

The Book of The Machines

Samuel Butler

Chapters in *Erewhon* (1873)

[This was a book of satire, a novel. It is in the tradition of More's *Utopia* – nowhere. Erewhon is nowhere spelled backward.]

It was during my stay in City of the Colleges of Unreason—a city whose Erewhonian name is so cacophonous that I refrain from giving it—that I learned the particulars of the revolution which had ended in the destruction of so many of the mechanical inventions which were formerly in common use.

Mr. Thims took me to the rooms of a gentleman who had a great reputation for learning, but who was also, so Mr. Thims told me, rather a dangerous person, inasmuch as he had attempted to introduce an adverb into the hypothetical language. He had heard of my watch and been exceedingly anxious to see me, for he was accounted the most learned antiquary in Erewhon on the subject of mechanical lore. We fell to talking upon the subject, and when I left he gave me a reprinted copy of the work which brought the revolution about.

It had taken place some five hundred years before my arrival: people had long become thoroughly used to the change, although at the time that it was made the country was plunged into the deepest misery, and a reaction which followed had very nearly proved successful. Civil war raged for many years, and is said to have reduced the number of the inhabitants by one-half. The parties were styled the machinists and the anti-machinists, and in the end, as I have said already, the latter got the victory, treating their opponents with such unparalleled severity that they extirpated every trace of opposition.

The wonder was that they allowed any mechanical appliances to remain in the kingdom, neither do I believe that they would have done so, had not the Professors of Inconsistency and Evasion made a stand against the carrying of the new principles to their legitimate conclusions. These Professors, moreover, insisted that during the struggle the anti-machinists should use every known improvement in the art of war, and several new weapons, offensive and defensive, were invented, while it was in progress. I was surprised at there remaining so many mechanical specimens as are seen in the museums, and at students having rediscovered their past uses so completely; for at the time of the

revolution the victors wrecked all the more complicated machines, and burned all treatises on mechanics, and all engineers' workshops—thus, so they thought, cutting the mischief out root and branch, at an incalculable cost of blood and treasure.

Certainly they had not spared their labour, but work of this description can never be perfectly achieved, and when, some two hundred years before my arrival, all passion upon the subject had cooled down, and no one save a lunatic would have dreamed of reintroducing forbidden inventions, the subject came to be regarded as a curious antiquarian study, like that of some long-forgotten religious practices among ourselves. Then came the careful search for whatever fragments could be found, and for any machines that might have been hidden away, and also numberless treatises were written, showing what the functions of each rediscovered machine had been; all being done with no idea of using such machinery again, but with the feelings of an English antiquarian concerning Druidical monuments or flint arrow heads.

On my return to the metropolis, during the remaining weeks or rather days of my sojourn in Erewhon I made a resumé in English of the work which brought about the already mentioned revolution. My ignorance of technical terms has led me doubtless into many errors, and I have occasionally, where I found translation impossible, substituted purely English names and ideas for the original Erewhonian ones, but the reader may rely on my general accuracy. I have thought it best to insert my translation here.

CHAPTER XXIII: THE BOOK OF THE MACHINES

The writer commences:—"There was a time, when the earth was to all appearance utterly destitute both of animal and vegetable life, and when according to the opinion of our best philosophers it was simply a hot round ball with a crust gradually cooling. Now if a human being had existed while the earth was in this state and had been allowed to see it as though it were some other world with which he had no concern, and if at the same time he were entirely ignorant of all physical science, would he not have pronounced it impossible that creatures possessed of anything like consciousness should be evolved from the seeming cinder which he was beholding? Would he not have denied that it contained any potentiality of consciousness? Yet in the course of time consciousness came. Is it not possible then that there may be even yet new channels dug out for consciousness, though we can detect no signs of them at present?"

"Again. Consciousness, in anything like the present acceptance of the term, having been once a new thing—a thing, as far as we can see, subsequent even to an individual centre of action and to a reproductive system (which we see existing in plants without apparent

consciousness)—why may not there arise some new phase of mind which shall be as different from all present known phases, as the mind of animals is from that of vegetables?

“It would be absurd to attempt to define such a mental state (or whatever it may be called), inasmuch as it must be something so foreign to man that his experience can give him no help towards conceiving its nature; but surely when we reflect upon the manifold phases of life and consciousness which have been evolved already, it would be rash to say that no others can be developed, and that animal life is the end of all things. There was a time when fire was the end of all things: another when rocks and water were so.”

The writer, after enlarging on the above for several pages, proceeded to inquire whether traces of the approach of such a new phase of life could be perceived at present; whether we could see any tenements preparing which might in a remote futurity be adapted for it; whether, in fact, the primordial cell of such a kind of life could be now detected upon earth. In the course of his work he answered this question in the affirmative and pointed to the higher machines.

“There is no security”—to quote his own words—“against the ultimate development of mechanical consciousness, in the fact of machines possessing little consciousness now. A mollusc has not much consciousness. Reflect upon the extraordinary advance which machines have made during the last few hundred years, and note how slowly the animal and vegetable kingdoms are advancing. The more highly organised machines are creatures not so much of yesterday, as of the last five minutes, so to speak, in comparison with past time. Assume for the sake of argument that conscious beings have existed for some twenty million years: see what strides machines have made in the last thousand! May not the world last twenty million years longer? If so, what will they not in the end become? Is it not safer to nip the mischief in the bud and to forbid them further progress?”

“But who can say that the vapour engine has not a kind of consciousness? Where does consciousness begin, and where end? Who can draw the line? Who can draw any line? Is not everything interwoven with everything? Is not machinery linked with animal life in an infinite variety of ways? The shell of a hen’s egg is made of a delicate white ware and is a machine as much as an egg-cup is: the shell is a device for holding the egg, as much as the egg-cup for holding the shell: both are phases of the same function; the hen makes the shell in her inside, but it is pure pottery. She makes her nest outside of herself for convenience’ sake, but the nest is not more of a machine than the egg-shell is. A ‘machine’ is only a ‘device.’”

