Chapter 2
Reforming the Concepts of Form and Information

Simondon inherited the concept of information from one of the fathers of cybernetics, Norbert Wiener. Although the structure of DNA was discovered in 1953, during the 1950s 'information' was not yet considered *the* fundamental paradigm for biology – and certainly not in France.[1] However, from the beginning cybernetics conceived the technological concept of information as a paradigm which could be at least in principle extended to all the fields of scientific research: biology, psychology, psychopathology, sociology and political economy. In that period Simondon was adopting it as a key methodological tool for his philosophy, as the entry *La psychologie moderne* [Modern Psychology], edited by Simondon for the *Encyclopédie de la Pléiade* [ENC] shortly before writing *Individuation*, clearly shows:

> The language of cybernetics, already applicable to nervous system physiology, could prove to be suitable for describing the relations between the human being and his natural and social milieu, overcoming the alternative between liberty and determinism, which seems to be the major obstacle for any psychological science. (ENC 1701)[2]

[1] Even Watson, Crick and Wilkins did not win the Nobel prize for the discovery of the structure of DNA before 1962. Born in the USA in the 1940s, during the 1950s cybernetics started to spread in France too. The conference *Les machines à calculer et la pensée humaine* of January 8th 1951 marks the initiation of a European audience to cybernetics (Guchet 2001: 231, n. 3; see also Guchet 2005, who quotes Simondon's unpublished texts on cybernetics; Geoghegan and Hayward 2012: 4–8). It is worth noticing that already in 1950 a series of conferences organised by L. De Broglie had taken place, later published as *La cybernétique. Théorie du signal et de l'information* (1951), and the text appears in the bibliography of *Individuation*. The astonishingly short bibliography of *Individuation* (Canguilhem GC: 40.2.1) presents only twenty references, four of which were on cybernetics, eight on quantum physics, three on biology, and five on the human psyche. These texts are particularly important, because they are the only 'official' table of Simondon's non philosophical sources for the book. In my interpretation I shall make substantial use of them.

[2] Simondon wrote the text in collaboration with F. Le Terrier. A letter he sent to Canguilhem in January 14th 1989, just a month before his death, not only gives some evidence of his mental illness at the time, but also testifies the value he attributed to this text about which he was still asking for advice from his former master (Canguilhem GC: 40.2.2). In France the relationship between social sciences and cybernetics was becoming quite *à la page*, thanks to the merging of structural

© Springer Science+Business Media Dordrecht 2015

A. Bardin, *Epistemology and Political Philosophy in Gilbert Simondon*,
Philosophy of Engineering and Technology 19, DOI 10.1007/978-94-017-9831-0_2

After the two theses,[3] terms like 'transduction' 'allagmatics' or even 'individuation' almost disappeared from Simondon's vocabulary while, throughout his entire intellectual life, he never abandoned the term 'information'. From this perspective *Individuation* can be considered an experimental work in progress in which all the problems Simondon had previously discussed, converge. The notion of information, because of its 'purely operative character, not linked to a specific matter, and defining itself only in relation to an energetic and structural regime' (I 220), perfectly responds to the above expressed exigency of an allagmatic theory, which therefore 'must be in relation to the theory of information, which concerns the translation of temporal sequences into spatial organisations' (I 238).

But, in order to reach an adequate elaboration of the concept, a few problems related to the notion of 'form' had to be settled:

> Cut off from the hylomorphic schema, the notion of form can become adequate to the polyphasic character of being structuring itself in a relational way. This accords with the research direction of theoreticians of Form. This relational meaning of form is better grasped through the notion of information, provided that one understands the concept of information as the relational signification of a disparation. (I 318)

In this chapter I shall follow the route traced by Simondon: after displaying his double criticism to the concept of form – both Aristotelian and *Gestalt*-like –, I will delve into what he conceived as a 'reform' of the cybernetic concept of information.

2.1 Criticism of the 'Hylomorphic' Concept of Form (*Gestalttheorie*)

The first conceptual enemy Simondon chooses to challenge in *Individuation* has a venerable name: hylomorphism. The Aristotelian 'hylomorphic schema' – he says – has prevented an ontogenetic approach to the question of being, and subsequently to knowledge, by maintaining a latent but undisputed dominion over both common sense and philosophical and scientific thought:

> The meaning of the present research is that in order to think individuation the hylomorphic schema must be abandoned [… as it] abusively replaces the knowledge of the genesis of a real; [that is,] it prevents knowledge of *ontogenesis*. (I 312)

The 'hylomorphic schema' derives from an ordinary conception of the technical operation as the shaping of some formless matter. This conception substantialises

---

linguistics, anthropology and psychoanalysis (in particular through the works of Lévi-Strauss and Lacan). The texts to which Simondon frequently refers are of course Wiener (1948) and (1950), plus the famous 'Macy conferences' held in New York from '46 to '53 (Pias 1946–53; three of them appear in the bibliography of *Individuation* and four in MEOT's). The theme is also dominant in the text Simondon seems to rely on in order to build his argument: De Broglie (1951). As I will explain in Sect. 2.3, Simondon intends to answer the questions posed by Raymond Ruyer in *La cybernétique et l'origine de l'information* (1954).

