

# Chapter 1

## Introduction

Like many others, while at high school I was very keen on Luigi Pirandello (and in love with a classmate as well). One of his short stories, *The Tragedy of a Character*, struck me in particular. In it, Pirandello tells us how, on Sunday mornings, he used to create his ideas for characters to be used in his future novels.

Inspired, I decided to follow his example. I would meet “my authors”, i.e. those writers who, from time to time, I liked rather more than others. On a Sunday morning, and maybe at other times too to tell the truth, I would go to a shelf and pull out a book of one of my favourite authors, look at it, smell it, thumb through it and hold it in my hand. I would do this for love, for inspiration or just for the joy of it. With a book in hand, it was natural for me to talk to the author; in particular, to ask him how he came to write such a beautiful thing. Few authors answered me, or maybe I did not understand, and almost always I would put the book back on its shelf without thinking any more about it.

Even now, half a century later, I still occasionally have such encounters (in a very physical way) with the books of my favourite authors. By now, there are many more books on my shelves, and they have undergone much change over the course of time. The other morning, a Sunday, and (who knows?) perhaps because it was a Sunday, I felt I wanted to meet again with Jules Verne, my absolute favourite author as a youngster. I own an old illustrated edition of *A Journey to the Centre of the Earth*, an impossible story that had always fascinated me. It is a book with an unmistakable and unforgettable scent of its own. I opened the book by chance at the page describing the Runic manuscript that will guide the intrepid Professor Lidenbrock towards the centre of the Earth, and again I was overwhelmed by the story.

A few words concerning Jules Verne, for the benefit of those who are less fanatical than I am about the famous French writer. He was a Frenchman, born in 1828 in Nantes, the port of sardines travellers; at the age of eleven, he runs away from home to embark on a ship to the Indies, but his father, a leading man of the law, finds him and takes him home. Forced to finish school, he becomes a lawyer, although reluctantly. He then unleashes in writing his passion for exploration, despite the legal career which he had had forced upon him by his father. For years,

he divides his time between work and writing plays; up to the age of thirty five, he had only written *Five Weeks in a Balloon* (although throughout his whole life he only spent a grand total of 24 min on a balloon) and then, in the space of two years, he wrote, *Journey to the Centre of the Earth* and *From the Earth to the Moon*, and immediately found fame in 1852, the same year Napoleon III became Emperor. During the decade, from 1865 to 1875, he wrote four other masterpieces: *The Children of Captain Grant*, *Twenty Thousand leagues Under the Sea*, *Around the World in Eighty Days* and *The Mysterious Island*. Globally, Verne had a formidable literary success, which allowed him a life of great wealth (he bought, among other things, two yachts). As a great gourmet, he had an intense relationship with food, which is reflected in the extravagant menu prepared or tasted by his characters, from the very elaborate meals enjoyed by Captain Nemo's mariners to the simple but nourishing food of the castaways in *The Mysterious Island*. Other works followed, mostly novels, eighty in all, to describe approximately 64 voyages, at a time when one wrote with a quill pen by candlelight. More or less over the same period, from the 1870 (with the Germans in Paris...) to 1880, four ponderous volumes were published on the history of the exploration of the whole Earth, its continents and oceans. By this time, he had become so famous that in 1884 he was able to visit Pope Leo XIII, who seems to very much appreciate the French writer. In 1902, he meets the first great French film-maker, Georges Méliès, who immediately shoots *A trip to the Moon*, inspired, of course, by Verne. In 1904, a year before his death, diabetic, nearly blind and paralysed, he collaborated on the screenplay of another Méliès film and adapted from a play of 1882 by Jules Verne and Adolphe d'Ennery, *Journey Through the Impossible*: what better title for the last work of Verne?

Returning to my experience the other morning: after an hour of feverish reading, I was almost in a trance, when suddenly and without warning, Jules appeared at my side in front of the bookshelf. I seemed to be dreaming (and perhaps I was dreaming...), but it does not matter, the opportunity was too good. He was accompanied by his odoriferous cigar from which he was inseparable and he seemed well prepared and in the mood to talk. What does one ask one's living legend when he stands in front of you? What does a mathematician ask to a resurrected Gauss? Or a philosopher to Aristotle, perchance met in a bar? I threw myself in headlong.

"Jules" I asked, "May I call you Jules?... You made up all these incredible adventures—underground, under the sea, in the air, in space, even in time—you made them come alive to me and to millions of people all over the world. How did you do that? What is the secret of your narrative technique? How do you enchant and entrap the reader, as you have just done with me, yet again?"

