

Essay

Swing Low, Sweet Chariot: Kinetic Sculpture and the Crisis of Western Technocentrism

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Academic Editor: Andres Pardey

Received: 6 July 2014 / Accepted: 28 May 2015 / Published: 7 July 2015

Abstract: Beginning with the chariot as an ancient and pan-cultural example of the way in which art has humanized technology, this essay explores the limited role which modern art has thus far played in dealing with the current crisis of technocentrism. It does so by bringing to bear on the subject a newly-promulgated theory of the development of modern art which focuses on the absence therein of an evolved kinetic sculpture.

Keywords: kinetic sculpture; kinetic art; technocentrism

Yet the relative aesthetic failure of Kinetic Art is significant in itself since the desire to make art kinetic is one of the prime artistic urges of the present century; to misrepresent this is to reject the direction to which Western art has committed itself.

Jack Burnham, *Beyond Modern Sculpture*

1. Introduction

The chariot, as a straight-forward application of the wheel and axle, might be said to represent humankind's first sophisticated mechanical technology, as opposed to simple machines such as the hand axe (*i.e.*, the wedge) and the digging stick (*i.e.*, the lever). Given the cultural conservatism which often distances itself from the new and sophisticated, it is therefore remarkable that the chariot appears nearly everywhere in early Indo-European art (Figure 1) and literature, whether Vedic, Hellenic, Celtic, or Germanic [1,2]; and equally remarkable—given the ironclad physics of the wheel and axle—

is the fact that the chariot has taken on the role of mystical conveyance, and has been so apotheosized in the famous African-American spiritual [3].



Figure 1. *Trundholm Sun Chariot*, c. 1700 BC. Bronze, 54 × 35 × 29 cm. National Museum of Denmark, Copenhagen. Image © Gianni Dagli Orti/Corbis.

The key point, in respect to Western culture, is as follows: almost as soon as there is technology, we find the arts engaged with it, and to the benefit of both—art finds fresh stimulation, and the technology itself is integrated into the landscape of the human psyche.

This virtuous cycle appears, at present, to be inoperative. On the one hand, there is a universal unease with the ever-increasing degree to which our lives seem to revolve about technology, but which technology seems to do little to ease our burdens. The visual arts, on the other hand—as per the example of the Renaissance, that sector of the arts most capable of assimilating and entering into a fruitful dialogue with science and technology—are currently pre-occupied, under the aegis of “Post-modernism”, with that which is difficult to characterize as anything other than ephemeral. At the very moment when we are depending upon the visual arts to create a mature vision of man and machine—and here we think of Monet setting up his easel at the Gare St. Lazare, or Rivera laboring over his *Man at the Crossroads*—we are offered ball bearings and slabs of black felt strewn petulantly across the floors of the Whitney Museum, or a cargo cult tribute to the Apollo missions at the Park Avenue Armory.

In attempting to account for this state of affairs, and without wishing to over-simplify—we are dealing here with something which is but part of a far larger and more complex stage in human evolution—it may be useful to consider a newly-promulgated theory of the evolution of modern art [4–6]. Like many such theories, it is a distillation of previous thinking, and in this case that of Jack Burnham [7]; it is a theory which represents a radical re-interpretation of said evolution, and not least in placing kinetic sculpture on center stage; and it is a theory which, in its focus on the actual sinews of culture, may be likened to the vector analysis of physics—a vector having both force and direction.

One must be careful, however, to distinguish between a theory and its expression. The exposition presented here is the work of a practicing kinetic sculptor [8] as opposed to an art historian; and although the sculptor in question is in fact one of the architects of the aforementioned theory—and although his research is clearly substantial, and his writing cloaked in academic garb complete with footnotes—his exposition nonetheless bears the inevitable marks of the artistic temperament: wide-ranging in scope; mercurial in transition; bold in declaration; and passionate in advocacy for a

particular approach, and equally scornful of alternatives. Indeed, it is part *manifesto* [9]; but let us hope that such extravagance of expression will not obscure for the reader a possible kernel of truth.

2. Regarding the Crisis of Technocentrism

The idea that we are becoming the slaves of our machines—or, stated in a slightly more plausible manner, the idea that we are becoming nothing more than a layer of connective tissue for our various technologies—has been so frequently touched upon in the mass media and popular culture, but with so little substance, that it has seemed worthwhile to go beyond the headlines to some recent history [10,11], and to find there a practical measuring rod—the length of the work week—with which to quickly survey the dimensions of the crisis.

It was recognized as early as the 1920s that our increasingly automated factories would allow us to enjoy a comfortable standard of living while permitting a continuous reduction in the length of the work week; and indeed, a 1965 U.S. Senate subcommittee predicted a 21st century work week of 14 hours.

