Engineering Fiction

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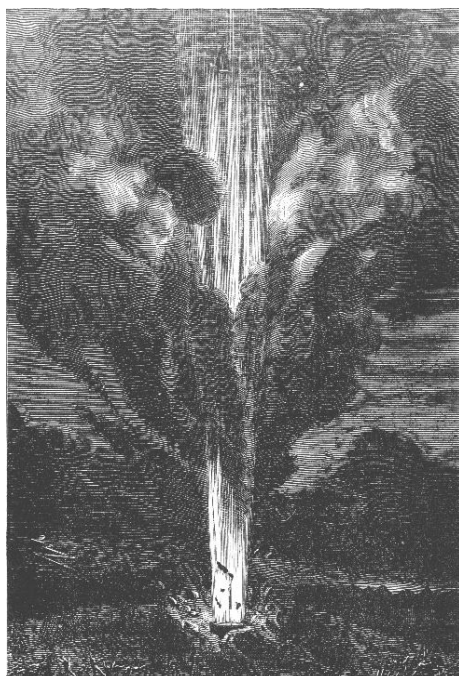
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Abstract

Without going back to the explicit mission assigned to Jules Verne by Hetzel, this article attempts to distinguish among the criteria that define scientific knowledge as it is presented in Jules Verne's work. From classifications to discoveries and a growing confrontation with the natural world, Verne's scientific explorations are best illustrated in the concepts of engineering and bricolage. These concepts also help define the writer's strategies when it came to engaging the reader in unexplored territories.

Résumé

Sans revenir sur la mission explicitement assignée à Jules Verne par Hetzel, cet article cherche à établir une distinction entre les critères qui définissent le discours scientifique chez Jules Verne. Classifications,

découvertes et confrontations toujours plus intenses avec le monde naturel, ces explorations scientifiques sont plus précisément illustrées dans les fonctions d'ingénieur et de bricoleur. Ces fonctions permettent aussi de mieux définir les stratégies littéraires de Jules Verne alors même qu'il entraîne ses lecteurs vers des territoires inexploités.

The Limits of Knowledge

All readers of *Twenty Thousand Leagues Under the Seas* remember—even and perhaps especially if they have not actually read them through—the long passages where Conseil recites endless lists of marine species, "the fourth and last class of the primary division of vertebrates" [1]. Conseil, as we know, memorized these lists without ever gaining anything from the information he had so meticulously stored in his brain. In fact, Aronnax notes, though he is an expert on classifications, from acanthopterygians to lophobranchiates and plectognaths, Conseil is incapable of recognizing a single fish. The *Nautilus*' adventures leave him unchanged: he started as Aronnax's trusted servant and so he will remain to the end of the novel. Interestingly, Conseil's first and most famous enumeration takes place in the chapter entitled "The Black River." The Black River is a sea current that travels from the Bay of Bengal to the North Pacific; it could also metaphorically describe the flow of obscure words cascading from Conseil's mouth, another entry into the universe of scientific classifications.

...the universe of scientific classifications

Classifications were the product of an age—the late seventeenth and the eighteenth centuries—that sought to establish an exhaustive inventory of a physical world divided into classes, genres, species, sections and subsections. The desire for exhaustiveness that motivated this methodological approach echoed the desire for a rationalization of natural wonders too long explained by legends of monstrous creatures. In this sense, the natural

scientist and the enlightened philosopher (as Jean-Jacques Rousseau and Johann Wolfgang von Goethe would demonstrate) shared the same task. The classifications of birds, insects, snakes, plants or rocks that flourished at the time all produced rational categories based on the visible, the same principles mentioned in Conseil's conscientious reporting on the place of fins and gills, or the workings of the jaw that distinguish among the various classes and subdivisions of fish. Rigorous observation of all visible elements was to produce order, recognition, and a form of appropriation of the natural world. In his analysis of scientific development during the European classical age, Michel Foucault quotes this observation by Carl Linnaeus: "All obscure similitudes are introduced to the shame of art." [2]

Linnaeus Classification, 1735

Many theories have been advanced to account for the pages dedicated to taxonomy in Jules Verne's works; critics such as Alain Buisine, Arthur B. Evans and William Butcher, among others, have stressed the poetic effect of what Timothy Unwin describes as an accumulation of "exotic terminology" not devoid of an incantatory force. Michel Serres's comments about the lists that punctuate *Twenty Thousand Leagues Under the Seas* are particularly interesting; he notes a double vertical movement towards the depths: the *Nautilus* diving under the sea and, in a parallel dynamic, an immersion into the depth of classifications, the vertical reading of a scientific dictionary [3].

