TIME TO LIVE

Sean Cubitt

Poets are the unacknowledged legislators of the world.

(Shelley, Defence of Poetry, 1821)

Programming is a poetry for our time.

(MJ Hibbett)

The dominant media of the 21st century are now in place: spreadsheets, databases and geographic information systems. Evolved from double-entry book-keeping, from the early adding machines and filing cabinets of the first office revolution, and from the maps that guided the first wave of European imperialism. All three share a move away from origins in chronological ordering. Time is being squeezed out of contemporary media. We need to look hard at its position in digital technology. The moving image media begin with succession – one frame after another – adding the interlaced and progressive scan with the invention of video. Digital imaging brings with it the clock function in image capture and processing; and the introduction of the time-to-live principle in packet switching, which ensures undelivered packages erase themselves so that they do not clog the system. Time is integral to digital media, far more so than to their mechanical predecessors. Vector graphics are a startling example of the potential of this temporal specificity. However, vectors are both constrained by the universality of raster displays, and redeployed in video codecs as a means for managing and controlling time. The aesthetics of digital time cannot be separated from its political economy and art that is digital needs to pay attention to the materiality of digital media, and the politics and economics that define them, especially in the moment of IPv6, HTML5 and the MPEG-LA patent wars.

I want to say only one thing today: that time is of the essence. The repression of time in the dominant media is a characteristic of the digital age. At the same time, the emergence of new forms of digital temporality at the technical level demonstrate grounds for hope that a new relationship with time can emerge. But then again, there are institutional and economic pressures fighting to maintain the atemporal character of our times. The struggle between space and time is the meat and potatoes of digital media. Let me try to explain.

It is was for many years a truism of film and other media studies that we live in an era dominated by the hegemony of illusionistic and narrative media. Avant-gardes struggled for abstraction, and for non-linear and anti-narrative modes of working. Meanwhile, it was becoming apparent that the development of neo-liberal finance capital on one hand and bio-political management of populations on the other had formed a new political economy whose foundation is a new aggregation of media.

I pause here to make a theoretical point. We have learned from the Marxist tradition, as much as from the very different theses of neo-liberal ideology, that the economy is the foundation of society. The rival claim, most cogently voiced by Foucault, is that power – politics, governmentality – is the formative agenda of social life. Both share the belief that there is a foundation. Some forms of feminist and green politics have similar structures: patriarchy, Gaia, or the relations between genders or to the natural environment are key to a a good many variants of both. It is important however to understand that these terms – market, polity, patriarchy, nature – are abstractions, as indeed is the term 'society.' We need such high-level abstractions in order to make arguments and discuss values, but we should not mistake them for materially, physically present facts. It is impossible to see a market, pick up a polity, or shake hands with nature. What we can, what we must do, is enter into relationships with human and non-human others, mediated through gesture, money, art, and bits. Mediation is the material form of power: what Foucault refers to as its 'capillary action,' the media through which authority travels from rulers to ruled, or resistance to power acts against rule. Mediation is the material form of exchange made concrete in the exchange of metals, bills, and now of bits, as well as of the material goods and services which we call the economy. A market is a complex collection of mediations between people and raw materials, factories and corporations. Mediations comprise the whole gamut of devices, from clothing to surgical intervention, which make the relations between genders materially significant. Furthermore, the relations between people and environment are not mental abstractions but enacted through the physical mediation of toxins, pollutants, husbandry and forestry. Both power and economy require media to complete their tasks, media without which they cannot function. Mediation names the material processes of interconnection, influence, reverberation and communication which, in specific formations and at specific levels of abstraction we call power, economy and so on. So much for the theoretical preamble. Mediation requires media, and those media have histories, which shape the digital forms that now in turn shape our world. (FN: There's not room here to make the argument that this is not technological determinism: mediation is not just machines but practices, nor is the relation linear causality, but the networked relationships which mediation mediates).

The dominant media of the 21st century are no longer story and picture but the three pillars of the political economy: spreadsheets, databases and geographical information systems. It is the task of digital arts in this century to address the peculiar qualities of these dominant media forms, and of eco-critical thinking to demand better, but first we need to analyze how they are constituted. The best way to do that is to analyze how they came into being: how their characteristic forms of action derived from earlier technologies and practices. This has the additional virtue of giving us some traction on how we might retrofit abandoned practices, and how to recognize genuinely new ones, to hasten the development of new media formations: new art, but also a new political economy, new human relationships, and new relations with the organic world.

