Computers and Intelligence

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I. Introduction

We are faced today with startling examples of computers emulating what we think of as intelligent behaviour. Not only do they control our factories' machines, perform secretarial tasks and keep track of our businesses' books, but they also seem to respond – sometimes even quite reasonably – to enquiries, play chess and predict our weather. In the face of such convincing achievements we readily assume that there must be *some* form of intelligence present and active in the computer.

Because we can see the workings of such simple mechanisms as mousetraps or mills we are not normally deceived into thinking that these are anything but purely mechanical devices. As technology becomes more sophisticated, however, we can no longer observe its workings, nor as non-specialists can we readily comprehend the principles by which the mechanisms operate. When this happens we may easily lose sight of their character as machines. This is particularly true of highly complex electronic devices, of computers. We may even begin to believe that they show signs of intelligence simply because *our* intelligence can no longer follow the workings of the technology that produces the results we see. That is to say, because they are not *simple mechanisms,* their nature *simply as mechanism* becomes more difficult to discern.

Let us take an analogy. We know that mousetraps can react to the presence of mice. We attribute neither a hunting instinct, a pleasure in the kill nor an intelligent plan to the mousetrap, for it is obvious that its working is purely mechanical. Because mousetraps are quite simple mechanisms, it is readily apparent that they are endowed with neither intelligence nor a feeling life. This case is a useful reminder that actions or reactions, however analogous to those of organisms imbued with an inner life these may appear, in no way prove the existence of instincts, feelings or intelligence.

Computers show a range of actions and reactions that often lead us to use the term 'artificial intelligence'. It is a short step from here to go on to ascribe an actual intelligence to them. What is the difference between actual and 'artificial' intelligence?

II. The Simulation of Intelligence

To understand the actual nature of the phenomenon often referred to as 'artificial intelligence' we must look back to the origins of computing devices. An early theorist of these devices laid down principles to which all modern computers essentially still adhere. He described the archetypal computer as consisting of a series of digital states (which can be imagined as a perhaps very long row of lights, each of which are either on or off at any moment) and a linear 'tape' of information. This 'information tape' simply consists of a series of positions, each of which is either punched or not punched (marked or not marked). With each position that the computer encounters on the tape, the computer's state (lights) may change, but only according to certain pre-determined and fixed rules. The limitation laid down is that the new state of the computer after this encounter (its new pattern of lights) must be *completely* determined by the operation of these fixed rules upon the computer's current state and the tape position currently encountered. After each of these occurrences, the tape may also be moved forward or backward one position; this too must be dependent upon fixed and pre-determined rules.

It is easy to show that – despite some apparent superficial divergences[1] – the modern computer still essentially conforms to these original principles. That is to say, *every* digital computer operates according to (and only according to) the sequence of mechanical[2] operations described above. Thus there can be no question of attributing any more *actual* intelligence to these highly complex but still essentially mechanical reactions than could be attributed to a mechanical loom or typewriter. What, then, do we mean by artificial intelligence?

[1] For example, computers now normally process a (fixed) number of positions, or bits, simultaneously and often have more than one source of information. The reception of data in either of these ways can also be achieved by the device posited by the original model, though more slowly and cumbersomely. Even the occasional use of so-called 'random generators' – devices which create more or less unpredictable (random) streams of data can be shown to be no exception to the original model.

[2] The term mechanical might be questioned given the electronic nature of the devices. All digital computers depend on two-state (on or off) switches. Whether these are effected by mechanical switching apparatus, vacuum tubes, transistors, printed circuits or light arrays affects the size, speed and energy consumption involved, but not the essential principle. All these devices simply simulate mechanical (two-state) switches, losing the character of their actual technical workings and material nature thereby. The *logic* employed is

Intelligence presupposes the ability to conceive the world in various ways. Aristotle categorized four fundamental aspects of the world: everything can be seen to have an original cause, a purpose in the grand world plan, a form and finally a substance or material of composition.[3]

