



Luigi Dei

Molecules of an author in search of memory

A civil-scientific play of two acts

*A poetic book on science's role in the
life and history of man*



Preface by **Roald Hoffmann**
Nobel Laureate in Chemistry, 1981

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Preface

The last few years I taught introductory chemistry, I read Primo Levi's *The Periodic Table* with the hundred or so students in my class. I've done it also with a class of a thousand – yes, we teach such gigantic courses in the US. And Levi's books are required reading as well in courses on biography, on memory, on the Holocaust at my university, Cornell University in New York State.

Why do I have my students read Primo Levi? Because even in this great university their lives are fragmented and compartmentalized. They study chemistry, survive through the next problem set in mathematics, step into a history course. And Levi's life was not fragmented. Chemistry was an essential part of his existence, hardly separated from survival or philosophy. Some of that may have been chance (the role chemistry played in his survival in the concentration camp, which you see and hear retold, in an exemplary manner, in this play), but it was also an inner choice. I want my students to feel this. Not because I want them necessarily to be chemists. But I feel a need to put before them a vision of a man, who might not have been one of the heroic figures of chemistry, but one for whom the world was one.

It would be natural that I, a chemist who is also a writer, and one who is Jewish as well, and a survivor of World War II, should encounter and be interested in the work and person of Primo Levi. But there is more to our bond – in so many things I've written I've found a resonance in Levi. For instance, the contrast of creation and discovery is something that has fascinated me. The twentieth century in chemistry was that of synthesis, of the making of molecules. Creation is different from discovery. It brings chemistry close to the arts. And, lest

we get too high on that, it brings us close to engineering. The recognition of the centrality of synthesis was well understood by Levi, thus the instant sympathy and admiration between the chemist and the builder Faussone in the *The Monkey's Wrench, La Chiave a Stella*. This is doubly interesting as Levi was by training an industrial and analytical chemist, and many of the achievements of *The Periodic Table* are discovery stories.

I wrote a book, *The Same and Not the Same*, in which there is conveyed a vaguely Jungian view of chemistry, each of the molecular science's facts precariously balanced along many axes or polarities. Pure/impure is one, as is natural/unnatural, harm/benefit, creation and discovery, to reveal/to conceal, equilibrium/extreme. And identity or difference, the greatest of polarities.

Sure enough Primo Levi expresses that tension beautifully, in the context of a chapter in *The Periodic Table* where he tires of chemistry «Where are theorems of chemistry?» he says, and turns to physics. Where he has to do some chemistry. He needed sodium to dry an organic solvent, but he used potassium, another alkali metal, right under sodium in the periodic table instead. He writes of what the experience meant to him:

[...] I thought of another moral [...] and I believe that every militant chemist can confirm it: that one must distrust the almost-the-same (sodium is almost the same as potassium, but with sodium nothing would have happened), the practically identical, the approximate, the or-even, all surrogates, and all patchwork. The differences can be small, but they can lead to radically different consequences, like a railroad's switch points; the chemist's trade consists in good part in being aware of these differences, knowing them close up, and foreseeing their effects. And not only the chemist's trade.

Now that is great writing, a deep human insight. I like it that it begins in chemistry.

May, 2013
Roald Hoffmann
Cornell University

I ntroduction

Luigi Dei is a Professor of Chemistry at the University of Florence, where he teaches degree courses in Science and Technology for the Conservation of Cultural Heritage at both undergraduate and graduate level. He is also head of a special interdepartmental University Centre for the application of science and technology to the preservation of cultural heritage – a concrete manifestation of his interest in the relationship between science and the arts. Dei is greatly appreciated by his students for his excellent communication skills, which he also uses in order to further the popularisation of science. By way of illustration, I should like to recall his fantastic presentation of Ravel's *Bolero*, in which he demonstrated the physical and chemical characteristics of various orchestral instruments, in relationship to their timbres and to their role in the musical score. His civic engagement has led him to give a series of lectures dedicated to Primo Levi, and he has also edited a volume in memory of Levi entitled *Voices from around the world for Primo Levi. In memory, for memory*.

This work represents the coming together of these various elements. Subtitled a 'civil-scientific play', it unfurls in the wake of an episode from Primo Levi's *The Periodic Table* which details the way in which Levi and his friend, Alberto Dalla Volta, manage to obtain bread in the concentration camp in which they are detained by trading cigarette lighter flints produced thanks to the intermetallic compound, iron-cerium.

The narration is carried out by a voice that complains of its world where remembering appears to be a thing of the past, no books are printed anymore and memories are wiped out. Into this scenario comes a common man, a man in the street, who has found some sheets of paper that he cannot decipher. With

the help of the narrator, Science, Technology and Nature, and of two voices that for a long while remain offstage, that of Primo and his friend Alberto, he succeeds in reconstructing the cesium episode as described by Levi in the afore-mentioned work.

The work hinges then on the issue of remembrance, and on the reconstruction of a lost identity – that of our history. In this reconstruction feature the wonderful contributions of Science, Nature and Technology, who by turns explain – via remarkable scientific illustrations – the attempts made by Primo and Alberto to obtain edible substances from whatever they could find in the laboratory where Levi was working outside the camp. These dialogues also exemplify how strongly entwined Science and Technology are, building to a crescendo which culminates in a declaration of true love between these two protagonists.

The narration ends with a beautifully moving passage – again inspired by Levi’s publication – on the carbon cycle, which takes as its point of departure a crematorium where Alberto may have ended his days and the observation made by the man in the street that no trace remains of him. This prompts Alberto to intervene, elucidating the way in which the carbon of his burnt body could potentially be present in the bodies of the spectators of the play that he and others are putting on.

In this book, or script, all of Luigi Dei’s principal qualities are present: a strong sense of moral and civil obligation, and a keen desire to demonstrate how the targeted use of science represents a fundamental part of life and of man’s history.

Florence, July 2011
Roberto Casalbuoni
President of *OpenLab*

Characters in order of appearance

Narrator

Man in the street

Primo (Levi)

Science

Alberto (Dalla Volta)

Nature

Technology

Act One

Scene One – A simple, sparse setting, in semi-darkness. Toward the front of the stage: a coat stand with an overcoat, hat and scarf; a desk with a computer, a few scattered sheets of paper, pens and pencils; several bookcases with no books, only ornaments and vases of flowers, and three television sets of varying size on the shelves; armchairs and sofas.

Characters: Narrator, Man in the street, Primo.

NARRATOR (*Alone on the stage, pacing up and down. Appears sad, but also rather agitated; angry with himself and with the world in general*) – What kind of world is this in which we live only for images, for the present, for unbridled hedonism and consumerism, with no memory of anything anymore? (*Man in the street enters timidly, taken aback by the force of the Narrator's outburst. He looks around and positions himself in a corner, unnoticed by the Narrator*) Look at the men of today, all professionals of forgetfulness: (*sarcastically*) what wonderful schools where one is taught to forget, how marvellous our national «Oblivion» award, that everyone is so desperate to win!

MAN IN THE STREET (*Having been slightly hidden now steps into view and addresses the Narrator, with neither fear nor awe*) But what on earth do you mean? That's a bit far-fetched if you ask me! As long as they are willing, people can read and not forget anything at all.

NARRATOR Oh, so in your opinion people can read can they? Come on! You know perfectly well that history books no longer exist, and that it's forbidden to ask people «who were you?» or «who have you been?». What is it all our

politicians say nowadays, no matter what party they may belong to? «Whatever you may ask me about my past, know this: I never existed». Books that people could read if they so wish you say? What planet are you living on? Books have become museum pieces, antiques, relics of a time gone by – obsolete like archaeological remains. Don't you know that it's nearly impossible to find a bookshop nowadays? Do you see bookcases in people's houses? (*With irony*) Just look at some furniture catalogues – you'll soon see how many beautiful bookcases there are to buy: (*articulates very clearly*) they don't make them anymore! It's sad but true.

MAN IN THE STREET It's not true what you're saying: as long as we have memories, we can write them down and pass them on to others. I think you're being a bit too pessimistic!

NARRATOR You think I'm a pessimist? Well I say your optimism is unfounded – open your eyes! It doesn't make sense to remember anymore; the new laws forbid you even to keep what you write: word processing software won't let you save your documents. It's got nothing to do with pessimism, I'm simply being realistic. It's ill-fated, this world that has no further need of its past (*The narrator moves over to the coat on the stand and reaches into one of its two pockets*).

MAN IN THE STREET Why do you say that? I feel a very strong need for our past, I want memory, and hate forgetfulness.

NARRATOR So you say. Fine, listen then as I read this extract – a few words, found in the pocket of this old coat: (*opens and reads from a scrap of paper*) «In the art of forgetting, the Italian intellect is without rival: it is unequalled, sublime». Do you know who coined this great phrase? An Italian writer, at the end of the second millennium. What truth, what prophetic potency, what a sense of foreboding!

MAN IN THE STREET You may be right. I too have a few torn pages which I found in my grandparents' cellar however, and it seems to me they contain writings that *do* recount things that have taken place, tragic events: they speak of hunger, of stealing, of receptacles, of lighter flints, of cigarette lighters, of death, life and cerium. Rather than getting so worked up in vain over your old world that no longer exists, why not help me to understand, to piece together this jigsaw of paper

and ink? Let's go back in time together and reclaim these lost memories.

NARRATOR (*Challenging tone*) How presumptuous you are! Who are you that dares to challenge the inevitable course of human affairs, which feed only on the present and the cult of the image?

MAN IN THE STREET (*Looking the narrator straight in the eyes*) I may be a man of the street, a common citizen, not particularly well-educated and lacking in memory – as you rightly say – but curiosity still gnaws away at me: I am the man that wants to understand, that wants to know who man was, what man has been, why man did this and why he did that... I want to understand the meaning of the dark marks written on these yellowing scraps of paper. Help me, I'm begging you: don't be so high and mighty. From what you say it seems that you know a great deal about our past.

NARRATOR (*Almost frightened by such a display of fortitude*) You scare me, man in the street. And do you know why? Because you don't know what might lie in store. Behind those words hunger, theft, receptacles, flints, life, death and cerium, you might discover a truly dark and awful side of yourself, a glimmer of something true, that «has happened and therefore can happen again». Think carefully: the blissful peace of an unaware mind could suddenly be replaced with the agitated suffering of reason and knowledge.

MAN IN THE STREET My mind's made up. I'll die if I don't know what these twenty-eight ink-stained sheets conceal: my 'blissful peace' has already become the anxious suffering of reason that is unable to see clearly. If you'll enlighten me, reason and knowledge could instead alleviate the mental torment that has troubled me since I found these sheets.

NARRATOR (*With changed attitude, as if with renewed faith in the future, or at least in the possibility of carrying out an important endeavour*) Very well then, I will try to guide you from the shadows into the light, but on one condition: once the mystery is resolved, you must dedicate the entire rest of your life to ceaselessly writing it down an infinite number of times in all the languages of the world, without respite, to the point of exhaustion, with this ink and on this paper (*from a drawer in the desk pulls out a ream of paper and a*

pot of dark ink). They are made from an unusual substance which is indestructible and bears the gift of eternal life: it's the product of a miraculous alchemy to which I have dedicated my whole life. And one more thing – on our journey from darkness into light, you must never ask anything about the human characters that we meet.

MAN IN THE STREET (*With conviction*) I accept the condition:

I swear and promise that if, with your assistance, I'm able to understand entirely the meaning of what is written on the pieces of paper, not a minute will pass from the moment of comprehension onwards that I don't dedicate to the ancient task of the scribe, with these magical implements, your paper and ink. You should know however that if my endeavour proves to be excessively demanding, and I die of exhaustion, then so too will yours be similarly demanding. I am a common man, in an era – as you say – of oblivion, and the absence of books and reading. Your didactic abilities will need to draw on untold resources. The rock face we have to climb will be (*thinks for a moment as if to find the best phrase with which to make an impact; then, all of a sudden, almost trance-like, as if inspired by some mysterious force, declaims in a resounding tone*) «an idle and ignorant adversary, inimical as human ignorance is inimical, and strong – as such ignorance is wont to be – by dint of its passive obtuseness».

PRIMO (*Offstage, enunciates the four words clearly, one by one*) I know those words.

MAN IN THE STREET Who was that? Where did that voice come from?

NARRATOR (*Trying to gloss over the verbal intrusion of the mysterious character in the wings*) Don't pay any attention. Listen to me and concentrate on what I'm saying instead. I'm not intimidated by such an undertaking. I'm too excited by the prospect of a climb, which – if we should reach the summit – might change this wretched world! Just be aware that in leading you toward the light of dawn I'll need to introduce some strange and mysterious characters to you – some of them in flesh and blood, others in a more unusual materialisation, lacking corporal features, but nonetheless vivid as only those of the animal and plant kingdom know how to be.

MAN IN THE STREET (*Pulls from his pocket a well-ordered collection of papers, held together by an elastic band, from which he extracts the first, delicately replacing the rest in his pocket*) Here is the first sheet. I can only make out four words – the rest are extremely faded – perhaps I can hazard a guess, but I can't see how they make sense as a whole, the meaning escapes me.

NARRATOR Go on, read me the four words in order.

MAN IN THE STREET (*Enunciates very clearly, without seeming to read any meaning in the phrase*) «Alternated», «at», «a», «rate»: what does that mean, «alternated»? How is this rate able to alternate?

