

THERE IS NO SUBCONSCIOUS* EMBRYOGENESIS AND MEMORY

The world is God, multiplied into Nature. Pantheism is true, or rather semi-pantheism. For beyond God-Nature, there remains a part of God, not "naturalized," unobservable.

God is not "holy" or "merciful". He is not philanthropic, and "human rights" are unimportant to him.

Instinctive social embryogeneses are often radically halted by pure, quite simplistic, reason. Man will have to learn to understand that reason uncorrected by instinct is something as dangerous as instinct uncorrected by reason.

Negative words or integrated negations: Nothingness, the completely Other, Nothing, the Infinite, the Unknowable, the Sub-

Translated by R. Scott Walker

* The following essay is taken from "Au Dieu inconnu, source de toute vie", an unpublished posthumous work by R. Ruyer.

conscious all have a certain poetic overtone. But we must be careful of linguistic sleight-of-hand taken for an idea.

Is a subconscious finality conceivable? Is it not a square circle? Organic finality is a fact, but the sub-conscious of an embryonic organism is not a fact. It is true the embryo, even if it is organized through a continuous inter-signaling between its parts, does not communicate with us who are observing it. It does not see us and it does not speak to us—and for a good reason. But neither does a very busy craftsman, a painter or a mathematician who is quite absorbed, communicate with children who watch him or even with his own wife and children. The craftsman is lost in his work in progress. Not lost, but he identifies himself intensely with the very form of this work being transformed by his hands and before his eyes.

The work in progress is an “absolute surface” and not a series of points, of isolated parts functioning together progressively. The hand and eye are not essential for the essence of consciousness that is “subjectivity,” the “for itself” of every “absolute surface”.

A unicellular entity has neither hands nor eyes. It nevertheless forms pseudopods, a mouth, a stomach, and it excretes. An egg, an embryo in its initial stage, acts like a unicellular entity. It deforms itself with regard to its overall form: an absolute overview (that is, an overview without a point of external overview, which would be perpendicular to the surface or the volume), this “paradoxical” overview (paradoxical for us), is the very fact that the unicellular entity or the young embryo is not a point or a series of points, but a delocalized form that is “seen” (with quotation marks), but which is not seen (without quotation marks).

The paradoxical nature of this “seen form” only comes from our adult habit of using our eyes fully formed for looking at objects outside ourselves. We look at objects on our table, bending over, putting on our glasses. We can only see the image of these objects because their image is transferred from the retina to the occipital lobe where their images are surely not like the objects on a table. Any form is, for us adults, an “image of form”. But this is a secondary complication that derives from the fact that in our organism there is a special region, the brain, or more precisely the cerebral cortex, where the absolute organic overview is applied not

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to its own form but to external forms projected onto it by sensory equipment. The “subjective” nature of the cortical image, its “for itself” nature, is borrowed from the subjective nature of the organism.

The image is only subjective, conscious, because first of all the organ providing the image is already subjective, conscious. If I close my eyes, my retinal organ (and its projection on the occipital lobe) is subjective, conscious of its dark vision not of its non-vision.

The unicellular entity or the embryo in its initial stage is a completely dark vision and not a non-vision. In other words, it is primary consciousness of its own form and not secondary consciousness of this prior form modulated by sensory contributions that do not yet exist.

The mathematician needs a blackboard or a sheet of paper. But mathematics is not a by-product of a blackboard or a sheet of paper. Likewise, our adult consciousness, perceptive and manipulating, needs a cerebral cortex, but consciousness is not the by-product of the brain; on the contrary it is the primary consciousness inherent in every organic form that alone makes it possible for the brain “to be conscious” of external forms projected on it.

It is characteristic that the “form, seen” in the visual field betrays its fundamental status as primary organic form (despite sensory projection), in that it has no edges. I do not see the edges of my visual field, no more when this field presents me with forms of external objects than when it remains void and dark. If a surgeon reattaches my detached retina by coagulating the diseased edge, I do not see the reattached edge. I simply note that some peripheral forms have disappeared and have become non-vision. Certainly the embryo manipulated by the biologist is not conscious of this manipulation. If it forms a dorsal cord on the ventral section of another embryo to which it is transplanted, it works at forming this cord well, but like Arago continuing, according to the anecdote, to write equations on the black wall of a carriage, like on a blackboard, paying careful attention to form them well. All consciousness is thus applied consciousness, limited without seeing its limits, but it is truly a consciousness. The subconscious, if a

subconscious could exist, would be a non-consciousness but not a sort of dark (or reddish) consciousness. Whereas dark consciousness is truly a consciousness and is even the condition for any consciousness.

