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Lucia Boldrini

Literature and Science. Full Stop?

(How) do full stops mean? This question is inspired by the full stops at the end of two very different texts preoccupied with the relationship between literature and science, between the referential and the symbolic function of language, between narrative, thematic, philosophical content and the conventionality or materiality of signs on the page. I shall suggest that in Primo Levi's *The Periodic Table* and in the "Ithaca" episode of James Joyce's *Ulysses* the final full stops, far from being a simple typographical convention that closes the texts, acquire narrative and symbolic meanings that continue the investigation of the relationship between scientific and literary language that the texts engage in, and open them up again to another story, and to further reflection.

Though the problem of reference has acquired a central position in debates on literature and language since the early twentieth century, in particular through the influence of Saussurean linguistics and, later, of poststructuralism, it is of course not at all a new one. In the middle ages, for example, when all knowledge was explicitly mediated through language studies, or the *artes sermocinales* of grammar, rhetoric and dialectic, the discussion on the relationship between word and thing was a lively one. When the problem was held to be the direct consequence of man's sinful use of language to challenge to divine power and God's direct intervention at Babel, language's inability to represent exactly what it tries to describe was seen, if not downright sinful, as a symptom of human inadequacy, painfully inferior to the Word, to the Logos that *is* the thing it names.[1] The debate also extended to the natural, historical mutability of all things human, and the

1 Hence the recurrent searches for the perfect, original language. See Umberto Eco, *The Search for the Perfect Language*, Oxford, Blackwell, 1995.

possibilities afforded by such apparent insufficiency were also brought into focus. Dante, for example, while deploring the inherent sinfulness of human language, clearly realised how linguistic inadequacy in fact resolves into a gift for the poet, insofar as ineffability requires him to continue to generate new forms that try to capture the inexpressible; in other words, the impossibility to describe is what makes poetic expression, variety, and experimentation possible and indeed necessary. We see this at work in the structure of his treatise *De vulgari eloquentia*, where the history of linguistic corruption originating with the Tower of Babel and due to man's historical mutability[2] becomes part of the wider purpose of describing – in fact inventing – a new illustrious language and its poetics; and throughout the *Commedia* and especially the "Paradiso", where linguistic invention is not so much the remedy for as, rather, the breath-taking product of the inability of human language to represent the realm of the divine. In other words, inadequacy becomes a resource that, in acknowledging the incommensurability of the unrepresentable, effectively achieves what Lyotard would call, in much nearer times, the effect of the sublime.[3]

If in the middle ages the breach between language and referent is thus a religious, philosophical, theological, as well as a poetic problem, in modernity – since the gradual evolution of "natural philosophy" towards what we now call "science" – it has often been re-cast in terms of an opposition between the objective language of science and the possibly pleasing but vague and inaccurate, or even obscure, language of literature. The demand for accessibility and clarity of lan-

2 In "Paradiso" Dante returns to the origin of linguistic changeability and attributes it not to Babel but to human nature tout court, so that change begins already with Adam. Thus while in the earlier treatise Babel is the origin of both changeability and plurality, in the poem it is only the origin of plurality, while linguistic evolution is an intrinsic feature of human language from the start. See Dante Alighieri, *De vulgari eloquentia*, Florence, Le Monnier, 1957, I.vii.7 and "Paradiso" (in *La Commedia secondo l'antica vulgata*, ed. Giorgio Petrocchi, Società Dantesca Italiana, Milan, Mondadori, 1966–1968, XXVI, pp. 124–126.

3 See Jean-François Lyotard, "Answering the Question, What is Postmodernism?", *The Postmodern Explained to Children. Correspondence 1982–1985*, London, Turnaround, 1998, pp. 11–25.

guage and for a close, univocal match between word and thing that we encounter within this strand of modern culture can be found, for example, in the ideal of linguistic simplicity promoted, in the seventeenth century, by Thomas Sprat in his *History of the Royal Society*, where he commends the Society's resolution to "reject all the amplifications, digressions, and swellings of style: to return back to the primitive purity, and shortness, when men deliver'd so many *things*, almost in an equal number of *words*" and require from all the its members "a close, naked, natural way of speaking; positive expressions; clear senses; a native easiness: bringing all things as near the Mathematical plainness, as they can: and preferring the language of Artizans, Countrymen, and Merchants, before that, of Wits, or Scholars."[4] What we note in Sprat's words is an equivalence between clarity, simplicity, native (that is to say, original, authentic) language and mathematics, accompanied by a distrust of literary culture (but also, of course, of scholarly writing inspired by tradition and the authorities rather than by the observation of reality). Sprat, in short, expresses a desire for a direct referential relationship between words and things that would bring us closer to nature and to things themselves.