It may well be that writing itself began in Sumer about 8000BCE in record-keeping for contractual purposes. For centuries across Old and New Worlds, various means of keeping tallies proliferated, and from them derived much of our mathematics. Double-entry book-keeping, providing a schematic record of profit and loss, was first formalized and published by Bartolomeo de Pacioli in 1494. The ledgers used at the time were narrative in form, in the sense that they began at the beginning and were ordered

chronologically. It was only the invention of new mechanical aids like adding machines and cash registers that changed this narrative form.

Much the same is true of the ancestors of databases. Ledgers recording the duties owed and redeemed by peasants to their feudal lords, of vassals to their sovereigns, and later daybooks recording the activities of the Spanish and Portuguese empires of the 16th and 17th centuries, and in factories and the emergent poor schools and hospitals of the 18th century, were written down in the order of their occurrence. Parish records of births, marriages and deaths were written as they happened, the writing part of the ritual life of the village. In this instance, the invention of the filing cabinet allowed a new kind of order: one based on arbitrary systems like the alphabet. These made retrieving information simpler, but did so by abstracting the acts described from their place in the order of time. Instead, date became a system as arbitrary as alphabetic order.

The mechanization of book-keeping and maintaining files went hand in hand with new media like calendars and diaries made popular by mass printing (Gitelman). The temporal order of exchanges recorded in the old ledgers was now rapidly being transformed into a spatial order; and that order was being matched to a cellular grid extending into the future as well as the past, matched to a conceptually infinite succession of days and of cells marking the advance of time, leaving behind the semantic cycle of monkish hours. Like the conceptually infinite succession of future transactions – notably the command and control of debt – and the filing cabinet as instrument of rule, calendars and diaries helped compose the rectilinear and conceptually infinite grid of contemporary spreadsheets and databases.

Accountancy and record-keeping involve essentially human relationships. The map, however, extended the range of power in the age of the great navigations and the first precursors of globalization and colonialism, to control over geography. Map-making completed the first great act of modernity, the alienation of land from the people who live in it which was at the most profound – and also most destructive – achievement of feudalism. The translation of typically lateral observation into typically flat representation, and of the curvature of the Earth onto 2D surfaces, created magnificent leaps in the geometric arts, and objects of great beauty. It also provided the rulers and colonists who were their chief market with a God's eye view of the planet. Many of them bore, and still bear, the trace of time in the form of trails or markers for historic monuments, or on older maps markers of risk and bounty: Here be Dragons, X marks the spot. Many maps trace historical boundaries and the shifting tides of empire. Maps do not exclude time, however they can subordinate it to space. In the 18th century, ubiquitous adoption of the systematic grid of longitude and latitude could predict, like a calendar, the indefinite extension of space into realms unvisited by Old World navigators – Terra Incognita. This was the first step towards the absolute map. The second belongs to the digital summa of the three great media of modernity – accounting, filing and mapping: Geographic information systems, GIS for short.

GIS compiles the data we have on populations and maps it against environments. When Foucault speaks of power mediating between populations and environments, he might almost have been speaking about

these massy software suites, where not only what we know, but extrapolations from the present into imaginary futures, are organized into communicable calculations. GIS allies the powers of these three media with the calendar to provide the perfect instrument of rule: a simulator of consensus and dissent, conformity and risk, whose product is a statistical predictor of changes to be avoided or managed. GIS is a machine for ensuring that the future looks as much like the present as the embrace of human and technology can devise. In a sense, the residue of cartography is only a metaphor for two entirely characteristic operations: the arithmeticization of knowledge, and its spatialization. All possible futures lie spread out as so many Feynman diagrams or forking paths, each of them open to the managerial rule of bio-politics.

The grid – of spreadsheet and database cells and stacks, of map coordinates, of calendrical dates – is the characteristic diagram, as Deleuze would have it, of digital media today. The array of the raster display and of CMOS and CCD cameras, LED, LCD and plasma screens, DLP and LCOS projectors; the matrix principle in storage, the grid of qwerty and calculator keys, the square waves that carry data through fiber-optic systems, all in Peter Lunenfeld's nice pun, snap to grid.

