The Human Underbelly of the Robotics Industry

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I Introduction – Setting the Stage

There is a hypothetical case for robots becoming indistinguishable from humans, at least within the epistemic optic of behaviourism and functionalism as explained in current literature in the philosophy of mind. This hypothetical case has been made by the positing of the Turing Test in 1950 (Turing, 433), if we construe the Turing Test in terms of behaviourism and functionalism.[1] At least two lessons emerge within the context of philosophy, one epistemological and one anthropological, from the evolution of robotics since the positing of the first mooting of the hypothetical case. First, epistemologically, it is not the rightful place of philosophers (e.g. philosophers of mind) to stipulate a priori what experts in the field of robotics can achieve and what is impossible for them. Secondly, anthropologically, robotics are today a fact of life exercising a big and increasing influence on the experience of what it is to be human. I will leave the first question for another discussion, and concentrate rather on the second anthropological question. We can already begin to see the contours of a third question – an ethical question – concerning what the field of robotics ought to do. But the direct discussion of this third question should be the subject of another discussion.

One obvious question that arises on a consideration of the anthropological lesson appraised above, borne and acted out in many films on artificial intelligence is: Are robots a menace or a positive addition to the experience of being human? I suggest, here, that the option of robotics being neutral is dissolved in the fact that robots are making a bigger presence either directly or indirectly in human life, globally. I argue, in this paper, that what value positive or negative the robots will have on the human experience is still within our power to choose or decide, as human innovators. Central to this position, I suggest, is that the entire human experience will have to be included in the robotics industry, from conception, trials, production, marketing, application, etc. all the way to disposal.

The more participatory or inclusive of "human experience" the "robotic experience" will be in the sourcing and building of this latter, the more intelligent and useful the latter will be, for the greater good of one entire humanity. Bridging the two experiences is the "hybrid human-robot experience" which at least fictionally goes all the way to a cyborg existence. I argue that the other two experiences are built on the human experience for better or for worse – i.e. that the human experience is necessary and sufficient for both the advancement and the evaluation of the other two experiences. This human experience is what I designate as the "human underbelly".

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[1] Just in case these two concepts are understood as making no ontological commitments about the nature of the mind, nor reducing mental states and processes to physical entity or location.

On a different axis, our estimation of robots takes place between two extremes. On the one extreme, we can estimate robots and our engagement of them on pure utility – i.e. how useful or useless they are. On the opposite extreme, we can evaluate robots on the grounds of their actual cooperation/ competition with us. While the former extreme is obvious and uncontroversial, anthropologically, the latter is open-ended and is a matter of ongoing debate.

This whole discussion is urgent and non-trivial because both robotics research and the robotics industry that results from the research can afford to ignore the philosophical discussion and proceed premised on what I designate as the "Laplacean fallacy". We can intervene emphasise the anthropological role we have to play as humans and ensure that it is part of the task that robotics research and the robotics industry set themselves.

II Analysis of the Laplacean Fallacy in Michael Polanyi – Rereading and Application

An anthropological/epistemic analysis of the creation and use of robots will reveal that robots are the result of articulation expressed as a manipulation (of symbols and objects) and an actualisation of the self. The path of manipulation has the stages of the formation of language(s) both natural and artificial, symbolisation (as in logic, including fuzzy logical systems), the positing of rules, the arrival at discoveries and ultimately self-discovery and self-realisation. (Polanyi)

In this process, our symbols which we ourselves have created, can speak back to us in a way that attests to our ingenuity both as persons and as communities. The quest continues in us to rise to ever greater heights of self-realisation. In the process, we need to step back and always remember that we are the bearers of responsibility, and that our creations should not replace us in our responsibility. Our algorithms, even as very efficient and accurate tools, cannot replace our human responsibility to choose what to make of their efficient and accurate results. We should resist the temptation of the facile shift from the complexity of our systems through the complexity of our choice to the complexity of machine responsibility.[2]

At the stage of manipulation, the sketchbook of the innovator is her laboratory. The essentials of the difficult situations that are resisting resolution can be articulated in symbols which are easier to manipulate using the imagination, hence the birth of engineering as a science. There are no true or real symbols. Rather, suitable symbols are invented in a language (with the powers of both linguistic representation and manipulation), which symbols can be manipulated according to given rules (syntax or grammar), in a process removed from direct experience, in a system of pure mathematics or a similar conceptual scheme. Hopefully, this pure mathematics or similar

[2] I need to point out here that I am steering clear of the debate of whether machines can be responsible. My answer to that question would be in the direction of establishing a differentiated responsibility between human and machine responsibility, but that is a matter for another debate.

scheme can "inform" and "bear" on experience whether that experience be human, hybrid or robotic.

