The Origin of the Idea of Time
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Preface by the Author

< [1]Modern psychology has clearly established that everything in us is present, even the past. When I recall having played with hoops in my childhood, the image that I bring to mind is as present as the paper on which at this moment I am expressing these abstract thoughts. The mere thought of bowling a hoop already evokes an internal preparation for the movements that are involved in this game. Similarly, thinking of an absent person is like calling him softly by name **[ii]** and almost like starting to speak to him. Something is really a part of the past only when we have lost all conscious access to it; in order to come back to consciousness, it must become present once again. But if, ultimately, everything is present in consciousness, if the image of the past is a sort of illusion, and if the future, in turn, is only a projection of our present activity, how then do we form and organize the idea of time with its distinctive parts, and how does this idea evolve in the human mind?

The idea of time, in my view, is basically a matter of perspective. I shall first demonstrate that this perspective is not present at birth and that it is not an a priori, necessary condition for the activity of thinking during its primordial period of confusion and vagueness. I shall then try to explain how this perspective evolves, and to follow the work of nature in its various developmental stages, in the same vein as one might trace **[iii]** in a painting the effort of the artist, noticing how, on an empty canvas, he has been able to render the murky depths of a forest or how, in contrast, he has made a sunray enter and joyfully light a room. Perspective in a painting is a matter of art, an artifact. Memory is an art too: I shall demonstrate how, in the process of conceptualizing time, this art follows a

natural and inevitable course. For this purpose I shall attempt to outline the respective roles of (1) passive, purely reproductive, imagination which provides the static framework of time, its form, and (2) the motor activity and the will which, in my view, provides the living and moving basis for the notion of time. These two elements together constitute the experience of time.>

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CHAPTER ONE

The Stage of Primordial Confusion

< It is difficult to deny that the idea of time as it exists in the modern adult mind is the outcome of a long evolution. In animals and children initially nothing can be found resembling the exact sense of time as it prevails in the human adult. It requires a period of formation. In Indo-European languages the distinction between past, present, and future is clearly anchored in the verb; the notion of time is therefore impressed upon us by language itself. We cannot speak without evoking and ordering, in time, a profusion of images. The quite subtle distinctions that **[6]** we experience between various aspects of time, such as the future, the future perfect, the perfect, the imperfect, or the pluperfect, gradually penetrate children's minds; yet it is far from easy to make them comprehend these distinctions. We give them a thousand ways to distinguish the various moments of time: the orbit of the sun, chiming clocks, minutes, hours, days. All these sensory images find their way into the child's head and help to organize the chaotic mass of its recollections. But animals, and children before they can speak, must indeed have great difficulties in establishing a representation of time. It is likely that for them everything is experienced on a single level. All primitive languages express the idea of action by means of verbs, but not all make a clear distinction between the various tenses. The verb, in its most elementary form, may equally well denote the past, the present, and the future. The study of language, therefore, does reveal an evolution of the idea of time.

The same applies to comparative psychology. Do animals, or even children, really have a past, that is, an ordered ensemble of memories, organized in such a way that it produces the perspective of passing days? **[7]** It seems not. It is often said that a child or an adult has a good memory when he possesses a set of very

vivid images. In this sense an animal may have a memory that is as good as or perhaps even better than human memory. But it is completely mechanical: it depends entirely on the intensity of the initial impression, compared with the strength of other impressions that were perceived later. However, from the psychological point of view the distinctive property of human memory is the exact sensation of duration, the order of our recollections, and the precision that this order imparts upon each of them: things that we owe to a large extent to the sun and other celestial bodies, to the hands that turn on the face of our clocks, and to the rhythmical regularities of the physiological processes in the clockwork of our organism. The animal and the young child, not having the means for measuring time, live day by day. An elephant attacks the person who maltreated him many years earlier; does this mean that the elephant has a clear idea of duration and a memory organization that resembles ours? No, it is primarily a mechanical association of present images. The image of this person is associated with another, still vivid and accessible image of being beaten, and these two images **[8]** act together like two interlocking cogwheels; one could almost say that the animal represents this person as hitting him now, and its rage is commensurate. For the animal there is no forgiveness because it has no clear sense of duration.

Similarly, all the sensations impinging on a child continue to resound internally, they co-exist with present sensations and compete with them; this is an ineffable chaos in which time has not yet been introduced. Time will only emerge when events can be positioned in linear fashion along a single dimension, length. But initially this is not the case: this long line, originating in our remote past and vanishing into the distant future, remains to be drawn.> Since children have not yet developed the art of remembering, for them everything is in the present. They have no clear distinction of times, places or people. Young children's imagination originates from a confusion of images produced by their mutual attraction.[2] Children confound what has been with what is or what will be; they do not live – as we do – in the real world, a permanent environment, and they do not consolidate any sensation or image. In other **[9]** words, by not distinguishing or perceiving clearly, it is as though they are dreaming. The child stores and reproduces images, much more than he invents or thinks, and that is precisely why he does not have a clear idea of time: as long as this is the only available process, reproductive imagination cannot be distinguished from, or contrasted with constructive imagination which, nevertheless, is nothing other than its later and higher developmental stage. The child and the animal, therefore, do not have a past that is neatly differentiated from the present, or from a future that is imagined or constructed according to one's fancies. The child is constantly confusing what it actually did, what it wanted to do, what it saw happening, what it said it did, and what others said it did.[a] <For the child the past is only

[9]a. On this matter see *Éducation et hérédité*. (Op. posth., 1889).

a dominant image in a jumble of incoherent images, indistinct, unordered and uncategorized; it resembles the way objects look in the twilight, or at early dawn before the sun has brought order and light and arranged everything on different planes. Later I shall examine the successive steps in the ordering process.>

[10] Investigators tend to agree that space perception takes precedence in animal development. The acuity of this perception is related to the movements the animal must perform to satisfy its needs, and it seems likely that it is precisely these movements – in every direction – which provide the representation of space. The investigators also agree, however, that animals, even the closest relatives of man, have a confused perception of temporal relationships and everything connected with these. In fact, animals only need senses and primitive imagination for spatial orientation, for coming and going, for eating, drinking, etc. Animal memory is entirely spatial: it is based on visual, tactile, olfactory and other images which are automatically activated and associated. While objects are certainly ordered in space there is no indication whatever of a true ordering in time, since the animal treats the past as if it were the present. Even instinct, seemingly future-oriented, is a complex of drives that have become automatic and in which the temporal is only implied by the spatial without the animal being capable of separating the future from the present. In short, the animal is totally involved in its images. Adaptation **[11]** to a future conceived as such, and in virtue of being future, is typical for man.

That the idea of time in adults, and more specifically in children, remains highly obscure compared with that of space, is a natural consequence of the course of evolution which developed the sense of space before the sense of time. We can easily imagine space; we have an inner eye for it, an intuition. Try, on the other hand, to represent time as such; you will only succeed by means of a representation of space. You will have to align successive events, placing one at some point along the line, and the other at a second point. In other words, you must evoke a sequence of spatial images in order to represent time.

It would violate the fundamental laws of evolution to derive space from time – as Herbert Spencer has done – when, in fact, humans arrive at a representation of time by means of space. As we have seen, the representation of events in their temporal order is acquired later than the representation of objects in their spatial order. The reasons are the following. First, the spatial array is associated **[12]** with the perceptions themselves, that is, with presentations, whereas temporal order is associated with reproductive imagination, that is, with representations. Secondly, time is not only connected with representations – the derived phenomena – but, as a matter of fact time can only be perceived if these representations are indeed recognized as representations rather than immediate sensations. This requires the ability to apprehend the difference between representations and presentations. On the other hand, spatial expanse and its more or less distinct regions are laid out in front of our eyes and can be perceived at a glance through

a large number of present sensations each having specific differences (the so-called local signs). To perceive space, children as well as animals only need to open their eyes: it is there, present and intense. Time, in contrast, is a 'faded dream.'

Young children may even attain a high level of understanding concerning the position of objects in space, the relationships near and far, inside and outside, etc., long before they have any definite ideas of order and duration of events. James Sully describes a $3\frac{1}{2}$ year old boy, who had very precise knowledge of the topographical relationships between the various places he had visited on walks, but who, **[13]** nevertheless, mixed up all temporal relationships. He had no definite representations corresponding to such terms as 'this week', or 'last week.' Even yesterday was a totally indefinite past, indistinguishable from any other period. Sully, in spite of this observation, still believes, as does almost the entire school of British associationists and evolutionists, that we acquire the idea of space through that of time. I, on the other hand, believe, with several German psychologists such as Hering and Stumpf, but also with William James and Ward, and with Alfred Fouillée that this is an artifact of a psychological analysis that confounds its own methods for decomposing complicated ideas with the spontaneous and synthetic processes that occur in children and animals.[a]

Spencer assumes that the congenitally blind do not have an awareness of space other than 'in the form of successively perceived stages that derive from movement.' Apart from some 'restricted perceptions of co-existence' evoked by simultaneous stimuli the congenitally blind person **[14]** would supposedly think he is moving in 'number, order, and time,' rather than in space as the rest of us do.[a] Riehl too maintains that space is an exclusive attribute of visual sensations. This presumption strikes me as highly implausible, as I cannot believe in this precedence of temporal over spatial organization. Moreover, how can we represent order if not in a figurative manner, which is always more or less spatial? A congenitally blind person will represent the sensation of his hand grasping a piece of bread and feeling the contact with it, the contact of the bread with his mouth, and finally the contact of the mouthful going down the esophagus. These are representations of tactile space, and not only of tactile time, since they involve contacts localized at various points of the organism. The blind person knows where his right and left hands, his mouth, his throat, etc., are located as well as we do. He does not need to see them; he does better than that: he feels and

[13]a. In this matter Mr. E. Morselli, in his psychological studies on the perception of time and space (*Rivista di filosofia scientifica*, 1886) agrees with me; he supports the conclusions of my study on time recently published in the *Revue philosophique*, 1885, *19*, 353–368.

[14]a. H. Spencer (1885). *Principles of psychology*, Volume 2. London: Longman Green; p. 209.

touches. With the psychologists mentioned earlier, I am convinced that every sensation, internal or external, has a more or less **[15]** vague extension. For example, the immersion of one's hand in cold water will yield a sensation of cold that is less extended than the immersion of one's whole arm. One does not have to see or even touch one's body in order to feel that one is completely submersed in water or that only one's little finger is getting wet. Space, in Fouillée's words, is 'the natural mode of representing simultaneous sensations arising from the various parts of the organism.' I think, in fact, that it is not necessary to measure times and distances between the different organs of the body in order to be able to visualize objects in space. Spencer, on the other hand, refers to the more obscure idea of the two, the idea of time, to clarify the less obscure idea which is the most directly intuitive or imaginative, the idea of space.

[17]

CHAPTER TWO

The Static Form of Time. Its Derivation from the Notions of Difference, Similarity, Plurality, Degree, and Order

<The onset of mental development, as I argued in Chapter One, is characterized by a diffuse multiplicity of sensations and feelings, a multiplicity that we can still recapture introspectively at a later age. In fact, there are no really simple and sharply defined states of consciousness at all; multiplicity is at the core of consciousness and above all of immediate consciousness. Any sensation is a mixture of a thousand elements. When I say: I am cold, I refer, in a single word, to a multitude of impressions that come from all over my body. In the same way that **[18]** each particular sensation is already compound, a general state of awareness consists, at any given moment, of a tremendous multiplicity of sensations. Right at this moment I have a toothache, my feet are cold and I am hungry, all of these quite uncomfortable sensations; at the same time I see the sun smiling at me, I breathe the pure morning air, while I think of having breakfast, sensations or images of a more enjoyable kind. And all this is combined with philosophical reflection, a vague feeling of being mentally alert, etc. The more one thinks of it, the more overwhelming becomes the complexity of what is called a state of mind (in the singular) and of the countless number of simultaneous sensations underlying such a state. It requires a tremendous effort to impose a temporal order on that mass in the way patient Psyche of the myth once put in order all the little bits and pieces she was obliged to sort.[3]

The starting point of this analytic effort is what the British have termed *discrimination*, that is, the perception of differences. Suppress the perception of differences and you suppress time. A remarkable feature of dreams is their constant metamorphosis of images which, when **[19]** *continuous* and without

clear transition, eliminates all feeling of duration. The other day I dreamt that I was patting a Newfoundland dog; gradually the dog changed into a bear, very slowly, without provoking any surprise on my part. Similarly the locations may change on occasion, not by a sudden *coup de théâtre* but through a series of transitions which will make the change go unnoticed: a while ago I was in a small cottage and here I find myself in an Italian *palazzo* admiring some paintings by Correggio; a while ago I was myself and now I am someone else. And all this happens as it would onstage, where one would see trees and homes vanish, gradually being replaced by different decors, with this difference that in the dream, because attention is put to sleep, every image that disappears is lost completely. Thus the comparison between a past state and the present state becomes impossible; each new entrant has the whole stage to himself and makes us totally forget the other actors or the other decors. Because of this absence of contrast, of differences, even the most dramatic changes may take place without being noticed and without being organized in time. This proves that we do not have an *a priori* frame of reference in which to position **[20]** objects, and that our perceptions provide their own frames of reference when they are properly distributed. In an absolutely homogeneous mass of impressions nothing could possibly give rise to the idea of time: the beginnings of duration lie in a certain variability of effects.

