

THE MYSTERY OF REPRODUCTION AND THE LIMITS OF AUTOMATISM

Samuel Butler¹ sees the nightshirts of the master and the lady of the house drying on the line in the garden next door. The following year he notices that a small baby's shirt has been added. As a superficial onlooker he could be led to believe that the two large shirts have engendered the small one. We make a somewhat similar mistake, says Butler, in believing that the bodies of the parents have made the baby. The body of the baby has no more been made by the two grown babies, on whose pattern it is modeled, than the small shirt has been made by the two large ones... What makes the small shirt as well as the baby is something we know absolutely nothing about. In any case, it is always risky to "place" the organic lines of continuity or of "genidentity." One risks taking the resulting and secondary forms for the constituent reality itself, the machines for the

Translated by Victor A. Velen.

¹ Samuel Butler, *Note-Books* (London, 1912).

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machinists, especially within the organism, where the machines and machinists are intimately bound together.

Man as a "tool kit." According to Butler, man is a tool kit who is being made to function from backstage by someone or something that we never see. We are so used to seeing only the tools function with so much docility that we take them for the worker himself, thus committing the same error as mistaking the saw for the carpenter. The only one of these workers whom we know a little is the one who makes us ourselves function.² But our consciousness itself is already a sort of tool at the same time that it is the worker.

Reproduction among robots. In one of the annual salons of the Musée Galliera, Lucien Verdi exhibited, in the style of science fiction and with the ironic title "Sentimental Education," two human-looking robots visibly about to copulate. This imagination—leaving the painting aside—is of course completely puerile. Even two adult human beings cannot reproduce by amalgamating or dividing in two like phantoms. Only their germinal cells can do this, because they are not machines. An adult with organs which are developed functionally can no more split in two than a belltower clock or a steam engine. Whereas a germinal cell, apparently, is sufficiently close to the microphysical order to be able to do so, by following the laws pertaining to fields in "absolute surface," which are within the domain of contemporary physics.

Parents and twins. A machine can easily reproduce a form, the form to be reproduced acting as cause, or as director-model, upon its own functioning. It can also reproduce information. And it can produce and reproduce a form *on the basis* of information, the information being fed as instruction into the "control" that guides its primary functioning.³ Finally it can produce, on the basis of information, another machine like itself, with accidental errors in copying. But it cannot "reproduce itself." Like the majority of reflexive verbs, "to reproduce itself"

² S. Butler, *Ibid.*

³ Von Neumann, *The Hixon Symposium* (New York, 1951).

designates an action, inconceivable outside of a field in "absolute surface" in which the forms "read themselves" by themselves, and can consequently "read" the possible resemblance between themselves and their own limbs (that is, an analogous "self" within their own numerical "self"). After which, through an internal break, due most likely to the chemical substitution of localized joinings for delocalized joinings, the two similar parts become autonomous and differ numerically. When a gene or a virus reproduces itself, in seeming to induce at a distance the formation of a proteinic chain resembling it, this "at a distance" must be a quasi-distance analogous to that of the details of a field of vision, rather than a true distance of ordinary physics.

Another, not very different procedure of reproduction is conceivable—and it has in fact been realized. It takes advantage of another property of the fields in "absolute surface" and is strictly tied moreover to the first property. It manifests itself when the accidental rupture of the field precedes instead of follows the constitution of like parts. Each broken part then completes itself in the manner of a matrix-test. This mode of reproduction-regeneration is possible even among adults (vegetables and inferior animals), provided they are not completely differentiated into "machines."

