Ion Irimie

Letters about Information

Translated from the Romanian
by Radu Grosu

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To my grandson Sergio

INHALT

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FOREWORD

It is a great pleasure and privilege for me to bring the philosophical jewel "Letters about Information" by Prof. Ion Irimie to a much broader audience by translating its original version, published in Romanian, into English.

Conceived already in the seventies, and revised in 2010, the ideas in these letters could not be more up to date than today, in the era of DeepL, ChatGPT, and the Semantic Web. Indeed, DeepL and ChatGPT greatly simplified my own endeavor. However, they also made me painstakingly aware of their own limitations, by failing every now and then to properly capture the semantical meaning of the ideas in these letters or, as Prof. Irimie himself would say, to capture their information content. The modern version of the Web, known as the Semantic Web, also takes the notion of information to its heart by enhancing content with intended meaning. Failing to do so in acts of communication and decision-making has often had dramatic consequences, as was the case of the catastrophic maiden flight of the European Ariane 5 space rocket.

Written as a series of letters to his grandson Sergio, the book first revises the mathematical notion of information, as introduced by Shannon and Wiener. It then explores the strengths and limitations of this mathematical notion and compares it to the notions of non-determination, redundancy, entropy, and energy. The main takeaway is that information is different from matter and energy, it is not conserved, and it is created and used by living organisms in their quest against entropy. Finally, the

book introduces the new concept of Re-Reflection Triad, which extends the mathematical notion of information and relates it to the philosophical reflection theory of Hegel, the very extensive semiotic theory from Plato to Sebeok, and the modern communication and decision-making theory of Shannon, Wiener, and Dawkins.

Overall, the letters are a very enjoyable read for philosophers, linguists, computer scientists, engineers, and life scientists, by unifying and extending their own views on information in a very consistent and captivating fashion.

Radu Grosu, TU-Wien, January 20, 2025

1. MOTIVATION OF THESE LETTERS

Dear Sergio,

I hadn't quite finished with the *Reminders* when I started another series of letters. One that will no longer be about someone, but about something, i.e. information.

But why this and not something else? Why about a subject that is so simple and yet so complicated? I chose it, dear Sergio, for at least two reasons. The first one is that information has been the topic that has been most on my mind, that, I might say, has been driving me crazy for most of my life. After so much agony of mind, I have come up with some ideas that seem, to me, better than those I have encountered in literature. It would be a pity, I think, to not put them down on paper. It is true that some of them are already committed to writing and published in certain magazines and collections. But not everything is written down and not everything is laid out for the world to see. Then, not all thoughts are currently put in their order. In what follows, I want to place both the written and the as yet unwritten in a certain ideational coherence. I want to approach what I consider to be information as information, and this from a more systematic perspective. I want to start with a certain beginning and then, step by step, to approach a certain end, a conclusion that is as neatly and as solidly articulated as possible.

My personal motivation is closely linked to a non-personal one, one that has to do with the situation on the pages of literature. This literature is very rich, the size of a veritable library.

However, the subject is far from being complete. It is still open and highly topical. And its openness and topicality are defined by the very characteristics of the theme, by the way in which it is both simple and complicated.

The theme is very simple, dear child, when we operate with a common, everyday notion of information. In that sense, really, who doesn't know what information is? Who doesn't know that, when they are at the station and don't know which track their train will be arriving on, they can go to the information desk and find out? Who doesn't know that letters, phone calls, newspapers, books, radio and television are used to transmit information? Who doesn't know that today's computers process information faster than our sacred brains? Why should it be complicated for you to go online and search for I don't know what kind of information in answer to I don't know what kind of question?

But things get more complicated, my child, as soon as we try to operate with the contemporary notion of information, and especially when we try to look for the relations that information has with other larger realities of the world we live in. You will come to realize that it is not so easy to answer the question of what information might be as a specific reality, nor to judge the relations it might have with what, in this world, is substance and energy, time and space, cause and effect, etc. It is not easy at all to decode its relations with what in the human world is science and consciousness, freedom and finality, truth and value, etc., etc.