Technology has kept its part of the bargain: the worker of today is many-fold more productive than the worker of 1965; yet even those few countries which have dared to introduce a work week less than the forty hours established by the U.S. Fair Labor Standards Act of 1938 find their policies under attack.

Certainly, the stability of the work week over this period reflects in part the achieving of a certain equilibrium in releasing human psychic energy—though perhaps not in an optimum fashion; and no doubt a tendency towards even longer working hours reflects an intoxication with both the incredible resources which technology has placed at our disposal, and the incredible goals which it has placed within our reach: if I myself were a member of one of the JPL teams driving a rover on the surface of Mars, I, too, would be working 60 hour weeks.

However—make no mistake—there has also been at work a more systemic and worrisome aspect of that same technology; and here we must return to the historical record.

If the automated factories of the industrialists threatened, by their very efficiency, to provide a modest but universal standard of living in combination with equally modest working hours—but also, of course, with a leveling-off in the growth of profits—then the solution for the industrialists was obvious: a plethora of new products, to afford which the worker was willing to spend more time in his machine-like factory, and *many of which were themselves machines*: dish washers; mixers; toasters; toaster ovens; blenders; waffle makers; electric ice cream makers; hot plates; electric crock pots; electric carving knives; electric rotisseries; pasta makers; vacuum cleaners; ceiling fans; box fans; table fans; attic fans; air conditioners; hair dryers; hair clippers; hair curlers; electric tooth brushes; electric bathroom scales; vaporizers; de-humidifiers; electric clothes lines; lawn mowers; edge trimmers; tillers; chain saws; electric winches; hand drills; orbital sanders; electric buffers; paint sprayers; pressure washers; heat guns; electric soldering guns; electric pencil sharpeners; radios; record players; televisions; self-rotating TV antennas; hi-fis; stereos; model gasoline airplanes; model electric railroads; rock tumblers; aquarium pumps; motorcycles; scooters; go-karts; golf carts; power boats; private aircraft—and so on [12].

Thus was born the mindless American “consumer society”—an effect of the twinned desires of the industrialist to keep his mechanized factory running at full capacity, and of the consumer to keep

himself entertained. Were it not for their environmental implications, these would seem to be harmless enough motives; but can we not already detect therein *a tendency for humankind to become swept up in a culture of relentless, machine-mediated activity* [13]? Moreover, can we not also hear a distant echo of Homer's warning that "there is a force in iron which lures men on" [14]?

Distant echo, indeed. In anticipation of our reinterpretation of 20th century art history, we have deliberately confined our examples to the artifacts of that era; and if even then there were indications of mankind falling under the sway of a technological demiurge, is there not even greater reason for concern in the present day, which, with its electronic machines of gigahertz-scale activity, is in some sense as far removed from 1950 as 1950 is from ancient Greece [15]?

If these machines are our servants, why are all of us—chained to our computer screens—working harder and more desperately than ever [16]?

Yet there can be no turning back. Machine begets machine; and on our near horizon are the android, the drone, artificial intelligence, and nanotechnology—and these with all of the even more dire warnings which come in their wake [17].

3. Regarding the Virtuous Cycle

As with our consideration of the crisis of technocentrism, we shall tarry here only as long as necessary; but if we are soon destined to live in a technological Oz, it is perhaps well to briefly review what we mean by saying that "art can integrate technology into the landscape of the human psyche"—and our starting point must be to present, as a corrective to the previous section, a more balanced view of technology.

The fact of the matter is that no one can predict the outcome of our ever-accelerating rush into its embrace—Teilhard de Chardin used the analogy of a whirlpool into which we are being swept [18]; and so I am not suggesting that we relax our vigilance.

At the same time (and please forgive me for stating the obvious, but the obvious is what we tend to overlook) it is worth remembering that humankind—*Homo Faber*—is a technological species; that the machine, though perhaps now emerging as a threat, can also be a marvelous and inspiring thing, as exemplified by those rovers on the Martian surface; and that our *virtuous cycle* is one of the most definite and characteristic features of Western culture, and one in which art plays a critical and complementary role in respect to technology.

In regard to that role, the operative term is *assimilation*: not the mere referencing of science and technology, but their complete transubstantiation—and there is no better example in all of Western art history than the famous *Kritios Boy* (Figure 2). We shall have more of substance to say about him later; the goal at present is simply to emphasize—if emphasis is necessary—the startling contrast which that work represents between a vital science and technology, and the even more vital power of art.