NARRATOR (*Worried*) My dear man in the street, we're off to a bad start! I wasn't expecting our climb to be so steep, at the outset at least! Let's start with the rate: think of a swing. Up and back, up and back – it seems to fly and then return to land, always in the same way: once up, once back, once up, once back, never twice up and only once back or viceversa. That's what the rate is: it's something that goes up and then down, and then up and then down again, monotonous, with no surprises. Tick tock tick tock – like the pendulum of a clock, like the wave that breaks and then rolls back out to sea, breaks and rolls back out, an infinite number of times. All perfectly measured, periodic, just as the sun rises and then sets, something that oscillates between a maximum and a minimum: fully light at midday, and pitch black at midnight. And so on and so forth, with this periodicity, this alternation. So now do you understand the meaning of these words?

MAN IN THE STREET (*Reassured and appeased by the explanation*) I would say so, although I'd like to understand more generally, without need of all those examples, such that the phrase were applicable to any situation, and not just the sun, a pendulum, a wave or a swing.

NARRATOR (*Visibly pleased, takes heart*) You're right, I can see you're getting into this search for knowledge. But I'm afraid I can't be of any further help on this matter. I can only explain things with examples, I'm not capable of generalising. However, I've got a friend who I'll introduce you to straightaway, one of those strange and mysterious characters

devoid of corporal features that I mentioned earlier; a friend who I think will be of great help all along the arduous path that we tread together. She is called Science – she is both very old and incredibly young, which is one of her mysteries – and she will certainly be able to satisfy your desire to understand more universally, more generally, as you say.



Scene Two – Of the previous decor, only the bookcases remain. We now see a chemistry bench with all sorts of laboratory glassware, another bench with instruments concerned with physical measurements, telescopes and microscopes, and a rotating chalkboard (the kind where you can write on both sides). On the visible side of the board there are there are graphs and formulas relating to the trigonometric functions sine and cosine.

Characters: Science, Man in the street, Narrator, Primo and Alberto.

SCIENCE (*Standing next to the chalkboard*) Greetings, man in the street. Although I wasn't actually here in the flesh, I was present during your exchange of ideas and I will do my utmost to give you a hand. My friend has provided you with excellent examples to illustrate the meaning of the alternating rate. But let's see if I can manage to make the meaning of these examples clear to you more generally, although alas! it will also be more abstract. A daughter of mine, very dear to me, who is called Mathematics, discovered one day the existence of periodic – specifically trigonometric – functions (don't be put off by the name which can frighten people), which follow a wavy pattern: the functions of sine and cosine (*indicates the chalkboard*).

MAN IN THE STREET (*Closely observing the chalkboard*) I believe I was taught them at school, but frankly now I don't remember a thing.

SCIENCE Yes, you're right. My beloved daughter, blessed girl, has had I don't know how many boyfriends, husbands

and lovers, and one of these – a Frenchman called Fourier (*turns the board over and the formulas relating to the Fourier transform appear*) – gave her a truly marvellous gift: he discovered that with these functions you can describe any physical phenomenon endowed with periodicity.

MAN IN THE STREET So in other words, everything in our lives that alternates at regular intervals can be described with this strange invention of Mr Fourier's?

SCIENCE Exactly! All those motions of the swing, the ocean waves, the oscillations of the pendulum – but also of the rather more complicated ones of a Beethoven symphony – they can all be perfectly described by an opportune combination of these functions!

MAN IN THE STREET But that's wonderful!

SCIENCE Wait till you see how many wonderful things we will discover thanks to my offspring! These functions are characterised by a parameter known as frequency – here it is then, the rate, that's what my daughter Mathematics calls it, frequency – (*turns the board again and the representations of sine and cosine reappear; two distinct graphs can be seen, one of low frequency and one of high frequency*) which tells us how many maximums and minimums, how many peaks and troughs of these sinuous and oscillating waves are contained in a given interval of time. If the high and low points of these waves are very dense, then we say that the frequency is high, if they are very spaced out, then it is low.

MAN IN THE STREET Well that all seems very clear to me, but to be frank I've no idea what on earth it's got to do with our story.

SCIENCE A little patience please! What normally varies over time with these functions is a physical, chemical or mathematical parameter; if however we take something rather more difficult to quantify, our state of mind, (*does some rubbing out and writes 'state of mind' on the vertical axis: 'time' is already written along the horizontal axis*) and manage in some way to assign numerical values to this instead, then we could say that the peaks and troughs represent the highs and lows of our mood. Normally the frequency, or the rate of alternation of our states of mind isn't too excessive...

MAN IN THE STREET (*Very happy*) I've got it! It's easy now!

NARRATOR (*Remaining doubtful*) How do you mean, you've got it?

MAN IN THE STREET (*With conviction and authority*) I've understood the examples, but also your magnificent generalisation. It is indeed abstract, but it works, and (*to Narrator also*) I can immediately show you how. It enables me to resolve the entire enigma of the first piece of paper. Now I understand those other faded words that I was trying to read earlier, but couldn't see how they could be connected with «alternated at a rate». Here is the complete contents of this sheet of paper: «Desperation and hope alternated at a rate that would have destroyed almost any normal person in an hour». The minimums and maximums of the waves – desperation and hope – have an awfully high frequency! Who is it that is so desperate? And why?

PRIMO (*Still offstage*) How much sorrow you are causing me with these words! I feel suffering and anguish upon hearing these sounds; it pains me to remember, but I am happy and I love you if you remember.

MAN IN THE STREET (*Turns quickly toward the voice behind the scenes, uneasy once more*) This voice too despairs and is happy, at a fast, almost frenetic rate. Can it be the same desperation and the same hope, that of this hidden man?

NARRATOR (*Trying to calm and reassure him*) Don't complicate things, and don't get blown off course by words that come up out of nowhere. Let's return to our writings. I believe I may have understood what it's all about. It is a man who writes, a man recounting his time as a prisoner in a concentration camp, a man who knows they are soon to be liberated because the liberators are nearby, and he waits for them, hour after hour. He seeks more information and somebody tells him that their arrival is imminent, and so there he is, right up at the maximum, on the crest of the wave, on the wings of hope... But after an hour, someone else whispers instead that no, they are still awfully far away, and he sinks once more right down to the minimum, to the trough of the wave, sucked down by despair.

MAN IN THE STREET I'm interested by this man's story – I want to know why he is so desperate, I want to find out if his hopes will be fulfilled. (*Pretends to rewrite the contents of the first sheet on a much larger scale – although in reality this is*

pre-prepared – such that it is legible by some of the audience, at least those sitting closest to the stage; fixes it onto the frame of the bookcase, removing an ornament and setting it to one side, on the ground. From now on, for every sheet fixed to the frame, the same happens – either an ornament, a vase of flowers, or even one of the television sets is removed: in this way eventually the bookcases will only display the papers filled with memories)

NARRATOR So now all you have to do is deploy the next sheet.

MAN IN THE STREET (*Carries out the same process of extracting – this time two pieces of paper – from those bound by the elastic band, and puts the rest back in his pocket*) No sooner said than done! (*Reads the first of the two*) This is even more enigmatic, since I can only see four words clearly, and no logical connection between them.

NARRATOR Read them out loud, and you, my dear friend, don't go anywhere – you'll be of even more help to us in this second charade.

MAN IN THE STREET «Stimulus», «eat», «memories», «death». Then there are plenty more, around forty in all: «distance» I think, «home», and then conjunctions, monosyllables, maybe also «fear» but I can't be sure.

NARRATOR What do you say to that, beloved Science?

SCIENCE Only two of the clues mean anything to me: «stimulus» and «eat». The others, quite frankly, leave me completely indifferent. «Memories» is too lyrical, and «death» really doesn't interest me at all: I'm only concerned with improvements to life! A human being is not only the swinging states of mind that we have seen, but also – above all for my daughter Biology – a collection of miniscule organisms, tiny cells of life.

MAN IN THE STREET And how many of these cells are there in our bodies then?

SCIENCE An incredible amount, to make your hair stand on end! Between fifty and a hundred trillion. (*Goes over to a microscope and looks into the eyepiece*)

MAN IN THE STREET It can't be possible! How on earth?! There are seven billion of us on this planet, and inside each of these seven billion people you're telling me there are fifty to a hundred trillion tiny lives in miniature! But that's crazy! I can't believe it: it's the first I've heard of it.

SCIENCE And that's not all! This immeasurable crowd of cells is constantly exchanging matter and energy with the external environment, and within each one millions of irreversible chemical and physical processes are taking place every minute.

MAN IN THE STREET Even now? Whilst we're talking?

SCIENCE Certainly! And that's not all. In order to keep going, this system needs a daily intake of matter, with which it is able to produce energy. And this matter of which we speak has been arranged into three large categories of compound by another of my daughters, Chemistry (*goes over to the Chemistry bench and picks up a tub of casein when talking about protein, then a beaker of olive oil when talking about lipids, then finally a box of sugar when talking about carbohydrates*): proteins – essential in order for our tiny cells to regenerate; lipids or fats – for storing some reserves in case of need; and carbohydrates or sugars – indispensable fuel for those cellular boilers that go by the name of mitochondria. When there is a reduction in the incoming matter, it produces a certain sensation, one that – in the extreme – is nowadays unfamiliar to most of us ...

PRIMO (*Still offstage*) How lucky you are, never to have experienced it!

SCIENCE ... but still unfortunately so widespread among hundreds of millions of individuals: hunger.

MAN IN THE STREET (*Visibly moved, involved*) So according to you, hunger could be the stimulus which is written about here?

SCIENCE I would say so, yes.

MAN IN THE STREET Incredible, you're right! On the third sheet I can read two words that support your reasoning: «hunger» and «cells»! (*Turns to the Narrator*) This friend of yours is brilliant, she foresees things we haven't even yet come to!

NARRATOR I know! You'll see just how useful she will be to us on our ascent – thanks to her our journey will be a lot smoother.

MAN IN THE STREET Now the second and third sheets are cleared up. I'll read them to you: «To eat, to get something to eat, was our prime stimulus, behind which, at a great distance, followed all the other problems of survival, and even still farther away the memories of home and the very fear of death». And then the third: «hunger lived in our

cells and conditioned our behaviour». (*Carries out the same operation as before, fixing the next two sheets to the bookcase which is beginning to be covered in paper and denuded of other ornaments*) I feel as though I'm starting to enter into the life of this man: he is desperate and at times hopeful, he is suffering, but above all he is overwhelmed by this state of malnutrition, and consumed by the inhuman life he is forced to live.

NARRATOR You've understood perfectly. I see you're climbing this wall with far greater ease than I had thought. But don't fool yourself – the road to understanding is still very long, or perhaps it will never even be possible to fully understand, but we must at least try to be more aware. Go on with the fourth sheet.

MAN IN THE STREET (*Same process of obtaining fourth sheet from pocket*) This represents an even trickier puzzle. I can only read five words clearly – well, actually only three as two are repeated. «I stole», and «bread».

NARRATOR Which occur twice?

MAN IN THE STREET (*Looks more carefully at the sheet*) «I stole». And you, dear friend, can you help us once more?

SCIENCE (*Moves away from the chemistry bench and positions self in centre of stage*) That's what I'm here for: to help mankind to solve its problems, be they large or small. I'll explain to you at once how the word «steal» bears some sort of relation to hunger, cells and all the rest. The cellular system of which you humans are made – you who are organisms of flesh and blood, unlike me, as I have no palpable substance – anyway, this cellular system can sometimes be caused to shut down, and its exchange with the outside world reduced to a minimum, stopped altogether even. Do you know what happens then? You feel extreme hunger pangs, and the cells begin to collapse and die. (*Bends double with hands on stomach as if suffering great pangs of hunger, starvation*)

MAN IN THE STREET It must be awful to experience such a sensation: I feel ill just thinking about it.

SCIENCE I know, but keep listening and you'll learn something truly mind-boggling. Before the cell collapses of starvation, a quite astounding mechanism is triggered between the cells of the body and those of the brain – my grand-daughter,

Biochemistry of Behaviour, could tell you a thing or two about it! – and our behaviour changes radically as a result.

MAN IN THE STREET Impossible! I can't believe it: you must be dreaming.

NARRATOR Of course you can't believe it – you've never experienced such extreme hunger, which is why you're hard pushed to believe what Science is telling you, but have faith and keep calm: the things we're telling you are one hundred percent true! When he is starving, therefore, the protagonist of your story becomes a completely different person, or rather an animal: like Buck the dog, he feels the call of the wild and becomes wolf-like, in his Klondike lager (*mimes a man becoming a savage wolf*). As a wolf he can't help stealing, out of a primordial survival instinct. (*Returns to normal expression.*) Is it clear to you now how «I stole» and «bread» are linked to that violent, indescribable sensation of extreme hunger?

MAN IN THE STREET (*Full of admiration*) It's really quite amazing how – from only three small words – you manage to reveal the sense of all the other blurred words: they seem to move into focus as you are speaking until the whole phrase becomes legible!

NARRATOR (*Still in awe of the man in the street's abilities*) And what does it say?

MAN IN THE STREET Here you are: «I stole like him and like the foxes: at every favourable opportunity but with sly cunning and without exposing myself. I stole everything except the bread of my companions». (*Fixes fourth sheet to bookcase as before*)

NARRATOR Bravo! And this «him» is the dog who turns wolf. As you can probably guess, it's a man who loses his humanity, a man who 'turns wolf'...