On the other hand, too great a heterogeneity, if it were at all possible, would also eliminate the idea of time, one of whose important characteristics is continuity, that is, unity in variety. If our life is subject to too many different situations, if too many heterogeneous scenes impinge on our eyes, memory gets confused, putting first what came later and mixing up everything. This is what easily happens when we are traveling, when a host of unrelated impressions follow each other in rapid succession. Pascal has pointed to the fact that a journey is similar to a dream: if we were constantly traveling, without stopping and especially without having planned the trip ourselves, we would have great difficulty in distinguishing a waking state from a dream state. A certain continuity in the flow of sensations, a certain natural logic is indispensible; one event must derive from the other and they all must chain together. *Memoria non facit saltus.* In order to notice change, one needs a reference point.[4] > **[21]** When we search our inner selves, we find behind every present image, behind every object or ensemble of objects we encounter, behind each of our present thoughts or feelings, an analogous feeling, thought, or image that we recognize as our own. The accumulation of experience makes part of the outside world gradually penetrate into our minds, and we have only to look deeply into ourselves in order to recover it from under the mobile surface of present sensations and ideas. Similarly, nothing is really new for us; and that is precisely the secret of our intelligence, because we are unable to comprehend what has no analogue in our past, what awakes nothing in us. Plato was correct in maintaining that knowing is half

remembering, and that there is always something in us that corresponds to the knowledge we obtain from the outside world.

An animal cannot *know*, precisely because it cannot, in the strict sense, *remember*. In its inner world, as I argued earlier, there is a confusion that renders its outer world equally confusing. In fact, to know is to match a recollection with a sensation. Well-defined knowledge must depend on **[22]** a distinct, circumscribed, and spatially localized recollection. If everything flowed in us like the water of a stream, our thinking would flow similarly and vanish together with the fleeting sensations. The principal function of thinking is to maintain itself through memory; cognition is re-cognition, at least in part. This is why animals live in a dream; we at least can recover some of our dreams and reconstruct them by confronting them with reality. But if we dreamed perpetually, we would only have the vaguest idea of our dreams: and such is essentially the case with animals. <The perception of differences and similarities, principal condition for the notion of time, leads to the idea of duality and from duality emerges the concept of number. Initially, the idea of number is nothing more than the perception of differences behind similarities. The various sensations, first the extremes such as pleasure and pain, then those from different senses such as touch and vision, are more or less clearly differentiated.

Thus discrimination, the primordial attribute of intelligence, does not require the idea of time to operate; on the contrary, the idea of time presupposes discrimination. Even the notion of **[23]** *sequence* which for Spencer actually constitutes the basis of time, is a derivation. At the most primitive level everything co-exists, and tactile as well as visual sensations tend spontaneously to assume a vague spatial form with no clear perspective and with no definite dimensions. When we say that everything co-exists, we are still borrowing too precise a term from the language of time, a term which expresses a conscious and reflective relation of simultaneity: initially we have no more a notion of co-existence than of succession, only a confused and diffuse image of a multiplicity of objects scattered around us, and for that chaotic state of affairs the term expanse is actually too accurate a term. Only movement will, later on, create divisions and distinctions as a result of the effort it requires; voluntary movement creates the third dimension of space in our mind, and without movement everything would remain on the same plane. What is more, the notions of plane and surface can only arise if this surface can be explored by movements of the hand or the eyes. We shall shortly see that this applies to time as well.

Apart from the first three elements underlying the notion of time: differences, similarities, and number, consciousness soon puts us in possession of **[24]** a fourth and extremely important one: intensity or degree.[5] In my view there exists an intimate connection between intensity and the moment. Between related sensations and between motor actions of the same type there are gradations which

form a kind of continuous scale. Initially I have an appetite, then I feel distinctly hungry, and I end up with a stomach ache mixed with acute hunger pangs and a general feeling of faintness: this is an example of a sensation going through a gamut of degrees. This is the case for the majority of familiar experiences of everyday life: qualitatively they can be reduced to a small number, but they are subject to continual variations, decrements and increments, almost without limit. Life evolves slowly; every moment presupposes a degree of activity and sensitivity, an increment or a decrement, some kind of variation... in other words, a relation involving both quantity and quality. If there were no division, no change and no gradation in activity or sensitivity, there would be no time. The primitive pendulum that serves to measure and even create time for us, is the beating, now more now less intense, now more now less emotional, of our heart.>

[25] Bain argues with good reason that we cannot lift a weight one, then two feet, without having a particular experience of duration; in the feeling of continuity, for instance in continuous movement, or in sustained effort, there is an 'apperception of gradation'. But Bain adds that 'this apperception of gradation is in fact what is called time or duration'. This conclusion is unacceptable! Duration is more than just an apperception of degrees of intensity, even though the latter may facilitate our perception of succession, the principal characteristic of time.

<The aspects discussed so far simply provide what one might call the *bed* of time, without reference to its *streaming*, or if you prefer, the frame of reference with respect to which time appears to move, the way in which it orders the representations of our mind, in one word: the *form* of time. It is *an ordering of both similar and dissimilar representations forming a plurality of degrees*. Furthermore, memory itself has its gradations, depending on whether it is more or less remote: every change which registers itself in consciousness leaves as a residue, a series of representations arranged on a sort **[26]** of line, from which the more remote representations gradually fade, making room for other increasingly sharper representations. In this way every change produces a sort of luminous trail in the mind analogous to those left in the sky by shooting stars. In contrast, a permanent state would always have the same conspicuity against a constant background, much like the bright stars in the firmament. Let me finally add to the preceding determinants of the experience of time the residues of varying distinctness and intensity left in memory by change.> The proof that the representation of before and after is an interplay of images and residues is that we can easily confuse them. That is what happens in psychophysical experiments in which a subject may become aware of a tone before he has heard it, and especially in experiments where two flashes of light are given in close succession and the subject confuses the first with the second. In the case of close attention the subject may represent a tone so strongly that he can hear it before it has sounded. The inversion of the order of two flashes is undoubtedly caused by the

fact that the shifting of attention from one to the other enhances the flash on which it is focusing, giving the latter **[27]** an intensity that will make it subjectively appear more recent, although it may in fact be more remote in time.

< I have specified everything which, in time, is not change even if it is directly observed: this is what I have called the *bed* of time, in contrast to its *stream*. What remains is to make time stream and flow in consciousness; this requires that in this stream-bed, readily provided as it is by imagination, something active and dynamic must present itself to our consciousness. Up to this point I have considered thought as something strictly passive, reflecting, as it were, a manifold of objects that have different *levels* – or degrees – and that leave *traces* in an increasing or decreasing *order*, the whole being in some sense *static*. Let me now try to establish the role of action, of cerebral and mental reaction. >

[29]

CHAPTER THREE

The Dynamic Foundation of the Idea of Time; its Genesis. The Role of Volition, Intention, and Motor Activity. Present, Future, and Past. Space as a Means of Representing Time

<The course of time, in the adult human mind, consists of three mutually contrasting parts, the present, the future, and the past. First of all, behind the idea of *present* is that of *occurrence* or *action*, which in no way seems to be derived from the idea of time but rather to precede it. Action implies time and, more specifically, *occurrence* implies the present, but the awareness of occurrence and action does not arise from time. The present as such is not yet time or duration, **[30]** since duration – that is, all passage of time – can always be decomposed into present and past, and thus essentially consists of something that is added to the pure and static idea of the present. This idea of present in itself is a derived, abstract notion existing only by virtue of the fact that it is implicit in the notion of action, or current effort. The true present, in fact, would be an undivided instant, a moment of transition between future and past, a moment that can only be conceived of as infinitely small, dying and coming into existence at the same time. This logical present is a product of mathematical and metaphysical analysis. The experiential present of an animal, a child, and even a naive adult, is quite different; it is an elementary parcel of duration, that really possesses [the characteristics of] past, present, and future [at the same time], a parcel that can be divided into an infinite number of mathematical *presents* which animals and children, or even unsophisticated adults cannot even conceive of. The real point of departure for the evolution [of the idea of time] is, therefore, neither the concept of present, nor that of past or future. It is, instead, [the idea of][6] *acting* and *undergoing*, it is the *movement* following a *sensation*.

The conceptualization of time into three independent parts constitutes a

dissociation of awareness. When the cells of certain animals have reached their **[31]** maximum growth level, they divide by mitosis; something analogous happens in the process of generating time.

How is this division of moments of time achieved in primitive awareness? In my opinion, it occurs as a direct consequence of the division between undergoing and acting. When we feel pain and react to eliminate it, we begin bisecting time into present and future. This reaction to pleasure and pain, when it becomes conscious, is called *intention*, and I am convinced that it is intention – whether spontaneous or deliberate – which generates our notions of space and time. With respect to space, the British [philosophers] have been blamed for having invoked a *petitio principii* in their attempts to explain the idea of space as a simple sequence of muscular efforts and sensations whose intensity, speed and *direction* we assess. In fact, when we postulate 'direction' we seem already to presuppose and postulate the very space that, supposedly, had to be created by our minds. But then, if the word *direction* is indeed so unfortunate it can be replaced by the term *intention*. *Intention* does not presuppose the idea of space; it only supposes images of pleasant or painful sensations, together with **[32]** motor efforts to achieve the former or to avoid the latter. The animal representing or even actually seeing its prey does not have to think of space or direction in order to have the intention of swallowing it and of initiating the necessary motor efforts. Initially direction is straightforward intention, that is, an image of pleasure or pain occurring in a specific context, followed by an innervation of the motor system. From *intention*, gradually developing into awareness of the self and its effects, emerges the notion of *direction* in the strict sense of the word, and with it, that of *expanse*.

The same applies to time. The future, initially, is *what is to be*, it is what I do not have but wish or need to have, it is what I attempt to possess. Just as the present can be reduced to a conscious and intrinsically gratifying activity, the future can be reduced to the activity-directed outward search for what is missing. When a child is hungry, it cries and extends its arms towards its nurse: this is the seed of the idea of the future. Every need implies a possibility of satisfying it; the ensemble of these possibilities is what we mean by the term *future*. A being without desire and without aspiration, would see time close itself before him. We reach out **[33]** and space unfolds itself before us, space whose succession of planes and multiplicity of dimensions cannot be captured by a single point of view. The same is true of time: we must have desires, we must have needs, we must reach out and move in order to create the future. The *future* is not *what reaches us*, but *what we are reaching for*.

At the outset, therefore, the flow of time is nothing more than the distinction between what one needs and what one has, which itself comes down to intention followed by a feeling of satisfaction. Intention and the effort associated with it constitute the core of our common sense ideas of *final* and *efficient* causes.[7] Only

after a series of formal abstractions can they be substituted by ideas of uninterrupted succession, necessary order of cause and effect, determinism and mechanism. The original notions of cause and goal have an anthropomorphic or, if you prefer, animistic connotation: they are an outward projection of muscular force (efficient cause) and intention (final cause). Such metaphysical notions have a fundamental significance, in both the human and the animal context, because need satisfaction and motor innervation are the basic expression of life in every animal. It is **[34]** the relationship between these two terms which, in my view, first engendered the awareness of time; the latter initially only being, in a certain way, the conscious gap between a need and its satisfaction, the distance between 'the goblet and the lips.'