The intelligence of a human being consists not least in the capacity for a fluid (thus playful[4]) relationship to these four ways of conceiving the world. Human intelligence normally understands *or can come to understand* each of these modes of understandings' contributions to the current situation and can adjust its relationship to them both sensibly and creatively, that is, 'intelligently'. Even a cat on the hunt for a mouse will react to many unexpected events appropriately. It will change its intention if appropriate (e.g., a dog appears or the mouse doesn't show). It will modify its approach (technique) if necessary (e.g., its hiding place is seen or the mice change their strategies). It will adapt its conception of form and of substance (e.g., it will eventually learn to ignore a child trying to fool it with an imitation mouse on a string, and when a bird flies by or a bowl of milk is brought it will happily seek out an alternative source of its breakfast).

Simulated ('artificial') intelligence can only adequately react to any situations foreseen by the developers: 'If the yarn runs out, stop the machine'. We do not consider the *loom* clever for stopping when there is no more yarn: rather its inventor and makers. There are, indeed, so-called 'learning programmes' for computers[5] through which they react increasingly appropriately through experience (e.g., handwriting recognition programmes that improve their accuracy each time they are corrected). These are not exceptions to this principle of mechanical reaction any more than a mechanical device for adjusting the loom tension on the basis of the already produced weave would be. *The*

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actually derived from mechanical, not electrical principles. In other words, the computer's mechanistic logic is in question here and not the technology used to implement this.

[3] Aristotle also formulated the principles of logic which underlie – two thousand years later – the workings of modern computing devices. Aristotle's historical connexion with the principles and evolution of computing will be shown to be deep and essential.

[4] Playful, in Schiller's sense of the word, that is, the ability to explore and move freely between polarities.

[5] I mean here programmes whereby the computer is meant to learn, not those intended to teach the user.

possibilities for recognizing and adjusting are actually static, and *truly* unpredicted[6] events (e.g., a person writing Chinese, or backwards, or employing an unfamiliar letter – á, ö, ø, π – or putting the wrong document into the machine, or the right one upside down) will always show up the precise limits of the makers' forethought. Note well: *we encounter the makers' intelligence (and the limits of their forethought), not the intelligence or forethought of the machine; the latter has neither of these.*

A human being in any of these situations would discover the nature of the problem and try to find a way to sort it out; a computer can, at best (that is, if it even discovers that there is an unexpected 'input') give some form of response equivalent to: 'Unpredicted situation encountered. The limit of the technology has been surpassed. Please call an intelligent being.' In other words, a human being can learn to read Chinese or ask for a translation, can learn the pronunciation of an unfamiliar letter and to check if the document is correct and face up. A computer can only be re-programmed to do these things.

In addition, a computer cannot be said to approach any sort of conception of any of our ways of experiencing the world: cause, purpose, form *or* substance. All that it has is *data* – electronic states, really – which *we* then choose to interpret as being 'about' the world.

The extraordinary range of simulated intelligence already and soon to be achieved must not and indeed cannot fool us. Computers are *un*intelligent machines, and anyone who works with such devices quickly discovers that the *user's* behaviour must be made equally unintelligent, that is, that we must conform precisely to the machine's severely limited schema. Any behaviour of ours that is outside this schema is either ignored or promptly leads to unexpected and normally undesirable results. The computer is of course completely unable to become aware that it is trapped in such a schema. It is left to the human being to discover this, and to progressively discover the nature, possibilities and limits of the machine's schema (this schema is often known as its programming).

[6] Not necessarily unpredictable, but unpredicted! How often do we wish that the programmers had predicted the 'obvious' potential for a given situation which has in fact arisen.

Sophisticated machines remain machines, whatever the level of sophistication reached. There are computer scientists who await a breakthrough of ‘quality’ through increasing ‘quantity’ of sophistication, but though a crystal appears vastly different than a stone, it will never become a plant. The degree of complexity of organization does not change an organism’s nature or level on the hierarchy of realms of being. A machine cannot be other than a machine through being very intricate in its workings.