PRIMO (*Still offstage, declaims passionately and with great emotion*) You who are safe / In your warm houses, / You who find, returning in the evening / Hot food and friendly faces: / Consider if this is a man / Who works in the mud / Who does not know peace / Who fights for a scrap of bread / Who dies because of a yes or a no. / Consider if this is a woman / Without hair and without name / With no more strength to remember / Her eyes empty and her womb cold / Like a frog in winter. / Meditate that this has happened: /

I command these words to you. / Carve them in your hearts
/ At home, in the street, / Going to bed, rising; / Repeat
them to your children. / Or may your house fall apart, /
May illness impede you, / May your children turn their
faces from you. / Consider if this is a man.

MAN IN THE STREET (*Visibly shaken*) This voice worries and
saddens me.

NARRATOR (*In a reassuring tone, trying to minimise the impact
of Primo's words*) Try to be strong, let's carry on and you'll
understand.

MAN IN THE STREET (*Wilfully, determined*) No, I want to
understand now.

NARRATOR You can't – remember our deal. Now continue with
your sheets.

MAN IN THE STREET (*Same process of extracting nth sheet from
pocket*) I don't understand. It's as if we're totally changing
topic; I can only read two words but it seems there are about
nine or ten in all. Here goes: «packaging» and «chemist».

PRIMO (*Still offstage*) I'm a chemist.

ALBERTO (*Also offstage*) I too know Chemistry.

SCIENCE My second daughter happens to be called Chemistry,
she's mother to my granddaughter Biochemistry of Behaviour.

MAN IN THE STREET Curiouser and curiouser! I can't go on any fur-
ther, I'm slipping down the wall, falling – I throw in the towel!

NARRATOR Hold it right there! Remember that you desired,
strongly desired to know and to understand. You can't back
out now! My dear friend, put your great wisdom to use once
more and help him.

SCIENCE You have seen then how stealing becomes a way of life
for the men imprisoned in the concentration camp.

PRIMO (*Enters the scene nonchalantly*) In a concentration camp, yes,
but whom by day go to work in a chemistry laboratory on the
outside. Only in the evening do they return to the camp. What
could one steal from a chemistry laboratory do you think?

MAN IN THE STREET (*Surprised and curious*) I haven't got the
faintest idea, but you – you are a strange sort of human
being; ethereal, but with physical features, unlike her (*nods
towards Science*), impalpable and non-human.

PRIMO I was a man. Then I was not-a-man, then I became a man
again, but the second man was no longer like the first, alas!

And so I made up my mind, in the end, to draw a close to my days as man / not-a-man / man / no-longer-a-man by returning to nothingness. And now here I am, seemingly a man once more, in order to lend you a hand – you, who without memory, have also become not-men, albeit in a far less tragic way.

NARRATOR (*Turns to Man in the street*) Stop asking questions and respect our deal. (*Turns to Primo*) And you, stop distracting my travelling companion. (*Turns back to Man in the street*) Let's get back on track. So, what can one possibly steal from a chemistry laboratory?

SCIENCE I'll help you on your way. In chemistry laboratories lives matter, and matter comes in three states of aggregation: the solid state (*holds up a mineral*) whereby atoms, ions or molecules are regularly arranged in space, tightly bound to each other, such that they possess their own form and volume; the liquid state (*holds up a beaker full of water*) in which the same particles are still fairly close to each other, yet bound with less force, and therefore freer, more easily incited to move by that thermal energy that pervades the entire universe and which I like to call kT ...

MAN IN THE STREET What's kT ? Anything like a certain extraterrestrial from a film I once saw as a child?

SCIENCE (*Going back over to the chemistry bench*) No, it's an energy relating to temperature, and was discovered by one of the many lovers of my two daughters, Physics and Chemistry, Ludwig Boltzmann. This thermal energy enables the molecules of a liquid to move freely over one another; (*moves beaker of water back and forth gently, making the water run up and down its sides but without spilling it*) liquids therefore have their own volume, but not their own shape, since they take on that of the receptacle they are in. And finally, gases (*takes a balloon, blows it up a bit and holds it momentarily inflated before releasing grip, allowing all the air to seep back out*) are the third inhabitants of the chemistry laboratory, with their particles completely free, no longer bound; capable of filling all the available space, and thus, not only without shape but also without volume.

PRIMO And so, with regard to stealing, the states of aggregation of matter behave in different ways: solids being pocketable

just as they are; liquids and gases instead requiring some sort of receptacle. An additional obstacle, therefore, for liquids and gases, which is...

MAN IN THE STREET Hold on! I'll go on (*reads from the sheet*) ... which is «the great problem of packaging, which every chemist knows!» (*Same process of fixing sheet to bookcase*).

NARRATOR Well done!

PRIMO The boy's got brains! Now you are able to understand that the difficulty lay in stealing goods that were in demand, for which the offer was high. For example, petrol and alcohol were greatly in demand for various reasons, not least for their caloric value as fuel, but at the same time I must add...

NARRATOR (*Turning to Man in the street*) It is up to you to speak, you can't allow others to resolve questions that are yours alone.

MAN IN THE STREET (*Same process of extracting paper from pocket*) Of course, anyway this sheet is almost entirely legible, and says precisely that «for petrol and alcohol, banal and inconvenient loot, the offer was high and also the risk, since liquids require receptacles». (*Same process of affixing sheet to bookcase*)

PRIMO Exactly that. It's all a question of packaging.



Scene Three – Of the previous decor only the bookcases remain. Now however we find ourselves out of doors: a screen at the back of the stage, visible to the whole audience, displays images of trees, flowering plants, sunsets, dawns and other natural scenes.

Characters: Nature, Man in the street, Narrator, Science, Technology and Primo.

NATURE You were talking just now about receptacles – well, I know a thing or two about that I'd say!

MAN IN THE STREET And who might you be? (*Turns to Narrator*) She is not a living being of flesh and blood: the

deal we made stipulated only that I can't ask anything of the *humans* that we encounter, but said nothing of these immaterial beings like our friend Science here, about whom I can therefore presumably know anything and everything?

NARRATOR But of course. This is another friend who will accompany us on our journey. Her name is Nature, and she is in everything that we find around us. She and Science get on very well – occasionally they can be a little competitive, but on the whole they've really rubbed along brilliantly together. Nature has a lovely character, but is often very difficult to comprehend. I must say however that Science is very good – she tries to understand her as best she can and nearly always succeeds. As long as they get on, we humans will have no problems; the problem would be if Science began to feel superior to Nature, and sought to overrule her through the use of violence. But I'd rather not think about such a possibility.

NATURE On the subject of not overpowering me, may I be allowed a small part in your conversation? You were talking about packaging: well it's definitely a thorny issue but – and not to boast – I think I found a rather ingenious solution.

SCIENCE It's true, credit where credit's due, she really did do well.

NATURE Yes well, not to boast but I really was rather good.

MAN IN THE STREET (*Aside, to self*) Who does she think she is! I'm not sure I think much of her. (*Turning directly to Nature*) So what exactly did you do that was so wonderful then? I'm truly curious to know.

NATURE Here are some of the crazy packaging materials that I've invented – it'll blow your mind! (*Pulls out an orange and cuts it with a knife to show the white pith inside, then removes a segment of fruit and shows the fine skin that holds the juice*) The three skins or membranes of an orange, which protect the fruit from dehydration: the thick orange external one, the white one immediately beneath, and finally the papery skin in direct contact with the juicy body. The three casings of an egg: (*pulls out an egg and cracks it into a mixing bowl, showing the calcareous shell, the inner membrane and the albumen that protects the yolk*) calcareous shell, albumen, and inner membrane. Grapes: (*takes a bunch of grapes, peels some skin from a grape and holds it up against the light, indicating the fine waxy coating on the outside of the skin*) for

which, since I didn't trust the thick cellulose membrane alone, I coated it with a very fine layer of wax for maximum protection and waterproofing. Your skin: (*indicates Man in the street's hands*) fundamentally another type of packaging. But the most spectacular packaging of them all – the most demanding task, and my most extraordinary achievement -- are the membranes of those cells that I overheard you talking about earlier. I must say (*turning to Science*) that your daughters Chemistry and Biology helped me a great deal – nearly everything that I have accomplished is fundamentally thanks to them, I shall never be able to repay them. Please embrace and thank them for me.

SCIENCE I will, most certainly.

MAN IN THE STREET (*Same process of pulling out nth sheet from pocket*) Well, as fascinating as that was, (*addressing Nature*) it didn't help me much in terms of solving the enigma of the next piece of paper, upon which I can make out only one word – «liquids».

SCIENCE I'm surprised at you. Nature has clearly shown you that all her creatures need packaging of some sort or other, and that she has provided it; she gave you some marvellous examples by way of illustration. She created shells and impermeable or semi-permeable membranes, and in your opinion why did she do all of this for you humans?

MAN IN THE STREET Ah! I get it now! Silly me. It's the easiest one of all: «because ultimately, we are liquids too». This is all beginning to get a bit clearer. (*Usual operation of fixing sheet to bookcase*)

NARRATOR Don't get too excited, we've hardly got anywhere yet. The summit is still a long way off, it's not even visible yet.

NATURE Can I add something else on the subject of packaging?

NARRATOR Of course.

MAN IN THE STREET I'd prefer to continue with these pieces of paper. (*Takes out another sheet*)

SCIENCE Hear me out – what Nature's about to say will be of use to you in the deciphering of your next enigmas.

NATURE I wanted to say a few more words about the most outstanding of my packaging materials: the membranes enveloping your cells. A truly extraordinary type of packaging – sometimes even I don't know how I managed to

make it so perfect. It's a few millionths of a millimetre thick, flexible and elastic; gas, ions and small molecules can pass through it selectively.

SCIENCE Allow me to remind you that you've forgotten to mention a further quality of this marvellous creation of yours: this cellular packaging is capable of recognising (*enunciates clearly*) mo-le-cu-lar-ly who is knocking at its door.

NATURE You're right! This property has proven itself to be very useful, particularly for you humans! By the way, I have to say that you do make me a bit cross sometimes, you humans, when you try to imitate me; like when you wanted to show me that you were able create other packaging materials. (*Indicates plastic glasses and bottles on a garden table to one side of stage*)

SCIENCE Now let's not exaggerate – I too had a hand in this packaging affair: it wasn't just you against the humans.

TECHNOLOGY (*Enters the stage right by the table with the bottle of water and the glasses on it – picks them up and turns them over in his hands with pride*) Ahem, if you'll allow me – when it comes to artificial packaging materials, I have played a not insignificant part. Until now I've kept silent, but if you're going to talk about man-made packaging, well, I deserve some recognition too.

MAN IN THE STREET Er, excuse me if I'm interrupting something, but I'd rather like to proceed with my writings.

NARRATOR He has a right to after all.

MAN IN THE STREET (*Extracts yet another sheet from his pocket*)

Only one word is clearly legible on this next sheet, and it's a real mouthful! «Polyethylene» – what the devil does it mean? Is somebody pulling my leg?

NARRATOR I don't think so. And I believe our latest guest has arrived just at the right time.

MAN IN THE STREET (*A little bothered by the new presence*) Indeed, who is this lady who hasn't deigned to introduce herself?

TECHNOLOGY Hello – please excuse me if I intervened earlier without introducing myself. I'll do it now: I'm Technology, and for some years now I've formed a rock-solid alliance with Science, whom I consider to be more than a dear friend. Despite being of different ages, we may as well be Siamese twins!

MAN IN THE STREET Frankly I understand very little, but let's continue nevertheless and I hope you might be as useful to

me as your twin! Can you both help me to understand what on earth this polyethylene is?

SCIENCE Look, one of Chemistry's daughters, my granddaughter, Organic Chemistry, has painted a wonderful painting, and in the painting – which I'm going to show you – you can clearly see that it all starts with a double chemical bond, (*shows a painting in which can be seen the formula for ethylene with its double bond, one of which is indexed with a large Pi symbol*) in particular with an unusual covalent bond, identified by surely the most famous Greek letter of all.

NARRATOR You mustn't have favourites among your children! Pi is the work of another daughter of yours, Geometry, who carved it out with great workmanship long before!

SCIENCE You're absolutely right! This bond I was telling you about isn't very strong: it breaks fairly easily and yet – one of my Chemistry's mysteries – how many wonderful polymeric structures are born of such destruction! Two molecules of ethylene, for example, join together to form a dimer, and then again to form a trimer, and so on...

TECHNOLOGY What do you mean, «and so on»? I think you'd better stop right there, seeing as after the «and so on» you really didn't have anything to do with it. Credit where credit's due! It was I who – working on that pi bond – gave humans the polymers of daily usage: the plastic bottles to replace those made of glass, (*shows bottles to audience*) cling film, (*pulls some from pocket*) bubble wrap to protect fragile objects in the post, (*shows a sample*) and so on and so forth.

MAN IN THE STREET So you mean to say that you revolutionised the world of receptacles and of packaging?

TECHNOLOGY Yes, I'd say so – although truth be told, (*turning to Science*) without your discoveries I wouldn't have got very far.

SCIENCE I thank you for your objectivity.

MAN IN THE STREET So could it be that this strange word, this polyethylene, is one of those polymers of daily use that you were talking about?

NARRATOR Well done, my man in the street! You've sussed it!

MAN IN THE STREET Here's what this one says then: «at that time, there did not exist polyethylene, which would have suited me perfectly since it is flexible, light, and splendidly impermeable». (*Usual operation of fixing paper to bookcase*)

PRIMO (*With great authority, as if somebody had appropriated something that was rightfully his*) It was I who said and wrote that phrase. It's absolutely true, «at that time, there did not exist polyethylene, which would have suited me perfectly since it is flexible, light, and splendidly impermeable».

