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## Introduction to the Method of Leonardo da Vinci

[1894]

*To Marcel Schwob*

WHAT A MAN leaves after him are the dreams that his name inspires and the works that make his name a symbol of admiration, hate, or indifference. We think of how he thought, and we are able to find within his works a kind of thinking derived from ourselves that we attribute to him; we can refashion this thought in the image of our own. It is easy to picture to ourselves an ordinary man; his motives and elementary reactions can be supplied quite simply from our own memories. The commonplace acts that form the surface of his life and those that form the surface of ours are linked in the same fashion. We too can serve as the bond that holds the acts together, and the circle of activity suggested by his name is no wider than our own. If we choose an individual who excelled in some respect, we shall find it harder to picture the workings and the ways of

*In the embarrassment of having to write on a great subject, I felt impelled to consider and state the problem before trying to solve it. That is not what usually happens with the literary mind, whose instinct is to leap across the crevasse, not to measure the depth of it.*

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*Today I should write this first paragraph in a very different fashion, while preserving its essence and function.*

*For its purpose is to make us think about the possibility of any project of the sort—that is, about the situation of and the means available to a mind that sets out to imagine a mind.*

his mind. In order to go beyond an indiscriminate admiration, we shall be forced to stretch in some particular way our conception of his dominating quality, which we doubtless possess only in the germ. But if all the faculties of the chosen mind were widely developed at the same time, or if considerable traces of its activity are to be found in all fields of endeavor, then the figure of our hero grows more and more difficult to conceive in its unity and tends to escape our strivings. From one boundary to another of this mental territory there are immense distances that we have never traveled. Our understanding fails to grasp the continuity of this whole—just as it fails to perceive those formless rags of space that separate known objects and fill in the random intervals between; just as it loses myriads of facts at every moment, beyond the small number of those evoked by speech. Nevertheless, we must linger over the task, become inured to it, and learn to surmount the difficulties imposed on our imagination by this combination of elements heterogeneous to it. In this process all our intelligence is applied to conceiving a unique order and a single motive force. We wish to place a being in our like-

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ness at the heart of the system we impose on ourselves. We struggle to form a decisive image. And our mind, with a degree of violence depending on its lucidity and breadth, ends by winning back its own unity. As if produced by mechanism, a hypothesis takes shape and proves to be the individual who achieved all these things, the central vision where all this must have taken place, the monstrous brain or strange animal that wove a pure web connecting so many forms. These enigmatic and diverse constructions were the labors of this brain, its instinct making a home for itself. The production of such a hypothesis is a phenomenon that admits of variations but not of chance. It has the same value as the logical analysis of which it should be the object. It is the basis of the method that we will take up to serve our purpose.

I propose to imagine a man whose activities are so diverse that if I postulate a ruling idea behind them all, there could be none more universal. And I want this man to possess an infinitely keen perception of the difference of things, the adventures of which perception might well be called analysis. I see him as aiming at all things: he is

*In reality man and Leonardo were the names I gave to what then impressed me as being the power of the mind.*

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Universe—a better word would have been “universality.” What I wished to designate was not so much the fabulous totality that the word “universe” generally tries to evoke, as the feeling that every object belongs to a system containing (by hypothesis) that which is necessary to define every object.

always thinking in terms of the universe, and of rigor.\* He is so formed as to overlook nothing that enters into the confusion of things; not the least shrub. He descends into the depths of that which exists for all men, but there he draws apart and studies himself. He penetrates to the habits and structures of nature, he works on them from every angle, and finally it is he alone who constructs, enumerates, sets in motion. He leaves behind him churches and fortresses; he fashions ornaments instinct with gentleness and grandeur, besides a thousand mechanical devices and the rigorous calculations of many a research. He leaves the abandoned relics and remnants of unimaginable games and fancies. In the midst of these pastimes, which are mingled with his science, which in turn cannot be distinguished from a passion, he has the charm of always seeming to think of something else. . . . I shall follow him as he moves through the density and raw unity of the world, where he will become so familiar with nature that he will imitate it in order to use it, and will end by finding it difficult to

\* *Hostinato rigore*, obstinate rigor—Leonardo’s motto. [P.V., as all footnotes in this section.]

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conceive of an object that nature does not contain.