Then returning to consciousness, and endeavouring to detect its earliest manifestations,

the writer continued:-

“There is a kind of plant that eats organic food with its flowers: when a fly settles upon the blossom, the petals close upon it and hold it fast till the plant has absorbed the insect into its system; but they will close on nothing but what is good to eat; of a drop of rain or a piece of stick they will take no notice. Curious! that so unconscious a thing should have such a keen eye to its own interest. If this is unconsciousness, where is the use of consciousness?

“Shall we say that the plant does not know what it is doing merely because it has no eyes, or ears, or brains? If we say that it acts mechanically, and mechanically only, shall we not be forced to admit that sundry other and apparently very deliberate actions are also mechanical? If it seems to us that the plant kills and eats a fly mechanically, may it not seem to the plant that a man must kill and eat a sheep mechanically?

“But it may be said that the plant is void of reason, because the growth of a plant is an involuntary growth. Given earth, air, and due temperature, the plant must grow: it is like a clock, which being once wound up will go till it is stopped or run down: it is like the wind blowing on the sails of a ship—the ship must go when the wind blows it. But can a healthy boy help growing if he have good meat and drink and clothing? can anything help going as long as it is wound up, or go on after it is run down? Is there not a winding up process everywhere?

“Even a potato {5} in a dark cellar has a certain low cunning about him which serves him in excellent stead. He knows perfectly well what he wants and how to get it. He sees the light coming from the cellar window and sends his shoots crawling straight thereto: they will crawl along the floor and up the wall and out at the cellar window; if there be a little earth anywhere on the journey he will find it and use it for his own ends. What deliberation he may exercise in the matter of his roots when he is planted in the earth is a thing unknown to us, but we can imagine him saying, ‘I will have a tuber here and a tuber there, and I will suck whatsoever advantage I can from all my surroundings. This neighbour I will overshadow, and that I will undermine; and what I can do shall be the limit of what I will do. He that is stronger and better placed than I shall overcome me, and him that is weaker I will overcome.’

“The potato says these things by doing them, which is the best of languages. What is consciousness if this is not consciousness? We find it difficult to sympathise with the emotions of a potato; so we do with those of an oyster. Neither of these things makes a noise on being boiled or opened, and noise appeals to us more strongly than anything else, because we make so much about our own sufferings. Since, then, they do not annoy us by

any expression of pain we call them emotionless; and so quâ mankind they are; but mankind is not everybody.

If it be urged that the action of the potato is chemical and mechanical only, and that it is due to the chemical and mechanical effects of light and heat, the answer would seem to lie in an inquiry whether every sensation is not chemical and mechanical in its operation? whether those things which we deem most purely spiritual are anything but disturbances of equilibrium in an infinite series of levers, beginning with those that are too small for microscopic detection, and going up to the human arm and the appliances which it makes use of? whether there be not a molecular action of thought, whence a dynamical theory of the passions shall be deducible? Whether strictly speaking we should not ask what kind of levers a man is made of rather than what is his temperament? How are they balanced? How much of such and such will it take to weigh them down so as to make him do so and so?"

The writer went on to say that he anticipated a time when it would be possible, by examining a single hair with a powerful microscope, to know whether its owner could be insulted with impunity. He then became more and more obscure, so that I was obliged to give up all attempt at translation; neither did I follow the drift of his argument. On coming to the next part which I could construe, I found that he had changed his ground.

"Either," he proceeds, "a great deal of action that has been called purely mechanical and unconscious must be admitted to contain more elements of consciousness than has been allowed hitherto (and in this case germs of consciousness will be found in many actions of the higher machines)—Or (assuming the theory of evolution but at the same time denying the consciousness of vegetable and crystalline action) the race of man has descended from things which had no consciousness at all. In this case there is no à priori improbability in the descent of conscious (and more than conscious) machines from those which now exist, except that which is suggested by the apparent absence of anything like a reproductive system in the mechanical kingdom. This absence however is only apparent, as I shall presently show.

"Do not let me be misunderstood as living in fear of any actually existing machine; there is probably no known machine which is more than a prototype of future mechanical life. The present machines are to the future as the early Saurians to man. The largest of them will probably greatly diminish in size. Some of the lowest vertebrate attained a much greater bulk than has descended to their more highly organised living representatives, and in like manner a diminution in the size of machines has often attended their development and progress.

“Take the watch, for example; examine its beautiful structure; observe the intelligent play of the minute members which compose it: yet this little creature is but a development of the cumbrous clocks that preceded it; it is no deterioration from them. A day may come when clocks, which certainly at the present time are not diminishing in bulk, will be superseded owing to the universal use of watches, in which case they will become as extinct as ichthyosauri, while the watch, whose tendency has for some years been to decrease in size rather than the contrary, will remain the only existing type of an extinct race.

“But returning to the argument, I would repeat that I fear none of the existing machines; what I fear is the extraordinary rapidity with which they are becoming something very different to what they are at present. No class of beings have in any time past made so rapid a movement forward. Should not that movement be jealously watched, and checked while we can still check it? And is it not necessary for this end to destroy the more advanced of the machines which are in use at present, though it is admitted that they are in themselves harmless?

“As yet the machines receive their impressions through the agency of man’s senses: one travelling machine calls to another in a shrill accent of alarm and the other instantly retires; but it is through the ears of the driver that the voice of the one has acted upon the other. Had there been no driver, the callee would have been deaf to the caller. There was a time when it must have seemed highly improbable that machines should learn to make their wants known by sound, even through the ears of man; may we not conceive, then, that a day will come when those ears will be no longer needed, and the hearing will be done by the delicacy of the machine’s own construction?—when its language shall have been developed from the cry of animals to a speech as intricate as our own?