The contemporary notion of information has been set in motion by three great achievements of human thought, which occurred at about the same time, i.e. in the years between the first and the second half of the last century. We are talking about the appearance of N. Wiener's work *Cybernetics* and C. E. Shannon's *Mathematical Theory of Communication* and,

last but not least, the first computers known as ENIAC I and ENIAC II.

These realizations were born in close dependence and interdependence; they could be seen as different perspectives on the same theme. The success then and the subsequent success of either of these achievements (theoretical works vs. and the first computers) cannot be fairly judged without the success of the other two.

The appearance of N. Wiener's work resounded like a great explosion at the time; an explosion of ideas, of new ideas. Some new paradigms were announced along the way, as T. S. Kuhn would say; the basic paradigms of the scientific and technical age that was then being born. As soon as *Cybernetics* saw the light of day, it was at the center of scientific and philosophical debate. The book's ideas have since been turned upside down. Their resonance has not faded, even today. The basic positions of the book, which are rooted in what is known as cyber-thinking or cyber-spirit, are still undeniably topical.

As to what would be principal and/or essential in the demands of this spirit, a certain misunderstanding was born. It still survives today in certain writings. Based on the title of Wiener's work, but especially its subtitle: *Communication and Control in Animals and Machines*, some authors have come to consider that the central and essential considerations of the book would be what is settled in the idea of feedback. Things, I say, are a little different. It is not the notion of feedback that is essential and axial in Wiener's work and in the spirit of cybernetic thinking but that of information.

In those areas, Wiener was the most innovative and original thinker. That the vein of information, for Wiener, was also the main strand of his work, is clear enough from his account of how he arrived at the name of the book, a book that was already

written. In his autobiography, he relates that he first browsed through the works of Greek philosophers with the idea of finding a term that would address and cover the novelties related to the notion of information. Only after he did not find a term that met his requirements did he turn to Kybernētikē = the technique of leadership or the art of steering. The term was suggestive or more suggestive of the second great notion of his work, that of feedback. By subordinating this notion to that of information, I do not in the least wish to diminish its place and role in the economy of ideas called Cybernetics. I only mean to say that from the perspective of this same economy, direct and inverse connections do make sense and can only function in acts of leadership and/or steering on condition that information flows through them. Hence, in my humble opinion, to think cybernetically means, above all, to think through the prism of the "lights" brought with them by the notion of information.

The second achievement, of the three mentioned above and linked to the name of C. E. Shannon, concerns the same notion but from an essentially mathematical perspective. In the pages of his paper, Shannon set in motion a mathematical apparatus that was immediately recognized as the mathematical theory of information. The expression is questionable. Later in this book we will see how and why. For now, I want to tell you that although there is a whole chapter devoted to the mathematical approach to informational phenomena in N. Wiener's book, Shannon's formulas have prevailed in the literature of the time and later. Thanks to this apparatus, what contemporary scientific and philosophical thought calls information has become a reality which, at least in certain aspects, can be approached with a few calculation formulas and especially with its own units of measurement — the bit and/or the dit. We'll see a bit later what these units represent and what they are used for.

For now, let me just say that without Shannon, even Wiener's ideas would not have enjoyed the attention they did. Without Shannon, the contemporary notion of information would not have had the impact it has.

The practical and terribly tangible consequence of the above ideas is called the computer. To praise the use of computers today is to force open doors that have long since been wide open. To you, who have been playing with computers since you were five years old, it is not appropriate to say a word about the role of computers in the life of your generation. What I can tell you is that the beginnings of today's performance can be traced back to 1947, when the first computer, built with electronic tubes and called ENIAC, was first tested. ENIAC II soon followed, and then the second and third generation, etc. The evolution in this field has been so rapid that today we don't even know which generation we are dealing with. By the time you're my age, there will probably be computers sitting on the heads of human-like robots, robots that will be walking down the streets as children now walk. They will be able to greet each other, shake hands, even hug each other. By the time your children are my age, there will be real robot football teams, and later on, there will even be world championships. What I don't think human-looking robots will ever get to do is love, really love. It seems that love will forever remain a specifically human dimension. They will be able to simulate some gestures of love, but they won't be able to vibrate the way you will vibrate when you're in the throes of love.