Nowadays psychologists have a tendency to reverse the order of the genesis of time. Full of their scientific, fashionable ideas about causality, they tell us that efficient cause amounts, conceptually, to a simple succession of antecedent and consequent, based on an invariant and even necessary order; similarly final cause reduces to a relationship between antecedent and consequent, that is, to a succession. Then, when these psychologists get to the question of time, they proceed to situate the idea of succession at the root of consciousness: they conceive of it as a regular series of antecedents and consequents caught *in midstream*; thus the *prius* and the *posterius*, the *non simul* become a constituent relation of 'representation', even a 'form of representation' and a form *a priori*. In my opinion this theory substitutes scientific ideas, belatedly, for such primitive, magical conceptions of consciousness as *force*, or **[35]** efficient cause, and *goal* or final cause. Animals simply apply the philosophy of Maine de Biran[8]: they feel and act, but they are not yet mathematician enough to think about *succession*, and even less about *constant succession*, let alone about *necessary succession*. The relation between antecedent and consequent, between before and after, only unfolds secondarily as a result of reflective analysis.

Does this mean that time is not already present in primitive consciousness? – It is there in the form of force, effort, and also as *intention*, at least when the organism begins to realize what it wants; but even then time is completely imbedded in sensibility and motor action, and consequently it merges with space. The future is what is in front of the animal and what it is looking for; the past is what is behind it and what it can no longer see. Instead of mentally constructing space from time in Spencer's fashion, the animal crudely builds time from space; it only knows the *prius* and *posterius* of the expanse. From his kennel my dog watches me approaching with a full trough: this is his future; he comes out, runs towards me and as he gets nearer, the impressions of the kennel become more remote and almost vanish because **[36]** the kennel is now behind him and he does not see it anymore: this is his past.

In sum, *succession* is an abstraction of *motor effort* produced in *space*; an effort which, when it becomes conscious, is *intention*.

In adult consciousness the idea of intention – end or goal – remains the essential element for ordering recollections. If we were only conscious of isolated actions and if we did not organize these actions in terms of a number of distinct goals or ends, remembering would be extremely difficult! Instead, given the idea of *end*, our actions become a series of *means*, arranging and organizing themselves with respect to the ends pursued in a way that would please an Aristotle or a Leibniz. If I wish to travel to America, it follows that I first need to cross the Atlantic Ocean, and therefore I first need to embark at Le Havre or Bordeaux. All these requirements are linked together in a certain logical order and all the recollections to which they will eventually give rise will find themselves connected too. There is a certain logic to life and it is this logic which makes it possible for memory to exist. Wherever the illogical and the unpredictable reign supreme, memory will lose its hold. Life absolutely devoid of logic would resemble those ghastly stage *dramas* in which the various **[37]** events are totally unrelated and from which one extracts only fuzzy images that blend into each other.

Intention – the desired goal – always generates a *direction* in space and consequently a movement; one might even say that time is an abstraction of movement or *kinesis*[9], a figure of speech under which we subsume a collection of sensations and actions that are neatly distinguished from one another. When we say: 'This village is two hours from here,' time serves only as a simple measure of the *amount of effort* needed to reach this particular village through space. This is equivalent to the expression: 'This village is at so many thousand strides' or, more abstractly: 'It is so many kilometers from here' or, finally, with the following more psychological expression: 'It requires so and so much muscular effort.' For our consciousness the very idea of movement boils down to the conception of a certain number of sensations of muscular effort and resistance, projected along a line connecting the point in space where one is and the point one wants to reach. But why should this idea initially presuppose the idea of time? I take a few steps in a certain direction: that requires a series of analogous muscular efforts which **[38]** coincide with a series of distinct sensations all along the way. This is the primitive notion of movement. In addition, if these steps are made with a specific *intention*, for instance in the direction of the fruits on a tree, then the ensembles of sensations that I have experienced will arrange themselves in my imagination along a line, some located at one point relative to the tree, and others at another point. Here we have the germ of the idea of time and that of the idea of spatial movement in one.

If I move from point A to point B and then return to point A, I am subject to two series of sensations. Every element in the first series corresponds to an element in the other series. The difference is that the corresponding elements are mentally organized with respect to point B in the first case, but with respect to point A in the second case. Consequently I have only to combine the two series, taking one in reverse order relative to the other, to make them coincide perfectly

from one end to the other. Such a perfect match between two sets of sensations is what best distinguishes space from time. If such a match is not accepted as possible or real, I find in my memory only a series of sensations that is ranked along a scale of clarity. The idea of time **[39]** is the product of an accumulation of sensations, muscular efforts, and motives put in order with some difficulty. The same repeated sensations, the recurring efforts towards the same end and with the same intention, constitute a series of which the first elements are much less distinct than the later ones; thus emerges an internal perspective, oriented toward the future.

The past is simply this perspective in reverse: it is the active turned passive, it is a residue rather than an anticipation and a conquest. As our days accumulate, a sort of regular, layered sediment of everything that once affected our thinking and our senses is deposited in our depths, as in those salt basins from which one lets the sea water evaporate. This internal crystallization is the past. If the waves are too strong the sediment will be deposited in irregular masses; if the waters are calm, it will assume more regular forms. The past is a fragment of space projected inwardly; it is fashioned after space. It is impossible to modify spatial relations: one cannot put on the right what is on the left, nor can one put in front **[40]** what is in back; consequently all the images provided by our memory, being attached to one spatial cue or another, become fixed and constitute a series whose terms are no longer interchangeable.

Thus any image produced by memory can only be correctly located or positioned in the past if it can be located at a particular point in space, or if it is at least associated with some other image that can.[a] Without association to trivial circumstances, every recollection would appear to be a creative act. Did I ever think and write anywhere '*La feuillée chante*,'[10] a picturesque expression that happens to come to my mind? This question releases a host of recollections: Latin words are associated with French words and to these words the name of Lucretius is attached. Ultimately, if I have a good memory, I will be able to recall the image of that old, torn little book in which I once read Lucretius' phrase '*frons canit*.'[11]

In summary, it is the interplay of feelings, the pleasures and the pains, which organizes our memory as a present representation of the past and thus **[41]** divides time into distinct parts. I am thirsty, I drink from a little stream. Half an hour later I find myself back at the same rivulet and by association it reminds me of my thirst, although I am not thirsty anymore and although the cool water has totally lost its appeal. Yet my representation is very distinct, it bears a special mark: this is the rivulet that quenched my thirst. In such a way a recollection is reinforced in the face of actual reality, the past in the face of the present. Similarly

[40]a. I will later return to a discussion of its mechanism of localization.

an animal that drank at the stream before begins to acquire separate mental slots for the past and for its current sensations.

Initially this feeling of pastness has nothing abstract or scientific about it; it is associated with the feeling of pleasure we have upon recognizing things we already know. Bring your dog home after a long voyage and it will jump for joy. Similarly a familiar face will make an infant smile while a strange face will cause distress. We are remarkably sensitive to the difference between seeing and seeing again, between discovery and recognition. Familiarity always instills a certain perceptual facilitation, and facilitation instills pleasure.> Familiarity as such is already sufficient to create a certain order: one might perhaps say that every feeling of disorder derives from lack of familiarity.

[42] The confusing and obscure bulk of our accumulated recollections resembles those large forests which, from a distance seem to be one dark mass; once we penetrate, however, we distinguish long alleys under the trees, undergrowths and open spaces, vistas as far as the eye can see. Soon one begins picking out landmarks that serve to orient oneself: one learns to tread without fear or hesitation. All these disarranged tall trees align themselves in our mind and arrange themselves by stable associations. Initially there are only passively retained recollections leading to the confusion I described above, thus resulting in the absence of a clear idea of the past in contrast to the present and the future. Then enter imagination and intelligence, to play with these images and ideas, putting them here or there at their whim, dreaming a world in keeping with our desires. At this point a distinction emerges between active imagination and the recollection present in our mind, over which we have little control because it is anchored in a mass of associations from which it cannot be detached. A split thus takes place in our mind: passive imagination – or memory proper – separates itself from active imagination.

We have already seen that the experience of time derives in part from the experience of difference. **[43]** The differences between our sensations, however, are smaller than one might expect or, rather, differences of degree do not necessarily exclude structural uniformity. Sensations come in a certain number of categories, depending on whether they originate in my arm, my leg, my head, etc. In the course of a day, or even throughout a whole period in our lives, one or more of these categories will usually dominate, establishing unity in diversity. Just now, while I was writing, my memory suddenly conjured up the image of a small gully with an overgrowth of pine trees and thuya shrubs. But when was it that I walked there, I ask myself. Without hesitation, albeit after an appreciable lapse of time, the inner reply comes to my mind: Yesterday! But how was I able to recall instantly that it was yesterday? Upon reflection I realize that my recollection of this walk is associated with a sensation of headache. I still have this headache, and that is why the temporal localization occurred so fast. Below the various events filling my day runs an undercurrent of continuous sensation

connecting them. At other times it may be a whole group of sensations that cling together. However, the prerequisite **[44]** for the existence of a precise recollection is that the most heterogeneous sensations be linked through sensations that are less heterogeneous.

<The distinction of past and present is so relative that when we pay close attention to a distant image in our memory, it soon begins to move closer and to appear more recent: it takes its place in the present. I follow a narrow road that I have not traveled for two years: the road winds among the olive trees, past a mountain ridge, with the sea in the background. As I go along, I recognize everything I see; every tree, every rock, every cottage tells me something; that high mountain peak in the distance brings back forgotten thoughts; deep inside me a diffuse choir strikes up the song of time long past. But is all this indeed as long past as I think it is? This two year-long interval, so full of multifarious events, which placed itself between my memories and my present sensations, appears to be shrinking quite noticeably. It seems as if everything happened yesterday or perhaps the day before yesterday, and I am tempted to say: 'The other day!' But why – unless the feeling of the past derives from the fading of my recollections? Indeed, all my recollections, aroused by the **[45]** influence of these new surroundings, and returning as it were to the world of sensations that once produced them, acquire considerable strength: they become literally *present* for me – here and now. If the dog who used to join me on my walks were here, he would evidently recognize this road too, he would feel happy to be here again, he would wag his tail and frolic. And since he would not measure time mathematically by applying celestial mechanics, but empirically on the basis of the strength of his memories, he too would perhaps feel as if he had been here only recently.>

There are dreams that one remembers suddenly one day, although one is unable to place them in a context. One is ready to confuse them with reality, at least if they are not too implausible and if they do not have the confusion characteristic of dreams. But one cannot place them, one searches in vain to connect them to the image of one object or another. Impossible! There are images, generated in our dreams (and occasionally in daydreams) in the vagueness of an undifferentiated thought, which resist attempts to determine when they occurred. We locate such images in the past because that is what we habitually do with images and **[46]** also because of their faded contours.

I have outlined the genesis of the idea of time in a general way, and I have shown its empirical and derived origin. The idea of time, like that of space, is empirically the result of the adaptation of our actions and our desires to an unknown – perhaps even unknowable – environment. What in the outside world is it that corresponds to what we call time and space? We do not know, but time and space are not ready-made categories that somehow independently precede

our behavior, our intelligence. Desiring, and acting toward our desires, we simultaneously create space and time. We live, and the world – or what we designate by that name – comes into being before our eyes. In particular it is the strength of our will which produces the persistence of memory, at least as far as events are concerned. When the Self is involved, either because it takes the initiative and acts upon the situation, or because the situation strongly imposes itself on the Self and thereby elicits an equally strong reaction, my recollection will establish and elaborate itself, and attain a strength that will persist in time.

[47] A desire contains the seed of the idea of possibility and this idea of possibility, in its opposition to the idea of reality, becomes an 'antecedent' – that is, something ideal and imaginary that precedes the true advent of the real. A desire, moreover, is a movement that has been initiated, and as such it is a parade of unfolding images, a sequence of scenes in space, in successive locations. The conditions for memory and for the idea of time are therefore:

(1) diversity of images;

(2) association of every image to a more or less well-defined location;

(3) association of every image to some intention and action, to some inner, more or less emotional event and – as the Germans say – a pleasant or unpleasant *tonality*. The result of all this is a spontaneous ordering of images into a sequential and *temporal* form.

Movement through space is what creates time in human consciousness. No movement, no time! The idea of movement rests on two concepts: force and space; the idea of force amounts to the idea of action, the idea of space to a mutual exclusion of actions, which causes them to counteract each other and to assume some kind of order. This mode of **[48]** organization where entities are not just distinct but *distantiated*, is what we know as space. Objectively, time can be reduced to necessary changes in space, changes that we sometimes represent as straight lines, and sometimes as closed curves or *cycles*.

[49]

CHAPTER FOUR

Time and Memory
Remembrance and the Phonograph
Space as a Representational Mode of Time

I [12]

Reasoning by analogy plays an important role in science; and to the extent that it is the principle behind induction, analogy may perhaps even be considered the basis of all physical and psychophysical sciences. Quite often a discovery has its origin in a metaphor. The light of reason cannot easily penetrate in a new direction and illuminate shadowy recesses unless it is reflected off surfaces that are already bright and clear.[13] We are only impressed by something that reminds us of something else and yet is different. To understand is, at least in part, to remember.