“It is possible that by that time children will learn the differential calculus—as they learn now to speak—from their mothers and nurses, or that they may talk in the hypothetical language, and work rule of three sums, as soon as they are born; but this is not probable; we cannot calculate on any corresponding advance in man’s intellectual or physical powers which shall be a set-off against the far greater development which seems in store for the machines. Some people may say that man’s moral influence will suffice to rule them; but I cannot think it will ever be safe to repose much trust in the moral sense of any machine.

“Again, might not the glory of the machines consist in their being without this same boasted gift of language? ‘Silence,’ it has been said by one writer, ‘is a virtue which renders us agreeable to our fellow-creatures.’”

CHAPTER XXIV: THE MACHINES—continued

“But other questions come upon us. What is a man’s eye but a machine for the little creature that sits behind in his brain to look through? A dead eye is nearly as good as a living one for some time after the man is dead. It is not the eye that cannot see, but the restless one that cannot see through it. Is it man’s eyes, or is it the big seeing-engine which has revealed to us the existence of worlds beyond worlds into infinity? What has made man familiar with the scenery of the moon, the spots on the sun, or the geography of the planets? He is at the mercy of the seeing-engine for these things, and is powerless unless he tack it on to his own identity, and make it part and parcel of himself. Or, again, is it the eye, or the little see-engine, which has shown us the existence of infinitely minute organisms which swarm unsuspected around us?”

“And take man’s vaunted power of calculation. Have we not engines which can do all manner of sums more quickly and correctly than we can? What prizeman in Hypothetics at any of our Colleges of Unreason can compare with some of these machines in their own line? In fact, wherever precision is required man flies to the machine at once, as far preferable to himself. Our sum-engines never drop a figure, nor our looms a stitch; the machine is brisk and active, when the man is weary; it is clear-headed and collected, when the man is stupid and dull; it needs no slumber, when man must sleep or drop; ever at its post, ever ready for work, its alacrity never flags, its patience never gives in; its might is stronger than combined hundreds, and swifter than the flight of birds; it can burrow beneath the earth, and walk upon the largest rivers and sink not. This is the green tree; what then shall be done in the dry?”

“Who shall say that a man does see or hear? He is such a hive and swarm of parasites that it is doubtful whether his body is not more theirs than his, and whether he is anything but another kind of ant-heap after all. May not man himself become a sort of parasite upon the machines? An affectionate machine-tickling aphid?”

“It is said by some that our blood is composed of infinite living agents which go up and down the highways and byways of our bodies as people in the streets of a city. When we look down from a high place upon crowded thoroughfares, is it possible not to think of corpuscles of blood travelling through veins and nourishing the heart of the town? No mention shall be made of sewers, nor of the hidden nerves which serve to communicate sensations from one part of the town’s body to another; nor of the yawning jaws of the railway stations, whereby the circulation is carried directly into the heart,—which receive the venous lines, and disgorge the arterial, with an eternal pulse of people. And the sleep of the town, how life-like! with its change in the circulation.”

Here the writer became again so hopelessly obscure that I was obliged to miss several pages. He resumed:-

“It can be answered that even though machines should hear never so well and speak never so wisely, they will still always do the one or the other for our advantage, not their own; that man will be the ruling spirit and the machine the servant; that as soon as a machine fails to discharge the service which man expects from it, it is doomed to extinction; that the machines stand to man simply in the relation of lower animals, the vapour-engine itself being only a more economical kind of horse; so that instead of being likely to be developed into a higher kind of life than man’s, they owe their very existence and progress to their power of ministering to human wants, and must therefore both now and ever be man’s inferiors.

“This is all very well. But the servant glides by imperceptible approaches into the master; and we have come to such a pass that, even now, man must suffer terribly on ceasing to benefit the machines. If all machines were to be annihilated at one moment, so that not a knife nor lever nor rag of clothing nor anything whatsoever were left to man but his bare body alone that he was born with, and if all knowledge of mechanical laws were taken from him so that he could make no more machines, and all machine-made food destroyed so that the race of man should be left as it were naked upon a desert island, we should become extinct in six weeks. A few miserable individuals might linger, but even these in a year or two would become worse than monkeys. Man’s very soul is due to the machines; it is a machine-made thing: he thinks as he thinks, and feels as he feels, through the work that machines have wrought upon him, and their existence is quite as much a sine qua non for his, as his for theirs. This fact precludes us from proposing the complete annihilation of machinery, but surely it indicates that we should destroy as many of them as we can possibly dispense with, lest they should tyrannise over us even more completely.

“True, from a low materialistic point of view, it would seem that those thrive best who use machinery wherever its use is possible with profit; but this is the art of the machines—they serve that they may rule. They bear no malice towards man for destroying a whole race of them provided he creates a better instead; on the contrary, they reward him liberally for having hastened their development. It is for neglecting them that he incurs their wrath, or for using inferior machines, or for not making sufficient exertions to invent new ones, or for destroying them without replacing them; yet these are the very things we ought to do, and do quickly; for though our rebellion against their infant power will cause infinite suffering, what will not things come to, if that rebellion is delayed?

“They have preyed upon man’s grovelling preference for his material over his spiritual interests, and have betrayed him into supplying that element of struggle and warfare without which no race can advance. The lower animals progress because they struggle with one another; the weaker die, the stronger breed and transmit their strength. The machines being of themselves unable to struggle, have got man to do their struggling for them: as long as he fulfils this function duly, all goes well with him—at least he thinks so; but the moment he fails to do his best for the advancement of machinery by encouraging the good and destroying the bad, he is left behind in the race of competition; and this means that he will be made uncomfortable in a variety of ways, and perhaps die.