The connection with Greek science, in the twin forms of the accurate anatomical observation and mathematically-tuned proportions at work in the *Kritios Boy*, is well understood. Perhaps not so well understood is the connection with technology—but that is only because we have come to associate technology with rapid change and progress, and have thus lost sight of the dominant role that stone and stonemasonry have played in human technological history. The Olduwan chipped pebble technology

reigned supreme for no less than one million years; and stone itself was not displaced as the premier building material until 1889, when Gustave Eiffel's iron tower wrested away from the masonry Washington Monument the title of the world's tallest man-made structure.

Indeed, we are dealing with a quite impressive phenomenon in terms of both quality and quantity: in quality, there is a certain magic in the process of quarrying and dressing stone which seems to have attracted humans of all cultures and climes [19]; in quantity, countless blocks of stone—The Great Pyramid of Cheops alone requiring 2.3 million—were being constantly shuttled about the ancient world during the four millennia bracketing the appearance of the *Kritios Boy*, and perhaps reminding us of the blocks of data being currently shuttled between the nodes of the Internet.

Yet—this almost a matter of definition—technology always comes up short in respect to the deepest yearnings of the human psyche. Stone can be a maddeningly uniform material; and the vast majority of those blocks were destined to become lintels, thresholds, horse troughs.



Figure 2. *Kritios Boy*, c. 480 BC. Marble, 82 cm. *Acropolis Museum*, Athens.

Not until a supremely talented *artist* got hold of one of them do we have the *Kritios Boy*—perhaps the first sculpture in Western history to truly shatter the limits of what could be imagined as emerging from a block of stone. Whenever we fall into despair regarding the continuing relevance of art in a world gone mad with technology, we must gaze upon him again, and remind ourselves not only of the visual perfection which was to serve as a sculptural model for the next two thousand years, but to remind ourselves as well that the same relaxed pose which worked so effectively at the level of

aesthetics also served to make the work a spiritual dynamo; for was it not the first sculpture to express that attitude which has become the hallmark of the Greek legacy: a sense of man's confidence regarding his place in the universe? [20].

Hence it is (fast-forward to the early 21st century) that we welcome two new and related artistic movements—"Techno Art" and "Sci Art", respectively—which show great promise in restoring to the aesthetic realm not only a substantive engagement with science and technology, but also a focus on the *visual* as opposed to the *anecdotal*. This the former accomplishes by taking advantage of the incredible power of electronic/computer media (and thus also known as "new media art"), and the latter by realizing the incredible expressive power of the latest scientific imagery. Nor are these initiatives unaccompanied by that which is the *sine qua non* of a revolutionary art—*i.e.*, the brash, new journal—and among which might be mentioned *Caldaria* [21] and *SciArt in America* [22].

However—as we are reminded by Joseph Nechvatal—art cannot follow an agenda [23]. If the young artists of today set out with the mere goal of "humanizing technology", they will make a terrible mess of things. They must work, rather, as artists have always worked—in the grip of an aesthetic frenzy; and here another lesson of the *Kritios Boy*: notwithstanding its poise and studied articulation, there can be no doubting the Eros under whose influence it was created.

Yet even an economy of the ecstatic must admit the possibility of a missing factor.

Despite the talent and energy and exuberance being poured into Techno Art and Sci Art, and despite the immensely pregnant situation represented by our technocentric society, must we not admit that at present there are few signs of the rumblings which must have accompanied the birth of, say, Impressionism—that Impression which, though not so far removed from us in time, and under the quite comparable circumstances of Europe's rapid industrialization and urbanization, yet held aloft a universal vision of beauty, and of a coherent human society (Figure 3)?



Figure 3. *La Place de l'Europe*, by Gustave Caillebotte, 1877. Oil on canvas, 276 × 212 cm. Art Institute of Chicago.

In short—with Impressionism and Cubism and Constructivism towering behind us—do not many of us sense that there is something missing at the very core of our own endeavors? Must we not also suspect that this missing element might have been in part responsible for the futility of Post-modernism and Conceptualism?

It is the thesis of this essay, and of the art-historical theory which it seeks to summarize, that *the visual arts may well be suffering under the effects of an evolutionary misadventure which occurred at a precise point in the 20th century*—and the possibility of which misadventure has not to this day been widely acknowledged, much less addressed.

4. A New Look at the Evolution of 20th Century Art

A brief outline of the history of 20th century art in accordance with our subject theory must seem to us as strange as it is familiar—but such is the inevitable effect of being aroused from a sleep of 50 years:

4.1. *Destiny*

If it was the destiny of Greek art to assimilate both early observational science and stonemasonry; if it was likewise the destiny of Renaissance art to assimilate the vast new perspectives revealed by contemporary science and exploration; and if Impressionism was destined to assimilate the new theories of color vision and the new technology of photography, and also to acknowledge in its subject matter the reality of industrialization and urbanization—then the destiny of 20th century art was quite clear: to assimilate the *machine*. That technology had reached a high point with Charles Lindbergh’s 1927 flight across the Atlantic in his “Spirit of St. Louis”, at the conclusion of which Lindbergh became overnight the most celebrated individual on the planet, and his quickly-written account of the mission, *We*—the title referring to Lindbergh and the aircraft itself—a best-selling hymn to the partnership between man and machine [24]. The art world, moreover, was paying attention: for much of the important art work of this period, it is likely to be more difficult to establish the absence, as opposed to the presence, of a machine-influenced aesthetic (Figure 4).