[3] As said, *Individuation* and MEOT were Simondon's *two* PhD theses (see p. 1, n. 1).

matter and form, hiding their constant becoming: it presents them as already individuated at the very beginning of the process of formation. Simondon develops a double objection. On the one hand, no inert and amorphous matter is present in nature: as it is evident in the case of wood venation or stone stratification, what we call matter always presents the implicit results of an earlier formation, and therefore is always partially individuated. On the other hand, no accomplished form exists in nature, neither is it a perfect idea in the artisan's mind: it is instead an operative sequence, a complex process with a determinate history and, in this sense, a characterising 'form'. In short, rather than correctly representing the actual dynamics involved in the technical operation, the hylomorphic conception of matter and form is definitely unfit to describe any real and singular process of 'formation' [*prise de forme*].

Simondon provides a sociological hypothesis concerning the historical success of the hylomorphic schema:

> If only the individual and technical operation existed, the hylomorphic schema could not emerge […] What the hylomorphic schema first of all shows, is a socialised representation of work and an equally socialised representation of the individual living being. (I 50–51)

He develops part of his argument referring to the different relationship established by the master [*maître*] and the artisan [*artisan*] in regards to the technical operation. The master's abstract relation is that of property, while the artisan's is the concrete immersion in matter through the technical process of its (trans)formation. This 'evocation' of the master–slave dialectic is less a Marxian debt than a Hegelian reference to the abstraction of the master's knowledge in front of the artisan's ability to grasp the singularity, the 'implicit forms' of worked matter (I 57–60). But, in the end, this sociological hypothesis is insufficient:

> The psycho-social conditioning of thought, even if it can explain the vicissitudes of the hylomorphic schema, cannot at all explain its permanence and its universality within reflection. (I 52)

Thus, he concludes, the problem can be solved only at a deeper level: the level of the physical analysis of the 'process of formation', i.e. of individuation.

In fact, according to Simondon, only a theory of individuation can give adequate reason for the structural inherence of the hylomorphic paradigm to knowledge, since the operation of knowledge itself is an operation of individuation which – *as such* – works according to the hylomorphic schema. In fact, knowledge *normally* proceeds through binary oppositions of symmetrically polarised terms, instituting and rendering compatible couples of clear and distinct ideas enclosing (and thus hiding) their relation. Against this tendency Simondon attempts to grasp being in its relational and active centre, or 'central operative zone' [*zone opérative centrale*], as he calls it, acknowledging that the *milieu* of a relation cannot be considered less important than its limit cases (I 313).[4] In this sense, in *Individuation* hylomorphism

[4] On the contrary, 'The hylomorphic schema entails and accepts an obscure zone: the central operational zone. It is the example and the model of all logical processes through which one attributes a key role to limit-cases, to extreme terms of a reality organised as a series' (I 312).

becomes a synonym of a 'substantialist dualism' which causes knowledge to be knowledge of individuals, instead of knowledge of the processes of individuation.

Although *Gestalttheorie* gave some useful indications for an alternative approach to the 'central operative zone', it failed to subtract the Aristotelian concept of form from its subjection to the dominant philosophical and scientific tradition. According to Simondon, *Gestalttheorie*'s limits derive from the 'psychologism' implicit in its central hypothesis, the stability of the 'good form', which prevents a valid application of it in the different fields of knowledge. In the psychology of perception the law of 'good form' (or *Prägnanz*) should explain the definition and stability of the figure: the way it imposes itself on attention and thus to perception through a dialectical relation with the background (hierarchical superiority), and its permanence in memory. Now, after denying the validity of the 'good form' hypothesis also in the psychology of perception,[5] Simondon states that – in general – the hierarchical superiority of a form and its stability can neither *ontologically nor logically* coincide. Let's see how he proceeds.