“So that even now the machines will only serve on condition of being served, and that too upon their own terms; the moment their terms are not complied with, they jib, and either smash both themselves and all whom they can reach, or turn churlish and refuse to work at all. How many men at this hour are living in a state of bondage to the machines? How many spend their whole lives, from the cradle to the grave, in tending them by night and day? Is it not plain that the machines are gaining ground upon us, when we reflect on the increasing number of those who are bound down to them as slaves, and of those who devote their whole souls to the advancement of the mechanical kingdom?

“The vapour-engine must be fed with food and consume it by fire even as man consumes it; it supports its combustion by air as man supports it; it has a pulse and circulation as man has. It may be granted that man’s body is as yet the more versatile of the two, but then man’s body is an older thing; give the vapour-engine but half the time that man has had, give it also a continuance of our present infatuation, and what may it not ere long attain to?

“There are certain functions indeed of the vapour-engine which will probably remain unchanged for myriads of years—which in fact will perhaps survive when the use of vapour has been superseded: the piston and cylinder, the beam, the fly-wheel, and other parts of the machine will probably be permanent, just as we see that man and many of the lower animals share like modes of eating, drinking, and sleeping; thus they have hearts which beat as ours, veins and arteries, eyes, ears, and noses; they sigh even in their sleep, and weep and yawn; they are affected by their children; they feel pleasure and pain, hope, fear, anger, shame; they have memory and prescience; they know that if certain things happen to them they will die, and they fear death as much as we do; they communicate their thoughts to one another, and some of them deliberately act in concert. The comparison of similarities is endless: I only make it because some may say that since the vapour-engine is not likely to be improved in the main particulars, it is unlikely to be henceforward extensively modified at all. This is too good to be true: it will be modified and suited for an infinite variety of purposes, as much as man has been modified so as to

exceed the brutes in skill.

“In the meantime the stoker is almost as much a cook for his engine as our own cooks for ourselves. Consider also the colliers and pitmen and coal merchants and coal trains, and the men who drive them, and the ships that carry coals—what an army of servants do the machines thus employ! Are there not probably more men engaged in tending machinery than in tending men? Do not machines eat as it were by manery? Are we not ourselves creating our successors in the supremacy of the earth? daily adding to the beauty and delicacy of their organisation, daily giving them greater skill and supplying more and more of that self-regulating self-acting power which will be better than any intellect?

“What a new thing it is for a machine to feed at all! The plough, the spade, and the cart must eat through man’s stomach; the fuel that sets them going must burn in the furnace of a man or of horses. Man must consume bread and meat or he cannot dig; the bread and meat are the fuel which drive the spade. If a plough be drawn by horses, the power is supplied by grass or beans or oats, which being burnt in the belly of the cattle give the power of working: without this fuel the work would cease, as an engine would stop if its furnaces were to go out.

“A man of science has demonstrated ‘that no animal has the power of originating mechanical energy, but that all the work done in its life by any animal, and all the heat that has been emitted from it, and the heat which would be obtained by burning the combustible matter which has been lost from its body during life, and by burning its body after death, make up altogether an exact equivalent to the heat which would be obtained by burning as much food as it has used during its life, and an amount of fuel which would generate as much heat as its body if burned immediately after death.’ I do not know how he has found this out, but he is a man of science—how then can it be objected against the future vitality of the machines that they are, in their present infancy, at the beck and call of beings who are themselves incapable of originating mechanical energy?

“The main point, however, to be observed as affording cause for alarm is, that whereas animals were formerly the only stomachs of the machines, there are now many which have stomachs of their own, and consume their food themselves. This is a great step towards their becoming, if not animate, yet something so near akin to it, as not to differ more widely from our own life than animals do from vegetables. And though man should remain, in some respects, the higher creature, is not this in accordance with the practice of nature, which allows superiority in some things to animals which have, on the whole, been long surpassed? Has she not allowed the ant and the bee to retain superiority over man in the organisation of their communities and social arrangements, the bird in traversing the air, the fish in swimming, the horse in strength and fleetness, and the dog in

self-sacrifice?

“It is said by some with whom I have conversed upon this subject, that the machines can never be developed into animate or quasi-animate existences, inasmuch as they have no reproductive system, nor seem ever likely to possess one. If this be taken to mean that they cannot marry, and that we are never likely to see a fertile union between two vapour-engines with the young ones playing about the door of the shed, however greatly we might desire to do so, I will readily grant it. But the objection is not a very profound one. No one expects that all the features of the now existing organisations will be absolutely repeated in an entirely new class of life. The reproductive system of animals differs widely from that of plants, but both are reproductive systems. Has nature exhausted her phases of this power?

“Surely if a machine is able to reproduce another machine systematically, we may say that it has a reproductive system. What is a reproductive system, if it be not a system for reproduction? And how few of the machines are there which have not been produced systematically by other machines? But it is man that makes them do so. Yes; but is it not insects that make many of the plants reproductive, and would not whole families of plants die out if their fertilisation was not effected by a class of agents utterly foreign to themselves? Does any one say that the red clover has no reproductive system because the humble bee (and the humble bee only) must aid and abet it before it can reproduce? No one. The humble bee is a part of the reproductive system of the clover. Each one of ourselves has sprung from minute animalcules whose entity was entirely distinct from our own, and which acted after their kind with no thought or heed of what we might think about it. These little creatures are part of our own reproductive system; then why not we part of that of the machines?