Figure 4. *Le Canigou*, by Juan Gris, 1921. Oil on canvas, 65 × 100 cm. Albright-Knox Art Gallery, Buffalo.

4.2. *The Pioneers*

A moment’s reflection will demonstrate that an uncompromising pursuit of an art of the machine must culminate in a *machine-based kinetic sculpture*; and although mainstream art history has failed to

connect the dots, we can note in retrospect that several prominent figures of the early 20th century experimented with, or envisioned, a mechanical art: Brancusi, with his polished bronze pieces rotated by hidden motors [25,26]; Tatlin, with his dynamic *Monument to the Third Internationale* [27]; Gabo, with his *Kinetic Construction*, and his planned *Monument for the Institute of Physics and Mathematics*; and Duchamp with his *Bicycle Wheel* and *Roto-Reliefs* [28].

4.3. The Chosen Son

Although the influence of these pioneers remained largely theoretical, following in their wake was a young sculptor seemingly destined by history to preside over the triumphant marriage of art and the machine—the son and grandson of sculptors, but also a mechanical engineering graduate of the Stevens Institute of Technology; one of those clever Americans, therefore, but working at the time in Paris, where he could absorb the technocentric influences of Constructivism, Futurism, and the Bauhaus; and who, as a private citizen, had been one of the multitude present at Le Bourget to welcome his countryman Lindbergh [29]. We should not be surprised, therefore, to recollect that this artist mounted in 1932 “the first entirely kinetic exhibition in the history of Western art” [30], and at which exhibition fully half of the pieces were *motorized* (Figure 5) [31]. (Einstein himself is later said to have spent forty minutes observing the complete cycle of one such work [32].)

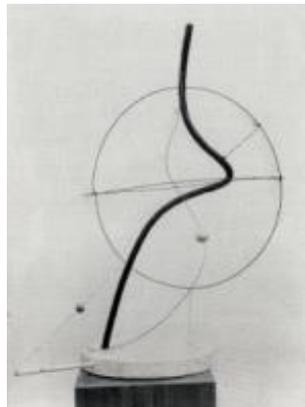


Figure 5. *A Universe*, by Alexander Calder, 1934. Pipe, motor, wire, wood and string, 103 × 76 cm. *Museum of Modern Art*, New York.

What *should* surprise us—and what has been totally ignored by art history—is the fact that this artist was shortly thereafter to retreat from his encounter with the machine in favor of a suspended, decorative art form which, though quite sophisticated in appearance, was actually of a simple construction that had *nothing whatsoever to do with the technology of the early 20th century*; and although this art form was indeed kinetic, its reliance on random wind currents completed the severing of his commitment to the dependable machines which modern humanity had been at such pains to forge—and one of which had carried Lindbergh safely across the Atlantic. The artist in question is, of course, Alexander Calder; and the suspended art form of course the *mobile* [33].

4.4. Post-Mortem

A post-mortem must presume that, in their attempts to create a true art of the machine, Calder and his fellow pioneers had encountered some sort of barrier, the nature of which is revealed in a key passage from Burnham:

As Rickey has observed, perhaps in years to come Calder’s stunning success with the mobile, coupled with a dearth of research by younger artists into the possibilities of mechanical motion, will appear as some curious breach in the plastic evolution of this century. Calder’s early overwhelming success with quasi-random motion convinced almost all observers that attempts to produce a machine-driven *deterministic* art [italics added for emphasis] would be clumsy by comparison [34].

The machine, in other words, can be a breath-taking thing when seen speeding through the skies—but when made to operate in the confines of an art gallery or museum, its repetitive, Sisyphean nature must become evident. We may therefore posit a “spectre of determinism”, and in reference to which the later trajectory of 20th century kinetic sculpture can be easily decoded: Calder, desperate to move forward with his innovations, “invents” the wind-driven mobile as the ideal antidote to the machine’s determinism; George Rickey and Lin Emery, finding themselves with a “latent affection for the machine” [35], endow their kinetic works with metal bodies and precision bearings, but continue to depend on the liberating effects of wind power [36,37]; and Jean Tinguely and Nicolas Schöffer—finding themselves with not only a latent affection for the machine, but also for its beating heart of an engine—discover that the inclusion of seemingly random *mechanical* elements will keep determinism at bay, and thus allow them to return to the practice of building motorized works of art (Figure 6) [38,39].