It is interesting to find this opposition reiterated again in the 20th century in the similar terms of objectivity of the scientific attitude and language vs. obscurity or even obscurantism of literary language. The striking example is C. P. Snow's famous 1959 lecture on "The Two Cultures".[5] Taking up the terms of the nineteenth-century debate between Huxley and Arnold, Snow starts by regretting the division that exists between the scientists and the literates who do not talk to each other and seem to speak different languages (*TC*, pp. 2–4), but he soon begins to qualify science as superior culturally and ethically, insofar as scientists, who "have the future in their bones" (*TC*, p. 11), can more

4 Thomas Sprat, *History of the Royal Society* (1667), ed. Jackson I. Cope and Harold Whitmore Jones, London, Routledge and Kegan Paul, "St Louis: Washington University Studies", 1959, Part Two, Section xx, p. 113.

5 Published in C. P. Snow, *The Two Cultures*, Cambridge, Cambridge University Press, 1998; hereafter, *TC*.

easily cross national or disciplinary boundaries and communicate among themselves, united by their common aim of improving the fate of mankind (scientists, one can infer, try, with some success, to overcome Babel). Literary intellectuals, on the contrary, are "natural Luddites" (*TC*, p. 22) who "wish the future did not exist" (*TC*, p. 11). Literature focuses on individual unhappiness, making it symbolic of an existential condition and therefore obscuring the need and capacity for progress (*TC*, p. 6); literary culture is defeatist, self-indulgent, morally vane (*TC*, p. 14) – all that science is immune from. Snow also takes up the terms of another late-Nineteenth century debate, that on degeneration,[6] by describing, in an earlier version of the lecture, the tone of scientific culture as "steadily heterosexual" while characterizing literary culture as "feline and oblique";[7] thus scientists display greater moral health than the literary intellectuals, who are tainted with fascist, racist, anti-Semitic tendencies, and a co-responsibility for the Holocaust, their attitude having contributed to make it come nearer (*TC*, pp. 7–8; "The Two Cultures", pp. 413–14).

There is much of interest to Snow's lecture that I do not have time to go into here – the structure of the educational system, for example, and its relationship with the politically and culturally dominant classes in Britain. What I am interested to note now is that the way Snow frames his intervention implicitly introduces science and scientific language as a solution to the limits, indeed the failure, of literature to represent reality correctly – and I mean "correctly" in terms of both accuracy and ethics. In this sense, Snow's can be seen as an intervention that also participates, albeit indirectly, in the debate on linguistic representation.

6 See Max Nordau, *Degeneration*, Lincoln, University of Nebraska Press, 1993, whose diatribe attacked the decadent, relativist, homosexual tendencies of writers and philosophers like Zola, Ibsen, Whitman, Wilde, Nietzsche. Excerpts from this, as well as from Huxley's *Science and Culture* (1880) and the entire lecture by Matthew Arnold, "Literature and Science" (1882) in response to Huxley's, are usefully collected in Laura Otis ed., *Literature and Science in the Nineteenth Century: An Anthology*, Oxford, Oxford University Press, 2002.

7 C. P. Snow, "The Two Cultures", *The New Statesman* (6 October 1956), p. 413–14.

Primo Levi too intervenes in this debate, bringing Snow's reflections into sharper literary focus. In the preface to his collection of essays *Other People's Trades*[8] he describes the "crevasse" between scientific and literary cultures as "absurd", and calls it "an unnatural schism, unnecessary, harmful, the result of distant taboos and the Counter-Reformation, when they do not actually go back to a petty interpretation of the Biblical prohibition against eating a certain fruit"; he concludes that "between 'the two cultures' there is no incompatibility; contrary, there is [...] mutual attraction" (*OPT*, p. viii). In the essay "On Obscure Writing" (originally written in 1976),[9] Levi takes up many of Snow's concerns, underscoring in particular what he sees as the necessity to write clearly and avoid obscurity in literature, and describing clarity as an ethical duty of the writer. Both Levi and Snow thus similarly appeal to a tradition of "clear" writing that reflects a purer, simpler language and mind – like that of the "Artizans, Countrymen, and Merchants" (or indeed, of scientists) and that is set against the abstract, corrupt, sophistic language of the "Scholars". Thus for Levi "a piece of writing has all the more value [...] the better it is understood and the less it lends itself to equivocal interpretations" (OPT, p. 158), and while this desired ideal of clear univocal language is not too distant from Sprat's, it is complemented by an anti-modernist sentiment – i.e. a rejection of experimentation with form and difficulty, condemned as immoral and reactionary[10] – that echoes Snow's position.