The rigorous grid natural history had sought to impose on the physical world was to be a complete repertory of its life and resources, but life immobilized at the moment the observer describes the specimen and classifies it. "Plants and animals are less visible in their organic unity than through the visible outlines of their organs. They are legs and hooves, flowers and fruits before they are breath or internal liquids," notes Foucault (149).

A few pages before Conseil's enumerations, Aronnax had given the reader another list: that of the remarkable marine species and shells on display in the *Nautilus* drawing-room. Though the list of specimens written down by Aronnax may superficially appear to be classified according to the principles that dictate Conseil's lists—and if this list corresponds in part to Milne-Edward "judicious classifications of madrepores," [4] notes Aronnax—it

nevertheless betrays a vastly different purpose. What Aronnax admires next to the magnificent works of art Nemo has assembled in the *Nautilus* drawing-room are the "natural rarities," "the most precious products of the sea." (73) If they have been classified and labeled, neither their selection nor Aronnax observations answer a desire for exhaustiveness; they are first and foremost "curious specimens," exceptional shells, and, among them, "the rarest of all, the magnificent spur-shell of New Zealand." (74) Totality has given way to selection. Or, to put it differently, another criterion has entered the world of classification, a search for the beautiful, unique, and exceptional. The observant classifier has become a selective admirer; and no reader is surprised when Nemo observes: "They may indeed interest a scientist, but for me they have an additional charm as I collected them all myself." (75)
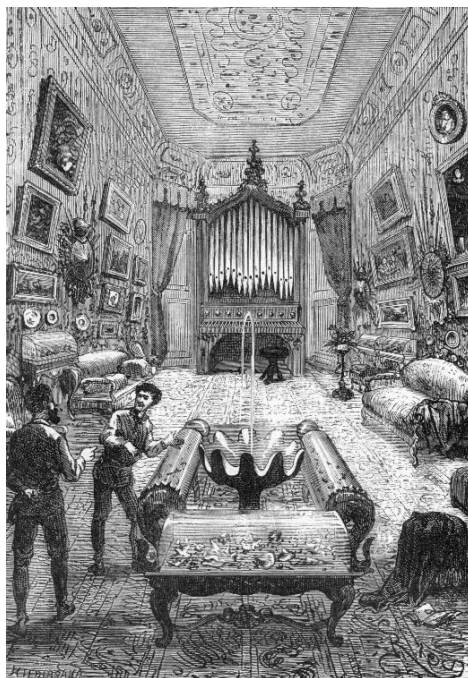
...on display in the *Nautilus* drawing-room

The aesthetic criteria that have guided Nemo's personal collecting have transformed the principles at stake in the eighteenth-century taxonomic ambitions. The Louvre Museum and the Paris Museum of Natural History were both created officially in the same year, 1793, and produced during the nineteenth-century similar debates on the organization and principles of their collections. "Always the object of pride and admiration in Verne's works, the museum is an organized showcase of human knowledge exhibiting a variety of artifacts, each labeled and assigned a specific niche in a neatly preestablished and ordered system," notes Evans [5]. But at the Museum of Natural History, the study of animals took priority over the botanic collections, and the Louvre Museum would rearrange on several occasions the presentations of collections, the better to illustrate the linear historical development of painting schools.. The classifications Jules Verne borrowed from natural sciences in particular—those of Conseil and, later on, Cousin Benedict, for example—may still have been in use, but they were becoming obsolete. They represented the science of the past, fixed categories detached from the living, and no longer accounting for the dynamic world Jules Verne was meant to describe and had, in fact, already evoked in the *Journey to the Center of the Earth* [6].

The tensions between totality and selection inform the way science is presented and the way Jules Verne's characters look at the natural world but this tension itself recedes behind the far more dangerous apprehension of the living. Encounters with sharks, squid, tigers, snakes, or polar bears are part and parcel of Jules Verne's novels; volcanology and storms disrupt geological observations, the better to provide direct and unforgettable understandings: they are a reminder that, at the origin of human efforts to confront the physical world, experience and the fight for survival alone provided a comprehension that was altogether limited, indispensable, and violent.