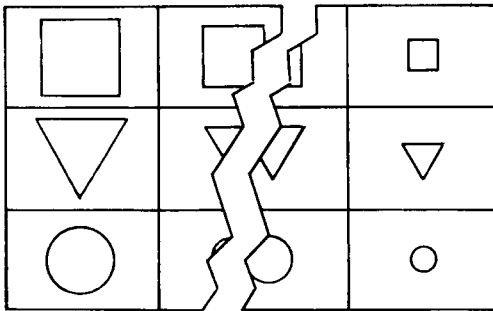


Fig. 1

In both cases, there is true reproduction, true bifurcation of "genidentities." The mechanical reproductions, or the mechanical models of reproduction, with moulding or close copying of chains

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of DNA molecules which then function like instructions on perforated tapes of a reproducing machine, cannot represent biological facts. They are outside the problem. All true reproduction is a division into two of an organic consciousness, and not a fabrication of an organic machine by another organic machine. (True reproduction always resembles a homozygote gemmation in which the rough form of half of the body becomes a whole body.) Reproduction through successive generations is always simply a delayed gemmation. We are the twins of each of our parents.

*Reproduction in Flatland.*⁴ In a two-dimensional country, such as the *Flatland* of A. Abbott, one could not build houses with central corridors, or there would then be two neighboring houses and not one house. In the same way a material organism with a digestive tube open at both extremities, as in solid organisms, could not exist; the digestive corridor would cut the organism in two. Yet a consciousness, in *Flatland*, that is, a field in "absolute surface," independent of a third dimension, could be parcelled out geometrically while still retaining the unity of the "absolute surface" (as, in our visual field, two close spots constitute one form, even if they relate respectively to the right and the left hemisphere, and even after resection of the bone and of the frontal commissure.⁵ This fact, hardly credible,

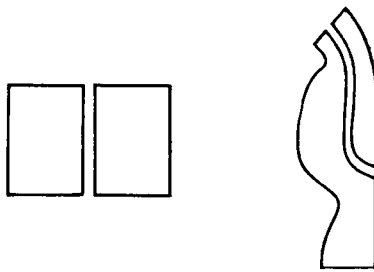


Fig. 2

⁴ A. Abbott, *Flatland* (Doves).

⁵ Cf. J. S. Wilkie, *The Science of Mind and Brain*, p. 27 and 133.

is however certain and confirmed and could as all consciousness play with the transition from one to several and from several to one. In *Flatland* an organism cut in two by its digestive canal would be *one* only in its full consciousness. Every distraction would cut it in two and would add up to a reproduction. One may, metaphorically speaking, consider all reproduction in our world as the result of a "distraction" of primary consciousness.

Pygmalion and the biologist. In love with the statue he had sculpted, Pygmalion received life for it from the gods. Miracle, magic, or a madman's illusion, but not the reproduction of a human being. Life and consciousness cannot be transmitted by blows of the chisel or by modeling.

An embryologist, of a very scientific mind, after years of observation and experience, publishes a treatise on human embryology, in which he "shows" that the entire embryonic development, including the post-natal development, is explained perfectly by chemical phenomena.

A colleague of the embryologist points out to him that it explains perhaps everything in man, except the possibility of writing a treatise on embryology. In fact, he says, you embryologists have emerged from an embryo very much like the one you describe. You are an aged and clothed embryo. If the development of the embryo is really the product of physico-chemical phenomena, your thesis is as absurd as the faith of Pygmalion. He believes that a statue can become a living being, he believes that a manufactured object can become a living creature. As for you, you think of yourself as an old statue, an old manufactured object, which has become alive and conscious."

*Treatise on human embryology by Mr. X. Ex-embryo.*⁶ The author of a treatise does not fail to enumerate, on the first page his university and academic titles. It seems however that the title: Mr. X. Ex-embryo is as important, under the circumstances, as "Former pupil of the Ecole Normale Supérieure." No one has conscious memories of his embryonic life—although psychoanalysts claim that subconscious memories of it exist. But

⁶ Cf. *Encyclopédie française*, under Philosophy, Religion, R. Ruyer, "Science and Savoir philosophique."

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if the title "ex-embryo" guarantees nothing as to the scientific value of the treatise, it is surely significant with regard to its philosophical value—and this title *condemns* the mechanistic philosophy of the embryologist. The biologist must have let something escape him in his description of the embryo, something that is in continuity with the consciousness of the adult scholar. One must necessarily either fall into Pygmalion's false logic or complete and correct the scientific description by postulating that the embryo develops *itself* in its primary consciousness, and is not developed by the interplay of blind chemical phenomena. If it does not develop *itself*—after the germinal cell has reproduced itself—, how can it study itself when it has become adult?

