What Kind of Turing Test Did Turing Have in Mind?

by Jean Lassègue

In memory of
Edward Gumbel,
1913-1995.

Alan Turing became famous among computer-oriented philosophers for a deed he never accomplished: the construction of a "test" that would show, on a statistical basis, that the discrimination between the verbal expressions of a human being and those of a computer lies beyond human decision. The claim of this paper is that this test is not feasible. The notion of a test is consequently to be understood in an entirely different way.

1. Turing's Advertised Aim

The test itself is supposed to have been fully described by Turing in his 1950 world-famous article "Computing Machinery and Intelligence" [1] which addresses the question whether machines can be said to think. In order to settle the problem experimentally and not on purely rhetorical grounds, which would not prove anything, Turing describes a game called the "imitation game" which is a kind of abstract oral examination. The text is so famous that, at first, I thought I should not quote it. But I have found so many times that the description of the game is so far from what Turing actually said that it is worth quoting it again: [2]

> "It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart from the other two. The object of the game for the interrogator is to determine which of the two is the man and which is the woman. He knows them by labels X and Y, and at the end of the game he says either "X is A and Y is B" or "X is B and Y is A." The interrogator is allowed to put questions to A and B . . . We now ask the question, "What will happen when a machine takes the part of A in this game?" Will the interrogator decide wrongly as often when the game is played like this as he does when the game is played between a man and a woman? These questions replace our original "Can machines think?"

Let us call the game played between human beings, game #1 and the game played between a woman and a computer, game #2. The Turing test itself is meant to be set up by substituting the machine for the man. Hence only game #2 is concerned with the test. As Justin Leiber puts it: [3]

> “Having explained the imitation game, Turing now proposes his question, "What will happen if a machine takes the part of A [the man] in this game?" This is what we now call the Turing test.”

And we may add: this is why Turing's article was shortly thereafter heralded as the first article ever published on AI. Hence functionalism prevailed. [4] If we assume that the test is feasible, the continuum of organisms on the biological scale would then be enriched with a new kind of organism which could be specified by two characteristics: first, this new organism would be completely independent of its human creator and behave in its own particular way; secondly, its organic form itself would not depend on any particular material components but only on a purely logical structure. Anyone could then use the results of the test to argue conclusively that intelligence is an abstract concept, completely disconnected from any material basis and therefore applicable to any kind of physical structure, whether biological, electrical or electronic.

It was not long before philosophy-oriented computer scientists set out to show that, thanks to the ever rapid progress of technology and programming, the test--whilst only a thought-experiment in Turing's mind--could be passed by real machines in the real world. In 1992, the BBC made a documentary [5] about the experiment that took place in Cambridge, USA, suggesting that the machine had indeed passed the test with full honors. By that time, the expression "Turing test" had acquired an entry in the Collins dictionary. And there the following description can be read:

> Turing test — A proposed test of a computer's ability to think, requiring that the covert substitution of the computer for one of the participants in a teletype dialogue should be undetectable by the remaining human participant.

Although fairly inscrutable to the average dictionary user, this inaccurate description shows at least that the expression of a "Turing test" had become sufficiently established to deserve an entry of its own in a non-specialized dictionary.

Why should I claim that there cannot be a "Turing test?" It would seem, after all, to be contradictory to do so. Was it not Turing's advertised purpose to constitute a kind of acid test that would show once and for all that the notion of mechanical intelligence was not a contradiction in terms? Indeed. But do we have to take Turing's alleged purpose at face value? Turing is obviously a father figure for the whole AI field, [6] but this should not blind us to the many obscurities which surround the very idea of a test. Let us then turn back to the 1950 article and find out whether or not we have reasons to believe in this famous test's validity.

2. "Test" Versus "Game" in Turing's 1950 Paper

To my knowledge, the expression "Turing test," obviously not Turing's own, appeared in the mid `70s, [7] long after the man's suicide in 1954. From all appearances it was coined after the mathematical expression "Turing machine," used for the first time in 1937 by Stephen C. Kleene in the Journal of Symbolic Logic to describe the logical apparatus used by Turing a year earlier to analyze the act of computation. [8] The expression "Turing test" keeps a flavor of its mathematical origin: just like a mathematical theorem, it bears the name of its discoverer but is not considered as a personal feat--it would, in this case, need the possessive case and would be

called "Turing's test." [9] On the contrary, the expression shows that it is considered to be a pre-existing concept, that it is to say as an objective notion, free of any personal bias. In the AI and cognitive science community, the idea of interpreting Turing's article as a test for mechanical intelligence serves a very precise purpose, if not scientific, at least sociological: it is a kind of shield that one uses to defend one's position as a scientist . This is exactly the issue I wish to address: is the so-called "Turing test" as objective and scientific as it is claimed to be in the AI and cognitive science community? Do we have to consider it as a threshold one has to cross to be able to enter the realm of a scientific approach to the mind? My answer is "no" because the so-called Turing test says in fact more about Turing's psychological life than about the science of the mind itself.

Strangely enough, there is no mention of a "test" in Turing's own description of the imitation game; and yet, it is called the "Turing test" in countless articles and books. [10] Turing does in fact refer to the imitation game as a "test," but only three times in the whole article and two pages apart. [11] It is used to answer an objection called the "Argument from Consciousness" that Turing quotes from Professor Jefferson's Lister Oration for 1949 entitled The Mind of the Mechanical Man : [12]

> “Not until a machine can write a sonnet or compose a concerto because of thoughts and emotions felt, and not by the chance fall of symbols, could we agree that machine equals brains--that is, not only write it but know that it had written it.”