Tools

Radically different forms of scientific knowledge are thus combined and opposed at the same time in the observation of the natural world and the human interventions that would develop simple tools into ingenious and destructive engines. If the scientists and the narrator's descriptions of the extraordinary machines they have conceived far transcend the passion for classification or the joys of collecting, they necessarily involve a dynamic of destruction. We remember the early scenes of Arthur C. Clarke's and Stanley Kubrik's *2001, A Space Odyssey*, when the joy of realizing that a bone can become a tool gives way to a scene of murder: the ape-men can now protect their water hole by attacking the group that previously shared with them this precious resource. The relationship among human artefacts, violence and murder has been long studied by anthropologists and philosophers alike, and is recalled in the multitude of theories about the ancient origin of the word machine: for some it was simply derived from the Greek word méchané, art or ruse; for others it came from Sanskrit roots mah, magham, to grow in power, or simply power. Adolphe Pictet, a well-known philologist who also happened to be an expert on ballistics [7], compared the Greek word mêchos to the Persan root mang, meaning gambling and deceit. All these theories underlined the art, the power, and the ambitions combined in machines that may hide what they are and are all the more dangerous because of it.

More interesting still, is the etymology given to the French word *engin* in the *Grand Dictionnaire universel du XIXe siècle*: "Ménage and all etymologists link this word to the Latin *ingenium,* mind, knowledge*,* from *in* and *genere* which means to produce, to engender, also *gân* in Sanskrit […] In all Aryan languages, it has been noted, roots linked to *gân*, to be born, and *gna*, to know, combine their forms and derivations so closely that it is sometimes difficult to distinguish them clearly. One is led to presume a primitive affinity among these meanings. Indeed, we can believe that ancient Aryans considered knowledge as the birth of the mind; since for the mind, to be is to know." The engine is at the same time the production and the very symbol of the developing mind. It testifies to the link between thought and knowledge, between knowledge and survival.

Taxonomy rationalized a world immobilized under the observer's eyes, a world both stable and named. It hopes to produce a grid that would cover the totality of the physical world, both living and inanimate, and strangely detached from the observer. By contrast, the knowledge that produces machines relies on the necessarily incomplete and fragmented vision of a specific problem that fully engages the mind: individual subsistence, social needs, hopes of power. The ways these forms of knowledge are displayed in Jules Verne's novels can certainly be categorized—as they have been already—under different levels of narrative strategies, but the respective premises of taxonomy and dynamics also

lead to a confrontation that goes far beyond the specific pages dedicated to their sole description.

When it came to defining technology, the knowledge dedicated to engines or machines, *Le Grand Dictionnaire universel du XIXe siècle* would put it better than anyone when it noted: "[A]n author considers technology as the science of processes through which men can act upon forces and raw materials provided by organic and inorganic nature, appropriate these forces and materials for his needs and uses." The classification of nature has given way to its appropriation and, above all, to its transformation; the engineer takes precedence over the observer. In his classic work, *Discussion of the Method Conducting the Engineer's Approach to Problem Solving* (2003), Billy Vaughn Koen wrote: "Engineering is a strategy aimed at furthering the best possible transformation with the help of available resources in a situation which is either not understood or full of uncertainty.[…] The engineer differs from the scientist looking to establish what constitutes true or false predicates." [8] In these lines, Koen clarifies the long-established distinction between scientific goals and engineering purposes [9], a distinction that resulted in great part from the Industrial Revolution. The scientist attempts to elucidate riddles, prove or disprove theories. The engineer's approach to the physical world is entirely different, if only because, far from trying to reproduce experimental conditions in search of the truth, engineers directly confront a world seen as uncertain and misunderstood. As the author of *Treasure Island,* Louis Robert Stevenson, would note in his *Records of a Family of Engineers*, the engineer is "a projector of works in the face of nature, and a modifier of nature itself." [10] Ambitious goals modified by individual experiences, no wonder Jules Verne's technological wonders have been described as "creating a kind of 'mechanical mysticism'." [11]

In Jules Verne's works, the descriptions that reflected the great works of classifications thus give way to, and are eclipsed by, a form of writing that privileges confrontation, process, and lead to a resolution that will somehow transform human relationships with the physical world itself. At one point in his explanation of the *Nautilus* workings, Nemo warns: "One must not confuse statics with dynamics, for that can lead to serious errors." (84) The *Nautilus* captain later sums up in one short sentence the transformation of the relationship between humans and the seas his submarine has made possible: "If everything seems dangerous for one of your ships subject to the hazards of the ocean, if the first impression when *on* the sea is that of feeling the abyss below one, as the Dutchman Jansen has so well put it, on board the submerged *Nautilus*, man's heart need no longer fear." (86)