This creation of our thoughts requires a name that will serve as a limit to the expansion of terms usually so far removed as to escape each other. I can find none more suitable than that of *Leonardo da Vinci*. Whoever pictures a tree must also picture a sky or background from which the tree stands forth; in this there is a sort of logic that is almost tangible and yet almost unknown. The figure I am presenting can be reduced to an inference from this type. Very little that I shall have to say of him should be applied to the man who made this name illustrious: I will not pursue a coincidence that I think would be impossible to define incorrectly. I am trying to give one view of the details of an intellectual life, one suggestion of the methods implied by every discovery, one, chosen among the multitude of imaginable things—a crude model, if you will, but preferable in every way to a collection of dubious anecdotes, or a commentary upon museum catalogues, or a list of dates. That kind of erudition would merely falsify the purely hypothetical intention of this essay. I am not ignorant of such

*An author who composes a biography can try to live his subject or else to construct him, and there is a decided opposition between these two courses. To live him is to transform oneself into what is necessarily incomplete, since life in this sense is composed of anecdotes, details, moments. Construction, on the other hand, implies the a priori conditions of an existence that could be completely different.*

*This sort of logic is what leads by way of sensory impressions to the construction of what I have just called a universe. Here it leads to a personage. In short, the problem is to use the full potential of one's thinking, under the control of the highest*

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*possible degree of  
consciousness.*

*I should express all  
this quite differently  
today, but I can  
recognize myself in  
the double effort I  
was making: to  
imagine the labor,  
and at the same time  
to picture the acci-  
dental circumstances  
that may have en-  
gendered the works.*

*The effects of a work  
are never a simple  
consequence of the  
circumstances in which  
it was generated. On  
the contrary, we  
might say that the  
secret aim of a work  
is to make us imagine  
that it created itself,  
by a process as remote  
as possible from the  
real one.*

matters, but my task above all is to omit them, so that a conjecture based on very general terms may in no way be confused with the visible fragments of a personality completely vanished, leaving us equally convinced both of his thinking existence and of the impossibility of ever knowing it better.

Many an error that distorts our judgment of human achievements is due to a strange disregard of their genesis. We seldom remember that they did not always exist. This has led to a sort of reciprocal coquetry which leads authors to suppress, to conceal all too well, the origins of a work. We fear the latter may be humble; we even suspect them of being natural. And although there are very few authors with the courage to say how their work took shape, I believe there are not many more who venture even to understand the process. Such an understanding can only begin with one's painfully relinquishing all laudatory epithets and notions of glory; it will not allow for any idea of personal superiority or delusion of grandeur. It leads to the discovery of the relativity that underlies the apparent perfection. And this research into origins is neces-

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sary if we are not to believe that minds are as radically different as their productions would make it seem. Certain scientific works, for example—and particularly those of the mathematicians—are so limpid in their structure that it is hard to believe they have an author. There is something *inhuman* about them, and this quality has not been without its effect. It has led to the belief that there is such a great distance between certain disciplines, notably the sciences and the arts, that the minds devoted to each have been set as widely apart, in the common view, as the results of their labors seem to be. And yet these labors differ only in their variations from a common basis: by the part of the basis that each preserves, and the part that each neglects, in forming their languages and symbols. We must therefore be a little suspicious of books and expositions that seem too pure. Whatever is fixed deceives us, and whatever is made to be looked at is likely to change its appearance, to seem nobler. The operations of the mind can best serve our purpose of analysis while they are moving, unresolved, still at the mercy of a moment—before they have been given the name of enter-

*Is it possible to make anything except under the illusion that one is making something else?—The objective of the artist is not so much the work itself as what people will think about it, which never depends simply on what it is.*

*An outstanding difference between the sciences and the arts is that the former must aim at results that are either certain or immensely probable, whereas the latter can only hope for results of an unknown probability.*

*Between the mode of generation and the*

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fruit, *there is an enormous difference.*

*Pascal's famous Pensées are not so much straightforward private thoughts as arguments, or weapons or stultifying poisons, for others. Their form is sometimes so finely wrought and deeply studied that it reveals the will to falsify the true "thought" by making it more imposing and terrifying than any thought could be.*

tainment or law, theorem or work of art, and, being perfected, have lost their mutual resemblance.