DUALITY OF CONSCIOUSNESS

An embryonic area, not yet induced to differentiate itself according to its competence, is a dark consciousness. Once the induced evocation has begun, it is so absorbed in its work that it is difficultly distracted by its surroundings to the point that if it is placed somewhere other than in its natural setting by a transplant, it still continues unperturbably the work it had begun. It seems unconscious or “distracted” in a task become absurd precisely because it is intensely conscious of this task. It “finalizes” with such ardor that it appears to be a robot. A prodigious calculator, it resembles an electronic calculator. By improvising it sets up auxiliary nervous circuits in its brain that resemble electronic circuits. Nevertheless, it has moved itself toward the right answer, where an adding machine simply functions.

A rudimentary organ, differentiating itself, seems to function chemically, but it tends toward the correct response, the correct differentiation. It seems “distracted” because it cannot be distracted. It seems unconscious because it is conscious of what it does and of nothing else.

Consciousness, all consciousness—biological, embryonic or cortical biological—can thus be analyzed into two elements: a “black” board as an “absolute surface” or a “competent” area before an evocative induction—and a “theme” evoked or evocable, a mnemonic theme or problem theme, arriving from a region “perpendicular” to this blackboard. When the retina or the occipital area that it extends ceases to be the board as absolute surface to become a seer of external forms, images (physical) only play an occasional role. They evoke themes, they do not act as stimuli-signals. It is a matter of experience that we only look to see, to become conscious of obstacles, dangers, auxiliaries, of interesting details, of details to be corrected—and that we only recall what we have thus seen.

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This is why we can think visually with our eyes closed. A topic evoked works and is transformed into various schemas on our blackboard. An embryonic anlage differentiating itself—unlike the example of the retina—does not receive a quasi-visual form. It only evokes a theme, under the influence of a banal induction, that passes by differentiating itself on its blackboard into formations that monitor themselves without having to “be seen” since they are seen on the board or the absolute surface.

The example of the ocular anlage is both particular and misleading, for the word “see” unfailingly makes us think of an image of a projected form, whereas in general “seeing” is inherent in the very form of the organ being formed. No eye, no retina can survey or monitor the eye and the retina being formed.

All consciousness, say phenomenologists, that is the “describers” of reality as it is, is “consciousness of...”. In fact a consciousness of “nothing” would be non-consciousness, non-vision and not dark consciousness.

But we must be careful to avoid two serious mistakes.

What follows the “of” of “consciousness of...” is not necessarily nor habitually an image of a visual nature. It is form being formed. A visual image is a particular form of form. But not every form is image. It is difficult for man, a very visual animal, to imagine a form that is not an image. Language itself encourages this error. How can we imagine something that is not image? Nevertheless, it must be said that the difficulty does not only come from our habits of being inveterate “voyeurs” or “lookers”. We are like someone who, having never seen but photographs of babies, would define a real flesh and blood baby as a “photograph of a baby, without a photograph but—amazingly—with the baby present” and who would find this mysterious and contradictory. Or again, we are like prisoners who have been locked up since our childhood who have never seen the world other than on television; leaving the prison they would be unable to conceive how they see a world so like that familiar from television but without any projection equipment and without any screen.

Moreover, “consciousness of...” cannot in any case signify “someone’s consciousness of...,” or consciousness belonging to an individual X who would be before the image or the form of which

he would be conscious, who would be the subject-of-the subjectivity of the image or the form. The subjectivity of an organic form (organic form as opposed to material and mechanical structure constructed by progressively linked liaisons) is subjectivity without a subject-individual who would be the proprietor of the consciousness.

Consciousness is dual and not triune. It has no distinct proprietor, at least initially. A proprietor who thinks himself distinct is formed gradually. Finally he says "I" and attributes himself consciousness as a sort of ray that shines from a luminous part of his organic person (that he generally locates in his head), begins to explain objects or ideas, making of them conscious images, annexing them to himself as personal ideas or as usable objects or as beings to be loved or to be avoided. The individual, the subject, the unreal point, brought out of subjectivity, of the absolute surface of the board, begins to annex not only this sentient board, from which in fact he comes, but also the themes that animate this sentient board, and he becomes an "I," a first person, then a person in the moral sense, a master of ideas that have become his personal ideas.

ORIGIN OF THE ILLUSION OF THE "I-INDIVIDUAL"

It is not difficult to discover the origin of this illusion; it is in the act of perception, then meditation. The painter or the mathematician (in flesh and blood) is before his board-canvas or his blackboard (to paint or to cover it with equations). He looks at it from outside. But also, he sees himself looking at it, for he sees his hands holding the brush or the chalk, and he observes the rest of his body, including his eyebrows, the round circle of his glasses, his nose, his cheeks, his chest.

He thus easily fails to recognize that all this is really in his head, organic, and that this scene cannot not be repeated in miniature in his head itself since there is no third eye in this head or third hand holding a piece of chalk or a brush—eye or hand that, once again, would be, at a distance, before an intracephalic board.

In practical existence, this illusion causes no great problem.