Turing answers back:

> “The argument appears to be a denial of the validity of our test. According to the extreme form of this view the only way by which one could be sure that a machine thinks is to be the machine and to feel oneself thinking .... I am sure that Professor Jefferson does not wish to adopt the extreme and solipsist point of view. Probably he would be quite willing to accept the imitation game as a test.... In short then, I think that most of those who support the argument from consciousness could be persuaded to abandon it rather than be forced into the solipsist position. They will then probably be willing to accept our test.”

But these three occurrences do not allow us to consider that the imitation game can be used to test people's reactions towards the notion of mechanical intelligence.

On what grounds can we transform the imitation game into a test? Andrew Hodges's excellent analysis of the game will help us clarify the real issue: [13]

> “The famously irreverent opening of his paper describes an "imitation game" in which an "interrogator" questions two unseen people, a man and a woman, and decides which is the woman on the basis of written replies--in fact by teleprinter communication--in which both man and woman are claiming to be the woman. Turing then went on to imagine a similar game in which human and machine compete to assert their human status under the same conditions.”

Let us begin with the central notion of an "imitation" in either of the two games.

3. The Notion of Imitation

Two possibilities can occur: either the reciprocal imitation of the two players is successful or it is not.

3.1. Unsuccessful Imitation

What if the imitation is unsuccessful? Well, the answer seems quite straightforward: the interrogator has reasonable chances of ending a match by saying truthfully who's who. But in that case, the idea of a test showing the incapacity of the interrogator to decide who answered the questions vanishes completely. The unsuccessful imitation seems to lead us astray because what we need for a real test is a failure on the interrogator's part.

3.2. Successful Imitation

On the other hand, the hypothesis of a successful imitation, the only one which is in fact worth considering if one wants to transform the game into a test, has at least one very strange consequence.

3.2.1. The Everlasting Match: From the Inside to the Outside of an Imitation Game

If, in fact, the imitation is successful, the game should not stop because the interrogator would go on asking questions forever . In this case, the interrogator's behavior would look like a Turing machine trying to decide the halting problem, which was proved undecidable by Turing in his 1936 paper. [14] So if a game is supposed to end, despite the success of the imitation, then we must suppose the intervention of someone who does not play (let us call him the "umpire" as in a tennis game) and has the ability to decide to stop the match after a finite amount of time.

Of course, the interrogator and the two players could decide in advance that the game would be played for a certain period of time and therefore an umpire would be superfluous; and Turing in fact mentions once in the article the length of a match: "five minutes." [15] But this does not solve the problem: it rather emphasizes it, for the function of an umpire, i.e., his imaginary position where the game can be observed from outside, is still necessary--no matter who occupies it, whether it be the participants of the game deciding the length of a match, Turing himself deciding that five minutes should do the trick, or the potential readers of his paper. The existence of this outer position must, then, be presupposed . It can be characterized from a temporal point of view: there is an imaginary outer position I the imitation game from which it is possible, after only a finite amount of time, to decide that the interrogator, being unable to differentiate the answers of the two players up to this finite moment, would not be able to differentiate them, no matter how long the game was played. But who could wager on such ill-balanced terms, depriving the interrogator of asking trickier and trickier questions for as long as he cares to play? Contrary to the logical undecidability of the halting problem, there are no computational means available that would decide that the interrogator, faced with the whole

infinite list of possible answers, would be unable to decide who gave them. Who, then, could take the ultimate decision to end the game?

Nobody except someone already convinced that the interrogator has no chance of finding out who's who. But who could be convinced of this after only a finite amount of time? Only someone who could decide that giving one more chance to the interrogator would not modify the final conclusion, that is to say only someone already convinced before the match that the final decision is not the interrogator's but the umpire's. The reasons for this conviction cannot derive from the game itself, since it is not yet played. So there must be other reasons outside the game which support this conviction. They will become more apparent if we study the two different games.

3.2.2. The Border-Line: From the Outside to the Inside of the Imitation Game

There is a kind of discrepancy between the two games in the event that the imitation is successful. As Andrew Hodges rightly puts it:[16]

> "In fact, the apparent analogy is curiously inexact and diverts attention from the idea Turing actually wishes to put across. In the first game, a successful imitation proves nothing at all; we know that physical gender is not determined by teleprinter responses. In the second game, however, the very point of Turing's argument is that the successful imitation of intelligence in teleprinter messages does prove something for it is intelligence. Intelligence (as opposed to gender, physical strength or other qualities) is effectively defined as that which can be manifested by the communication of discrete symbols."

When studying game #1, nobody would establish a connection between the physical constitution of the players and their intellectual capacities to imitate the other sex. So it seems that Andrew Hodges is right to conclude that a successful and reciprocal imitation would not prove anything.