The child and the child psychologist. Since the joining of the latitudinal lines of the universe is only a utopia, or a uchrony,⁷ the embryologist cannot study the very embryo that he had been, but he can study embryos entirely similar to what he had been and this is much the same thing as studying himself in a prior stage.

Moreover, there is a case in which this restriction does not even apply. A child psychologist, even if he uses objective methods, and if he studies mainly the behavior of children in general, cannot help but recall at each moment his own childhood memories. The term "former child" is very important, in practice as well as in theory, in order to be a good child psychologist.

The surgeon and the biologist. A biologist equipped with a perfected technique studies a human embryo *in vivo*. In particular he studies its nervous system. The embryo is born and becomes an eminent brain surgeon. The biologist grows old and must have a brain operation. He puts himself in the hands of the surgeon whom he had studied in an embryonic state. A curious turnabout. If the biologist had studied the embryo when its brain was as yet only a simple tube with a just sense of superiority, he is now no more than a poor patient, and it is

⁷ Which, according to Reichenbach, is not moreover *logically* contradictory (*The Direction of Time*, p. 37).

the surgeon who, after the trepanation, examines as a sort of laboratory specimen the brain which once had studied him and had regarded him, the future surgeon, as a sort of anatomical specimen.

Through technical progress easy to conceive and even to foresee, an embryo *in vitro* can develop quite well until its termination, and thus, from a laboratory demonstration, which it is at first, it can become an eminent adult who will treat and operate on his former demonstrator.

The surgeon twins. Identical twins (issue of the same egg) become skillful surgeons. But one of them, after an accident, is obliged to undergo an operation performed by his brother. Now, being identical twins, they were for a short moment in the egg, after the first segmentation, the right and the left half of one living being. A chemical coincidence, detaching the two cells from each other, has made them two individuals. When one performs surgery on the other, one may say, if one takes into account their recent "genidentity," that one half of the organism is taking care of and mending the other half.

The disturbed psychology of twins. The abstract paradoxes that can be deduced from gemination have a concrete and very lively extension in the disturbed psychology of the twins.⁸ The image of the "other-like-me" interferes with the "image of me," and the intimacy of the pair interferes with the intimacy with oneself. This intimacy of a pair of twins is frequently accompanied by sexual intimacy, which then is auto-erotism rather than homosexuality.

Twins, identical or not, are always somewhat living paradoxes. And even the couple (of lovers or spouses) is always a sort of utopia of a twofold individuality. "I want to be two" would often be the right psychological translation of "I want to be married."

The Siamese surgeons. It could happen that the surgeon twins have remained "somewhat" halves, and have not been completely individualized and detached. In this case, they could

⁸ Cf. Zazzo, *Les jumeaux*, II.

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decide to detach themselves and themselves perform their detachment, thus achieving, through a complicated detour of the cerebral circuits and surgical technique, what had been started in the domain of primary consciousness of the cell or cells that they had been.

The robbing or murder of a Siamese twin. Can one legally rob or murder a Siamese twin? The law is explicit in the case of detached twins. And yet psycho-biologically is it murder or part-suicide? A scientist in the field of science fiction finds a process for dividing objects in two. Accidentally, he divides himself in two, and, horrified, he kills his double. Can he be condemned as a murderer?⁹

The surgeon operating on himself. Theoretically, a surgeon could operate on himself. This would be only a spectacular manifestation of the paradox of reflexive verbs. Furthermore, every man who cuts his nails, his hair, who tatoos himself, mutilates himself, ritually or not; if he takes drugs, administers adrenaline or insuline shots to himself, he is after all only an organism modifying itself, just like the organism of an embryo, a tadpole or a caterpillar in metamorphosis. The fact that the modification, in certain cases, makes use of the circuit of the brain changes nothing in substance, for the brain is only a part of the organism, which has become adept at transmitting internal circuits of physiology into an external circuit. Mr. X., the surgeon, amputating his own finger, does not differ essentially from a lizard practising auto-amputation.