8 Primo Levi, *Other People's Trades*, London, Abacus, 1989 (orig. edn *L'altrui Mestiere*, 1985); hereafter *OPT*.

9 Primo Levi, "On Obscure Writing", *OPT*, pp. 157–163.

10 See for example, "Personally I am also tired of the praise lavished in life and death on Ezra Pound [...]. I am convinced that his poetic obscurity had the same root as his belief in the superman, which led him first to Fascism and then to self-alienation" (*OPT*, p. 160); "It is not by chance that the two least decipherable German poets, Trakl and Celan, both died as suicides" (*OPT*, p. 161); "talking to one's fellow man in a language that he cannot understand may be the bad habit of some revolutionaries, but it is not at all a revolutionary instrument: it is on the contrary, an ancient repressive artifice, known to all churches, the typical voice of our political class, the foundation of all colonial empires" (*OPT*, p. 162).

Therefore, it seems, the gap between literature and science *can* be bridged, but only if literature renounces difficulty and obscurity and chooses instead clarity, and as direct, univocal a relationship between thing and word as would bring it nearer to the *ideal* of the (univocal, referential) language of science (and Levi knows that even for science this remains an ideal) and to universal communicability. Levi's model literary style thus appears to be that of realism, located somewhere between, on the one hand, the "objectist" language of the land of Balnibarbi of Swift's *Gulliver's Travels* or of chemistry textbooks[11] and, on the other, modernist obscurity, especially of writers like Celan, whose incomprehensible poetry represents in itself a kind of suicide, the whine of an animal, a cry in the desert.[12]

11 The language of the chemists that reproduces the structure of the molecules on the page "tries (or expects) to give us a portrait, an image of the minuscule molecular edifice; it has renounced a good part of the symbolism which is characteristic of all languages, and has regressed to illustration, to pictography. [...]. The system reminds us of the scholar in the country of the Balnibarbi, about whom Swift speaks in *Gulliver's Travels*: according to him one must reason without speaking and he suggested keeping on hand in place of words 'such things as were necessary to express the particular business they are to discourse on' that is, what today is called the 'referent', a ring if the talk is about rings, a cow if cows are being talked about, and so on. In this way the scholar argued, 'it would serve as a universal language to be understood in all civilised nations'. There is no doubt that the objective, in fact objectist, language of the Balnibarbi and the structural formulas of chemists approach perfection from the point of view of understandability and internationality, but both involve the inconvenience of bulk, as the unhappy compositors of organic chemistry textbooks know only too well." ("The Language of Chemists (I)", *OPT*, pp. 100–105 (pp. 103–104)). Again, an important outcome of univocal reference would be the overcoming of the linguistic plurality of the post-Babelian condition.

12 See esp. *OPT*, pp. 160–161. I have discussed elsewhere how the debate on the two cultures and their languages overlaps in the aftermath of the Second World War with that on the function, commitment, and ethical duty of the writer, and how Snow's lecture and Levi's thoughts on the issue resonate with the terms of Sartre's essay on *littérature engagée* and Adorno's response to it in his essay "Commitment". See Lucia Boldrini, "Between Reference and Obscure Writing: Primo Levi's *The Periodic Table*, The Two Cultures, and the Ethical Duty of the Writer", in Cedric Barfoot and Valeria Tinkler Villani eds, *Science and Literature*, Amsterdam, Rodopi, forthcoming.