On their own, the mathematical (or similarly useful) symbols "embod[y] the conception of [their] operability, just as a bishop or a knight in chess embodies the conception of the moves of which it is capable." (Polanyi, 85) This continued effort of manipulation and invention could continue to give birth to more powerful applications in all kinds of experience. Now, Laplace recognizes and acknowledges this power of symbolisation and its role in innovation with effects on experience. Polanyi points out that "Laplace remarks how fortunate was Descartes' notation of the exponent of a power in stimulating speculations about the possibility of other than positive integer powers in F. Laplace, *Traité de Probabilité*, 1886.

The fallacy of Laplace is that he does not capitalise on the human contribution, and in fact the logical consequence is the trivialisation of the human role. He glosses over the fact that in the process of manipulation, there is nothing that inexorably imposes itself on the human innovator. Realism about the processes is fallacious in the sense that it does not follow from the process of manipulation, however fascinating it may become. Rather, the innovations talk back to the innovator, however fascinatingly, because the innovator accommodates herself to them. A fuller account of the accommodation would include an account of the enduring human role.

Thus far, in the manipulation of a language, whether natural or artificial, Polanyi holds that when we analyse our use of a descriptive term in the language, we do so with a purpose: to contemplate the subject matter of the term in such a way as to make a link or to realise the contemplated object itself. There can be an easy transition from "meaningfulness" to "existence". Our analysis of the descriptive term stands in for an "… analysis of the conception by which we are jointly aware both of the term and the subject matter, or … an analysis of the particulars covered by this conception…." The positive result of the process of manipulation is that we may end up with a fuller or more rational use of the term as well as a better grasp of the particulars it designates. (Polanyi, 116) It is perhaps in this context that robots understood as manipulation and articulation can make our understanding of the world better – we can learn about the world, including the human experience, from our engagement in robotics.

To extend the model of manipulation beyond the field of mathematical sciences and to illustrate some use in natural language, Polanyi moves from the treatment of abstract mathematical terms to a comparison with literary theory. When a mathematical term is suggested (e.g. non-Euclidean alternatives to Euclid's postulates of parallels as laid out by Saccheri and developed by Lobatschevski and Bolyai a century later), its "truthiness" may only be borne out when it spawns new and interesting ideas. Polanyi compares this to the distinction made by E.M. Forster, between 'flat' and 'round' characters in a novel. The latter strike the reader as real, because they are unpredictable and thus interesting. They "convincingly surprise" the reader,

even though they actually remain "true to character"[3], all of which character is in fact made up or fictional. (116-117).

Thus far, we see how powerful a language is. But the Laplacean fallacy consists in missing the point, when it reduces reality to this admittedly powerful tool of exactitude in abstraction. In terms of science understood as an effort to make sense of the world and perhaps even to manipulate or intervene in it (Hacking), a balance has to be maintained for true scientific value to be attained. The intellectual interest or scientific value in any area of research (e.g. physics, biology, etc.) is a balanced combination of supreme exactitude/coherence (e.g. present in physics and less present in biology), and obvious/tangible effects on animate life or society (more present in biology than in physics). Life and society are to be understood as the source from which abstract concepts are taken and developed. (Polanyi, 139) Language and abstraction (including logic) are to remain at the service of the human, and not vice versa, however efficient the former turns out to be.

We see then that a certain understanding of science or robotics in our particular case, as the pursuit of of a detached and absolute ideal captured in exact particular terms and processes as foreseen by Laplace, is erroneous. Laplace posited an intelligence which knew at one moment of time "… all the forces by which nature is animated and the respective positions of the entities which compose it … would embrace in the same formula the movements of the largest bodies in the universe and those of the lightest atom: nothing would be uncertain for it, and the future, like the past, would be present to its eyes." (Laplace, *Traité de Probabilité, Oeuvres* (Acad. Sc.), Paris, 1886, 7, pp. vi-vii) Laplace promises that such an intelligence would possess scientific omniscience of the universe. The counterexample to such a position is not quantum mechanics, for this latter would in Laplacean fashion present in a wave equation that would enlighten us on the statistical distribution of particles. For Polanyi, this would only still be data, devoid of scientific value. (Polanyi, 140) The data must still be complimented with experience, understanding, and meaning. These latter are human, and a robot would only attain them according to the image and likeness of humans, if it ever did. Knowledge and culture, including scientific knowledge and culture, must go beyond observational accuracy and systematic precision. Such knowledge must be brought to bear on its subject matter. (141)

