

## Primo Levi. Chemistry, Languages and Literary Style

Antonio Di Meo\*

*Abstract.* Twenty-five years after Levi's tragic demise, the deepest links between his scientific education and his literary work are still waiting for a full investigation. Levi himself repeatedly insisted he was a writer not despite his being a chemist but thanks to it: yet, this statement is oft-quoted but rarely considered seriously. Levi himself has openly revealed his chemical spontaneous approach, his *insight*, concerning his own psychological and intellectual behaviour in the Lager and in his thought after it. It was the 'naturalistic' approach he got from chemistry which made of Levi a 'saved one'. Most Levi scholars have emphasized the analogy between his style and the chemical analysis. Few have wondered why there must be such a strict relationship between chemistry and the need for a strong linguistic rigour, i.e., what is the *chemical specificity* of the problem. Such relationship, in fact, is the outcome of the very historical development of chemistry, which consolidated itself through «a terrible confusion of languages» (Levi). The repeated statements by Levi on the conditions for his own writing, allude to a true *discourse on style*.

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The work of Primo Levi has witnessed a growing interest and success, not only in the world of literary studies but also among scientists, especially chemists. However, twenty-five years after Levi's tragic demise, the deepest links between his scientific education and his literary work are still wanting of a full investigation. Studies in this direction have been attempted, even in recent times, Levi himself having repeatedly insisted he was a writer not *despite* his being a chemist but thanks to it: yet, this statement of his is oft-quoted but rarely considered in studying his writings. (Cases, 1990; Porro, 1990; 1997, pp. 434 ss.; Mattioda, 2011)<sup>1</sup>.

Many of the scholars who have probed this field are men of letters, or even men of science, but not chemists: hence they do not know chemistry's past and present history and philosophy. Chemists who have read Levi's texts have found in them many items from chemistry, and even the possibility to directly or indirectly use such texts for didactic purposes. I think that Massimo Bucciantini is quite right when, in his 2011 'Lezione Primo Levi' *Esperimento Auschwitz-Auschwitz Experiment*, he reproaches the chemists for having limited themselves to a self-referential reading, and for having avoided

Trying to approach with a chemist's eye Levi the essayist or inventor of fantastic tales, or his most best-known books, revealing lexical progressions and semantic shifts which would escape a non-chemist (Bucciantini, 2011, p. 93).

In a former occasion I have tried myself to examine the limits of such interpretations, and to suggest some different modes of investigation (Di Meo, 2011). But the lack of a more penetrating chemical point of view has had some consequences. To it, most likely, must be attributed the statement by Alberto Cavaglioni that, despite *Se questo è un uomo* (engl. transl. *If This Is a Man* in UK or *Survival in Auschwitz in USA*) being the work of a chemist, nonetheless

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\* Historian of Science. E.mail: dimeoantonio@interfree.it. Whenever the reference to the original in English is not given, the translation is by Andrea Micocci.

<sup>1</sup> Mattioda, in his reconstruction of scientific education of Levi, analyzes the scientific contents present in his works, sometimes attributing them to disciplines other than chemistry. Mattioda's references to the Leopardi-like 'cosmic pessimism' with a cosmological and thermodynamic foundation in the thought of 'last' Levi are very pertinent (see also Di Meo, 2011). In Mattioda's text, however, is unfortunately present some confusion between different scientific concepts that signify widely different objects that cannot be collapsed together, such as 'obscure matter', 'black hole', 'entropy'.

chemistry does not occupy in this book the space that – making a mistake – we could have imagined. Borrowings from the jargon of the elements of the periodic table are sporadic, while from the language of laboratories come only rare style modules. There is the heritage of Galileo Galilei, which supplies an essential imprinting, but *Se questo è un uomo* is above all a text where the primacy of the classics of literature...cannot be challenged (Cavaglione, 2012, pp. IX-X).

If we go beyond the paradox of re-proposing for this fundamental text a primacy between science and literature, we must admit that in it we find, both at a superficial and at a profound level, a structure of thought that is typical of chemistry. Just think of the metaphor of the Lager as *laboratory*, in which the analysis of human interactions (according to chemical theory of affinities) is decisive, which makes us think that the laboratory Levi is thinking about – despite the literary references that make us think about Galilei's mental experiments (Bucciantini, 2011, pp. 11-27) – is different from the mechanical type. In any case, the recurrent presence in *Se questo è un uomo* of the term 'machine' is not sufficient to turn the Lager into a mechanical (or Galileian) model, like Cavaglione proposes (Cavaglione, 2012, p. 234). The usage of that term by Levi to me rather expresses the idea of being taken in a complex and automatic mechanism built to pursue persecution and terror aims but also to deride – being incomprehensible and above the individual – and whose goal is not so much the production of useful labour starting from human labour, whether in order to enhance its efficiency or to substitute it (e.g. through mechanization), but the direct and progressive extermination of human labour itself. Also, the usage of the term 'machination' in Levi signifies the working of an occult activity bent at damaging someone, rather than the work of mentally organizing and then realizing machines. In reality in the Lager, in the *machine-machination* of the Lager, the crazy objective of extermination produces a gigantic dissipation of useful work and an immense, gratuitous and demented production of *pain*, the only thing that – unlike matter and energy – for Levi can be created out of nothing.