His argument is based on an original conception and evaluation of systemic stability. For Simondon true stability characterizes systems deprived of potentials and therefore incapable of any further transformation. Such systems are difficult to understand precisely because of their high degree of stability, since knowledge – according to the thesis Bachelard (1951) derived from quantum physics – requires a perturbation of the system. In short, the stability of a system prevents its knowledge, therefore duration entails inferior evidence of form (*Prägnanz*). On the contrary, the superior evidence of form derives from the fact that the system is full of potentials, thus still becoming, and therefore capable of becoming involved in the further processes of formation, including knowledge processes. In this sense, by conceiving stability as the fixation of a 'good form' into a long lasting, clear identity, *Gestalttheorie* ends up presenting as the genesis of a 'good form' what is in fact a process of slow degradation (i.e. reduction of potentials) into a system the main feature of which is a long lasting sterility (FIP 540–41).

In other terms, what the concept of form lacks is precisely the possibility of conceiving the actual metastability of systems, their tendency towards producing transductive amplification, rather than (apparently) ensuring a long duration with no effects. For this reason Simondon turns his attention to the emergent concept of information, since it allows for the understanding of 'formation' as a process concerning a dynamical system. Also for cybernetics a system (whether physical, biological, social) is a complex system, each element of which is related to the others and with the system as a whole, but it is also characterised by self-regulatory processes. Thus the system is conceived as permanently active, its equilibrium 'dynamic' rather than 'stable'.

[5] According to Simondon, *Gestalttheorie*'s 'static' conception of form fails to explain the dynamic character of the background and the differential nature of the figure: in fact, only a stimulus variation, not its 'good form', can produce information (I 236).

2.2 Criticism of the 'Technological' Concept of Information (Cybernetics)

If the notion of 'form' is conceived in terms of identity and 'structure', 'information' instead can be conceived in terms of a differential relation and 'operation'. Thus Simondon feels confident that a critical enquiry into the concept of information could supply a paradigm to direct his own quest for a science of the relations between structure and operation. Indeed, he thinks that the notion of information elaborated by cybernetics in connection with the concept of homeostasis,[6] remains insufficient in explaining the operating of complex systems, and therefore it must also be reformulated.

The cybernetic paradigm for the understanding of information is derived from engineering problems related to cable communication technologies, such as the telegraph or telephone. The basic schema consists of a linear energetic exchange between a Sender and a Receiver connected by a channel through which low potential energy transports information. Such a schema has different technological fields of application and is extendible to biology and society. But what is necessary for the process to take place, is the presence of the same code in the Sender and in the Receiver. The code ensures that the initial and final information really *is* the same. In other words, the identity of the code preserves the identity of the piece of information going through the whole process, from the Sender to the Receiver. In addition, the elementary process is complicated by a *feedback* cycle in which the roles of Sender and Receiver are inverted.

Let us look at Simondon's basic example, however, since it aims to effectuate a change of paradigm. Two electronic oscillators[7] with different frequencies, if close enough for their magnetic fields to overlap, end up stabilising their frequencies on a value which corresponds to the magnetic field which results from their merging. In the proposed example there is neither an 'ontological' nor 'logical' identification of a system-Sender and a system-Receiver, since the two systems A and B actually fulfil both functions. Furthermore, there is no univocal transmission, nor a one-to-one correspondence (as it happens in a *feedback* cycle) between the systems, but rather we have a concurrent reciprocal influence, and therefore a macro-system composed by A, B and their interaction. Thus we have a newly constituted macro-system where the difference between the frequencies of the two sub-systems originates as an information flux which modifies both of them, and therefore the macro-system itself from within. In fact, from the moment in which a relation between the two oscillators is set (and their fields overlap), the unique differential relation between the frequencies is a single signal which generates two different

[6] The concept of 'homeostasis' refers to the tendency of some systems (notably organisms) to maintain stable functioning and constant properties. The notions of *homeostasis* and *entropy* play a central role in Simondon's argument against cybernetics. For a wider discussion of the topic, see Chap. 7.

[7] The example of oscillators recurs frequently in Simondon's writings, e.g. I 222–24, MEOT 134–37 and, notably linked to the notion of 'field', FIP 534, 539.

pieces of information in A and B, according to their respective frequencies, thus determining different modifications within them. The process goes on until the two frequencies of A and B coincide, and a system in dynamic equilibrium will be structured.

Simondon's example has the merit of highlighting what the schema derived from the 'cybernetic paradigm' has the tendency to hide: the dual oscillators schema, in fact, subverts a few classical assumptions which, according to Simondon, still 'infect' the cybernetic concept of information.

1. *Active/Passive*. There is such a perfect reciprocity between the Sender and the Receiver that, logically speaking, it is impossible to differentiate the two functions. Furthermore, since there are no isolated linear sequences in the systemic relations, one should not speak of feedback mechanism, but rather of a *simultaneity* of transmission-reception.
2. *Internal/External*. In an oscillator what is internal (oscillation) and what is external (magnetic field) are regimes of functioning which correspond to each other and influence one another. Thus it is not possible to conceive the second as the effect of the first, nor vice versa.
3. *Information/Relation*. From the moment the process starts (when the two fields overlap) it no longer makes sense to distinguish the relation between the two systems and the circulating information, since information *is* precisely the (differential) relation between the two oscillations, i.e. what drives the sequence during which information progressively emerges and the relations between the systems progressively change.

