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Review

Andrew Gregory: "Anaximander, a re-assessment"

Carlo Rovelli

Anaximander of Miletus is one of the greatest thinkers of all times. A towering figure that opened the way to the vast Western naturalistic scientific and philosophical developments of the last two and a half millennia. The significance of his legacy, long underestimated, is increasingly recognised by historians with scientific sensibility, as one of the deep historical roots of modern science. Daniel Graham writes "Anaximander's project proved in the hands of his successors a program capable of endless development and, in the light of its modern incarnations, productive of the greatest advances in knowledge the world has ever known. In a sense, his private project has become the grand quest for knowledge of the world." Dirk Couprie calls Anaximander "on a par with Newton". In the introduction to the essay collection `Anaximander in Context', the editors write "We are convinced that Anaximander was one of the greatest minds that had ever lived, and we felt that this had not been sufficiently reflected in the scholarship, until now." Karl Popper salutes Anaximander's realisation that the sky is not just *above* us, but continues also *below* us —pictorially: Earth floats suspended over the void— as "one of the boldest, most revolutionary and most portentous ideas in the whole history of human thought".

But Anaximander is also an shadowy figure. We have a badly incomplete and fragmentary picture of his thinking, based on a single cryptic fragment and sparse references to his ideas in texts written centuries after him. Some of these ideas shine like diamonds through this mist, for their astonishing novelty and the profound influence they have clearly had over the entire Western though; but the overall conceptual cadre in which they were framed is unclear, and open to different readings. Any renewed effort to bring Anaximander's thought into focus is therefore precious, and Gregory's learned and detailed `re-assessment' is much welcome.

Gregory's work is particularly praiseworthy where he analyses in detail the numerous open questions of interpretation of Anaximander's ideas. He makes an excellent good job comparing the divergent opinions in the literature and criticising those that do not hold; I find his instinct and judgment mostly reliable. He is particularly convincing when he criticises theological or non-naturalistic interpretations of Anaximander. I have appreciated many details, for instance his pointing out the issue of the stability of the wheels of the heavenly bodies, or his sensibility in realising that some issues (such as where are the limits of the cosmos) might well not have been a concern for Anaximander. There is a lot to learn on Anaximander from this book.

When `assessing' an ancient author, two perspectives can be taken; the difference is especially relevant in this case. The first is the specialist who struggles to reconstruct all views of an author as closely as possible as they were expressed at the time. The second is the wider perspective of studying the role played by a thinker in the net of the concatenation of the ideas: what is novel, how novel, and its influence. The second perspective cannot do without the first, but the first alone risks to get lost in details of marginal significance and be blind to what turns out to become

influential. I have written a book on Anaximander from the second perspective, focused on the influence that he (or the Milesians in general) have had on the development of science. Gregory's work, on the contrary, is within the first: a vast source of valuable scholarly information.

There are issues where I find Gregory's account less convincing. A thesis of the book is that Anaximander's explanation of natural phenomena are biological rather than mechanical. Gregory uses terms like "organic" and "irreducibly biological". The problem I see is that these are terms of a debate that is two centuries old, and has no meaning today, nor —I suspect— at Anaximander's time. The existence of a radical mechanical/biological divide, and the issue of the reducibility of one side to the other, are not anymore relevant in today's science (life is just one of the natural phenomena and complexity is not unique to it), and were most likely not relevant in the VI century BCE either. It is a XIX century's issue, part of the outdated debate on the mechanical philosophy; it seems to reflects specific intellectual concerns by Gregory more than a distinction useful for understanding Anaximander. Anaximander's nature is what it is, and Anaximander has a very unitary notion of it, as Gregory himself nicely points out; he uses analogies of both kinds, without distinction; to discuss Anaximander in terms of the largely artificial mechanical/biological distinction seems to me to obscure matters rather than shed light.

A key related issue is the importance that Gregory attributes to the notion of "steering". The claim is that the *apeiron*—the "entity" that Anaximander puts as the `principle' of everything— "steers", or "governs" natural phenomena. I find the evidence weak: a single verb used by Aristotle, while the notion is never repeated by any of the numerous ancient authors that talk about Anaximander. I do not see `steering' to fit in the naturalism universally attributed to Anaximander. Gregory talks explicitly of "pantheism", "intelligence", "intentionality" and even, insistently, of "the modern theory of intelligent design" (sic). Intentionality requires somebody to have an intention, and what Anaximander is universally recognised for having achieved seems to me precisely the opposite: glimpsed and practiced a way of thinking healed from this anthropomorphism. More importantly, we do know quite a consistent number of tentative explanations of natural phenomena by Anaximander: definitely none of these refers to any `steering'. What is interesting in these explanations is precisely the complete lack reference to reference to intentionality in them.