In any case, the knowledge of any system (including that of the Lager), at least if one follows the model of 'classical' science, initially passes through its simplification and its isolation from the rest of the environment where it is placed. Levi himself describes this method – considering it inevitable and even advantageous from the evolutionary Darwinian point of view – in *I sommersi e i salvati* (engl. transl. *The Drowned and the Saved*), right when he deals about the «zona grigia» («grey zone»), i. e., when he *complicates* the preceding analysis contained in *Se questo è un uomo* (Levi, 2003, p. 24). But Levi justly warns against confusing the *result of the method* with *reality*: If the method is necessary and unavoidable, reality is not, despite all our wishes, simple and schematic (Levi, 2003, p. 25). This has always been clear to all scientists, including the chemists, starting from French chemist Antoine-Laurent Lavoisier who, in his well known *Traité élémentaire de chimie* (1789), stated that

Un des principes qu'on ne doit jamais perdre de vue, dans l'art de faire des expériences, est de les simplifier le plus qu'il est possible, et d'en écarter toutes les circonstances qui peuvent en compliquer les effets (Lavoisier, 1789, p. 57).

Finally, to remain with the first masterpiece of Levi, take the chapter titled *Esame di chimica* (*Chemistry exam*), or the true *analysis* of the convicts in the Lager which proceeds from the complex to the simple, or think of the chapter titled *I sommersi e i salvati* (also in *If This Is a Man*).

Levi himself, in his last work in 1986, the book *I sommersi e i salvati* (the same title of the above-mentioned chapter) has openly revealed his spontaneous approach, his *insight*, concerning his own psychological and intellectual behaviour in the Lager and in his thought after it:

Together with the baggage of practical notions I had got from my studies, I had brought along with me into the Lager an ill-defined patrimony of mental habits which derive from chemistry and its environs, but have broader applications. If I act in a certain way, how will this substance I hold in my hands react, or my human interlocutor? Why does it or he or she manifest or interrupt or change a specific behavior? Can I anticipate what will happen around me in one minute or tomorrow or in a month? If so, which are the signs that matter, which those to neglect? Can I foresee the blow, know from which side it will come, parry it, elude it?

But above all and more specifically: from my trade I contracted a habit that can be variously judged and defined at will as human or inhuman – the habit of never remaining indifferent to the individuals that chance brings before me.

They are human beings, but also ‘samples’, specimens in a sealed envelope to be identified, analyzed and weighed. Now, the sample book that Auschwitz had placed before me was rich, varied and strange; made up of friends, neutrals and enemies, yet in any case food for my curiosity which some people, then and later, have judged to be detached. A food that certainly contributed to keeping a part of me alive and which subsequently supplied me with material for thinking and making books. As I said, I don’t know if down there I was an intellectual: perhaps I was one in flashes, when the pressure relented. If I became an intellectual afterwards, the experience I drew from it certainly helped. *I know that this ‘naturalistic’ attitude does not derive only or even necessarily from chemistry, but in my case it did come from chemistry* (Levi, 2003, pp. 113-114; Levi, 1989, pp. 114-115. Italics are mine).

It was precisely this ‘naturalistic’ approach he got from chemistry which made of Levi a ‘saved one’, meaning not just he who survives the hell of Lager, but also he who keeps his own personality in extreme conditions (though it is not granted that what is preserved is what we ‘outsiders’ would deem the most positive part) (Mengoni, w. d., pp. 4-5). Let me add that it is precisely this mental feature of his, associated to the will to tell, or having to tell, which helped Levi to psychologically bear his terrible experience. In fact, putting oneself in the condition of would be future narrator of one’s life is in itself *putting oneself outside one’s own immediate context* (Levi, 2012, p. 3; Levi, 1987, p. 15).