In Simondon's example, what results particularly questioned is the nature of the code. In cybernetics' technological paradigm the codes of Sender and Receiver must coincide in order to allow a correct exchange of information, which is a process independent of the code permanently inscribed in the system's structure. On the contrary, for Simondon the code and functioning of the system depend on each other. Therefore, on the one hand the functioning of a system according to the code entails an emission of signals which can be transformed into different information by other systems and, on the other hand, each signal which actually modifies the operating of a system in fact can modify its code. In short, the code is both producer-of and produced-by information exchange, i.e. it can generate and be modified by signals. And this explains how systems with completely different codes can in principle (and they actually do) communicate, such as human being and machine or machine and animal, but also a human being and virus, orchid and wasp.[8]

[8] The last examples are in fact to be ascribed to Deleuze rather than to Simondon. But also Simondon, as I will explain, is particularly concerned with code in organisms: 'the content becomes the code', 'the living being transforms information into forms, *a posteriori* into *a priori*; but this *a priori* is always oriented towards the reception of information' (MEOT 123, 137). A probable common reference – through Canguilhem 1952: 144 ff. – is J. von Uexküll (1934), the German ethologist who provides the well-known example of the *milieu* of the tick (Sect. 9.4).

As a result, Simondon's example of oscillators – although not completely flawless – enables him to shift towards a relational and non-deterministic point of view, focusing on the way information exchange continuously modifies the relations between systems and *therefore* their identity. According to Simondon, the cybernetic conception of information, affected by its technological origins, proves to be tied to a double fetishism of 'identity' and 'determinism', a symptom of which is the confusion between signal and information. Of course, the transmitted energy has not only a quantity, but also a form, a 'quality' derived from its frequency and tension, or just from its distribution in time – as happens with the Morse code. Of course, the signal *is* this energy modulated in order to be converted into something else, such as the possible beginning of a procedure (if received by a machine) or a meaning (if received by a human being) (I 221–222). But the signal *is not* to be considered information, unless it encounters and modifies a system (or a subsystem) with a proper code. Therefore one should not properly call 'information' what emerges from the natural expression of a code, but exclusively what produces the *interruption* in the continuity of communication processes, a crisis in the self-regulatory functioning of systems, and can trigger, after all, the structural reconfiguration of the system.

On the basis of this conceptual disjunction of signal and information, Simondon attacks the contradiction between the ordering function and the operational efficacy cybernetics attributes to the signal. For Simondon dynamic *order* depends on the transmission of *signals* expressed by the code for the normal functioning of the system, while *efficacy* concerns the disorganising impact of new *information* on the same functioning. They are two radically different processes – the first deterministic, the second partially aleatory – which must not be confused. On the contrary, by identifying signal and information (I 224), cybernetics reduces information exchange to a unique deterministic process which leaves substantially untouched the identity of the systems involved, reducing them to subsets of the macro-system they are supposed to entirely depend on.

2.3 Reforming the Concept of Information

It is now possible to understand how Simondon can 'reform' the concept of information both in terms of systems' metastability and of processes' transductivity. As I will show, this theoretical framework allows him to avoid the cybernetic assimilation of information and negentropy, and subsequently solve the problem of the origin of information which was posed – precisely against cybernetics – by Raymond Ruyer in *La cybernétique et l'origine de l'information* [Cybernetics and the Origin of Information] (1954).

On the one hand, a system is not variable by just any signal, its changing is submitted to differential conditions of possibility or 'disparation' (in fact the ideal condition of information exchange corresponds to a 'relative maximum' of 'disparation', a threshold over which there would be no relation at all). This entails the abolition

of the ontological distinction Sender/Receiver, as much as the abolition of the Aristotelian distinction Form/Matter. These distinctions are no longer valid, since the system conditions do not depend on the supposedly 'stable' initial condition of the Receiver on which the metastability of the Sender would produce its effects. In fact, also the Receiver's metastability is needed for the information exchange to take place: 'the metastability of the receiver is the condition of efficacy of the actual information' (API 159).

On the other hand the production or exchange of information cannot be the necessary outcome of processes which could be entirely calculated on the basis of the initial metastability conditions of the two coupled systems (Sender and Receiver). The shape of a system resulting from processes of information exchange can be only approximately foreseen, as such processes are transductive, i.e. discontinuous. And the more the system is phase-shift, the less forecasting is possible, because the relation among different phases of different systems follows different rhythms and modalities. That is why, for instance, the development of a social system – which is made of physical, biological and psychic-collective phases functioning according to different regimes of individuation and communicating among them at different levels – is highly unpredictable.