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Common sense does not overload itself with contradictions, and it can quite easily be admitted that one is an existing “I” with a body, with ideas, with intentions and applying them to fields of action outside of oneself, while also admitting that if there is a cerebral accident, or just a strong migraine, all this is extinguished for “me,” however, without things or forms—including mathematical forms—disappearing or being eliminated.

In philosophical speculation, to the contrary, there is hopeless confusion when “subtle thinkers” consider it good to maintain that the representation is the real presentation, that the image or the idea of the form is more real than the form, or that the primitive nebula or the primitive explosion out of which came the world only exists in our scientific theories and that it is human thinking or human observation that causes reality. From post-Kantian idealists to Sartre, or even to a few scholars who want to put on an appearance of being philosophers, we flounder in the quicksand of subjective idealism. Realist materialists are correct to reject this academic concept, even though they are wrong to confuse subjective idealism with panpsychism, with objective idealism and the realism of consciousness. For although subjective idealism is false, panpsychism is true.

Let us be careful not to get bogged down in this swamp and return to the solid ground of biology and embryogenesis. This demonstrates that the individualized field as “absolute surface” precedes, in formation, the individual who will say “I” of himself or who will believe, without saying so, that he is acting like an “I”.

In embryo transplant experiments, in Spemann’s experiments on the Triton’s gastrula, if a small graft is taken from the dorsal lip of the blastopore and transplanted to a second gastrula of the same age but in the ventral region, the gastrula receiving the graft develops two individuals or two cerebro-spinal nervous systems, one of which is almost as developed as the other.

More simply still, if during bilateral symmetrization, a Triton’s egg is tied in such a way that the ligature passes through the middle of the grey crescent where the bilateral symmetry begins, two embryos result and not just one. If the ligature is loose, a double animal results at the head and the rear part and a single animal at the caudal section where the two heads are joined in a Y.

The morphogenetic field (in this case the dorsal lip of the blastopore), cut or tightened into two halves, can thus supply two individuals instead of a single one.

To come back to our comparison of a morphogenetic field engendering organic forms of the species with the board before which the artist or the mathematician seems to work, as consciousness and distinct individual, Spemann's experiments show that the individuality of the field-board is primary and that the distinct individual results from this (or seems to result) secondarily.

To use the cliché, "it is just like" in applying a ligature to the canvas conceived for an artist at a sufficiently primitive stage of his conception, the canvas and the artist are split, resulting in two similar canvases and two artists. As if the artist was one with the canvas and could continue it after the cut or ligature.

The organic artist at work in embryogenesis is thus not really distinct as point-subject of the subjective surface; he is not really distinct, as individual, from the individuality of the absolute surface as the young embryo is. The young embryo, we might say, only has "individuality"; it is not an individual. It knows its own surface without needing an external point. It is nothing more than a way of speaking of this self-transforming subjectivity, placing the source of this transformation at an imaginary external point.

This subjective "individuality" without subject normally distributes itself into sub-individualities, into a multitude of secondary and tertiary craftsmen who are responsible for forming particular organs. The craftsman does not distribute the work. "He" distributes himself into a multitude of apprentices up to the terminal mosaic in which the specialization of the "apprentices" is pushed to the point that they seem "mechanized". As if the painting crumbled of itself by recruiting thousands of "tiny craftsmen" to complete the details.

THE THEMES OF THEMATIC MEMORY

Individuals, the "I" s, stated or virtual, are illusory. They have no proper reality apart from the domains, the canvases, subjective of

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themselves, of which they claim to be the *dominus*, overseeing and conscious.

This is why Nature (*sive Deus*) is never, apparently, overly concerned with the exact number of individuals: birch trees, herrings or men. The exact number of units is apparently unimportant. It only prefers large numbers as a precaution, to maintain the species.

The same is not true for the theme that can be represented as being external to the self-conscious subjective tableau present and actual, extended in a spatial field, whether it be a theme-form (in the case of the unicellular entity or the young embryo) or of a theme-image or idea (in the case of a second cerebral consciousness).

This theme, in embryonic formation, is manifested as the mnemonic potential of the species. It is theoretically separable from the actual domain and actualized as the extended field in a localized domain. The actual domain is inseparable from the theme and without the theme would not at all be different from a non-living series of juxtaposed molecules. A cell, an embryo, fixed and colored for research purposes, theoretically retains for the observer's eye the form of the cell of the living embryo. But separated from the theme, it is no longer a true form; it is no more than a snapshot of it.

Every authentic form is in time as well as in space. It subsists in time by translating a potential, of itself untemporal, into space. Embryogenesis is mnemonic. The potential is a memory. The theme is not a sort of vital animation, a creative breath recommencing in each individual being the mythical breath of Yahweh on Adam. There is no individualizing entelechy. The life-giving breath is organic memory. If there is a breath, it is more like the action of a theater prompter, which is nothing more than the memory of the species.