MAN IN THE STREET I don't know why this gentleman has to be such a smart aleck – it seems he knows everything already, and it's getting on my nerves a bit.

NARRATOR Remember the deal and be respectful. I can't tell you anything about this gentleman, other than that although to you he may seem an arrogant know-it-all, we owe him a great deal. The work that we are doing at the moment on reconstructing memory is both for him and thanks to him.

NATURE Can I say something else? You are all talking about your great inventions of a few decades ago. Now, not to boast, but I have also built some complicated molecular structures, and – if you don't mind – I did it a good while earlier than the two fair ladies, Science and Technology here, but hats off to them all the same!

MAN IN THE STREET What are you trying to say exactly? That you made complicated materials long before my friends here? (*To self again*) She really isn't very pleasant, always wanting to make out that she got there first!

NATURE Allow me to present my marvellous molecular edifices, sempiternally recycled, and needing no maintenance.

MAN IN THE STREET (*With irony*) Go on then, let's have a look at these wonders! I'm really very curious to know what you've done!

NATURE Here then is the first great 'cathedral' if you will – cellulose, a polysaccharide made up of only three types of atom: carbon, hydrogen and oxygen. I started off with the smallest of bricks, a simple sugar, which – with the help of tiny fibres, cylindrical filaments rather like your hair – is repeated over and over again to make the polymeric molecule which is the emblem of the plant kingdom.

(*Images relating to the plant kingdom appear on the screen*) Trees, leaves, flowers – show yourselves, show everybody what a marvellous structure I have built! (*A photo of a red blood cell and an image of a molecule of haemoglobin appear on the screen*) And to follow, my dears, haemoglobin – a

macromolecular protein to which I added nitrogen, and also – for strength and propulsive force – iron too, magical transporter of oxygen and carbon dioxide, variations in the concentrations of which cause your energy level to fluctuate.

MAN IN THE STREET I feel very fit – so does that mean I’ve got plenty of iron in my blood?

SCIENCE I’d say so. What’s more you need to be in good shape for climbing this rock face!

NATURE And finally, (*on the screen appears a representation of the DNA double helix*) the very core of your being, dear living organisms, the control centre of every species: deoxyribonucleic acid, for which I’ve thrown one further protagonist into the mix – phosphorous, another element key to life. This marvellous polymer splits in two, and then each half reduplicates, making a perfect copy of its original. It is this molecule that means you look like such and such a relative or parent! After all that I’ve done, don’t you think I’ve earned a rest?

MAN IN THE STREET With all due respect for your clever speech, I would very much like to proceed with my story and the deciphering of my pieces of paper. (*Takes following sheet from pocket*) On the next I can definitely see «polymerisation» – thanks to your explanations I now know to what that refers – and also «God Almighty», and «incorruptible». I really don’t see how the words «God Almighty» and «incorruptible» can be found together.

PRIMO (*Confidently, giving impression of knowing everything already*) I greatly appreciated Nature’s speech, and I must admit that her polymers are more complicated than our plastics by a long way – and above all more labile, more perishable, subject to change at times with unpredictable results. All of them very different from polyethylene too, which «is a bit too incorruptible, and not by chance God Almighty himself, although he is a master of polymerisation, abstained from patenting it: He does not like incorruptible things».

MAN IN THE STREET I’m flabbergasted! This mysterious man has deciphered my sheet. How did he do it? It’s not fair! (*Fixes nth sheet*)

NARRATOR Silence! You know that I cannot tell you anything about the humans that present themselves to us. It’s clear

that this gentleman knows a great deal about our story but you are not given to know how, nor why.

MAN IN THE STREET I feel I'm losing my thread a bit. I think you and your three friends wandered a bit off-topic talking about these mysterious and philosophical things. I'd like to get back to my story, to my desperate and hopeful man, starving, dehumanised, and forced to steal from the chemistry laboratory in which he works as a slave.

NARRATOR You're right. Deploy the next sheet, let's try and move on.

MAN IN THE STREET (*Same process once more of taking sheet from pocket*) Three words this time, once again with no obvious connection or meaning: «loot», «solid», «cumbersome».

Perhaps it says then that the loot was solid and cumbersome?

NARRATOR It would seem strange to me that somebody should choose to steal something that was cumbersome. (*Turning to Science and Technology, who remain silent*) What do you say, taciturn twins?

PRIMO I can add that the goods to be stolen needed to be preferably solid, not voluminous, and of high unitary value.

MAN IN THE STREET Well, that doesn't help me in the slightest.



Scene Four – same decor as for scene two. As the scene begins the formulas for density and specific weight can be seen on the visible side of the chalkboard.

Character: Science, Man in the street, Narrator, Primo and Alberto.

SCIENCE My dear investigator and reconstructor of memory, it means nothing to you then that the goods to be stolen needed to be preferably solid, not voluminous, and with high unitary value? Well, another daughter of mine, Physics, has – since time immemorial – established what property gives us high unitary value: it's density, or, if we like, specific weight – the relationship between mass and volume in the case of the former, or between weight and volume in the latter.

TECHNOLOGY It's that property which, when asked «which weighs more, a kilo of cotton or a kilo of metal?», makes many people answer «a kilo of metal».

SCIENCE (*Taking them from the chemistry bench, show a certain volume of cotton in one hand and a piece of metal of the same volume in the other, showing via a mime that the second weighs somewhat more*) That's the one! How ridiculous! It should be obvious that they weigh the same – a kilo! The tricky thing to understand on the other hand is that equal volumes can weigh different amounts.

TECHNOLOGY I, who am highly aware of the application of scientific discoveries, can assure you that it is far more expedient to steal an object of high density for the simple reason that – volumes being equal – if you needed to hide it in your pocket for example, you'd be able to make off with a greater quantity weight-wise. Simple really, don't you think?

MAN IN THE STREET Finally a bit of clarity, and on subjects that I too can understand! Now it's all clear, including the contents of this sheet. It's obvious – it says: «the ideal loot would therefore have had to be solid, not perishable, not cumbersome, and above all new». I'm beginning to shed some light on this story: my man, desperate and hopeful, starving and suffering, is seeking to steal something in order to survive. Under normal circumstances he'd never usually have done it, but he finds himself forced to. I don't know exactly what a lager or concentration camp is, but from what I've heard up to this point I've formed an impression of something truly awful, and it worries me that at the beginning you said «it's happened, and therefore it can happen again».

(*Puts nth written sheet on another section of the bookcase*)

NARRATOR I told you there would be a price to pay. And that's not all.

MAN IN THE STREET (*Extracts another sheet and reads*) The forest gets darker and darker... Here I can read only three totally incomprehensible words: «fatty acids», «paraffin», «oxidation». And then the usual «hunger», which he seems obsessed with.

PRIMO As a chemist I can tell you only that paraffin is a substance, that oxidation is a type of chemical reaction, and that fatty acids are more substances. That's all.

MAN IN THE STREET But that's of no use to me at all.

NARRATOR Don't lose faith, I'm sure our friend Science will be able to help.

SCIENCE (*Turns the chalkboard to reveal the reaction between paraffin and oxidising agents that gives fatty acids*) Paraffin is the main constituent of wax votive candles in your churches: it's a saturated hydrocarbon, made up of only carbon and hydrogen, and a fairly inert compound, as its name suggests: from the Latin *parum*, 'not very, or too little', and *affine*, 'associated with'. If, however, you make it react with an appropriate oxidising substance, watching carefully to ensure that the oxidation process does not go so far that it instead gives rise to water vapour and carbon dioxide, then it is possible to isolate an intermediate substance, a fatty acid, which contains two oxygen atoms. Don't thank me, but my daughter Chemistry – or rather, my granddaughter, Organic Chemistry.

PRIMO (*Inspired, full of pride*) Now do you understand the stuff that chemists are made of? People often think that the chemist is some sort of sorcerer, who stirs his magic pot, makes a reaction and holds aloft the elixir. In reality, yes, we mix and stir, and of course we cause reactions to happen, but we supervise these reactions, we control them: we stop them, we restart them, we speed them up, we slow them down. We direct them as we wish, we break them down and we build them back up again – we study the whole reaction just as we do every last stage of the reaction, until we know them down to the millionth of a billionth of a second.

MAN IN THE STREET Bravo! And then what do you do with your wondrous reactions?

PRIMO My dear man, after having studied them so scrupulously and in such great detail, we put them, white on black, on these marvellous boards the colour of carbon, and then we can also predict those we've never even studied. Those formulas, those strange symbols, transfer themselves very conveniently from the stony chalkface to the glassware of the laboratory. That's who we are!

SCIENCE Allow me to add one final thing. Fatty acids, prepared as I explained, provide cells with a significant source of energy: every gram that is burnt gives nearly the same quantity of energy as a gram of sugar (*lights a candle that*

is in a candleholder on the chemistry bench). There: this heat and light energy, when inside us, helps us to survive. Do you now see why fatty acids are linked with «hunger»?

MAN IN THE STREET It's truly marvellous how with so few words you manage to shed light on my darkness. Here is the finished phrase: «I had stolen... fatty acids obtained by the oxidation of paraffin... I had eaten some... it took the edge off my hunger... it had such a nasty taste that I gave up the idea of selling the remainder». (*Turns to Primo*) You who were so exalting the art of the chemist – you haven't exactly made a great impression on us with these fatty acids! (*Attaches the sheet to the bookcase with a scornful glance directed at Primo*)

PRIMO (*Immune to the scornful look, calm and confident*) It's true, this chemist's first attempts did not succeed; but the chemist – and don't you ever forget it – is endowed with an infinite patience, a patience that will never allow him to despair, since he is convinced that – once we find the right way of handling it – matter will bend itself to our will. It is all about finding exactly what is the right way.

MAN IN THE STREET That's as may be, but as things stand at the moment, it doesn't seem to me that being a chemist is much of an advantage for our man. (*Takes out another sheet*)

NARRATOR Go on with your reading and don't make ungenerous judgements – you might say something that you later come to regret.

MAN IN THE STREET «Fritters», «cotton», «hot plate» and «sugar». Well you tell me what I should understand by that! It's obvious that he is searching for something to eat: «fritters» cooked on a «hot plate» or even just some «sugar». But what's cotton got to do with it?

NATURE I might be able to give you a pointer. My cellulose creation, that fantastic polymer which is the undisputed hero of the plant kingdom, cost me great effort. But I'm happy, because when I look out over those tremendous fields of cotton plants, with their white, vaporous and tufty flowers, I get a great feeling of aesthetic satisfaction, like that which you humans experience in front of the great paintings of your artists. I feel as if I'm an artist too!

TECHNOLOGY The same thing happens to me too! But rather more prosaically, I'm moved only once those natural tufts

are subjected to my processes of spinning and various other treatments to become cotton wool!

PRIMO I'd like to remind you that we chemists are good at managing reactions, whether that be for constructing or destructing. I've nothing more to add.

MAN IN THE STREET And what does that mean?

SCIENCE (*Usual calm, reassuring coolness*) I'll try to explain it to you, but you must concentrate hard because it's not that straightforward. In a polymeric molecule such as that of cellulose, a monomeric unity – a building block let's say, made of something much like sugar – repeats itself many many times. Now I ask you and I ask myself: how can such a structure be dismantled in such a way as to reobtain its individual components, these building blocks, or simple sugars? What is it that in catastrophes is responsible for razing buildings to the ground, leaving us with nothing but piles of bricks and mortar?

MAN IN THE STREET Earthquakes of course, but what's this got to do with the deciphering of my papers?

SCIENCE Don't be impatient – listen. Or perhaps up till now what I've had to say has bored you, or has been of no help in piecing together the contents of your papers?

MAN IN THE STREET You're right – I'm sorry. Please continue.

SCIENCE (*Lifts up a table next to the physics bench that has an impressive house of cards built on it and wobbles it, making all the cards fall, some of them to the ground*) Earthquakes therefore are nothing more than strong shakes, vibrations of the ground. And so, to destroy the polymeric structure of cellulose, we need to shake the atoms up, or in other words to increase the rate at which they vibrate.

MAN IN THE STREET But how do you shake atoms up and get them to vibrate more? It's hardly as if there's an equivalent of an earthquake for them!

SCIENCE No, there are no earthquakes for atoms, but to shake them up you only have to increase the temperature.

MAN IN THE STREET Heat them up, you mean?

SCIENCE Exactly! Just provide heat to increase the temperature.

In so doing, we shake up the structure and should be able to achieve a certain degree of degradation of the same, obtaining these sugary building blocks. (*Picks up a*

Lego construction from the physics bench and takes it apart, collecting the different coloured bricks in cupped hands)

TECHNOLOGY Beware however not to go too far up the Richter scale with your shaking, as otherwise you won't get bricks so much as brick dust.

SCIENCE You're exactly right – our man wants bricks, or rather monomers, the simple sugar. He doesn't want the single atoms – he wouldn't be able to do much with them in terms of his alimentary requirements. Rather, he needs bonded atoms, since it is in these bonds that the energy he wishes to exploit is stored.

MAN IN THE STREET Fantastic! That's what the hot plate must be for – to heat the cotton and obtain something to do with sugar. I've understood this bit too now then.

NARRATOR I'm very happy for you – but can you read it out for us too please?

MAN IN THE STREET «I had tried to make fritters with cotton wool, which I pressed against an electric hot plate; they had a vague taste of burnt sugar, but they looked so awful that I did not consider them marketable.» (*Turns again to Primo*) My dear man, if I'm not much mistaken, that constitutes your second failure! (*Again with a certain arrogance, almost mocking, moves to fix to the shelves the sheet which contains mention of cotton wool*)

PRIMO What are two consecutive failures for he whom, like the chemist, is used to getting only one positive result following years of work?

