

Project Dick

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“Half-baked ideas of people are better than ideas of half-baked people”
Irving John Good

Every time that, for my own instruction, I re-read one of my articles in *Flying Saucer Review* and I find it strewn with ridicule, sarcasms, and bad jokes, a blush of shame rises to my brow as I think of the promiscuous outrage thus inflicted on so many serious investigators, investigators who respect their readers, and I swear that I will display more decency next time.

Alas, that next time won't be yet. Desirous of setting forth my thoughts regarding the epistemology of our investigations, I have been immersing myself in the innumerable works devoted to *Interstellar communication*, *Communication with superior intelligences*, *Intelligent life in Space*, and so on (about 80 titles in Lynn Catoe's 1969 bibliography⁽¹⁾ — I do not have all of those she lists, but I have also others) and, apart from a few exceptions^{(2), (3), (4)} one must admit that what has been written on the subject so far can only invite derision. Almost all these solemn works are inspired by one single and solitary idea, always the same one: to wit, the crazy presumption of the human mind, which would have the immense Universe teeming with non-human superintelligences, always provided however that — as Bergier puts it — those superintelligences have studied at the Sorbonne or Oxford or M.I.T.

As a start, let us quote a few of the most illustrious of these authorities:

For Su-Shu Huang⁽⁵⁾ “these superintelligences, in order to increase their chances of contacting civilisations in other worlds, must (*sic*) divide the antenna time and beam the signals successively to all stars which are within reach.”

For Michael H. Briggs⁽⁶⁾ “attempts by intelligent extraterrestrials to establish contact might (*sic*) be by radio transmissions, space probes, and emissions of radiation in the far infra-red.”

For A. G. W. Cameron⁽⁷⁾, “the laser may be the obvious (*sic*) way of communication, since the signal-to-noise ratio of their optical transmissions should be orders of magnitude better than that calculated for the Sun by Schwartz and Townes.” (Let us pity the poor superintelligences who might perhaps not have read Schwartz and Townes.)

Let us recognise however that many other scientists, more cautious, have refused to speculate on the means of communication that superintelligences *would have to* employ, and have confined themselves to studying, among the various means that are imaginable by man, those which we could try to detect. Let us note in particular the authors of Project Ozma⁽⁸⁾, von Hoerner⁽⁹⁾, F. J. Dyson, Melvin Calvin⁽¹⁰⁾, etc. On the other hand, others, like the Nobel Prizewinner, Jacques Monod⁽¹¹⁾, do not shrink from affirming that man is very probably the

sole intelligent being in the Universe, which view is apparently shared by Harlow Shapley⁽¹²⁾, while the great expert on evolution, G. G. Simpson⁽¹³⁾, thinks all contact may be for ever impossible.

All speculations on the means of communication between superintelligences, and on projects for the detection of such means, recall to my mind a certain other “Project Ozma” much earlier than the one that failed so notably a few years ago. I shall call it “Project Dick”, from the name of its author. With my own eyes, at about the age of 15, I watched this Project Dick being formulated, being developed, and I saw it fail in the same way and probably for the same reasons as, later. Project Ozma failed.

Project Dick

Dick was an immense and fierce sheepdog (a German sheepdog) who looked after my father's cows. He had only one method of communication, but one which he understood to perfection. This method consisted, on the transmission side, in deftly piddling in a thousand different ways. On the reception side, it consisted in unerringly sniffing the emissions of his colleagues. His virtuosity and skill both ways were prodigious. He had piddles that were protective, aggressive, benevolent, possessive, dreamy, meditative, scornful, evasive, dubitative, and peremptory. He had one for every kind of circumstance. And, inversely, one single exploratory sweep of his nasal radar enabled him to identify instantaneously all the concepts put into circulation in his intellectual space-framework by all the beings present in that space, that is to say, by all the dogs of the neighbourhood.