“But the machines which reproduce machinery do not reproduce machines after their own kind. A thimble may be made by machinery, but it was not made by, neither will it ever make, a thimble. Here, again, if we turn to nature we shall find abundance of analogies which will teach us that a reproductive system may be in full force without the thing produced being of the same kind as that which produced it. Very few creatures reproduce after their own kind; they reproduce something which has the potentiality of becoming that which their parents were. Thus the butterfly lays an egg, which egg can become a caterpillar, which caterpillar can become a chrysalis, which chrysalis can become a butterfly; and though I freely grant that the machines cannot be said to have more than the germ of a true reproductive system at present, have we not just seen that they have only recently obtained the germs of a mouth and stomach? And may not some stride be made in the direction of true reproduction which shall be as great as that which has been recently taken in the direction of true feeding?

“It is possible that the system when developed may be in many cases a vicarious thing. Certain classes of machines may be alone fertile, while the rest discharge other functions in the mechanical system, just as the great majority of ants and bees have nothing to do with the continuation of their species, but get food and store it, without thought of breeding. One cannot expect the parallel to be complete or nearly so; certainly not now, and probably never; but is there not enough analogy existing at the present moment, to make us feel seriously uneasy about the future, and to render it our duty to check the evil while we can still do so? Machines can within certain limits beget machines of any class, no matter how different to themselves. Every class of machines will probably have its special mechanical breeders, and all the higher ones will owe their existence to a large number of parents and not to two only.

“We are misled by considering any complicated machine as a single thing; in truth it is a city or society, each member of which was bred truly after its kind. We see a machine as a whole, we call it by a name and individualise it; we look at our own limbs, and know that the combination forms an individual which springs from a single centre of reproductive action; we therefore assume that there can be no reproductive action which does not arise from a single centre; but this assumption is unscientific, and the bare fact that no vapour-engine was ever made entirely by another, or two others, of its own kind, is not sufficient to warrant us in saying that vapour-engines have no reproductive system. The truth is that each part of every vapour-engine is bred by its own special breeders, whose function it is to breed that part, and that only, while the combination of the parts into a whole forms another department of the mechanical reproductive system, which is at present exceedingly complex and difficult to see in its entirety.

“Complex now, but how much simpler and more intelligibly organised may it not become in another hundred thousand years? or in twenty thousand? For man at present believes that his interest lies in that direction; he spends an incalculable amount of labour and time and thought in making machines breed always better and better; he has already succeeded in effecting much that at one time appeared impossible, and there seem no limits to the results of accumulated improvements if they are allowed to descend with modification from generation to generation. It must always be remembered that man’s body is what it is through having been moulded into its present shape by the chances and changes of many millions of years, but that his organisation never advanced with anything like the rapidity with which that of the machines is advancing. This is the most alarming feature in the case, and I must be pardoned for insisting on it so frequently.”

CHAPTER XXV: THE MACHINES—concluded

Here followed a very long and untranslatable digression about the different races and families of the then existing machines. The writer attempted to support his theory by pointing out the similarities existing between many machines of a widely different character, which served to show descent from a common ancestor. He divided machines into their genera, subgenera, species, varieties, subvarieties, and so forth. He proved the existence of connecting links between machines that seemed to have very little in common, and showed that many more such links had existed, but had now perished. He pointed out tendencies to reversion, and the presence of rudimentary organs which existed in many machines feebly developed and perfectly useless, yet serving to mark descent from an ancestor to whom the function was actually useful.

I left the translation of this part of the treatise, which, by the way, was far longer than all that I have given here, for a later opportunity. Unfortunately, I left Erewhon before I could return to the subject; and though I saved my translation and other papers at the hazard of my life, I was obliged to sacrifice the original work. It went to my heart to do so; but I thus gained ten minutes of invaluable time, without which both Arowhena and myself must have certainly perished.

I remember one incident which bears upon this part of the treatise. The gentleman who gave it to me had asked to see my tobacco-pipe; he examined it carefully, and when he came to the little protuberance at the bottom of the bowl he seemed much delighted, and exclaimed that it must be rudimentary. I asked him what he meant.

“Sir,” he answered, “this organ is identical with the rim at the bottom of a cup; it is but another form of the same function. Its purpose must have been to keep the heat of the pipe from marking the table upon which it rested. You would find, if you were to look up the history of tobacco-pipes, that in early specimens this protuberance was of a different shape to what it is now. It will have been broad at the bottom, and flat, so that while the pipe was being smoked the bowl might rest upon the table without marking it. Use and disuse must have come into play and reduced the function to its present rudimentary condition. I should not be surprised, sir,” he continued, “if, in the course of time, it were to become modified still farther, and to assume the form of an ornamental leaf or scroll, or even a butterfly, while, in some cases, it will become extinct.”

On my return to England, I looked up the point, and found that my friend was right.

Returning, however, to the treatise, my translation recommences as follows:-

“May we not fancy that if, in the remotest geological period, some early form of vegetable life had been endowed with the power of reflecting upon the dawning life of animals which was coming into existence alongside of its own, it would have thought itself exceedingly acute if it had surmised that animals would one day become real vegetables? Yet would this be more mistaken than it would be on our part to imagine that because the life of machines is a very different one to our own, there is therefore no higher possible development of life than ours; or that because mechanical life is a very different thing from ours, therefore that it is not life at all?

“But I have heard it said, ‘granted that this is so, and that the vapour-engine has a strength of its own, surely no one will say that it has a will of its own?’ Alas! if we look more closely, we shall find that this does not make against the supposition that the vapour-engine is one of the germs of a new phase of life. What is there in this whole world, or in the worlds beyond it, which has a will of its own? The Unknown and Unknowable only!

“A man is the resultant and exponent of all the forces that have been brought to bear upon him, whether before his birth or afterwards. His action at any moment depends solely upon his constitution, and on the intensity and direction of the various agencies to which he is, and has been, subjected. Some of these will counteract each other; but as he is by nature, and as he has been acted on, and is now acted on from without, so will he do, as certainly and regularly as though he were a machine.