[50] In order to understand the faculties or, rather, the functions of the mind, a good many parallels have been drawn and metaphors evoked. And here, given the still imperfect state of science, metaphor is an absolute necessity: before we *know* we must *portray*. The human brain too has been compared to many different objects. According to Spencer, it has a certain analogy with those player-pianos that can reproduce an unlimited number of tunes. Taine makes it into a sort of printing press, incessantly making and storing imprints. But all these analogies appear somewhat crude. Generally the brain is taken to be in a resting state: images are conceived of as stills or engravings, but this is not correct. There is nothing fixed in the brain, there are no actual *pictures*, only virtual or potential images, waiting for a signal to become active. But the question remains how this transition to actuality takes place. And this is the greatest mystery of the cerebral mechanism; it is the part that is reserved for what is dynamic as opposed to what is static. This requires a criterion for distinguishing the state of an object while it receives and retains **[51]** an impression from the state in which that impression

comes back to life and induces a new resonance in that object at a later time. The most delicate instrument – receptacle and generator at the same time – that comes to mind, after due consideration, as an analogy for the human brain is perhaps the phonograph, recently invented by Edison.[14] I had been tempted for some time to point out that this is a suitable metaphor, when I happened to read, in an article on memory by Mr. Delboeuf, the following casual remark that strengthened this intention: 'the mind is an album of phonograph records.'

When someone speaks into the phonograph, the resonances of the voice are transferred to a needle which engraves into a metal sheet lines that correspond to the sounds uttered, irregular grooves that vary in depth, depending on the nature of the sounds. It may well be that in a similar way invisible lines are incessantly engraved into the cells of the brain, lines that constitute the beddings for the nervous currents. When, after some time, the current happens to encounter one of these previously formed beds, through which it has already passed before, it engages itself in them once again. Consequently the nervous cells resonate as they did the first time, and this comparable resonance **[52]** corresponds psychologically to a sensation or a thought that is similar to the forgotten sensation or thought.

This is actually what happens in the phonograph when, as a result of the action of the needle following the grooves which it cut before, the little copper membrane begins reproducing the vibrations that it did perform before. For us these vibrations once more become a voice, speech, songs, melodies.

If the phonograph membrane had a consciousness of its own, it would say, when we made it reproduce a tune, that it remembered this tune; and it would perhaps perceive as a marvelous ability what to us seems to be simply the output of a machine. Moreover, it would distinguish new tunes from those it had played before, novel sensations from mere remembrances, the present from the past. In fact, the first impressions forcibly make an incision into the metal sheet or into the brain. They meet with greater resistance and consequently require more force: when they occur they cause the heaviest resonance. If, on the other hand, the stylus finds a way through grooves that have already been traced, rather than cutting a **[53]** new path into the sheet, this will occur with much greater ease: it glides without pressure. The term *inclination* has been used: the *inclination* of memories, the *inclination* of reverie. And indeed, to pursue a memory is like letting oneself slide gently down a slope, it is like waiting for a certain number of pre-existing images to present themselves in a sequence, one after the other, without jarring. Hence the tremendous difference between present sensations and memories of the past. All our impressions naturally fall into one of these categories: the former have a greater intensity, sharp contours, and their characteristic bold outline; the latter are fuzzier, indistinct, weaker, although they still appear to impose themselves on us as orderly. *Recognizing* an image is to place it into the second of the two categories, which is that of time. Here one

senses more weakly and one is aware of sensing in this fashion. It is through this awareness of (1) the lesser intensity of sensation, (2) its greater facility, and (3) its pre-established links with other sensations, that memory is engendered and that the temporal perspective is produced. Just as the experienced eye distinguishes a replica from the original painting, **[54]** so we learn to distinguish a memory from an actual sensation, and we can distinguish a memory even before it has been localized exactly as to time or place. We project a particular impression in the past before we know to which part of the past it belongs . This is because a memory always retains its own distinctive character, in the same way a sensation coming from our stomach differs from a visual or an auditory sensation. Similarly, the phonograph cannot reproduce the human voice in all its strength and warmth: the voice of the instrument always remains shrill and cold; it is, somehow, incomplete and abstract, which is at the same time its revealing characteristic. If the phonograph could hear itself, it would learn to recognize the difference between the voice which, coming from outside, would be imprinted forcefully on it[s sheet] and the voice it is emitting, simple echo of the first, following a path already traced.

There is yet another analogy between the phonograph and our brain: the rate of the vibrations imparted on the instrument may profoundly alter the character of the reproduced sounds or evoked images. With a phonograph you may shift a melody from one octave to another by making the membrane vibrate **[55]** at a lower or a higher frequency: turning the crank more quickly will shift a tune of low and indistinct tones to one composed of very sharp and penetrating tones. Would it not be appropriate to say that an analogous effect occurs in the brain when, by directing our attention towards an initially vague recollection, we gradually turn it into a more distinct memory and, so to say, transpose it a few tones upward? Wouldn't it be appropriate to explain this phenomenon too by the greater or smaller rate and force of the activity of our [brain] cells? There is in us a kind of scale of recollections; images are constantly moving upward and downward along this scale that we evoke and dispel, at times vibrating in the depths of our being in a mute resonance, at others bursting out in vibrant sonority above all the other images. Depending on whether they dominate or fade away, they appear to approach or recede, and occasionally we observe how the duration separating them from the present moment expands or contracts. Consequently, an impression I had ten years ago may seem no older than yesterday, because it comes to life again with new strength under the influence of an association of ideas or simply because of **[56]** attention and emotion: similarly singers produce illusions of distance by lowering their voice, which they have only to raise in order to create the impression that they are coming closer.

One might easily add any number of analogies. The essential difference between the brain and the phonograph is that in Edison's – still rather primitive – contraption, the metal membrane is essentially deaf to itself: there is no

translation of its movements into consciousness; and such translation – a most marvelous achievement – is what goes on incessantly in the human brain. A mystery remains, therefore, but this mystery is, in one sense at least, less astounding than it may seem. To presume that a phonograph might be able to hear itself is perhaps less strange than to presume that we might hear it, and yet we do hear it. In fact its vibrations translate, in us, into feelings and thoughts. We must admit therefore that a transformation from *real* movement[a] to thought is always possible. This transformation is even more plausible when it concerns an inner movement **[57]** of the brain than when this movement comes from the outside. From this point of view it would seem neither too inexact nor too outlandish to describe the brain as a perfect phonograph, a conscious phonograph.

[56]a. As opposed to movement understood as a change of relations.

[59]

II

If I now turn from the mechanical to the psychological point of view, I should first state once more that, according to the British school, to understand is to differentiate. Thus intelligence is reduced to *discrimination*, and by the same token memory can be reduced psychologically to this faculty as well. To remember is to distinguish one past sensation (or faded image) from another past sensation (or faded image), and to distinguish these together from present sensations. Let me therefore consider what essential contrast I can establish between sensations on the one hand and representations or mnemonic conceptualizations on the other hand.

It has been maintained that the 'actual conceptualization' of an object by means of imagery and recall **[60]** is impossible 'so long as this object acts upon our senses (...) The percept and the concept of a single object cannot co-exist in consciousness; its perception would completely suppress its conceptualization. Reality is greedy and jealous: all ideation is obscured in its presence, much as the sun outshines the stars'. In support of this position, Mr. Delboeuf calls upon experience. Try to imagine a familiar painting as vividly as possible. It will help if you close your eyes, and the image may even attain such intensity that you would almost take it for real. A painter may indeed draw a portrait from memory. If you keep your eyes wide open, however, the required effort is much greater; you must, so to say, cancel their viewing power with your will-power, 'strike them with blindness' with respect to everything that might attract attention. If you look closely at a particular object, an engraving for instance, it will be almost impossible to mentally visualize your painting. 'You would not succeed in any

case, says Delboeuf, even if the real piece would be directly in front of you and you were looking at it intently.'

Now this, I think, is a considerable exaggeration. It **[61]** is true that perception and conceptualization of the same object are mutually exclusive insofar as they are different, and that they tend to merge – or even do merge – insofar as they are identical; but it is no less true that in the case of superimposition of an image and a percept, one is aware of this coincidence, this adaptation.

Mr.Delboeuf also mentions the example of someone who is mentally singing a familiar tune. Noise might be disturbing to some extent, but a different tune, played in the immediate vicinity, would be much more obstructive to the extent that its tempo and rhythm resemble the tune one had chosen. Ultimately, 'if the two songs are identical, any attempt to hear the internal notes will be totally in vain.' This is indeed so for attempts to separate and distinguish representation from perception at the time they coincide; but the difficulty involved in representing how an object feels while one is feeling it is not insurmountable.

The preceding considerations lead Mr. Delboeuf to reject the so called 'law of resemblance', according to which likes evoke the memory of likes. He does not deny that a portrait reminds us of the **[62]** original; only, what in the portrait reminds us of the original are not the features that it has in common with the original, but precisely those that it does not share. For example, because the portrait does not move or speak, one can say that 'one is expecting to see it gesticulating, to hear it talking.' And it is an everyday experience to remember having seen a person before when you meet him for the second time. 'To be exact, you recall the first occasion on which you met that person.' In fact, the true object of memory is the context in which you have met originally, in as far as this context differs from the circumstances under which you meet this time. You will remember the room where she was, the people with whom she chatted, the dress she was wearing; you will notice that she was younger, or thinner, or healthier. In short, 'you will not at all recall the features and circumstances that were exactly alike. How could it be otherwise, since you have them right before your eyes?' This leads Mr. Delboeuf to the conclusion that the perception of something that has been perceived before re-activates one or more earlier peripheral states that will then generate certain concepts, to the extent that they differ from the actual peripheral **[63]** state. The mind decides that the objects of these conceptualizations are absent because their images are faded in comparison with those of objects that are actually present and that constitute the setting for the thing which in fact elicits this memory. This is, in Mr. Delboeuf's opinion, the true significance of the laws of similarity and contrast, which some psychologists incorrectly place among the laws of association. Resemblance activates the recall of differences. The present image, in as far as it is identical with the past image, regenerates the old context in as far as that context differs from the present one.

Although I do not reject the principle of association through similarity, I agree with Mr. Delboeuf that the context is the decisive factor in remembering; and this context is, above all, a place which provokes the recall of a date. To remember means to re-place a current image in time and space. It is like 'finding the right page and location in an atlas where something has been engraved.' In my view the maps in this atlas of time are made of spaces, places, and local scenes. The image of a past object, reflected by a similar, present object, reproduces in a fainter form one of the pages from this atlas, that is, a particular place with a particular scene, and this is when we say we **[64]** *recognize* the object. Since, moreover, the pages are more or less vaguely numbered on the basis of their remoteness and their mutual connections, we sometimes, but not always, transform local scenes into temporal ones by assigning them a date. Here space is always the prime initiating factor.

Messrs. Taine and Ribot have shown quite clearly how we succeed in localizing images in time with considerable precision. Theoretically, they argue, we have only one way of proceeding: we determine positions in time exactly the way we determine positions in space, that is, relative to a *fixed point* which, in the case of time, is our present state. Messrs. Taine and Ribot maintain correctly, and in agreement with what I said earlier, that the present is a *real* state which already possesses a certain *amount of duration*. However short it may be, the present is not just a spark, a nullity, an abstraction analogous to the mathematical point: it has a beginning and an ending and, in addition, its onset does not strike us as an absolute beginning: it is always contiguous with something else that it fuses with to achieve continuity. This is what Mr. Taine has called the 'two extremes of an image.' When we read or hear **[65]** a sentence, adds Mr. Ribot, at the fifth word something will remain of the fourth word. Each state of consciousness fades in a gradual fashion: it leaves behind a trail similar to what in physiological optics is called an afterimage (*after-sensation, Nachempfindung*). As a result the fourth and fifth words are continuous, the endpoint of the former meeting the onset of the latter word. For Mr. Ribot as well as for Mr. Taine this is the capital point. There is contiguity, but not an undefined one, arising because two *arbitrary* extremes meet, but because the *initial point* of the current state touches the *endpoint* of the immediately preceding state. According to Mr. Ribot a correct understanding of this simple fact automatically entails an understanding of the theoretical process of temporal localization, because the retrograde influence may also affect the transition between the fourth word and the third, and so forth; and since every conscious state has its duration, 'the number of mental states traversed regressively plus their duration determine the position of a given state relative to the present one, that is, its distance in time.' Such is theoretically the process of localization: 'a retrograde trajectory which, **[66]** starting from the present traverses a series of terms of variable duration.'

