

The blue room

by Paolo Giordano

Until an age that maybe my parents thought worrying, I slept with the lights on. The night light, a crayon-shaped table lamp, was in a corner of the room opposite the bed. To dim its intensity, my father had painted the bulb with blue tempera. I clearly remember the day he did it: the painted light bulb left to dry on an old newspaper stained with a blue colour that he called “ultramarine”. Since then, all my nights became blue. Sometimes, if I was feeling especially restless, I used to stare at the crayon-shaped lamp and witness a strange phenomenon: the distance between myself and the light increased, the table lamp or I or both ran away in opposite directions. It was a feeling that left me breathless and the way I remember, there was nothing psychological about it: it really happened.

Many years later when I first heard about space-time curvature, and later, at university, when I was racking my brains to understand the underlying algebra, my mind kept going back to the blue room of my childhood, to the fear of those nights when objects ran away from me and volumes became distorted. I knew of space-time elasticity way before someone showed me its field equations, and that knowledge was linked to fear.

Indeed, if I look back at the story of my conscience - which is the only stable reference for a writer -, I find irrationality well before reason. I find the blue room before all the beliefs acquired later about what's true and what isn't, as if at the core of the atomic structure of my personality were a minuscule entity made of childhood impressions and memories, kept together by a tangle of mostly unnamed emotions - an indivisible nucleus of fear of anything unknown.

So why talk about it here then? In a temple of reason like this one, where formulas, charts, and statistics lighten up the darkness and draw a clear, strict, and *unequivocal* line between what's true and what isn't? The short answer: because we live in an era dominated by irrationality and fear. The more articulate answer is: because I want to encourage you, as young scientists, to always bear in mind, at every step in your career, the fears of the human-being-in-general.

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I borrowed the expression “human-being-in-general” from a series of lectures by Robert Oppenheimer, eloquently entitled *Science and the Common Understanding*. All of us here know who Robert Oppenheimer was. We have all devoted time to his theories and formulas, we have all admired his genius coming to light. And it is likely that each one of us, albeit in passing, has lingered at least once over the profound crisis of conscience that Oppenheimer must have experienced after witnessing the gruesome consequences of the Manhattan Project, of which he was the scientific director. But therein lies the problem: in the fact that we did it “in passing” at best, as if, as scientists, his formidable hypothesis - the Born-Oppenheimer approximation, the quantum tunnelling prediction, the theory of black holes -, concerned us way more than the tragic meaning his genius has had in human history.

Oppenheimer wrote the lectures of *Science and the Common Understanding* in 1953, with eyes still blinded by the Hiroshima and Nagasaki explosions, and even though his

words are always sober, obedient to the placidity typical of every scientist, dismay transpires and makes them somewhat falter. His need for redemption, or even just liberation, is evident from the words he wrote with a Messianic tone, and I quote: “All these things have happened and all surely will happen again. This means that, if we are to take heart from any beneficent influence that science may have for the common understanding, we need to do so both with modesty and with a full awareness that these relationships are not inevitably and inexorably for man’s good.”

Ten years later, although in a very similar emotional state of mind, Elsa Morante wrote her essay *Pro o contro la bomba atomica*. “It seems clear to me that no topic nowadays affects each and every writer as much as this one. (...) There is no doubt that the most important thing happening today, and that no one can ignore, is this: we, the inhabitants of civil nations in the 20th century, live in the atomic era. (...) But, as to the full and substantial meaning of the adjective, people, as it happens, mostly defend themselves against it with a (somewhat forgivable) repression.”

The infamous pamphlet by Charles Percy Snow, which validated the separation between scientific and humanistic knowledge in the collective consciousness, dates back to the same period, exactly sixty years ago. Upon rereading it, the text appears rather mediocre, poorly argued, and often surrenders to the temptation to let off steam, yet it is undeniable that the fortunate choice of the title, *The Two Cultures*, represented a thought watershed. Snow’s reprimand is well-known: men of science do not read novels, nor do they bother to bring their knowledge outside of academies and laboratories; by contrast, men of letters, often too lazy and scared to concern themselves with scientific progress, dismiss it at best, and, at worst, pretend it doesn’t exist at all.

Oppenheimer, Morante, Snow: the man of science, the woman of letters, and the man suspended between two cultures who, over the same period, each from their own perspective, wondered about the same issue, namely the extremely dangerous divide that had opened between science and conscience. It is no coincidence that those years saw the Cold War, the nuclear threat, the arms race and the ever-closer hypothesis of global destruction, which make the topic urgent. The human-being-in-general was gripped by the most intense fear ever experienced in history.