At the heart of the grid is the triumph of space over time, or rather the spatialization of time. Time is a mysterious thing: Augustine observed in the 5th century that as long as no-one asked him to define it, he knew perfectly well what time was, but if they did, he didn't. Once upon a time, time was on the human side of the population-environment equation. Very gradually, time migrated to the environmental side: something that stands over against us, in the way our tools became factories that dominated and constrained our actions. To use a now rather old-fashioned term, our tools were alienated from us; and now time has been alienated too. Alienation has an important legal meaning: something is alienable if it can be sold, given away or otherwise gotten rid of. Slavery is illegal because a human life is not alienable. To say that time has been alienated then can be construed as meaning, time (like factories, and now like information) can be sold.

When we speak of political economy, we mean the inextricable involvement of economics and politics. The pseudo-science of economics, once abstracted from politics, has resolutely failed every test (see Mosco 2009); at the same time, politics without economics has no traction as explanatory system. Most of all, neither has any actuality unless it is grounded, as we have seen, in material mediations. The alienation of time, its placing over on the side of the environment, makes it necessary, as Foucault suggests, that the political economy should mediate alien time back to the population. The instruments through which it does this are the media technologies whose history we just sketched: spreadsheets, databases and geographical information systems. So, what exactly happens to time in the media technologies of the neo-liberal database economy?

Our first observation is anatomical: time shares the arithmetic properties outlined above. Time occurs in unit steps that comprise the counting numbers. Take the basic process of digital imaging. The lens is opened for a fixed duration, during which photons flood in. Where they strike the pixel array of

receptors, the photons cause reactions which release electrons. The electrons en masse are what we call charge. To get them off the chip, ready for the next image to be taken, they have top be drained into some sort of storage. The design of the chip ensures that the charge will always flow in channels in a specific direction: let's say these are the columns of the future image. The problem then is the rows; and the solution is to have the charge from each pixel 'row' cascade down the column in strict lockstep: first the pixels from row one, then row two, and so on. This requires a clock function. Incidentally, writers complaining of the 'death of cinema' have missed this difference between analog and digital images, concentrating instead on a rather bogus argument about realism. The real distinction between the two is that analog images only succeed one another in time, where digital images contain time in the structure of each and every frame.

The time they contain was of course worked out, grosso modo, in the succession of cinema frames; and in greater detail by the scanning function of interlaced TV and analog video. But the soft blur of the old cathode ray tube gave away an ontological secret which cinema's photographic basis had hidden. No electronic image is ever complete. Even the startlingly fast refresh rates of progressively-scanned high-definition screens cannot disguise the fading of each image before the successor scan begins. It is this fading which drives television towards 24/7 broadcasting: there is no point in time when broadcasting can come to an end, not, that is, in the sense of 'the sense of an ending' that Frank Kermode identified as a crucial structuring and humane aspect of story-telling. The indefinitely extended future of simulation, the pseudo-virtual science of risk avoidance, allows no such satisfactions. (It is pseudo-virtual in the sense that pseudo-virtuality plots the knowable outcomes of known trends: the real virtual is the open becoming of unknown futures – as I'll explore in my conclusion.)

The endlessness of transmission is a quality of the pixel as the automated aggregate atom of perception, the flicker that enchants the eye, the essence of distraction which has exercised commentators on modernity from Benjamin and Kracauer to Jonathan Crary. Historically, the function of editing was to structure the flux by interrupting it, shaping space in continuity cutting, but also structuring the experience of flux into discernible scenes that succeed one another. Distracted gazing at flux is like watching the waves: the cut, which separates figure from ground and one scene from another, is a mimesis of the concentrated gaze that selects the telling detail and constructs a story – a temporal direction – from the manifold of perception. That process of in-forming flux is now undertaken at a far smaller scale. Though tiny, the pixels of a camera or projector chip are finite in dimension. The duration of exposure is also tiny but finite. But where pixels are atoms, photons are quanta, and the individual pixel in an individual exposure are aggregates of all the photons raining on them: their wavelengths as well as their numbers. The result is an average, reduced to the counting units of hexadecimal numbering. The ordering of time thus occurs not at the level of the frame now, but of the pixel. In addition, most codecs use a form of prediction to reduce redundancy in the signals they transmit. When a block of four pixels, a group of four blocks, or a less regular slice, is made up of pixels of more-or-less the same color, the codec reduces them all to one numeric code. If they stay more-or-less in the same place for the duration between keyframes, the data transmitted instructs the display to maintain that color throughout. Nothing emerges, nothing evolves or changes, in that duration. The ideology of

efficiency, now embedded in the very media through which, increasingly, we learn about the world, reduces change to its minimum. Four principles are in play:

the statistical averaging of captured light to a single figure;

the use of unit counting;

the clock function as a way of regulating the spatial configuration of the pixels;

and the predictive tools that minimize change over time.