When a radio plays music, a child will wonder where the singer is. She will assume that there is in fact a musician inside of the box. We as sophisticated adults will of course smile at the question, for we know that there is no singer in the little black box but only a mere reproduction of music. We, however, must be careful not to do something similar when faced with sophisticated modern computing devices.

We must learn to look at computers and know that there is no intelligence there, but simply a cleverly made recording of intelligence, subject to all the limitations and distortions of any recording, and above all to those of its fashioners.

Part III

A. The Nature of Intelligence

There was a time when meadow, grove and stream,
The earth and every common sight
To me did seem
Apparell'd in celestial light,
The glory and the freshness of a dream.
It is not now as it has been of yore;–
Turn wheresoe'er I may,
By night or day,
The things which I have seen I now can see no more!

W. Wordsworth

How is it possible that even a remotely plausible or momentarily convincing illusion or simulation of intelligence can be produced by a mere array of switching devices?[7] What do we mean by intelligence, if this looks like a case of it? Which aspects of intelligence are in fact present in the machine's behaviour and which are absent? Finally, what is the ultimate limit of the simulation? How far can it be taken?

Human intelligence has actually been on a path of transformation, in some senses decline, for a very long time now. Wordsworth describes how even our very perception has changed in this process: 'The things which I have seen I now can see no more!' When human intelligence first awoke long ago, it was indeed in the form of a direct perception of the Being and Beings implicit in and indwelling all things. This was the Paradise situation: man lived face to face with God.

This underwent a transformation as man took hold of and incarnated into successively deeper layers of his own being. Man began to experience his soul life and thereby gained a first awareness of himself as a being having an existence separate from the rest of the cosmos. He gained the experience of being an individual, however, at the cost of losing his direct experience of the rest of the world – and indeed of himself – as *individuality*, as being. Previously he had dwelt amidst a world populated with beings and

[7] It seems worth emphasizing again that this question is not different in kind from wondering how it is possible that a fairly convincing simulation of music can come from a (slightly different) box of gadgetry; our experience of music and our experience of intelligence must be open to being fooled by replications or imitations of both. It is worth exploring the reasons for this.

knew not that he was one as well. Now, he 'knew himself' to be separate but had lost the direct awareness of all other beings. The world of being, of direct communication with and experience of the Gods, was lost (the Fall from Paradise). A door was closed. Only the *revelations* of these beings were now experienced, while a veil hid the beings themselves, though their presence or existence could still be sensed dimly behind the veil.

This was the temptation offered: *be yourself as a God*; unsaid was, *but lose God, be lost to God.*

Man now experienced the separateness that gives the possibility of knowing and choosing between good and evil. He thus gained the experience of an independent soul life. But this soul life was only capable of experiencing the world at a *soul* level, no longer at that of pure spirit. The highest sense had been lost, that for the ego of another being. Indeed, man now experienced even his own individuality only through this soul experience, not as ego per se, not through his spirit. More precisely: he no longer had a direct experience of himself as *individuality*, only as *individual*. A veil had also fallen between his *own* higher being and his consciousness.

It was at this time that initiation acquired its first task: to reawaken the experience of *Being* in man. 'For now we see through a glass, darkly: but then face to face: now I know in part; but then shall I know even as also I am known.'[8]

Intelligence was now devoted to comprehending the revelations of the 'Gods', of the world's beings. This included as a matter of course the beings of the natural world as well as fellow human beings and being of the higher worlds. Every daisy and buttercup spoke to man's soul at this time: the world was one of revelation everywhere.