Within the mind a drama takes place. Drama, adventure, agitation, any words of the sort can be used provided that several of them are used together, so that one is corrected by another. Most of those dramas are lost, like the plays of Menander, but we do have Leonardo's manuscripts and Pascal's dazzling notes. These fragments insist that we examine them. They help us to realize by what starts and snatches of thought, by what strange suggestions from human events or the flow of sensations, and after what immense moments of lassitude, men are able to see the shadows of their future works, the ghosts that come before. But without having recourse to such great examples that they might be dismissed as exceptional cases, we need merely observe someone who thinks he is alone and left to himself: he recoils from an idea, grasps it, denies or smiles or stiffens, and mimes the strange predicament of his own diversity. Madmen often act like this in public.

By such examples, physical movements that can be measured and de-

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fined are shown to be closely related to the personal drama of which I was speaking. The actors in the drama are mental images, and it is easy to understand that, if we eliminate the particular features of the images and consider only their succession, frequency, periodicity, varying capacity for association, and finally their duration, we are soon tempted to find analogies in the so-called material world, to compare them with scientific analyses, to postulate an environment, to endow them first with continuity, velocities, properties of displacement, then with mass and energy. Thereupon we may realize that many such systems are possible, that any one in particular is worth no more than another, and that our use of them—which is rewarding, since it always casts light on something—must be continually watched over and restored to its purely verbal function. For, in precise terms, analogy is only our faculty of changing images, of combining them, of making part of one coexist with part of another, and of perceiving, voluntarily or involuntarily, the connections in their structure. And this makes it impossible to describe the mind, where images exist. In the mind words lose their force.

*I should be inclined to say that what is most real in our thinking is not the part of it that consists in forming a simple image of perceptible reality. Rather it is the process of observation—precarious and often untrustworthy as it may be—of what takes place within us and induces us to believe that the variations in the two worlds are comparable. This process enables us, at least in a rough way, to express what is properly the psychic world in terms of metaphors taken from the perceptible world, and particularly from acts and operations that we can effectuate. Thus, note the relation of “thinking”*

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and "weighing"  
(*penser and peser*),  
of "grasping" and  
"comprehending,"  
of "hypothesis,"  
and "synthesis,"  
etc.  
"Duration" comes  
from the same root  
as *dur*, "hard." All  
this amounts to giving  
certain visual, tactile,  
and motor images—  
or their combinations  
—a double value.

They are formed, there they leap forth, under its *eyes*; it is the mind that describes words to us.

And so man carries away *visions*, whose power becomes his power. He connects it with his history, of which his visions are the geometrical site. From this process arise those decisive acts that astound us; those perspectives, miraculous divinations, exact judgments; those illuminations, those incomprehensible anxieties, and stupid blunders as well. In certain extraordinary cases, invoking abstract gods—genius, inspiration, a thousand others—we ask with stupefaction how these marvels came to be. Once again we believe that something must have created itself, for we worship mystery and the marvelous as much as we love to ignore what goes on behind the scenes; we ascribe logic to miracle, although the inspired author had been preparing for a year. He was ripe. He had always thought of this work, perhaps unconsciously; and while others were still not ready to see, he had looked, combined, and now was merely reading what was written in his mind. The secret—whether of Leonardo, or of Bonaparte, or that of the highest intelligence at a given

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time—lies and can only lie in the relations they found—and were compelled to find—among things of which we cannot grasp the law of continuity. It is certain that, at the decisive moment, they had only to complete definite acts. Their supreme achievement, the one that the world admires, had become a simple matter—almost like comparing two lengths.

From this point of view we can perceive the unity of the method with which we are concerned. It is native and elemental to this environment, of which it is the very life and definition. And when thinkers as powerful as the man whom I am contemplating through these lines discover the implicit resources of the method, in a clearer and more conscious moment they have the right to exclaim: “*Facil cosa è farsi universale!*—It is easy to become universal!” They can, for the moment, admire the prodigious instrument they are—at the price of instantly denying the element of prodigy.