Then, the nuclear threat abated, the alarm has ceased, and, as it always happens, was replaced by comfortable oblivion. Once the bomb was exorcised, the gap between the two cultures never again appeared on the agenda of scientists and scholars. But what I’d like to ask you today is: does it really have no relevance in the present?

Giving a fleeting and distracted look at the scientific section of my bookshelf, on the spines I read expressions such as “big data” and “sixth extinction”, “dark web” and “living will”; I read acronyms like GMO; I read words such as “transhuman” and “climate”, the latter used in any possible apocalyptic scenario; I read commonly-used terms, seemingly domesticated, like “vaccine”, “race”, “gender”. And I realise that each and every word is pervaded with fear. While in the post-war “only” the nuclear threat existed, around which all the ghosts of a century crowded, over the course of fifty years that unit of terror broke down into countless pieces, each bringing along its specific fear.

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Hence, the reason why my lamentation is addressed precisely to you is clear. Because of all you sitting here are on the side of the fortunate ones. You have a more or less long familiarity with science, but a familiarity nonetheless. However, I’d like to remind you that,

no matter how expert, no matter how brilliant you are in your field, each and every one of you is still the human-being-in-general, incompetent and lost in any field other than their own. This wasn't true in Oppenheimer's day, or rather, it wasn't *as true* as it is today. Each scientist was still *the* scientist, whereas today a scientist is only *a* scientist. There's no way out: in the face of modernity, we are all scared children.

Then again, who in this room hasn't felt at least once powerless and frustrated before a computer technician who tries to explain to you how to run the new Linux operating system on your computer and, instead of calmly showing you how to do it, types in commands on the shell at lightning speed blabbering geeky terms, while being completely unaware of the fact that you are not understanding a single word, being completely unaware *of you*. And who hasn't experienced at least once a sense of annihilation similar to the one you feel with a doctor who does nothing to make you really understand something which affects you way more than it does them? It's true, doctors and computer technicians are especially bad at explaining things, and physicists are no better. As a matter of fact, physicists don't even try. If someone asks them, with tender naivety, of the "God particle", the one so much heard about on the radio and on TV, they mostly answer with a condescending smile, because talking about spontaneous symmetry breaking is not worth it. If it weren't true, there would be no reason why some discoveries of the 20th century, such as the DNA double helix, have more or less become part of collective consciousness, while other similar and equally important discoveries, such as the Standard Model, are mostly surrounded by mystery. It isn't just a matter of complexity or mathematics, since we could understand enough about the Standard Model without bringing up one single formula. If anything, the problem is that, as Oppenheimer writes "All this means that science is cumulative in a quite special sense. (...) This is one reason why the growing edge of science seems so inaccessible to common experience. (...) This is why this long tunnel, at the end of which is the light of discovery, is so discouraging for the layman to enter, be he an artist, scholar, or man of affairs."

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One could object that those who are here today at least have a method. But is the method really enough to effortlessly move among the countless brand-new ethical and material questions that scientific progress continuously poses? I find it difficult to believe that those who have made demonstration, precision, and insatiable in-depth study the pillars of their knowledge, like you did, are so easily satisfied. Deep down we know that to voice an opinion, or even to just have one, on GMO and artificial intelligence, on vaccines and nuclear energy, or on self-driving cars, to have a sensible opinion on all of these things *at the same time* we would need to know each and every topic with an acceptable level of accuracy. Otherwise, we have no choice but to blindly rely on the opinion we see as the most authoritative, on the official version of the scientific community, when there is one, or on something more fleeting, a personal inclination: which is precisely what we all necessarily do.

Anyway, the real issue is not the people in this lecture hall. The real issue is all the people *outside* of this lecture hall, all the people who, because of their life paths, by choice or by mere chance, have been kept away from scientific knowledge, all the people to whom progress seems a wild horse racing at full speed, dangerously brushing past them with its hooves and kicking handfuls of dust at them. They are the human-beings-in-

general Oppenheimer worried about, a bit too late to tell the truth, and whom each modern scientist should worry about, while there is still time.