But this experience also had to be lost to man. As mankind incarnated more deeply, the experience of the body's own life forces and organic activity was entered into. Through this, the ability to experience the world as revelation was lost. Now, instead of world revelation the *activity* of the world was present before us. Before, everything had been experienced as speaking a word of the great cosmic language. Now our ability to perceive the cosmic words was lost, but in exchange man himself gained the ability to

[8] I Corinthians 13, 12.

speak. Before, all things had spoken to him, and he was present in the world and had heard their revelation. He himself had only spoken as they did, as cosmic revelation poured through him. Now man could speak out of himself – and this was new – but his speech was not revelation, not even of revelation of man's own being. It was purely subjective *speaking*, speech as subjective activity. Speech had fallen, and the direct sense perception of the world as Word was lost.

Intelligence was now only active as a capacity to comprehend the world of driving impulses and effects (modern popular astrology's descriptions of the constellations and planets retain an impression from these experiences).

Mankind went further yet. Man began to experience himself as a purely physical being. In Renaissance times this began, curiously enough, as an experience of rejuvenation, in a reflection, as it were, of the balanced Greek experience of the life forces in nature and the life forces in the human organism. Now, however, the life forces were no longer experienced, but rather the physical body itself. The decline made itself felt rapidly; the world of inter-connected activity was lost and only the dead, silent, outer sense-impressions were to be found. For the first time, man experienced himself as being fully disconnected from the rest of the world. The cosmos was no longer experienced as working in and through him; he himself was now responsible for his own physical existence, and felt himself to be alone in this task.

Intelligence now was given the task of grasping physical existence, of making it possible to comprehend and take hold of the outer physical world. Modern natural science, the science of the material nature and physical workings of the world, was born.

Man had previously experienced the activity and influences of the world working through him; now, for the first time, he experienced himself as being independently active. But his activity was that of the physical body, not of the life forces. What we experience now as activity is our physical activity and the physical activity around us; the real activity of the life forces has been lost to our consciousness.

Such has been the situation for the last half-millennium.[9]

[9] The author would like to express his debt to Rudolf Steiner's descriptions of human and world evolution, in particular his *Leading Thoughts*, without which this chapter could not have been written in this form.

B. Intelligence applied to the Physical World

Through the development over approximately the last five centuries of an increasing consciousness of his physical body it has become possible for man to create machines which imitate various bodily functions externally. The physical experience of the limbs as mechanical apparatus has led to the development of a wide variety of machinery that works on analogous mechanical principles: for example, digging, hammering, sawing, kneading, weaving and sewing machines. These 'limb-machines', which generally deal with solid matter, have been driven by devices that use the rhythmic circulation of fluids[10] primarily to transform energy into usable power: water wheels, steam and diesel engines, the modern automobile engine, turbines.[11] Finally, we come to the (usually electronic) devices which record and process information as well as controlling machines of the first two types.

We have systematized a great deal of our thinking over the last few centuries. The process actually began with Aristotle, who formulated the rules of logic in the fourth century BC. He thereby gave thinking a direction towards understanding the material world and its laws and away from the imaginative, pictorial thinking that had previously held sway. This Aristotelian logic was practised for two thousand years and has been absorbed into humanity's evolution (who is unfamiliar with causal logic today?). It has accompanied and perhaps even guided the process of incarnation into our physical brains and thereby allowed us to use their workings as a (perhaps largely unconscious) model for the computing devices of the last century.

[10] Or the flow of air: windmills, etc.

[11] There is a functional relationship between the flow of blood through the chambers of the heart to that of the flow of fuel through the cylinders of an engine: the valves and cylinders of the latter have an analogous working to the valves and chambers of the former. Of course, the heart serves more as a regulator of rhythm for a circulation which originates outside of itself, whereas the engine's driving power is located inside of the engine itself; the latter could be said to be an inversion of the former.

We are now all masters of many intellectual faculties which were reserved for a rare few not many centuries ago. Reading, writing, calculating and logical analysis were rare accomplishments until the Renaissance and the popular revolutions of the eighteenth century brought their impulses towards universal intellectual education.[12] We usually speak of universal education without noting that the education of many skills – spinning, weaving, milking, mowing and reaping, etc. – *was* nearly universal in earlier days and has been nearly completely replaced by the intellectual skills taught in our schools today.