The freedom from fear is an essential factor in the development of human technology, and the meaning of engineering adds another important component: one endowing the engineer with a particular task that is even more ambitious and more complex than the building of a war engine. For Koen, and those who, from James Watt to Edison, applied themselves to improve and develop technologies that would radically modify human interaction with their environment, engineering is concerned with the need for change and the need for solutions. In a development surprisingly appropriate for philosophy rather than technology, engineers, Koen argues, answer social anxieties and anticipate still unexpressed needs, taking stock of all available resources to produce the best answer to the problems they perceive, their own or those of others. The best of them also face a double uncertainty: that their invention will indeed be an answer to a need for change, and that it will not in turn cause additional anxieties, dangers, or even social upheavals.

The freedom from fear

If Verne often described "savants" from Paganel to Palmyrin Rosette or Cousin Benedict with benevolent irony, he endowed his engineers with an admirable capacity to deal with "a world full of uncertainty." Such are Cyrus Smith learning how to survive on Lincoln Island, James Starr faced with the mysteries of the Aberfoyle mine, and again Nemo confronting with hatred a world he has sworn to forget.

"Engineering has no hint of the absolute, the deterministic, the guaranteed, the true," adds Koen. "Instead, it fairly reeks of the uncertain, the provisional, the doubtful. The engineer instinctively recognizes this and calls his ad hoc method '*doing the best with what you've got*' […] or just muddling through." [12] We recognize in these words the underlying principle of many of Verne's novels, in which dangerous, unprecedented, incomprehensible situations require his characters to find a solution, relying on accessible tools, and re-using available materials. Nemo used existing elements gathered from all the parts of the world to build his *Nautilus*. Pieces came from Le Creusot, London, Glagow, Paris, Prussia, Sweden and New York; none of these parts excited curiosity, but put together and adapted to use electricity alone, they produced Nemo's *Nautilus.*

This way of understanding engineering, we should add, has also been called bricolage in many modern writings on engineering that have adopted the French term, though in a fluid manner: "The word connotes resourcefulness and adaptiveness," notes the author of a handbook, "of making do with things at hand." [13] In his original description of bricolage, which inspired recent writings on engineering, Levi-Strauss gives a precise account of the thought process that leads to the manufacturing of a new idea or a new object: "Consider [the bricoleur] at work and excited by his project. His first practical step is retrospective. He has to turn back to an already existent set made up of tools and materials, to consider or reconsider what it contains and, finally and above all, to engage in a sort of dialogue with it and, before choosing between them, to index the possible answers which the whole set

can offer to his problem... But the possibilities always remain limited by the particular history of each piece and by those of its features which are already determined by the use for which it was originally intended or the modifications it has undergone for other purposes." [14]

The bricoleur's work thus duplicates and completes in many ways that of the engineer. The engineer/bricoleur takes stock of what is available to find a solution that may include— and this is important—the use of a tool for a purpose other than its original one. This definition was already suggested in the *Grand Dictionnaire universel du XIXe siècle*, when Pierre Larousse described *bricoler* as acting in an indirect and ingenious way: Michel Ardan suggesting to use the small rockets meant to soften the shock of landing on the moon to escape the moon's orbit, or Clawbonny, the born bricoleur, making a list of available resources in the first chapter of *The Desert of Ice*—a chapter aptly entitled "The Doctor's Inventory"—; and Clawbonny, again, breaking the thermometer to extract the mercury that will help killing the polar bear that threatens the explorers. But the most exemplary novel about engineering as a high form of bricolage is of course *The Mysterious Island*, in which Cyrus Smith draws from all possible materials, not to create new and miraculous machines, but to survive on the island: two watch lenses light a fire, and the balloon envelope recycled to make a sail. Even before Nemo's generous gift of arms and tools, the colonists have managed to recreate many of the technological advances of the modern world.