This superlatively controlled technique encountered no defeat until its utiliser got into his head the idea of detecting the problematical existence, within his environment, of non-canine intelligences. One day when, in a meadow, I was engaged in discussion with a very distinguished gentleman (subsequently a member of the Paris Academy of Medicine), Dick came and sat down near us, gave us a long and pensive look, and suddenly received his Project Ozma revelation. I do not think I am misrepresenting his thoughts if I attribute to him the following line of reasoning:

“These two natural phenomena clearly obey simple physical laws. When I take my cows to the meadow, the smaller phenomenon of the two does this, that, and the other. I manipulate him at will, triggering off in him elementary mechanisms in conformity with the experimental method. I have not studied the other, taller phenomenon, well, but, as they are identical, he should present no particular problem. However, it is necessary to recognise that at times they do behave like dogs. At this present moment they are making this voice-noise together, which is well known to specialists. As it costs us nothing, let us suppose that they are trying to communicate. Naturally this isn't the way in which one communicates. But all the same I can try to find out whether they are capable of communicating. Taking into consideration the velocity of the wind by which smells are carried, the height of the things that might be their noses, the specific odour of each of them, the spectrum of the chemical molecules stimulated by the surrounding temperature, the *signal-to-nose ratio* calculated by my dog colleagues Médor and Biquet* (in this case a series of calculations too complicated to be reported here), it is obvious that the experiment we are going to attempt is simple and feasible.”

So he proceeded to carry out his experiment which, as I have said, was a failure, although I, inspired by the same scientific curiosity as my dog, had observed, with the most careful attention, and without intervening in the slightest, the unfolding of this experiment. When Dick had piddled, in vain, on the calf of the right leg of the future Academician, and, having then ascertained that this was producing no result, he had piddled, with the same scrupulous care, on the calf of the left leg, he finally walked off, greatly disappointed. Very unfairly, the gentleman with whom I was talking disputed that this experiment was of any interest and also took his departure. And yet, as I have already said, he is a scientist, and he has honoured me with his friendship.

“Ah, but I beg your pardon”, people always say when I tell them about that set-back, “it isn't the same thing at all! Comparing the relations of dog and man to relations between man and superintelligences is just a silly gimmick. Your story is funny, maybe, but it is philosophically absurd. Man is a rational being, which the dog is not, but which, on the contrary, superintelligences are bound to be. If, one day, we encounter these superintelligences, we shall in any case be able to make ourselves understood by them, by basing ourselves on the universal truths arrived at by human reason, such as the quantity π ; $2 + 2 = 4$; $(a + b)^2 = a^2 + 2ab + b^2$, and so on. Ivan Bell, H. Freudenthal and others have given examples of simple arithmetical messages having a universal value⁽¹⁴⁾.”

To this I invariably reply that these values are only universal within the limits of human reason; that we call them universal only because we cannot imagine anything else beyond them, just as the dog cannot attain to anything beyond the olfactory concepts which for him are also universal. This reply leads in turn to an obscure philosophical discussion regarding the principle of immanence (“one only thinks one's own thoughts”); nominalism and realism; the dispute about universals; logical positivism; the Vienna Circle; Rudolf Carnap; Israel Scheffler⁽¹⁵⁾; and, finally, my favourite philosopher, the Greek of the Stoic decadent period, Sextus Empiricus⁽¹⁶⁾, and there one stops without any result, for I have never yet had the good fortune to meet one of the five or six people in the whole world who have perhaps read Sextus Empiricus, apart from the French Hellenist Mario Meunier, who died from it.

I shall therefore attempt here to tackle the problem from another angle, namely from the angle of the experimental method. Let us begin by propounding this problem clearly:

Do there exist experimental facts, in the domain of observation, of measurement, of calculation, showing that human thought, far from being a receptacle for universal knowledge, is limited by the physiology and the anatomy of homo sapiens, precisely as the intelligence of the dog is limited by his odour and his brain?