Figure 6. *Hannibal II*, by Jean Tinguely, 1967. Steel, motor, pulleys, black paint, 250 × 715 × 140 cm. *Museum Tinguely*, Basel. Note, in particular, the dangling chain.

More recently, there have been several kinetic sculptors—Arthur Ganson chief among them—who have gone over to the dark side of the force, *i.e.*, who have *embraced* the depiction of the Sisyphean struggle, but with the result that they have been able to create some marvelously active and exact machines, and, in particular, the humming but very much geared-down motor which will never discover that the shaft which it is attempting to turn is in fact embedded in concrete [40]. Not to this

day, however, has a kinetic sculptor established a major reputation by creating works in which the deterministic aspect of the machine is treated in parallel with the dynamic and heroic, *i.e., in which the machine is treated on its own terms*. There is, moreover, an unfortunate corollary: filled with spectacular machines, the Smithsonian's Air and Space Museum is the world's second most visited; yet the machine as the "precise and splendid instrument of human aspiration" [41] remains little known to art.

4.5. Aftermath

The handful of kinetic sculptors just mentioned—and some not mentioned—have nonetheless kept open a vital artery; but that century which had begun with a determination to re-connect art and engineering had now not only run headlong into the very real challenges of an art of the machine, but had also found itself further disoriented by the attempt to substitute for it Calder's colorful mobile:

The whimsical, romantic spirit of Calder's art, with its affinity to the paintings of Arp and Miro, is quite independent of the spirit of Constructivism. And it was Constructivist principles that formed the core of modernist abstract sculpture, including kinetic sculpture. [42].

The larger myth of the mobile is that it represents the triumph of kinetic sculpture, when in reality the mobile was as different as one could imagine from the original vision: passive rather than active; not at all mechanical; and random rather than directed in its motion. Indeed, the mobile drew upon none of the incredible technical resources of the twentieth century, the appropriation of which had of course been the principal inspiration of the original kineticists [43].

The aberration of which we speak directly affected only sculpture; but as an art of physical presence, sculpture of course has a great psychic impact on its sister art of painting. (Whence Impressionism without Rodin? Whence Cubism without Brancusi?) The entire enterprise of art was thus affected—cut off from an authentic engagement with the machine, which should have been its source of vitality, and encouraged by the mobile to substitute style for substance. To be sure, there remained some important experiments in extending the limits of a traditional sculpture and painting, as highlighted by the work of Giacometti [44] and Diebenkorn among many others; and for one shining moment in the early 1960s it even seemed as if the art world was on the verge of whole-heartedly embracing the mechanical experiments of Tinguely, and the public on the verge of embracing Tinguely himself (Figure 7) as the new embodiment of the artist:

We are reminded [by the new Museum Tinguely catalog] that exhibitions of Tinguely's work typically drew record crowds to the galleries and museums; and we are further reminded that, in the summer of 1964, there were no less than two Tinguely-like characters on the screens of American movie theaters [45].

Yet the name of Warhol was surfacing at precisely this same time, and it is of course his work that was to mark the end of a Modernism to which the term "heroic" could be easily and often applied, and that was also to set the pattern for the rest of the century: all that was necessary was to do

something “new” and obviously “modern”, and thus provide fodder for the insatiable 20th century media—a substantive technique and the continuity of Western art be damned [46]; and all of this the precise rap which can be lodged against the mobile. How tempting it is—and how easy—to connect this Calderian misadventure with most of the subsequent woes of modern art; but as the 20th century has passed into the 21st, one thing can be said with confidence: if art brings to the consideration of things a certain maturity, a certain intensity, and a certain vision, then it must be clear that art has not occupied its strategic and traditional position in respect to our technocentric society. Yes, we have art a-plenty in which science and technology serve as window-dressing [47], medium, and source of imagery. Contemporary art has essentially failed, however, to come to terms with the machine as *entity* [48]—and it is as entity that we shall surely re-encounter the machine in the very near future.

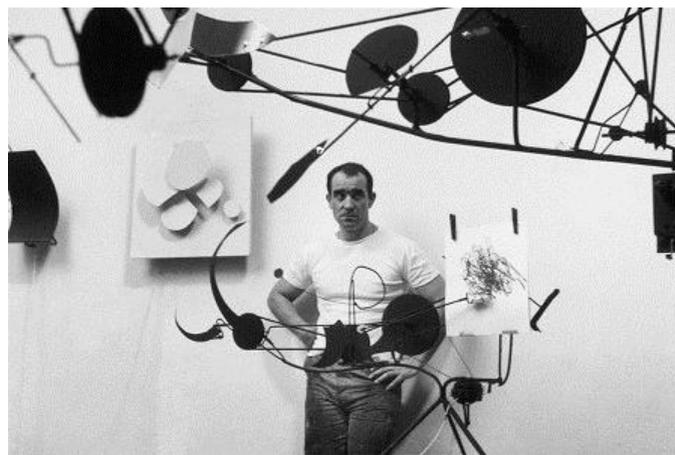


Figure 7. Jean Tinguely in his atelier in 1959. Martha Rocher/*Museum Tinguely*, Basel.