Furthermore it is important to notice that information can be treated as a process both internal and external to the system, since for Simondon there is no difference in considering the exchange of information as a relation between systems or – at a larger scale – as an internal relation between different parts of a system: 'there's only information when what emits signals and what receives them form a system' (I 223, n. 30). Now, to point out that in any system there is *always* an internal exchange of information between different scales, Simondon speaks of the 'internal resonance' of systems as an actual condition of their functioning.[9] By 'internal resonance' he means, in fact, the discontinuous relations between different parts of a system which produces quantic structural changes and therefore prevents any determined knowledge of 'the becoming of this system according to a theory of continuity or to the laws of great numbers, as thermodynamic does' (I 148–49). This leads him to conceive the different individuals-systems as closely connected through processes of energetic exchange which simply happen through the mediation of the respective oscillations (FIP 532).

Consistently with this theoretical framework Simondon rejects the cybernetic equation information = negentropy, presented by Wiener.[10] In Wiener's terms, *information* is the unit of measurement of order, the contrary of which is *entropy*, as the unit of measurement of disorder: it follows that information is by definition negentropic, i.e. opposed to the system's energetic process of degradation (Wiener 1950: 28 ff.). From the same engineering example, Simondon arrives at the opposite

[9] In physics the 'internal resonance' of a system is the progressive widening of its oscillation, due to the application of an external force with compatible frequency. Simondon's usage of the concept is wider, including the actual functioning of any system. For a deeper discussion of the scale problems entailed by the concept of 'internal resonance', see Sect. 4.4.

[10] Wiener's expression is 'negative entropy', later abbreviated as 'negentropy'.

conclusion. To transmit information it is necessary to input some energy (a signal) into the system. Now, in order to avoid signal degradation and improve the transmission of information, two paths can be followed: on the one hand one can increase the signal energy (thus increasing the total amount of energy in the system), on the other one can decrease the background noise. In the second case, through a diminution of the total amount of energy in the system one improves the transmission of information, thanks to a different *distribution* of energy within the system. What is fundamental to note is that, in this case, a diminution of energy increases order (I 222–23).

For Simondon this is enough to prove that there is no constant mathematical relation (direct or inverse) between the quantity of energy input into a system and the quantity of information transmitted. On the contrary, it is the actual distribution of energy in a system, i.e. its 'form' or 'quality', which determines the quantity of information that can be transmitted. Simondon speaks also of the *ecceitas* of information (I 223), but in conclusion he rejects all terms incapable of expressing the 'relational attitude' of a system. What actually produces/transmits information by differentiating information from background noise, is in fact the relation between the code and an energetic variation. The singularity of this encounter can be reduced neither to structured form, nor to pure chance:

> Information is halfway between pure chance and absolute regularity […] information is not a kind of form, neither a set of forms, it is the variability of forms, the intake of a variation upon a given form. It is the unpredictability of a variation, not the pure unpredictability of any variation. We shall distinguish three terms, then: pure chance, form and information. (MEOT 137)

According to Simondon, Wiener's identification of information and 'negentropic order' must therefore be rejected, since it explains information only in quantitative terms, hiding its relational, differential value. He claims there is *no* univocal relation between information and energy, since the *quantity* of information actually transmitted depends also on the relation between that quantity and the 'form' of energy, the asymmetrical distribution of potentials within a metastable system. In short, information is relatively independent of the calculus of the quantity of energy present in a system, and its transmission is the result of a differential relation between systems or parts of a system, which cannot be expressed by a scalar measure.

In Simondon's intentions, this constitutes also the solution to Ruyer's question on the origins of information. Ruyer underlines that the postulates of cybernetics can explain how information circulates, but not, in general, the way it emerges:

> The paradox clearly results from two of Wiener's theses. The first states that informational machines [*machines à information*] cannot increase information […] the second that brain and nervous systems are informational machines […] let us combine the two theses: it becomes impossible to conceive the origin of information. (Ruyer 1954: 13)

In order to overcome the determinism of cybernetics, Ruyer introduces the indeterminacy issues of microphysics into the chinks made on classical physics by the entropic evidence discovered with thermodynamics:

> Despite its unquestionably "modern" spirit, cybernetics exclusively borrows concepts from classical physics, not from microphysics […] thermodynamics, although deterministic in its postulates, has been compelled by technical reasons to pose the question of origins. (Ruyer 1954: 25–26)