In my opinion the answer is yes, and I will quote some of these facts.

(a) Between Ape and Man

I think it will be granted that a chimpanzee will never be able to compose a Mozart sonata, repair a defective TV set, or calculate the flight path of *Apollo XV*. He will never be able to do it, not because he has not learnt how to do it, but because he lacks, *irremediably*, the necessary physical and intellectual instrument for doing it.

I think it will also be granted that man's ancestors, towards the middle or even the end of the Tertiary Era, were, from the point of view of intellectual possibilities, precisely at the point

where the present-day chimpanzees are now. If anyone wishes to dispute this, I would refer him to the palaeontologists and prehistorians, and let him sort it out with them. Between the animal ancestors of man and man himself, there is the same impassable gulf as between the chimpanzee and man.

It will also be granted, I think, that this gulf has nevertheless been crossed, as a consequence of continuous evolution. In order to challenge this statement, it would be necessary to start by destroying all the palaeontological and prehistorical museums in the world. Between the pebble culture and the atomic bomb, the remains found by prehistorians reveal no discontinuity of any kind. However, those who created the pebble culture were beings incapable of mastering fire. Man or animal? One would need to be pretty smart to say. What is certain, is that the impassable intellectual gulf to which we referred exists between *Australopithecus* and Plato. *This gulf has nevertheless been passed in one continuous process.* To anyone who argues that this assertion is absurd, I would suggest that he reflect on the following problem which, 2,000 years ago, the Greeks spent several centuries discussing:

Does a man who has hair become bald when he loses one hair?

The reply is obviously *no*. Then, if I tear out all the hairs, *one by one*, from the head of the most hirsute of hippies, he will *never* be bald, even if he looks like Yul Brynner. (This reasoning is called *sorites* in Greek.)

(b) The Evolution of Homo Sapiens

So far I have only cited observed facts. Now let us add calculation to it.

The geologist Andre de Cayeux⁽¹⁷⁾ has shown in graph form, on a logarithmic time-scale (see Chart), the direction and the date of the successive different industries of prehistoric times as they are given by the 15 or 20 world authorities (Americans, British, French, Germans) most respected in questions of Prehistory. Let us make it clear that these 15 or 20 scholars, who often oppose each other fiercely on other questions, are in agreement on these datings, owing to the reliability of the various methods used and the manner in which they confirm each other. The graph covers 2,000,000 years — up to the Iron Age — that is to say a period of time reaching, in man's ancestry, from the animal to *Homo Sapiens* of the great civilisations of Antiquity — a *Homo Sapiens* who intellectually is absolutely identical with you and me, and includes such geniuses as Homer and Moses.

On this chart we find two remarkable facts:

Whatever the law of succession of those prehistoric or protohistoric industries, it is the same throughout, from one end of the period of time under consideration to the other, as the line formed is a straight one in which no singularity of any sort can be detected, nothing to indicate that at any moment anything particular has happened, nothing that marks a break or any change, sudden or not. The appearance of *Homo Sapiens* on the scene, in particular, between the Mousterian and the Perigordian, passes completely unnoticed.

Now, what we are concerned with — let us not forget this — are successions of *industries*, that is to say, products of intelligence. Here we put our finger on the fact that, backed up by figures and graphs, the evolution of intelligence has shown an absolute continuity from the animal right up to the man of the Iliad, the Odyssey, and the Pentateuch. The appearance of the supposed universal human reason took place according to the process of *sorites*.

But (and this is the second lesson the graph teaches us, and perhaps the most important) *the time-scale, shown on the graph in abscissa, is logarithmic*. If it were not, the curve, instead of being a straight line, would be ever more vertical. This means that the law of the evolution of prehistoric intelligence from animal to man remaining always the same, its effect, measured in quantity of information i , is given by the function:

$$f \sim i^c$$

Or, if we prefer, the quantity of innovations invented by prehistoric thought doubles in the course of the equal successive periods of time.

