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## Mathematics

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## MATHEMATICS

ABSTRACT. — If, between André Weil and his sister Simone, mathematics was first and foremost the concern of André, a genius in this field, it nevertheless has played a considerable role in Simone's thought. As admiring as she was of her brother's extraordinary abilities, she was no less opposed to him in the way she conceived mathematics. For André, mathematics was a world unto itself. For Simone, it was one of the mediations (*metaxu*), one of the bridges – with the religion of the Mysteries, philosophy, art – that the ancient Greeks had worked to build between thought and the cosmos, between man and God. The practice of mathematics, as she saw it, was a spiritual experience, through which thought comes into contact with necessity, as the body does in authentic work, and adheres to reality, in the double sense of the word adherence – adhesion and assent.

Keywords. — Algebra; André Weil; Geometry; Mathematics; Science; Simone Weil.

To evoke Simone Weil's relationship with mathematics, it is impossible not to mention her brother André, who is among the most important mathematicians of the 20th century. Throughout their childhood, André and Simone were very close to each other. "As children Simone and I were inseparable," writes André, adding, "but I was always the big brother and she the little sister" (Weil A. 1992:11). As the eldest child, André led the way. At the age of eight, he was spontaneously studying the geometry textbook that the eminent mathematician Émile Borel had written for secondary school. He was fifteen years old when he passed a double baccalaureate, humanities and sciences, sixteen when, still wearing short pants, he entered the École normale supérieure, nineteen when he was awarded first place in the agrégation, twenty-two when he obtains his doctorate.

Simone could not fail to be admiring, and stimulated by such an example. This being the case, the fraternal model was undoubtedly not foreign to the despair that seized her in adolescence, and which she mentions in her spiritual autobiography. "At fourteen I fell into one of those fits of bottomless despair that come with adolescence, and I seriously thought of dying because of the mediocrity of my natural faculties. The exceptional gifts of my brother, who had a childhood and youth comparable to those of Pascal, brought my own inferiority home to me" (letter to Father Perrin, May 14, 1942; WG:64) Her admiration for her brother had led Simone to place a supereminent value on the areas that he cultivated, first among them mathematics. When she was a child, her inferiority was

easily explained by the fact that she was precisely still a child; but at fourteen, this no longer held true: she understood that three years did not matter anymore, that her brother would *always* be infinitely superior to her in mathematics. Hence, at least in part, her despairing feeling of “mediocrity”, at first sight so astonishing in a teenager as wonderfully gifted as Simone.

With the intellectual requirement and integrity that characterize her, Simone Weil did not find her salvation in a dodge, by fleeing or devaluing the field where her brother excelled, but by overcoming the difficulty, thanks to a renewed relationship to the world and to the truth. “After months of inward darkness, I suddenly had the everlasting conviction that any human being, even though practically devoid of natural faculties, can penetrate to the kingdom and truth reserved to genius, if only he longs for truth and perpetually concentrates all his attention on its attainment” (WG:64).

This conviction, which, from the crisis of her adolescence, permeated her entire life, is reflected in the attitude she subsequently adopted towards mathematics. Far from turning away from it, she continued to be interested in it with astonishing constancy. She had no desire to compete with her brother, and she was no longer concerned about the limits to her understanding – limits that exist for everyone, and whose location is, in her view, of secondary importance. “If a workman, in the course of a year’s eager and persevering efforts, manages to learn a few geometrical theorems, as much truth will have entered into his soul as in that of a student who, during the same period, has shown a corresponding ardor in assimilating a portion of higher mathematics” (NR:63\*). What matters most is not the extent of what the intelligence embraces, but the way in which the truth penetrates the soul: “Not to understand new things, but by dint of patience, effort and method to come to understand those truths which are evident with one’s whole self” (NB:I.144\*).

Beyond the brotherly example, Simone Weil’s attention to mathematics is justified in two ways. The first virtue that she recognized in mathematics was common to all subjects that involve study: “Although people seem to be unaware of it today, the development of the faculty of attention forms the real object and almost the sole interest of studies. Most school tasks have a certain intrinsic interest as well, but such an interest is secondary. All tasks which really call upon the power of attention are interesting for the same reason and to an almost equal degree” (WG:105-6). Now mathematics, in order to assimilate its concepts and to solve the problems that arise, requires flawless attention.