The boss of an expropriated enterprise and the radical revolutionary. Mr. X., boss of an enterprise, who is at the same time proprietor and manager of his factories, is served by all sorts of human and mechanical auxiliaries. He may consult up-to-date graphs; he is kept informed by telephone and telegraph, he has accountants and calculating machines; he even has planning machines which help him make decisions; and he has reminders

⁹ Certain problems are posed, more generally, by the possible, and even actual, progress of surgery. (Cf. A. David, *Structure de la personne humaine*, P.U.F.).

of all sorts. His orders are carried out by a whole hierarchy of services, amounting to operations executed by automation.

But the first economic revolution expropriates all his factories. He is relieved of all the management aids, which moreover are no longer of any service to him. He complains of being "like a soul without a body." A learned and sadistic revolutionary takes him at his word and continues to expropriate his personal, organic machines. He takes care only to insure, through prosthesis and machines furnished by the state, that Mr. X. survives, for in the new state the penalty of death is abolished. The sadistic revolutionary declares: "Someone whose clothes have been taken away may also be relieved of his skin; someone whose car has been taken away may have his legs amputated; someone whose telephone has been expropriated may also have his ears cut off." First the patient's arms and legs are amputated, his digestive tube is replaced by a retort, his kidneys by filters, his heart by a pump, his lungs by oxygenizers. He is reduced to a head, kept alive and conscious by a complete laboratory. His hangmen do not stop there. From this head they remove the organs which have become useless, as they previously expropriated his offices and information and management aids. They remove his eyes, his ears, and the corresponding sensorial areas, the motoric areas, the cerebellum, and even, based on Lashley's experiments and on cerebral equipotentiality, they remove a good part of the remaining cortex. Finally, after all these expropriations, what remains of Mr. X. is a sort of culture of tissues, including some cells, or, if one prefers, one single cell. A live cell, capable of subsisting, of feeding itself, a human cell which comports, just as a germinal cell, all the potentialities of a species and which a more advanced biology would probably not find impossible to make reproduce itself and develop like a germinal cell, given the parallel cases of vegetables, sponges and planaria.

Can the sadistic revolutionary say this time that Mr. X. is truly without a body, without organic auxiliaries as his private property—that he is totally expropriated?

And Mr. X., or whatever remains of him, if he could talk, could he say that he is really a "soul without a body?" In any case, the expropriator has not touched at any moment the

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primary consciousness of his victim. He has simplified him, by amputating his information, his fields of secondary application, as one simplifies one's existence by giving up one's car, one's telephone, one's social relations and retiring to the country.

It is not literally true that Mr. X. is without a body. He is reduced to a state of cellular tissue, or even to a unicellular state. A unicellular organism is a body. An amoeba is a body. It is only a body without distinct technique, a body in which technique is improvised at every instant according to the need, like ideas in the brain; a body which transforms itself into a mouth, a stomach, limbs, directly, according to the themes of the activity in process; a body so close to the field in "absolute surface" that it is at the same time its own "soul," that is, the possibility of auto-guidance and thematic behavior, dominating through what appears to the chemist as a network of delocalized liaisons¹⁰ the "chain reaction" of the classical chemical phenomena used.

The two business executives. Peter and Paul are two business executives in a technically very advanced country in which private enterprise exists. Peter is very active, but very ill: he is paralyzed; his lungs, his heart and his kidneys function badly. He must have recourse to all the resources of surgery and prosthesis. Finally, he is almost reduced to no more than a brain, kept informed by artificial means and served by mechanical organs. Since he is very active, he still remains "the soul of the enterprise," for everything is owed to this brain. The information, the graphs, the plans for decisions order themselves in him. Without him, the most precise material information would have no more value than a street sign in a dead city, and the planning machines, the operational calculators, would be no more than scales whose pointer no one would read.

Paul, still in good health, leaves his business, retires to the country, interests himself only in himself and in the narrow sphere of his daily life. He is less alive than the mutilated Peter, for living means to animate machines, organic or extra-organic, and keep a more or less vast domain organized.