MAN IN THE STREET How sure of himself he is! (*Meanwhile take another sheet from his pocket*)

NARRATOR Let's go on, and stop being so caustic towards our interlocutor. You must be respectful of him; he really doesn't merit your barbed polemics.

MAN IN THE STREET It's the usual chemists' vocabulary: «glycerine», «fats», «calories». I'm a bit fed up with this chemistry.

SCIENCE Please show some respect for my daughter, otherwise I'm off.

MAN IN THE STREET I apologise. What do these words mean to you?

SCIENCE (*Writing the formula for glycerine on the board, highlights the three OH groups*) Glycerine is a viscous liquid, a bit like

honey: (*takes a beaker of glycerine from the chemistry bench and pours it into a second beaker, demonstrating that it does indeed flow poorly*) it flows about one thousand times worse than water – it'd be mean of me to ask you to measure out precisely small amounts of it. Glycerine is very soluble in water.

TECHNOLOGY (*A photo of Alfred Nobel appears on the screen*) I might add that it is also essential as far as I'm concerned: without it we'd be unable to award the Nobel Prize, since it was Alfred Nobel himself who used it in 1867 to make dynamite.

SCIENCE You're exactly right. But glycerine is also really important to my daughter, Biochemistry, and to her sister, Molecular Biology: it constitutes the polar part of the phospholipids that make up cell membranes – that extraordinary packaging that our friend Nature has told us so much about.

MAN IN THE STREET But I can't be doing with all these details! Let's get to the crux of the matter!

SCIENCE Wait, have some respect! Glycerine is also important in the kitchen too. It is a component of triglycerides – fats – those substances that make food so pleasurable and flavoursome, whilst at the same time causing weight issues, or, more seriously, vascular problems. Take triolein for example, a constituent of olive oil. (*Takes beaker of olive oil from bench*) Its molecule is made up of glycerine and three hydrocarbon chains – the fatty acids. The glycerine constitutes the backbone of the molecule, and is polar and hydrophilic – in other words it is attracted to water. The three hydrocarbon chains on the other hand are hydrophobic – or repelled by water.

MAN IN THE STREET So these triglycerides are pretty ambiguous then – on the one hand they hate water and on the other they love it!

SCIENCE Exactly! It's no coincidence that we refer to these molecules as being amphiphilic, which in Greek means ambiguous, or attracted simultaneously to two opposing things. Triglycerides then, since they are fatty substances, provide a great deal of energy: one gram of triolein for example, provides more energy than two grams of sugar. And on the basis of these thermochemical considerations...

MAN IN THE STREET Can I finish?

SCIENCE It'd be a pleasure, if you think you are able.

MAN IN THE STREET I'll read it out. «I also forced myself to ingest and digest glycerine, basing myself on the simplistic reasoning that, since it is a product of the splitting of fats, it must after all in some way be metabolised and furnish calories.» (*Immediately makes for bookcase in order to affix sheet, but then stops en route*) There's something else written after calories: I can just about make out «unpleasant», but I've no idea what it's referring to.

NARRATOR (*Addressing Primo, Science, Technology and Nature*)
Can I give him a helping hand?

PRIMO All I can say is that you must now try to explain the phenomena of diffusion and osmosis to our Man in the street.

SCIENCE I'll endeavour to make my usual contribution. Have you ever drunk coffee?

MAN IN THE STREET Of course I have! But what's that got to do with it? I want to get to the bottom of whatever these 'unpleasant' things are.

MAN IN THE STREET You'll see that all becomes clear if we take as our point of departure a cup of coffee with sugar at the bottom.

MAN IN THE STREET Let's hope so! But I don't have much faith.

SCIENCE You know perfectly well that the sugar at the bottom of a cup sooner or later will move toward the top, and the water of the coffee from the top toward the bottom, so that after a while the coffee will be uniformly sweetened.

MAN IN THE STREET I know it perfectly well and I don't see anything strange in it.

SCIENCE Right, well the first and second principles of another daughter of mine – Thermodynamics – along with the free energy of a lover of hers named Willard Gibbs, confirm that spontaneously, or without expending energy, a more or less speedy diffusion will take place in a precisely determined direction: or rather, the molecules of sugar will migrate from the bottom of the cup toward the top, and the molecules of water from the top to the bottom. (*During this explanation carries out an experiment, placing sugar in a beaker, adding water and swirling the beaker to show that the sugar gradually dissolves*) This phenomenon is called diffusion driven by the chemical potential gradient – it's governed by well-defined laws and in brief, it's what makes coffee uniformly sweetened! (*Drinks sugared water from beaker*) Now it's sweet!

MAN IN THE STREET I'm not as educated as you, but I know how to accelerate the spontaneous process that you have just described – just stir the whole lot with a spoon!

SCIENCE Well done – exactly. However, even without stirring, I can assure you that Gibbs' theory of free energy guarantees that movement will always be from where there is more to where there is less.

MAN IN THE STREET That's odd! I would have said quite the opposite. People always seem to follow the crowd: really very few go against the flow, moving from where there are more to where there are fewer.

SCIENCE Listen very carefully now. If, halfway down the cup (*takes a beaker in which sugar can be seen at the bottom, along with some water, and then at the halfway point a sort of transparent film, and above it more water*) I placed a semi-permeable packaging membrane which allows water to pass for example, but not sugar, since its molecules are too cumbersome – well, then it all gets a bit more complicated.

MAN IN THE STREET It certainly does! Thanks to this membrane, I'll never be able to sweeten the top half of the cup!

SCIENCE Right! Not only that, but if I were to repeat this experiment using a slightly strange 'cup' – this glass tube (*shows a U-shaped tube made especially for the performance, taken from the chemistry bench*) – with the same semi-permeable membrane separating the two sides of the U, (*indicates where*) I would see that, whilst the sugar, present only on the right hand side, doesn't pass from right to left, the water not only passes from left to right, but does so with a certain force which acts on the surface of the membrane...

MAN IN THE STREET It's true! Here there's a column of sweetened coffee rising on the right hand side, defying gravity! (*Indicates the side on which the column of water is rising*) It's incredible! Like some sort of conjuror's trick!

SCIENCE No my dear friend! I've no truck with magic and illusions, only hard facts interest me. And this miraculous thrust, or impulse – that the Greeks called *osmòs* - that makes the coffee rise on the right hand side goes by the name of osmotic pressure, and the process is called osmosis.

TECHNOLOGY You've got no idea how many times I've used this osmosis in the making of my various contraptions.

NATURE I too can assure you that I've also made extensive use of diffusion and osmosis.

MAN IN THE STREET I have perfectly well understood your explanation, clear and exhaustive as always, and universal despite its use of exemplification, but I do not understand how it relates to the content of my piece of paper.

SCIENCE Allow me to finish and you'll understand. If, instead of in this U-shaped tube, the phenomenon I've just described were to take place inside the intestine, which also happens to have partially permeable walls – more specifically in the intestine of the protagonist of your story following his attempt at ingesting a certain quantity of glycerine (and therefore having a raised concentration of the same) – well then there would be a pronounced accumulation of water within the walls of the intestine (*bends double as if suffering from a painful stomach-ache*).

TECHNOLOGY (*Very serious despite the fact that next utterance could be deemed humorous*) I know exactly where you're going with this. Such knowledge was useful to me when making my beloved laxatives. They work thanks to osmotic action, and are made with ordinary glycerine, just as you can find in any pharmacy!

PRIMO (*Also serious, and almost sad all of a sudden*) I can assure you that having to run to the bathroom at that time was really rather dramatic.

ALBERTO (*Enters stage but not too noticeably*) I know absolutely what you mean.

MAN IN THE STREET (*A little surprised, but not overly so as he is so involved in his story*) These two seem to know about everything already, I have to confess they're getting a bit irritating.

NARRATOR Remember the deal – don't give any thought to these gentlemen. All I can tell you is at least one of them belongs to another world: the universe of memories lived but now without life.

MAN IN THE STREET No more mysteries! I think I've understood the contents of this sheet. It comes after my man's third attempt at overcoming his hunger, with glycerine. And it doesn't end well this time either. Indeed, following your explanation, it's clear that what he is saying is: «perhaps it did furnish them, but at the cost of extremely unpleasant side effects».

NARRATOR Explain yourself more clearly. What exactly did this glycerine supply?

MAN IN THE STREET (*Very confidently, as one who has by now learnt enough to no longer feel semi-illiterate*) Energy! How can you possibly not have understood? It provided some energy and so took the edge off his hunger. It's really very simple now: my protagonist ingested glycerine hoping to obtain the calories necessary for survival, but osmosis rendered his intestine vulnerable and he experienced those unpleasant side effects that make it necessary to run to bathroom with a serious stomach-ache! (*Fixes sheet to bookcase with pride*)

NARRATOR Am I much mistaken or are you getting rather adept in this confrontation with the Sphinx?

MAN IN THE STREET I can't take credit for it – you know that I am a common man in the street, semi-illiterate in a world without books or reading, in a world with no past or roots. The credit belongs entirely to these three handmaidens, and perhaps also to these two gentlemen, or in particular one of them, seeing as the other has remained almost completely silent, in spite of the fact that their presence makes me uneasy more than it helps me in my endeavour.

NARRATOR Memory ought to produce a degree of uneasiness, otherwise it serves no purpose.

MAN IN THE STREET In any case, in spite of all of that, it seems we've not got very far. The story is getting a bit stagnant – my man is desperate, exhausted, starving, intelligent and impassioned; he has tried everything but frankly without much success. (*Addressing Science and Technology*) What use has it been to him to be your faithful servant?

SCIENCE Don't be in such a rush.

TECHNOLOGY Be patient and you'll see that all will be revealed.

ALBERTO (*Forcefully takes centre-stage*) Remember, a great English statesman of the twentieth century once said: «Success is going from one failure to another, without losing enthusiasm!».

Act Two

Scene One – same decor as for scenes two and four of first act, but now the chalkboard is blank.

Characters: Narrator, Man in the street, Primo, Alberto, Science and Technology.

NARRATOR (*Addressing Man in the street, who, pensive and clearly downhearted, is reading the nth sheet taken from those in pocket*) You seem pensive and downhearted. Remember the great wisdom of our friend's words: are you losing your enthusiasm after so few failures?

MAN IN THE STREET It's not that that's the problem. It's just that the thread of my story seems so desperately tangled up that I'm worried I won't be able to unravel it after all.

PRIMO I can assure you I managed to find my way out of a far more dead-end situation!

MAN IN THE STREET Let's hope so! This page is concerned with receptacles once more: I can read «jar», and then «camp» – that'll be the concentration camp that you were talking about perhaps? – and then «Germans» and lastly «little rods» and «tasteless». We must be talking about hunger again I guess.

ALBERTO Come on, cheer up! This could be the definitive effort, the one that'll be successful.

MAN IN THE STREET (*Addressing the Narrator, with regard to Alberto's remark*) This man is marvellous – every word of his oozes optimism. (*Addressing Alberto*) Thank you, I need some of that.

SCIENCE Perhaps I can still be of use?

PRIMO I believe your – (*whispered only to Narrator and Alberto*) my – prisoner's attention is being drawn to some little rods.

TECHNOLOGY Well that seems obvious, just as it seems obvious to me that they are inside a jar. Moreover, if they possess their own shape, it means they are solids and therefore they have a discrete density, and consequently a high unitary value. And I would also say that they don't require packaging, since, given their dimensions – they are called «*little rods*» after all – they can be hidden in a pocket.

PRIMO The eye of a chemist, what an important quality! It senses that therein could lie the keystone of salvation.

MAN IN THE STREET How stupid of me! It was so much more straightforward than the others. Here is the complete text: «There was a mysterious jar... It contained about twenty grey, hard, colourless, tasteless little rods and did not have a label... Germans never forget the labels... I hid three in my pocket and carried them with me that evening into the camp». Perhaps this time he'll succeed in using chemistry to satisfy his hunger, but I wouldn't be too sure, after all those failures with wax, cotton and glycerine! *(Takes this last piece of paper to the bookcase which is now beginning to be well covered with the fragments of story; far fewer ornaments and vases of flowers are on display, and only one television set remains)*

NARRATOR I see you are rather more optimistic than I would be. To be honest I can't see that the contents of this last sheet adds anything more to our story. Indeed, whereas the earlier pages at least allowed a glimmer of hope that chemistry might be able to make foodstuffs from the raw materials available, it seems unlikely that the «*little rods*» of this one will be usable. *(Addresses Primo)* And your assertion surprises me. *(To self, taking care not to be heard by Man in the street)* Or rather, I understand why you might be so hopeful, but don't spoil the sense of pathos and expectation.

MAN IN THE STREET I am immediately curious to know what these rods – damned or blessed as they may be – are made of. Perhaps the answer lies in the next sheet of paper? Let's see. *(Deploys nth piece of crumpled paper)* «Alberto», twice I believe but I'm not certain, and «scrape it».

ALBERTO What a feeling!

PRIMO You're telling me.

NARRATOR Do please be quiet: you can't ruin everything now that we are finally nearing our destination.

SCIENCE I don't think it was possible, in that time and place, to use the fantastic means made available by my daughter, Analytic Chemistry, in order to determine the nature of the rods.

MAN IN THE STREET I don't think they had great means either! Rather, it was necessary to improvise 'in the field', as it were.