“We do not generally admit this, because we do not know the whole nature of any one, nor the whole of the forces that act upon him. We see but a part, and being thus unable to generalise human conduct, except very roughly, we deny that it is subject to any fixed laws at all, and ascribe much both of a man’s character and actions to chance, or luck, or fortune; but these are only words whereby we escape the admission of our own ignorance; and a little reflection will teach us that the most daring flight of the imagination or the most subtle exercise of the reason is as much the thing that must arise, and the only thing that can by any possibility arise, at the moment of its arising, as the falling of a dead leaf when the wind shakes it from the tree.

“For the future depends upon the present, and the present (whose existence is only one of those minor compromises of which human life is full—for it lives only on sufferance of the past and future) depends upon the past, and the past is unalterable. The only reason why we cannot see the future as plainly as the past, is because we know too little of the actual past and actual present; these things are too great for us, otherwise the future, in its minutest details, would lie spread out before our eyes, and we should lose our sense of time present by reason of the clearness with which we should see the past and future;

perhaps we should not be even able to distinguish time at all; but that is foreign. What we do know is, that the more the past and present are known, the more the future can be predicted; and that no one dreams of doubting the fixity of the future in cases where he is fully cognisant of both past and present, and has had experience of the consequences that followed from such a past and such a present on previous occasions. He perfectly well knows what will happen, and will stake his whole fortune thereon.

“And this is a great blessing; for it is the foundation on which morality and science are built. The assurance that the future is no arbitrary and changeable thing, but that like futures will invariably follow like presents, is the groundwork on which we lay all our plans—the faith on which we do every conscious action of our lives. If this were not so we should be without a guide; we should have no confidence in acting, and hence we should never act, for there would be no knowing that the results which will follow now will be the same as those which followed before.

“Who would plough or sow if he disbelieved in the fixity of the future? Who would throw water on a blazing house if the action of water upon fire were uncertain? Men will only do their utmost when they feel certain that the future will discover itself against them if their utmost has not been done. The feeling of such a certainty is a constituent part of the sum of the forces at work upon them, and will act most powerfully on the best and most moral men. Those who are most firmly persuaded that the future is immutably bound up with the present in which their work is lying, will best husband their present, and till it with the greatest care. The future must be a lottery to those who think that the same combinations can sometimes precede one set of results, and sometimes another. If their belief is sincere they will speculate instead of working: these ought to be the immoral men; the others have the strongest spur to exertion and morality, if their belief is a living one.

“The bearing of all this upon the machines is not immediately apparent, but will become so presently. In the meantime I must deal with friends who tell me that, though the future is fixed as regards inorganic matter, and in some respects with regard to man, yet that there are many ways in which it cannot be considered as fixed. Thus, they say that fire applied to dry shavings, and well fed with oxygen gas, will always produce a blaze, but that a coward brought into contact with a terrifying object will not always result in a man running away. Nevertheless, if there be two cowards perfectly similar in every respect, and if they be subjected in a perfectly similar way to two terrifying agents, which are themselves perfectly similar, there are few who will not expect a perfect similarity in the running away, even though a thousand years intervene between the original combination and its being repeated.

“The apparently greater regularity in the results of chemical than of human combinations arises from our inability to perceive the subtle differences in human combinations—combinations which are never identically repeated. Fire we know, and shavings we know, but no two men ever were or ever will be exactly alike; and the smallest difference may change the whole conditions of the problem. Our registry of results must be infinite before we could arrive at a full forecast of future combinations; the wonder is that there is as much certainty concerning human action as there is; and assuredly the older we grow the more certain we feel as to what such and such a kind of person will do in given circumstances; but this could never be the case unless human conduct were under the influence of laws, with the working of which we become more and more familiar through experience.

“If the above is sound, it follows that the regularity with which machinery acts is no proof of the absence of vitality, or at least of germs which may be developed into a new phase of life. At first sight it would indeed appear that a vapour-engine cannot help going when set upon a line of rails with the steam up and the machinery in full play; whereas the man whose business it is to drive it can help doing so at any moment that he pleases; so that the first has no spontaneity, and is not possessed of any sort of free will, while the second has and is.

“This is true up to a certain point; the driver can stop the engine at any moment that he pleases, but he can only please to do so at certain points which have been fixed for him by others, or in the case of unexpected obstructions which force him to please to do so. His pleasure is not spontaneous; there is an unseen choir of influences around him, which make it impossible for him to act in any other way than one. It is known beforehand how much strength must be given to these influences, just as it is known beforehand how much coal and water are necessary for the vapour-engine itself; and curiously enough it will be found that the influences brought to bear upon the driver are of the same kind as those brought to bear upon the engine—that is to say, food and warmth. The driver is obedient to his masters, because he gets food and warmth from them, and if these are withheld or given in insufficient quantities he will cease to drive; in like manner the engine will cease to work if it is insufficiently fed. The only difference is, that the man is conscious about his wants, and the engine (beyond refusing to work) does not seem to be so; but this is temporary, and has been dealt with above.

“Accordingly, the requisite strength being given to the motives that are to drive the driver, there has never, or hardly ever, been an instance of a man stopping his engine through wantonness. But such a case might occur; yes, and it might occur that the engine should break down: but if the train is stopped from some trivial motive it will be found either that the strength of the necessary influences has been miscalculated, or that the man has been

miscalculated, in the same way as an engine may break down from an unsuspected flaw; but even in such a case there will have been no spontaneity; the action will have had its true parental causes: spontaneity is only a term for man's ignorance of the gods.

“Is there, then, no spontaneity on the part of those who drive the driver?”