"*Tu sais*", he replied, "it is not difficult. There are no special narrative techniques, no secret invocations of complicity or of suspension of disbelief with whoever might be holding one of my books. Simply, leave it to the reader, let them dream and then let them find written on the next page what they had dreamed of when reading the previous page. I mean, I've never written that stuff that you now call science fiction, my stuff was all perfectly believable, designed by engineers, and it was credible because it came of your desire to believe it. *Et voila!*"

“Your Secret” I said, “has the simplicity of genius, *mon cher, Jules*, and I hope you allow me to copy it a little, in a small... Actually, I had in mind to write something about the mania that man has, has always had, and always will have, for exploration. I was just looking in your books for a way to make the subject understandable, orderly, and attractive at the same time: I would like to mention man’s constant path towards the exploration...”

Here Verne interrupted me: “*Justement, mon cher ami*, You know that after 1870 I wrote a long treatise in four volumes on exploration... but having thought about it, truth to tell, I’m not quite satisfied with it...I think it came out a little... dry... and, well, seeing that I cannot change it, at least let me enter into this adventure with you”.

I turned pale at the thought: “How so? Jules, you with me? This is too great an honour”. With a good-natured smile, Verne said: “*Allons-y*, come along—let’s try...” and with that I felt his hand on my shoulder.

A shiver ran all through my bones: Jules Verne had touched me! Reality or dream—it does not matter. Since that moment, I was never the same person: I was refreshed in spirit; every idea, every page seems to me to have been validated, if not suggested, by Jules, and everything is easier. An initial idea that we (!) had considered was first to talk about the birth of man’s passion for exploration, but then, more importantly, to talk about what there is still left to explore and how we could do it today, tomorrow and the day after.

Jules, I must say, it is very well-versed concerning the extent of the exploration of the Earth’s surface; think of the saga of *The Children of Captain Grant*, in which a group of adventurers go around the world in search of a disappeared hero. Verne, however, died a few years before both the North Pole (Peary 1909) and the South Pole (Amundsen 1911) were reached, and almost half a century before the last symbolically inaccessible place on the planet, the summit of Mount Everest was trod on in 1953. Moreover, Verne in 1870 knew what was then possible to know about underwater exploration. So when I told him what we know today about the centre of the Earth, the oceans or, even more, outer space, beyond the Moon—that was enough: a partnership was born: Jules would guide me through (he suggested it to me) the “conquest of the seven spheres” I would simply explain what we know today and what we hope to be able to do tomorrow. Jules, however, promised to supervise all the work and, most importantly, to send me by way of help, his imagination, where my own may not be enough.

I shall now try to explain what the seven spheres are, at least as I understand them. This one of the spheres is also one of Verne’s ideas, passed to me with the generosity of a great gentleman. Even the term “conquest” is his: I probably would have preferred “exploration”, but it is hard to argue with a great writer. But perhaps the difference is nuanced in time: if today one plants fewer and fewer flags, and tomorrow still fewer, maybe it is because what really matters is the exploration itself, rather than the achievement of goals, i.e. the “conquest”.

The nearly spherical surface of the Earth with (its land to roam on and its seas to navigate) was for mankind their first field for exploration, and we shall call this Sphere 0, or the sphere of the land and sea. Today, there is not much mystery to

Sphere 0, but that is where we learned to explore (and to plant flags, often with disastrous consequences).

Going downwards, under miles of water, we come to Sphere  $-1$ , or the sphere of the deep sea and ocean floor. Today, we can do much better than Captain Nemo, the commander of the Nautilus, the “electric” submarine of *Twenty Thousand Leagues Under the Sea* which was so innovative for its time. Sphere  $-1$  is essentially still being explored, and we will see how to do it, and why.

Further down, we find what we shall call Sphere  $-2$ , or the sphere of the underworld, the deep interior, the totally unexplored part of planet: here the famous *Journey to the Centre of the Earth* will be set in modern times. It will be an exploration of something that holds big surprises, we shall discover, and an exploration which could begin by using some incredibly innovative means.

It is inevitable that today we observe the Earth as entering a new geological era, which many have called the “Anthropocene”. The term seems to us one that well defines a period with environmental conditions that have been altered by human activities, since modern *Homo sapiens*, with all their strengths and weaknesses, became the dominant ecological force on Earth. Thus, even if Spheres  $-1$  and Sphere  $-2$  still remain (relatively) spared by these onslaughts, imagining a future in which we will need to explore more and more seriously other planets to which we might need to travel is unavoidable.