Psychologists have pointed out that in practice we may rely on simpler and

more expeditious procedures. We rarely take this regressive route through all the intermediate states of mind, and generally not even through a majority of them. We achieve simplification above all by the use of *reference points*. Mr. Ribot gives an example: 'On the 30th of November I am expecting a book that I urgently need. It is being sent from afar and shipping normally takes at least twenty days. Have I ordered the book in time? After some deliberations I remember that I made my request the night before a short trip which, I know with certainty, took place on Sunday, November 9. At this point recall is complete.' The principal state of consciousness – the request for the book – is initially projected into the past in an indeterminate way. It arouses secondary states and establishes its position relative to them – before or after. In Taine's words: 'a memory image travels along the line of the past, sliding forward and backward; every [relevant] mental proposition will affect its position.' After a few oscillations, large or small, the image will **[67]** settle in its final position; it is stabilized and recognized. In this example the recollection of the trip is what Mr. Ribot calls the 'reference point.' The reference point is an event, a state of consciousness, whose exact position in time we can identify – that is, its distance relative to the present – against which we measure other temporal distances. 'It is a state of consciousness which resists forgetting better than other states because of its intensity, or which, because of its complexity is capable of arousing many connections thereby increasing its chances of being revived. These reference points are not arbitrarily chosen, they impress themselves upon us.' I wish to add that they are always drawn from or related to spatial expanse. Thus the trip in Mr. Ribot's example consisted of a series of spatial scenes. Even if a pronounced pain or joy serves as a reference point, that pain or that joy is inevitably localized in space; only by that token can it be placed in time and, subsequently, serve as a reference point for further temporal localizations. Indeed, it is primarily by means of space that we determine and measure time.

[68] Mr. Ribot compares these reference points to milestones and signposts which, from a single point diverge in several directions. 'However, it is remarkable,' he adds, 'that these sequences can, in a sense, juxtapose and compare themselves against each other.' But, let me ask, how can we contrast durations if genuine juxtaposition is only possible in space? This is because we believe we are directly comparing durations whereas, in fact, we are comparing spatial images, spatial perspectives. We take the years of our life, periods of years, and each year is represented by an observable revolution of the sun, divided into smaller parts between which we interpolate the most prominent events of our lives during the year.

Reference points facilitate the mechanism of temporal positioning. The event that serves as a reference point is repeatedly recalled to consciousness; its temporal position is repeatedly re-established relative to the present, that is, the intervening states which separate it from the present are revived more or less clearly.

According to Messrs. Taine and Ribot the result is that the **[69]** position of the reference points is – or appears to be – established more and more accurately. Due to the effect of repetition, the localization becomes immediate, instantaneous, and automatic. This process is analogous to habit formation. Intermediate states vanish because they are no longer useful. The series is reduced to two terms, which suffice because their temporal separation is sufficiently established. 'Without this *abridgment procedure*, without the disappearance of an enormous number of elements, localization in time would be very time consuming, clumsy, and confined to narrow bounds. Thanks to this procedure, however, an image is provisionally and immediately positioned the moment it is aroused, it is located between two anchor points, the present and some other reference. The process is terminated after several, sometimes laborious, fruitless, and rarely precise attempts.'

Everybody will notice how closely this process resembles the way we localize in space. Here too we use reference points, shortcuts, and well-established distances that we use as our yardsticks. But Mr. Ribot might have added that there is more than an analogy in this case: there is an identity! **[70]** Actually, to localize in time we attach reference points to space and the abbreviating procedures so well described by Messrs. Taine and Ribot are, really, shortcuts in space, representations of visual scenes with vaguely defined distances that are subsequently given precision by means of *numbers*. The present moment is clearly the point of origin for any representation of time. We can only conceive of time from a present perspective, in which we represent the past behind us and the future in front of us. But this perspective is always a spatial scene, some event that occurred in a material and *extended* context. The form of our *representation* of time, the way we imagine it, is essentially spatial.

The space we perceive is *in front of us*; the space we simply *represent* without perceiving it is behind us. In fact, we can only represent the space behind our backs by imagining that we are frontally facing it. So it is with time; we can envision the past only as a perspective *behind us*, and the future emerging from the present as a perspective **[71]** *in front of us*. The primitive view of time in animals and young children must be a simple string of increasingly faint images. Time acts, initially, as a fourth dimension of the objects in space. It has lines, surfaces, distances that are impossible to traverse without moving and, finally, there is one kind of distance that can only be traversed by intermediate steps, namely the separation between the desired and the possessed object, that is, separation in time. Hours, days, years, they are just as many empty pigeonholes in which we deposit all the sensations as they come to us. When the pigeonholes are full and we can run through the whole series without hiatus, they constitute what we call time. Initially these were no more than divisions of space; now the accumulation and the regular distribution of sensations in space, generate this phenomenon that we call time.

Not only do we categorize and label our internal events, but in exactly the same way we classify events that took place before we were born; moreover we impose the same divisions on future time. We draw, from the past towards the future, **[72]** a long and heavily subdivided line that basically represents the line followed by sun and stars in their eternal course. The convenient subdivisions of this line provide us with an opportunity to put everything in order. Spencer states that in ancient times and in uncivilized parts of the world people define space in terms of time and that later, due to progress, time is defined in terms of space. Thus savages express the location of a place, like the ancient Hebrews, in terms of the number of days away. In Switzerland tourists are told that a village is so many hours away. Spencer's theory is artificial, though. It is quite natural that, in earlier times, when rigorous yardsticks for measuring space were lacking and the distances to be appreciated were *walking* distances, the answer would be in terms of walking time. But, in reality, the day and the hours, marked by the visible positions of the sun are a regular sequence of spatial scenes, of visual expanses. None of this implies that the notion of time actually *preceded* the notion of space. Time is an artifact arising from the indirect measurement of large distances, but from this it does not follow that one has to count **[73]** time in order to perceive the elementary visible and tangible expanses.

From a scientific point of view the most primitive and fundamental unit of measurement must evidently be a quantity that can be measured (1) directly, and (2) by comparison against itself. Expanse – spatial extension – indeed satisfies these two conditions. It is measured directly by superimposing one expanse on another and comparing them. Neither time nor movement are required as elements in this comparison. In contrast, neither time nor movement can be measured directly or by self-reference. I cannot *directly* superimpose a standard interval on another time interval because time is in constant flux and never repeats itself. I can certainly recall an interval and compare it with a real time interval, but in that case the standard is unreliable and the measurement unscientific: I will certainly be wrong! Moreover, if you look more closely, you will see that in the case of this *approximate* internal measurement, in order to compare two durations, you are forced to *represent* the standard interval: how will you represent it? If you come to think of it, this will turn out to be in terms of space. **[74]** You will remember what you did at a certain time in a certain place and you will compare this recollection with your present impressions, and you say: 'This is – or is not – roughly of the same length.' Reduced to duration without space you will not succeed in constructing a measure [of time]. This is why giving a certain permanence to this incessant flow of time requires its being represented in spatial form.

The ear is the peripheral sense which, in addition to the internal processes, has been important in detaching time from space and in giving it a dimensionality of its own. The reason is that the ear provides only vague spatial cues while its

localization in time is excellent. An animal is lying motionless somewhere in a quiescent landscape: a sound is heard once, twice, three times, which creates a series of events in contrast with the unchanging scene: it is as if time becomes alive in the sound. The ear evolved to help animals detect the proximity of an enemy. On that assumption it is easy to understand the distinction between the first, soundless scene, the second in which the sound is heard, and then the third in which the enemy appears. This invisible and intangible entity, sound, **[75]** has gradually projected itself into a non-spatial domain, more or less analogous to the internal domain of vital needs which essentially constitutes time. The sense of hearing, gradually detached from spatial forms, has developed into a sort of rhythmic counter; it is the principal sense for evaluating duration, order, rhythm and meter.

Another means of separating time and space is imagination. We do not only move with our legs, we also move by means of our representations, passing from one to the other in our thought, and we have no difficulty distinguishing our mental promenades from actual locomotion. Given a particular state of consciousness we attach to it a string of other representational states that naturally and always lead to the present state as its terminal point. Thus we proceed backward in order to finally return to the point of departure. Such an idealized space is quite unlike real space and it allows us to conceive of a[n abstract] setting in which things occur *in succession* instead of co-existing like objects in space.

While space enables us to generate and measure time, time allows us, as we have seen, to compute **[76]** spatial relations. Here we have a case of a mutual action and reaction. A blind person will declare that a stick is long or short, depending on the time it takes to explore the stick manually from end to end. If the stick, instead of remaining stationary, moved in the same direction as the person's hand – which would eliminate the feeling of friction – it would appear extremely long, while moving it in the opposite direction would make it appear very short. This has been confirmed in some experiments on Laura Bridgman.[15] It does not follow, however, that the idea of *duration proper* is implicated here. The idea of number is perhaps sufficient to account for this case: a distance traversed seems longer when it gives rise to more sensations, while it seems shorter when it generates fewer sensory impressions. I am not arguing that we actually count every individual sensation; neither do we have to measure the volume of two unequal mountains in cubic meters of earth, and yet we can tell at first sight that one is larger than the other and contains more earth. Numbers can exist in the absence of enumeration and one can estimate without detailed computations. Animals do not know arithmetic and yet a bitch knows very well if the number **[77]** of her puppies has decreased or increased. In some cultures people do not count beyond two, for example the Damara, but they nevertheless keep immense herds of cattle, and they immediately notice if one of their animals

is missing.[16] In evaluating the number of sensations during an interval we follow the example of animals and primitive tribesmen, that is, we cast a glance and guess. The result of this evaluation represents simultaneously the apparent length of time and the spatial expanse traversed during that time.

This clearly proves that we measure time on the basis of the number of sensations and in no way on the basis of their pure duration; this is the way we arrive at the approximate length of a dream. In this case there is no artificial measurement: no tick-tock of a watch is telling the time. Since this judgment is exclusively based on conscious deliberation, our only recourse for estimating how much time has elapsed is the number of images that passed before our eyes, which can lead to the most peculiar errors. A particular dream seems to have lasted several hours, even though in reality it has not lasted more than a few seconds. There is the example of **[78]** a student who unexpectedly fell into some state of lethargic sleep but who was instantly woken up by his friends. In that brief instant he had acquired a very clear impression of a tremendous number of adventures during, what seemed, like a long journey in Italy. If one would have asked this young man to estimate how long he had been asleep he would undoubtedly have guessed several hours. He just could not believe that all these towns, monuments, people, that all these kinds of events would have passed before his eyes in two or three seconds. Of course this extraordinary phenomenon will only occur in a dream where images, not being associated with any particular spatial location, can follow one another at a tremendous rate. This would be impossible in a state of wakefulness, because people move through space relatively slowly. However, what transpires from these examples is that we do not really become aware of the *duration* of our sensations and perceptions as a result of some predetermined form but that, instead, we evaluate duration *a posteriori* on the basis of their number and variety.

Excavations have shown that under the cities buried by Mount Vesuvius there are traces of even older cities **[79]** that were buried and disappeared in still earlier times. Their inhabitants erected one layer of buildings on top of the other whenever the latter had been covered again by the rising ashes; thus layer upon layer of city has been added; underneath the streets you will find subterranean streets, below intersections there are other intersections, [in other words,] the living city is founded on the sleeping cities. The same happens in our brain; our present life covers, without erasing it entirely, our past life which serves as support and hidden foundation, If we descend into our inner depths, we are lost among the debris. To restore and reconstruct them, to bring them into full daylight again, the most important and almost unique means available is spatial organization.

Once memory has been established, the *Self* is established too. Time and motion are derived from two essential sources: outside the unknown, and inside

a certain activity, a certain energy being released. We can neither know ourselves in depth, nor know that which exists outside us and from which the Self is to a large extent derived. What are our **[80]** inner strengths, and what are the limits to the development of this internal source of energy? And, on the other hand, what is the secret of this silent nature surrounding us? These two unknowns constitute, in my view, the fundament for all the other [epistemological mysteries], time included.

We have seen that <memory derives from the feeling of sameness contrasted with the idea of difference and opposition; physiologists agree that empathy derives from the discovery of a resemblance or a harmony between ourselves and others; I recognize myself in the other through empathy[17]; similarly I recognize myself in the past through memory.[a] Memory and empathy have basically the same origin.