We are already paying the price of not doing it, of not worrying about it. It is there for all to see and the price can become even greater: it is the uncontrolled growth of collective fear, it is the search for ever-easier solutions to increasingly complex problems, it is the unpleasant impression of living in an anti-scientific country, within a Europe which is all becoming anti-scientific; it is - and I can say this without exaggeration - the endangerment of democracy itself. With what freedom is a citizen, who fumbles around in an unintelligible reality, a reality which becomes every day more hostile and unclear, making decisions? "All these things have happened and all surely will happen again."

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It may seem paradoxical, but I started thinking about science in these terms only a few years after I had distanced myself from it. To tell the truth, I began thinking about science very late. If anything, earlier it was a field I moved in, an element I breathed, and which had no need to be "thought about". Everything around me encouraged this careless attitude. During my university years, and later during my PhD, I didn't attend a single course on epistemology or the history of physics. There simply weren't any. If I had wanted it badly enough, I could have looked for one on the other side of Turin city centre, in Palazzo Nuovo, the refuge of humanists, where, however, I felt - and still feel - like an outsider, a spy.

And yet, I recently learnt that a good writer rethinks literature as a whole in all his works. And a good philosopher behaves similarly, by philosophising. Why should it be any different for a good scientist? Why should he sit here, on top of this wonderful hill overlooking the sea, in the bright rooms of this former sanatorium, and not bother thinking about science and its relationship with the world, while he acts *within* science to make it progress?

I realise that as a proclamation, it is easy enough, but actually putting it into practice is quite difficult. I will try and find my way out of this by borrowing another metaphor from particle physics. When a century ago Niels Bohr discovered quantum mechanics, while he was trying to teach us how to imagine something which wasn't entirely imaginable, he was driven by a principle related to common sense, known as the "correspondence principle". According to this postulate, the new and absurd world that was manifesting itself before his eyes, governed by counterintuitive rules and various quirks, had to necessarily connect with the everyday world, skilfully described by newtonian mechanics. Each new equation, within its limit for large distances or infinite states, had to reproduce already-known equations. And the discrete universe of the infinitely small had to resemble the continuous universe humanity had been familiar with for centuries, if looked at on a sufficiently wide scale. As if to say: the physicists of the nineteen-hundreds were free to venture into the open sea as much as they wanted with their imagination, amidst violent storms and unknown sea monsters, but they were never to lose sight of the mainland on the horizon.

Hence, the correspondence principle, that was extremely useful to Bohr precisely because it was so strict, may perhaps be valid for every scientist: while he lets himself get sucked in by the abstruse beauty of his experiments and theories, he should never lose sight of the human-being-in-general, nor should he entirely lose the capacity to include humanity in everything he does.

The first time I came to Trieste and to the ICTP for a summer school on particle physics, I was twenty-four years old and I didn't care about any of this. I was working on semileptonic B-meson decays and I didn't want to explain to anyone what they were and what their relevance for the universe was. If anything, I wanted to belong to the blessed Empyrean of the very few people who already knew these things, and much better than I did. My inspired desire for scientific knowledge was purely ascensional, a contemptuous rising off the ground.

Strangely enough, it was precisely during the two weeks I spent here, at the end of my classes on supersymmetry and extra-dimensions that filled me with fervour, that I wrote a handful of final chapters of my first novel, the same one that shortly afterwards would, somewhat violently, tear me away from the blue skies of theoretical physics. I said "strangely enough", but the truth is that for me there was nothing strange about it: physics and writing were just two things that I *did*. I didn't perceive that "gulf of mutual incomprehension" which C.P. Snow talked about.

Now, when I walk along the corridors of the former sanatorium, when I follow the timeline glued to the flooring of the sixth floor as if I was travelling at a maddening speed from the Big Bang to the present, I peek into the classrooms through half-closed doors. I see the boards full of symbols and equations that once had a precise meaning for me and I feel a twinge of nostalgia. Nostalgia for the solace they brought me. Nostalgia for the feeling of omnipotence they gave me. And I feel a bit envious of those who still master that language, like you do. Because in the meantime I have become a human-being-in-general, frightened by the knowledge he doesn't have, or perhaps I have always been like this, without even realising it. Hence, after all the exhortations, I'd like to make a deal with you. I shall try to never forget the solace of those boards. In return, you shall try to never forget, during the brilliant years of intellectual work that await you, the human-being-in-general. Try to never forget his inadequacy, his fears, and the blue light that moved irretrievably away from him - the same light that many years ago perhaps you left on too, in the opposite corner of your childhood bedroom.

By courtesy of Paolo Giordano

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