But this final clarity is attained only after long wanderings and inevitable idolatries. A consciousness of the operations of thought, which is the unrecognized logic I mentioned before, exists but rarely, even in the

*The word “continuity” was not at all the right choice. I remember having written it in place of another word that could not be found. I meant to say: among things that we cannot transpose or translate into a system of the totality of our acts—that is, into the system of our powers.*

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keenest minds. The number of conceptions, the ability to prolong them, and the abundance of discoveries are something different, and are produced without respect to one's judgment of their nature. Yet the importance of that judgment is easy to appreciate. A flower, a proposition, and a sound can be imagined almost simultaneously; the intervals between them can be made as short as we choose; and each of these objects of thought can also change, be deformed, lose its initial qualities one after another at the will of the mind that conceived it, but it is in one's consciousness of this power that all its value resides. That consciousness alone permits us to criticize these *formations*, to interpret them, to find in them nothing more than they contain, and not to confuse their states with those of reality. With it begins the analysis of all intellectual phases, of all the states that consciousness will have the power to define as fallacy, madness, discovery—which at first were only nuances impossible to distinguish. Equivalent variations of a common substance, they were comparable one to another, existed at indefinite and almost irresponsible levels, could sometimes be named, and all

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according to the same system. To be conscious of one's thoughts, as thoughts, is to recognize this sort of equality or homogeneity; to feel that all combinations of the sort are legitimate, natural, and that the method consists in arousing them, in seeing them precisely, in seeking for what they imply.

At some time in this process of observation, this double life of the mind that reduces ordinary thinking to something like the dream of a wakened sleeper, it appears that the sequence of the dream—with its mass of combinations, contrasts, and perceptions, either grouped around some project or moving forward indeterminately, at one's pleasure—is developing with *perceptible* regularity, with the obvious continuity of a machine. The idea then arises (or the wish) that this movement might be accelerated, that the terms of the sequence might be carried to their *limit*, to that of their imaginable expressions, *after which everything will be changed*. And if this mode of being conscious becomes habitual, it will enable us, for example, to consider beforehand all the possible results of an imagined act and all the relationships of a conceived object, and

*This observation (about carrying psychic processes to their limit) is one over which the author might well have lingered. It would suggest a further investigation of time, of the mental process I have sometimes described as subjecting ideas to the pressure of time,*

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*of the part played by external circumstances, and of the willed establishment of certain thresholds. Here we should be entering an area of extremely delicate psychic mechanics, in which particular durations play an important part, are included one in another, etc.*

*My opinion is that the secret of this reasoning process or mathematical induction resides in a sort*

then to proceed further to the faculty of putting them aside, of divining something ever more intense or exact than the given object, to the ability to rouse oneself from any thought that was lasting too long. Whatever its nature, a thought that becomes fixed assumes the characteristics of a hypnosis and is called, in the language of logic, an idol; in the domain of art and poetic construction, it becomes a sterile monotony. The faculty of which I speak—one that leads the mind to foresee itself and to picture as a whole whatever was going to be pictured in detail, together with the effect of the sequence thus presented in brief—is the basis of all generalization. In certain individuals it manifests itself with remarkable energy, becoming a veritable passion; in the arts it is the cause of each separate advance and explains the continually more frequent use of contraction, suggestion, and violent contrast; while the same faculty exists implicitly, in its rational form, at the base of all mathematical concepts. It is very similar to the operation which, under the name of reasoning by recurrence,\* extends the application of

\* The philosophical importance of this form of reasoning was demonstrated for the

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these analyses—and which, from the type of simple addition to infinitesimal summation, does more than save us from making an infinite number of useless experiments; it produces more complex structures, since the conscious imitation of my act is a new act that envelops all the possible adaptations of the first.

*of consciousness that the act in itself is independent of its subject matter.*

This tableau of drama, agitation, lucidity stands in opposition to other scenes and movements that we call “Nature” or “the World.” But we can do nothing with this natural world except to distinguish ourselves from it, and then immediately replace ourselves within its frame.

Philosophers have generally concluded by implying our existence in the notion we hold of nature, and nature in the notion we hold of ourselves; but they seldom go beyond this point, for we know they are more inclined to dispute the ideas of their predecessors than to look into the problem for themselves. Scientists and artists have exploited nature in first time by M. Poincaré in a recent article. When consulted by the author, the eminent scientist confirmed our statement of his priority.