But enough about those moments in and from which the contemporary idea of information sprang. In the "laboratories" of those moments, one notion went in and another came out; one much more comprehensive in scope and much richer in content.

If we were to point out even a few of the ideational changes to which the notion we are pursuing has been subjected, we could at least note the following:

1. The notion of information is no longer cognitively concerned only with what has happened and is happening at all the counters in the world; it has come to be concerned with something that can be traced in all cases of inter-human communication, something that pertains to the very contents and meanings of communication.
2. In the words of N. Wiener, information no longer appears as something that characterizes only the socio-human sphere, but also that of organisms; it carries with it the "secrets" of life.
3. Wiener even targeted the world of certain types of machines, machines with memory and programs, machines that could process information.
4. Thanks to Shannon, but not exclusively, information has come to be considered as something that can be subjected to quantitative evaluations, to explicit mathematization processes.
5. The same "laboratories" gave birth to the idea that the effectiveness of information must be judged in terms of its relationship with that which always opposes and always accompanies it: redundancy. Little redundancy means a lot of information, and vice versa.
6. The factual and substantive functions of any information must ultimately be revealed in its anti-entropic functions; only as negentropy does it fully justify its purposes.
7. If we want to say anything at all about what information might be as information, as a specific reality, then we have to relate it to and differentiate it from what in the world

is substance and/or energy; only in the light of these relationships can we grasp its specific existential particularities.

Proceeding from these seven points, it is easy to see that the expression "information", initially an expression of everyday life and common consciousness, has become the linguistic attire of a highly theorized notion, the cloak of a genuine concept of contemporary scientific and philosophical knowledge. It became a word on everyone's lips and a notion worn under almost every hat. As such, it was cognitively aimed at a very large and very complicated reality. Information as information is a complex reality, first by its very *way of being*. It is never and nowhere an autonomous, self-sufficient reality, something that has its own spatial and temporal dimensions. It has forms and durations only through the forms and durations of the systems in and through which it exists. Information as information is par excellence a *relational phenomenon*, a product of multiple mediations. From this point of view, it is no easy task to identify it, to put it into statements that capture it in what it is in itself.

Added to the complications related to the informational mode of being are those related to the range of its *forms of manifestation*. Even if we do not extend this range to encompass all forms of order and/or disorder in the world, even if we do not push the thought so far as to consider it as a universal phenomenon, the range in question is still a very wide one, stretching from genetic information to the highest forms of culture. To capture all this diversity under the banner of a single concept, to talk about information and not about informations, is an approach that is difficult to accomplish. Judging the synchronic and diachronic relationships that are established between the different genres and species of information always holds the possibility of

introducing one-sided emphases, the possibility of violations of the measure of things.

If it is not at all easy to theorize about the way information is or the forms of its manifestation, the problem is not at all simpler when it comes to its *functions*. And from this point of view, we can deal with several possible approaches, one of them being the relationship with the state and/or states of indeterminacy, with functions designed to eliminate or reduce uncertainty, to guide decisions, to facilitate choices in the case of alternative courses of action. There could also be the functions that arise in terms of redundancy, novelty, and efficiency. Last but not least, anti-entropic functions, i.e. those ensuring the ontogeny and phylogeny of certain categories of systems, could be discussed. Another possible approach would be to talk about information functions from the perspective of relationships: biotic, psychic, cultural.

In addition to the complications arising from *the ontic status* of information itself — its mode of being, forms of manifestation and functions —, there are also those arising from *literature*, from the history of efforts to conceptualize it.

These complications begin with the very attempt to mark the boundaries between prehistory and the history of ideas. In a certain sense, human thought has grappled with the theme of information as long as it has existed and throughout all its development. Any interrogation about the themes of language, of thought, of the spiritual life have implicitly been interrogations about the themes of information. If the *pre-history* of the idea spans several millennia, its actual *history* has barely passed the half-century mark. However, its literature now has the dimensions of a library, and its points of view are a veritable labyrinth.

