Science's fiction

Scientists deal with the facts. But they wouldn't get anywhere without dreaming up stories first.

Jean-Marc Lévy-Leblond

Fact versus fiction — is there a more entrenched opposition? It underlies our very conception of science, which investigates solid facts of the world, in contrast to art and poetry, which produce fictitious creations of the mind. Indeed, the very word 'fiction' comes from the Latin verb *fingere*, meaning to fake, to feign, to pretend. This is exactly how Newton used it when he claimed "*Hypotheses non fingo*" to express his refusal to contrive an ad hoc mechanism for explaining his law of gravity. "I stick to the facts" is perhaps the most faithful translation, an assertion repeated by many physicists since.

Rejecting fiction is meant to insure the positivity of scientific knowledge against the risk of uncontrolled imagination. Yet the drafting of hypotheses — that is, precisely, *fictiones* in Latin — is one of the first endeavours of scientific activity. How, then, can we discriminate between hypotheses that we should dismiss as irrational fantasies, and those that we posit right at the outset of our investigations? Could it be that science paradoxically offers the best proof that fiction can lead to facts?

Let us go back to our etymological inquiry, which we interrupted too soon. In fact, the verb *fingere*, in archaic Latin, is very concrete and factual — its initial meaning is to model (in clay), to sculpt, to mould, to represent. The word thus forms the root of 'fictions' and 'figments', but it is just as relevant to 'effigies' and 'figures'.

It is the very history of language, then, that advises us not to oppose fictions, as inventions and creations, to figures, as representations and models. The former are to the latter as imagination to imaging, a deployment without discontinuity. It now becomes possible to think that science and fiction are not incompatible — in spite of the purposely oxymoronic use of the two words in the naming of the literary genre known as science fiction. I would even advocate the idea that theoretical physics, that paragon of exact sciences, is, first and foremost, fiction. The physicist, as does the novelist, invents worlds and tells stories. Any historical episode of some import illustrates this thesis.

Euclidean geometry, which is a physics of space, already deals essentially with the basic geometrical figures, which are but fictions — points with no extension, lines with no end, planes with no width. These first mathematical entities have no factual existence, and are (worthwhile) figments of the imagination.

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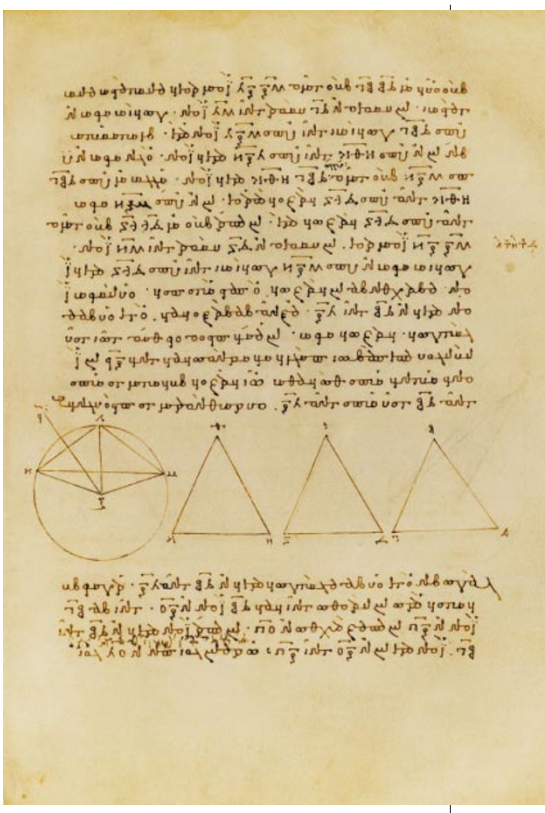
Galilean physics gave us the law of free-fall, which is mother to all legislation of the physical world. But its claim of constant acceleration cannot be true except in a perfect vacuum. This statement thus starts as a children's game: "Pretend there is no air …", to which one must immediately add "… and pretend that the Earth is flat and does not move", and so on. Hypotheses, indeed, that we feign and try fitting to the facts.

Contemporary theoretical physics is no different. Nuclear forces are studied as if gravity did not exist. Special relativity describes the structure of space–time as if it were empty. And, following Einstein, the recourse to a *Gedankenexperiment* (fictitious experiment) is one of the favourite methods of modern theoreticians.

These are instances in which fiction operates by restriction, so to speak, letting us study simplified figures and reduced models of the world. But there are other cases in which it operates by extension, leading us to investigate radically different universes, reaching well outside our representations. To stay within theoretical physics, although our space-time has 3 + 1 dimensions, we will not shun exploration of hypothetical universes with 10 or 26 dimensions, in case our own world should resemble some corner of these super-universes. Although a powerful and sturdy theory forbids any object from exceeding the limiting velocity of light, we will dare to conceive of 'tachyons', supraluminous particles, and then desperately try to clear up apparent contradictions in their behaviour. The scientist is an unrepentant dreamer — far from sticking to factual observations, he must imagine fictitious situations, which may, from time to time, prove to be veracious.

Such a thesis might be accepted without too much reluctance as far as it concerns the theoretical activity of science. But, it will be objected, this cannot hold for science's other facet, experimental practice, through which science grapples with external reality so brutally that friction, rather than fiction, becomes the password. Indeed, far be it from me to deny or underplay this confrontation, which permits the specificity of scientific knowledge.



Art imitating life: the fictitious constructs of euclidean geometry help us to describe reality.

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Yet no proper experiment is a direct and naive affair with nature. What are sophisticated experimental apparatuses, if not fictional devices that enable the outside world to reveal itself in comprehensible terms? Why would we need to experiment, that is, to imagine and produce artificial phenomena, if mere observation of natural ones sufficed? Forcing bodies to fall along a slanted trajectory instead of letting them follow the spontaneous vertical direction (Galileo); coercing electrons to circulate along manmade metallic wires (Faraday, Ampère); and creating *de novo* elements endowed with artificial radioactivity (Irène and Frederic Joliot-Curie) — are these not tantamount to requiring nature to tell us unheard stories and to unfold new narratives?

According to Jean Cocteau, poetry is "a lie which tells the truth". The same is true of science. At least, this seems an interesting hypothesis to feign. ■

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