*Here we have the essential vice of philosophy. Philosophy is something personal, but does not wish to be personal.*

*It hopes to accumulate a steadily increasing capital of transmissible values, as science has done.*

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*Hence all the philosophical systems that pretend to have no author.*

their different fashions: in the end the former measured, and then constructed; the latter came to construct as though they had measured. Everything they have made finds a place of its own accord in the natural world, where it also plays a part, helping to extend it by giving new forms to its constituent materials. But before generalizing and building we observe. From among the mass of qualities that present themselves, our senses—each in its own fashion, with its own degree of docility—distinguish and choose the qualities that will be retained and developed by the individual. At first the process is undergone passively, almost unconsciously, as a vessel lets itself be filled: there is a feeling of slow and pleasurable circulation. Later, one's interest being awakened, one assigns new values to things that had seemed closed and irreducible; one adds to them, takes more pleasure in particular features, finds expression for these; and what happens is like the restitution of an energy that our senses had received. Soon the energy will alter the environment in its turn, employing to this end the conscious thought of a person.

The universal man also begins with

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simple observation, and continually renews this self-fertilization from what he sees. He returns to the intoxication of ordinary instinct and to the emotion aroused by the least of real things, when one considers both thing and instinct, so self-contained in all their qualities, and concentrating in every way so many effects.

Most people see with their intellects much more often than with their eyes. Instead of colored spaces, they become aware of concepts. Something whitish, cubical, erect, its planes broken by the sparkle of glass, is immediately a house for them—the House!—a complex idea, a combination of abstract qualities. If they change position, the movement of the rows of windows, the translation of surfaces which continuously alters their sensuous perceptions, all this escapes them, for their concept remains the same. They perceive with a dictionary rather than with the retina; and they approach objects so blindly, they have such a vague notion of the difficulties and pleasures of vision, that they have invented *beautiful views*. Of the rest they are unaware. In this one instance, however, they feast on a concept that

*Why artists are useful: they preserve the subtlety and instability of sensory impressions.*

*A modern artist has to exhaust two-thirds of his time trying to see what is visible—and above all, trying not to see what is invisible.*

*Philosophers often pay a high price for striving to do the opposite.*

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swarms with words. (A general rule that applies to the weakness existing in all branches of knowledge is precisely our choice of *obvious* standpoints, our being content with definite systems that facilitate, that make it easy to grasp. In this sense one can say that the work of art is always more or less didactic.) Even these beautiful views are more or less concealed from ordinary observers; and all the modulations so delicately contrived by little movements, changing light, and tiring eyes are lost to them, neither adding to nor subtracting from their sensations. Since they know that the level of still water is horizontal, they fail to observe that the sea is *upright* at the horizon. Should the tip of a nose, the whiteness of a shoulder, or two fingers happen to dig into a pool of light that isolates them, our observers never think of regarding them as new jewels enriching their vision. Those jewels are fragments of a person, and the person alone exists, is known to them. Moreover, since they utterly reject anything that lacks a name, the number of their impressions is strictly limited in advance!\*

*A work of art should always teach us that we had not seen what we see.*

*The deeper education consists in unlearning one's first education.*

\* See proposition CCLXXI of Leonardo's treatise *On Painting*: "*Impossibile che una memoria possa riserbare tutti gli aspetti o muta-*

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The exercise of the opposite gift leads to analyses in the true sense. One cannot say that the gift is exercised in *nature*. This word, although it seems general and apparently contains every possibility of experience, is altogether personal. It evokes particular images, determining the memory or history of one man. In most cases it calls forth the vision of a green, vague, and continuous eruption; of some great elemental work as opposed to everything human; of a monotonous quantity that will some day cover us; of

*zioni d'alcun membro di qualunque animal si sia. . . È perchè ogni quantità continua è divisibile in infinito*—It is impossible for any memory to retain all the aspects of any limb of any animal whatever. This is because any continuous quantity is infinitely divisible."

What I have said of sight also applies to the other senses, but I have chosen sight because it seems to me the most intellectual of them all. In the mind, visual images predominate. It is between these images that the analogical faculty is most often exercised. When we make analogies between any two objects, the inferior term of the comparison may even originate in an error of judgment caused by an indistinct sensation. The form and colors of an object are so evidently uppermost in our minds that they enter into our concepts of qualities relating to another sense. If we speak of the hardness of iron, for example, the visual image of iron will almost always be produced, and seldom an auditive image.