In game #2 on the contrary, the situation is more complex. Let us follow Turing's line of argument first. In the beginning of a match, we do (or at least we pretend to) find a connection between the physical constitution and the intellectual capacities of imitation of the two players because we think wrongly that the computer should behave differently from a human being. But this is a conclusion that the test, if we accept it, will prove wrong. That is why we can conclude that the interrogator, unaware of the change on the players' side--just like the reader of the article is usually unaware of the possibility of mechanical intelligence or pretends to be--cannot become aware of it through the experience of the game. In the case of a successful imitation, then, the notion of intelligence will be disconnected from any physical basis, just as it was already so from a particular physical point of view: that of gender difference. Intelligence would be recognized as a truly universal concept as soon as the reader realized that he had changed his mind through the process and experience of the imitation game. So the same reason that makes the interrogator unable to differentiate the players inside the game will make the reader (or Turing or even the players themselves) able to recognize outside the game that, despite their obvious physical differences, a human being and a machine are intellectually on par.

But this has unexpected consequences. If the imitation is really successful, then the physical difference between a human being and a machine will be at the same time abolished inside the game and forever presupposed outside the game , since if it were abolished outside the game also, nobody could differentiate a human being from a computer. Of course, we could object that we can perceive in every day life the physical difference between a human being and a machine and that the function of the game is precisely to demonstrate that the difference is only apparent. But this is not the point. Rather, it is the very strange, if not contradictory, status of the outer position. Let us sum up the argument. First, there must be a point of view outside the game where the difference between a human being and a machine is established on a physical basis; secondly, this physical perception is necessarily presupposed for the game to be played since it is only in the process of a match that, outside the game, one becomes aware of the intellectual parity between a human being and a machine; thirdly, the outer position is a point of view where the physical difference is abolished , since it is the point of view occupied by the umpire. The outer position is therefore ambiguous: in order to build the imitation game as an experience, the physical difference between a human being and a machine is at the same time presupposed (since the umpire himself must perceive the physical difference between a human being and a machine) and abolished (since even for the umpire it must be only an apparent physical difference, otherwise he would not adjudicate the game in favor of the machine). The reader must therefore occupy this ambiguous position to be able to reach the conclusion that the interrogator will be unable to take the right decision. This is why the physical difference between the players is not abolished once and for all but only shifted in the outer position, where it goes on living in a repressed way. Therefore the function of the imitation game is to induce this representation in the reader's mind.

Hence the problematic aspect of the notion of a successful imitation, since it presupposes what it is supposed to demonstrate and is therefore more akin to a vicious circle than to a full-fledged logical demonstration. The outer position is in fact on a border line, in the game (where the physical difference between the players is supposed to be abolished) and out of it (where the physical difference between the players is presupposed).

So the successful imitation seems to lead us astray too. Perhaps we should turn back to the unsuccessful imitation and reconsider this option after all. In fact, the whole argument concerning the interrogator's inability to differentiate the players' answers rests upon the fact that the imitation must be reciprocal to be successful. But is the imitation really reciprocal?

3.3. Let's Play a Game

Let us go back to Turing's description of his first game and to the strategies displayed by the players. In fact, the only example given by Turing would not lead to a successful imitation but on the contrary to an unsuccessful one, that is to say to an unreciprocal imitation.

Here is how Turing describes the woman's strategy: [17]

> “The best strategy for her is probably to give truthful answers. She can add such things as "I am the woman, don't listen to him!" to her answers, but it will avail nothing as the man can make similar remarks.”

What can we infer from this description? That the woman will at once be recognized by the interrogator and that the match will end immediately. If the strategy followed by the woman is to tell the truth about herself without imitating the man's behavior, this truth will become very quickly apparent to the interrogator.

Why should the woman speak the truth? It is obviously a very bad strategy, since it should be characterized, more than anything else, as an absence of strategy. Turing does not give any reason for this but it has many unforeseen consequences, one of them being that the gender difference is not a contingent matter in the imitation game . As a matter of fact, if the imitation were reciprocal--as it should theoretically be--the gender difference would merely be a example of a physical difference between human beings like wearing glasses or being fair-haired. But in Turing's article, the odds are weighed too heavily against the woman and this fact must be somehow explained. Let us simply remark for the moment that since the first game must now be considered as a necessary preliminary to the second, the two games should be played in a row (this was not specified by Turing in his description of the game). Of course, the woman's strategy as described by Turing is only an example. But shouldn't we read the text first and try to make sense of it before repressing these bothersome details?

What about the man's strategy then? As Turing said in the passage just quoted: "the man can make similar remarks," which means that he should try to imitate the woman. Turing gives an example: [18]

> “C: Will X please tell me the length of his or her hair?
> A: My hair is shingled, and the longest strands are about nine inches long.”

The answer could be given by a woman (at least an American one, since the expression "shingled hair" is not used in British English). Therefore the interrogator would be facing the task of trying to work out who is the true author of this ambiguous response. Little by little, a kind of hierarchy in the players' responses emerges from the text: the woman imitates herself (this is why she is a poor player), the man imitates the woman (he is therefore a better player than the woman). What about the machine which replaces the man in the second game?

The longest example of a dialogue in a match is devoted to the answers of the machine: [19]

> “Q : Please write me a sonnet on the subject of the Forth bridge.
> A : Count me out on this one. I never could write poetry.
> Q : Add 34957 to 70764
> A : (Pause about 30 seconds and then gives an answer) 105621.
> Q : Do you play chess?
> A : Yes.
> Q : I have K at my K1, and no other pieces. You have only K at K6 and R at R1. It is your move. What do you play?
> A : (After a pause of 15 seconds) R-R8 mate.”

At first sight, these three answers are ambiguous too. But they do not have much in common. The first and the third one could be answered by a human being of whatever gender.