Moving more deeply into the structure of the text, we can hypothesize that the Nazi chemist Pannwitz, who examines Levi in the Lager laboratory, must in reality be considered Levi’s own mirror image: both, in fact, have studied the same textbooks (German, such as Gattermann etc.), using the same (German) instruments and reagents, the same natural and technical language (German, and the chemical language and symbols). However, they cannot be juxtaposed, they are *chiral* (Di Meo, 2011, pp. 85-92)<sup>2</sup>. This, in my opinion, is meant to signify the metaphor of seeing each other as immersed in two different media: each man’s way to see the other is so chemical asymmetric, as to be non-superposable, as to be *incommunicable*, despite the views of both being almost identical. More explicitly, this same theme is re-proposed by Levi in his tale *Auschwitz, città tranquilla* (*Auschwitz, a tranquil city*), concerning the Nazi chemist Mertens:

He was a *quasi-me*, another myself, inverted. We were the same age, similar as education and may be even as to our character. Him, Mertens, was a young German Catholic chemist, while I was a young Italian Jewish chemist. Potentially we could have been colleagues: as a matter of fact we worked in the same factory, but I was inside the barbed wire and he outside. However, despite there being forty thousand persons operating in the workshop of Buna-Werke in Auschwitz, he the *Oberingenieur* and I the slave-chemist have met, unlikely as it was and no longer verifiable. We have not met again outside (Levi, 2003, p. 32).

As said before, most Levi scholars have emphasized the analogy between his style and the technique of chemical analysis, the most fundamental and time honoured practice in chemistry. This is caused by Levi’s idea that language «separates, weighs and distinguishes», and is a way to convey with words, in a synthetic manner, as much information as possible. On June 9, 2012, in an interview, the physicist Tullio Regge, when asked «Who are the writers you admire?» answered emphasizing the following aspect: «Primo Levi, of course. His clarity, which comes from his being a chemist, his irony, his crystal clear witnessing the Nazi Lager» (Regge, 2012, p. XI).

Levi’s style, indeed, makes you think about the great theoretical and linguistic reform of chemistry at the end of the 18<sup>th</sup> Century, particularly with Lavoisier (who took it from the *Logique* of Etienne de Condillac). In it language had to be considered a true analytical method, and the art of reasoning came down to a well crafted language, as there must be a one-to-one correspondence between facts, ideas, and the terms you use (Lavoisier, 1789, p. 1).

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<sup>2</sup> The terms *chiral* and *chirality* was first used by the British physicist William Thomson (Lord Kelvin) in 1884 in a lecture given at Johns Hopkins University, Baltimore (USA) (Thomson (Lord Kelvin), 1884). In chemistry a *chiral molecule* is a type of molecule that has a non-superimposable mirror image. The feature that is most often the cause of chirality in molecules is the presence of an asymmetric carbon atom. Human hands are the most universally recognized example of chirality: no matter how the two hands are oriented, it is impossible for all the major features of both hands to coincide.

Levi's style has opened up a wide set of considerations on the structure of the language of his works and on his conception of the communication between subjects. The precision and clarity in his writing, in fact, was to him functional to best offer to the reader the meaning of what he wanted to write. To Levi it is the well understood word, the mention of things and events, which makes the feelings provoked by the outside world (as in the case of odours, as we shall see) meaningful.

As a matter of fact few have wondered why there must be such a strict relationship between chemistry and the need for a strong linguistic rigour, i.e., what is the *chemical specificity* of the problem. Such relationship, in fact, is the outcome of the very historical development of chemistry, which, as Levi himself says «consolidated itself through a terrible confusion of languages» (Levi, 1982, p. 121), and also by means of a painstaking work to denominate and classify, in a precise and *shared* form, an ever growing number (millions) of natural and artificial compounds and of experimentally obtained elements, as well as its fundamental concepts, its laws, its principles. This has not taken place without sharp contrasts. No wonder then if the first scientific community to gather in order to clarify the sense of its theoretical concepts was that of the chemists, in the Karlsruhe congress of 1860. The meaning of the terms *atom*, *molecule*, *equivalent*, i.e., the fundamentals themselves of the disciplines, were at stake (and in any case no agreement was reached!).

But – since its modern origins (17<sup>th</sup>-18<sup>th</sup> Centuries) – we also find in chemistry other idea: that its first principles or material elements constitute a true *alphabetum naturae*, of which they were the letters. Like from the combination of the letters of the alphabet we build – following given rules – syllables, phrases and discourses, in the same way from the orderly combination of the elements we get substances of a different, more or less complex, composition. The world, therefore, even from the chemical point of view, should be considered like a *book*, whose grammar and syntax is endowed with a sense. It was the task of the researcher to discover them and make them understandable by means of an adequate special jargon. To the Platonic 'geometrician God' of Galilei, we find added, in the modern era, also a 'chemist God', both being, in different ways, the builders of the Universe:

Et si Platon avoit raison de dire que Dieu ne fait rien sans les règles de la Geometrie, on peut ajoûter qu'il ne produit rien sans celles de la Chymie (Duncan, 1683, p. xxv).