*That is, the gift for seeing more than one knows.*

*These remarks are the naïve expression of a doubt long held by the author, as to the true value or function of words.*

*The words of ordinary speech are not made for logic. The permanence and universality of their meanings are never assured.*

*In short, errors and analogies result from the fact that an impression can be completed in two or three different fashions. Land, a cloud, or a ship are three different ways of completing a certain appearance on the horizon, at sea. Desire or expectation puts one of these words in our minds.*

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something stronger than we are, entangled in itself and tearing itself apart while sleeping on and working on; of something to which, personified, the poets accorded cruelty, kindness, and several other motives. Hence, our ideal observer must be placed not in nature, but in any corner whatever of that which exists.

*An early attempt of mine to represent an individual universe. An "I" and its Universe—if we admit that these myths are useful—should have, in any system, the same relation that exists between a retina and a source of light.*

The observer is confined in a sphere that is never broken. It has variations that will reveal themselves as movements or objects, but its surface remains closed, although every portion of the sphere is renewed and changes position. At first the observer is only the condition of this finite space; at every moment he is this finite space. He is troubled by none of his memories or powers so long as he equates himself with what he sees. And if I were able to conceive of his remaining in this state, I should conceive that his impressions differed hardly at all from those received in a dream. He is vaguely conscious of pain, pleasure, and a sense of tranquility,\* all imparted

\* Without touching on physiological questions, I might mention the case of a man suffering from a form of depressive psychosis. This patient, whom I once saw in a clinic, was in a state of retarded life; he

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to him by these indefinite forms, among which is numbered his own body. And now, slowly, some of the forms begin to be forgotten, almost disappearing from sight, while others make themselves visible for the first time—in the place where they had always been. It must also be noted that changes in vision resulting from the mere duration of one's attention, and from tired eyes, are likely to be indistinguishably confused with those due to ordinary movements. Certain areas in one's field of vision become exaggerated, in the same way as an ailing limb seems larger and, because of the importance it acquires from pain, distorts our notion of the body. These exaggerated areas will be more amenable to observation and easier to remember. At this point the spectator begins rising from simple perception to reverie; henceforth he will be able to extend the particular characteristics derived from the first and most familiar objects to other objects in greater and greater number. Remembering a precedent, he perfects the recognized objects only after an extraordinary delay. Sensations took a very long time to reach his mind. He felt no needs. This form of insanity is exceedingly rare.

*Inequalities are certain to appear. Consciousness is by essence unstable.*

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*There is a sort of liberty with regard to groupings, correspondences, and neutralizations that is exercised in the entire field of perception. If several persons are speaking at the same time, we can, if we choose, listen to only one of them.*

*These are intuitions in the narrow and etymological sense of the word. An image can serve as the anticipation of another image.*

*The persistence of impressions has an essential role.*

*There is a sort of symmetry in these mutually inverse transformations. Corresponding to the*

given space. Then, at his pleasure, he can arrange or undo his successive impressions. He can appreciate the value of strange combinations: a group of flowers, or of men, a hand or a cheek seen by itself, a spot of sunlight on a wall, a gathering of animals brought together by chance—all these he regards as complete and solid beings. He feels a desire to picture the invisible wholes of which he has been given some visible parts. Thus, he infers the planes designed by a bird in its flight, the trajectory of a missile, the surfaces delimited by our gestures, and the extraordinary fissures, the fluid arabesques, the formless chambers created in an all-penetrating medium by the grating and quivering of a swarm of insects, by trees that roll like ships, by wheels, the human smile, the tide. Traces of what he imagined can sometimes be seen on water or on rippled sand; and sometimes his own retina, as the moments pass, can compare some object with the form of its movement.

From such forms, born of movement, there is a transition to the movements into which forms may be dissolved by means of a simple change in duration. If a drop of rain appears to be a line, a thousand vibrations to be a

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continuous sound, and the irregularities of this paper to be a polished plane, and if duration is taken to be the sole cause of these impressions, then a stable form may be replaced by a sufficient rapidity in the periodic registration of a thing (or element) chosen for the purpose. Geometricians will be able to introduce time and velocity into the study of forms, just as they can eliminate both from the study of movements. In common speech, by a similar process, a road will *climb*, a jetty will *stretch*, a statue *rise*. And the intoxication of analogy, as well as the logic of continuity, will carry these actions to the limit of their tendency, to the impossibility of their ever being halted. Everything moves by gradations, imaginarily. Here in this room, and because I concentrate on this one thought, the objects about me are as *active* as the flame of the lamp. The armchair decays in its place, the table asserts itself so fast that it is motionless, and the curtains flow endlessly away. The result is an infinite complexity. To regain control of ourselves in the midst of the moving bodies, the circulation of their contours, the jumble of knots, the paths, the falls, the whirlpools, the confusion of velocities, we