I wish to add that memory produces attachment to objects that best provoke this feeling of similarity and that are the most instrumental in making us re-live our lives. Secret ties bind us to a host of things around us in our heart of hearts, things that appear insignificant to everyone **[81]** else and that only have a voice and a language for us. But this uncertain love invoked by memory and habit is never free of melancholy; it counts even as one of the most active sources of sorrow because its object is forever changing and inevitably associated with the remembrance of things past, things that are no more. Consciousness is a representation of changing objects, but consciousness itself does not change as rapidly. While we are adapting to a novel environment, we still retain the bent and shape of the earlier environment in the depth of our mind, which creates a polarity in our consciousness, two tendencies, one towards a past to which we are still attached in so many respects, the other towards a future, unfolding before us, to which we are already adapting ourselves. This feeling of being mentally torn apart is one of the causes of the melancholy created by reflective memory, a sad feeling which, at least in human beings, replaces the charms of spontaneous memory. In some way simply thinking of a past event, whatever it may be, already carries the seed of sadness which grows as we focus inwardly. Remembering, for a thinking being, is frequently very close to moral suffering. The idea of past and **[82]** future is not only a necessary condition for suffering, but in some sense it is also its sufficient ground. Human greatness – the ability to recognize oneself in one's past and to project oneself into the future – may eventually become a persistent source of bitterness. The idea of time itself is the incipience of regret. Regret and remorse constitute the solidarity of past and present; this solidarity always introduces sadness into reflective thought because it is the feeling of the irredeemable. Even in a simple recollection, in the

[80]a. I found an eloquent expression of the same idea in *Psychologie* by Mr. Rabier.

consciousness of past, there is what the poet has expressed with some profundity in this verse:

Comme le souvenir est voisin du remords![18]

Remembering is always being conscious of something we cannot change – and yet this something is forever attached to us. Remorse is also a feeling of inner impotence and precisely this feeling is in some vague fashion inherent to the way we recall a life that is constantly escaping us, a world **[83]** to which we no longer have access. The holy myth tells us that our forbears burst into tears when, banished from Eden, they saw their lost paradise recede and vanish behind them; this is the symbol of primal remorse but also the symbol of the first remembrance. Whatever range of our experiences, each of us has a past, a lost paradise filled with joy and melancholy, to which neither we nor our progeny can ever return.

If there is a bitterness at the bottom of every recollection, even of one which at first seems pleasant, how will it be with painful memories, especially the moral ones, the only memories that we can integrally revive and represent? The painful recollection may strike an adult with a force that swells with the effort he expends to overcome it. The harder one struggles to be rid of it, the deeper one sinks in. It is like being drawn into quicksand. We become aware of the fact that the depth of our Self is in constant motion, that every thought and every sensation permanently generate turbulence and undulations, that there is no solid ground on which to walk or stand. The Self escapes **[84]** our clutch like an illusion, a dream; it disperses and dissolves into a multitude of fleeting sensations, and with a certain vertigo we feel it sink into the moving abyss of time.>

[85]

CHAPTER FIVE

The Illusions of Time: Normal and Pathological

I

The estimation of duration, being purely a phenomenon of internal optics, a perspective of images, cannot but display a fundamentally relativistic character. It is indeed relative to:

(1) the *intensity* of the represented images;

(2) the intensity of the *differences* between these images;

(3) the *number* of images involved and the number of their differences;

(4) the *rate* of succession of these images;

(5) the mutual relations between these images, their intensities, their similarities and differences, their respective durations, and finally their temporal *positions* in time;

(6) the time required for conceiving these **[86]** images and their relations;

(7) the intensity of our attention to these images and to the feelings of pleasure and pain that are associated with them;

(8)[19]

(9) the appetites, the desires or emotions that accompany these images;

(10) the connection between these images and our state of *expectation* and anticipation.

This shows how a multiplicity of relationships between representation, emotion and will influences our sense of duration.

Consequently I have no idea how I could possibly accept the overly simplistic laws [of time judgment] that have been suggested; in my opinion each expresses only one aspect of the problem. Romanes, for instance, argues in his research on time consciousness that, apart from the *number* of states of consciousness, there is an additional factor which influences the lengthening or shortening of time, namely 'the relation of states of consciousness to their intrinsic succession.' In experiments in which subjects have to judge one-second intervals, time seems relatively long; this is, according to Romanes, because in this case attention is entirely focused on the production of a single, unique series of changes, much like the ticking of a chronometer; during the experiment these changes constitute, therefore, the total content of conscious awareness; consequently all their sequential relations are **[87]** clearly imprinted in memory, thereby filling it. Such a large number of clear impressions has the effect of making the series appear longer.

Everyone has noticed that objects are distorted in memory. We perceive them as larger or smaller, more pleasant or unpleasant, more beautiful or ugly, etc. Ordinarily, time is the great attenuator of reality, blurring out or rounding off its sharp contours. This distortion can be explained by the struggle for survival: among the persisting memory traces those which are the deepest are also the most vivid. Moreover, the attribute of an object which has struck us most tends to mask all the other characteristics: shadow prevails all around, and this attribute is the only one to appear in the limelight of the mind. When I return to the street where I used to play as a child and which always seemed so wide and so long, I find to my astonishment that it is just tiny. The reason is that in my childhood all my impressions were intense, new, and fresh. The impression created by the dimensions of the street was therefore a very vivid one. Later, when I recall the street to mind, the intensity of my subjective impressions is transferred upon the original object and translated into spatial terms, simply because **[88]** in memory everything tends to be spatialized, even duration.

The vividness of an image causes errors, since it separates the event [represented by the image] from the series of reference points we use to delineate the past. According to Sully the most striking examples of such errors are engendered by public events, which extend beyond the narrow bounds of our private lives, and which are not connected to specified points in time like ordinary events. Such events can move and engross us at a given moment; but, in most cases, they leave the mind as quickly as they came. We have no opportunity to return to them; and if someone reminds us of them later, they will almost certainly appear more recent than they are, simply because the interest they initially aroused has given their images a particular vividness. Sully mentions a curious example of this type of illusion, provided recently by the newspapers recalling the trial and conviction

of several police detectives, who were about to be released after having served their sentences (three years of hard labor). 'The news that three whole years had passed **[89]** since this sensational case astounded me as well as many of my friends; we agreed that the event did not seem to us longer ago than about one-third of its real distance in time. Several newspapers also mentioned the apparent brevity of the time that had passed, and this evidently shows that in this case a causal factor had been at play to create a widespread illusion.' The apparent distance of an event that is not clearly localized in the past is inversely proportional to the vividness of the mnemonic image; all consciously focused attention to a recollection tends to make it seem closer in time. It is, according to Sully, like observing a remote object through binoculars: the haze disappears, new details emerge, to such an extent that we may even come to think that the object is actually within our reach.

In cases where the mind, under the influence of an unhealthy tendency to nourish a passion, gets into the habit of returning incessantly to some painful circumstance, this momentary illusion can become periodical and even lead to a partial confusion of remote and recent experiences. An offense one has kept alive in one's **[90]** memory will, in the end, act like something that moves forward at the same pace as we; it constantly presents itself to our memory as something that happened very recently. In cases of insanity brought on by some terrible shock, we can observe the unrestrained development of this tendency to rake up the past: 'events long past, remote circumstances will merge with present facts'[a]

Another cause for error in our evaluation of duration is that we tend to combine the time required for representing an event with the actual duration of the event. In psychophysical experiments, when asked to judge the duration of the fast beating of a metronome, I overestimate. Unconsciously I add the time needed for representing and evaluating the beats to the objective duration of these beats which, as a result, seem to be lengthened. In contrast, when the beats are very slow, I tend to make them shorter than they are: in this case their representation is more rapid than the beats themselves, and I tend to confound the subjective rate with the objective rate, **[91]** just as, earlier, I confounded the subjective slowness with an objective slowness. The dancer who is required to follow too fast a rhythm will be short of breath and lag behind; if he is made to move too slowly, he will remain with one foot in the air trying to accelerate the movement. Thus, effort, more or less brief and fast, plays an important role in our notion of time. It is through effort or desire that we first encounter time; and we preserve this habit of estimating time on the basis of our desires, our efforts, our will. We affect its length by our impatience and our haste, just as we alter its rapidity by the sluggishness of our efforts to represent time. Estimation of past duration depends on the apparent duration of the process of reconstruction itself, that is,

[90]a. J. Sully (1881). *The illusions.*

on the effort spent in recalling various events. Thus, when all these events are related and resemble each other, the attentional effort required for retrieving them from memory will easily adapt itself to each of the successive images, as is argued by Wundt, and the whole series, easily processed, will appear shorter. On the other hand, if the events are discontinuous, unrelated, or too varied and dissimilar, the reproductive effort **[92]** requires more time and the series of events will seem longer. This is similar to the case of two equally long horizontal lines, one of which is hatched with vertical lines: this line will appear longer because the eye that is scanning it will be stopped by these cross-lines, and since the movement of the eye is slowed down, the line will take on an apparent additional length. Analogous optical phenomena exist for time as well. But this offers only part of the explanation, not all of it.

In psychophysical experiments on the judgment of duration of chronometer beats, one finds that the point where an estimated time interval is, on the average, equal to the real interval and is reproduced faithfully, is on the order of 0.72 seconds; in fact, this is also the mean value of the duration that is, on the whole, necessary for reproduction by remembering or representation. Therefore, the processes of reproduction and association are most readily accomplished at a rate of approximately 3/4 of a second. From this Wundt concludes that when we have to represent objective intervals that are longer or shorter, we try **[93]** – involuntarily – to make them equal or at least as similar as possible to this normal rate of representation. This is one reason why we accelerate taps that are slower than three quarters of a second and decelerate those that are shorter. Here again, is a matter of desire and satisfaction that dominates our representation of time. But Wundt mentions an even more remarkable fact. That same 3/4 of a second also happens to be the time it takes the leg to execute one step in a quick pace. And thus, I should add, it is ultimately the duration of *one step in space* from which derive our measure of time. It is likely that the stride was man's first measure of space, and consequently, his measure of time. Initially the most general form of time was the sequence of images that one has when making a series of movements, viz. a series of steps. One observes the displacement of objects to the left and to the right, and if one turns around one will find them again. In this way the three dimensions of space and the unique dimension of time organize themselves in our imagination. At a later age we still match the rate of our representational processes to our steps and, because of a natural tendency **[94]** we try to adapt the rate of time to the pace of our thoughts and our legs.[a]

[94]a. Let me add that in music a tempo of 0.72 constitutes an Andante giusto which proceeds neither too slow nor too fast, but at a natural pace.

Stevens has obtained results that differ from those of Vierord[t][b], Mach[c], Kollert[d], Estel[e] and Mehner[f]. Stevens found that brief intervals tend to be shortened even more, and similarly that the length of long intervals tends to be increased further. In Stevens' experiments the 'indifference point', that is the point of accurate reproduction, is essentially the same as for the other investigators. But it should be pointed out that his experimental conditions were not the same. Vierord[t] and his successors made a comparison between two time intervals, and this process was entirely *mental*. Stevens restricts himself to a single interval which he has the subject reproduce [repeatedly[20]]. This introduces completely new aspects and intervening factors, as Stevens himself recognizes: the use of the will, motor impulses, the transmission of impulses via the efferent nerves, as well as the latency introduced by **[95]** muscular contraction. Stevens himself does not propose an explanation for the results he obtained. But perhaps, since the will to reproduce and the reproducing movement are the most important factors in his experiments, the following result must obtain:[21] when the interval to be reproduced is below the point of indifference, one will initially judge it as being short even if one *imagines* it to be longer than it is, and one will adopt a rate of motor reproduction whose purpose is not to stay below the standard. This rate then induces a further shortening of intervals that are already short. In contrast, when the time interval is longer than the indifference interval it will seem long notwithstanding the spontaneous shortening imposed on it by imagination, and the will imparts a slow, restrained movement, for fear of too high a rate [of reproduction]. The result is a lengthening of intervals that are already long. The musician to whom the metronome indicates a rapid beat tends to play even faster in order not to lag behind; if the metronome indicates a slow tempo, he will perform even more slowly for fear of going too fast. This is the explanation that I would propose for the observed discrepancies between investigators.

[96] According to Estel, our representations of time, like other sensations and representations, are influenced by past impressions that occurred in the domain of a specific sensory system. A time interval that has been perceived as short by the auditory sense, will make the following sound appear even shorter.[a]

[94]b. K. Vierordt (1868). *Der Zeitsinn nach Versuchen*. Dissertation University of Tübingen. Tübingen: Verlag Laupp.