The repeated insistence by Levi on the clarity of communication is born also by his awareness of the above story. Certainly, more in general the problem of *style* in literature, even in scientific literature, is important. This has produced a lot of thinking, starting from the 17<sup>th</sup> Century. A rigorous and elegant writing, with a beautiful style, in modern Italian literature had been started by Galilei, even though the Counter-Reform, fostering multiple forms of intellectual dissimulation, compelled Galilei himself to *oborto collo* modify the style of his communication modalities (Stabile, 2005, pp. 321 ss.). Nonetheless, it seems clear to me that Levi is part of that current of Italian literature that appeals to the linguistic rigour of science, and which goes from Galilei, to Francesco Algarotti (Algarotti, 1737, p. VIII), Giacomo Leopardi (see Gensini, 1984), Italo Calvino (see Bucciandini, 2007), to quote only a few.

I think that the repeated statements by Levi on the conditions of possibility for writing, for his own writing, allude to a true *discourse on style*. In other words, he applies that need for clarity and rigour he has strongly absorbed from chemistry. Such experience was conjugated with the tragic experience of the linguistic confusion of the Lager, where not understanding could have meant losing one's life; where the reciprocal *incommunicability* did not just put at stake an experiment or a research, but the very possibility of recognizing oneself as a man-individual, capable of starting a relationship with the others by exchanging information. In *Se questo è un uomo* and in *I sommersi e i salvati* above all, such question is posed clearly and repeatedly.

To consider the *incommunicability* in the Lager as one of the conditions of individual suffering for the prisoners and a risk for one's life is perhaps one of the most original contributions by Levi to

the description of the concentration camps, distinguishing it from the others, which Levi himself states in his *Conversazione con Paola Valabrega (Conversation with Paola Valabrega)* in February of 1981:

One of the experiences of the Lager for me has been that of the missing communication, and I was deeply struck by the fact I did not find that in books by others... I must say that I have found the very same descriptions... but I have not found these topos of the lacking communication (Levi, 1997, p. 78).

Not by chance Levi, in *Se questo è un uomo*, opportunely resorts to the Bible metaphor of the tower of Babel:

The Tower of carbide, which rises in the middle of Buna and whose top is rarely visible in the fog, was built by us. Its bricks were called Ziegel, briques, tegula, cegli, kamenny, bricks, téglak, and they were cemented by hate; hate and discord, like the Tower of Babel, and it is this that we call it: Babelturm, Bobelturm; and in it we hate the insane dream of grandeur of our masters, their contempt for God and men, for us men, and today just as in the old fable, we all feel and the Germans themselves feel, that a curse – not transcendent and divine, but inherent and historical – hangs over the insolent building based on the confusion of tongues and erected in defiance of heaven like a stone oath (Levi, 2010, pp. 77-78).

Now the «new Bible» (Levi, 2003, p. 55)<sup>3</sup> auspicated at this point by Levi, that is the entirely human collection of the stories of the contemporaneous persecution of the Jews, is really *new*. Not only because in it there is no trace of a communication with God<sup>4</sup> and of God's action towards his people (Israel), but also because the possible analogies with the ancient Bible are not pertinent, as proved by the above quoted analogy Tower of carbide/Tower of Babel. In the Lager, in fact, the Tower of carbide is built *after* the confusion of the tongues, compelling by means of terror those who speak differently to build it, while, as well known, in the Bible the confusion of tongues is God's punishment to men who have a common tongue for having dared build it according to king Nemrod's project to gather them all in one place only, instead of occupying the whole Earth as had been commanded. The construction of the Tower of carbide represented, instead, exactly the result of an inverted Biblical process. The Nazis, in fact, had realized their «demented dream» concentrating *by compulsion* the Jews and other types of prisoners from all places and all tongues in a single place. Such people, though incapable to communicate for lack of a common tongue, were forced to undergo a persecution project that implied, instead of «grow, multiply and fill the Earth», their very extermination. This is, I think, what Levi refers to when, in his *Itinerario di uno scrittore ebreo (Itinerary of a jewish writer)*, talking about the Biblical references present in *Se questo è un uomo*, he states that in the book recur, in an insistent manner

The theme of the linguistic confusion as a punishment for man's insolence crops up insistently. But here the emphasis of the myth has been shifted; the insolence is that of Hitler's Germany that compels its slaves with their hundred tongues to construct its daring towers, and will be punished for this (Levi, 2005, p. 161).