We can easily admit that most people would be unable to write a poem to order, as Turing rightly says. Regarding the third answer, there is no need to be a chess-master to end this game successfully, since there are almost no options left. Here again, the machine is undetectable. The second answer is much more interesting because it is false: 34 957 plus 70 764 does not make 105 621 but 105 721. How can we explain this? [20] Obviously, it looks like a careless mistake: the machine "forgot" to carry over the hundreds properly. This exemplifies the strategy of the machine: it must hide its superiority in arithmetic by introducing approximate results which look like careless mistakes, i.e., the kind of mistakes human beings are very likely to make. In this case, the machine does not imitate a particular gender of human beings but humanity. From that point of view, the machine overcomes the particular case of gender while simulating the only too human way of thinking .

We can now complete the hierarchy in the players' responses, as they are imagined by Turing: the woman imitates herself, the man imitates the woman and the machine the two of them. But the final result is not, as would be expected, that mechanical intelligence has definitely overcome the form of intelligence connected to this particular physical substratum based on gender difference which characterizes humanity. Since the woman is deprived of any strategy, there is, in Turing's mind--and in his mind only of course--a secret connection between gender difference and intelligence. Therefore intelligence is not that abstract,contrary to what Turing claimed at the beginning of his article.

Gender difference is hard to get rid of. As a consequence it could be argued that the final outcome of the imitation game should be more accurately described as a breakthrough of the repressed than a scientific prophecy concerning the future of AI.

It seems to me that Turing does not, to say the least, follow a strictly logical line of argument in his article which is all the more surprising coming from a professional logician. Therefore the whole argument involving the imitation game must have another purpose which has to do with the procedure of repression of gender difference that Turing tries to work upon the reader.

3.4. Induction and Learning: Casabianca

Repression appears in the guise of scientific induction in Turing's paper. In the long series of objections Turing addresses, there is one allusion to induction contained in the "Arguments from Various Disabilities" which is worth quoting at length:[21]

These arguments take the form "I grant you that you can make machines do all the things you have mentioned but you will never be able to make one to do X." Numerous features X are suggested in this connection.... No support is usually offered for these statements. I believe they are mostly founded on the principle of scientific induction. ... A few years ago, when very little had been heard of digital computers, it was possible to elicit much credulity concerning them, if one mentioned their properties without describing their construction. That was presumably due to a similar application of the principle of scientific induction. These applications of the principle are of course largely unconscious. When a burnt child fears the fire and shows that he fears it by avoiding it, I should say that he was applying scientific induction. (I could of course describe his

behavior in many other ways.) The works and customs of mankind do not seem to be very suitable material to which to apply scientific induction. A very large part of space-time must be investigated, if reliable results are to be obtained. Otherwise we may (as most English children do) decide that everybody speaks English and that it is silly to speak French.

The objection is answered by means of two examples dealing with the process of learning. The first one shows how a child can be aware of the danger of fire thanks to the feeling of fear. The second example deals with the learning of languages. The example shows how easy it is to make mistakes concerning the universality of the notion involved in learning when it is of a cultural nature. Contrary to the feeling of fear which is transmitted through the body, the misuse of the induction principle in thesecond example is due to an abstract cause: the improper knowledge of the use of linguistic symbols. English is not the Universal Language contrary to what English children living in an English-only environment are prone to believe. From these two examples, Turing draws the conclusion that the process of learning must be grounded, just like in the first example, on rewards and punishments. Turing gives an example of how rewards and punishments should be used in the process of learning: [22]

> "Roughly speaking, if the teacher has no other means of communicating with the pupil, the amount of information which can reach him does not exceed the total amount of rewards and punishments applied. By the time a child has learnt "Casabianca" he would probably feel very sore indeed, if the text could only be discovered by a "Twenty Questions" technique, every "NO" taking the form of a blow. It is necessary therefore to have some other "unemotional" channels of communication. If these are available it is possible to teach a machine by punishments and rewards to obey orders given in some language, e.g. a symbolic language."

This paragraph looks insignificant, but it in fact reveals many details of Turing's thought. The poem "Casabianca" has been learned by generations of pupils in British public schools. It was written by a woman, Felicia Hemans (1793-1835), and tells the story of a French feat of arms in the battle of Abukir lost to Admiral Nelson in 1798: the heroic death of young Giacomo Casabianca. This is the story. The French Admiral Brueys had been killed and the flag-ship, L'Orient , placed under the command of Captain Louis Casabianca, who, although the battle was lost, would not stop fighting until he was also killed. His son Giacomo, aged 13, refused to leave the burning ship and died with his father when an ammunition dump exploded: his remains were scattered all over the sea. The first stanza is the best-known:

> "The boy stood at the burning deck
> Whence all but he had fled;
> The flame that lit the battle's wreck
> Shone round him o'er the dead."

If we keep in mind the two examples of induction, the poem can be interpreted as another example of induction which mixes the first two. Giacomo Casabianca should have run away from the ship with all the other seamen, applying correctly the induction principle which consists of being afraid of fire and avoiding it, as shown in the first example. Could we say that Giacomo refuses to apply the induction principle? No. What Giacomo does is to disconnect the inductive proposition "fire burns" from its obvious practical consequence which consists in avoiding its

contact. As a matter of fact, Giacomo knows from induction that fire burns but does not show he knows it, by avoiding fire but by being burnt . In this case, there seems to be an exceptional way of applying the induction principle that seems contradictory to its normal application. And it leads to the sacrifice of the body. In accepting this sacrifice, Giacomo puts to test his faith in his father's post, even if it means following the example of his sacrifice. Giacomo's sacrifice can be compared to a kind of message, his own body being used as a linguistic signifier signifying loyalty. Therefore, the double sacrifice of the Casabiancas is not a mere example of duty but one of its universal symbols. We could even say that their tragic story reveals how a symbol is constituted through sacrifice.

