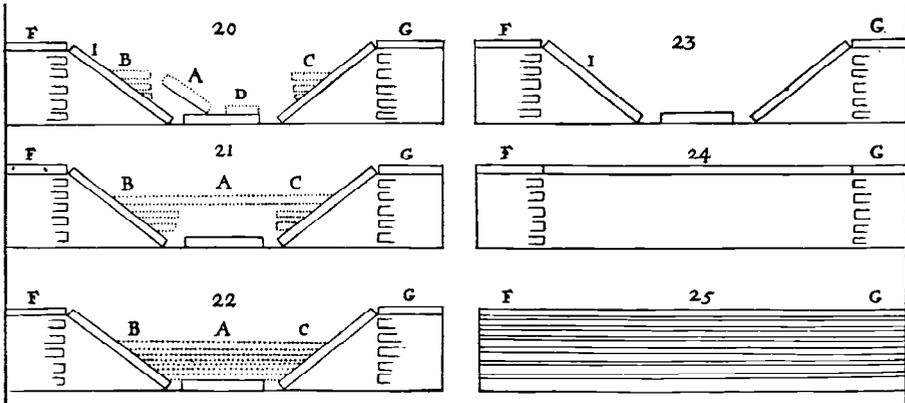
[1] Steno observed sedimentary rocks and formulated three basic principles of historical geology, which are commonly referred to as "Steno's Laws." The first of which is called the basic *principle of horizontality of stratification* and the fissures inside the plane of horizontality (folds): Sediments are deposited in flat, horizontal layers. Steeply dipping or folded rock layers indicate tectonic disturbance after deposition. Fissures indicate folds inside the plane of

immanence or the *Principle of Original Horizontality*

[2] *Principle of Superposition*: Oldest rocks can be found on the bottom, younger rocks on top

[3] *Principle of Original Lateral Continuity*: Sediments are deposited over a large area in a continuous sheet. Rock layers extend continuously in all directions, until they -at the edge- thin out of the depositional basins, or grade into a different type of sediment

[Superposition of strata at origin (25) and “back-stripping” a landscape in Tuscany to present days (20), from the Prodomos on a solids, OPH II, 226” cit. in: T.Kardel, P.Maquet (eds.) (2013). Nicolas Steno: Biography and Original Papers of a 17th century scientist. Heidelberg: Springer, 212]



→ “The last six diagrams, while indicating how six distinct aspects of Tuscany may be inferred from its present appearance, at the same time serve to make more intelligible those things we have stated above about the strata of the earth. The dotted lines represent sandy strata of the earth, so called from their main constituent, although various strata of stones and clay are mixed with them; the remaining lines represent rocky strata, likewise so called by their chief constituent, although sometimes other strata of softer material are situated among them. I have explained the letters of the diagram in the dissertation itself, in the order of which the diagrams follow each other: here, I shall review briefly the order of change. Diagram 25 shows a vertical section of Tuscany at the time when the rocky strata were still complete and parallel to the horizon. (...)” Steno, N.(2013). “The Prodomus to a Dissertation on the Solid Naturally Contained Within a Solid” In: T.Kardel, P.Maquet (eds.) (2013). Nicolas Steno: Biography and Original Papers of a 17th century scientist. Heidelberg: Springer, chapter XXVII, 659 ←

11 Krämer, S. (2010). „Epistemology of the Line,“ in: O.Pombo, A.Gerner (eds). Diagrammatology and Diagram Praxis (=Logic and Cognitive Systems 24) London: College Publications, 13-38

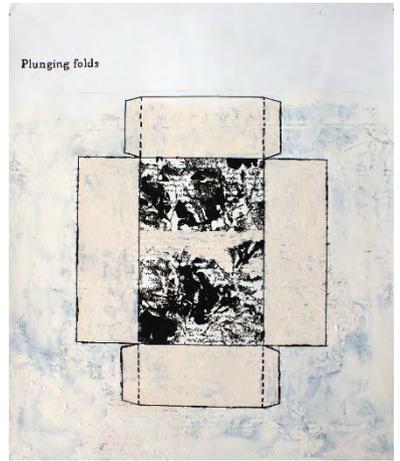
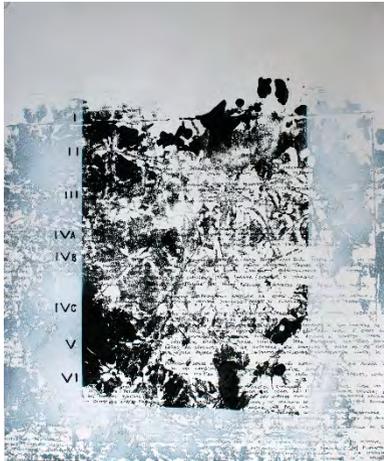
■