Now, precisely because Simondon will draw on the schema of Ruyer's criticism, it is necessary to underline immediately what clearly differentiates the two positions: Ruyer calls 'consciousness' the operation which orders a domain, thus generating information. Only consciousness, 'anti-causality' *par excellence* (127), can give a form to a structure, i.e. transform it into signification, information (11). His entire discourse aims to demonstrate how a fundamental mechanistic approach compels cybernetics, in order to keep an internal coherence, to be involved in a sort of dialectical antinomy (a quite classical one, indeed) which would reveal as genuinely original what was supposed to be explained at be beginning of the argument, i.e. consciousness (136). Ruyer's assumption eventually becomes explicit when he not only uses the concept of organism to explain the elementary features of matter, but he also goes so far as to expand the phenomenological paradigm of the 'absolute overview' [*survol*] – the precedence of consciousness over microphysical systems.[11]

Simondon's perspective is completely different, and in a way it reduces the problem of the origins of information to a false one. As explained above, the transmission of information does not necessarily entail any 'external' intervention (neither a physical operator – whether a human being or a machine – nor 'consciousness') to introduce a supplementary piece of information in the system. In fact, due to their constitutive disparation and metastability, systems continuously emit signals which *can* be converted into information, *if* only they encounter another metastable system with a 'compatible' code. Of course, this works for any kind of information exchanges among systems (physical, biological or social), since the actual encounter of partial indeterminacies of different systems is what really originates information, independently of the typology, scale and regime of their operating.

In this sense Simondon claims that not just any signal emitted by the Sender is information, but only the one which 'comes through the test', i.e. enters a structuring relation with the code (here 'form') of the Receiver, thus being implemented in its functioning:

> One can distinguish the *signal* transmitted, the *form* through which the signal is received by the receiver, and the *information* properly named, which becomes actually integrated in the functioning of the receptor after the test of disparation carried on the extrinsic signal and the intrinsic form. (I 224)

[11] 'Also an organism partially functions *according* to its structure. But its structuring is manifestly not an operation depending on a existing structure […] in this sense the fundamental beings of microphysics resemble organisms' (139). In the domain of microphysics 'where the individuality of the constituents is partially scattered within the individuality of the system, experience reveals similar behaviours to those induced, in the psychic-organic individualities, by the existence of fields of consciousness of absolute overview [*à survol absolu*]' (139–40). On Ruyer's project of expanding the concept of form-structure, in order to overcome the opposition determinism/contingency, see Ruyer (1930).

If the program of cybernetics consists in expanding a technological paradigm to the biological and social systems, Simondon's attempt seems rather the opposite. He aims to expand a biological and/or psycho-social paradigm of communication to the physical and technological fields, relying on what quantum physics associated to thermodynamics allows him to think, i.e. the quantic nature of all systems and the non-deterministic characterisation of all processes, against the essentially *deterministic nature* of cybernetics' concept of information.

This partly explains the fact that in *Individuation* Simondon develops his criticism against the 'technological concept of information' precisely when closing the part devoted to the individuation of living beings, at the threshold of the psychic-collective individuation. The study of the organism, in fact, highlights many problems related to the identity of the 'code' in the relation between the organism and its environment, which is consistently read by Simondon as a transmission of information *within* an individual-milieu system. Similarly, the psyche-body relation shows at a macroscopic level its relative metastability within the larger system of society. The consequence is that human communication itself – if not highly formalised, as happens in logic and mathematics (but these are limit-cases, not the essence of communication) – cannot be explained in terms of information exchange between stable systems with stable codes.

Thus, the 'reformed' concept of information is consistent with: (a) the 'oscillating' structure of the individual as a metastable system, the 'internal resonance' of which derives from quantum gaps which keep the system in tension (I 330); (b) the discontinuous transductive operation, which is relatively non-deterministic, i.e. dependent on incalculable events based on calculable conditions of state. Finally, it appears to solve a problem within Simondon's research: the 'allagmatic' problem of explaining how 'structure' and 'operation' can be repeatedly converted one into another, making of this 'conversion' the central core of information exchange itself. Simondon's theory of information is thus intended to be 'non probabilistic' and 'non deterministic' (FIP 549–50), and therefore apt to describe metastable systems by highlighting what in their transductive-operational functioning exceeds any 'coded' homeostatic functioning: this surplus is precisely the indefinite re-emergence of information within the systems which, at the same time, it *constitutes*. And this is true at any scale one would consider the individual as a system.