It is these intellectual achievements that are capable of being mechanized by computer.

In order to simulate an intellectual skill on a computer, this skill must be reduced to a series of mechanically executable steps. In particular, these steps must be capable of being translated into a series of automatic operations on a range of electronically simulated noughts and ones ('off's and 'on's).[13] It is this reduction of intellectual work to a series of primitive operations on a series of binary values which results in the highly impressive achievements of calculation, presentation and systematized record keeping with which we are familiar. The history of computing is thus in part the history of the reduction of intelligent activity to mechanical process. Important to note here is that this mechanization of thinking has often *preceded* computerization. Bookkeeping, for example, became a rather dull, mechanical activity long before computers took on the task. The task has often become *fit* for computers (and unfit for human beings) long before it has been given over to the machines. To a considerable extent, human beings are being freed from dreary repetitive *intellectual* tasks through the activity of computers just as we are being freed from wearying, backbreakingly repetitive *mechanical* tasks by the busy practical machinery which surrounds us.

[12] It should be noted that the Renaissance brought an impulse towards an education much less universal but also much less one-sidedly intellectual than the later movement for popular education. The value set in Renaissance times on artistic capacity and sensitivity and on practical skills gave expression to a humanism to which the later Rationalists had little access.

[13] Modern computers provide the possibility of using pre-established groupings of these primitive operations so that the human being need not always break everything down into the extremely simple steps that the computer is actually capable of performing. This work is accomplished by programming languages and user interfaces. This 'user-friendly' (and programmer-friendly) visible face of the computer conceals further the actual operations of the devices. This concealment, of course, has concomitant advantages as well as disadvantages.

Perhaps it is worth emphasizing one last time, however, that though a great deal of creative ability and intelligence are devoted to developing the machines in our times, these same human creative abilities and active, penetrative understanding can never be accessible to automatic machinery. The latter can only take over processes devoid of these qualities.

The physical processes of the metabolic-limb, rhythmic and sense-nervous systems in man are accompanied by *soul* processes. His limb activity is directed by an active *will*, his rhythmic activity of the circulation of fluids and of air is interwoven by a life of *feeling*, his nervous system is active as the expression of meaningful *thought activity*. In the machine, none of these soul qualities is present; it is as if we had before us a being that is just limb movement, without direction, or one that is purely endless rhythmic circulation, without significance, or one that is purely calculation, without understanding. Of course, man can employ these dumb servants for his own purposes, significance and understanding. Who is it that we are employing here, though? Perhaps at times we will even begin to ask: who is serving whom?

IV. The Role of Artificial Intelligence in Earth's Evolution

Mankind is becoming increasingly responsible for guiding the evolution of the earth. The mineral world of earth and stone is already increasingly being given form by man's activity, while the plant and animal realms are to a substantial extent subject to our influence or even control and are becoming increasingly dependent upon our direction for their evolution. This is a valid and extremely important part of our task on earth: we are (becoming) the lords of all creation. The difficulty here is to keep the balance between two extremes. One extreme is the wish to deny this task and give nature over to 'itself' (a self that it has not yet developed). The other is the contrary tendency to impose our might and will on the lower realms of creation without perceiving and having respect for their own nature and character. The balance between these could be described as the human being's attempt to exercise a respectful yet active guidance over the realms of nature.

Nature was once under the wise guidance of spiritual forces; long ago this included being cultivated by man. Nature has never been truly 'left to itself'; it has always been part of a larger whole. The Gods have now withdrawn from their creation and have drawn back from their active guidance of mankind as well. We are thus confronted with a new situation, and one for which we shall increasingly have to take responsibility.