I would like now to go back to the relationship between Levi and Regge, who are the protagonists of a well known *Dialogo (Conversations)* in 1984, because we can better show the difference between the way they intend their respective disciplines and the literature (Levi, Regge, 1989). Regge, for instance, declares he loves Borges because of the constant interest by the Argentinian writer for the dimension of the infinitely large. This allows Regge to link the universe to Borges's *Biblioteca di Babele (The Library of Babel)*. But the library comes out to be, potentially, infinitely bigger: according to Regge, in fact, the number of possible books equals  $25^{656,000}$ , i.e., a number with 900,000 digits, but the volume of the Universe we can observe in  $\text{cm}^3$  is a number of only 85 digits, and therefore it cannot contain the library! Hence the need for the

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<sup>3</sup> In *Se questo è un uomo* is also contained a sort of *negative Gospel*, an «evil story» on which Levi insists very much. (See C. Segre, 1997, pp. 58-59; Di Meo, 2011, pp. 124 ss.).

<sup>4</sup> Like in the thoroughly secular and mundane poem *Shemà* in *Se questo è un uomo*. (A different, penetrating, point of view is to be found in Meghnagi, 1991,1997; pp. 153-161, pp. 289-299 ).

physicist to declare the need to think about an infinite Universe: «The very mentioning of infinity gives many an anguish and a sense of insecurity. To me instead it is the closed universe, with its poorly  $10^{63}$  Km<sup>3</sup> of volume which bores me and gives me claustrophobia» (Regge, 1996<sup>4</sup>, p. 296).

Levi, on the contrary, thought the excessive and super-human dimensions that Borges and Regge allude to intimately disquieting, which also involves the writings of Calvino (Calvino, 1988, pp. 55 ss.). Like in Pascal, the infinite frightens him, and that is perhaps the reason why Levi does not like Borges. To the question why he had not inserted the Argentine writer in his *La ricerca delle radici. Antologia personale (The Search for Roots: A Personal Anthology)* Levi answers that he knows him but little and that he feels «a silent antipathy for him», and to perceive «in Borges something that I feel extraneous and far» (Levi, 1997, p. 126).

Levi could have opposed a chemical infinite to the cosmological infinite of Regge, that is the infinite combination possibilities of the natural or synthetic molecules, for which not enough material could be found on Earth and in the Universe. For instance, in the synthesis of vinyl chloride each time you add to the chain 1 monomeric unit there are 4 different ways to do so.  $N$  vinyl units, if they enter in a casual chain as a primary or secondary concatenation, and again at random, with both their 2 different chiralities, could establish a succession in 4 different ways. The connections in a macromolecule of  $N$  monomeric units could take place in  $4^N = 10^{N \log_4} = 10^{0,6N}$  different ways. If  $N$  equals 1000 it could be done synthetically, in the absence of an ordering mechanism, in  $4^{1000} = 10^{600}$  different ways. To understand the dimension of such number, please notice that the number of atoms present in the Universe is estimated to be  $10^{82}$ » (Corradini, 2003, p. 795).

Levi could have done the same with the infinitesimally small dimensions of the combinations of atoms and molecules, the nanometres, (1 billionth of 1 metre). Also in this case, however, Levi feels that the descriptive, literary language reaches an insuperable limit. In fact, concerning the photosynthesis of the atom of carbon described in *Carbonio (Carbon)*, he repeats his belief that the representation of the events that take place at the atomic level is fallible:

If to comprehend is the same as forming an image, we will never form an image of a happening whose scale is a millionth of a millimetre, whose rhythm is a millionth of a second, and whose protagonists are in their essence invisible. Every verbal description must be inadequate, and one will be as good as the next, so let us settle for the following description» (Levi, 1986, p. 227).

The same principle is valid for the primitive causes of chirality of which we talked above:

Chirality could take place in the sub-atomic realm, where no language is valid any longer except that of mathematics, where intuition does not reach and metaphors fail (Levi, 2002, p. 209).

However, this is not the chemistry Levi likes. First of all, as he writes already in *Se questo è un uomo*, because «our human condition... is inimical to all infinities» (Levi, 2010, pp. 10-11), and second, because human language is conceivable and effective only if it can be circumscribed to the world of bodily feelings. Levi, in fact, had a commanding necessity that his relationship with concrete matter take place at the level of what can be felt: «I had this rather precise and continuous need to verify with my senses the presence of matter» (Levi, 1997, p. 78). Such need later becomes a literary style, for he feels a similar necessity with nature in general, and with mountains in particular, where his senses become fundamental. But every practical *job* is a wrestling game that uses the hands, on which Levi poses all the time a heavy emphasis, and which leads him to say that compared to the other parts of the body «hands are more talkative» (Levi, 1997, p.78), or – like in *Il fabbro di se stesso (His Own Blacksmith)* – that «doing things, other things occur to you, in a chain: I often get the impression that I think more with my hands than with my brain» (Levi, 1990, p. 200; Malabrega, 1997, pp. 380-392).