2.4 Royaumont: All the Paradigms of Information

In July 1962 the prestigious *Colloque international de philosophie* traditionally held at the Royaumont Abbey was dedicated to *Le concept d'information dans la science contemporaine* [The Concept of Information in Contemporary Science]. Simondon was not only responsible for introducing Wiener's paper on *L'homme et la machine* [Man and Machine], but was also indeed, in the words of Martial Gueroult, 'the soul of the conference' (RO 157). Many of his interventions offer evidence of his attempts to orient the discussion towards questions he was

particularly concerned with. One cannot but notice, for instance, the 'traces' of his allagmatic theory in what Wiener recalls, by referring to the previous day's discussion 'with a small group', on 'how to transform the function into a structure and vice-versa' (RO 131).[12]

Simondon's paper concerned *L'amplification dans les processus d'information* [Amplification in Information Processes] and was still focused, perhaps for the last time, on the research of a fundamental paradigm. However, when editing the acts of the conference, Simondon decided to substitute it with a brief abstract, in which he intended to summarize 'continuous modulation' and 'discontinuous transduction' in a unique paradigm of biological derivation which he calls 'organizing amplification'.[13] It is worth quoting it in full:

> There are three main typologies of amplification: transductive propagation, modulation, organisation. The first does not have limits in itself; it is discontinuous, proceeds by all-or-nothing and does not entail gradation; it is irreversible; its energetic performance is quite high. The second, which is continuous and progressive, presupposes a reduction of the energetic performance of the system; it corresponds to the operation of technical modulators used for treating the information signal. Lastly, organisation, which is manifest in biological processes, is a synthesis of the former two; it corresponds to a quantum regime and functions through consecutive waves, mainly during growth processes. The three typologies provide paradigms for the understanding of complex situations. They share the primordial condition of any process of information: the existence of a metastable state and of a quasi-system [*quasi-système*] capable of effectively receiving an incident signal which modifies the equilibrium of the system rich in potential energy. (RO 417)

Although a few years had passed, Simondon's paper at Royaumont was still inspired by the same goal: provide a paradigmatic unification of scientific research. As shown, *Allagmatique* was the attempt to derive fundamental paradigms from the processes of modulation and crystallisation, while in *Individuation* the same problem was solved with a partial convergence of the two in explaining the process of individuation. The Royaumont paper clearly represented for Simondon a further occasion to reformulate an old problem. The theory of information, such as he elaborated it in *Individuation* as a relation between metastable systems and the 'incident signal', underwent no substantial modifications at Royaumont, where it provided the common basis for the three paradigms of 'amplification'.[14]

---

[12] Wiener continues: 'I think it is worth considering the relation between structure and function by means of a general theory of synthesis and analysis of machines' (RO 131). Among the participants at the conference we can find scientists (N. Wiener, B. Mandelbrot, D. MacKay, A. Lwoff, L. Couffignal) and philosophers (J. Hyppolite, L. Goldmann, G. Granger, L. Sebag, M. Gueroult). Gueroult (president of the Royaumont International Philosophy Conferences Committee) declares he expects from the conference a contribution to the regeneration of Cartesian philosophy. In his paper *Is Information Theory still Useful?* the mathematician and IBM researcher Mandelbrot argues against the hypothesis of a future unification of sciences and the excessive publicity of a theory which, according to him, has already exhausted its 'historical function' (RO 98).

[13] The entire paper has been recently issued as API, but Simondon did not publish it during his lifetime.

[14] The concept of a 'transductive' amplification is used here by Simondon to cover the semantic field of 'crystallisation' as the counterpart of modulation. It is in a way the model of the primitive

In conclusion, at Royaumont Simondon still adopted the same perspective of unification for *all* sciences, definitively focusing on the field of 'human sciences'[15] through a 'biological' reform of the technological concept of information. This constant tendency in Simondon's thought not only is confirmed by his notes to the Royaumont paper (174–76), it is also evident in what he states when closing the conference:

> The idea of organising this conference derives from the fact that the notion of information originally elaborated within the fields of some exact sciences and of the technology for submarine cable transmission, has now some *fringes*. It is now used out of its original context, sometimes metaphorically, sometimes abusively. However, what the borrowing [*emprunt*] clearly shows is the presence of a need. The usage for an emerging function pre-exists the fully formed instrument. Put differently, we wished we could demonstrate – starting from a usage which is perhaps abusive but in fact reveals an actual tendency – a possible research path towards the widening of the notions of information and organisation, starting from the awareness [*prise de conscience*] of existing needs in exact sciences and, probably, in less exact sciences such as the social sciences which are now organising themselves. What we tried to do to be precise is to generalize this notion of information. (RO 157)