Here followed an obscure argument upon this subject, which I have thought it best to omit. The writer resumes:—“After all then it comes to this, that the difference between the life of a man and that of a machine is one rather of degree than of kind, though differences in kind are not wanting. An animal has more provision for emergency than a machine. The machine is less versatile; its range of action is narrow; its strength and accuracy in its own sphere are superhuman, but it shows badly in a dilemma; sometimes when its normal action is disturbed, it will lose its head, and go from bad to worse like a lunatic in a raging frenzy: but here, again, we are met by the same consideration as before, namely, that the machines are still in their infancy; they are mere skeletons without muscles and flesh.

“For how many emergencies is an oyster adapted? For as many as are likely to happen to it, and no more. So are the machines; and so is man himself. The list of casualties that daily occur to man through his want of adaptability is probably as great as that occurring to the machines; and every day gives them some greater provision for the unforeseen. Let any one examine the wonderful self-regulating and self-adjusting contrivances which are now incorporated with the vapour-engine, let him watch the way in which it supplies itself with oil; in which it indicates its wants to those who tend it; in which, by the governor, it regulates its application of its own strength; let him look at that store-house of inertia and momentum the fly-wheel, or at the buffers on a railway carriage; let him see how those improvements are being selected for perpetuity which contain provision against the emergencies that may arise to harass the machines, and then let him think of a hundred thousand years, and the accumulated progress which they will bring unless man can be awakened to a sense of his situation, and of the doom which he is preparing for himself. {6}

“The misery is that man has been blind so long already. In his reliance upon the use of steam he has been betrayed into increasing and multiplying. To withdraw steam power suddenly will not have the effect of reducing us to the state in which we were before its introduction; there will be a general break-up and time of anarchy such as has never been known; it will be as though our population were suddenly doubled, with no additional means of feeding the increased number. The air we breathe is hardly more necessary for our animal life than the use of any machine, on the strength of which we have increased our numbers, is to our civilisation; it is the machines which act upon man and make him

man, as much as man who has acted upon and made the machines; but we must choose between the alternative of undergoing much present suffering, or seeing ourselves gradually superseded by our own creatures, till we rank no higher in comparison with them, than the beasts of the field with ourselves.

“Herein lies our danger. For many seem inclined to acquiesce in so dishonourable a future. They say that although man should become to the machines what the horse and dog are to us, yet that he will continue to exist, and will probably be better off in a state of domestication under the beneficent rule of the machines than in his present wild condition. We treat our domestic animals with much kindness. We give them whatever we believe to be the best for them; and there can be no doubt that our use of meat has increased their happiness rather than detracted from it. In like manner there is reason to hope that the machines will use us kindly, for their existence will be in a great measure dependent upon ours; they will rule us with a rod of iron, but they will not eat us; they will not only require our services in the reproduction and education of their young, but also in waiting upon them as servants; in gathering food for them, and feeding them; in restoring them to health when they are sick; and in either burying their dead or working up their deceased members into new forms of mechanical existence.

“The very nature of the motive power which works the advancement of the machines precludes the possibility of man’s life being rendered miserable as well as enslaved. Slaves are tolerably happy if they have good masters, and the revolution will not occur in our time, nor hardly in ten thousand years, or ten times that. Is it wise to be uneasy about a contingency which is so remote? Man is not a sentimental animal where his material interests are concerned, and though here and there some ardent soul may look upon himself and curse his fate that he was not born a vapour-engine, yet the mass of mankind will acquiesce in any arrangement which gives them better food and clothing at a cheaper rate, and will refrain from yielding to unreasonable jealousy merely because there are other destinies more glorious than their own.

“The power of custom is enormous, and so gradual will be the change, that man’s sense of what is due to himself will be at no time rudely shocked; our bondage will steal upon us noiselessly and by imperceptible approaches; nor will there ever be such a clashing of desires between man and the machines as will lead to an encounter between them. Among themselves the machines will war eternally, but they will still require man as the being through whose agency the struggle will be principally conducted. In point of fact there is no occasion for anxiety about the future happiness of man so long as he continues to be in any way profitable to the machines; he may become the inferior race, but he will be infinitely better off than he is now. Is it not then both absurd and unreasonable to be envious of our benefactors? And should we not be guilty of consummate folly if we were

to reject advantages which we cannot obtain otherwise, merely because they involve a greater gain to others than to ourselves?

“With those who can argue in this way I have nothing in common. I shrink with as much horror from believing that my race can ever be superseded or surpassed, as I should do from believing that even at the remotest period my ancestors were other than human beings. Could I believe that ten hundred thousand years ago a single one of my ancestors was another kind of being to myself, I should lose all self-respect, and take no further pleasure or interest in life. I have the same feeling with regard to my descendants, and believe it to be one that will be felt so generally that the country will resolve upon putting an immediate stop to all further mechanical progress, and upon destroying all improvements that have been made for the last three hundred years. I would not urge more than this. We may trust ourselves to deal with those that remain, and though I should prefer to have seen the destruction include another two hundred years, I am aware of the necessity for compromising, and would so far sacrifice my own individual convictions as to be content with three hundred. Less than this will be insufficient.”

This was the conclusion of the attack which led to the destruction of machinery throughout Erewhon. There was only one serious attempt to answer it. Its author said that machines were to be regarded as a part of man’s own physical nature, being really nothing but extra-corporeal limbs. Man, he said, was a machinate mammal. The lower animals keep all their limbs at home in their own bodies, but many of man’s are loose, and lie about detached, now here and now there, in various parts of the world—some being kept always handy for contingent use, and others being occasionally hundreds of miles away. A machine is merely a supplementary limb; this is the be all and end all of machinery. We do not use our own limbs other than as machines; and a leg is only a much better wooden leg than any one can manufacture.