But Gregory has a point he cares to defend: he comes back over and over again in the book on the relation between science and religion, to argue against the idea of a conflict between the two. He states the thesis —arguably questionable— that the notion of a conflict between science and religion is an "old model". He insists in interpreting the *apeiron* as something "divine", dismissing with nonchalance all contrary arguments, such as the very explicit testimony of a definite expert: Saint Augustin: "…nor did he [Anaximander] attribute *anything* to a divine mind in the production of all activities of things" (*City of God* VIII, 2). And Augustin was trying hard to find the divine in ancient authors. I am not convinced by Gregory's effort of bring the divine, intentionality, and intelligent design into the apeiron.

To be sure, Gregory agrees that Anaximander's major historical merit is his naturalism. He agrees that the greatest merit of Anaximander is to have sought natural explanations for all phenomena, where the intervention and caprice of the gods plays no role. He acutely notices, in particular, that the most interesting part of Anaximander's naturalism is the treatment of human beings on par with other animals: the origin of human beings is accounted for as part of the natural order with entirely natural origin. There is no sense of a special relation to the gods for humans, either in terms of their origin or their lives. He also agrees that the *apeiron* is part of nature, not something extra-natural.

But he seems to be himself disconcerted by this radical naturalism. At the end of Chapter 8, after having described the structure of Anaximander's cosmos, he (Gregory, not Anaximander) exclaims: "Could a cosmos which exhibit such taxis (order), such specific placement and structure, come about by chance or by unguided physical/mechanical processes?" Seems to me that that this is Gregory's argument for the `steering': he is simply rejecting the profound intuition of Anaximander's naturalism, on which so much of the later development of our civilisation will be built: nature does not need somebody or something to stir it. Equivalently: `being steered', is no explanation *at all*. It is just setting up a mysterious hypothetical agent, to whom to delegate what we do not understand.

Of course, evidence about Anaximander's detailed ideas is so weak that the missing dots in the reconstruction of his thinking can be filled in different manners. But here is where perhaps a larger historical perspective can have value, over the concentration on details. If we take a wider perspective, we can detect the historical novelty of a school of thought from its legacy. And here the evidence is overwhelming, because the cleavage between before and after the Milesian thinkers is unequivocal, almost dramatic, and it is specifically to Anaximander that ancient authors attribute most of it, even when they take their distances from it, as for the naturalistic interpretation of the meteorological phenomena, considered obvious today but mostly rejected in antiquity. What has emerged around Anaximander is what the Greeks called Περὶ φύσεων ἱστορία, (hence "Physics"), the "inquiry into nature", one the deep roots of modernity: the creation of a tradition that would form the basis for the entirety of the scientific evolution to come: Greek, Indian, Arab, European and today planetary. Event the literary form of this tradition, a treaty in prose, starts with Anaximander. Milesian is the first rational view of the natural order. For the first time, the world of things and their relations is seen as directly accessible by the investigation of thought, without a passage by the divine. Anaximander opens the way to geography. To biology, contemplating the possibility that living beings had evolved over time. To astronomy, making a rational study of the movements of heavenly bodies and seeking to reproduce them with a geometrical model. He is the first to propose two conceptual tools that would prove fundamental to scientific activity: the idea of natural laws that describe the unfolding of events over time and by necessity; and the use of theoretical terms to postulate new entities, hypostases needed to make sense of the observable world. He founds the critical tradition that forms the basis of today's scientific thinking: he follows his master's path, while at the same time searching his master's mistakes.

Most importantly, he realises the first great conceptual revolution in the history of science: the universality of falling (all heavy things fall down along up-down parallel lines) is questioned, and a new image of the world is proposed, where space is not structured in up and down, and the Earth `floats free' in space. For the first time, the overall map of the world is redrawn in depth. It is the discovery of the world view that will characterise the West for many centuries, the birth of cosmology and the first great scientific revolution. Even more, it is the discovery that scientific revolutions are possible at all: in order for us to understand the world, we must be aware that our world view may be mistaken and we can redraw it. This is the key feature of scientific thinking. What seems most obvious to us about the world (everything unsupported falls) can be false (the Earth does not fall). Scientific thinking is a continuous quest for novel ways for conceptualising the world. Knowledge is born from a respectful but radical act of rebellion against what we currently think. This is the richest heritage that the West has bequeathed to today's global culture, its finest contribution. But it is also an act of rebellion, a challenge launched by Thales and Anaximander: freeing humanity's understanding of the world from the mythical-religious matrix that had structured thought for thousands of years; considering the possibility that the world is understandable without recourse to divinity, intentionality, intelligent design, or mysterious `steering'. This is a new prospect for humanity—one that, twenty-six centuries later, still frightens the majority of women and men on this little planet floating in space.