SCIENCE Very good! I see that you are having no trouble following me and so allow me to talk to you about yet another of my daughters, one with the truly esoteric name of Tribiology – which comes from the Greek, *tribein*, meaning to rub, or to wear down by rubbing – and who has been always been in love with a young lad named Friction.

MAN IN THE STREET Even though I don't know the young man, I think I know what friction is!

SCIENCE He is very bound up with certain forces that we call dissipative, and which tend to resist, or at least hinder, relative motion between two surfaces in contact with each other.

MAN IN THE STREET And what do they dissipate, these mysterious forces?

SCIENCE I'll tell you. They give out that energy which is the very quintessence of dissipation – heat, or thermal energy! I must warn you however not to confuse dissipation with destruction or annihilation: energy cannot be created nor destroyed, it is always preserved. When it dissipates, it's because some of the energy goes toward increasing the molecular chaos, preventing us from exploiting its full potential. But if molecular chaos increases, then the speed of the particles is also increased...

MAN IN THE STREET ...and therefore the temperature goes up!

SCIENCE Excellent! You're a perfect student – you really do pick things up quickly!

TECHNOLOGY It certainly poses a real problem for me, and one that is directly connected with those words «scrape it», that you managed to decipher previously.

MAN IN THE STREET What do you mean to say?

TECHNOLOGY Well, for ages I've had the following – not insignificant – problems to deal with: when there is a great deal of friction, a great deal of heat is also produced, and you've no idea how maddening it was when (*on the screen a Formula One car can be seen braking hard*) I was making

break discs for Formula One cars – so much friction occurs when they brake that my discs have to tolerate heat of up to a thousand degrees centigrade! On the other hand, you well know that if there is very little friction, I don't need to worry too much about my materials, but then the heat gain is pitiful. Think about when (*rubs hands together and places them on face to feel what temperature they have reached*) you rub your hands together out of cold: the friction is not really very significant, and the corresponding increase in temperature will be similarly slight, but it'll suffice to warm your hands a bit! Of course I have also had to address situations that are somewhere in the middle of those two extremes: where the friction isn't all that great, but enough however to reach 150-200 degrees centigrade, like when one scrapes... (*shows a penknife to Man in the street*)

MAN IN THE STREET ...the little rod with a penknife! It's obvious, here's the phrase: «I showed them to my friend Alberto. Alberto took a penknife out of his pocket and tried to scrape it». (*Fixes the sheet*)

PRIMO (*Moved*) Why these memories, that are for me so heartrending?

MAN IN THE STREET (*Astonished, surprised*) I don't understand why this man feels as he does.

NARRATOR You'll understand in the end. Now keep going – the summit is no longer all that far.

MAN IN THE STREET So my man is doing a chemistry experiment with this Alberto. Perhaps by scraping the little rods with the penknife he is able to deduce something? Who knows. Let's see if I find any clues as to the outcome of this experiment on the next sheet. (*Takes it from pocket*) Unfortunately I can only read one word: «yellow». But I thought the rods were grey?

SCIENCE In order for you to understand the outcome of this experiment I must tell another story linked to my daughters, Physics and Chemistry. It's about processes that are both mysterious and fascinating but also disturbing and dramatic: namely autoignition, and sparks – not electrical, but mechanochemical in origin.

MAN IN THE STREET Maybe the word «yellow» was referring to these sparks.

SCIENCE Don't rush – listen carefully and you'll understand.

Let's entertain the notion that chemical elements too have their own inclinations, in a manner of speaking: oxygen, for example, is a ruthless electron hunter. It will steal them away from pretty much any substance, according to the reaction 'substance plus oxygen equals oxide plus energy'. (*Goes over to the chalkboard and writes the reaction substance + oxygen = oxide + thermal energy or heat*) And as it is filling its game bag, depriving its prey of electrons by transforming it into an oxide, oxygen is so happy to be taking possession of these electrons and binding itself to the atoms of its prey, that it releases a decent quantity of energy in the form of heat. The hunt is sometimes rather slow and gradual, like when oxygen attaches itself to iron, corroding it to produce rust: (*shows a rusty nail*) yes, it gives off heat, but slowly and in tiny amounts each day – one gram of iron will take a month to rust completely! Imagine minute by minute how little energy is really released!

TECHNOLOGY (*Smiling*) If I had to use this process to warm you up, making a heater that relied on iron and oxygen, its power would be risible: fifty thousand times weaker than the common electric heaters that you can pick up nowadays in any shopping centre!

SCIENCE But if we consider another prey – white phosphorous – then the hunt is lightning-quick: in a few seconds, or fractions of a second even, all the energy is released, the game bag is completely filled – the power like that of an electric power station.

TECHNOLOGY (*In the grip of a sudden and uncontrollable despair, but also terribly irate; addressing Man in the street and the Narrator as the screen displays awful stock images of fires and men turned into human torches by white phosphorous bombs*) It's your fault, I shall never forgive you! You made me create a chemical weapon based on white phosphorous and now it is I who has tens of thousands of deaths on my conscience! Then you banned it with the Geneva Convention, but despite that went on to use it extensively in Vietnam, and then against the poor Kurds, and then who knows how many more times without even telling me! No, I'll never forgive you! (*Addressing Science*) Why do they exploit us for such unspeakable and violent ends?

SCIENCE It's a real problem, undeniably, but we can't allow it to get in the way of our protégé's current quest for truth and memory. Let's go on. I was saying then that when all this energy is released in a fraction of a second, just imagine what increases in temperature can come about in the precise moment in which the reaction takes place – thousands of degrees even: the products of the reaction with the oxygen melt, boil, volatilise and ionise; the electrons are excited and then relax at an alarming rate; bright flashes of light energy appear. In layman's terms...

MAN IN THE STREET I'll tell you myself: fire, flame, sparks, intensely coloured flashes.

SCIENCE In terms more appropriate to the chemist or the physicist on the other hand, which you cannot know and so I'll help you out: autoignition – which means auto-combustion – and the emission and absorption of radiation. Every substance has its own autoignition temperature: that of those little rods was evidently around one hundred and fifty to two hundred degrees centigrade, since from the abrasion of the penknife on the rod...

MAN IN THE STREET I'll never cease to be amazed at your incredible ability to explain that which, to me, seems inexplicable.

SCIENCE If only I were able to explain the inexplicable when it came to your human affairs! There are things that you do and have done, you humans, that I simply cannot understand, let alone explain.

MAN IN THE STREET I don't understand what you are referring to.

NARRATOR You'll understand, by the end of our endeavour together; you'll understand and I don't know if it'll be for better or for worse.

MAN IN THE STREET Anyway, in the meantime I've deciphered my bit of paper: from the abrasion of the penknife on the rod arose «a spray of yellow sparks». (*Fixes this piece of paper to bookcase*)

PRIMO Colour – what a marvellous clue in the hands of the chemist.

ALBERTO We didn't have spectrosopes, but we were familiar with the processes of emission and absorption of radiation, and we knew that elements could be identified by colour.

MAN IN THE STREET (*To narrator*) But why are they using the past tense? What have they got to do with my story?

NARRATOR Remember our deal: you can't ask anything about these two!

SCIENCE It's true that colour really is a marvellous clue in the hands of chemists and physicists. I'd like to recount a brief anecdote to help you understand, Man in the street, how my two faithful friends here react so differently from you, a layman if you like, when faced with certain phenomena. On the 29th May, 1856, the English celebrated the end of the Crimean War with great fanfare, including an unforgettable fireworks display (*fireworks seen on screen*) which the population followed with awe and wonder. Well, in between gasps of amazement at the bright colours lighting up the sky, all the onlookers – common men like you – were saying: <how beautiful that yellow is, how marvellous the red, isn't that blue incredible> and so on. Yet one man – a lover of my two daughters Physics and Chemistry, called Michael Faraday – could be heard exalting with uncontrollable enthusiasm: <how beautiful sodium is, how marvellous calcium, isn't copper incredible>! For him, the colours were beautiful because they recalled his beloved chemical elements!

MAN IN THE STREET Do you mean that the colour yellow perhaps furnished my man with a clue as to the nature of his rods? (*Takes out another piece of paper*) As a matter of fact, I can read <diagnosis> on this next piece of paper.

SCIENCE I can tell you that from the colour and autoignition temperature, one can in fact make a diagnosis. At the beginning, you told me that you could also read the word <cerium> on your crumpled sheets. Know then that cerium – which chemists call rare earth precisely because it is not very diffuse – is a chemical element. It has been known since as long ago as 1803, and was discovered simultaneously by two Swedes and a German.

TECHNOLOGY These recollections make me feel nostalgic! It drives me mad how nowadays information has to be transmitted faster and faster. How wonderful to return to the days when information took an age to get from one place to another, and everybody made do with submultiples of the Baud, and 'kilo' and 'mega' meant nothing to anybody!

SCIENCE You're always moaning about your difficulties! And what about me?

TECHNOLOGY Oh be quiet, you're much freer than I am!

SCIENCE Once upon a time maybe, certainly not now! Let's return to the matter in hand, and uncover together some of the qualities of this rare earth: if scraped with a knife it autoignites at about one hundred and fifty to two hundred degrees centigrade, but it doesn't scrape easily since it is too malleable. With iron it forms an intermetallic compound with the same properties, but harder and therefore more easily 'splinterable'.

MAN IN THE STREET Here is the incisive conclusion of the analytical chemist: <at this point diagnosis was easy: it was iron-cerium>. (*Fixes this sheet to the bookcase*)

TECHNOLOGY The history of the intermetallic compound, iron-cerium, is rather curious. It'd be worth your while to hear it from me, since I had first-hand experience of it.

MAN IN THE STREET It really doesn't interest me a great deal!

SCIENCE But listen, in any case – it'll be of use to you. Trust me: I don't believe we've let you down up to this point.

TECHNOLOGY (*Addressing Man in the street*) Cerium, as we've heard, is malleable, or easily worked into thin layers, and therefore not easily splintered to produce microfragments – the metallic microfragments which in combustion constitute the sparks of mechano-chemical origin.

MAN IN THE STREET That's obvious – soft things aren't easy to splinter.

TECHNOLOGY One of my lovers, an Austrian baron, discovered in 1908 that by adding to this rare earth a rather more common element, one that everybody has heard of called iron, you could obtain a substance that had the same autoignition temperature as cerium, but was far less malleable, harder...

MAN IN THE STREET ...and therefore far more easily splintered.

TECHNOLOGY Exactly! (*Addresses Science*) See? I too occasionally make discoveries of note: I may be more pragmatic than you, but that doesn't mean to say I'm any less ingenious. Anyway, by then information could travel rather faster than when cerium was discovered and sure enough, two years later the American, Aronson, who owned a metals company, patented

a system for producing sparks based on iron-cerium – on the flint of the Austrian baron in other words – and the famous Ronson lighters were born. (*Pulls one out and lights the flame*) A peculiar return to the past, to the flint-stone, to those cavemen of the comic strips, whose name – the *Flintstones* – comes precisely from this flint, the stone that makes metals pyrophoric.

MAN IN THE STREET Now I understand what these rods are made of I don't need to read the next sheet – they're made of iron-cerium, of lighter flint!

NARRATOR You can't draw your own conclusions like that. I understand that you've become a good deal more perspicacious, but you still have to read the sheet.

MAN IN THE STREET I'll read it but it's redundant, I've understood already by myself. They are made from <the alloy from which the common flints of cigarette lighters are made. But why were they so large? Alberto... explained to me that they were mounted on the tips of oxyacetylene torches to ignite the flame>. (*Affixes sheet*)

PRIMO I am deeply moved by the memory.

ALBERTO How wondrous! You make me live again!

MAN IN THE STREET Again this name: Alberto. That's not my man however. A friend? Who knows. A companion on this misadventure perhaps?

SCIENCE (*Addressing Technology*) This tale of cigarette lighters is touching – it reminds me how since time immemorial now you and I have become so fond of each other that we simply couldn't live without each other.

TECHNOLOGY Every time I am reminded of it I am moved just as you are, if not more so. It's thanks to you that I am now so well-established and also spiritually evolved.

SCIENCE (*Continuing the dialogue with Technology*) Don't be so modest. Our relationship is one of equals: I often realise that you're ahead of me, I don't know how, but then thanks to your generosity I find myself at your side once again.

TECHNOLOGY (*Still in conversation with Science*) Do you remember that story, the one about benzene and your daughter Organic Chemistry? (*Writes the formula for benzene on the chalkboard and, underneath, bicarburet of hydrogen*)

SCIENCE (*Continuing the dialogue with Technology*) But of course! I remember it very well: in 1825, Michael Faraday, lover of my daughters, discovered benzene and called it bicarburet of hydrogen. And you, you were either about to be born or were only a couple of years old! And then, after several years, when you were older and more mature...

TECHNOLOGY (*Still in conversation with Science*) ...I found great amusement in taking your useless benzene as the starting point for an infinite world of organic dyes. And so towards the end of the nineteenth century, that lover of your daughter Organic Chemistry – a German, by the name of Hofmann – clearly told us which moral underpins our alliance: the moral of those two marvellous synthetic colours mauve and magenta, (*pulls from pocket two marvellous snippets of silk in these colours and shows them*), is that your behaviour – that which gave us benzol – is governed only by love of the truth. Utility and service are of no interest to you: if they do come, it's only afterwards.