Polanyi's concerns were specifically about science. I draw an extrapolation to show that his concerns have got relevance for robotics in its current phase. For robotics to progress, there must be a conscious effort to disabuse robotics of the same Laplacean fallacy that could have and perhaps could still ruin the value of science. Just as some sought to drive a value-free science, which tendency was a danger to science itself, those who seek to drive a value-free robotics (free of the universality of the human experience) may not only work counterproductively for robotics, but for humanity too. More than science which would clearly seek to satisfy the intellectual passions of the scientist, robotics can easily be perceived as aimed at satisfying the utility for

[3] This is to be understood in the sense of being mostly predictable or calculable by some discernible rules.

improving the standard of living. This new dynamic can quickly enjoin the capitalist reflexes to maximise profit, at the expense of communal and individual liberties. The devaluation of the human would lead to the very devaluation of science and similarly a devaluation of robotics, for the person who guarantees the scientific and the robotic values would count for nothing. Furthermore, this understanding of robotics, rooted in the Laplacean fallacy, would create pockets of disadvantage and inequality in so many aspects of society.

That is to say that the most fruitful way forward for robotics is to standardise the process of self-accreditation of humans without leaving behind any section of the human population, nor aspect of the human experience. As Polanyi asserts:

> "The story of the Laplacean fallacy suggests a criterion of consistency. It shows that our conceptions of man and human society must be such as to account for man's faculty in forming these conceptions and to authorize the cultivation of this faculty within society. Only by accrediting the exercise of our intellectual passions in the act of observing man, can we form conceptions of man and society which both endorse this accrediting and uphold the freedom of culture in society. Such self-accrediting, or self-confirmatory, progression will prove an effective guide to all knowledge of living beings." (142)

In other words, it is up to us to self-accredit in our entirety as a human family. But that is not a flippant expectation – it is the central nerve of scientific and by extension of robotic activity. Also, we are trying to replicate or better extend the human experience. It is a more accurate replication, and a more fruitful extension, if we take these human aspects and aspirations into consideration as fully as possible.

"Scientists – that is creative scientists – spend their lives in trying to guess right. They are sustained and guided therein by their heuristic passion." (143) But we must remember the "passionate" nature of scientific pursuit. It somehow entails or opens itself up to the possibility of error, but hopefully not error that obliterates all the advances. (Polanyi points out the erroneous beliefs of both Kepler and Einstein, in spite of the high value of their discoveries about planetary bodies and relativity). I argue that one sure way to reduce the error is the inclusion and participation of as much data as possible – i.e. human-like experience – without leaving out the global south in its entirety, nor pockets of exclusion in the global north.

More succinctly for the purposes of my argument, Polanyi holds:

> "Of course, living machinery has a purpose only in the interest of the living individual as appraised by the observer. But it must possess this purpose. Organs and their functions exist only in their bearing on the presumed interest of the living individual. All physiology is teleological, and in this sense we may speak here also of reasons and causes. We say that the *reason* for having valves in the circulatory system is to prevent the regurgitation of the blood; while we ascribe the *causes* of

> any regurgitation, occurring in spite of these, to an insufficiency of the valves owing to malformation or disease. Physiology is a system of rules of rightness, and as such can account only for health. Accordingly, we do not enquire into the causes of health – any more than into the causes of a mathematical proof; but we do enquire into the causes of disease, as we do into the causes of a mathematical error." (360)

The value of this position is that it enshrines the human experience at the centre of science and by extension of robotics, or robotics understood as a science. To it I add that the more complete the inclusion and participation by the observer of the human experience, the more valuable the science or the robotic process and product. Obviously, there can be a small but important question of teleological reductionism. If Polanyi's position assumed such reductionism, there would be no room for accidental discoveries that have been put to good use for humans and societies. Further, any account of how connectionism works even by backward propagation would leave many questions unanswered. Ian Hacking proposes an account of science that is more amenable to robotics in this aspect. An account of science that includes the purely experimental, the pragmatic, etc. is a fuller account than a purely theoretical, aprioristic and deductive one. Such experimentation, such tinkering simply for the sake of it, is part of being humanly creative.

III Synthesis – Opportunities and Dynamics of Universal Human Participation

Robotics can be put to full use to enhance the human experience, as is seen in the advances in robotics in various aspects of life: medicine, agriculture, industry, transport, commerce, military, etc. The danger is to seek to seek directly enhance the human experience of some against the experience of others, or to neglect pockets of human society and focus on a few individuals and privileged societies. These latter two, if they form the inspiration of robotics, are poorer in terms of contributing to the human experience. As argued above, science and robotics construed as a science, will be guilty of committing the Laplacean fallacy, if the human experience is not fully included, or if human participation from any aspect of society is neglected or excluded.