This desire to bridge the gap between literature and science thus becomes the correlative of a desire – recognised here as unsolvable, even rather ridiculous in its extreme forms – to solve the problem of reference and of linguistic diversity. While Levi thus extends the reflection on the divide between the language of literature and the objective language of science, his discussion of the issue also seem to call up – if not quite resolve into – that older divide between human inadequate imperfect language and the ideal of divine language where Logos and world coincide. These are themes that also run through Levi's *The Periodic Table*, and especially inform its conclusion.[13]

Originally published in 1975, *The Periodic Table* uses Mendeelev's table of chemical elements to organise Levi's autobiographical account of his life, focused especially on his being a chemist, a Jew and survivor of Auschwitz, and, of course, a writer. What is striking from the start is the almost doctrinal belief in the ethical value of science displayed by the young Levi, who sees it as a way of combating the arbitrariness and rhetoric of Fascism and of a stale literary tradition. While the author Levi ironises his younger self's idealist faith in science by emphasising his grandiose rhetoric of heroism, we also perceive in the mature writer's words the appreciation for the enthusiasm of youth, and science does, despite the irony, maintain the role of antidote to fascism. Thus if we may smile at the young Levi's expression of a religious, if not even mystical, faith in the power of science explicitly contrasted to the inadequacy of books –

> for me chemistry represented an indefinite cloud of future potentialities which enveloped my life to come in black volutes torn by fiery flashes, like those which had hidden Mount Sinai. Like Moses, from that cloud I expected my law, the principle of order in me, around me, and in the world. I was fed up with books [...] and searched for another key to the highest truths [...]. (*PT*, pp. 22-23)

– we certainly share his sense of the discriminating, formative value of science which teaches to respect difference and reject arbitrary truths:

13 Primo Levi, *The Periodic Table*, London, Abacus, 1986, hereafter *PT*.

> [...] the so tender and delicate zinc, so yelding to acid which gulps it down in a single mouthful, behaves, however, in a very different fashion when it is very pure: then it obstinately resists the attack. One could draw from this two conflicting philosophical conclusions: the praise of purity, which protects from evil like a coat of mail; the praise of impurity, which gives rise to changes, in other words, to life. I discarded the first, disgustingly moralistic, and I lingered to consider the second, which I found more congenial. In order for the wheel to turn, for life to be lived, impurities are needed, and the impurities of impurities in the soil, too, as is known, if it is to be fertile. Dissension, diversity, the grain of salt and mustard are needed: Fascism does not want them, forbids them, and that's why you're not a Fascist; it wants everybody to be the same, and you are not. (*PT*, pp. 33-34)

This kind of episode seem to me to be at the root of Levi's later defence of clear language. What we learn from the opposite behaviour of zinc in different chemical contexts is the need for a language of precision and discrimination – one whose actual import the young Levi may still be too enthusiastic to fully grasp (hence his rhetoric of heroism) but which is already a premonition of the clear language that Levi defends against modernist obscurity and which resonates with Sartre's call for a "clear meaning" capable of healing the distortions of fascism and wartime propaganda by learning again to call a spade a spade.[14]

As Levi grows older and more experienced, science too is presented more humbly than as a burning bush. It is, rather, a tool in the search for the solution of practical problems (why a lipstick runs and whether one can make cosmetics from chicken dung, why paint has gelled and how one can make it liquid again), and thus also a way of solving the practical problems of life (how to return to normal life after the camp, how to earn a living). Similarly, the superiority of science over

14 "[W]e are living in a century of propaganda [...]. The function of a writer is to call a spade a spade. If words are sick, it is up to us to cure them. Instead of that, many writers live off this sickness. In many cases modern literature is a cancer of words [...] There is nothing more deplorable than the literary practice which [...] consists of using words for the obscure harmonics which resound about them and which are made up of vague meanings which are in contradiction with the clear meaning." Jean-Paul Sartre, *What is Literature?*, London and New York, Routledge, 2001 (orig. pub. 1948), pp. 217, 218–19.

literature implied by the youth's being "fed up with books" (*PT*, p. 23) and with "all the poetry we had swallowed down in liceo" (*PT*, p. 41) is increasingly toned down, and if the young scientist had rejected books in favour of a chemistry that captured life's poetry better than the artificial poetry of books,[15] the man that returned from the *Lager* realises that he needed both the practicality of chemistry and the healing power of writing to tell his story and return to normality, as he shows in the chapter "Chromium", where the job of chemist, the writing of his memoir of Auschwitz, and his finding love come together. And finally the last chapter, "Carbon", inverts the hierarchy according to which fact-bound science is more valuable, even respectable, than literature by offering a literary solution to a chemical problem: how to follow the history of an atom of carbon through the many changes of its existence by narrating its epic story, something that chemistry was not able to do yet, as it did not have the means to isolate the single atom of carbon or fully understand its transformations.