Potential, as we shall see, is not only mnemonic, it is also inventive. The potential-theme is truly creative and the creative aspect of the theme is inseparable from the mnemonic and repetitive aspect. But for the moment let us consider above all the mnemonic aspect.

Do not think here of the well-known and perhaps arguable generalities about the recapitulative embryogenesis of the entire

evolution of the species; let us consider the experimental facts in the embryogenesis of a species today. The experimenter, we have seen, can easily multiply organs or even organisms by grafting anlagen outside their original locations in the embryo. He can make a dorsal cord appear on the ventral section, make an eye appear (or an optic vesicle with crystalline lens anlage) outside its natural place, or a tail or a head (incomplete) in the ventral region of a Triton. But the experimenter cannot change the specific mnemonic potentialities of a graft. The graft is plastic (before determination) with regard to the organ it develops in the individual on which it is grafted. It harmonizes its development with the site on the host where it is grafted. But it is not plastic with regard to the specific character that it supplies. This is seen clearly in so-called xeno-induction experiments, for example between Anurae and Urodela. Their adhesive organs are different, Urodela tadpoles have gimbals while those of Anurae have suckers. If a still undifferentiated Anura graft is transplanted onto the head of a Triton embryo, the graft develops suckers and the jagged teeth of the Anura type. Conversely, if tissue from the Triton is grafted on the Anura, the head of the Anura produces the gimbals of a Urodela.

The embryo is thus similar to a child to whom is said, "Recite your poem". The interrogation leads him to this "memoration" rather than to some other one, but it teaches him nothing. The local inductors say to the graft, "Form adhesive organs"; they leave it to the graft to decide "how to go about doing it," depending on its own memory.

The inductor-prompter of the mnemonic theme to be developed has the role of a signaler. This is why it can be replaced by a common chemical agent, which in any case acts only in an apparently chemical manner and which should instead be compared to an evocative odor. An invisible extraterrestrial creature equipped with sophisticated means of observation, who would experiment on human brains like embryologists do on Triton embryos, would also discover that with a few milligrams of vanillin he could induce, in certain sensitive brains, the appearance of an immense tissue of childhood memories, vanillin playing the role of prompter of a theme: "Provincial childhood memories".

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All memory is thematic. At first we memorize only the meaning of what we see, hear or read. In fact, every conscious act is thematic, that is "according to a meaning". Only meaning is perceived through the forms photographed on the retina or through the sounds recorded in the auditive realm. Every mnemonic recall occurs from an evoked *sense*. It is always analogous to that which, in the embryogenesis of the Triton, follows the command, "Form adhesive organs". The differentiating realization thus begun is continued through subordinate themes, more specialized mnemonic prompters with inter-stimulations that ultimately mimic automatic functioning.

The child who recites his poem, that he knows by heart, can recite it like a parrot without understanding. Nevertheless, even in the details, it is the appearance, the sonorous theme of one verse that induces, more microscopically, the sonorous theme of the following verse and thus prompts the rest of the poem. The mechanical aspect of the recitation is like the mosaic aspect of the embryonic zone when it reaches the end of its development. It is only a boundary that still retains something of the fundamental epigenesis. In cerebral psychological life, habitual behavior is only apparently automatic and mechanical. When habits break down, the theme is generally more solid than the details of its realization. "There is something that can be done with this drum," the monkey observed by Köhler seems to be saying to himself, "but what is it exactly?" And furious, he bangs on the drum without knowing how to use it. "There is something that can be done with this box of matches," says the apraxic to himself, who knows they can be used to light a cigarette, "but how?" "The name of this man has a German ring to it and it has two or three syllables," says the aphasiac or the old person whose memory is failing. "This telephone number has two numbers that are repeated, but which ones?"

Good memories seem to picture even insignificant details of a complex ensemble, like an electronic recorder. And certainly there are in the brain constructions that are quite analogous to the molecular recordings of a magnetic tape. This then goes beyond mnemonic habits in the true sense—always psychological and thematic—to enter the order of pure molecular functioning.

Despite the general—and often unmerited—discrediting of Bergson today, because he is in almost complete opposition to the scientist catechism, several of his theses continue to enjoy a curious appeal and they seem to have become part of the common ideas of the “average thinker”: the theory of the image as reality in our mind outside our head, the opposition of image memory and habitual memory and the thesis that image memory is of the spiritual order, habitual memory of the mechanical order.

Unfortunately these theses rescued from the relative demise of Bergson are false, and the last one, which interests us here, is not only false but at the very antipodes of the truth.

Habitual memory—which is thematic, delocalized, immaterial as the potential of an embryonic region, that does not depend on a physico-chemical trace in specifically determined nervous cells—can be easily transferred from one nerve center to another, retaining its form and its general meaning despite its transfers. On the other hand, image memory, despite an essential difference, most resembles a material image or a photograph, a material fact in mosaic form, localized.