For Levi then literature must use a language closer to a world that is *tailored for man*, i.e., to *man's senses*. In fact an appropriate description of the objects in the infinitesimally small or in the

extremely large requires by necessity a special language (especially mathematical) whose meanings are very far not only from our senses but also from our imagination. It is another matter if we limit ourselves to what is close to us: only at this level chemistry was felt by Levi as a large reservoir of useful metaphors (Levi, 2002, p. 149), i.e., as a science from which to draw, to a literary purpose, *sensitive* materials that are not common. That is why, in the *Dialogo* with Regge, and before the exhibition by the physicist of a Universe very far from our common perception, he defines his own discipline a “low chemistry”, almost a kitchen, a sort of Cinderella of the sciences (Levi, Regge, 2005, pp. 60-61). He means the chemistry of colours, smells, tastes, of manual and instrumental operations. That means the science of the *secondary qualities* of the bodies, that in chemistry have maintained a knowledge function almost until our own days, but that have been banned from physics starting from Galilei, to be replaced by the *primary qualities* (corpuscular matter, geometric form, movement, etc.).

As a matter of fact, there is a strict relationship between chemistry and the sense of smelling, which pushed Levi to suspect that in fact his choosing that science had been dictated by the need to find a chance to exercise his nose. (Levi, 1998, p. 226). But smells for Levi, besides being ways to perceive chemical compounds (and being useful to recognizing such compounds) are also linked to persons, places and landscapes, and are «extraordinary evokers of memories» (Levi, 1996, p. 229), true and resistant *loci mnemonici*. Hence the association made by Levi of the chemistry of smell and the memory of places he lived in or went through, of the persons he met there, among which the smells of the Lager and of what was outside the Lager. One of the first forms of knowledge of the Lager in fact concerns, in a direct way, the senses of smell and taste: «The water is lukewarm and kind of sweet, and brackish to the smell» (Levi, 2012, p.15).

We find a huge number of possible citations concerning smells in Levi, so many that we can hypothesize a new way to write and describe reality by means of smells.

For Levi, then, smells represent a true language, strongly evocative, the language that most directly – in a direct as well as indirect way - gets us close to external reality, nature, although this last is little comprehensible and little translatable in ordinary language. In fact, there is a contrast between the tenacity of the memory of smells and its escaping verbalization, and hence literary description. As Levi himself says, translating smells into words is extremely complex, also because we lack a classification system whereby we can give order to it, and a shared vocabulary of smells. Nonetheless, however imprecise and unstable, the vocabulary of smells is not poor, as it can draw from the names of the sources from where smells emanate, and from the resources of linguistic creativity, i.e., metaphors, metonymy, periphrasis. Its unavoidable characteristic is the noteworthy variation in individual definitions, which, as we know, for Levi represents an obstacle to communication, but also, in this case, a privileged ground for creativity (Cavaliere, 2009). Levi's style, from this point of view, situates itself inside a long tradition of using odours literarily, which developed above all starting from the 19<sup>th</sup> century, with, among others, the Italian Giacomo Leopardi, usually disregarded in this respect (Dell'Aquila, 1993; 2000), Honoré de Balzac, Charles Baudelaire, Gustave Flaubert, Emile Zola, Marcel Proust (i.e., great writers) as far as our contemporary Patrick Süskind (*Perfume: The Story of a Murderer*, 1985).

The above introduced ‘secondary qualities’ and their statute within chemistry have been recuperated to aesthetics since the 18<sup>th</sup> Century, in order to create a world distinct from the physical world, endowed with a different form of truth. In the case of Levi it is precisely the peculiar situation that chemistry attributes to them that prevents him from living dramatically the separation between scientific and literary and poetic languages, that is the existence of a *double* reality: *objective*, which is the abstract and mathematical one tied to reason, and entirely subjective, linked to sensations. Chemistry, then, appears like a *bridge* between these two worlds, which modernity seemed to have irreversibly separated (Starobinski, 1977, pp. 128-145; Starobinski, 2003, pp. 69 ss.).