The digital image respects space, but time is diminished.

Yet time is by no means redundant in digital systems. The basic device of packet-switching, foundational in the TCP/IP suite and increasingly to digital terrestrial and satellite broadcasting, is tied to time. The basic idea is simple: every message, whether an SMS message or a multimedia file, is split into smaller packets that find their way through the network to be reassembled at their destination. The problem is this: messages sent into the network have to have a limited lifetime, or the millions of undelivered fragments – the 404 errors, the 'unrecognized recipient' responses – would circulate forever, clogging up the vast but again finite resources of the Internet. Packets are therefore designed to contain not just data but a complex 'envelope,' which includes key data for its transmission. In addition to a sender and receiver address, each packet contains information on its position in the whole message: how many packets there are, and which one is included in the present item. Finally, the packet contains a kind of clock, listing the number of nodes it can pass through on its way to its destination. As it passes through each node, that number is reduced by one, until, if it fails to arrive, the number reaches zero and the packet is erased. This is what network engineers call the time-to-live or TTL of a packet.

I scarcely need to tell a room filled with artists and analysts of the media arts of the rich field of metaphors that can be evolved from this nomenclature. However, in obedience to my theme of the temporalities of digital media, I'll emphasize one in particular. Digital media are intrinsically ephemeral. As we have learned at various Media Art History conferences, through the flowering of archive research projects, and from important experiments like Jon Ippolito's Variable Media Network, digital media are even more prone to decay and loss than their predecessors. One facet of this ephemerality coincides with the management of time – time-management, risk management – that we have been discussing: the tendency for digital media technologies to live in an indeterminate and unending present, whose visual isomorph is the flux of pixel space.

There are then three large-scale activities going on in the digitization of time. Firstly, as countable units alienated from the human population and placed over against us as our habitat, time becomes commodity. Secondly, through the controlling mechanisms of both GIS simulations and predictive codecs, time becomes a medium of power, specifically of bio-political power. Thirdly, what both these economic and political analyses share is an aesthetic of spatialization and the endless present. To

reiterate, the aesthetic is not the icing on the cake: it is the recipe that makes the cake possible, the oven it is baked in, the chef that creates it. Political economy is conducted through these media; the forms of these media shape and are shaped by the political economy they mediate. Therefore, the electronic arts we celebrate at ISEA are by no means marginal, but the key material resources from which any new political economy will have to be articulated.

I take one last example. One of the interesting genealogies is that of projection, as ancient as the caves, as new as liquid crystal on silicon chips. Common to the mechanical projectors that launched in the 19th century are the combination of parabolic mirrors and condenser lenses used to force the light from a lamp through a tiny aperture onto a vast screen meters distant. Making light coherent would reach one apogee in the pillars of searchlights at Albert Speer's Zeppelin Field at Nuremberg; and though I don't want to make the strong statement, that coherent light is fascist, the organization of light Speer achieved should be recognized as emblematic of a certain kind of modernism, still borne in the Fox Searchlight logo.

Parallel with the development of cine-projection, late 19th century experimenters started working with the phenomenon of total internal reflection in water and glass. Two new features came onstream in the 20th century. One was laser, light with carefully construed coherence capable of traveling great distances and carrying information. The other was glass-fiber technology. The combination of light, coherence and glass in fiber-optics is the direct descendant of the assemblage of technologies which give us projection. There is, however, a final step in this process. The waveforms carrying digital signals through fiber-optics, which form the backbone of all our digital networks, are of a peculiar kind, sharing their shape with more and more universally standardizing transmission protocols within as well as between devices. This is the 'square wave.'

The units of digital media are, as we know, ones and zeros. Equally, we're all aware that zero charge is all but unrealizable, and that 'zero' is a polite fiction for 'small.' In diagrams of square waves, we see equally that the transitions from one to zero and vice versa are not immediate and total, but graduated: another feature we leave out of our logic. Like the photons we express as hexadecimal numbers, digital media deal in approximations. The approximations fit our current commodity-based, managerialist form of political economy. As we all know, transmission does not differentiate between different content types, only between units (packets, pixels); neither in packet switching nor in routers. All that is important to the TCP/IP suite, and to the functioning of any digital device, is that data be ordered in units, and that the units can be handled as if coherent. Processing – such as compression-decompression algorithms and color management systems – and display – now almost universally raster – only complete the universalization of the unit grid as the core diagram of our age. Even the hypercube that provided the essential geometry of Baran's anti-hierarchical networking is a cube, that is, composed of sides of unit length.