A responsible attitude towards nature implies an ever-increasing consciousness of the natural world's diversity, rhythms and inter-dependencies: its ecology. Unless we respect, preserve and enhance these, treating them as if these beings were our own children, we shall lose the right and the capacity to live in a natural world. Indeed, our *own* health and balance depend upon our maintaining a caring relationship towards the beings of nature.

We must remain modest about our present capacities to be true cultivators of the earth. Thousands of years – indeed, epochs and aeons – of work and research lie ahead

before we shall again be able to do justice to this task. To understand the full magnitude of the task we must look back to how spiritual beings once played a role in establishing the original physical basis for our own being to enter into evolution on the physical plane.

Mankind evolved under the guidance of higher beings.[14] Already during the earliest, so-called Saturn phase of earth's evolution certain of these had the task to lay down the archetype of man's physical body. These first forms of physical bodies were *only* physical, that is, empty of life, consciousness or self-awareness. Shaped from the Earth's still incoherent warmth-substance (analogous to the masses of rock underlying the earth of today, though made up of warmth rather than mineral substance), a two-fold structure was developed. One part of the structure was formed of warmth-substance with a more static tendency while the other portion was formed of a more active substance, a less physically substantial warmth more inclined to interchange with the environment. Thus there was a more physical warmth in the interior structure and a more enlivened (etheric) warmth in the exterior structure. These were early stages of our skeleton and sense organs, respectively.

The beings which particularly impressed their character upon the physical bodies of this first phase of mankind's (and earth's) evolution had the cosmic task and gift of becoming Spirits of Personality. In shaping portions of the world's primeval warmth-substance into new forms, a task to which many kinds of beings contributed, they had the particular task of giving expression to their characteristic element of personality. In Rudolf Steiner's words, 'these Beings communicate to the particles of the Saturn body a semblance of the character of personality. Yet personality itself is not yet present in the warmth element on Saturn, but only its mirrored image – as it were, an outer shell or husk of personality.' [15] The Spirits of Personality experienced the *reflection* of the personality which they had developed streaming back to them from what they had shaped.[16] They had imprinted the warmth bodies with the outer form of a being equipped with

[14] Here again I must express my debt to Rudolf Steiner; without his research into the earth's evolution (see his *Occult Science: An Outline*) this chapter could not have been written at all. The considerations here however have been extended to computers and man's role as a co-creator responsible for the realms of nature; the responsibility for these is wholly my own.

[15] Rudolf Steiner, *Occult Science*, Rudolf Steiner Press, 1963, p.116.

[16] 'Throughout the whole of Saturn there is no inwardness; but the Spirits of Personality behold and recognize the image of their own inwardness, in that it streams out to them as warmth from Saturn.' Steiner, p.121.

personality, but no actual personality was present in these bodies. The beings thus had no inner life, but gave the appearance of having one through their form.

Our responsibility and capacity for the evolution of new beings is analogous to what was once done for us. In the diffuse sphere of warmth available as a medium at the moment when the basis for our own physical bodies was laid down, beings of evolution three stages ahead of man established forms which would serve as the basis for man's physical body to evolve.[17] Now, three stages of world-evolution later, having evolved life forces, consciousness and self-consciousness, man is coming to the time of his own responsibility for the evolution of other beings, and indeed for helping to form physical bodies from which new evolutions may develop. In his work with the mineral realm, three kingdoms below his own level of evolution[18], man has an analogous task to that of the Archai at the time when these helped form the basis for man's physical body. The mineral world is now in the position in which man was to be found during the Saturn phase of earth's evolution. Man now has the task of taking the material substance of the earth and giving it new forms. Into these new forms beings awaiting the chance to enter into evolution can incarnate.