A robot can roughly imitate habitual memory in its thematicism and its delocalization, through the use of feedback. A robot can thus “be directed” toward a source of heat or light, no matter how, perhaps even committing “errors”. A robot playing chess can be set to play simply or with difficulty with quasi-habits of more or less developed calculation. This is more a matter of the actual adaptation of a machine to pseudo-perception than actual habits in the metaphoric sense. A door controlled by infra-red rays does not acquire a habit of opening for a customer. The extreme difficulty of industrial production of learning robots, even “pseudo” and elementary ones, contrasts with the astonishing progress made in increasingly miniaturized electronic units, with integrated “memory,” making it possible to reproduce faithfully in every detail, here and now, a concert or a show produced last year in Tokyo.

The child, said Bergson, recites his lessons by heart: habitual memory. He also recalls the first reading of this lesson, the evening before, in his room, just before dinner, alongside his older brother: image memory. Image memory would be in the mind, not in the

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body, like the lesson learned by heart.

And yet, on the contrary, it is image memory that electronic devices imitate so easily, with the very special conditions of filming images or recording sounds—including the coughing of a spectator. But we are still waiting for the robot that will compose a sentence thematically and will say indifferently either, “It’s later than usual, I’m going to bed” or “Already eleven o’clock, it’s time to get to bed!”

It is characteristic that less and less is being said of cybernetics and more and more of data processing. Cybernetic robots mimic habitual memory in their functions. Recorders and transmitters of detailed information mimic image memory. They may only be sham imitators of basic organisms with real memories, but the relative facility of an imitator of image memory, contrasted with the extreme difficulty of a sham imitator of habitual memory, indicates in fact that image memory is not, as Bergson believed, farther from but nearer to material, physical or chemical phenomena.

The very word image, used in psychology, was borrowed from the material technique of engraving and photography, arts that are much older than the invention of robots. Modern psychologists have had to struggle against the temptation of confusing a mental image with a material image. Contradicting the old associationist psychology of Hobbes and Taine, they have shown that the mental image was more an “imaging activity,” that the “image of John” was less similar to a photograph of John than to an active habit: “Let us form the image of John”. They have shown that it was not an image in the mind but a psychological activity, thus recognizing that it is the habitual activity that is super-material, whereas the quasi-material result of this habitual activity, when it supplies something—perhaps with the aid of auxiliary cerebral micro-processors—that superficially resembles a photographic image, is on the contrary more like a physical phenomenon.

TRUE THEMATIC MEMORY HAS BUT A TEMPORARY HOME IN SPACE

Embryogenesis is only very approximately recapitulative. It shortens enormously the episodes of its long history to which it

simply alludes, like a new practice retains something of a former practice. But it is beyond any doubt mnemonic when it repeats almost literally the several million previous embryogeneses. “Life and habit”: Samuel Butler most clearly defended—as an amateur—the mnemonic conception of vital organization against the dogmatic scientists of his times.

Because of his amateur’s timidity, he unfortunately hid himself behind the authority of Doctor Hering and his lecture “Memory as property of living matter”. This risks leading to confusion, for if memory is considered to be a property of matter, whether living or not, there is a danger of falling into a materialist conception of memory and of returning to the error of an operating memory. Memory is not the property of bodies. Bodies, or what appear as “bodies,” are the property of memory.

It must thus be emphasized that habitual memory is not a property of the present material medium to which it is applied. It forms this medium, it is not derived from it. It is potential not actual. It is a potential theme outside space, potential that passes into space by using the small spatial domain that serves as its permanent *pied-à-terre*, but which does not contain it, which is only a starting point, an initial field of application for its full deployment. This *pied-à-terre* constantly offers it the basic equipment it needs for its initial work and complete models of molecules that it need not reinvent with each embryogenesis and that have a mnemotechnical nature more than a mnemonic one. Mnemonic potential, outside of space, does not appear, does not arrive in this *pied-à-terre* like some sort of extra-terrestrial creature landing. It is always in this *pied-à-terre* that it actively maintains, like the flame of a pilot light constantly maintains the possibility of lighting the gas of a heater. If an accident should destroy the *pied-à-terre*, the mnemonic potential can no longer pass into space. It seems annihilated.

The principal difference between the coarse evolutionism of Empedocles and modern evolutionism is that the former did not recognize this necessity of having a permanent *pied-à-terre* attributing to the vital creative power of the undifferentiated earth monstrous embryonic productions, like “heads without necks, eyes without foreheads,” monstrosities corrected by rudimentary nat-

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ural selection. Whereas modern evolutionism recognized the necessity for a regular biological memory, subordinated not to diffuse vital properties but to specialized “permanent presences” carefully maintained as the *sine qua non* of mnemonic deployment, and of invention that is never vague creativity but a progressive perfecting of mnemonic deployment.