De Cayeux's graph covers only the prehistoric period. But it has been found again, in precisely the same form, in the historical evolution of man; in the evolution of the technology of recent centuries; in the evolution of the technology of recent decades; and of the technology of the present years. In France, for example, the output of electricity doubles every ten years. The technology which is at present the most advanced one, namely informational technology, is doubling every five years(18), (19).

In a word, the same law has governed Palaeontology ever since the beginning of life(20).

What emerges from all this is that, measured in quantity of information, the evolution of life obeys an unchanging temporal law, of exponential form, from its origin 3,000,000,000 or 4,000,000,000 years ago, right up to the technology that we see developing now before our eyes.

My well-known paranoia inclines me to recognise that the appearance of Aimé Michel in this world will bring about a miraculous interruption in a *processus* that has been going on since the beginning of life on Earth. However, there are times when I doubt it, and wish that a little could be done to demonstrate to me the cosmic importance of the birth, around the early 1920s, of a small backward peasant in an out-of-the-way corner of the Alps.

Let us suppose indeed that the birth of this backward peasant has, definitely, absolutely no importance. What then would that mean?

It would mean that the straight line on de Cayeux's graph will continue to be straight in the centuries to come just as it has been for 30 or 40 million centuries (the constancy of a law that has *never been disproved* so far).

And it would mean that — the exponential form of the law — our descendants will be as superior to us in thought in a few centuries or a few millennia from now as we are superior to our ancestor, the poor upright ape, stark naked, chasing after the Olduvai rabbits and eating them raw, as a dog does, fur and entrails and all.

And, in a word, that the mind and thought of the years 2,500 or 3,000, and their products, will be to our 20th century brains as a Mozart sonata, the electronics of my TV set, or the calculations of the Houston computers, are to the brain of my dog and to his piddles. I mean of course that, from us to those intelligences *irremediably incomprehensible* to the intelligence that we now possess in this 20th century, we shall move through a continuous progression. Yes, indeed! Continuous, just as from *Australopithecus* to us, as also from the slug to *Australopithecus*. The ufologists and the philosophers of the sciences will never reflect sufficiently upon *sorites*, that brilliant discovery of the Greek spirit, and upon the art of not being bald when one has lost every hair on one's head, every one without exception, but *one after the other*.

KEY TO THE CHART

Since the close of the 19th century, the students of Prehistory have established a chronological classification of the cultures which have successively existed on Earth in the times prior to the beginnings of History. Each new culture leaves its traces upon the traces of the previous culture everywhere where it is possible to observe the succession (stratigraphic superposition). It has been possible to establish the order of succession (relative chronology) of the cultures long before the dating of them and the establishment of their duration (absolute chronology).

On this Chart, the data given indicate the stratigraphic order that is actually observed on the terrain, the oldest (the pebble culture) being thus at the bottom, and the most recent (iron) at the top. But the author (de Cayeux) has *conventionally* given equal intervals of time to the successive cultures on the Y-axis.

When new methods have permitted absolute datings it has been possible to make charts like this and show the time on the X-axis (horizontal). *A priori* there is no reason why the *conventional* attribution of equal time-intervals to the successive periods on the Y-axis should give, with the absolute chronology on the X-axis, a curve obeying a law. Well now, what we find is an exponential function of perfect regularity: on a logarithmic time scale the curve is a straight line. This means that human thought has never stopped progressing twice as fast, in every time-interval shown, as during the preceding interval of the same length. It will be observed that the arrival of *Homo Sapiens* passes unnoticed.

The width of the hatching symbolises the duration of each culture and the uncertainty of the dates (which uncertainty grows the greater the antiquity).

If the curve is prolonged into the future, this means that our descendants will distance themselves psychologically from man far more rapidly than we have distanced ourselves from the animal.