*spatialization of linear movements is something I once described as the chronolysis of space.*

*Something like this might be seen from a certain level of observation, if light and the retina were continuous—but then we should no longer see the objects themselves. Hence the function of the “mind” here is to combine two incompatible orders of size or quality, two levels of vision that are mutually exclusive.*

*It is thanks to the hierarchy of the senses and the varying duration of our perceptions that we can oppose to this chaos*

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*of palpitations and substitutions a world of solid masses and identifiable objects. There are only two things we perceive directly: persistence and averages.*

*Always the motive force of inequality.*

must have recourse to our grand capacity for deliberately forgetting—and without destroying the acquired idea, we introduce a generalized concept, that of the orders of magnitude.

And so, by the extension of the “given quantity,” we lose our intoxication with these particular objects, of which there can be no science. When we look at them fixedly, they change if we think of them; and if we do not think of them, we fall into a lasting torpor, of somewhat the same nature as a tranquil dream; we stare as if hypnotized at the corner of a table or the shadow of a leaf, only to waken the moment they are *seen*. There are men who feel with special delicacy the pleasure that is derived from the *individuality* of objects. What they prefer and are delighted to find in a thing is the quality of being unique—which all things possess. Their form of curiosity finds its ultimate expression in fiction and the arts of the theater and is called, at this extreme, the *faculty of identification*.\* Nothing seems more deliberately absurd when described than the temerity of a person who declares that he *is* a certain object and feels its

\* Edgar Allan Poe, “On Shakespeare” (*Marginalia*).

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impressions—especially if the object is inanimate.\* Yet there is nothing more powerful in the imaginative life. The chosen object becomes as it were the center of that life, a center of ever multiplying associations, depending on whether the object is more or less complicated. Essentially this faculty must be a means of exciting the imaginative vitality, of setting potential energy to work. Carried too far it becomes a pathological symptom and gains a frightening ascendancy over the increasing feebleness of a decaying mind.

From a pure observation of things to these complex states, the mind has merely extended its functions, forming concepts in response to the problems offered by all sensation and solving the problems more or less easily, depending on whether a larger or smaller production of such concepts is demanded. It is evident that we are touching, at this point, on the very *springs* of thought. Thinking consists, during almost all the time we devote to it, in wandering among themes

\* Whoever explains why identification with a material object *seems* more absurd than that with a living object will have taken a step toward explaining the problem.

*Inequality again.  
The transition from  
the less to the more  
is spontaneous. The  
transition from the  
more to the less is  
deliberate and rare,*

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*since it has to go against the customary practice and appearance of comprehension.*

*If everything were irregular, or if everything were regular, there would be no thinking—for thinking is only an effort to pass from disorder to order. It requires the former as an occasion for being exercised, and the latter for models to imitate.*

*The isolated, the exceptional, the singular are inexplicable—that is, they have no expression but themselves. The insurmountable difficulties presented by prime numbers.*

about which we know, first of all, that we know them *more or less well*. Hence, things can be classified according to the ease or difficulty they afford to our comprehension, according to our degree of familiarity with them, and according to the various resistances offered by their parts or conditions when we try to imagine them together. The history of this graduated complexity remains to be conjectured.

The world is irregularly strewn with regular arrangements. Crystals are of this nature; so are flowers and leaves, many striped or spotted ornaments on the fur, wings, or shells of animals, the patterns made by the wind on water or sand, etc. Sometimes these effects depend on a sort of perspective and on temporary juxtapositions. Distance produces or disfigures them. Time reveals or hides them. Thus, the number of births, deaths, crimes, and accidents presents a regularity in its fluctuations, one that becomes more and more evident as we follow the record through the years. The most surprising events, and the most *asymmetrical* in relation to neighboring moments, return to a semblance of order when considered in relation to

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longer periods. One might mention other examples in the realm of instincts, habits, and customs, as well as the semblances of periodicity that have given rise to so many philosophies of history.

The knowledge of regular combinations is divided among the different sciences; or, where none can be established, it comes under the calculation of probabilities. For our purpose we need only the observation made on introducing this topic: that regular combinations, whether of time or space, are irregularly distributed in the field of investigation. Mentally they seem to be opposed to a vast number of formless things.