“*Omne vivum ex ovo, omne ovum ex ovo*”. This is true, if by *ovum* we mean every mnemonic *pied-à-terre*, even simpler and more rudimentary than a fertilized egg.

A MNEMONIC THEME CAN ONLY BE WITHIN SPACE

The necessity, proven by experience, for a *pied-à-terre* for organic memory should not, at least not immediately, lead us to imagine a beyond, a Platonic paradise of mnemonic themes or ideas. Organic memory is closely united with forms realized or to be realized in space. The epigenetic passage of mnemonic themes into the presumptive realm, then into an *anlage* oriented by the first evocation, is closely linked to increasingly detailed forms in space.

For a short moment, the moment of evocation-determination of the presumptive realm, the moment that is not manifested by any observable differentiation of the realm concerned and that can only be noticed indirectly by the impossibility (if this embryonic realm is transplanted into an abnormal place in another embryo of the same age) to obtain a development “according to the location” (*ortsgemäss*) of the graft and of prohibiting the graft from developing “according to its origin” (*herkunftsgemäss*) during the short moment between the evocation and the first directly observable developments, the mnemonic theme evoked is thus present without being active, in a sort of nonlocalized within, yet “close at hand” or “nearby”.

This evocation-determination can only be compared in this instant or in this short moment to what is happening similarly in the cerebral memory of an inventor or an artist. Henri Poincaré, in an almost embryonic stage of research on functions that he later called “*fuchsiennes*,” while placing his foot on the step of a streetcar, felt the quasi-presence in his consciousness of the

decisive idea (“to use non-Euclidian geometries”). He had no paper nor pencil and he could not begin to develop the idea immediately, but he felt that the correct theory was loosened from its surroundings, that it would return as soon as he could “get busy” with a pencil and paper. Proust also felt the loosening of his souvenirs of Combray brought on by the taste of the tea cake. Or, to take a less well-known example, Ingres was seeking the spatial arrangement for his painting *Les Songes d’Ossian* when he had the idea, after looking at an early sketch, of two figures framing the sleeping Ossian in an abstract and thematic form. “I will place one figure here in the foreground, seated or standing;” and then he went to bed before using a pen or a brush, with the certitude of having found the right solution. In each of these cases, the mnemonic or inventive theme released in this manner is no longer distant, in the world of Platonic ideas. It is quite near to a determined localization, and yet it is still not in the space of figured and detailed forms since it can only be designated by abstract words schematically giving meaning to future figured forms.

In the entire embryogenesis of an organism, as in an artistic work or a scientific theory, what can be seen in space is repeated within, by a semantic space of abstract themes that have a meaning but not a defined form.

This is precisely the narrow implication of the space of observable forms and of the within of the space of themes—meanings that lead to specific localizations or delocalizations in every living organism—so strange for “scientific” observers who are accustomed to so-called physical realities (physical on our scale).

The within of space in the organism is only perceived under the negative aspect of delocalization, of the impossibility of localizing that which, nevertheless, reveals itself later as “real”.

Of course the notion of a within of space nevertheless near to space seems unacceptable to scientific thinkers, obstinately attached to the “old principles,” to the “safe explanations”. We recognize—experience requires it—that the determination (of a presumptive realm) is acquired before any differentiation of visible structures. Determination can therefore only be a connection in itself still mute to a correspondent, an instructor that will quickly

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begin “speaking,” indicating the forms. Where can this correspondent be other than outside ordinary space? What can it be if not a theme which, not materialized, can only be a meaning that can be expressed by abstract words: adhesive organs, visual organs, auditive organs, etc.

The designation of the theme seems completely verbal. But the nature of the theme is in fact analogous to the nature of a word or of a phrase of the language. The “verbal” interpretation is here realist because embryogenesis in fact resembles a three-dimensional discourse in which an instructor-speaker announces his “topics”. “I am now going to ‘speak’ the external organs of the eye, I am going to form them.” “I am going to speak-form a pharynx.” It announces and initiates many subjects at the same time, because it works on an entire surface or rather on an entire volume, unlike a real speaker subject to the linearity of the world. But with the passage from the announced theme to its development there truly is a sort of explicative discourse. Or rather a discourse in the true sense is an embryogenesis continued in the cerebral cortex of the speaker.

A MNEMIC THEME IS BEYOND MOLECULAR EXPLANATIONS

Naturally, once again, the orthodox biologist seeks the interpretation of the still invisible and undetectable determination in a morphological differentiation, observable, theoretically, in the cells of the realm thus determined, in “the very quality of proteins constituting the cytoplasm of the cells”.

The biologist can only invoke here the cellular cores or the famous “genetic information code” of nuclear chromosomes, since determination, in an experimental graft, can be dependent on the location of the graft and not dependent on the original presumption, since the subsequent differentiation of the graft can be different (with the same chromosomes of the cellular core) from what it would have been without the intervention of the experimenter.