But let us remember the second example of induction: most English children believe that their mother tongue is universal because everyone around them speaks it. They are obviously wrong about the universal status of their language because they did not face the ordeal by fire like Giacomo. And this may be the reason why Turing denies the woman the use of a good strategy in the imitation game: as the bearer of the mother tongue, the woman uses and teaches the language in an emotional way only. But to become truly universal and receive a formal status, the "space-time experience" needed to apply the induction principle correctly must make it possible to leave the material mode of transmitting messages through bodily emotions and to acquire through the sacrifice of the body a purely abstract and symbolic aspect. In Turing's mind, the process of learning is therefore akin to a process of repressing feminine and childish bodily emotions. The two examples of induction are therefore connected if we interpret the poem as the missing piece between them. The two meanings of the notion of symbol (construed either as a formal term or as a meaningful act) are therefore merged in a single one: the constitution of a language only composed of formal symbols is made possible by a symbolic approach to the body, that of sacrifice.

There is one more question we should ask about the process of induction. Turing said:

> “The works and customs of mankind do not seem to be a very suitable material to which to apply scientific induction. A very large part of space-time must be investigated, if reliable results are to be obtained.”

But, from the viewpoint of Turing's own "space-time" experience which was necessary to invent the concept of a Turing machine, what is it that lies concealed behind this intriguing remark? Let us note firstly that scientific induction is not only effective in perception (as shown in the first example) but also in the cultural domain since Turing invented a cultural concept of his own, that of a Turing machine. By what kind of induction was Turing able to conceive the concept of a Turing machine?

In this context, one detail should retain our attention: the closing section of Turing's 1950 article ([[section]]7) is dedicated entirely to the cultural question of how it would be possible to build a brain. But what is most akin to a brain in Turing's opinion? A Turing machine, since it can replace the brain of a man, as exemplified in game #2. So the question of how Turing managed to invent the cultural concept of a Turing machine might well be exemplified by the problem of building a brain which he addresses at the end of "Computing Machinery and Intelligence." In short, the inductive process necessary to build a brain appears to be equivalent to the regressive process of remembering what was necessary to invent the concept of a Turing

machine. This regression which should normally lead to the remembering of memories takes, in [[section]]7 of "Computing Machinery and Intelligence," the awkward form of mechanizing a child's behavior, that is to say of building a very primitive machine that would be submitted to learning thanks to induction:[23]

> "Instead of trying to produce a program to simulate the adult mind, why not rather try to produce one which simulates the child's? If this were then subjected to an appropriate course of education, one would obtain an adult brain. Presumably, the child-brain is something like a note-book as one buys from the stationers. Rather little mechanism and lots of blank sheets."

The parallel drawn between a child's education and a machine's leads, therefore, to the fantasy of Turing's own education as a machine . Hence the way in which Turing invented the concept of a Turing machine was to be this machine[24] (as he twice said himself). First, in 1939, in a mathematical logic paper called "Systems of Logic Based on Ordinals," Turing made the following comment on his 1936 article which introduced the notion of a Turing machine as a basic description of the intuitive act of computation:[25]

> "It was stated above that "a function is effectively calculable if its values can be found by some purely mechanical means." We may take this statement literally, understanding by a purely mechanical process one which could be carried out by a machine."

Turing took the metaphor of mechanical computation literally: the action of computation in a human mind is not akin to the action of a machine, it is the action of a machine. Hence the term "computer" in Turing's 1936 article, used to depict the human being in the state of mind required for computing as a Turing machine. The origin of the concept of a Turing machine is therefore a metaphor that was taken seriously here for the first time: Turing himself was this human being who was a computing machine.

Secondly, in a 1948 text called "Intelligent Machinery," Turing defines education as requiring both initiative and discipline:[26]

> "If the untrained infant's mind is to become an intelligent one, it must acquire both discipline and initiative. So far we have been considering only discipline. To convert a brain or machine into a universal machine is the extremest form of discipline. Without something of this kind one cannot set up proper communication."

But Turing gives in "Computing Machinery and Intelligence" an example of an extreme form of discipline which sets up a very special type of communication: the sacrifice of Giacomo Casabianca with whom Turing identifies. It seems that the invention of the concept of a Turing machine is linked to the poem by Felicia Hemans: the mathematical metaphor "man as a machine" is psychologically based on another metaphor, that of Giacomo's sacrifice which signifies loyalty through the destruction of his own body (the signifier). In the regressive process of his own remembering, the "man as a machine" metaphor is constructed by Turing through the process of making his own body hysterical qua a signifier in order to signify "machine" as a signified. This metaphorical process reflects the process of gender difference repression in

"Computing Machinery and Intelligence." The tropes of natural language are, perhaps, as hard to get rid of as gender difference.