Moving away from the surface of the Earth, we shall go into space, and here comes the good part. We immediately meet Sphere  $+1$ , or the sphere of Terrestrial Heaven: it is the strip a few 100 km above the Earth, where today thousands of satellites orbit and where hundreds of astronauts come and go all the time. Jules had overlooked this sphere a little bit, since in his time it was still too unknown. For us, however, Sphere  $+1$  is increasingly used as a region in which to conduct fundamental science and test its applications, and it will become even more so, as well as a place in which to train ourselves to go farther into space.

Sphere  $+2$ , or the sphere of the Moon, is a thousand times farther from the Earth than is Sphere  $+1$ , and a thousand times more difficult to reach. Yet we did reach it half a century ago, and it remains a great historic undertaking. On the Moon and nearby, there is still much to do. I’m sorry, Jules, *From the Earth to the Moon* is a wonderful work of fiction... but to get to and from the Moon was not so simple, as you imagined as we shall see. However, chemical engines will still be all we need to travel on.

Sphere  $+3$  is that of the “outer” planets of the solar system, i.e. that which starts with Mars, a thousand times more distant than the Moon, and continues as far as the Trans-Neptunian Objects. Here, we have to shift gears, as we will see, and concern ourselves with those forms of energy that will allow us to get there. Jules will be of little help here, since this is where nuclear physics will be of service and, indeed, at this point, we will leave him, probably going over modern books to understand nuclear propulsion.

He himself told me: “From now on, beyond the Moon, I can be of no more help, *hélas*. We need a professional: do you not know someone?”

Luckily yes. For Mars and beyond, we will be accompanied by a hero of real space exploration, Wernher von Braun, the (real) conqueror of the Moon; one who perhaps had less imagination than Verne, but who had more precise ideas on rocketry. We must be able to get hold of him in some way.

If we decide to use the right form of energy, and we already know that it is the nuclear one, we will see how the exploration of Mars is within our reach. And, inevitably, at that point, we will take off, just as the Phoenicians, the Vikings or Columbus did when they had at their disposal the right vessels. Not only that: but with a “little” extra effort, necessary, to achieve the right scientific and technological know-how, we may extend our reach a 1000-fold and penetrate the thickness of Sphere +3. We could arrive at the edge of our Solar System. Brace yourselves, Jules and Wernher: here, we will even need to go a step further, and study thermonuclear fusion...

Just like the Aristotelian system had one final sphere (which Aristotle called of “the fixed stars”, not knowing that they happily move around...), we also have a “seventh sphere”, our Sphere +4, which we will also call “the fixed stars”, in keeping with tradition. It is a sphere that has a radius of about twenty light years from us, and it is one that will take us into our galactic neighbourhood. It contains at least 131 stars around which we now know that numerous planets are orbiting. Indeed, many of them we have already discovered. They are very close to us and also very interesting: a good reason to go there as soon as we are able.

We do not yet know *how* to do it, but we already know that we would like to go there; we shall need one form of energy so efficient to make thermonuclear fusion look like petrol. Here, we have to work imaginatively and will do so in the company of and be inspired by someone who did not joke as to how much imagination he had: Titus Lucretius Caro, the Roman poet who, in the first century BC, wrote more than 7400 beautiful hexameters in six books entitled *De rerum natura*, where he describes more than The Nature of Things.

We will find the right method of propulsion strictly respecting the physics that we know today (because here we are not, unfortunately, in a Dan Brown novel...), just as Verne did when faced by problems bigger than he could imagine. However, even if we do not know how to be able to pierce the sphere of the fixed stars, we at least know that we have a strong motivation to do so: we will see that we have already discovered that some of the planets orbiting stars in our neighbourhood could be habitable (or, indeed, inhabited?).

*Bon voyage* everyone, and Jules, Wernher, Titus, please help me stay with me... And if seven spheres seem too many to our reader, consider this: the original idea of the celestial spheres was developed by Eudoxus of Cnidus, who, in the first half of the fifth century, guessed there to be 27 spheres, to account for the motion of the planets and the stars. Aristotle, half a century later, stole the idea, but with his mind more akin to that of an engineer (for a philosopher...), he wanted to imagine the spheres in more concrete, physical terms: as made of crystal, or something similar. Except that, by doing so, one confounds further a complicated mechanical system and Aristotle come to need as many as 55 spheres rotating and oscillating... We, after all, shall necessary in theory manage with far fewer.