SCIENCE (*Continuing the dialogue with Technology*) Thank you my dear friend, for such compliments, but allow me to be similarly affectionate toward you. Your way of living – always in the name of utility and service for them (*indicates Narrator and Man in the street*) – leads to discoveries of inestimable worth, easily comparable with that of my speculations. I'd like to remind you that when you were still very young, at the start of the nineteenth century, a great man called Sir Benjamin Thompson, Count Rumford, created an institution in London to promote the application of science to the commonplace necessities of daily life. In other words, he understood that you and I were of equal importance and that our friendship should forever be so strong and fruitful.

MAN IN THE STREET (*Who has already taken out and smoothed the nth sheet*) Frankly I don't think I fully grasped the sense of what you were saying, not least because the next sheet is awfully complex and I was caught up in its obscure meaning. «Loot» once more, this «Alberto» again, and then «renunciation» and «abominable». Perhaps he means to say that the conditions in which they were living were abominable?

ALBERTO May I reproach you? He has already told you that the conditions were abominable, has he not? What sense would it

have to repeat it! One must never be sceptical about the future, never allow oneself to be overwhelmed by discouragement!

MAN IN THE STREET But this man must have a perfect copy of my sheet, one that isn't faded – it's not fair!

NARRATOR Why do you say that?

MAN IN THE STREET Because as he was speaking those words, I became aware that they were the very same as my faded marks.

NARRATOR It's not possible.

MAN IN THE STREET Well just have a look – you read the sheet then. (*Offers the sheet to him, indicating that he is to read the words in order*)

NARRATOR (*Enunciates the words clearly as though trying to make out unclear handwriting*) «At this point I felt sceptical about the commercial possibilities of my loot... Alberto reproached me. For him renunciation and discouragement were abominable and culpable.» Incredible!

MAN IN THE STREET This Alberto is brilliant! I too would have sought to exploit those rods fully. Why throw in the towel? I didn't back off when I found these crumpled, faded sheets of paper – I decided to try. It's always important to try, and to persevere to the point of exhaustion. (*Affixes the sheet and immediately pulls out the next*) And I must say that the next section is precisely one of those that might drive me to throw in the towel. Listen to what I'm able to read: «cigarette lighters» again, «workers», «fire» and «vulture». «Cigarette lighters» and «fire» come as no great surprise, perhaps not even «workers», seeing as we are in a camp that most likely is not only one of extermination but also of work or labour, but what on earth has «vulture» got to do with anything?

ALBERTO (*By now demonstrating total ownership of the story*) My feeling is that in that situation it was necessary in any case to try and produce something of commercial value from those flints, even if the market of the camp was rather unusual.

TECHNOLOGY I don't have much to do with economics, but for better or worse I am fairly up to speed with industrial activity, which is what produces goods of commercial value. Industrial activity consists of raw materials, energy and human activity.

MAN IN THE STREET I don't see the relevance of your speech on industrial activity and commercial goods.

PRIMO I'll tell you! Our, (*immediately coughs to cover up the fact that he has said 'our'*) your heroes' finished product might be the flints of cigarette lighters. Indeed...

MAN IN THE STREET Thank you, marvellous companions on this journey! I have understood that the finished product may have been flints for cigarette lighters, indeed – I'll read the sheet – «there was a clandestine industry of cigarette lighters... they made them for important persons and civilian workers. ...Prometheus had been foolish to bestow fire on men instead of selling it to them: he would have made money, placated Jove, and avoided all that trouble with the vulture». The vulture wasn't linked to my story – it was a mythological reference! But who on earth is this great writer? (*Affixes sheet*)

TECHNOLOGY Allow me to continue my reasoning on industrial activity. In order to produce something, raw materials are required, and raw materials cost money. But if one wants to produce something, yet doesn't have any money, well then he must procure the raw materials without incurring cost.

MAN IN THE STREET I know how – just steal it!

NARRATOR Exactly! Remember the origins of your story? With the changes in his behaviour that incite your man to steal, the ideal loot, etcetera... Perhaps at this point the ideal loot, the raw material for production has been found: the lighter flints. See how the eye of the chemist has been truly premonitory!

MAN IN THE STREET (*Already holding another sheet*) At this point everything is clear for the sheet that I hold in my hands. Your words have chased away any doubt that I might have had. This sheet tells us precisely of the theft: «about ten in the morning the siren of the *Fliegeralarm* burst out... the lament of a wounded beast as all-encompassing as the horizon... As the bombs began to fall, lying on the frozen mud and the sparse grass, I felt the small rods in my pocket». What is this *Fliegeralarm*? (*Fixes this sheet to the bookcase at the same time as asks the question*)

PRIMO I know German fairly well: the *Fliegeralarm* is the air-raid alarm. The liberators, as you saw at the start, are near. And then there are also other liberators close by, but up in the sky dropping bombs!

MAN IN THE STREET That's not of much interest to me. I'm intrigued by the story: he's stolen the rods. Now what will he do? On the next sheet (*that he has already pulled from pocket*) unfortunately, there are no new words: «little rods», «bread», «lighter flints», «cigarette lighter». Alas, I've no further clues!

NARRATOR (*Encouraging*) Try and think. The lack of new words is a good sign. If the words are all the same it means you already have all the elements you need to solve the puzzle.

TECHNOLOGY As it seems we are staying on the topic of industrial activity and producing commercial goods, I shall try and give you a hand again. So, how does this economy of the production and sales of cigarette lighters work against the backdrop of the concentration camp?

MAN IN THE STREET I haven't got the faintest idea!

TECHNOLOGY I'll tell you then: thanks to the human activity of your worker-craftsmen, the little rods of iron-cerium – the raw material – could be transformed into lighter flints which in turn could be used to create cigarette lighters. And what kind of budget did this entail? (*Flips the board and draws schematic representation of the following with chalk*) It's very simple: if retail value is arrived at by adding profit to production costs, where the economy of the concentration camp is concerned the calculation is easy: production costs are zero, as the raw materials are stolen and the labour is free; and as for profit – well, what do you think it would have been? the bare minimum for sustenance; and so it is clear that the value of the product, its market price, was...

MAN IN THE STREET ... a piece of bread, of course!

ALBERTO (*whispers to Technology*) It would be fairer if you refrained from appropriating my thoughts.

TECHNOLOGY (*Justifying self*) I'm sorry, but you know perfectly well why I must do so: (*whispering*) he mustn't know.

MAN IN THE STREET Here is as much as I have been able to decipher then: «according to Alberto, the price of a lighter flint was equivalent to a ration of bread, that is, one day of life; I had stolen at least forty rods, from each of which could be obtained three finished flints. The total: one hundred and twenty flints, two months of life for me and two for Alberto». And as a matter of fact, on the next sheet there is

mention again of «small rods», of «flints» and of «bread», but also I believe something about the transformation of the rods, as I can make out «calibre» and «thin down». (*Fixes this sheet too to the bookcase which is nearly full*)

TECHNOLOGY Well done! Now that the budget has been drawn up and business development plans made, it is time to go operational – for manufacturing to begin. Now it's all down to human activity: my friend Science and I had already made our contributions, now it was the turn of man and manual dexterity.

PRIMO And now we learn that there are two qualities which distinguish a good chemist from an average one: imagination and creativity. Try and imagine the work bench, there in the concentration camp: the little rod, a penknife for a lathe and a pierced tin for a calibre. The outcome: the little rod thinned down just the right amount, reduced to the appropriate dimensions.

MAN IN THE STREET (*Already with another sheet in his hand*) Fantastic. I don't know if this man already knows everything, including how the story ends, or whether he simply has a great deal of perspicacity and extraordinary foresight. In any case, he's practically guessed the contents of the sheet: «that evening I brought into camp the small rods, and Alberto a metal plate with a round hole: it was the prescribed calibre to which we had to thin down the rods in order to transform them into flints and therefore bread». (*Fixes the sheet to one of the last available spaces on the bookcase*)

NARRATOR Now concentrate well, because – as you'll soon see – the end of the story is near, your summit is within reach. Don't get distracted now!

MAN IN THE STREET (*Holds the last five sheets in his hand*) I know. And this one seems really difficult; by the way, after this one there are only four remaining – we're really nearing the end! It's difficult because it's full of dots, as if bits were missing. I can read various words, but many have already made an appearance. The only new ones are «blanket» and «sleep». What are they up to? Surely not sleeping just at the best bit?

NARRATOR Think hard. Our friends have nearly finished helping us. Now it's you and only you who must get all the tiles in this mosaic to fall into place. Let's recap. We're at the

hardest and most complex part, the point where intuition, knowledge, creativity and imagination no longer suffice: it is time to work the lathe, time for hard, manual labour – that noblest of activities which has no need to envy its oft more highly-regarded intellectual counterpart.

PRIMO I'm completely in love with this wondrous manual labour: what could be more noble, more poetic than a spanner?

NARRATOR Exactly. And so where and how do your protagonists realise the first phase, the transformation of the little rods into lighter flints? The production of the lighters themselves would have been of no concern to them: they would have sold the flints directly to the clandestine lighter-makers, the unknown craftsmen who were making these utensils for important people and civilian workers. We're in a prison: what then is the only time in which the prisoners have any freedom of action, albeit minimal?

MAN IN THE STREET In bed, I think. During the night. But I imagine that with the horrendous lives they were leading, by evening they would have been utterly overcome by tiredness. Or maybe not, maybe they renounced sleep. I'm imagining a scene, tell me if I'm right: I can see camp beds, or bunks, and I see too my heroes, trying to resist falling asleep; I can see a blanket – indeed, here it is written «blanket» – raised up like a tent, and I see flashes of yellow sparks underneath.

NARRATOR Dreams are not only premonitory, sometimes they also tell the truth.

MAN IN THE STREET (*Almost in a trance*) I can read: «we worked for three nights... we did not give in to sleep... we kept the blanket raised with our knees... and scraped away at the small rods, blindly and by touch... a slight crackle could be heard... a spray of yellow sparks... if the rod passed through the sample hole... we broke off the thinned-down stub and set it carefully aside». They've made the flints, don't you see! Now they'll have their ration of bread, they'll survive! (*Fixes the sheet to the bookcase emphatically, and with great enthusiasm*)

ALBERTO Don't be too optimistic!

MAN IN THE STREET Why do you say such a thing, you who are the very essence of optimism and willpower?

ALBERTO You'll soon see!



Scene Two – as for Act One, Scene One. A simple, sparse setting, in semi-darkness. Upstage: a coat stand with an overcoat, hat and scarf. Downstage: a desk with a computer, and a few scattered sheets of paper, pens and pencils. The bookcases are by now almost entirely covered with the sheets of paper; the three television sets of varying size have been removed from the shelves during the affixing of the sheets, as have the ornaments and vases of flowers; the arm-chairs and sofas are still present.

Characters: Science, Man in the street, Narrator, Nature, Primo, Alberto and Technology.

SCIENCE So I would say that we are nearing salvation. Do you understand now why before I told you that those little rods could provide the key to salvation? Salvation – thanks to my daughter Chemistry of course, but not only thanks to her; thanks also to all my other daughters and grand-daughters. Chemistry, that we summarise in one single table, (*shows a large Periodic Table*) the icon which is perhaps most representative of my entire being: the periodic table as drawn up by Mendeleev – who, besides chemistry, had studied art, education and economics. Mendeleev, who, along with Amedeo Avogadro and his number, is perhaps the most well-known of chemists to a non-expert. The periodic table of the elements, the essence of the entire material universe. And in this Table there is, naturally, also Cerium, (*indicates it on the Table*) rare earth, the element in which those mysterious, f-orbitals begin to fill up.

MAN IN THE STREET (*With great emphasis, demonstrating that he is by now totally involved in the story*) Salvation that comes from the heavens, from Providence, that planted the seed of the idea that the rods could be valuable!

SCIENCE Or rather, salvation that comes from cerium! If you really wanted to continue to use your old saying, salvation that comes from the heavens, I could find myself in agreement, but I'll explain how: not thanks to Providence, as you say, but because in those heavens – in that sky (*takes a telescope from the desk and points it up above*) where my

daughter Astronomy directed her telescope such a long time ago – there is an orbiting dwarf planet between Mars and Jupiter that was discovered on New Year’s Day, 1801, two years prior to the discovery of cerium, by the Neapolitan astronomer, Giuseppe Piazzi. This asteroid has a precise significance that you should now be able to decipher easily enough from your fourth-last sheet.

MAN IN THE STREET (*Who has in his hand one of the last sheets*)

It’s true, this sheet is a great deal clearer than the others.

NARRATOR It’s right that it should be so. Just like when after a hard climb through cloud, as you approach the final stretch a patch of blue sky opens up and the much longed-for summit can be seen in all its glory.

MAN IN THE STREET This writing is deeply fascinating:

«finally cerium would have liberated us... cerium, which belongs to the equivocal and heretical rare-earth group family, and whose name has nothing to do with the Latin and Italian word for wax, *cera*... but which celebrates instead (great modesty of the chemists of past times!) the asteroid Ceres... And this is how we won the bread which kept us alive until the arrival of the Russians». So they are saved, I’m greatly relieved now! (*Fixes sheet to bookcase with joy*)

NARRATOR Don’t rush! Clouds may part, but they can just as quickly draw in again.

MAN IN THE STREET Alas it is true! On the next sheet I find sad, sad omens: I can read «slavery», but more than anything I’m frightened by this brief phrase, that for the first time I can read in its entirety: «Alberto did not return».

SCIENCE (*Whose words betray sadness for the first time*) Chemistry as the road to salvation – a necessary but unfortunately not sufficient condition: sure enough, the destinies of your beloved protagonists diverge dramatically, and here you will find I also had a hand – in a positive sense for one of them, but in a truly tragic sense unfortunately for Alberto. Scarlet fever streptococcus is the reason for this fatal divarication. And now it would be fitting to tell another chapter, about some of my other close relatives, Organic Chemistry, Pharmaceutical Chemistry, and Bio-Inorganic Chemistry, who have always – as wonderful architects or scholars of molecules for our health and well-being – contrived truly extraordinary compounds.