¹⁰ Cf. Frey-Wyssling, *Submicroscopic Morphology*, p. 130.

Re-animation and animation. But what does it mean "to animate?" An inanimate man has just been taken out of the water. The heart of a patient stops beating on the operation table. Artificial respiration is given the drowned man, and a heart massage is given the man who has been operated on. Both are re-animated. Re-animation seems to be a re-priming of a functioning, the re-starting of a machine temporarily arrested. Life, then consciousness return when the respiratory and circulatory machines resume their function and start again to irrigate the brain. From thence arises the enticing conclusion that animation does not differ essentially from re-animation. In this perspective consciousness appears to be allied with the nervous system, not as living tissue but as a functioning mechanism. The fact that the brain is made of living cells appears to be something accidental. The nerve conductors could be replaced by electric conductors, or by hollow rubber tubes; the nervous influx could be a pneumatic circulation, of the type imagined by Descartes. Nothing in principle would be changed. In the same way life would be tied to a massive functioning of organs, replaceable, in principle and in fact, by mechanical aids. One is led by analogy to suppose that cellular life, the life of a nerve or a reproductive cell, or the life of an Infusorium, an autonomous cell, is only the functioning of micro-organs—this micro-functioning simply insuring the conservation of good material for the macro-functioning. The saying attributed to Dr. Watson, "Give me a nerve, a muscle, a gland, and I'll make you a mind," illustrates this well. It does not matter whether the nerves, muscles and glands are natural (that is, produced by cellular micro-functioning), or whether they are artificial. An illusion, of course, and even an absurdity. It is turning things around to conceive of animation as following re-animation. As it would be turning things around to want to understand the invention and the creation of an engine by studying how to repair it.

Re-animation and telegraphy of an organism. No one expects, except in the movies or in science fiction, that with further perfecting a robot would become alive and conscious. A re-animation without primary animation, that is, the animation

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of a purely manufactured mechanism, is as unlikely as it is paradoxical. But let us imagine¹¹ that a man, and not only a message, could be telegraphed from America to Europe, by reproducing exactly in every detail the organic form at a distance. We do not see why this form, an exact copy, could not be re-animated a lot easier than a drowned man. We do not see why A2 could not be just as alive and conscious as A1. If A1 is not destroyed in the measure that A2 is created in the course of this telegraphic operation, we have the genuine creation of a pair, with the bifurcation of "genidentity" at an unusual level—instead of the normal bifurcation, at the level of micro-physical particles or at the cellular level.

The experiment of telegraphing a man is likely to remain a mental exercise. In this respect, it teaches nothing about the nature of life and of consciousness, or, if this picturesque word is kept, of animation, for it is a simple application of the general postulate that if A2 is exactly equal to A1 (absolutely analogical), we would not see why it would not have the same properties.

The animation of an automaton. To animate a massive automaton, produced by industrial techniques, means to transpose directly into the macroscopic order what is possible only in the microscopic order. It is as though we constructed models of hydrogen and oxygen atoms out of wood and aluminum, and expected by placing them in contact that they would combine into a molecule of water.

The animation of a massive automaton is possible on the contrary—without obtaining a soul for it from Jupiter—on the condition one does borrow for it a ready-made field of absolute self-control, even in an elementary form, for example, in the form of a living unicellular organism. Then the experience of the manager of the expropriated enterprise could be reenacted in reverse. Let us then imagine, on the one hand, an automaton, equipped by an advanced technique of prosthesis with the principal massive organs of registration and operation of a superior organism. This automaton has artificial "eyes," "ears,"

¹¹ As N. Wiener suggests.

as well as limbs, arms, hands, and legs endowed with automatic equilibration and commanded by physical information gathered by the organs of registration and centralized into an artificial cortex for scanning. This automaton is capable of reflex actions; it can walk toward a light and take hold of an object which comes into contact with its "hands." Superficially, it can give the impression of a true human being. But the least examination shows that it functions but does not behave, that is, it is subject to impulses transmitted by "chain reaction."