Two objections could be raised concerning this interpretation. First, why would Turing try to repress the notion of gender difference? We cannot answer this question unless we have access to Turing's biography. This we have thanks to Andrew Hodges's eloquent Alan Turing, the Enigma of Intelligence . Therefore the real question would rather look like this: what had to be repressed in Turing's life that nonetheless could have partly influenced his work? Secondly, why would Turing try to influence the reader's judgment by means of the imitation game? As for the second question, this influence was not intentional on Turing's part: the fact that the imitation game fails in the purpose it was built for only shows that it should be considered as an unconscious and mythical autobiography and not as a philosophical introduction to the main issues of AI.

I shall focus my attention on what I called the process of repression, to show how much of Turing's biography becomes manifest in "Computing Machinery and Intelligence."

4. A Touch of Memory

I shall recall three facts about Turing's childhood that appear through the surface of "Computing Machinery and Intelligence."

4.1. Creating Versus Building

In 1922, Turing, aged 10, was given a book written by the American author Edwin T. Brewster: Natural Wonders Every Child Should Know . Alan Turing told his mother that it was this book that "opened his eyes to science," as Andrew Hodges reports.[27] The introduction of Natural Wonders explains how the book tries "to provide a foundation on which a perplexed but serious-minded parent can himself base an answer to several puzzling questions which all children ask--especially the most difficult of them all: By what process of becoming did I myself finally appear in the world?" [28] As far as I can see from Hodges's analysis and quotations, Brewster's book is a masterpiece in the art of avoiding direct answers about this intriguing subject. Brewster would mention gender difference without saying what it is exactly: "little boys and little girls are far from being alike and it isn't worth while trying to make either one over into the other." [29] This rather obscure sentence suggests that, from the perspective of the process of generation, boys and girls are entirely different. Brewster would then start describing the process of generation by evoking its final result first, i.e., the constitution of an individual, passing over in silence the process by which the generation itself brings two cells together. Brewster would only mention that "the egg itself arose by the splitting of still another cell which, of course, was part of the parent's body," hence reversing the direction of the process that leads from the conception to the constitution of an "egg." As in "Computing Machinery and Intelligence," the regressive process towards the unknown origin--the act of generating and of inventing--is transformed into a progressive process, that of growing. The biological growth of the egg was then compared to the building of a brick wall: "So we are not built like a cement or a wooden house, but like a brick one. We are made of little living bricks." This is the reason why,

for Brewster, the body is a machine: "For, of course, the body is a machine. It is a vastly complex machine, many, many times more complex than any machine ever made with hands; but still after all a machine." Hence the way the process of generation is hinted at transforms the mysterious question of sexual reproduction into that of building a highly complex machine. This is precisely the way Turing approaches the problem in the last paragraph of "Computing Machinery and Intelligence."

Two other facts about Turing's childhood may be of interest for the understanding of his thought. First, Turing was circumcised in his childhood on purely medical grounds and admitted later on that the operation greatly determined his sexual orientation as a homosexual. Secondly, his first platonic love for a boy at school ended up in a tragedy. These two facts can be connected to the process of induction as it is described by Turing in his 1950 article.

4.2. Circumcision

Circumcision may be interpreted as a wound on the skin just like the ordeal by fire in the example of Casabianca and it may result in the same creative function in Turing's mind.

In his book, Andrew Hodges reproduces a letter by Turing dated "Feb 11 1923" which deals with the poem:[30]

> “Dear Mother and Daddy
>
> I have got a lovely cinema kind of thing Micheal sills gave it to me and you can draw new films for it and I am making a copy of it for you for an easter present I am sending it in another envelope if you want anymore films for it write for them there are 16 pictures in each but I worked out that I could draw "The boy stood at the tea table" you know the Rhyme made up from casabianca. [sic]”

In the letter, the allusion to "Casabianca" is connected to the making of a film. As Turing says, it is not "Casabianca" which is represented on the film but a parody of it. This is another important feature about the poem: learned by generation of pupils, the poem is usually transformed into parodic verses which often contain rude or saucy lines. Turing must have known that his parents would be aware of it. Therefore Turing takes the risk of making them think that he is aware of it too. If we try to make sense of all these details, we may suppose that the making of a film connects the idea of sacrifice--which is the main theme of the real poem and which is linked in Turing's mind to circumcision--to that of film making, i.e., of building a tape in which the parodic verses are split up into successive steps.

Is this the first trace of Turing's future work, the construction of an abstract Turing machine in the field of mathematical logic and the parodical imitations of either sex by the hidden machine in the imitation game? If it is the case, the machine would therefore be an entity beyond gender difference whose function would be to split up on a tape the steps of a parodic narrative, usually filled with saucy hints. The function of the tape itself would be to recollect the lost integrity of Turing's body burnt in the circumcision in the stepwise procedure of a temporal succession. From this point of view, the tape would represent the now missing integrity of the

body and more specifically the lost skin itself. As to the stepwise procedure itself, it would represent the specific way Turing found to save his hide. [31]

If one reads Turing's 1950 article carefully, one is struck by the numerous allusions to skin.[32] Two of them are of particular importance. The first one describes the mechanical mind as a skin with nothing inside: [33]

> “The "skin of an onion" analogy is also helpful. In considering the functions of the mind or the brain we find certain operations which we can explain in purely mechanical terms. This we say does not correspond to the real mind: it is a sort of skin which we must strip off if we are to find the real mind. But then in what remains we find a further skin to be stripped off, and so on. Proceeding in this way do we ever come to the "real" mind, or do we eventually come to the skin which has nothing in it? In the latter case, the whole mind is mechanical (it would not be a discrete-state machine however. We have discussed this.)”