A final consideration concerning smells. In his 1984 *L'ultimo Natale di Guerra* (*The last Christmas of war*), in which Levi narrates the guided visits of the young Nazis to observe the

prisoners in the Lager, he notices that such prisoners were derisively described as stinking. The smell of the prisoners, also, is a recurring theme in *Se questo è un uomo*. Levi himself had been addressed with the expression «Stinkjude», stinking Jew, by Fräulein Liczba, one of the civilian girls that operated in the chemical laboratory of the Lager.

The above question indirectly evokes a belief that has been present for long in the Christian world, especially at the popular level: that the Jews had an unpleasant, devilish smell, a mephitic stench by which one could recognize them. In other words since the Middle Ages smells were used as a classification and individuation element of the Jews in order to persecute them, although in the 17<sup>th</sup> Century the physician Thomas Browne (Browne, 1658<sup>3</sup>) and in the 18<sup>th</sup> Century the physician Bernardino Ramazzini (Ramazzini, 1713<sup>2</sup>) had confuted such belief, attributing any possible smell to the life condition and the jobs to which the Jews were reduced, denying a divine curse for their presumed deicide. Nonetheless the belief in the (foul) smell of the Jews will reach the 20<sup>th</sup> century, e.g. in the case of the racist French anthropologist Georges Montandon, and of the Nazi physician Otmar Freiherr von Verschuer, who sought to give it a ‘scientific’ basis, giving a non-secondary contribution to the culture that fed the Shoah.

The relationship between chemistry, literature and colours is in Levi as strict as in the case of smells:

To me blue is not just the colour of the sky, I have five or six blues at my disposal... I mean I have had in my hands materials of non-current use, with properties out of the ordinary, that have helped widen in a technical sense my language. Thus I hold an inventory of raw materials, of tesserae to write, a bit wider than that held by who has no technical education (Levi, Regge, 2005, pp. 60-61).

Here is an example of utilization of such ‘tesserae’:

We had entered the forest, an autumn forest splendid with unpredictable colours: the green gold of the larches, whose needles had just started falling, the bleak purple of the beeches, and elsewhere the warm brown of maples and oaks. The naked trunks of the birches lured you to touch them like you do with cat (Levi, 1991<sup>2</sup>, pp. 162 sgg.).

Or also:

The water reflected the colors of a sky the like of which Antonio had never seen: dark blue high above, emerald green to the east, and mauve with large orange streaks to the west (Levi, 1996<sup>2</sup>, p. 671).

Colours are here defined as ‘unexpected’, and are repeatedly presented in the landscapes Levi glimpsed or described, just like the colours in his chemical analyses might have been unexpected too. He himself, in fact, in several occasions had deemed a strong metaphorical relationship between the chemistry of colours, moods and concrete places possible. The variation and variety of colours are then the *indicators* of such a possibility.

Levi’s term of a *zona grigia* (*grey zone*) seems to me to render well what I just said. It has been the object of many studies from many points of view (Bravo, Mengoni, w. d.). Rarely, however, it has been related with Levi’s chemical *insight*. In the first place, such term is utilized in order to refine the *analysis* of the human soul of a peculiar stratum of Lager prisoners, who constituted an intermediated layer of persons with roles distinguishable in various shades, and who, corrupted by the despotic and terrific power of the Nazis, were available to make themselves «vectors and instruments of the guilt of the system» (Levi, 1989, p. 45), in that they occupied part of the functional space that separated the victims from the persecutors. They were victims themselves, but with a set of minimum privileges (often evil and degrading), which posed them above the other victims, of whom they often were the executors.

Second, it connects to *intermediate states* of the human soul. There is no doubt that chemistry is a science that considers highly such intermediate states both in classifying compounds and in chemical reactions, and, last, in the behaviour of some compounds that depends on circumstances (a

substance can react differently according to the experimental conditions) (Di Meo, 2011, pp. 138 ss.). This defines once again what type of 'laboratory' Auschwitz was.

Thirdly, Levi resorts to a *colour*, grey, to identify this particular zone of prisoners, victims and executioners. Grey is obtained by mixing black and white and is endowed with a wide range of shades. Very effectively Bucciantini says that just as there are coloured lines of many elements excited with a flame or with a Voltaic arc, so grey is taken by Levi as the typical line of a typical sample of humanity « each of which is the result of modifications owing to particular relationships and circumstances» (Bucciantini, 2011, p.108). This is very suggestive and metaphorically convincing. However, given that grey is in reality a mixture of 'special' colours (black and white). I am using here the ancient chemical meaning of colour (colour as dyestuff) in that different from the physical point of view according to which *black* and *white* are respectively the presence of all colours, and the lack of all colours. Hence, in my opinion, the grey of the 'grey zone' is not a «primary colour», as argued by Bucciantini (Bucciantini, 2011, p. 109), but the *circumstantial* result of a mixing process. The different nuances of human *grey* symbolise a concrete historical *possibility*.