5. Discussion

The above account raises at least three important questions—and these with some clear implications attendant upon the answers to them:

The first question, as always, is “Who is to blame?”; and here we must exercise compassion: working at the exact midpoint of the unsettling interlude between the first and second world wars—and somehow conscious of the burden which history had placed on his shoulders—it is no wonder that Calder attempted to pull a rabbit out of the hat:

And though it is absurd, and even grossly unfair, to think that things might have been different had Calder succeeded in 1931 in creating a true art of the machine, the fact remains that the machine continued as the near exclusive property of the industrialists and the generals—and so began the steady march to World War II, Stalin’s “war of motors”. If artists did not know what to do with the machine, the generals did! [49].

In terms of misappropriating technology, however, the United States would of course put the European combatants to shame, demonstrating at war’s end the capability of ending civilization itself, and in the process killing tens of thousands of Japanese civilians; all of which I mention only by way of emphasizing two related points: first, that Calder’s evolutionary misadventure takes on added

significance in being to some extent the result of historical forces as opposed to chance occurrence; and second, that the subject of an art of the machine was not—at least at that time—one of rarified aesthetics.

But perhaps it has become so; *i.e.*, perhaps we have entered an age in which the art *object* has finally and truly become passé.

Under the heading of “the machine”, I have in this essay conflated the mechanical with the electronic; and although the computer is indeed a machine, it has become so sophisticated as to have helped make possible a virtual universe—and which universe, it might be argued, has become the preferred venue for the creative spirit. Thus our second question: does there remain any value in a *physical* art of the machine?

Foolish, indeed, the occasional writer on art who would attempt to present a definitive answer to this question, with its far larger implications. Let him, rather, present a series of observations which demonstrate that the field of the mechanical has enjoyed a symbiotic relationship with the electrical and electronic, and thus continues to evolve in spectacular fashion—and to surround us everywhere:

- The silent, compact *electric motor*—which has been, and will continue to be, the motive element of choice for a progressive kinetic sculpture—is only now about to enter its own golden age, and this by virtue of replacing the internal combustion engine in hundreds of millions of automobiles.
- Were your own computer under threat, it is the electro-mechanical *disc drive* which you would hope to rescue—a device, moreover, powered by that same electric motor, and as much responsible for the explosive growth of the Internet as is the purely electronic microprocessor.
- Another electro-mechanical device—the *android*—is without doubt this century’s equivalent of the once unimaginable flying machine: it can walk, and talk—and if given the key to one’s apartment, let itself in—and it is just around the corner.

We have here, in short, an arena in which art must not only retain the presence captured for it by the exertions of the pioneer kineticists—it is an arena above which must soar the engine of a fully-evolved kinetic sculpture (Figure 8).



Figure 8. *Wave*, by Lin Emery, 1988. Polished hollow aluminum forms mounted on precision, all-weather steel bearings, 457 × 427 cm. *New Orleans Museum of Art*.

Hence our third, and final, question—and one which might be equated with Lenin’s “What is to be done?”: no matter how much we might wish to create an art of the machine, are we not facing the “spectre of determinism”, *i.e.*, are we not dealing with a tautology—the ideal machine as relentless and unvarying as possible, and the ideal work of art expressive of a sense of freedom and possibility?

To claim that it is therefore impossible to create a true art of the machine is, of course, precisely the type of challenge upon which art depends for its existence; and is this not, after all, the point of *all* art—to animate the lifeless, to infuse substance with spirit, to “forge out of the sluggish matter of the earth a new soaring, impalpable imperishable being” [50]?

Even more to the point, have we not here stumbled upon the very subject and question which have become the universal focus of modern inquiry: the subject of *emergent phenomenon*—and the question of how consciousness has emerged from deterministic matter [51]?

We have also strayed, however, into the often fruitless realm of philosophy. As artists, let us rather continue our inquiry within the realm of the concrete—and what could be more concrete than the marble *Kritios Boy*?