There are various directions which this can take. We can picture for instance the awesome transformation involved in reshaping masses of incoherent rock into the magnificence of Chartres Cathedral. According to Steiner, a work such as Chartres will arise in metamorphosed form during the phase of Earth's evolution which will follow our own. Such artistic creations will appear again as flowers appear during our phase of evolution, that is, equipped with life forces and capable of growth and decay, though with a mineral body. New life forces capable of enlivening a body of stone will permeate their transformed existence. We must visualize here magnificent flower-like organisms with crystalline blossoms, a more stone-like leaf and stem region and then truly stony roots[19],

[17] Following Steiner: Man-Angel-Archangel-Archai (Spirits of Personality); thus three stages separate man and the Archai or Spirits of Personality.
[18] That is, Man–Animal Kingdom–Plant Kingdom–Mineral Kingdom.
[19] It should be emphasized that the terms, 'flower', 'blossom', 'leaf' and 'root' can only be used by analogy. The forms of beings on Jupiter (the next phase of earth's evolution) will be radically different from present-day forms.

and then imagine such a transformation of Chartres Cathedral or the Parthenon, Hagia Sophia and Goetheanum (to name but a few examples).

Now, other physical structures which man has created will also provide paths of incarnation for beings. In particular, let us turn to the devices known as computers. Computers are fashioned by shaping mineral substance – crystals (traditionally silicon) and conductive metals – into incredibly complex and finely fashioned patterns of electronic circuitry. These transformations of the mineral realm are an expression of something fundamentally different from the exquisite artistry of the above-mentioned works of architecture. Architectural works are always a combination of the practical will, aesthetic feeling and the insightful mind (Vitruvius[20] called these 'structure, beauty and function'). The design of computer circuits is not so influenced by aesthetic considerations and the functions aimed at no longer include the full range of human life.[21] Computer circuitry is purely determined by the rational intellect's logic working at a refinement and complexity, but also at a merciless absoluteness of principle previously unknown in world evolution. An automobile engine, otherwise a triumph of modern precision engineering, is but a child's toy in comparison.

What beings will find a path to incarnation through these formations (both now and in future planetary phases)? We saw that the wondrously complex harmony of Chartres can be imagined transformed in a future evolutionary phase into a flower having all the lovely, wonderfully complex harmony of the cathedral yet equipped with life – a mineral form capable of growth and decay. When we come to the integrated chip, the computer, we must imagine a living, growing being with the laws of *these* devices as their basis: one-sided, virtually a parasitic virus of the future earth. Incapable of existence except by feeding on beings of more well-rounded capacity to live and evolve, these could only have one purpose: to reproduce themselves and extend their crystalline maze of logic over all the earth.

[20] Vitruvius: a Roman architect who – in the earliest known treatise on architecture – set down these three as fundamental architectural principles.
[21] An architect can design a sitting room or garden; a computer has no room in its circuits for the life of these.

The universe we now live in was formed out of *wisdom*. The microcosmic correspondence to this cosmic wisdom is our human intelligence, which has evolved through the successive stages described above until it has reached the level of understanding applicable to the physical world. Because of this, we can comprehend the universe's laws, rhythms and workings by reaching out to it with human understanding. We are now using this intelligence to fashion the mineral world into many forms and structures, and while doing so either permeating these with a harmonizing aesthetic and higher purpose – or neglecting this.

But our universe was not meant to and has not remained solely an expression of wisdom. The principles of freedom and love have entered into man's – and thus the world's – evolution. Through us, the kingdoms of nature can become imbued with love; we can shape the mineral world into forms literally built out of love rather than those simply dictated by the intellect or the will to power. The plant world, cultivated with love, will evolve in different directions than if we impose a mineralized, rationalized farming upon it. The animal world, nurtured with love, will find through us new possibilities of evolution supportive of and in harmony with man's activities and needs rather than simply being subdued to man's voracity.