The clashes of opinions were very intense during the 1960s and 1970s. A certain picture of the diversity of the "swords" and

the intensity of the "duels" can be gained from reading V. A. Săhleanu's book *Science and Philosophy of Information*. Written from an encyclopedic rather than a synthetic perspective, the work had the merit of outlining the main points of view at the time and of cultivating interest in the subject. Don't take it as praise, but I can't fail to write to you, my child, that the pages of the book also contain some considerations of my views on the relationship between reflection and information.

The tone of the discussions in the 1960s and 1970s has calmed down over time. But it did so without any rapprochement of points of view. The same lines of thought are still heard from time to time today.

In this respect and in this case, the questions are still quite open: To whom should justice be done? Whose point of view could one subscribe to? Which of the options would come closest to and best approximate what information as a specific reality would be?

Should we believe those who, frightened by so many different kinds and species of information, believe that it is better to talk only about "informations" and not about "information"? Should those be given credit who see the notion of information as a primary concept, a concept which, ab initio, cannot be subjected to definition and characterization? Should we join those who argue that what cognitively denotes the concept in question is something intuitive, something that arises spontaneously and contextually each time? Should we subscribe to the idea that information represents and summarizes only a few calculation formulas, that it is only a measure, only a way of quantitatively evaluating order and/or disorder, diversity and/or complexity? Or should we give credence to those who assert that information is itself an undeniable reality, something that has its own quantitative and qualitative determinations?

If we follow this last point of view, we are immediately faced with another range of alternatives. Which one should we go for? Which way must we look for the reality now in question? Should we side with those who consider information to be a universal phenomenon or with those who see it as an insular reality? Should we give credence to the notion of *bound information* or only to that of *free information*? Should we dissociate it from substantial-energetic connections or identify it with them? May we regard it as negentropy itself or think of it only as a particular case of negentropy? Should we look for it solely in the area of non-redundant communications or also in those with 100% redundancy? Should we link it organically only to the fact of producing and handling signs and/or signals, or should we admit that it could be beyond their horizons?

If we link it to the world of signs and/or signals exclusively, several possible lines of thought open up. For some authors, for example, information only arises from the statistical articulations of signs, for others, it also presupposes the *sine-qua-non condition* of semantic, syntactic, and pragmatic connections. In the latter case, some reduce it to the semantic content of signs, while others play the pragmatic value card.

The list of questions raised by the reality of information and the literature that moves around it could be continued. The above seems sufficient to me to support the following:

1. At present, it is not easy for anyone to maneuver through the pages of literature on information, it is not easy to dissociate with a certain clarity that strand of ideas which might best fit the substantive determinations of the reality concerned. To the complications generated by information itself are thus added, as we have mentioned, those produced by the approaches of endeavoring to knowledge.

2. In spite of so many theorizing efforts, the problem of defining and characterizing information is still *an open and topical problem*, still a problem of interest.
3. The above questions suggest quite clearly the thematic thread of the following letters and pages, a thread that lies in the question: *what is information, what is it as a specific existential entity?*

I could approach this thematic thread, my child, in at least two different ways. One of them would be an approach centered on literature, on books and authors, on varying points of view. Such an approach could lead to pages based on other pages, to ideas about other ideas, to an answer drawn only from other answers. It would become a predominantly metatheoretical or encyclopedic approach. In this case, the factual and substantive themes could remain hidden somewhere in the back of the literature or its pages; the main question could slip through our fingers.

The second approach could be mainly theoretical and/or synthetic. The thematic questions would be foregrounded. Literature would be second, but not secondary. We would be interested in the theoretical challenges of the given reality rather than the literature. I will appeal to information about information only and only to the extent that I consider it stating something relevant about information as reality, as fact, as phenomenon, as presence in some parts of the world. I would like information as reality to be the sun around which what has been said and can still be said in the planets and satellites of literature revolves around.

Always giving "to Caesar what is Caesar's", i.e. giving to the authors what belongs to the authors, I will set out on my journey with the intention of following this last possible approach.