*—which has overrun  
almost all of Physics  
since 1894.*

I think they might be described as “first guides of the human mind,” except that such a proposition is immediately reversible. In any case they represent continuity.\* Any thought permits of a change or transfer (of attention, for example) among ele-

\* Here the word is not employed in its mathematical sense. It is not a question of inserting a numerable infinity and an innumerable infinity of values into an interval; it is only a question of simple intuition, of objects that suggest laws, of laws that are evident to the eyes. The existence or possibility of such things is the first—and not the least surprising—fact of this order.

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*The easiest to conceive, but extremely difficult to define. This whole passage is a youthful and not very successful attempt to describe the simplest intuitions—by means of which the world of sensory images and the system of concepts can sometimes be brought together.*

ments apparently fixed in their relation to the thought, which it selects from memory or immediate perception. If the elements are perfectly similar, or if their difference can be reduced to mere distance, to the elementary fact of their existing separately, then the labor to be performed is in turn reduced to this purely differential notion. Thus, a straight line will be the easiest of all lines to conceive, because there is no smaller effort for the mind than that exerted in passing from one point of a straight line to another, each of the points being similarly placed in relation to all the rest. In other words, all portions of the line are so homogeneous, however short we may conceive them to be, that they can all be reduced to one, always the same; and that is the reason why the dimensions of shapes are always expressed in terms of straight lines. At a higher degree of complexity, periodicity is employed to represent continuous properties; for this periodicity, whether it exists in space or time, is nothing else than the division of an object of thought into fragments, such that they can be replaced one by the other under certain conditions—or else it is the multiplication of an object under those same conditions.

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Why is it that only a part of all that exists can be so reduced? There is a moment when the figure becomes so complicated, or the event seems so new, that we must abandon the attempt to consider them as a whole, or to proceed with their translation into continuous values. At what point did our Euclids halt in their apprehension of forms? What was the particular degree of interruption that set a limit to their notion of continuity? They had reached what appeared to be the furthest point of a research at which one cannot fail to be tempted by the doctrines of evolution. One is loath to admit to oneself that this limit could be final.

It is certain, in any case, that the basis and aim of every speculation is the extension of continuity with the help of metaphors, abstractions, and special languages. These are employed by the arts in a fashion to be discussed in a moment.

We have arrived at the conception that parts of the world let themselves be reduced, here and there, to intelligible elements. Sometimes our senses suffice for the task; sometimes the most ingenious methods must be employed; but always there are voids. The

*We are now—1930  
—at a stage in which  
those difficulties have  
become pressing.  
What I awkwardly  
tried to express in  
1894 is the state we  
are in today. We  
have come to despair  
of finding any  
figurative—or even  
any intelligible—  
explanation.*

*Langevin is hopeful  
on this point; I, not  
at all. Discussed at  
the Société de  
Philosophie, 1929.*

*What takes place, in  
other words, is a sort  
of adaptation to the  
diversity, multiplicity,  
and instability of  
facts.*

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*By now—after thirty-six years—this hypothesis has been curiously confirmed. Theoretical physics of the boldest and most difficult sort has been forced to abandon images and the whole notion of visual and motor representation. In its effort to subjugate its vast domain—to unify its laws and make them independent of the place, time, and movement of the observer—it has no other guide than the symmetry of its formulas.*

attempts remain lacunary. It is here that we find the kingdom of our hero. He has an extraordinary sense of symmetry that makes him regard everything as a problem. Wherever the understanding breaks off he introduces the productions of his mind. It is evident how extremely convenient he can be. He is like a scientific hypothesis. We should have to invent him, but he exists; the universal man can now be imagined. A Leonardo da Vinci can exist in our minds, without too much dazzling them, in the form of a concept; our dream of his power need not be quickly lost in a fog of big words and ponderous epithets conducive to inconsistent thinking. Could one believe that Leonardo himself would be satisfied with such mirages?

This *symbolic* mind held an immense collection of forms, an ever lucid treasury of the dispositions of nature, a potentiality always ready to be translated into action and growing with the extension of its domain. A host of concepts, a throng of possible memories, the power to recognize an extraordinary number of distinct things in the world at large and arrange them in a thousand fashions: this constituted

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