The mechanical mind is hence akin to a very special skin which does not introduce a difference between the outside and the inside, just like the point of view occupied by the umpire in the imitation game. As to the last line of the quotation, nowhere in "Computing Machinery and Intelligence" did I find that Turing already discussed the particular important point of knowing whether "the whole mechanical mind" would be entirely considered as a discrete-state machine. Hence this problem is not solved in "Computing Machinery and Intelligence" but only alluded to by means of a reflection on the gender status of the skin.

The second allusion to the skin refers to the process of brain-growing: [34]

> “Presumably the child-brain is something like a note-book as one buys it from the stationers. Rather little mechanism and lots of blank sheets. (Mechanism and writing are from our point of view almost synonymous.) Our hope is that there is so little mechanism in the child-brain that something like it can be easily programmed.”

Two things must be kept in mind to understand the way Turing sees the process of brain-growing. First, since the mechanical mind is identified with a skin, we must infer that it is on this very peculiar surface that Turing is supposed to write the primeval program modeling the child-brain. Secondly, since the description of the child's brain is in fact connected to the description of Turing's own education as a machine, we must conclude that it is on his own skin that this program has been written. Programming is hence the way Turing overcame the sacrifice of his skin through fantasy .

4.3. Christopher Morcom

A second biographical fact also plays an important role in "Computing Machinery and Intelligence." Turing's first platonic love, Christopher Morcom, who was educated at the same boarding school, introduced him to scientific questions and especially to mathematics and chemistry, but died of tuberculosis when he was about to enter Trinity College, Cambridge. Turing was deeply shocked by this death and recognized that it had a great influence on his choosing a scientific career, for he felt he had to take over what Christopher Morcom would have

done if he had lived longer. Here is how I connect these two biographical facts with the poem "Casabianca," a poem that plays such an important and fantasmatic role in the 1950 article.

As for Christopher Morcom, I would think that he plays the role of Giacomo's father whose example has to be followed at any cost. Soon after Christopher Morcom's death, Turing sent a letter to Christopher's mother telling her that Christopher Morcom would continue to live in some way: [35]

> "I feel sure that I shall meet Morcom again somewhere and that there will be some work for us to do together, and as I believed there was for us to do here. Now that I am left to do it alone, I must not let him down but put as much energy into it, if not as much interest, as if he were still here."

Turing must take over Christopher Morcom's scientific calling. From then on, the ghostly presence of Christopher Morcom would occupy Turing's mind. He sent this other letter to Christopher's mother which takes the form of a text entitled "Nature of Spirit": [36]

> "Personally I think that spirit is really eternally connected with matter but certainly not always by the same kind of body. I did believe it possible for a spirit at death to go to a universe entirely separate from our own, but I now consider that matter and spirit are so connected that this would be a contradiction in terms. Then as regards the actual connection between spirit and body I consider that the body by reason of being a living body can "attract" and hold on to a "spirit" whilst the body is alive and awake the two are firmly connected. When the body is asleep, I cannot guess what happens; but when the body dies the "mechanism" of the body, holding the spirit, is gone, and the spirit finds a new body sooner or later, perhaps immediately."

How could we not connect this text to the imitation game in which the communication between pure spirits is at the core of the whole argument? Another detail goes in the same direction: in the 1950 article, there is an objection called "Objection from Extra-Sensory Perception" which is usually flatly ignored by commentators. If tele-pathy is real, then there could be an undetectable influence between the questioner and the players. Turing imagines a very special room which would be "telepathy-proof." This answer has obviously no interest in itself and it is an easy charge against Turing to say, like D. Hofstadter, that, as a scientist, he does not believe in extra-sensory perception. This is not the point. The point is that Turing believed in Christopher Morcom's reincarnation in his own mind. That is why the objection of extra-sensory perception plays a role in "Computing Machinery and Intelligence" and that is also why, from a symbolic point of view, the example of Giacomo's identification with his father is so important.

Conclusion

I hope that the reader will be convinced that, for purely logical reasons, there cannot be a "Turing test." The expression, if it were to be used in Turing's case, means the necessary ordeal one has to face to be able to create new concepts. This is far from the kind of test which is supposed to check that intelligence is a universal concept. This interpretation has, I believe, two consequences.

First, by inheriting from Turing's point of view on what a machine is, we inherit not only a superb scientific concept and a powerful technology , but also a very strange way of understanding the old Cartesian motto "body as a machine." From this point of view, gender difference plays a secret role in the construction of a formal approach to the mind. The computer should hence be considered as a bodily-minded machine.

Secondly, AI is obviously a science of the mind but not of all the mind. More specifically, AI cannot justify the origin of one of its major concepts, that of a Turing machine, by its purely formal approach. This is why AI still has a long way to go to be able to take into account the symbolic level which is so characteristic of the human way of creating new concepts.

Jean Lassègue,
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1 A. M. Turing, (1950), "Computing Machinery and Intelligence," *Mind*, vol. LIX, no.236, 1950, pp. 433-460.

2 Ibid., pp. 433-434.

3 J. Leiber, *An Invitation to Cognitive Science*, Oxford: Basil Blackwell, 1991, p. 110.

4 As is described by N. Block, *Readings in the Philosophy of Psychology*, I, Harvard University Press, 1980.

5 "The Strange Doctor Turing" by C. Sykes.