Of all this, little is recognisable in Gregory. On the contrary, the book has frequent polemics against any scientific reading of Anaximander. Gregory for instance criticises the connection between Anaximander and modern evolution theory with a detailed and punctilious list of differences between modern evolution theory and Anaximander, concluding "Clearly Anaximander has some sense of the development of life on earth but wether that ought be though as a theory if evolution is another matter"; as if a thinker of two and half millennium ago could have guessed the entire modern evolutionary theory. What Gregory fails to see, in my opinion, is that modern evolutionary theory is not born out of nothing: it grew influenced by older ideas, it has roots, and key ones are in Empedocles and Anaximander, as Darwin states explicitly in his book. Another polemic in the book is against the use of expressions such as "The First Scientist", which —I am afraid— was chosen by my American publisher as the English title my own book on Anaximander. Gregory's polemic is that Anaximander is not the only thinker that could be so named: a triviality, of course, and a misinterpretation a simple colourful expression. There is similar polemic against the use of "float" or "suspended in the void" to picture the novelty of Anaximander's idea that the sky continues below the Earth. Gregory punctiliously remarks that there is nothing to "float" upon and nothing to be "suspended" to. As if those employing this metaphorical language (Karl Popper, for instance) wouldn't know.

I think that Gregory genuinely does not appreciate the radical novelty and the historical relevance of the steps taken by Anaximander. He is not the first on this, and the reason is the pernicious modern separation between sciences and humanities. The long underrating of Greek science, which is fortunately beginning to change today, was simply due to the fact that most scientists are not interested in history and most historians are not interested in science. Consequences could reach the grotesque: one still finds in the literature the claim that Ptolemy did not know trigonometry because he did not use *Sin* and *Cos* (he uses *Cord*, which is twice the *Sin* of half the angle). So much of the ancient Greek reflection is closer to science than any other modern activity, and the lack of scientific sensitivity makes the best historians blind to what is actually going on. Sometimes they sounds like a deaf man explaining Beethoven.

Gregory is definitely not a scientist: in discussing Anaximander's earthquakes he considers plausible that Anaximander could have predicted an earthquake, and suggest that he may have done so on watching the winds, which is a nonsense. He lists fragments where Anaximander attributes meteorological phenomenon to the action of the sun on the particles of air and humidity, and comments that "we do not explain meteorological phenomena in this way today". Of course we do. In the conclusion, he writes that he offers a picture of Anaximander "with fewer superficial similarities to modern scientific theories". This precisely misses the point of the Milesian's relevance for science: what is relevant is not the superficial similarity to modern scientific theories: what is relevant is the beginning of a radically new way of posing questions and seeking answers. This, via a long path, has lead to modern scientific theories. By not seeing all this, Gregory ends up filling the missing dots with hypothetical archaic aspects of Anaximander thinking, rather than emphasising the aspects that have had historical significance. The risk of this specialist approach is to pass next to diamonds without noticing them. One example for all: the realisation that Earth floats over the void —the "boldest and most portentous ideas in the the whole history of human thought" according to Popper— is barely mentioned by Gregory.

Gregory's book is precious, and I will keep going back to it when I have doubts about details of Anaximander's thinking. But I think it does not contain the essential. At the beginning of the Prologue, Gregory tells a little story regarding Bayes theorem. It is a joke and not particularly important, but it contains a revealing detail. Gregory writes that he found that "nothing is so dull and so tedious" as Bayes theorem, and that a colleagues of him that fell asleep during a talk on the theorem had the "proper philosophical response to Bayes' theorem". Bayes theorem has

since become the foundation of modern confirmation theory, it plays a central role in the contemporary philosophy of science, and once its full significance is understood, it is amazing for its beauty, simplicity and depth. But you need a scientific sensibility to grasp its reach. You need scientific sensibility to see what Anaximander, a giant, has achieved.

Andrew Gregory
"Anaximander a re-assessment"
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