Let us therefore follow for a moment the adventures of the protagonist of the last chapter: it was originally found in limestone, was then freed into the air by being "roasted" in the lime kiln and escaping through the chimney, became part of plants through photosynthesis, was absorbed and then expelled by the bodies of living beings, became part of the water cycle by evaporating into clouds and dissolving into the sea, was in the eye of an insect, and finally, several centuries later:

> It is again among us, in a glass of milk [...] crosses the intestinal threshold and enters the bloodstream; it migrates, knocks at the door of a nerve cell, enters [...]. This cell belongs to a brain, and it is my brain, the brain of the *me* who is writing; and the cell in question, and within it the atom in question, is in charge of my writing, in a gigantic minuscule game which nobody has yet described. It is that which at this instant, issuing out of a labyrinthine tangle yeses and nos, makes my

15 "That conquering matter is to understand it, and understanding matter is necessary to understanding the universe and ourselves: and that therefore Mendeleev's Periodic Table [...] was poetry, loftier and more solemn than all the poetry we had swallowed down in liceo; and come to think of it, it even rhymed!" (*PT*, p. 41).

> hand run along a certain path on the paper, mark it with these volutes that are signs: a double snap, up and down, between two levels of energy, guides this hand of mine to impress on the paper this dot, here, this one. (*PT*, pp. 232–33)

Full stop.

The final chapter establishes a fine balance of mutual implication of literature and science, with literary imagination supplying what science, constrained by the requirements of precision, cannot provide, and thus pushing science on to account for what the scientist is able to imagine but cannot yet explain. Yet, even at this point, the desire that drives the scientist-writer is that of healing the split between language and world, to achieve absolute reference in that deictic, referential full stop that closes the story of the atom and the autobiographical book that we have been reading.

I shall soon return to the end of *The Periodic Table* and in particular the final full stop. First, however, I'd like to make a detour via James Joyce's *Ulysses* and its own final full stop at the end of the "scientific-mathematical" episode "Ithaca", the penultimate in the novel.[16]

This is the chapter that Joyce wrote according to the question-and-answer technique of "impersonal catechism", explicitly recalling the discourse of catholic religious instruction, and in a mock-scientific language:

> I am writing *Ithaca* in the form of a mathematical catechism. All events are resolved into their cosmic, physical, psychical etc. equivalents, [...] so that the reader will know everything and know it in the baldest and coldest way, but Bloom and Stephen thereby become heavenly bodies, wanderers like the stars at which they gaze. The last word (human all-too-human) is left to Penelope. This is the indispensable countersign to Bloom's passport to eternity. I mean the last episode, *Penelope*.[17]

16 I have discussed some of these issues in relation to Stanley Kubrick's *2001: A Space Odyssey*, in "'Intimations of proximate dawn'. A 2001 *Ulysses*", in Mario Curreli and Fausto Ciompi eds, *Many-Voicèd Fountain, Studi di anglistica e comparatistitica in onore di Elsa Linguanti*, Pisa, ETS, 2003, pp. 360–71.

17 *Letters of James Joyce*, vol. I, ed. by Stuart Gilbert, London, Faber, 1957, pp. 159–60. The letter dates to February 1921, during the composition of "Ithaca", and was sent to Frank Budgen.

The effect of the cold, inhuman language of mathematics and (ideal of) scientific exactness of this chapter is to crush the individual (Bloom) and dehumanise him; one of the chapter's catechistical instructions even demands that we "Reduce Bloom by cross multiplication of reverses of fortune, [...] and by elimination of all positive values to a negligible negative irrational unreal quantity",[18] turning character from human agent into mere "quantity". In parallel, of course, the effect is also to crush, through mocking excess, the very ideal of scientific exactness itself and of its literary correlative, found in the precise detail of the descriptions of realism. Descriptions in "Ithaca" there are aplenty, but they are far from being precise, accurate or referential – or even believable: see for example the lengthy account of the course of and administrative arrangements for the water that issues from Bloom's tap when he opens it, a 19-line description where the simple initial "yes" would have sufficed (*U*, pp. 623–24), or the 42-line list of the qualities of water as admired by Bloom (*U*, pp. 624–25), or the startling measurements of Bloom's body (at 12 inches after two months of exercising, his – still very small! – thighs would be the same as his calves, and only a little bigger than his biceps; even more startlingly, before the exercises, his 11-inch calves were larger than his 10-inch thighs (*U*, p. 674)). Thus the cold (pseudo-)scientific tone of the chapter collapses, undermined by its own weight, by the vestiges of a poetical language that refuses to be descriptive and referential[19] and by the breaking down of language itself as consciousness drifts into sleep, returning the subject to the foetal, to the origin, and to the potentiality of renewal:

> [...] reclined laterally, left, with right and left legs flexed, the indexfinger and thumb of the right hand resting on the bridge of the nose, [...] the childman weary, the manchild in the womb.