If this law is a general characteristic of life (as appears to be indicated by the book by Meyer quoted in the text) then a planet that has evolved a few thousand years further than the Earth might have inhabitants that are more superior to man than man is superior to the dog.

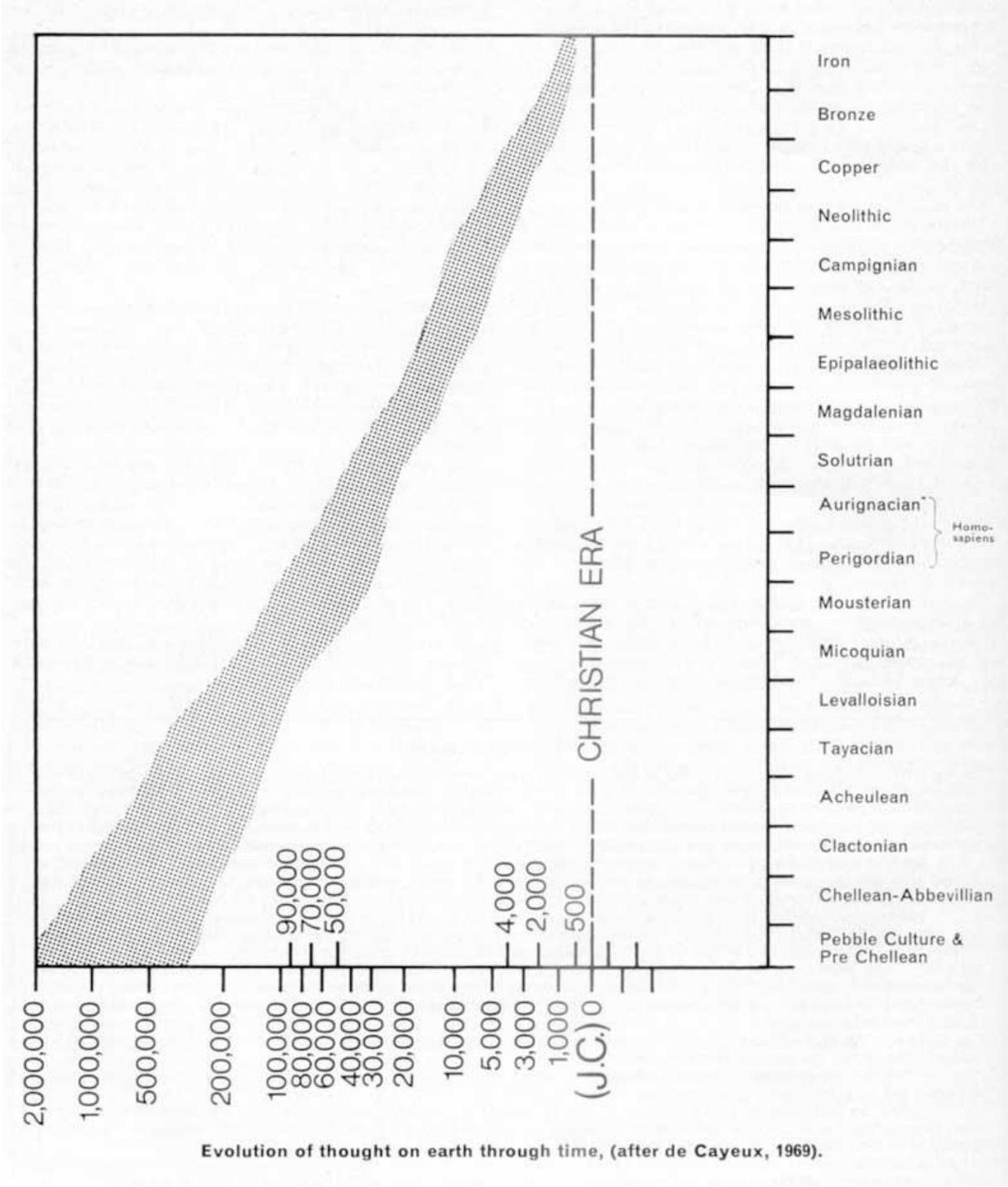
And as a matter of fact it so happens that this curve leads at the end to some physical impossibilities during the course of the 21st century, which fact would appear to imply a discontinuity in the history of mankind.