It may be supposed that, having established this Greek masterpiece as an exemplar of the virtuous cycle at work, we return to it now only to address our final question—and this will indeed come to pass in the few words remaining to us. As I have attempted to indicate throughout this essay, however, art cannot be reduced to a formula. *If consciousness is the great enigma of the universe, then art is the great enigma of consciousness*; and although we presume to have already placed the *Kritios Boy* under consideration, the fact of the matter is that this compact figure—re-discovered on the Acropolis in 1865, beneath the rubble of the Persian Wars—has for Western cultural history no less revolutionary significance than Henri Becquerel’s small mass of uranium salts has had for the history of Western science, and thus defies adequate assessment.

We have already alluded, for example, to the stringent circumstances of its genesis; but could we not go so far as to say that a block of fine-grained marble is no less deterministic, in its own way, than an ingot of steel; and as evidence of this refractory quality, could we not cite the fact that previous generations of Greek sculptors, working to the Egyptian model, had been able to wrest from such blocks nothing more than their rigid and lifeless *kouroi*?

Yet before us stands the *Kritios Boy*—and who, in merely standing, has brought into being a universe of possibilities for Western humanity.

To this, also, we have already alluded; but again, there is always more to be said: his contrapposto position a model throughout not only the classic and neo-classic periods, but also for Rodin’s thoroughly modern *Age of Bronze* of 1877; the emphasis placed by a modern source on that same contrapposto pose as the first exposition of the human form as *system*—and thus the possibility of seeing the *Kritios Boy* in surprisingly contemporary terms [52]; and finally this summary statement by Kenneth Clark in which is established no less than an ethical dimension:

In comparison to the soft figures of Indian art, Greek bodies have structure, depicting a humanity capable of endurance, effort, accomplishment, sacrifice [53].

An astounding legacy, and one which certainly banishes the spectre of an impregnable determinism; but there is also a quite unexpected lesson for those who would take up the challenge of an art of the

machine: *the phenomenon of the Kritios Boy utterly transcends what might be considered even the most expansive bounds of an artistic practice*. Yes, great art is characterized by the longevity of its influence; and yes, the author of this work was no doubt aware that it represented some daring innovations; that same author, however, could have had no inkling whatsoever of the degree to which those innovations would continue to resonate for two millennia.

We are dealing here, in other words, with a phenomenon on the order of Magellan's miraculous 1519 circumnavigation of the globe, or Pasteur's miraculous 1885 cure of the viral disease rabies; *i.e.*, we are dealing here with the mysterious creative power of the universe itself:

Another parable put he forth unto them, saying, the kingdom of heaven is like to a grain of mustard seed, which a man took and sowed in his field; which indeed is the least of all seeds; but when it is grown, it is the greatest among herbs, and becometh a tree, so that the birds of the air come and lodge in the branches thereof [54].

6. Conclusions

Therefore think not, young sculptor, that you are going to waltz into your studio and create the definitive work of mechanical art, and so help launch the new “poetic-mythic-scientific renaissance” [55]. Retain, nonetheless, your youthful passion. Know also that the wind is at your back, and that society is massing its forces behind you, in the forms of a computing infrastructure which has for the first time made it possible to share videos and animations of your designs with those of like mind [56]; a technological infrastructure which caters increasingly to the artist [57]; and a commercial infrastructure which looks increasingly to the arts for direction.

Know this, as well: the cosmos is said to be nothing more than a vast mechanism, and therefore indifferent to your existence—yet it has endowed a much suppressed people with an unsurpassed musical genius, and has placed in their throats this vision of a quite beautiful and personal machine:

Swing low, sweet chariot,
Comin' for to carry me home!

Acknowledgments

The author would like to acknowledge Taney Roniger and her editorial dedication in *Caldaria* to the subject of kinetic sculpture.

Conflicts of Interest

The author declares no conflict of interest.