So, there we have a certain map of the digital terrain. From the dominant applications and displays to the clock function, chip design, packet-switching, and the square-wave in fiber-optics, our media are dominated by unit counting, statistical averaging, and the form of the grid. These qualities conspire to reduce time to a function of space; most of all, they replace the emergent and unforeseeable future with the indefinite, calendrical extension of the present. They do so, I argue, in the interests of a very specific configuration of power and wealth, which we can describe as the database economy.

Of course, this analysis of the political-economic aesthetics of digital media is problematic. It is a critique, and critique does not in general lend itself to building new options. Perhaps more important, there is no sign here of work practices that change technologies in subtle or radical ways: the work of the Peer-to-Peer Foundation and the gift economies of Linux, Wikipedia and so on; or the resilient, evocative, powerful and beautiful art that has been, and is being made, in this media. Technique, I mentioned in opening, is an engagement in media that goes way beyond the mastery that is all too often in subordination to the inbuilt norms of the toolset. In Marx's account, technology is the congealed form of the skills of generations of workers: we could, learning from indigenous wisdom, say that technology is where we in the west keep our ancestors. Indigenous people, when they pick up a tool, address the ancestors responsible for bringing it to the people. We however have forgotten the name of anyone but the proprietor of the technology, and in many instances not even that. Reconnecting with the living labor of the past in our contemporary technologies is one of the key actions of the digital arts. Inventing new techniques for using existing technologies is another: demonstrating their limits, working at and beyond them, creating new uses and retro-engineering what we are presented with, these are also digital arts.

We have little time to discuss the governance structures and commercial decision-making which have produced the current round of standardization. A case in point is the EMV chip, as used in chip-and-pin debit and credit cards. The letters EMV stand for Europay, Mastercard and VISA. EMV is a proprietary technology and perhaps the most significant interface between end-users and the global electronic flow of capital. In another field, the MPEG-LA Consortium control the vast majority of the patents involved in the MPEG-3 and MPEG-4 codecs. Lawyers working for the unholy combination of Microsoft and Apple assert that Ogg, and indeed any of the other open source codecs being propounded by Google and Mozilla for HTML5, infringe those patents, and that HTML5 – and implicitly IPv6 – should be tied to these proprietary formats. As even the Economist has argued in recent years, patents are becoming barriers to innovation instead of rewards. The miracle of the Internet – governed through the competing interests of over a dozen major panels and twenty or thirty minor ones – is that it works at all. But as many key organizations, among them the International Telecommunications Union, the International Standardization Office and even the IEEE, open themselves to deeper and deeper influence from transnational corporations; pressure mounts to slow the pace of genuine innovation, standardize devices and procedures, and concentrate on global market penetration.

The problem is that, from the psychology of perception used to test color responses to the design of cellnet coverage, good enough is always the cheapest option. Standardizing on the good-enough is

always the first option: think of the history of VHS tape. Only when the market is saturated and can consume no more does it make market logic to launch the next format. As long as we accept as necessary and unavoidable the constraints of digital media as given today, there will be no investment in getting hexadecimal computing, or quantum, or optical, or bio-computing out of the lab.

This does not mean that we should we be waiting for the corporations to develop our media for us. My favorite example of the road not taken is Ivan Sutherland's Sketchpad. Remember, it's not so long ago that these things were being pioneered: Alvy Ray Smith told us a story at the Digital Light symposium in Melbourne about writing the code for HSV color space overnight, because he needed it in the morning. We should not be daunted by the existence of sophisticated binary machines, any more than Sutherland or Smith were daunted by the existence of sophisticated automotive engineering. Sutherland's pioneering graphics machine used a light-pen and a vector screen: an oscilloscope. Vector displays don't scan: the gun only points to the part of the screen to be activated: a bit like a plotter printer, it makes gestures.