A.M.

I shall perhaps be told that all this is indeed true for the past and demonstrated by the facts and figures established in Geology, Palaeontology, Prehistory, and the History of Technology, but that there is nothing to prove that the future will obey the same laws as the past. The times in which we are now living are — so it will be said — so different from everything that took place upon the Earth up to now and in the human species, that perhaps 20th-century Man really does represent the unsurpassable summit of all possible evolution whether on Earth or even in the whole Universe⁽²¹⁾.

To this argument I have sufficient theoretical and speculative answers to make a book weighing one kilo, which will not fail to provoke several other kilos of refutations. I shall therefore confine myself to answering with one single, solitary fact — only one, but one

which has the merit of being a fact, of being irrefutable, and of proving that **already** there exist among us, in the bosom of Humanity, human beings possessed of minds superior to ours and functioning in a manner that is so far inexplicable. I am referring to the *lightning calculators*. These lightning calculators are the phenomenal folk who perform the most complicated calculations in their heads and in a few seconds.



To give you an idea of their gift, I shall cite the case of Paul Lidoreau, who died recently in Paris and who used to give, in a few seconds, and without ceasing to chat with the other

person about some totally different subject, the square root of a seventeen-figure number and who, every night, to calm his mind and go to sleep, used to solve the following problem:

Being given any six-figure number, to break it down into the sum of five perfect squares and five perfect cubes which, added together, give the number proposed, with an error of less than one in a million. This problem, as can be seen, entails an infinity of solutions for each number: this is what entertained Lidoreau and put him peacefully to sleep every night.

An example proposed by Robert Tocquet (a professor at the École d'Anthropologie in Paris)(22) was 724832.

In a little over two minutes, and while carrying on a conversation having no bearing on his calculations, Lidoreau offers the following solution: Cubic roots:

48; 83; 26; 28; 10

Square roots: 40; 16; 4.358898900; 5 477225580; 4 472136

Having offered these figures, he immediately gives their cubes and their squares:

Cubes: 110592; 571787; 17576; 21952; 1000

Squares: 1600; 256; 18 999999620421210; 30 000000054206336400; 20 000000402496

And finally the sum of the cubes and squares: 724832 000000077123546400

All of which, I repeat, done in his head and in two minutes and a few seconds, and while talking about something else. Lidoreau is dead now but there are, alive in the world today, scores of calculators of the same power or even better. I know two of them in France, whom I have studied, just as I studied Lidoreau, who was my friend: they are Maurice Dagbert and Marius Portal.

The latest “with-it” idea (put forward by French and American psychiatrists whom I prefer not to name so as to be able to treat them as cretins) is that lightning calculators are *mentally sick people*. I have had correspondence with the best-known of these psychiatrists. He did not know that a considerable number of scientific geniuses were lightning calculators (Karl Friedrich Gauss, Leonhard Euler, Francois Arago, André-Marie Ampère, the Scottish mathematician A. C. Aitken, and so on). He was unaware that Portal was a highly esteemed teacher and pedagogue, and that Paul Lidoreau had made a fortune by setting up an industry of artistic bookbinding. All that he did know was that lightning calculators are to be found in mental hospitals. (Why indeed should lightning calculators be expected to be the only men never to go mad?)

I suggested to this psychiatrist that he himself was quite certainly mad according to his own method of reasoning, since he had black hair, and I knew several black-haired madmen who are shut up in psychiatric hospitals. I also begged him vigorously to inoculate me with the virus of mental calculating as soon as he discovered it, as I have no objection to doing my bookkeeping in my head, which is what Lidoreau used to do — instantaneously — in respect of the whole of the personnel of his factory.