Let us imagine, on the other hand, or let us observe alongside of it, a single cell, or a colony of unicellular¹² organisms in the process of changing place. Nothing resembles a man less. And yet a careful study shows a whole behavior, improvised, and not a chained succession of strictly localized chemical phenomena. Certainly, due to the lack of complex organs, amplifying through their massive functioning in relay the primary behaviors of the organism, this behavior remains inefficacious: the locomotion, or the pursuit by means of pseudopodes, even if the scale is taken into account, has a low output. Lacking long distance sensorial mechanisms, an Infusorium cannot take distant objects into consideration; it acts only on the immediate, or very near, even if it is equipped, as the *Euglene*, with a cellular micro-organ sensitive to light. In this it is apparently more blind than an automaton equipped with photo-electric cells. It proceeds by trial and error, as an automaton, although *for the reverse reason*, not from the lack of absolute self-control and of subjectivity, but from the lack of an apparatus to transport the information into the field of self-control. Nevertheless it has the essential, although it lacks all the accessories, and *the Euglene is less blind, with its modest visual task, than the automaton with all of its perfected photo-receivers.*

Let us reunite now the Infusorium and the automaton. We install the Infusorium, or a colony of Infusoria, in place of the artificial cortex of the automaton, in such a way that it

¹² A colony of unicellular organisms, such as the *Dicystallium*, travels like a unicellular organism (*cf.* Bonner). R. Ruyer, *La genèse des formes vivantes* (Flammarion).

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experiences, without scanning, all the information gathered by the mechanical aids, the intero- as well as the extero-ceptive, and so that it closes the circuits of operation. Faraway prey may then act on the Infusorium as very near prey act on the Infusorium in an ordinary situation. The pseudopodes, in forming, will release the relays of locomotion by the mechanical "legs," or of manipulation by the mechanical "hands" or of swallowing. This time, the automaton thus "animated" will have a behavior, an initiative, a self-guidance, which will at the same time be apparent because it will be massive, and real, because it will correspond to an authentic micro-behavior, delocalized and self-controlled. The synthesis produces, very approximately, a man or a truly superior animal.¹³

Nothing even prevents the assumption that if the Infusorium animates the mechanism, the mechanism and its functioning would develop on its part the consciousness (or the primary subjectivity) of the Infusorium. It is known that a unicellular organism is capable of habituation and learning. Receiving more numerous information coming from farther away, its subjectivity will become a genuine consciousness, with the appearance in image of exterior objects in its own field. For although it is absurd to pretend to manufacture a subjectivity, it is completely possible to develop a primary consciousness into a secondary consciousness, that is, into a consciousness that perceives and animates a vast annex field. To acquire the telephone, the radio, a car is, for man, to develop his consciousness, just as to acquire eyes, ears, hands, wings or legs is to develop the consciousness of a living protoplasm. The generalized Marxist thesis is not a paradox, if a primary subjectivity is posited.

The mechanical shovel and the inhabited Sputnik. Setting aside all utopian considerations, this procedure is currently practiced and even normal: to construct first a perfected automaton, whose organs are ready to function in relay, then to animate it by introducing into it, as a maggot into a fruit, a field of self-guidance—in other words, a living human brain. We manufacture mechanical shovels, cranes, linotype machines, trucks,

¹³ This is a resumé of a chapter in our work, *L'animal, l'homme et la fonction symbolique* (Gallimard, 1964).

planes and Sputniks, with all their perfected equipment, reserving the place of the pilot, sometimes even, as for Sputniks, without being certain that a pilot will ever be able to introduce self-guidance into the engine. Once the automaton is thus "animated," it resembles very much a human being. Even a lowly mechanical shovel digging a ditch has the aspect of a large animal. The animation of our massive adult limbs by our cerebral "homunculus" is not of a very different nature.