NATURE Here we go again! It's true that your relatives are very good, but in actual fact I often preceded them, and they followed my example. Do you know how long ago I made molecules against the life of microorganisms? Millennia! I accept that I was a bit naughty, hiding these molecules – that you humans then named antibiotics, in homage to your fantastic ancestors the Greeks – inside another life form, that of mould! And I must excuse myself and apologise for having made the hospital doctor, Fleming by name, Scottish baronet in point of fact, work so hard to discover them and ultimately spawn a new era of pharmacology!

SCIENCE Fair considerations, and I don't want to do you out of any credit, but allow me to point out that until I came along, your antibiotic molecules were of little use! Let's return to our scarlet fever streptococcus. Well then, when this bacterium enters into our organism, it sets off the system of alarm and defence, which gives rise to a highly complicated series of biochemical reactions that will result in one of two diametrically opposed outcomes for our heroes: the infection is either eradicated before it can do any damage, with a marvellous mechanism that is called immune memory, or else the immune system hoists the white flag in the first instance only to then react – to gather its forces and end the battle victorious.

MAN IN THE STREET I feel very sad, because I've understood how this story is going to end: it seems this sheet contains the very living exemplification of the double alternative that you just so clearly illustrated for me. For one of my beloved characters the first mechanism comes into play, and for the other, the second. This piece of paper clarifies why the first mechanism – the one that doesn't lead to illness, and so is preferable under normal conditions – becomes, in these circumstances, so truly tragic. I shall read it out: «what happened to me is described elsewhere. Alberto left on foot... the Germans made them walk for days and nights in the snow and freezing cold... to a new chapter of slavery, Buchenwald and Mauthausen. Alberto did not return, and not a trace remains of him». (*Dutifully fixes sheet to bookcase*)

PRIMO (*Crying*) Why must you make me suffer so again? Have I not suffered enough?

ALBERTO (*Unperturbed*) A trace remains, and how!

SCIENCE The story you have recounted enables us to discover the different facets of a particular profession – that of the chemist – which is often shrouded in mystery for most people, for people like you, Man in the street. Don't believe anyone who tells you that scientists must have vertiginous intelligence quotients, enormous, unparalleled brains that can understand tremendously complicated things. Chemists are very normal people: their trade is far simpler than one may think. Of course, certain qualities are required, but try to decipher them in one of your last sheets.

MAN IN THE STREET I'll try. (*Enunciates clearly word by word as if reading a rather illegible and poorly written manuscript*) «Yours too is a fine trade: you need an eye and patience. And he who hasn't got them, it's best that he look for something else».

PRIMO I know who pronounces this elegant phrase.

MAN IN THE STREET Who?

PRIMO Isn't it strange, it's a cobbler! Yes, the profession of the chemist compared to that of the cobbler, for which the requisite qualities are nothing but a good eye and patience!

MAN IN THE STREET That seems a bit reductive, and excessively modest coming from you who has already declared himself to be a chemist. (*Fixes penultimate sheet to bookcase*)

PRIMO I'm surprised that you are surprised by such a definition of the chemist. It is your story after all that bears witness to it in such a striking way. Think again: it surely required a very good eye to surmise that inside that unlabelled jar, within those anonymous little rods that lacked smell or flavour, there lay the potential for salvation! And surely also much patience was required, in order to oxidise paraffin to fatty acids and try to nourish oneself with the latter, or to roast cotton wool hoping to obtain sugary fritters, or to ingest glycerine and try to metabolise it with those accompanying side effects that we heard about, or lastly to work on those small rods with such a rudimentary lathe and calibre.

MAN IN THE STREET (*A little dispirited*) You've convinced me! Now all that is left is to decipher the last sheet, even if it isn't likely to add much to my story, which appears clear at this point whichever way you look at it.

NARRATOR Don't be so hasty, there's not much left but we're not quite at the summit yet. Come on, just a little more effort.

ALBERTO (*Emphatically, as if wanting to say his last words, to leave a spiritual testament*) I would like to add something to your story. Something which perhaps may help you to understand your last sheet, and will then be of use to you when tackling your infinite writing task, in memory of all that you have deciphered. (*Indicates a photo which is projected onto the stage, visible to the entire audience; all the characters on stage turn their attention toward it: it is of a crematorium, from whose chimneys rises a dense smoke, and within the smoke is written $O=C=O$, the C in red. During Alberto's monologue, whilst the various images play on the screen, «Lascia ch'io pianga» from the second act of G.F. Handel's Rinaldo is heard*)

Look closely at the chimneys of these crematoriums and turn your attention to that smoke, which, as an old but still relevant song goes, «was rising slowly, carrying so many people off into the wind»; and now, in your imagination, climb onto that carbon atom, united with its faithful oxygen twins to form one of billions of billions of billions of carbon dioxide molecules, fruit of the combustion of so many poor bodies, perhaps of mine too. And riding on this atom you fly back through the decades, by now so many – too many. And you watch as the carbon dioxide molecule dissolves who knows how many times in the water of the rivers, of the lakes, of the seas, (*a photo of a breaking wave with the writing $O=C=O$ appears*) and re-emerges in the froth of a wave or in the splashing of a waterfall (*photo of a waterfall, and $O=C=O$ as before*). And finally, as if by magic, watch it land on the chloroplast of a plant cell, illuminated by a ray of sunshine, (*a picture of a leaf with a red letter C on it, backlit by a gentle sun*) and thanks to that amazing series of chemical, biochemical and photochemical reactions known as photosynthesis, you realise that it is abandoning the great book of inorganic chemistry and plunging into the pages of Beilstein, into the great tracts of organic chemistry, (*a photo of the structure of glucose appears, with one of the six carbon atoms coloured in red*) to form part of a molecule of glucose. Then keep following this atom, into the dimerisation of cellobiose (*the formula for cellobiose appears with red C as*

usual) and finally observe it as part of the great architecture of the cellulose cathedral, (*schematic formula of cellulose is shown with the usual C in red*) leaving thus the tomes of organic chemistry and immersing itself once more in those of biochemistry and molecular biology. Now imagine that this atom hasn't really gone very far at all, only a couple of hundred kilometres north as the crow flies, ending up in the trunk of a tree of a Swedish forest (*photo of forest in Sweden and the usual C on the trunk of a tree*) and, ultimately, in some of that furniture which is all the rage nowadays (*photo of furniture and usual red C*). Or perhaps it has covered even less ground, in the opposite direction, going south to end up on a Turkish cotton plantation (*photo of a cotton plant with the usual C in red on the boll*) and so, after spinning and weaving, (*a picture of a faceless person wearing a cotton shirt*) to make one of your shirts. Or – the most moving hypothesis by far – watch it as it ends its flight over European pastures, (*photo of cows at pasture and red letter C on grass*) and so, after another series of wondrous chemical reactions that constitute the food chain (*diagram of food chain showing the course of the red carbon atom*) ending up in this very theatre, to form one of the billions of billions of billions of molecules (*all the characters on stage turn to face the audience and a spotlight rapidly moves around the theatre, briefly stopping on faces of people sitting in the stalls, galleries and boxes*) that dwell in those bodies. And after so many years then, here is a trace of me, the trace of Alberto right here, much closer than whatever any other notion of memory could propose. (*Leaves the stage*)

MAN IN THE STREET (*Stunned, visibly moved, faltering*) I don't understand anything anymore. So you're... I get a shiver down my spine to think that even just a single atom of yours, Alberto, could be listening to me or be here with us and with you all, (*addresses audience*) together with the body in which it is residing.

PRIMO Don't talk to me about getting the shivers! Deploy the last sheet and follow what is written there, this time I'll recite from memory, I shan't need any prompting. (*Enunciates very clearly the sibylline phrase which follows*) I know very well what I wrote!

MAN IN THE STREET (*Even more stunned and moved, addressing Primo and seeking out Alberto offstage, falters*) And so you're... (*Smooths out final sheet and follows as Primo recites*)

PRIMO I'll tell you who Alberto was. «He was a man of good and strong will, and miraculously he had remained free, and his words and his acts were free: he had not bowed his head, he had not bent his back. A gesture of his, a word, a smile had a liberating virtue, they were a rip in the rigid fabric of the *Lager*, and all those who had contact with him felt it, even those who did not understand his language. I believe that nobody, in that place, was loved as much as he was.»

NARRATOR Now we have truly arrived at the summit of our Everest! Now you know everything, now you can begin your infinite task as scribe. The sense of your twenty-eight pages is complete, and from there we can begin to reconstruct memory.

MAN IN THE STREET (*After having positioned the last sheet in the centre of the bookcase*) I have not yet recovered from the shock of understanding, in those few last moments, the sense of the whole story! I will reconstruct memory, as I promised to do so, and I will tirelessly write this whole story with your magic ink, and on your magic paper, and nobody will be able to destroy it or erase it. But this strange memory that Alberto revealed to us – this chemical memory made of substance and energy, strong, eternal and universal – is even greater, as it helps us to remember despite the passing of time, not to allow events and responsibilities to fade, but to make History a living entity rather than a form of archaeology, stripped of passion. Memory cannot be an archaeological operation, bleaching the past as it seeks to resuscitate buried times and civilisations. Memory must be alive: and what is more alive than the idea of a carbon atom that is inside of us, and that used to be inside of Alberto, or any other victim of human injustice?

NARRATOR Do you realise how different you are from when we started our joint adventure? Do you understand now that it is right, that it is incumbent upon us to lament the violent fate of millions just like you, whom the wind carried away?

MAN IN THE STREET Yes, I'm aware of having grown a great deal, and I can't hold back the tears that flow from my

heart and mind. The people, stories and other characters (*addresses Nature, Science and Technology*) that I've come across have transformed me. I'd never have thought that a simple man in the street, lacking knowledge, memories, books or reading could – in such a short space of time – come to possess such learning. I must thank you all.

NARRATOR (*Takes the indestructible sheets of paper and the bottle of ink and hands them to Man in the street*) And now to work! Here is the permanent ink and the indestructible paper. The onerous and honourable task of lifting humanity out of oblivion is yours.

PRIMO Before you start such a praiseworthy undertaking, just listen to me for a moment. I wrote a great deal, recounted even more and yet you humans still decided to erase everything. Even for me it is now difficult to remember everything that I saw and wrote. However, I'm a chemist, and as a good chemist would I have kept the essence of my entire literary production in these two small vials. If I opened them these precious drops would immediately evaporate and my words would have vanished forever. But now that you have the permanent ink and the indestructible paper, I can finally open the vials, that you may capture the essence of my work and make it endure. Are you ready?

MAN IN THE STREET (*Seizes the stylus, dips it into the ink and gets the sheet ready*) Right, I'm ready!

PRIMO (*Moves closer to the screen where the images evoked by Alberto were displayed and positions the vials at its base*) I'll open them one at a time. (*Opens the first and a vapour rises up, condensing into the words «If understanding is impossible, knowing is necessary», which appear on the screen and fade away once Man in the street has read them and written them down*)

MAN IN THE STREET (*As he reads the vapour that has condensed into words and letters, he writes on the magic paper*) «If understanding is impossible, knowing is necessary.»

PRIMO (*In the same way as before removes stopper from second vial*) Here is the second. (*Leaves the stage*)

MAN IN THE STREET (*As he reads the vapour that has condensed into words and letters, he writes on the magic paper*)
«Chemistry teaches vigilance combined with reason.»

SCIENCE (*Linking arms with Technology*) And with these words you no longer have any need of us.

TECHNOLOGY You can go on alone. (*They both disappear from the stage*)

NARRATOR I too can go, my work here is done! (*Leaves the stage*)

MAN IN THE STREET I'm afraid to face the work of writing by myself: am I equal to the task?

NATURE Of course. Remember that you belong to me like so many other species, but that your species is special. Yes, you're simply heaps of carbon and water scattered about the universe, like many of the other beauties that I've produced, but you have something extra: you're a heap of carbon and water that has the ability to go beyond its material essence, to become he who finds the strength to change the cellulose molecules of the paper and the organic dyes of the ink into concepts, sensations, feelings, emotions and everything else that goes into making the whole human enterprise so fascinating, and at times, dramatic and tragic. Go on, and stop at nothing – write, write, write until you return are recalled unto my bosom! (*Leaves the stage*)

MAN IN THE STREET (*Alone, addressing the audience, goes to the desk and moves the computer, ordinary paper, pens and pencils to one side. Starts to write with the magic sheets and ink*) Here is the carbon atom which descends from the ink onto the page. Finding other atoms of carbon it fraternises with them to become the story which stimulates the atoms of your hearts and your minds. (*Stops writing all of a sudden and looks up*) I forgot to ask about the title of the story I'm about to write: now what shall I do? (*Brightening up, as if struck by a good idea*) This story will not be a narrative, but a civil-scientific play: I want to bring theatre back to life. We will perform this play, even if there are no longer any theatres: we'll perform it in squares, supermarkets, stadiums – anywhere that you can find ordinary men, just as I was prior to my experience. And the title will be... (*Struggles for a moment, seeking a concise way of expressing or condensing that which he has experienced*) «Molecules of an author...» (*Pauses again*) «...in search of memory!» (*The curtain falls as Man in the street hunches over his sheet of paper and frenetically starts to write*)