The interest that lightning calculators exhibit for Ufology is manifold.

On the one hand, if one does succeed in understanding the calculating procedures that they employ, those procedures will still remain unusable by normal brains, for they presuppose performances that are outside of human possibilities. Marius Portal wrote a very detailed and very clear book explaining his procedures(23). Those procedures are all of a beautiful simplicity. The sad thing however is that, in order to use them, you need, for example, to be capable of thinking simultaneously of two fifteen-figure numbers. (Lidoreau executed

operations showing that he could think simultaneously of ten numbers each having 36 figures; for example, he added them up in his head in about five minutes. Zacharias Dase was able to multiply, in his head, two 100-figure numbers.)

One of the most remarkable of the particular features of lightning calculators is *attention multifocalised at will*: they are able, whenever they so desire, to embark simultaneously on several high-level intellectual activities of different natures. Dagbert, who is an excellent violinist, can calculate while rendering very difficult pieces of music.

On the other hand, even the best of them are quite incapable of explaining how they go about it, though they declare that they understand it very clearly. Everything occurs as though they are manipulating concepts (but are they indeed concepts?) that are untranslatable into human language. "God has put these things into my head", Zerah Colburn used to say, "but as for myself, I should never know how to put them into *your* head(22)."

Finally, and this is perhaps the most instructive part of it all, *they vigorously dispute the idea of their own supernormality*.

I keep, preciously guarded in my files, the numerous letters that I have received from Portal and Dagbert, in which they try, by all manner of arguments, to prove that there are no lightning calculators and that what they do simply corresponds to the only normal means of thinking and that the obstinacy of other men in refusing (*sic*) to calculate as they do is incomprehensible. With me they have the same difficulty of understanding as my dog Dick, but in the opposite sense: here, in this case, it is *I* who am the dog.

I do not say that the gift of lightning calculation corresponds to a rare gene floating about in the genetic-heritage of mankind and destined one of these days to multiply among men: I don't know about that, not being a biologist myself.

But what I do say, having spent a lot of time with the lightning calculators, is that if it were to come about that their gift should spread, the new humanity that they would constitute together would be intellectually a totally impenetrable one for us. What would social life be like, what would the economic, technological, and political organisation be like, what would the science or the pedagogy be, of beings who, like Zacharias Dase, Lidoreau, Aitken, Dagbert, are capable of manipulating, each second of their lives from the age of four years onwards, immense and uncountable numerical data? Will the reader who is able to think about this without being seized with vertigo please accept the expression of my highest respects! As for myself, in order not to go mad, I should hasten to ask the directors of that new humanity of lightning calculators to have an extra cage erected at the Vincennes Zoo, where the monkeys are, and to be good enough to accept me there till the end of my days, even if it were in the company of Dr Condon.

Now lightning calculators are only slightly different from the rest of us. So far as I know, nobody has ever done an autopsy of the brain of any one of them, but externally there is generally nothing that distinguishes them from any other *Homo Sapiens*. That they are genetic phenomena has been suggested (but has certainly not been proved) by certain particular cases: for example, Marius Portal's son is also a lightning calculator; Uranie, the sister of the famous Greek calculator Pericles Diamandi, also possessed the gift herself; Zerah Colburn had six fingers on each hand and six toes on each foot; Prolongeau was born without arms or legs. All this suggests — but only suggests — a chromosomic phenomenon which is sometimes simple (as when the calculator is *only* a calculator, remaining in all other respects a man like the rest)

and sometimes complex (as when a somatic mutation is at the same time also to be seen). In any event, if the lightning calculators are different from us, they are not *very* different — much less than, for example, Neanderthal man.

The moment has now come for us to apply our reflections to the problem of our dealings with the mind which is responsible for UFO phenomena or with any other supposedly superhuman mind — as in Project Ozma.