References and Notes

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2. Burrough Hill archaeologists find Iron Age chariot remains. *BBC*, 13 October 2014. Available online: <http://www.bbc.com/news/uk-england-leicestershire-29598266> (accessed on 24 November 2014). Note that this was apparently a ceremonial, artistically-enhanced chariot.
3. Willis, W. *Swing Low, Sweet Chariot*. Composed prior to 1862. Available online as performed by the Dutch vocal group CALL: <https://www.youtube.com/watch?v=wj3dSWxNzQY> (accessed on 25 August 2014).
4. Smith, G.W. *Lin Emery by Philip Palmedo: A Review by G. W. Smith*. *Caldaria*, September 2013. Available online: <http://www.caldaria.org/2013/09/lin-emery-by-philip-palmedo-review-by.html> (accessed on 4 July 2014). See, in particular, the last twelve paragraphs.
5. Palmedo, P. Chapter VII, *The Historical Context and Beyond*. In *Lin Emery*, Hudson Hills Press: New York, NY, USA, 2012.
6. Smith, G.W.. *Aesthetic Wilderness: A Brief Personal History of the Meeting Between Art and the Machine, 1844-2005*. Birds-of-the-Air Press: New Orleans, LA, USA, 2011.
7. Burnham, J. *Beyond Modern Sculpture: The Effects of Science and Technology on the Sculpture of This Century*. George Braziller: New York, NY, USA, 1968. My epigraph is taken from page 219 of this book.
8. See <http://www.space-machines.com/> for the author's portfolio; http://www.space-machines.com/smith_2015_cv.pdf for his CV; and <http://artent.net/2015/03/27/art-and-artificial-intelligence-by-g-w-smith/> for an autobiographical sketch (all accessed on 15 May 2015).
9. There are affirmative precedents for the question of whether or not such material belongs in a scholarly journal of the arts; see, for example, this recent, idiosyncratic, and in some ways quite aggressive essay by Karen Schiff in *Art Journal*: Schiff, K. L. *Connecting the Dots/Hijacking Typography*. *Art Journal*, Spring, 2014. Available online: <http://www.tandfonline.com/doi/pdf/10.1080/00043249.2014.891911> (accessed on 15 May 2015). It could be argued, of course, that a warning of the polemical nature of Ms. Schiff's contribution is implicit in its not having been presented in academic format; but the author feels that the declarations in the last paragraph of his introduction decisively accomplish this same goal. This is, in short, an essay with footnotes.
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11. Hunnicutt, B.K. *The End of Shorter Hours*. *Labor History*, 1984, 25, 373-404. Available online: http://www.jhemingway.net/515_Mats/515_Readings/Hunnicutt_End_Shorter_hours.pdf (accessed on 17 May 2015).
12. The middle class family in which I grew up during the 50s and 60s possessed, at one time or another, at least one example of most of these devices, including the private aircraft – my father owned a one-third interest in an Aeronca Chief.
13. "It has dawned on many thoughtful persons today that while we started out to make mass production a means for a better human life, the means have become transformed into ends. As Emerson put it, 'Things are in the saddle and ride mankind.'" Erich Fromm, from his foreword to *Looking Backward* by Bellamy, E. New American Library: New York, NY, USA. 1960; p. 23.
14. Homer. *The Odyssey*; Rieu, E.V., Translators; Penguin Books: London, UK, 1991; p. 286.

15. Humanity is characterized by its capacity to deal with information in abstract form; and although the 1439 invention of the printing press automated the *distribution* of such information, the vastly greater undertaking of its collection and indexing remained a strictly manual task prior to the circa 1950 introduction of the computer. Regarding the computer itself, a later section of this essay will consider it in more detail as a type of machine – the point at the moment being that the computer and its electronic brethren can be regarded as a continuation and intensification of twentieth century machine culture.
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19. As is well known, the Yap Islanders at one time made 600-mile round-trip expeditions by sail to Palau to quarry their stone "money discs".
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22. *SciArt in America*. Available online: <http://www.sciartinamerica.com/> (accessed on 4 July 2014).
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25. "Brancusi introduced one more important innovation to twentieth-century sculpture – mechanical movement. Not all of his bases are movable but for some he has constructed turntables which slowly rotate the sculpture before the observers' eyes." Ritchie, A.C. *Sculpture of the Twentieth Century*. The Museum of Modern Art: New York, NY, USA, 1952; p. 23.
26. "A peep into Brancusi's studio, with its extraordinary collection of tools and instruments, reveals certain points of contact between even work of so timeless a quality as his and the field of modern inventions. Brancusi's preference for showing his sculpture on revolving turn-tables, and his claim that films are the only adequate means of illustrating it, provide pertinent cases in point." Giedion-Welcker, C. *Contemporary Sculpture: An Evolution in Volume and Space*. George Wittenborn: New York, NY, USA, 1960, p. 20.
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46. "The increasing diversity, inventiveness, and popularity of kinetic sculpture in the mid-1960s came face-to-face with upheavals in the concept of what constituted art. Post-Vietnam disillusionment crushed the art object under the heavy antiart weight of conceptual postmodernism." Palmedo (2012), p. 127.
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48. "The sole purpose of the arts is neither description nor imitation, but the creation of unknown beings from elements which are always present but not apparent." Raymond Duchamp-Villon, as quoted in: Hamilton, G.H.; Agee, W. *Raymond Duchamp-Villon*. Walker & Co.: New York, NY, USA, 1967; p. 112. As to my own contention that modern art has not addressed the machine as entity, the industrial paintings of Charles Sheeler might be proposed as a counterexample; but rarely, if ever, does Sheeler present a complete, functioning machine – his interest, rather, is in

the machine as a formal compositional element. For an example of art in which a non-human subject is treated as an agent of some gravity, one might turn instead to the nineteenth century animal sculpture of Antoine-Louis Bayre and Emmanuel Frémiet.

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