Not that the engineer/bricoleur's capacity for re-using what is already available always yields the best solution: when the Gun-Club engineers, bored by peace, decide to use a giant cannon to send men on the moon, the shell, as we know, fortunately misses the earth's satellite. Their more ambitious plan to redress the globe's axis, a feat catastrophic for the human race, fails as well. As to Professor Schultze's idea of building a powerful cannon to destroy the rival city of France-Ville, we know the projectile will end up circling the earth indefinitely. Like the word *engine*, the word *bricole* initially designated a war machine, a construction meant for battle and destruction: so a submarine that explores the depths of the seas and also sinks a ship; a flying machine that crosses the oceans and races over the roads the better to impose the will of its master. The Gun-Club members offer a vivid image of the original meaning of engineers—those who construct or deal with a war engine. Need we mention it? The Gun-Club members themselves look like the result of bricolage, the curious assembly of parts hastily put together: crutches, wooden-legs, steel hooks, artificial arms and a quantity of gutta-percha, all replacing parts lost on the battlefield and the pursuit of happiness.

A Short Parenthesis: March 11, 2011

We may still debate whether Jules Verne can be classified as a science fiction author who anticipated many discoveries, but recent history gave us a striking example of the relationships among engineering, human desires to control energy, and the humble practice of bricolage. On March 11, 2011, an earthquake registering 9 on the Richter scale, the strongest ever recorded in Japan, struck the north-east coast of the main island, seriously damaging the 6 nuclear reactors at Fukushima Dai Ichi. The violent shock of the earthquake shut down 3 reactors, as was meant to happen in such circumstances (the remaining three were stopped at the time for inspection). An emergency response team was set up on the second floor of the seismic-proof building located near the number 1

reactor. All electric power had failed almost immediately after the earthquake, but emergency diesel generators had taken over and were used to pump cooling water in the three nuclear reactors. All was going according to the book.

The tsunami of March 11, 2011


Unit 4 fire

Explosion Unit 3

Masao Yoshida

But, as we know, a few hours later, a tsunami such as Japan had never seen or anticipated, drowned the area under a wave reaching 45 to 50 feet. Buildings were flooded and the water disabled the diesel generators. Three of the six reactors exploded, the measuring instruments no longer worked for lack of power. Masao Yoshida, the plant's director later testified: "When I ordered my teams to think of a way to find a source of direct current, the "rehabilitation" group thought of fetching car batteries, setting them up in the control rooms, and using them as energy source for control instruments. *One starts to manage with whatever is available*." [15] In what a French engineer later described as "the violence of Masao Yoshida's encounter with Chaos, the radical alterity of an untamed nature," [16] we also recognize the thought process that allowed so many of Jules Verne's characters to adjust to disastrous circumstances, storms, wrecks, volcanic eruptions, and other manifestations of an untamed natural energy.

Literary engineering

To suggest that Jules Verne is a master of engineering fiction, is to highlight not just the way he privileged the use of engineering in his novels but the ways he himself—as a literary engineer of sorts—used existing materials in order to provide a solution to the two problems that resulted from his contract with Hetzel: how to present "all" the knowledge

accumulated in the course of human history, and how to produce two or three volumes a year. Jules Verne, we know, is a massive borrower of already-published materials. He takes stock of available information and makes use of it, gathering pieces in a new way or using information for a new purpose. He may borrow directly, but there is always a shift, a displacement between the original text and Jules Verne's own use of it.