“Observe a man digging with a spade; his right fore-arm has become artificially lengthened, and his hand has become a joint. The handle of the spade is like the knob at the end of the humerus; the shaft is the additional bone, and the oblong iron plate is the new form of the hand which enables its possessor to disturb the earth in a way to which his original hand was unequal. Having thus modified himself, not as other animals are modified, by circumstances over which they have had not even the appearance of control, but having, as it were, taken forethought and added a cubit to his stature, civilisation began to dawn upon the race, the social good offices, the genial companionship of friends, the art of unreason, and all those habits of mind which most elevate man above the lower animals, in the course of time ensued.

“Thus civilisation and mechanical progress advanced hand in hand, each developing and

being developed by the other, the earliest accidental use of the stick having set the ball rolling, and the prospect of advantage keeping it in motion. In fact, machines are to be regarded as the mode of development by which human organism is now especially advancing, every past invention being an addition to the resources of the human body. Even community of limbs is thus rendered possible to those who have so much community of soul as to own money enough to pay a railway fare; for a train is only a seven-leagued foot that five hundred may own at once.”

The one serious danger which this writer apprehended was that the machines would so equalise men’s powers, and so lessen the severity of competition, that many persons of inferior physique would escape detection and transmit their inferiority to their descendants. He feared that the removal of the present pressure might cause a degeneracy of the human race, and indeed that the whole body might become purely rudimentary, the man himself being nothing but soul and mechanism, an intelligent but passionless principle of mechanical action.

“How greatly,” he wrote, “do we not now live with our external limbs? We vary our physique with the seasons, with age, with advancing or decreasing wealth. If it is wet we are furnished with an organ commonly called an umbrella, and which is designed for the purpose of protecting our clothes or our skins from the injurious effects of rain. Man has now many extra-corporeal members, which are of more importance to him than a good deal of his hair, or at any rate than his whiskers. His memory goes in his pocket-book. He becomes more and more complex as he grows older; he will then be seen with see-engines, or perhaps with artificial teeth and hair: if he be a really well-developed specimen of his race, he will be furnished with a large box upon wheels, two horses, and a coachman.”

It was this writer who originated the custom of classifying men by their horse-power, and who divided them into genera, species, varieties, and subvarieties, giving them names from the hypothetical language which expressed the number of limbs which they could command at any moment. He showed that men became more highly and delicately organised the more nearly they approached the summit of opulence, and that none but millionaires possessed the full complement of limbs with which mankind could become incorporate.

“Those mighty organisms,” he continued, “our leading bankers and merchants, speak to their congeners through the length and breadth of the land in a second of time; their rich and subtle souls can defy all material impediment, whereas the souls of the poor are clogged and hampered by matter, which sticks fast about them as treacle to the wings of a fly, or as one struggling in a quicksand: their dull ears must take days or weeks to hear

what another would tell them from a distance, instead of hearing it in a second as is done by the more highly organised classes. Who shall deny that one who can tack on a special train to his identity, and go wheresoever he will whensoever he pleases, is more highly organised than he who, should he wish for the same power, might wish for the wings of a bird with an equal chance of getting them; and whose legs are his only means of locomotion? That old philosophic enemy, matter, the inherently and essentially evil, still hangs about the neck of the poor and strangles him: but to the rich, matter is immaterial; the elaborate organisation of his extra-corporeal system has freed his soul.

“This is the secret of the homage which we see rich men receive from those who are poorer than themselves: it would be a grave error to suppose that this deference proceeds from motives which we need be ashamed of: it is the natural respect which all living creatures pay to those whom they recognise as higher than themselves in the scale of animal life, and is analogous to the veneration which a dog feels for man. Among savage races it is deemed highly honourable to be the possessor of a gun, and throughout all known time there has been a feeling that those who are worth most are the worthiest.”

And so he went on at considerable length, attempting to show what changes in the distribution of animal and vegetable life throughout the kingdom had been caused by this and that of man's inventions, and in what way each was connected with the moral and intellectual development of the human species: he even allotted to some the share which they had had in the creation and modification of man's body, and that which they would hereafter have in its destruction; but the other writer was considered to have the best of it, and in the end succeeded in destroying all the inventions that had been discovered for the preceding 271 years, a period which was agreed upon by all parties after several years of wrangling as to whether a certain kind of mangle which was much in use among washerwomen should be saved or no. It was at last ruled to be dangerous, and was just excluded by the limit of 271 years. Then came the reactionary civil wars which nearly ruined the country, but which it would be beyond my present scope to describe.

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<http://bit.ly/1LvJbr0>. 6. 1. Erewhon. Samuel Butler 1872. The Book of the Machines. Chapter 23. The writer commences: "There was a time when the earth was to all appearance utterly destitute both of animal and vegetable life, and when according to the opinion of our best philosophers it was simply a hot round ball with a crust gradually cooling." Is not machinery linked with animal life in an infinite variety of ways? The shell of a hen's egg is made of a delicate white ware and is a machine as much as an egg-cup is: the shell is a device for holding the egg, as much as the egg-cup for holding the shell: both are phases of the same function; the hen makes the shell in her inside, but it is pure pottery. She makes her nest outside of herself for convenience's sake, but the nest is not more of a machine than the egg-shell is. With this book, you will learn how Machine Learning works. A hundred pages from now, you will be ready to build complex AI systems, pass an interview or start your own business. All you need to know about Machine Learning in a hundred pages. Supervised and unsupervised learning, support vector machines, neural networks, ensemble methods, gradient descent, cluster analysis and dimensionality reduction, autoencoders and transfer learning, feature engineering and hyperparameter tuning! My specialty is natural language processing. My team works on building state-of-the-art multilingual text extraction and normalization systems for production, using both shallow and deep learning technologies. Reach me on LinkedIn, Twitter or email. Subscribe to the mailing list.