The second virtue of mathematics is more specific. In one of her very own formulas, Simone Weil writes: “It is the same truth which penetrates into the senses through pain, into the intelligence through mathematical proof, and into the faculty of love through beauty” (SNL:186-7). The same truth, perhaps – but it is worth approaching it from all sides in order to be better penetrated. This is why, throughout her life, Simone Weil will

do mathematical exercises. This is also why she made so much effort to teach it – to high school girls or to workers. For her, mathematics had a spiritual dimension, and its practice should allow the soul to accept necessity, not only as a constraint, but also, through the intelligence we have of it, as a participation in the divine work. “Man is a thinking being; he is therefore on the same side as that which dominates force. He is certainly not lord and master of creation ... but he is the master’s son, the child of the house. Science is the proof of this. A little child belonging to a wealthy home is in many respects under the control of the servants; but when he is sitting on his father’s knees and identifies himself with him through love, he has a share in the father’s authority” (NR:285-6\*).

Simone Weil attended some meetings of the Bourbaki group, of which her brother was one of the main initiators. This small group had given itself the task, at the end of the 1930s, of giving a coherent presentation of mathematics according to an axiomatic approach, by privileging the notion of structure. She listened to this cénacle of brilliant mathematicians expounding ideas which, despite her efforts, remained essentially incomprehensible to her. However, in the face of an increasingly utilitarian science, sacrificing the spirit to efficiency, it seemed to her that the immense theoretical effort she witnessed, and the rigor with which it was accomplished, were a way of reconnecting with the inspiration of the ancient Greeks, for whom mathematics was neither a pure exercise of the mind, nor a way of ordering the world according to our reason, to prepare it for the hold of our will, but a bridge, an intermediary (*metaxu*) between human thought and the cosmos: for the Greeks, “mathematics constituted, not an exercise of the mind, but a key to nature; a key sought not for technical power over nature, but in order to establish an identity of structure between the human mind and the universe” (letter to André, March 1940, OC 7.1.448\*).

Soon, however, Simone Weil had doubts about the Bourbaki enterprise, which she wondered whether, in the end, would not so much allow the Greek spirit to flourish again as contribute to the extension of formalism, and to the unshared reign of a thought that manipulates without seeing. We know that in her eyes, there was a “complete analogy” between what she called “the three monsters of contemporary civilization” (OC 6.1.100\*) – money, mechanization and algebra which, each in its own way, puts at a distance the world as it is given to us, prevents us from paying attention to it, immerses us in a bath of abstraction. Money imposes itself as a universal means subsuming all ends, a general equivalent that abolishes all ontological differences by reducing everything to a price; mechanization separates the worker from the product of his work, makes them strangers to each other – the objects are made by the machine that the worker is content to serve; as for algebra (which Simone Weil opposes to geometry), it allows us to calculate without seeing, it disposes of magnitudes without knowing to what they concretely correspond – “algebra ...puts everything on the same level” (SNL:54). The mathematician who confides in algebra “lives in a universe apart, whose objects are signs. The relation

between sign and thing signified no longer exists; the play of interchange between signs develops of itself and for itself” (FLN:31).

It was perhaps in an attempt to prevent this drift, which she thought she detected in her brother, that in February 1940 – when, having delayed joining France after the declaration of war and disobeyed the mobilization order, André was incarcerated in the Rouen prison – she suggested to him in a letter that he should endeavor, from the depths of his cell, not to make mathematics progress, but to bring out its meaning. “A good occupation when you have too much time would be to think of a way to make laymen like me have an inkling of what exactly the interest and scope of your work is. For even admitting that it is quite impossible, as you claim, the fact of trying it would surely not be without profit for you. The profit would be, I believe, considerable” (letter to André, February 1940, OC 7.1.434\*). What Simone was asking for was not some kind of “popularization”, in the sense that this word often has, that is to say the substitution of a more or less pleasant account for the science itself, which erases its singularities and difficulties, gives the public a vague impression of understanding based on misunderstandings, and disorients the mind more than it gives it to think. The popularization thus practiced is harmful, it shakes the common sense without replacing it by anything solid: “We have lost the sense of reality, partly because of the popularization of science” (OC 6.1.173\*). What Simone was inviting her brother to do, in the end, through her urgent request (André speaks of this, not without irony, as “persecution”), was to reflect for his own account on the interest and scope of his work, not as a mathematician, but as a human being. The answer she received from André was clear, and disappointing: “As for talking to non-specialists about my research or any other mathematical research, it would be as good, it seems to me, to explain a symphony to a deaf person. It can be done: one uses images, one speaks of themes which run after each other, which intermingle, which marry or which divorce; of sad harmonies or triumphant dissonances: but what is done when one has finished? Sentences, or at most a good or bad poem, without any relation to what it pretended to describe. Mathematics, from this point of view, is nothing other than an art; a kind of sculpture in an extremely hard and resistant material (like some porphyry used, sometimes, I think, by sculptors). ... The mathematician is so subject to the grain he works with or against, to all the curvatures and accidents of the material he works on, that this confers on his work a kind of objectivity. But the work that is done (and this is what you are interested in) is a work of art, and therefore inexplicable (it alone is its own explanation)” (letter to Simone, February 29, 1940, OC 7.1.532-3\*).