We can find an ordinary and at first invisible example of literary bricolage in *Around the World in Eighty Days* at the moment when Fogg, Aouda and Passepartout arrive in San Francisco: "To express his joy on finally reaching America, Passepartout thought it a good idea to disembark by means of a perfect summersault. But when he landed on the quay, he almost fell through the worm-eaten planks. Put out by the way he had set foot on the new continent, the worthy fellow produced a formidable yell. He frightened away an uncountable flock of cormorants and pelicans, the usual occupants of the mobile quays." [17] Passepartout's way of landing on American soil fits perfectly with his character: we have just been witness to his acrobatic abilities when he performed in Japan with the Long-Nez. Passepartout's arrival, however, is a nice piece of bricolage or literary engineering: in an article published 12 years before the book, Louis Simonin had given a short description of San Francisco, noting that the wharfs/quays were made of wood and mentioning elsewhere the "wooden sidewalks with loose boards, through which a pedestrian could disappear entirely." [18] The use of these details, or rather their reframing within the narrative seems so natural that it does not even signal that Jules Verne is in fact giving us an authentic, if somewhat dated, report on the state of San Francisco's pedestrian alleyways. This detail was part of an inventory, selected, recombined, re-invented.
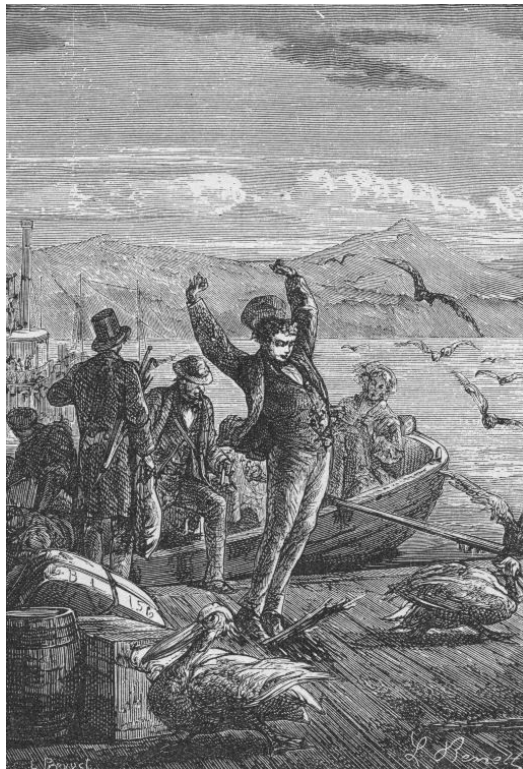
San Francisco landing

Here, a distinction needs to be made between the use of information we call literary engineering and what Daniel Compère has rightly described as intertextuality in Jules Verne's works, i.e. "the processes through which a new text appropriates another's discourse that it transforms and assimilates." [19] The transformation of an initial text into another can take many forms and it can be acknowledged or not. In Jules Verne's highly conscious writing method, the reader can capture echoes of what Daniel Compère calls at one point "the nineteenth-century's multiple voices." [20] Indeed, Jules Verne had thoroughly read and absorbed what was already considered to be the literary canon of his time; he had also read with passion contemporary writers he hoped to emulate. These authors were part and parcel of his creative powers. Literature came as a model and a legacy. By contrast, scientific information and engineering practices were not a given but, for Jules Verne, an exploration that closely paralleled a traveler's progress over new territories and, in my view, also transformed the intertextual practices that fed his own imagination.

In discussing the way he wrote his books, Jules Verne told Robert Sherard that he had no scientific background, adding: "[i]n the course of my readings I have noted tons of things *here and there* that proved to be useful.[…] I directly write down everything that I find interesting or that *could be of use* for my books." [21] The "here and there", "*ici et là*" best describes the bricoleur's gathering of elements, just in case they would later prove to be useful. They provide an inventory from which a selection will be made. Note-taking is "a constant preoccupation," as Verne will state later [22], yet there is something haphazard in the note-gathering process, not just because these notes may never serve at all, but also because they can be used in a way the author himself had not yet anticipated.

The random note-gathering process Jules Verne continued to use over the years allows us to speculate as well on the circumstances that may have led to the writing of his novels. Some of the *Voyages Extraordinaires* were no doubt the echo of sudden public interest in a topic, some may have resulted from the author's long-standing fascination with parts of the globe—such as the poles—but they may also have been the result of a retrospective first step, of looking back at his notes, what Lévi-Strauss described as "turn[ing] back to an already existent set made up of tools and materials, to consider or reconsider what it contains and, finally and above all, to engage in a sort of dialogue with it and, before choosing between them, to index the possible answers which the whole set can offer to his problem." [23] The writer's notes, now available as part of the Jules Verne collection at the Amiens-Metropole library, offer a striking display of fragmented thoughts, short pieces of information gleaned from a variety of newspapers, not unlike parts of a marvelous machine waiting to be assembled. [24] Before the encyclopedias and the dictionaries, before the works of scientific vulgarization Jules Verne consulted in the course of writing his novels, we may pause to consider the quantity of modest hand-written notes, just 2 or 3 sentences, ready to engage the writer's imagination: the kind of dialogue that would lead to yet another textual adventure.

NOTES

1. *Twenty Thousands Leagues Under the Seas*, trans. William Butcher, Oxford University Press, 1998, p. 94. Philippe Noiray describes these lists as the « zero-degree » of incorporation of scientific knowledge. See « L'Inscription de la science dans la littérature », *Jules Verne ou Les inventions romanesques*, p. 43.