[94]c. Quoted in W. Wundt (1874). *Grundzüge der physiologischen Psychologie*. Leipzig: Engelmann; p. 785.

[94]d. J. Kollert (1883). Untersuchungen über den Zeitsinn. *Philosophische Studien, 1*, 78–89.

[94]e. V. Estel (1885). Neue Untersuchungen über den Zeitsinn. *Philosophische Studien, 2*, 37–65.

[94]f. M. Mehner (1885). Zur Lehre vom Zeitsinn. *Philosophische Studien, 2*, 546–602.

[96]a. V. Estel, o.c.

The influence of waiting on apparent duration is well known. If a waiting period seems *long* this is because it contains a series of disappointments, of *not yets*. Our longing, combined with the representation of the awaited object – the arrival of one's beloved, for instance – tends to make us envision the future as already present, and because we would like to see this future happen instantly, we leap over the intermediate events, we imagine that the distance has been bridged; consequently we wish and conceive of it as shorter than it can or must be. This is the source of the interminable *when*? By comparison with the ideal time and its ideal tempo, real time seems to drag intolerably.

When the waiting is over, some authors say (with Wundt) that the time which had seemed so long suddenly contracts as soon as they **[97]** forget their *ennui*; others (following Sully) maintain that they do not at all forget their tedium and that the waiting period retains its characteristic slowness in their memory. Everything, in this case too, depends on the actual comparison made and on the presence or absence of a recollection of tedium.

Now, why does the time of happiness – play for the child, the amorous *rendez vous* for the young man – appear to have *flown by* with such distressing rapidity? This is because, as a result of the idealized anticipation, we were expecting and longing for an extended bliss – a never ending happiness: but how brief does reality seem in comparison with the reason for our longing and our waiting! 'What? Already?' We have projected before us, by force of imagination, a long way to go, a genuine 'lovers lane' and when we reach the end we inevitably find it has been too short. In happy times we desperately cling to every hour that passes; it leaves in us a luminous trail, and we continue to watch it growing dimmer and dimmer without altogether vanishing before our spellbound eyes.

Wundt explains most of the errors of judgment of duration by the fluctuations of **[98]** *apperception*, – that is, *attention to representations* – which is in a state of greater or lesser tension. In this case, however, the level of attention is only a secondary factor. True tension resides in desire, in motivation, the internal force which is pushing from the present to a future goal, sometimes desired and sometimes feared. In the first case, time is passing too slowly; in the other it goes too fast. We cannot help but measuring its length relative to our desires: *apparent time* varies with motivation or desire.

Sully argues that the shortening of time judged *in retrospect* does not obey any law. One cannot say that it is judged proportional to remotenes; one must even admit that it is not. 'If I represent the last ten years of my life by a straight line one meter long, then the past year will cover three or four decimeters; the fifth, full of events, covers as much as two decimeters; and the other eight years are squeezed into the remaining stretch.' In history the same illusion prevails. Certain centuries appear longer: 'the period between the present and the fall of Constantinople seems longer than that which connects the latter event with the first **[99]** crusade, although the two periods are chronologically of roughly the same

length.[22] It is likely that this is due to the fact that we know the former period better and perhaps also because we fill it in with personal memories.'

In my opinion, the apparent length of time, judged in retrospect, increases as a function of the number of well-delineated and *intense* differences perceived in the events we recall. A year, filled with notable and varied events will seem longer. An empty and monotonous year will seem shorter: the impressions are superimposed and the time intervals blend and seem to contract. Here again is a phenomenon that has an exact analogue in space. The distance of an object is visually perceived as greater if a number of objects is interposed which serve as landmarks. Just as in space sharply outlined objects appear closer, we have seen that in well-defined events in time seem to have taken place yesterday.

Errors in judging time are greater for remote periods than for recent intervals of equal length: thus the retrospective estimation of an interval far removed from the present moment, for example **[100]** the time one has spent in school, is much more superficial and much more fragmentary than the estimation of an equally extended, but more recent period. The perspective in past time corresponds therefore to a spatial perspective where the size of the relative error due to perspective diminution would increase with the distance.[a]

In a similar fashion we can, I think, explain the familiar phenomenon that the years appear so long in childhood and so short in old age. Youth is impatient to satisfy its longings; it would like to devour time, but *time is dragging*. Moreover, impressions in youth are vivid, novel and numerous; consequently the years are filled, differentiated in a thousand ways, and the young man perceives the past as a long series of spatial scenes. The back of the stage recedes into the distance, as it were, behind all the changing props that follow each other as if they take place by open curtain: one knows that in the theater a whole line of decors is waiting below stage ready to rise before the eyes of the spectator. These decors are like the images of our past that reappear; some are more faded, more indistinct and **[101]** hazy, creating an effect of distance, while others serve as coulisses. We classify them according to their degree of intensity and their order of appearance. And the stage-hand is our memory. Thus, for the child, last New Year's Eve recedes ever more behind all the events that occurred since then, and next New Year's Eve also seems very far away, so impatient is the child to grow up. In contrast, old age is like the unchanging decor of the classical theater, a simple, unassuming setting. Sometimes [it creates] a veritable unity of time, place and action which focuses everything on one dominant action to the exclusion of all others, at other times [it only leads to] a nullity of action, place, and time. The weeks resemble each other, the months resemble each other; that constitutes the monotonous rut of life. All these images become superimposed and in the end merge into one. Imagination abridges time. Desire does likewise; as the end of

[100]a. J. Sully, o.c., p. 179.

life approaches, one says: 'There goes another year! What have I done with it? What have I felt, seen, accomplished? How is it possible that three hundred and sixty-five days have passed in what appears to be no more than a few months? If you want to lengthen the perspective of time fill it, if you have the opportunity, with **[102]** a thousand new things. Go on an exciting trip, which would rejuvenate by rejuvenating the world around you. The host of events, the distances traveled will accumulate, bit by bit, in your retrospective imagination: you will have a large number of fragments of the visible world arranged serially, and this will, as has been said so aptly, occupy a long *space* of time. According to Mr. [Paul] Janet, the apparent duration of a certain period of time interval, in every person's life, is 'proportional to the total duration of that life.' [a] For a ten year-old child, he says, a year represents one tenth of its whole life; for a fifty year-old person the same year will not be more than one fiftieth, and accordingly it will appear five times as short. Moreover, the age of fifty seems extremely old for the child, but not for the middle-aged person. In fact, this law supposedly applies only to rather long time periods, of the order of years, not days or months, which we would never consider comparing with a whole life. In my opinion, Mr. Janet's law expresses a genuine tendency of the imagination to judge **[103]** quantities against what it can represent as larger or smaller: to those who have not traveled a great deal, the village seems large; to those who have seen Paris, a provincial town will appear small. But the law proposed by Mr. Janet is much too mathematical and too simple to be the sole explanation for the apparent shortening of the years in the old person's eyes. The fusion of similar impressions and similar periods that are superimposed upon each other plays, I think, a much more important role in this case.

Mr. Janet provides yet another example of the way we evaluate duration by comparing part and whole. If you only travel by train from Paris to Orleans, you will already feel tired at Choisy; if, on the other hand, you go from Paris as far as Bordeaux, you will only experience the same feeling of fatigue and boredom near Orleans. In my opinion this effect can be explained by the difference in *expectancies*. When going from Paris to Bordeaux, you prepare for a long journey, you adopt an attitude of resignation in advance and you feel upset by boredom only much later. But if you board the train for Orleans, you say to yourself beforehand: 'This will not take very long, I'll arrive soon.' And **[104]** when at Choisy, you exclaim: 'It is longer than I thought!' The important aspects in this case, once again, would seem to be attention, expectation and motivation.

We represent and estimate the duration of an interval objectively by means of the succession of states of consciousness that can be – and in fact are – represented, and that we place within the confines of that interval. In other words, we judge the length of an elapsed time interval by means of a series of

[102]a. Paul Janet (1877). Une illusion d'optique interne. *Revue philosophique*, 1, 497–502.

recollections that we insert into it. Nothing that we do not remember can, of course, ever enter into this series. The result is that the more numerous, intense and distinct recollections we have to insert between two endpoints, the longer the interval will appear. Thus, the child has many and varied representations to locate within the period of one year. In contrast, for the adult memories will fuse and overlap, and only a few salient points will stand out. This then is the principal explanation for the apparent shortening of the years. Conversely, if one night's dream seems to span a century, it is because there has been a rapid succession of vivid and distinct images: a series, by being densely filled, appears longer. Now, which representations **[105]** are most easily representable in memory, and consequently the easiest to place in the perspective of time? These are, besides our strong emotions, the spatial representations. Our physical pleasures and pains are represented in memory only vaguely and sketchily, our moral pains and satisfactions derive their distinctness from ideas which, in turn, derive their precision from places, from the visible environment. As we saw before this implies that in order to imagine time we imagine, above all, spaces, and that we estimate lengths of time by the amount of space or the spatial scenes that we interpose between two extremes.

Sully is right in comparing certain illusions of temporal distance with analogous illusions of spatial distance. Look at the Jungfrau from the Wengernalp[23]: it seems you could easily throw a stone across the deep valley in between and hit its radiantly white glacier. This is because nothing intervenes in the transparent air between you and this clear view: there are no anchor points whatever, and you say: 'How near it is!' Similarly, when there are striking events that seem to have happened yesterday, it is because we cannot pay attention to all the **[106]** intermediary states: striking events stand out just like the mountain, and everything else vanishes. If someone reminds you of the many years that have passed, you exclaim: 'How is it possible!' Basically, what you see through the eyes of your imagination is a certain part of space where something has happened, perhaps something that made you feel happy and that you then lost. All the rest of space you may have traversed will disappear. You see your past happiness take shape before you as if it were a mountain peak in radiant sunlight. It seems so close in time because your imagination observes it from nearby in the space where it has situated these things.

Thus the measurement of time, like time itself, is a matter of perspective, and mostly even *spatial* perspective, represented in imagination. Depending on the vantage point and on the measure we use, this perspective will expand or shrink: it is simply an effect of imaginary *optics*. In order to achieve a certain stability in these visions, we must borrow from external space what is required to control our internal space: we appeal to the succession of day and night, to the **[107]** seasons or, artificially, to the isochronous ticks of the pendulum clock.

The poetry of time, with its illusions, is first of all based on our tendency to *idealize* things past. An *ideal* is a form preserving only what is most characteristic and typical, eliminating all unfavorable details and augmenting the salience of favorable details. Time, in and of itself, is an artist idealizing the world. In fact, we remember only the prominent and characteristic aspects of past events; the tiny, contrasting details cancel each other for this very reason and only what has impact, intensity, and interest comes to the fore. This is the equivalent of the visually perceiving of spatial distance. Only the vivid and substantial representations will persist. If the eye could perceive all the little details of a landscape at the same time, there would no longer a real landscape but only a patchwork of sensations all on the same level. The eye is a painter, and a skillful one at that. The same is true for the inner eye looking at things from a temporal distance.

Moreover this process of idealization accumulates and grows with time, as if it **[108]** had picked up speed in a certain direction. We tend to embellish what has been pleasing to us and to deform what has displeased us, and this tendency, incessantly adding effect upon effect, finally reaches a point of maximum beauty or ugliness that constitutes the adaptation of a recollection to our personal inclinations. The painting is finished, the landscape completed. Henceforth it will be 'a historical fact' that the events have taken place in this way, splendid or gruesome, that this person possessed a stunning beauty and that this other one was equally exceptionally ugly, etc. I have argued elsewhere[a] that time constitutes a spontaneous classification of things according to the relations they entertain with us, and that this is necessarily an esthetic classification. Time is therefore a judgment based on the strength and the esthetic value of objects and events.

[108]a. La poésie du temps. In *L'art au point de vue sociologique*. (Op. posth. 1889).

[109]

II

Insanity may cause past events to be either totally blotted out from memory, which is rare, or pushed far back into the past, which is the more frequent case. In the latter condition events have become so vague and so foreign to the individual that he can hardly recognize them as having occurred to him personally. Insanity therefore suppresses or alters the perspective of time.