The problem is first of all individuating which parts of the humanity in the Lager to Levi can be identified with such colours. *Black* poses no problems, for there is no doubt it is for the Nazis.

We immediately realized, from our very first contact with the contemptuous men in the black patches, that knowing German was a watershed. With those who understood them and answered in an articulated manner, the appearance of a human relationship was established. With those who did not understand them, the black men reacted in a manner that astonished and frightened us: an order that had been pronounced in the calm voice of a man who knows he will be obeyed, was repeated word for word in a loud, angry voice, then screamed at the top of its lungs as if he were addressing a deaf person or indeed a domestic animal, more responsive to the tone than the content of the message (Levi, 1989, p.70).

Individuating the whites is more complicated. I think we can take that for Levi the whites were those who, in some circumstances, showed a «disposition to be» (Leopardi, 1991, *passim*) assimilated to the order of Nazi terror.

*White*, then, is the representation of a vacuum, in this case a moral vacuum, a condition of lack of personality and of individual values on which to base oneself. White is the colour of anguish: «Anguish is known to everybody since childhood, and everybody knows it often is white, undifferentiated» (Levi, 1989, p. 53). In the same way, in Levi's memory got recorded voices and words of languages he did not understand, like on an «empty, white» (Levi, 1989, p. 73) magnetic tape. According to its chemical meaning, white is nothing, is the absence of memory, the colour of can't remember.

As to the *musselmann*, I think that they can be defined as *colourless*, transparent, light going through them without them perceiving or holding it. There are, however, many places in Levi's work where he uses *grey*, especially when he describes masses of prisoners, with the meaning of undistinguishable, shapeless, without a typical character that we can use to distinguish one man from another.

*A Leopardian conclusion.* In this paper I have sought to prove that chemistry has been the instrument that allowed Levi to conjugate in his work *precision* in the descriptions and an *expressive* and *elegant* language. According to Leopardi (Leopardi, 1991, 30)<sup>5</sup>, this is a typical characteristic of Italian language, which is different from the cold geometry of French, more linked to 'understanding' than to 'seeing'. But this did not mean that Italian lacked precision or was not amenable to scientific work:

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<sup>5</sup> Giacomo Leopardi (1798-1837). One of the great writers of the 19<sup>th</sup> Century. He was an Italian poet, essayist, philosopher, and philologist. Although he lived in a secluded town in the ultra-conservative Papal States, he came in touch with the main thoughts of the Enlightenment, and, by his own literary evolution, created a remarkable and renowned poetic work, related to the Romantic era.

The suppleness of French language merely enables one to be understood. The easiness to express oneself in the Italian language has the advantage of carving things with the effectiveness of expressivity, so that French can say what it wants, while Italian can put it before your eyes, the former can easily be understood, the latter can show. However, to the French language, that as long as it is understood cares for nothing else, and to which the weakness of the expression does not matter, nor does the poverty of some tours (for which it is praised as supple) which express a thing but only most coldly, palely and watery. It is a language good for the mathematician and for the sciences, not for imagination, which is the true realm of Italian: in it, efficacy does not impinge on precision, and sometimes increases it, putting before your senses what the French propose to your intellect. Hence it is less good for science and more suited to eloquence and poetry, as shown by the precise effectiveness and carvedness evident in Redi, Galilei etc. (Leopardi, 1991, 30).

Italo Calvino, much later, will produce a similar argument in his lecture *Esattezza (Exactitude)* in *Lezioni americane (Six Memos for the Next Millennium)*, stating that in him lived together both models of writing (the French and the Italian):

From the moment I wrote that page it became clear to me that my search for exactitude was branching out in two different directions: on the one side, the reduction of secondary events to abstract patterns according to which can carry out operations and demonstrated theorems; and on the other the efforts made by words to present the tangible aspect of things as precisely as possible (Calvino, 1988, p. 74).

I think that the ‘coldness’ and ‘detachment’ of which Levi is sometimes accused in his descriptions, as if he were writing in the form of ‘geometry’ his experiences inside and outside the Lager, the presumed ‘rationalistic’ and ‘Enlightenment’ character of his thought and of his prose, should rather be evaluated from the point of view of his capacity to conjugate the expressive feature of his works, by means of the Leopardian «commerce with the senses» (Leopardi, 1969, p. 915), with the exactitude, the precision and the economy of his way of writing and, last, his imagination.

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