2. Michel Foucault, *Les Mots et les choses*, p. 146. Linnaeus, *Philosophie botanique, paragr.* 299.

3. Michel Serres, *Jouvences sur Jules Verne*, Paris, Éditions de Minuit, p. 152; also discussed in Henri Scépi's notice for *L'Île mystérieuse*, Paris, La Pléiade, p. 1314.

4. Henri Milne-Edwards (1880-1885) was a French zoologist who included physiology in his classifications without, however, accepting theories of evolution.

5. Arthur B. Evans, *Jules Verne Rediscovered, Didacticism and the Scientific Novel*, Greenwood Press, New York, 1988, p. 40.

6. Arthur Evans and Philippe Noiray, among others, have analyzed the didactic imperative that presides over Jules Verne's novels and the various forms of narrative that combine impersonal scientific exposes, educational dialogues and these lists that nevertheless compose what, for Noiray, is a form of symphonic writing, rich with images, assonances and harmonization. Evans, in the most complete analysis yet of Jules Verne's didactic discourse, has examined the literary strategies meant to disseminate information throughout the text: en bloc information and descriptions, completed at times by illustrations, semi-direct information, and indirect information mediated by characters acting as narrators as well as dialogues.

7. Adolphe Pictet (1799-1875) wrote on ballistics, philosophy, linguistics, history and literature. He corresponded with Michelet, George Sand and Renan and befriended the composer Franz Liszt. He had perfected a system of percussion cannon. His etymological discoveries are quoted by Pierre Larousse in the *Grand Dictionnaire universel du XIXe siècle.*

8. Billy Vaughn Koen, *Discussion of the Method Conducting the Engineer's Approach to Problem Solving,* Oxford, Oxford University Press, 2003, p. 9.

9. This is not a distinction between science and applied science: laboratory experiments need to be repeated in the same conditions and with the same results for these results to be proven reliable and thus able to provide a true statement from which further applications may be derived. (The discovery of the origin of the cholera during Jules Verne's life is a perfect example).

10. These lines are quoted and brilliantly discussed in Rosalind Williams' chapter on Robert Louis Stevenson. See *The Triumph of Human Empire, Verne, Morris, and Stevenson at the End of the World,* Chicago, The University of Chicago Press, 2013, p. 257.

11. Arthur B. Evans, "Jules Verne's Dream Machines: Technology and Transcendence," *Extrapolation*, vol. 54, no. 2, Summer 2013, p. 130.

12. Billy Vaugh Koen, *Critical Perspectives on Nonacademic Science and Engineering*, ed. by Paul Durbin, Lehigh University Press, Bethlehem, PA, 1991, p. 41. Emphasis mine.

13. Anon. *Mobilizing Resources in Constrained Environments: A Study of Technology*, ProQuest, 2008, p. 16. Emphasis mine. See also David Laurence Higgitt*, Perspectives on Environmental Management and Technology in Asian River Basins*, Springer Science and Technology Media, 2011.

14. Claude Lévi-Strauss, *The Savage Mind*, ed. by Julian Pitt-Rivers and Ernest Gellner, Chicago, The University of Chicago Press, 1966, pp. 18-19.

15. http://www.asahi.com/special/yoshida_report/en/1-3.html.

16. Frank Guarnieri et al. *L'Accident de Fukushima Dai Ichi*, Paris, Presse des Mines, 2016, vol. 2, p. 41.

17. *Around the World in Eighty Days*, trans. and edited by William Butcher, Oxford University Press, Oxford, New York 1995, p. 134.

18. Louis Simonin, "Voyage en Californie," *Le Tour du monde*, 1st semester, 1862, p. 4.

19. Daniel Compère, *Jules Verne écrivain*, Genève, Droz, 1991, p. 161. Julia Kristeva's initial use of the word has much to do with Levi-Strauss' s remarks on bricolage : the two visions of literary creations were developed at the same time within the structuralist approach to the study of literature and culture.

20. *Ibid.,* p. 57-88.

21. *Entretiens avec Jules Verne*, *1873-1905*, ed. by Daniel Compère and Jean-Michel Margot, Slatkine, Geneva, 1998, p. 91. Emphasis mine.

22. *Ibid*., p. 93.

23. See above, note 13.

24. From a somewhat different perspective, Arthur B. Evans has seen the "fictional dream machines" as *mise-en-abyme*, "'textual machine that functions as a semiotic device, generating both content and meaning." "Jules Verne's Dream Machines: Technology and Transcendence," p. 141.

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