In the “Strata” series Costa introduced an almost invisible difference line of experience in between the two images that could pass unnoticed as an illusion of unity of being one and the same image. By the introduction of the fine separation line, the lineature (Krämer¹¹ 2010), experience breaks into the reality of the presented image sujets of the “strata”, and cracks up into two images-samples. This, however, not only opens up the image as such to aesthetic experience but also properly virtualizes the image and makes it a thinking image about stratification, destratification and re-stratification in which attention partakes. The question raised by Costa’s art is: how do attentional habits partake in aesthetic experience, and how might they partake in the introduction and production of the *new* on the plane of the image. This means that strata become multiple means of expression, not only linked to one medium, as the oil painting series proposes, but as well can be found in Sérgio Costa’s drawing series “Strata and Diagrams” as in the landscape exhibition of 2014 at the Bangbang Gallery in Lisbon:

→



Strata and diagrams | exhibition view | Bangbang Gallery, Lisbon | 2014



Sérgio Costa's *Strata #4* (2008) is composed by four horizontal discontinuities in the upper image and three horizontal discontinuities in the lower part. At the same time the upper part of the same painting shows clearly in the second strata on the left side one vertical crack and another vertical rupture that prolongs, dislocates and unites the rock layers vertically from the second to the third, →



Strata #4 | 2008 | oil on canvas | 144x120cm

If strata, as Sérgio Costa's paintings apparently show, are ordering principles of (rock-) bodies, then a assumed plane of consistency as horizontality - as well as the principal that the lower the strata, the older the time, and the higher the strata, the younger- are orientation principles that are deeply questioned in Sérgio Costa's work on the cracks and fissures of long term experience as they focus on the virtual horizontal interstice line that in Strata #2-18 –with exception of Strata #5- break with a representative depiction of mere archive paintings of historically lawfully constituted strata of nature as rock layers. This gets clear by the rehearsing principle that Costa applies in his paintings in which for example the curved crack running through the first strata on the lower half of strata #4 (2008) rehearses a new connection on the fourth strata of the upper part of strata #12 (2011). The same happens at the painting event of rehearsing parts of strata #5 in strata #13 →



Strata #5 | 2008 | oil on canvas | 130x160cm

WHERE ARE WE NOW?

EARTH, 2016: THE YEAR THE PROFESSIONAL ORGANIZATION RESPONSIBLE FOR DEFINING THE EARTH TIMESCALE –THE INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS), DECIDED THE CHANGE IN THE ACTUAL OFFICIAL DESCRIPTION OF EARTH-TIME, LEAVING THE HOLOCENE BEHIND, A PERIOD STARTING AFTER THE LAST GREAT ICE AGE 11,700 YEARS AGO. MANY SCHOLARS TODAY ADVOCATE AN "ANTHROPOCENE" -OF ANTHROPOLOGICAL, "MAN" INFLUENCED EARTH-TIME, IN WHICH MAN IS –AMONG OTHER LONG LASTING EFFECTS- CAUSALLY PART OF MASS EXTINCTION OF ANIMAL AND PLANT SPECIES, POLLUTES THE OCEANS AND CHANGES THE CLIMATE AND ATMOSPHERE, THUS TRANSFORMING EARTH AS ITS NATURAL HABITAT. THIS BOOK TAKES UP ABSTRACT GEOLOGY AS A COMPLEMENTARY PERSPECTIVE TO THINK STRATA AS A CONCEPT DERIVED FROM GEOLOGY AND MADE OPERATIONAL IN THE HUMAN REALM IN ARTS AND KNOWLEDGE DEVELOPMENT. MORE THAN ANYTHING ELSE- THIS BOOK IS A SEVERAL YEARS LONG ENCOUNTER OF THE GERMAN THEATRE-MAKER AND PHILOSOPHER ALEXANDER GERNER WITH THE MOZAMBIQUE BORN VISUAL ARTIST SÉRGIO COSTA, BOTH BASED IN THE PORTUGUESE CAPITAL AND CULTURAL CONTACT ZONE LISBON. IN STRATA -GEOPHILOSOPHICAL NOTES ON SÉRGIO COSTA ALEXANDER GERNER PRESENTS AN ATLAS OF FRIENDSHIP BETWEEN PHILOSOPHY, SCIENCE, ART AND HUMAN TECHNOLOGY BY TAKING AS A STARTING POINT AN OBSERVATIONAL PROGRAM PRESENTED IN THE PAINTING SERIES "STRATA" AND OTHER WORKING IMAGES OF THE ARTIST SÉRGIO COSTA.

+

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