6 To my knowledge, Turing is (with Einstein) the only twentieth-century scientist to have inspired not only scientists and philosophers but also literary writers and film makers: there is a television play about him (I. McEwan, "The Imitation Game" in *Three Plays for the Television*, London: Picador, 1981), a biography (A. Hodges, *Alan Turing, the Enigma of Intelligence*, London: Unwin Paperbacks, 1983) and lately, a science-fiction novel co-signed by one of the greatest names in the AI field, Marvin Minsky, founder of the first AI laboratory at MIT (H. Harrison and M. Minsky, *The Turing Option*, New York: Warner Books, 1992).

7 See D. Michie, *On Machine Intelligence*, New York: Halsted Press, 1974, p. 65.

8 A. M. Turing, (1936), "On Computable Numbers with an Application to the Entscheidungsproblem," *Proceedings of the London Mathematical Society*, 42, pp. 230-265.

9 Let me note that in a recent article D. Michie uses the expression "Turing’s test," adding a more personal touch to the look of the expression. See D. Michie, (1993), "Turing’s Test and Conscious Thought," *Artificial Intelligence*, 60, pp. 1-22.

10 See for example: M. Boden, "Introduction" to *The Philosophy of Artificial Intelligence*, ed. M. Boden, Oxford: Oxford University Press, 1990, p. 4; R. M. French (1990), "Subcognition and the Limits of the Turing Test," *Mind*, 99, pp. 53-65; J. Haugeland, *Artificial Intelligence, the Very Idea*, Cambridge, Massachussetts: MIT Press, 1985; D. Hofstadter and D. Dennett, *The Mind's I*, New York: Basic Books, 1981; J. Leiber, *An Invitation to Cognitive Science*, Oxford: Basil Blackwell, 1991, chap. 9, "The Imitation Game"; D. Michie, *On Machine Intelligence*, p. 65; R. Penrose, *The Emperor's New Mind*, Oxford: Oxford University Press, 1989, "The Turing Test," pp. 7-8; Z. Pylyshyn, *Computation and Cognition*, Toward a Foundation for Cognitive Science, Cambridge, Massachussetts: MIT Press, 1984, p. 53.

11 A. M. Turing, (1950), "Computing Machinery and Intelligence," pp. 446-447.

12 *British Medical Journal*, 25 June 1949. Sir Geoffrey Jefferson was a brain-surgeon who occupied the chair of neural surgery at the University of Manchester. Quoted in A. Hodges, *Alan Turing, the Enigma of Intelligence*, p. 404.

13 A. Hodges, "Alan Turing and The Turing Machine" in *The Universal Turing Machine*, R. Herken ed., Oxford: Oxford University Press, 1988, pp. 9-10.

14 See A. M Turing, (1936), "On Computable Numbers with an Application to the Entscheidungsproblem," [[section]] 8.

15 A. M. Turing, (1950), "Computing Machinery and Intelligence," p. 442.

16 "Alan Turing and The Turing Machine," p. 10.

17 A. M. Turing, (1950), "Computing Machinery and Intelligence," p. 434.

18 Ibid.

19 Ibid., pp. 434-435.

20 The mistake was noticed by D. Hofstadter. But he only mentions it and does not seem to take any advantage of this crucial fact.

21 A. M. Turing, (1950), "Computing Machinery and Intelligence," p. 447.

22 Ibid., p. 457.

23 Ibid., p. 456.

24 This is precisely what Turing argued against Prof. Jefferson in "Computing Machinery and Intelligence."

25 A. M. Turing, (1939), "Systems of Logic Based on Ordinals," *Proceedings of the London Mathematical Society*, ser. 2, vol. 45, pp. 161- 228; reprint in M. Davis, *The Undecidable*, Hewlett, New York: Raven Press, p. 160.

26 A. M. Turing, (1948), "Intelligent Machinery," reprinted in *Mechanical Intelligence, Collected Works*, D. C. Ince ed., Amsterdam: North-Holland, 1992, p. 49. As to initiative, it is examplified by the research of algorithms for open arithmetical problems.

27 A. Hodges, *Alan Turing, the Enigma of Intelligence*, p. 11.

28 Ibid., p. 12.

29 Ibid.

30 Ibid., p. 13.

31 The hiding of gender identities in the imitation game is obviously concerned with the same topic. But let us notice also that Turing's last research field on morphogenesis was partially focused on building a computer model that would explain the growing of particular "dappled patterns" on animal hides. See A. M. Turing, (1952), "The Chemical Basis of Morphogenesis," *Phil. Trans. Roy. Soc.* B 237, p. 60; reprint in A. M. Turing, *Collected Works of A. M. Turing, vol. 4*, "Morphogenesis," Amsterdam: North-Holland, 1992, p. 24.

32 I found seven allusions to the notion of skin in "Computing Machinery and Intelligence": (1) page 434, line 27; (2) p. 436, l. 3; (3) p. 448, l. 8; (4) p. 453, l. 11; (5) p. 454, l.37; (6) p. 456, l. 38; (7) p. 457, l. 17.

33 A. M. Turing, (1950), "Computing Machinery and Intelligence," pp. 455-456.

34 Ibid.

35 Quoted in A. Hodges, *Alan Turing, the Enigma of Intelligence*, p. 47.

36 Ibid., pp. 163-64.