Among the pathological illusions of time perception, one of the most peculiar is that of 'false memory'[24] which is characterized by the belief that a present, and clearly novel situation has been experienced before, although it is actually occurring for the first time; it seems **[110]** therefore to be a repetition, a *bygone*. Wigan mentions in his book on the *Duality of the Mind* that, 'while at the funeral of Princess Charlotte in Windsor Chapel, he suddenly had the impression of having been witness to the same spectacle before.' Lewes compares this phenomenon to several other, more frequent ones. In a foreign country a sharp turn in a footpath or a river may present us with a view of the scenery that we seem to have seen before. 'Being introduced to someone for the first time, one may feel that one has seen him before. Reading a book with new ideas, one may *feel* that these ideas had already been present in one's mind for some time.' [a]

According to Mr. Ribot this illusion can be explained easily. The sensory impression arouses in our past analogous impressions, vague, confused, almost beyond awareness, but sufficient to make us believe that the new situation is their duplicate. There is an immediate feeling of resemblance between two states of consciousness that forces us to consider them as identical. This is an error, but

[110]a. G.H. Lewes (1879). *Problems of life and mind. Third series.* London: p. 129.

only a partial one, because there is in fact **[111]** always something in our past to resemble a first experience. While this explanation is adequate for very simple cases there are others to which it hardly applies at all, as Mr. Ribot is well aware. A patient by the name of Sander, when informed of the death of someone he knew, was caught up in unspeakable terror because he felt that he had already experienced this impression. 'I felt that already once before, while lying here in this same bed, X. had come in and had told me: 'Müller is dead.' I replied: 'But Müller has been dead for some time, he can't have died again!" Dr. Arnold Pick mentions a case of genuine false memory, manifested in almost chronic form. An educated man, with considerable insight into the nature of his own illness – about which he has produced a written account – fell victim to a remarkable state of mind at age thirty-two. When at a party, when visiting some place, or when meeting someone, the event with its entire context would appear so familiar to him that he would be absolutely convinced that he had experienced the same impressions in the presence of exactly the same people or objects, under the same sky, the same weather conditions, etc. Each time he engaged in a new activity, it seemed to him **[112]** as if he had already performed it before and in the same context. This feeling would sometimes occur the same day after a few minutes or hours, or sometimes a day later, but always with perfect clarity. The difficulty, says Mr. Ribot, is to find out why such an image, emerging a minute, an hour, or a day after the actual event, would qualify that event as a repetition. Here we observe, in fact, an inversion of time. Mr. Ribot has proposed the following explanation: the image formed in this condition is very intense and of a *hallucinatory nature*; it presents itself as real, because there is nothing to redress this illusion. Consequently, the original impression is pushed to a secondary plane and with the faded character that memories have; it is localized in the past, wrongly if one looks at the objective facts, but justifiably if one takes the subjective point of view. This hallucinatory state, however vivid it may be, does not totally suppress the actual impression; but, becoming detached from it after having been produced by it, this state necessarily appears to be a second experience. It replaces the actual impression, it seems to be more recent – and it is in fact! For us, judging from the outside and on the basis of what has happened externally it is not true that the same impression has been experienced **[113]** twice. For the patient, who judges on the basis of his mental contents, it is true that the same impression has been experienced twice, and within these limits his certainty is indisputable. In other words, according to Mr. Ribot, the mechanism of memory 'operates in reverse': the vivid image of a recollection is taken for the real sensation, and the latter, already waning, is taken for a recollection. However, I tend to believe – with Fouillée[a] – that we are dealing here with 'a morbid

[113]a. See A. Fouillée's two studies on memory, published in the *Revue des deux Mondes* (1885, *69*, 357–389 and 1885, *70*, 131–*162*).

manifestation of echo and internal replication', analogous to what takes place in true recall: 'All the new sensations reverberate and are associated with subsequent images that replicate them; by a sort of mirage these ensuing representations are projected into the past. We might well call this 'temporal diplopia.' Double vision, in space, means that the two images do not superimpose; similarly diplopia in time implies that our cerebral mechanisms are lacking synergy and co-incidence, as a result of which similar wave patterns do not fuse entirely; the result is a double image in consciousness, one **[114]** vivid, the other subject to memory decay; and with the mental stereoscope deranged, the two images no longer combine to form a single object. Although any attempt at a definitive explanation is fruitless given the present state of science, these clinical cases help us to understand that what appears to us as familiar and known, depends on a feeling that is just as difficult to describe as the sensory impression of blue or red, but that might perhaps best be thought of as a feeling of recurrence or duplication. Sully mentions that he himself is able to represent any new object as one that is already familiar to him. No doubt there must be some duplication in his mind, a vague resurrection of objects similar to the one he is actually perceiving. According to Fouillée it is precisely this mechanism which explains why it is possible to remember without realizing that one is indeed remembering and at the same time feeling a sense of novelty. 'In this case the normal doubling of images is destroyed and only one image is observed where there should have been two. This is the reverse of the phenomenon of false memory in which the normal unity of images is replaced by an abnormal doubling. Frequently too, the feelings of familiarity and of recognition aroused by a novel **[115]** impression stem from what we have dreamed about similar objects and circumstances.' [a]

One last problem. Does our representation of time remain essentially discrete, or does it ultimately become continuous? – Kant endows us outright with an *a priori* notion of continuous and even infinite time, which he calls 'a given, infinite quantity.' But he is really too generous. The mind, when representing time or any other dimension, in particular space, works predominantly in jumps, leaping over unseen intermediaries. There are fragments of time as well as of space, with clear interruptions and gaps. Only in the end, when impressions have been experienced repeatedly, do these gaps become smaller, finally reaching a vanishing point as a result of which a fusion between different intervals of perceived time can take place. This phenomenon has been compared with the effect demonstrated by the wheel of Savart[25] where the initially separate beats finally merge when the wheel spins faster and faster, producing the **[116]** impression of a continuous tone. Similarly, in space, we arrive at an uninterrupted, idealized view of things

[115]a. A. Fouillée, o.c.

we do not actually see, as a result of some acquired momentum; and similarly also, we smoothly fill in the temporal gaps to ultimately conceive of time as a mathematical continuum.

[117]

CONCLUSION

< From everything we have seen thus far, we may conclude that time is not a condition, but rather a simple product of consciousness; time does not constitute consciousness, it derives from it. Time is not an *a priori* form which we impose on phenomena, it is a set of relationships that experience establishes among them. It is not a pre-established template that accepts our perceptions and our feelings, but a *river bed* that they erode and [at the same time] it is their spontaneous *stream* through this bed.

Time as I see it, is nothing but a kind of systematic tendency, an organization of mental representations. And memory is nothing but the art of evoking and organizing these representations. **[118]** There is no time outside the bounds of desires or recollections, that is, without certain images which, by juxtaposing themselves in the same fashion as the objects that produced them, generate the appearance of both time and space.

Time, initially, is no more intrinsic to our mind than it is to an hourglass. Our sensations and our thoughts resemble the grains of sand that escape from the narrow opening. Like these grains they are mutually exclusive and they repel each other in their diversity instead of forming an integrated whole; time is like this tiny stream of falling particles. > But is there a reality outside our consciousness corresponding to the idea we have of time? Is there, in other words, an objective time? Time is frequently presented as a kind of mysterious reality meant to replace the antiquated ideas of Providence.[26] Time has been attributed near-omnipotence, <it has been declared the essential factor of evolution and progress.> But time is neither a *factor*, nor an *environment* that as such is

capable of influencing actions and their consequences. If I pick an apple from a tree, and later I pick another, absolutely identical one, growing in exactly **[119]** the same place on the same tree; and if, moreover, I am caught in the same stream of thoughts and impressions and I do not remember my first action, then the two acts will be absolutely indistinguishable, they will produce the same effects and merge into one overall experience. Time by itself is, therefore, not sufficient to establish real differences between entities.

In my opinion, time is only one of the forms evolution takes; instead of producing evolution, time emerges from it. Time is, in fact, a consequence of the transition from the homogeneous to the heterogeneous; it is a differentiation instilled in things; it is the reproduction of similar effects in a different setting or of different effects in a similar setting. Instead of saying that time is the essential factor of change and, consequently, of progress, <it would be more appropriate to say that progress (evolution) *constitutes a factor* and fundamental element of time: time is the abstract formula for describing change in the universe. In the completely homogeneous mass that, as a result of a logical fiction is sometimes thought to be at the origin of the present world, time does not yet exist. Imagine a rock, thrashed by the sea: time exists for this rock, because the centuries are breaking it and wearing it away. Now, **[120]** suppose that the wave beating it stops, without receding and without being replaced by a different wave, and suppose that every particle of this rock remains forever in the same place, in contact with the same drop of still water. Time will cease to exist for the rock and for the sea, they will have become part of eternity. But eternity seems to be a notion that is incompatible with the notions of life and consciousness as we know them. Life and consciousness presuppose change, and change generates duration. For us eternity is either nothingness or chaos; it is with the introduction of *order* in sensation and thought that time begins.>

NOTES

[1] Parts of *La genèse de l'idée de temps* appeared almost verbatim in *Revue philosophique*, 1885, *19*, 353–368, under the title *L'évolution de l'idée de temps dans la conscience*. In the present translation these parts are bracketed by < ... > ; see pp. [3–8, 9, 17–20, 22–24, 25–26, 27, 29–41, 44–45, 80–84, 117–120]. In some places a few words have been added to the text for clarification of the structure of the sentence. Such additions are marked by square brackets. Guyau's reference notes are very incomplete. In this translation we have extended these notes so as to conform more fully to modern conventions.

[2] It is not totally clear what Guyau intends to say here. He seems to suggest that the highly associative character of children's thinking prevents the consolidation of sensation or image, to which he refers in the next sentence.

[3] The myth is that Psyche married Amor against the will of Venus. As part of her punishment she was given a pile of objects to sort. In Apuleius' story of *The Golden Ass*

(Asinus aureus or *Metamorphoses)*, Venus mixes various grains and peas. The insects are called to help Psyche to complete her task in time.

[4] In the 1885 paper in *Revue philosophique* this passage is concluded with a semicolon and then continues: 'a water droplet does not feel itself flow even though it successfully reflects all the objects on the river bank: simply because it does not retain any image of them. We on the other hand retain the image of the bank and the streambed through which we pass: space.' (p. 357).

[5] Degrée will be translated either by degree or gradation, depending on whether the author seems to refer to a level of intensity, or to a scale of (levels of) intensity respectively. Occasionally the term transition (degrée = step) would seem to be appropriate as well.

[6] The 1885 text in *Revue philosophique* has indeed: 'C'est l'idée de l'agir et du pâtir ...'.

[7] According to the original text the order should be 'efficient and final causes,' but this does not fit with the beginning of the present sentence, nor with the rest of the argument below.

[8] Maine de Biran (1766–1824) saw the will as the fundament of existence and its experience (effort) as the proper starting point for philosophical analysis. One of his central issues concerns the way in which the will exercises its influence on the physical body of an organism. Another deals with the effort the body requires to overcome the resistance offered by the environment. Guyau's ideas clearly lean on these conceptions.

[9] Greek for motion or movement.

[10] The foliage sings.

[11] The foliage sings.

[12] Part I of this chapter originally appeared in *Revue philosophique*, 1880, *9*, 319–322 under the title: 'La mémoire et le phonographe'.

[13] Translating lumineux by luminous would suggest active production of light, which is not what the author intended.

[14] The phonograph was invented by T.A. Edison in 1877. The design with the flat, circular recording disk was invented by E. Berliner in 1887.

[15] Laura Bridgman was a woman in a similar predicament to Helen Keller: congenitally blind and deaf. She was educated by a Dr. Howe. Some details can be found in W. James' *Principles of Psychology* (vol. II, pp. 358 and 420).

[16] Refers to the Damara tribe in what is now Namibia.

[17] The term empathy = identification is preferred here over sympathy = responsiveness, concern.

[18] How close are memory and remorse.

[19] No 8th factor is listed in the original edition of 1890, nor in the second edition of 1902.

[20] This addition is necessary because most experiments use single-interval reproduction which always gives opposite results. Stevens, on the other hand, did indeed use the technique of serial reproduction.

[21] In the following passage Guyau has used the terms long and short vs. slow and rapid in an inconsistent way, speaking, for instance, of a rapid interval when he means an interval judged as short. To avoid confusion the translation has been made consistent with both Guyau's intentions and Stevens' results.

[22] The first Crusade began in 1096; Constantinople fell in 1453. *The Origin of the Idea of Time* was completed around 1888.

[23] Peaks in the Swiss Alps.

[24] Presently known as *déjà-vu*.

[25] Savart's (1831) wheel is a toothed wheel which, if rotated while keeping a piece of cardboard against it will produce either a rattle or a tone.

[26] Discussed at length in *L'irréligion de l'avenir*.