18 James Joyce, *Ulysses*, Oxford, Oxford University Press, 1993, p. 677. Hereafter *U*.

19 Cf. for instance the "heaventree of stars hung with humid nightblue fruit" (*U*, p. 651), or the interspersed lyrical touches ("its imperturbability in lagoons and highland tarns", "stagnant pools in the waning moon") in the otherwise generally matter-of-fact list of properties that Bloom admires in water (*U*, p. 624–25).

> Womb? Weary?
> He rests. He has travelled.
>
> With?
> Sinbad the Sailor and Tinbad the Tailor and Jinbad the Jailer and Whinbad the Whaler and Ninbad the Nailer and Finbad the Failer and Binbad the Bailer and Pinbad the Pailer and Minbad the Mailer and Hinbad the Hailer and Rinbad the Railer and Dinbad the Kailer and Vinbad the Quailer and Linbad the Yailer and Xinbad the Phthailer.
>
> When?
> Going to dark bed there was a square round Sinbad the Sailor's roc's auk's eggin the night of the bed of all the auks of the rocs of Darkinbad the Brightdayler.
>
> Where?
> ■ (*U*, p. 689)

Large full stop: the material encapsulation of the point at which (and the night into which) Bloom's consciousness disappears, but also of the egg, the embryo that presages rebirth and the renewal of the bright day.

The collapse of the (pseudo)scientific language of "Ithaca" into the poetic and the oneiric, and its general mocking through excess throughout the chapter, deny however neither the validity of scientific knowledge nor of the desire to understand and describe the world rationally. Science and its language are tools, weapons of self-defence against the "incertitude of the void" (*U*, p. 650); they are part of the noble human desire to understand reality, make sense of it, give sense to it – as is the language of poetry. As it also happens at the end of *The Periodic Table*, the languages of description and of the imagination are mutually implicated and equally necessary. One of Leopold Bloom's most distinctive and attractive traits is his perseverance in his attempts to rationalise, through his "scientific" "temperament" (*U*, p. 635),[20] a reality that often resists any such rationalisation. Without the exactness or the rigour of the chemist Primo Levi, or the latter's youthful heroism, but with the enthusiasm of the amateur, he too (incidentally, and coincidentally, also a Jew), appeals to

20 But a scientific temperament accompanied by the artistic: "There's a touch of the artist about old Bloom" (*U*, p. 225).

science and its language to keep at bay the difficulties of life. Thus the impersonal narration of "Ithaca", which mocks Bloom, crushes him, deforms his body, must also be seen as the narrative correlative of the attempt by Bloom's consciousness, at the end of a long day in which he has suffered the betrayal by his wife, anti-Semitic feeling, and violent attack by the Citizen in "Cyclops", to distance and neutralise these painful events, and the absurdity of a reality that does not let itself be comprehended. It is a weapon, but a weapon that is not, of itself, sufficient. That is also why the ideal of a descriptive, referential, transparent language cannot work: because reality itself – and human reality in particular – is not clear, simple, or transparent. Like *The Periodic Table*, though through a very different process, "Ithaca" too concludes by giving way to the imaginary; linguistic exhaustion takes over from (inadequate) descriptive exhaustiveness. Recall Joyce's words in the letter quoted above, and notice the "thereby": "the reader will know everything and know it in the baldest and coldest way, but Bloom and Stephen *thereby* become heavenly bodies, wanderers like the stars at which they gaze" (my emphasis). The mathematical, scientific language of "Ithaca" actually appears to *generate* a poetic-mythic outcome for the characters it both tries to crush under its excess, and helps to survive.

Through the scientific-mathematical catechism of "Ithaca", *Ulysses* thus also denies the gap between literature and science. Language cannot be restricted either to a purely utilitarian role or a purely aesthetic function; *Ulysses* rejects, that is, the opposition between two cultures and two modes of knowledge reflected in two distinct uses of language, suggesting that the two coexist and, indeed, mutually implicate each other.