The principles of love and freedom must enter into all of man's life and deeds – especially into his formative activity with the realms of nature. The critical question accompanying the evolution of artificial intelligence, then, is this: how do we imbue these constructions with the new principle of love? Is this possible? They will certainly carry over into future evolutions the outer form of the low-point of earthly intelligence, the intellect. This is surely part of their task: to carry out for man the repetitive functions of earthly intellect, not least in order that man himself is freed to move forward *beyond* this, to remount the steps of intelligence's fall through our own conscious and purposeful activity. But *how* we shape these beings' physical form of incarnation is of vital importance to *how* this task will be carried forward. In particular, they can be created and used in a way which leads us further down the path that then leads to the mechanization of our *own* intelligence – or they can be used to free our intelligence from a focus on mechanical tasks to enable it to find its way back to its cosmic inheritance.

We are imprinting our intellectual achievements here upon the lowest realm accessible to us, the mineral world.[22] But in doing so we face the danger of being confronted everywhere with the outer form, the hardened shell, the husk of intellect in the very world we fashion for ourselves. Only if we truly understand what we are doing here will we find the proper place for this synthetic intellect and ensure that there is still room in the world for man's human qualities: an engaged will, an active love and a living intelligence.

There are thus two challenges to meet in our confrontation with the form of artificial intelligence to be met with in computers. One is that human intelligence will be led by the mechanization of intelligence, rather than leading it. This danger is least likely to be noticed by those developing the technology, as they are least in danger of falling into a non-creative, subsidiary relation to the machinery since they best understand it and are actively creative in their work with it. What they of course often fail to comprehend is the effect of these technologies upon man's life of soul and spirit – including their own. Many of those who are most concerned with this effect, on the other hand, are unable to fully understand the technology itself. To bring an increased comprehension of both the technology and the soul and spirit realities that underlie our relationship to it is the first challenge.

But even if man preserves a healthy soul life despite his inevitable contact with computers, what of the beings that are thus incarnating into the world? In a sense there is *one* being who underlies all computer technology, incarnating in a manifold of individual devices. What effect does our fashioning these technological forms have on world evolution? What vessels for incarnation are we creating? This is the greater challenge, the macrocosmic one: to remain responsible for the cosmic deed we are engaged in. This is a task that will need to be carried over aeons and phases of world evolution: both to care for the world to which we are introducing a new, in many ways and levels detrimental element; and to care for the future development of these beings.

[22] We have full and conscious control over the mineral world. The electrical realm which we seem to manipulate in computer circuitry is actually not directly accessible to us; we can only manipulate the mineral layers to form the conditions under which the electrical realm will operate predictably.

Love is active knowledge, and without real understanding there can be no love. If we can awaken in ourselves a real understanding of the nature of the beings we are working with here and of their mission; if we can even face these beings with not just understanding of but compassion for their nature and mission, then we will begin to find the ways to redeem them that cosmic evolution will also need. And if those who create new forms in this realm become capable of real understanding, knowledge and perception of what it is that they are creating, and in the face of this develop this love and compassion, then the future will be able to be looked forward to with a degree of confidence.

The beings of pure logic will be there with us in the future. They will incarnate into the forms being made available for them. But human love and the will to redeem these beings through the forces and insight developed out of an unsentimental recognition of and compassion for them may also be there in sufficient force. Upon this depends our future – and not just ours alone. Upon our insightful love and compassionate will depends the whole earth's evolution as well.

We posed the question as to what form of intelligence it is that inhabits the computer. The answer is, it is the *dead image* of intelligence, the reflection that we ourselves have put there. It is intelligence's shadow, without intelligence's light. It is an empty form, a barren shell.

We can breathe life into this mirror for moments. As soon as man steps away from in front of the devices, they return to being empty mechanisms. Looking at our creation, we see our own reflection, our own intelligence in the polished mirror we have made, and we almost believe the reflection before us to be itself imbued with life.

'Outwardly – out into the heavenly spaces – there is a manifestation as of personality, a personality, however, that is not guided by an inner I, but regulated from outside like a machine.'[23] So Steiner described our own existence on Saturn, our own physical bodies given the form but not yet the inner nature of personality. So are computers now; they have the outer form but not the inner reality of intelligence.

[23] Steiner, *Occult Science,* p. 125.