There were several things in these words that Simone Weil was not likely to approve of. In a decisive passage of *The Need for Roots*, she wrote: “The art of transposing truths is one of the most essential and the least known. What makes it difficult is that, in order to practice it, one has to have placed oneself at the center of a truth and possessed it in all its nakedness, behind the particular form in which it happens to have found expression.

Furthermore, transposition is a criterion of truth. A truth which cannot be transposed isn't a truth; in the same way that what doesn't change in appearance according to the point of view isn't a real object, but a deceptive representation of such. In the mind, too, there is three-dimensional space" (NR:64-5\*). From this, it follows that either what André says is false – the alleged impossibility to make people perceive the interest of his mathematical work is not an impossibility, and is only a refusal, or an incapacity on his part; or, if it is indeed an impossibility, mathematics as he practices it, however "correct", however "exact" it may be, no longer has anything to do with the truth. In the latter case, mathematics, instead of contributing to unifying thought, is only one of the multiple tumors that grow blindly, each one without worrying about the others, on the ancient trunk of culture. "Amidst all the present forms of the uprooting malady, the uprooting of culture is not the least alarming. The first consequence of this malady, equally affecting all spheres, is generally that, relations being cut, each thing is looked upon as an end in itself. Uprooting breeds idolatry" (NR:65\*).

Moreover, the presentation of mathematics as an art, and its comparison to a kind of sculpture in an extremely hard material, could not but repulse Simone Weil. Even if art has rules, it also includes a part of free creation and play of the mind; and even if the matter is extremely hard, resists, imposes its constraints, the sculpture also consists in imposing a form to it. However, for Simone Weil, it is a question with mathematics, on the contrary, of meeting an absolute necessity, of welcoming in oneself the very form of the world. Simone, with all the admiration she had for André's mathematical genius, did not hide her disagreement with the way he conceived mathematics. In the correspondence that they exchanged at the beginning of 1940, she wrote to him: "I fear that today we have fallen back to the Babylonian conception of mathematics [both operative and combinatorial]. It is true that much attention is paid to axiomatics; but aren't the axioms chosen to some extent at will? You speak of art and hard matter; but I cannot conceive what this matter consists of. The arts themselves have a matter that exists in the physical sense of the word. Poetry itself has for matter the language considered as a set of sounds. The matter of mathematical art is a metaphor; and to what does this metaphor answer? The matter of Greek geometry was space, but three-dimensional space, really given, condition imposed in fact to all the actions of men. It is no longer so. Wouldn't the matter of your work be the sum-total of the previous mathematical works, with the language and the system of signs which results from it?" (letter to André, March 1940, OC 7.1.449\*). If this is the case, there is a substitution, for the real, of a "garb of signs." In the course of successive scriptural sedimentations, mathematics becomes autonomous, becomes its own matter. Such an evolution emptied mathematics of what, in Simone Weil's eyes, was its essence, namely the bringing together of human thought with cosmic necessity – and, through this relationship, the contemplation of divine wisdom. Of modern

mathematicians, she thought: “They concoct mathematical theories without knowing what us to make of them” (NB:I.35\*).

On the back cover of Michel Foucault’s French edition of his last two books, *The Use of Pleasure* and *The Care of the Self*, appears this quotation from René Char, taken from *The Brittle Age*: “The history of man is a long succession of synonyms for the same vocable. To contradict it is a duty” (Char 2009:44-5). Foucault understood this sentence in his own way: it allowed him to criticize the gaps, even the hollowness of meaning that false synonymies conceal – as when one imagines, for example, that “sexuality” adequately translates the *eros* of the Ancients. False synonymies are also hidden in the invariance of certain terms, whose meaning changes with time. Thus, if there is a kinship between the *mathemata* of the ancient Greeks and the mathematics of the moderns, there is also an abyss – as much in the way they are conceived as by the place they occupy in the general economy of thought. In a text entitled *Science and us* (*La Science et nous*), Simone Weil wrote: “We are ruled by a double law, an obvious indifference and a mysterious complicity, as regards the good, on the part of the matter which composes the world” (SNL:12). What she reproached to modern science in general, and to mathematics in particular, was to have taken the indifference of the world as the only principle, and to have lost sight of the “mystérieuse complicité de la matière qui constitue le monde à l’égard du bien.” Geometry, as she understood it, combined the two. “I myself quite agree with the Pythagorean saying that God is ever a geometer – but not that he does algebra” (letter to André, February 1940, SL:112\*). For her, geometry (in which she saw inseparably a physics), was one of the bridges that, from man, lead to God.

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