Seen in this optic of the enhancement of the human experience, robots and robotics becomes less of a field of competition between human and machine, and less of a source of anxiety about the loss of jobs, the arrival of a singularity, etc. In the area of industry, robots can be seen as an opportunity to enhance the human experience. Weekley points out that the resolutions passed at the 1982 Trade Skills Conference, a policy-making body, show a focus on safeguarding the economic security of factory employees, involving employees at every decision-making step, informing them on any new technologies being acquired, and making sure the employees share in the benefits that the new technologies are bringing about. (Weekley, 148-149) Further benefits mooted at the same conference included an assurance of life-time employment, retraining for new and higher skills, etc. A pertinent question in making adjustments and retraining is whether humans should adjust to the conditions of the machine, or the machine to the human conditions, in such areas as speed of production, for example. Overall, it is essential that the advances made

in robotics empower us humans, creators of automation, to structure policies to ensure the well-being of humans as a paramount value.

One obvious area in which robotics would enhance the human experience is in the innovativeness that the area of robotics opens up. The best minds come together to solve problems by way of inventing robotic solutions. But in order for such innovativeness to fit in well with a wider and better human experience, a number of steps must precede. The robotics industry must enhance the human experience at every step. The first step is conception, designing and prototyping. I propose that the best in these initial areas is attained when robotic technologies are not built on an inter- or intra-societal technology gap. If humanity is ushering in robotics, it is for the best interest of both humanity and robotics itself that nobody gets left behind. What fills such a technology gap is the Laplacean fallacy – that there are sections of humanity or the human experience that do not matter for robotics construed as a science. This, we have argued above, is false.

The second area in which participation ought to be encouraged for the better of robotics as a science that eschews the Laplacean fallacy and enhances the human experience is the extraction of the various minerals that go into creating robots. One country that is gifted with rich resources of Coltan is the Democratic Republic of Congo – DRC. The conditions under which this strategic mineral is mined are appalling, sometimes involving the use of child labour (cf. Sky News Documentary) and very low wages for the miners who risk life and limb to get the metal. A recent United Nations Document reporting on the security situation surrounding the mining areas in Congo reveals that foreign armed groups are active in eastern Congo. While traceability, certification and due diligence programmes for metals like gold have not been implemented, gold remains a key but not the sole metal for funding conflict and criminality. The Document also notes that "Challenges in fully implementing due diligence in the tin, tantalum and tungsten sector remain a threat to the positive developments noted by the Group in previous reports." (UN Report) The mining of these metals has not made the human experience of the people in the mining areas better, nor has robotics helped in improving the human experience.

A third opportunity for bettering both robotics and the human experience is in the production of robots and smart machines. Often, the big factories outsource the production lines to poorer regional neighbours that will provide cheap labour without due regard for the rights of the workers in those factories (often young women), nor of the occupational hazards they suffer. Long working hours, coupled with very low pay and unhealthy work conditions are a common occurrence.

A fourth opportunity that needs to be thought through is the marketing and accessibility of the products of robotics. Very often, the prices are driven up and unrealistic, creating pockets of inequality. Robotics ends up bettering the human experience of some at the expense of many. Related to this area of opportunity for robotics to enhance the human experience is the disposal of used or outdated products of the robotics industry. Very often, when the machines have been

surpassed by the next model, the ancestors can be sold off at a cheaper price, often in the Global South. Inadvertently, then, the Global South becomes the dumping ground of outdated robotics products. This militates against the human experience by creating class, but also by damaging the environment in which the waste is accumulated.

All in all, the key word is participation. Robotics is at its best if we as humans can together account for our responsibility in the conceptualisation, production, use, maintenance, growth, dissemination, and disposal of the products. Robotics is at its best when humanity is involved in a consultation process. As part of the Laplacean fallacy: even with all our advancement in science and technology, we have never managed to shake off the entire human experience that involves and embraces: suffering, pain, confusion, frustration, love, heartbreak, etc. If robotics promised us a way to shed these, we should know that it is both a lie and a promise for less than we can truly and fully be. Robotics should involve and embrace these, rather than serve to emphasise the chasm between peoples and nations. Robotics must begin with involvement and participation, and end with affordability and sustainability. The human environment would have to be adjusted, to adapt to the arrival and proper use of robots. Our intelligence, as a factor of our adaptability, would be gauged on our flexibility to accommodate the machines without ceding our humanity to them (Miller). As an South African proverb that has gone viral advises: If you want to go quickly, go alone; but if you want to go far, go together.

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