We shall return to the “genetic code”. Here, in determination, it cannot be concerned in any case. Orthodox thinkers must thus

compromise to preserve the molecular explanation of the molecules of the cytoplasm by arguing that the cytoplasm is anisotropic and that “in the best cases” it should contain “plasmas” endowed with particular morphogenetic properties. “Morphogenetic properties”: pure verbalism or a pure act of faith. “We do not yet know, but one day we will certainly find, soon, molecular explanations for determination”. It is not manifested by anything visible, not by anything macroscopically observable, thus “the key to the explanation must be found in the molecules of the cellular protoplasm”.

Meanwhile, the most obvious facts forbid an explanation of a global thematic form involving a large number of cells in an entire embryonic realm by particular properties hidden in the intimacy of cells and that must be progressively coordinated to produce a significant global form.

But, “Invoking a theme outside space is magic”. Perhaps, but magic for magic, the appearance of a form having a micro-chemical meaning, in which each point is blind with regard to the others, would also be magic. How could molecules distinct in space be induced to give forms as complex and harmonious as an adhesive organ, an eye, a nerve center? But, “Each cell receives signals that coordinate its action.” In fact it receives signals, but every signalization system functions according to an overall schema. It is the secondary auxiliary of this schema. An “awareness of a signal” is never more than a subordinated psychic automatism, that depends on a field of consciousness as absolute surface and that can serve as keyboard for superordinated themes.

A realm differentiating itself according to its determination is similar to a piano keyboard whose melody would be the pianist himself. A pianist-subject, distinct from the organic keyboard, is but an illusory idealization, but not the real and indispensable theme. When it is a matter of forming the organism itself, the theme will be the craftsman or the artist, painter or pianist. For the adult artist, with a formed brain and who has become an individual before the material keyboard that he has constructed or caused to be constructed, the same necessity to oversee through global consciousness as absolute surface, despite appearances, is found elsewhere, with the only difference being that this time the

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embryonic realm is nothing other than his cerebral cortex.

The pianist only apparently plays “by degrees”. In a rapid musical movement, it is proven that the movements of his fingers commanded by the cortical homunculus are not a series of reflexes with one bringing on another. The pianist conceives the ensemble and executes it as an ensemble. The same is true for an acrobat executing a dangerous jump. The sequence of nerve commands is but the expression in space and time of a theme of primary movement. The swimming movements of a fish, a reptile or a swimming mammal are not a series of local reflexes. It has been proven that they depend on a unitary theme of swimming, for this theme of swimming already appears in the embryo, even before the members that execute it are completely formed.

The biologist passionately interested in physico-chemical explanations is like the observer who would only agree to explain the melody and the harmony by looking inside the piano at the levers and hammers tapping the strings through localized actions and step by step or by mechanical interactions. Then, still armed with his pseudo-scientific postulates, he would go from piano to piano and pretend to find in the motor cortex of the pianist localized movements and chemical intersignaling through the still step-by-step transmission of motor commands: all this of the same order as the movements of the hammers inside the piano.

The experience of all embryogenesis should prevail, however. In the entire organic domain the mosaic and the linked developments always appear after a thematic epigenesis. This obstructs the persistent hope of molecular explanations for the evocation of determination.

Physico-chemical reductionism, which considers only molecular phenomena in the physiology of adult organs—without even speaking any more of embryogenesis, is required to reverse reality completely. There is a certain meaning in the paradoxical thesis that says, “The chicken is for the egg; a woman is for ova”. This paradox underlines the importance of continuity in the temporality of life. But there is no reason to push the paradox even further by saying the true reality of the chicken, or of the woman, is the ensemble of DNA molecules; the ensemble of molecular phenomena resulting from the functioning of DNA molecules.

What value is there, for molecules, and automatic natural selection, to form complicated organisms in which they could only act according to physico-chemical laws? At the very most it can be admitted that the cells of higher organisms seeking to organize a digestive system or a system of oxygenation have, with natural selection, succeeded in producing a digestive tract, lungs and a heart. But why would these molecules organize a complicated system of cells and multi-cellular organisms? Why would they produce a splendid supple feline or a seductive woman with red lips and silken skin?

When we watch the marvelous films with enlargements and slow motion views that show the actual functioning of the various respiratory, circulatory and digestive organs, the reality proper to the stages in organic phenomena are evident. The heart, the stomach, the esophagus: we have the same sensation that we have when we watch animals in a zoo. Each organ is a small organism within an organism, And this is true at all levels—molecular, cellular, tissue, organic, in a literal sense. There is no reason to favor the molecular level.