If we consider Levi's and Joyce's extremely different texts together, our attention is inevitably drawn to their so obvious foregrounding of the final full stop: what should be a simple item of punctuation turns into a carrier of symbolic content and potentialities that contradict the conventionality of the sign. The question arises, what is the attraction of the full stop for a discourse on science and literature?

One could say that, as the full stop signals the end, it can be used playfully – in a modernist or postmodernist way –

both to emphasise the idea of an "end" and, at the same time, to convey, ironically, its denial (there is a full stop but the text doesn't quite stop signifying). But such playfulness is clearly not enough, for either text.

If, as we have seen, for the modernist James Joyce the dot is more explicitly an opening, a re-beginning, a moment generative of new possibilities with its references to the egg, the embryo, the coming of the new day, even for the much more realist Primo Levi the final full stop – the material embodiment of the desire to conclude the autobiographical journey of the scientist-writer by bridging the gap between sign and referent – opens up to something else, raising a number of questions, some of which appear potentially disturbing, precisely because Levi, as we saw earlier, condemns literary obscurity, meanings that are not clear.

The moment of bridging the gap of reference through the deixis of the full stop would condemn us to silence, to the denial of the possibility of existing in a condition where the wound has been healed, for any other word would re-open it. The consequence of the conclusion of Levi's book, it would seem, is that the breach between world and word can be healed only by a condition of falling silent. I believe that Levi is aware of this, and of the impossibility of a fully referential or deictic language, as his remarks on the language of the Balnibarbi testify. Yet there is no other way out, and total, absolute reference can only be posited at the conclusion, when language ceases; and this may echo, somewhat uncomfortably, in the mind of the reader of "On Obscure Writing", written only one year after the publication of *The Periodic Table*, where Levi, as we have seen, expresses his disapproval of those obscure writers whose language is already a condemnation to silence.

But there is more, and the ambivalence of the text becomes for me manifest in the echoes carried by its last lines: "these volutes that are signs" takes us back full circle to the moment when the young Levi saw chemistry in terms of "black volutes torn by fiery flashes, like those which had hidden Mount Sinai". The mysticism and metaphorical nature of the language of the young scientist distance us from simple, direct reference, while the effect of evoking the Word, Logos, the Law would be to dismiss altogether the need for refer-

ence: the Word/Logos simply is. (Similarly the full stop, which would, very simply, be.) The tension posited is not only between the languages of literature and science but calls the language of religion into play again; ultimately, the solution for a language that aspires to absolute reference – or coincidence of word and thing – would be either silence or divine Logos, to the exclusion of the possibility of human language.

But let us take a step back, and return for a moment to the epic story of carbon: this atom that was freed into the air by being processed in a lime-kiln, a furnace, is now part of this Jewish writer's body that has escaped the furnaces of the camp. Implicitly, perhaps unconsciously, the story of carbon (this triumph of life that allows Levi to achieve a coincidence of sign and referent, freed as it were, like the atom of carbon, from hard matter and the factual demands of scientific description into the imaginary and the poetic) also suggests, more obscurely, the history of the Lager; and the black volutes of the ink at the end of the book thus also evoke the dark volutes of smoke that rose from the furnaces where other living bodies (many of them also Jewish, all of them also made of atoms of carbon) were charred, their remains escaping into air through the chimneys to become organic, but no longer human, part of the life cycle, by-products of a rational, scientific but inhuman process of destruction and annihilation (these echoes are stronger in Italian thanks to the greater similarity between *carbone* (coal, charcoal), *carbonizzare* (char, burn to ashes) and *carbonio* (carbon)).

In an earlier episode, Levi had said of his friend Sandro, a man of few words who deflated his youthful rhetoric, and of great moral stature, the first man in Piedmont to die in the Resistance:

> Today I know that it is a hopeless task to try to dress a man in words, make him live again on the printed page, especially a man like Sandro. He was not the sort of person you can tell stories about, nor to whom one erects monuments – he who laughed at all monuments: he lived completely in his deeds, and when they were over nothing of him remains – nothing but words, precisely. (*PT*, pp. 48–49)

Nothing but words, precisely: and yet words are the only way to remember Sandro and make him live on; the writing itself undermines the explicit message of the statement. Now, at the

end of *The Periodic Table*, just as the work of imagination and of narrative is celebrated as the vehicle to supply the knowledge that science cannot yet provide, the ramifications of linguistic echoes and associations (what literature is made of, beyond its descriptive, referential substance) lead us to the very different, disturbing thought of the Holocaust; to the ambivalence of a life cycle that is also a cycle of death; and, finally, into a silence that denies the power of language.