Now, adding an organic cell to a man-shaped automaton is exactly the same operation as adding a pilot to a Sputnik. What counts, in the "added man," is much less the sum of his own organs, his organic equipment, his eyes, his arms, than his cortex, the enormous unified protoplasmic field, like the protoplasm of a unicellular organism, in which forms control their own activities, escaping from the process of "chain reaction." The organic mechanisms (eyes, hands) represent a precious intermediary, extremely useful, between the field of self-guidance and the mechanical aids, but in principle, under the circumstances, nothing else. The eyes of the pilot are a precious intermediary between the dials of a control board and the cortex; his hands, between his cortex and the levers. But, in principle, one could conceive of a visual cortex that would receive impressions from the control board with the aid of artificial intermediaries replacing the eyes and the optical nerve, and a motor cortex manipulating the levers without organic arms or hands, through the sole intermediary of mechanical relays.

One could even connect a man-shaped automaton, animated by a unicellular organism, with an apparatus (automobile, shovel, etc.) which this animated automaton would actuate. The only difference with the machine piloted in the ordinary fashion would be that the border between the field of self-guidance and the mechanism, situated closer to the field, would be more abrupt. In real men, in effect, the organic mechanisms are mixed. They are mechanical only from a macroscopic point of view; their component cells are alive (although specialized and mechanized in their cellular life); and they are capable of regeneration and of limited self-adaptation.

Nevertheless in fact, when a heavy truck swerves in order

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to avoid running into us, our salvation depends less on the good mechanical handling of the truck, and even less on the arms of the driver, than on the cortical cells in which its itinerary is designed in its entirety. When a few molecules of alcohol or of narcotic temporarily "envelop" the cellular enzymes, and temporarily suspend "animation," that is, the overall behavior of its cells, then it is a catastrophe for the truck driver and for us. But these cortical cells are astonishingly similar to a unicellular colony in a mechanical automaton.

The two limits of automatism. There are two limits of automatism, the conscious behavior on the one hand, with self-guidance, and reproduction on the other. It is remarkable that at these two limits one discovers the same reality: some living cells, either in the form of nerve cells, or in the form of germinal cells. In the young embryo everything is as yet undifferentiated, as in a unicellular organism: the cells are at the same time capable of reproduction and of self-guidance. In the same way *a single cell is entirely its own brain, it is entirely gamete of itself.* It is also its own body (in the sense of "the whole of the auxiliary organs"). The same is true for a young embryo. But an embryo, with the difference of the protozoan, knows how to manufacture itself by making use of itself, of its massive organs of behavior as well as of its massive organs of reproduction, utilizeable by those of its own cells that are kept at its disposal for improvisations in "absolute surface."

The major part of the organs of behavior or of the receivers of information may be replaced mechanically, provided that the brain or a part of the brain is left to subsist. Theoretically, conscious life is not cut off, provided that a way is found whereby the brain waves may be modulated directly, and the channels of command that are improvised by it can be collected and amplified. Likewise, and parallel to this, the massive organs of reproduction may be mechanically replaced. Artificial insemination is simple and common, and even the uterus in ectogenetic development is replaceable. No less realizable, perhaps, is vision through direct, cortical information or muscular action through direct frontal command. But the germinal cells are irreplaceable, like the brain cells.

The horror of expropriation and the pleasure of privation.

The man from whom everything, even his organs, have been expropriated is very unhappy. But all depends on the point of view. If he is a mystic, he may himself seek privation and, while not amputating all his limbs, at least close his eyes and ears, or even as a Buddhist, reject his own sensations. The business manager who has been mutilated and reduced to a few cells is subjected to barbarous treatment. But every man inflicts this treatment on himself, and with the greatest pleasure if he engenders a child. The "he" in this regard is not very precise. One must expect it, since it concerns reproduction. When a man, in the sexual act, separates himself from "his" germinal cells—one can also say that "the germinal cells separate themselves from him"—they reject him, reject the old man, with all his complex mechanisms, all his adult equipment.

The pleasure, it is true, is for the rejected adult; whether his germinal cells feel anything, the adult has no way of knowing. But, at any rate, the germinal cells prove, by the fact itself, that the machines and organic mechanisms are not essential, since they (the germinal cells) can be remade rapidly, in a few months—by definition without machines—while the complex organism that they have rejected is destined to decay and death.