All these stages, or levels, converge instead toward the top rather than toward the bottom. Heart cells isolated *in vitro* beat, but the beats of a heart are not the average of its cellular rhythms. An isolated red blood corpuscle can yield its oxygen, but pulmonary circulation depends on this property of corpuscles. Skin cells have a certain chemical function, but the skin has a general function and even an aesthetic function. Sexuality includes chemical and cellular functions, but it envelopes all these aspects and all these stages in a very real embrace. Venus, or Eros, cannot be reduced to a few chemical substances that serve to produce an attraction or repulsion between molecules or between cells. An animal or a man is beautiful for his skin, that is formed by a convergence of a multitude of molecular phenomena. The higher stages are based on the lower stages and arouse their actions in order to use them. In our behavior, we use the semi-autonomous behavior of our organs, or our cells; we do not result from them.

Embryogenesis is obviously a matter of formative instincts and themes. Sometimes they can be seen as through a window. The embryo of a marsupial, three centimeters long, interrupts its

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embryogenesis, leaves the maternal uterus, climbs toward the pouch and there attaches itself to a semi-mammary tube, obeying an instinctive excursion. Morphological modifications—prematurely sufficient muscles, front feet with claws—do not seem destined for any other reason than to make this excursion possible. The conscious finality, in the usual sense, shows through with evidence.

This conclusion is very general. It is true for all morphogenesis, for every appearance of true form that is not a pure cluster. In the appearance of forms of the embryo, experience leads to separating, on the one hand the orientation toward a given organ rather than toward another (and the experimenter can modify the normal orientation), and on the other the specificity of this oriented formation (or disoriented in the experiment of the inter-specific graft). In both cases a thematic memory within space, a true conscious memory is at work, either in the evocation of the theme or in the development of the detail of differentiation and in the distribution of subordinated themes.

Molecular genetics certainly has a great practical interest since it will make it possible, or makes it possible already, to intervene in the development of substances and chemical auxiliaries of development, perhaps correcting deficiencies and errors in heredity. But, in the speculative order, it has the disadvantage of seeming to confirm in biology the dogmas of the old reductionist and physico-chemical “model,” and at the very moment when physics is avoiding this, opens the way to a new “paradigm” and discovers the impossibility of punctualist or pointillist explanations.

INTELLIGENCE AND MEMORY

In morphogenesis, as in the solution of a test or of a crossword puzzle, it is difficult to distinguish what is intelligent from what is mnemonic. The testee should have knowledge (generally linguistic) and mental habits (generally practical). He must know the meaning of the words or the figures used. This is why tests measure not

general intelligence, as Spearman * thought, but intelligence in a certain culture and according to diverse specializations. This is why it is almost always impossible, practically, to establish truly pure intelligence tests, culture free, and it is almost always unjust to judge and condemn as unintelligent an individual of a certain culture by making him pass tests developed according to a different culture made up of different memories.

In particular, it would be evidently absurd to judge biological intelligence by tests of verbal, psychological and sensorial intelligence. A protozoan manifests a great deal of intelligence and intelligent memory when it hunts and eats its prey according to its specific culture. But it would be fully incapable of holding a micro-pencil and filling in a micro-sheet of tests with correct answers. Just as we would be totally incapable of improvising legs and a stomach for ourselves, and a protozoan would be correct to judge us completely lacking in intelligence. But we prefer to believe in classical tests (classical for us). This leads to the illusion that only adult human beings can be intelligent. It leads to the naive belief, especially among adults, that animals and plants are unintelligent, as is the human embryo. But the protozoan, or the embryo, could just as easily judge the human adult as stupid since humans, in order to walk, only know how to use legs that are provided instead of knowing how to shape legs like an embryo does or knowing how to improvise pseudopods like an amoeba. All living species could consider the others inferior in tests of intelligent behavior that go beyond their own specialty. Every species is specialized.

From one species to another, or from the embryo to the adult, practical (and non-verbal) intelligence tests are fortunately much more culture-free (and even species-free), more independent of cultural memory, even of specific memory. For the most ingenious technical inventions, the adult human, placed in competition with animals and plants, is not at all certain to win the prize for intelligence every time. This is why humans often copy other

* Spearman, the psychologist, not to be confused with Spemann, the embryologist (ed. note).

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species, not only in their artistic creations but also in technical, practical or scientific creations. Man was not the first on earth to use ultra-sounds, wings that warp to fly, diving bells, push buttons, camouflages, lures, bait, poison, toxic gases, underground shelters, storerooms. The adult human even copies the embryo that he was, for example by making miniaturized calculators based on the model of the cerebral cortex or catalyzers that imitate the action of enzymes (mimetic catalyzers). We refuse to recognize the intelligence of the embryo or that of other species. We speak of unconscious intelligence, of formative instinct or of behavioral instinct or even of physico-chemical automatism. In fact, however, an adult is more automatic, more mechanized than the embryo he was, the embryo that had to improvise, or use its memory to remake the structures that are the conditions for these very automatisms. It is as if the user of an automobile, a radio receiver or a calculator would automatically be thought more intelligent and more conscious than those who designed and produced these instruments.

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