For the modernist Joyce, conversely, opposites much more comfortably and explicitly call each other into play. Though catechism (i.e. a discourse of religious explanation and instruction, placed, in its methodical – one could almost say mathematical – precision, at the opposite end of religious experience from mysticism and the ineffability of its experience) is also part of the equation, it is so only to be denied, even ridiculed. Its certainties, learned by rota, are shown to be, for the human being, no less alienating than the mathematical, mechanistic discourse of post-Newtonian science when it tries to be objective and accurate about the world and excludes humanity (with its consciousness, unconsciousness, dreams, imagination, fallibility ...) from its realm.[21] For Joyce, meaning is given not by exact correspondence, accurate description, or clarity in communication, but by the infinite possibilities of language as it describes, generates, breaks down into the lyrical, the poetic, the oneiric, and is reborn: it is the constant renewal and transformation of language, and not the contrary desire to close it down into a coincidence of word and thing, that is sought and celebrated.

So we have, encapsulated in the two final dots on the page, the expression of two quite different desires and two quite different conceptions of language and literature, one aspiring to (an impossible) unity of word and thing that tries to pare down the polysemy of language, and one that celebrates and finds its enjoyment in the unending possibilities and polysemy that the gap between word and thing generates.

21 On this see also Patricia Waugh, "Revising the Two Cultures Debate: Science, Literature and Value", *The Arts and Sciences of Criticism*, ed. by David Fuller and Patricia Waugh, Oxford, Oxford University Press, 1999, pp. 33–59.

But this is not all, and another question opens up. The comparison between the two texts suggests that the scientific attitude that generated realism as its privileged mode of literary expression may have another paradox at its heart: the scientific attitude that frequently, though by no means universally, finds a correlative in an anti-religious stance, and even more, the religious view that often results into an anti-scientific stance (stances that have emerged for example in the debates around the Copernican system, evolutionary theory, or, more recently, genetics) appear in fact to be subtended by a similarly ideological conception of language and of its relationship with the world. Both aspire, one could say, to the condition of an Adamic, pre-Babelian language, where one word is one thing. Poetry, literature, on the contrary, need polysemy (even as they lament, often explicitly, the impossibility of capturing a referent): it is the condition that enables their existence. Joyce openly mocks the ideal of accurate description and magnifies the metaphoric, generative, humanly necessary force of language. Levi, as a scientist, continues to aspire, even as he realises its impossibility, to establishing a univocal relationship between language and world, yet he too is eventually defeated by language's inability to being harnessed in such ways – and thereby triumphs as a writer.

Abstract

In modi diversi, *Il sistema periodico* di Primo Levi e l'episodio "Itaca" dell'*Ulisse* di Joyce esplorano il rapporto tra linguaggio scientifico e letterario, e in particolare la questione della referenza. Levi, che riprende il dibattito di C. P. Snow sulle "due culture" e condanna il linguaggio oscuro incapace di comunicare chiaramente i propri contenuti, sembra aspirare a un rapporto univoco tra parola e cosa simile a quello generalmente attribuito al linguaggio scientifico. Lo stile "matematico-catechistico" di "Itaca", lontano nel suo eccesso dall'univocità referenziale, umilia il personaggio, ma anche distanzia dalla sua coscienza le difficoltà della giornata, rivelandosi anch'esso un modo per cercar di capire una realtà spesso incomprensibile. Il suo dissolversi finale, con l'addormentarsi di Bloom, rappresentato dal grande punto che chiude il capitolo, apre alla possibilità di una rigenerazione linguistica e narrativa del personaggio. Nell'ultimo capitolo de *Il sistema periodico*, l'immaginazione e le sue forme narrative permettono di descrivere ciò di cui la scienza non può dar conto, e così celebrare nell'epica dell'atomo di carbonio il costante rinnovarsi della vita. Alla fine, tuttavia, i meccanismi del linguaggio poetico permettono a un'altra storia, ben più oscura – quella della distruzione disumana dell'Olocausto – di emergere: a dispetto del tentativo di chiudere la produzione di nuovi significati nella referenza assoluta del punto finale.