“Never forget”, said Vauvenargues, “that what you know is nothing compared with what you don't know, and that what you don't know is nothing compared with what you will never know”. Vauvenargues was a philosopher of the century of the Enlightenment. He believed in Reason and in its methods. He knew that knowledge cannot advance save by starting, at the outset, by making allowance for the unknowable, and that Science only began when men stopped theologising.

The unknowable, in Ufology, is the mind — if one can indeed call it a mind — that is hidden behind the phenomena. I am not saying that we should stop thinking about this unknowable, any more than it is necessary to be an atheist in order to be a good physicist. But what I am saying, paraphrasing Vauvenargues, is that, if it is desired to secure concrete results, our research must rigorously, and on all occasions, refrain from any hypothesising upon the nature of that mind. The further investigations now being carried on in France into the UFO wave of 1954 are bringing to light, almost regularly, a mass of new facts that had escaped me before because I already had certain ideas as to the possible nature of flying saucers: the saucers were (I thought) either facts of a collective psychopathy, or extraterrestrial devices, or secret military machines. The idea that (for example) the phenomena might be related to the psychopathology of the witnesses *and yet be materially real* had in those days never touched my mind, for such an idea was already ruled out in advance by my own implicit hypotheses. Because of this, I failed to perceive certain facts of primary importance, and we were retarded by years in our thinking. I am convinced that we are at present still blinded by a mass of implicit hypotheses (though our imagination has made some progress during the past few years) and that, in the same way, other facts of primary importance are still continuing to unfold before our eyes without our seeing them.

Ufology, so far as it is a science, is at present in the stage of coming into being, thanks to the investigative networks and the great electronically treated catalogues of which Vallée's will have been the first historic example. But our research is totally lacking in the philosophical reflection that would be capable of supplying it with the orientations that Physics, in its first hesitant beginnings, once received from the *Instauratio Magna*, from the *Novum Organum*, from the *Discours de la Méthode*, and from the *Dialogues* of Galileo.

Lacking this preliminary reflection, we wander around at the mercy of our own personal whimsies, occasionally piddling among the stars with the same simplicity and artlessness as my dog Dick.

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- (14) *Scientific American*, August 1965.
- (15) Israel Scheffler: *The Anatomy Of Enquiry* (A. A. Knopf, New York, 1963).
- (16) See in particular R. G. Bury: *Outlines Of Pyrrhonism* (Heinemann, London, 1961).
- (17) André de Cayeux: *La Science de la Terre* (Bordas, Paris, 1969, p. 725). (André de Cayeux is a professor at the Sorbonne and at Laval University, Québec.)
- (18) Erich Jantsch: *La Prévision Technologique* (OECD publications, 1968). (This work contains an extensive bibliography on the processes of technological evolution.)
- (19) R. M. Ashby: *La Seconde Génération de la Microélectronique* (*La Recherche*, No. 2, June 1970, Paris), pp. 127-134).
- (20) François Meyer: *Problématique de l'Évolution* (Paris, P.U.F., 1954, and particularly the graphs on pages 121, 122, 123, 124, 125, 126, 127, 128). (François Meyer is a philosopher and Dean of the Faculty at Aix en Provence.)
- (21) Voltaire has said all there is to be said on this ridiculous illusion (which was already rife 200 years ago) and notably he said the following: "Dieu a fait l'homme à son image, et l'homme le lui a bien rendu." ("God made man in his own image, and man has returned the compliment in good measure.")
- (22) M Robert Tocquet: *Le Calcul Mental* (Paris, 1960). (I would be very grateful to readers of this article if they would kindly send me the references for any studies in English on lightning calculators.)
- (23) Marius Portal: *Le Calcul Mental* (Aubanel, Avignon, 1963).
- * **Translator's Note:** The French equivalents of (say) *Fido* and *Spot*.

Translation by Gordon Creighton