The whole argument refers to the lack of legitimation characterising social sciences, which was in that period a central issue *also* concerning the epistemological status of exact or 'hard' sciences and the debated nature of life sciences. Even if after Royaumont Simondon abandoned the issue, concentrating on his academic career and focusing on the teaching of psychology and of technics, in his speculation he always kept questioning the political significance of a science of society inspired by biology and technology. But, before tackling this topic, it is worth delving again into *Individuation*, where Simondon's attempt to merge different paradigms was still haunted by a notion which seemed to concentrate all the unsolved problems concerning the relation between structure and operation: the notion of 'pre-individual'. This notion, in fact, depends on a profound intellectual debt, which Simondon revealed at Royaumont by precisely summarising – in his own jargon – the sense of the whole conference:

---

amplification generating structures: 'transduction is precisely capable of creating structures starting from a homogeneous metastable milieu' (API 174). In *Individuation* Simondon already referred to 'a process of amplifying communication, the most primitive modality of which is transduction, which already exists in physical individuation' (I 33, n. 10). Although the notion of 'amplification' often recurs in Simondon's texts, it will never gain the epistemological centrality which characterizes the notion of transduction in *Individuation*. The same applies to the concept of 'organising amplification', although still present, for instance, in the course *Formes et niveaux de l'information* (1970–71), where Simondon proposes again the three typologies of amplification (Bontems 2006: 323).

[15] It is worth noting the French use of the expression '*sciences humaines*', which approximately corresponds to the English 'social sciences', with the premise that it bears a major importance to the theory – and an implicit contraposition – of the natural and human domains. In what follows, if not strictly necessary, I will keep the English expression. The reader must therefore assume that, in the quotations, the expression 'social sciences' corresponds to the French 'human sciences'.

> In order to explain how difficulties and possible encounters can emerge, it is necessary to go back to the ontogenesis of this conference […] The notion of *fringes* to the concept of information was suggested one year ago by the late Merleau-Ponty, precisely when we were organizing this conference. (RO 157–58)[16]

References[17]

Bachelard, G. 1951. *L'activité rationaliste de la physique contemporaine*. Paris: PUF.

Bontems, V. 2006. Encyclopédisme et crise de la culture. *Revue philosophique de la France et de l'Étranger* "Gilbert Simondon" 2006/3: 311–324.

Canguilhem, G. (GC). *Archives de Georges Canguilhem*. Paris: CAPHES, ENS.

Canguilhem, G. 1952. *La connaissance de la vie*. Paris: Vrin (English trans. *Knowledge of life*. New York: Ordham University Press, 2008).

De Broglie, L. 1951. La cybernétique. Théorie du signal et de l'information. (With a preface of J. Loeb). *Revue d'optique théorique et instrumental*. Paris.

Geoghegan, B.D., and M. Hayward. 2012. Catching up with Simondon. *SubStance* 129(41/3): 3–15.

Guchet, X. 2001. Théorie du lien social, technologie et philosophie: Simondon lecteur de Merleau-Ponty. *Les Études Philosophiques* 50(2): 219–237.

Guchet, X. 2005. Simondon, la cybernétique et les sciences humaines. Genèse de l'ontologie simondonienne dans deux manuscrits sur la cybernétique. *Chiasmi International 7: Merleau-Ponty. Vie et Individuation*: 187–206.

Pias, C. (ed.). 1946–53. *Cybernetics – Kybernetik: The Macy-Conferences 1946–1953*, 2003. Zürich: Diaphanes.

Ruyer, R. 1930. *Esquisse d'une théorie de la structure*. Paris: Alcan.

Ruyer, R. 1954. *La cybernétique et l'origine de l'information*. Paris: Flammarion.

Von Uexküll, J. 1934. *Streifzüge durch die Umwellen von Tieren und Menschen – Bedeutungslehre*. Berlin: Springer (French trans. *Mondes animaux et monde humain. Suivi de La théorie de la signification*. Paris: Denoël, 1965).

Wiener, N. 1948. *Cybernetics: Or control of communication in the animal and the machine*. New York: John Wiley & Sons.

Wiener, N. 1950. *The human use of human beings. Cybernetics and Society*. London: Sphere Books, 1968.

[16] Merleau-Ponty died a few months before the conference, in May 1961. Three years later Simondon dedicated IGPB to Merleau-Ponty. Direct references to the latter are quite rare in Simondon's works (e.g. in CSP) and indeed not particularly relevant. I shall not measure here Simondon's unquestionable debt towards Merleau-Ponty as I will limit myself to the use of some of his theses in order to challenge a few problems in Simondon's philosophy.

[17] *Simondon's complete bibliography and a list of abbreviations are provided in the* Appendix.

http://www.springer.com/978-94-017-9830-3

Epistemology and Political Philosophy in Gilbert Simondon
Individuation, Technics, Social Systems
Bardin, A.
2015, XI, 251 p., Hardcover
ISBN: 978-94-017-9830-3