There are two things about a vector that make it an oddity in the arithmetic domain we've just charted. Firstly, vectors do not work on the counting numbers but infinitesimals. A vector can be scaled up and down forever without producing the tell-tale 'jaggies' of bitmap imaging because it is not composed of the numerical addresses of pixel cells on the grid. A vector is a line expressing an algorithm, one that can be recalculated on the fly, which has a direction: the line A to B is not the same as the line B to A. A vector moves in time: that is why it is a sound metaphor to describe it as a gesture. Because it is re-calculable, like a gesture, it can change direction, constantly or inconstantly as it moves into the future. Vectors thus include time, and reject the grid.

Ironically, they can only be displayed on raster screens, because in almost every domain, since the abandonment of vector screens in favor of CRTs in the games industry during the 1980s, raster displays dominate everywhere except in a few fields of science and engineering. However, the history of raster displays gives us a possible example of how abandoned technologies can be revivified. In the 1970s, research of plasma screens had reached a dead-end, and though IBM and others kept plasma labs open, the technology was pretty much mothballed. But in 2002, its originators took home an Emmy, and Fujitsu were in full production. Now, there are serious reasons for not wanting to boost plasma screens, not least general ignorance on how to recycle them, but the principle of revisiting residual technologies is one we can bear in mind in the case of vector screens.

Those of us who grew up in Marxism, or indeed in many other Western and Islamic traditions stretching back to Ibn Khaldoun, know to expect, at the high point of a civilization, the seeds of its decay and replacement by another. The job at hand is to investigate which emergent principle or principles stand opposed to the hegemony of the grid and its spatialization of everything. This is the actual state of affairs, where by 'actual' we should understand the result of all previous actions. What we are looking for is then the 'virtual' of that actual, the vast array of possibilities which arise at the present, the only

moment in which an action can occur. Alain Badiou in his Numbers and Numbering, and Laura Marks in her wonderful book on the Islamic origins of digital art, Enfoldment and Infinity, give convincing mathematical arguments why the units or counting numbers are unstable; concealing the fact that they derive from the anti-Aristotelean principle of non-identity. Posing as coherent and unified wholes, digital media persuade us not only that the present extends indefinitely, but that no action is possible in the wholly actualized digital domain. As Benjamin might have said, the vector smashes this glass prison open with the force of its algorithms. The planned, regimented extension of the actual into indefinite sameness dreamed of by Stalinists and corporate risk managers alike crumbles on its own internal dialectic. This is the satirical strategy of Benjamin Edwards's 'digital paintings,' roundly attacked by Whitney Davis in October (117). Edwards works by gathering images and logos from the streets of the USA, rendering them into 2D and 3D objects for manipulation and composition, and in many instances then reproducing the results as acrylic and mixed-media paintings. For Davis, the satire falls flat, “Ah, the wit of the digital”, he says ironically, "of digital analogy to the digital!” Davis recognizes in passing “Edwards’s point seems to be that in the digitally constructed world of office parks and shopping malls nothing does exist between the digital units,” but sadly he dismisses the point. Edwards is entirely impressive in his analysis of the artifice of coherence, and in the Shockwave sequence documenting the construction of the 2008 painting The Triumph of Democracy, painted in response to the financial crisis, the ghostly incompleteness of a planned landscape could not be clearer. If there is a criticism to make, it is that the work deploys vector graphics only to caricature the depthless spatiality of bitmaps. That leaves unaddressed the affordances of the vector to produce difference: the mathematics of emergence.

The vector is not an exclusively digital mode. They are traceable in Hogarth's line of beauty, in Klee's admonition 'to talk a line for a walk,' and in one of the most emotionally and intellectually satisfying works to date in vector graphics, Chris Brandreth's Ryan, the genealogy of vector graphics in the playful, imaginative, ever-evolving animations of its subject Ryan Larkin is entirely explicit. What appears in all these examples, as in the pioneer animations of Emile Cohl, and in popular culture in some of the best work of Pixar, is the room they create for futures of which we can only say that they are not the same as the present.

On those rare occasions when it is still possible to act outside of the planned accommodations of bio-politics – which already has in place strategies to manage the one per cent who walk up the down escalator – we make actual the virtuality, the potential stored in the existing state of affairs. That is the aesthetic of the vector: openness to unregulated, and indeed risky futures. Where time to live is measured in the dull ticking down of the square-wave clock function in packet-switching, the vector veers out of the plane of the grid – I want to say, at an angle I. (As mathematicians in the room will recognize, the complex numbers derived from I, the square root of minus one, can be represented as vectors on the complex plane whose axes are real and imaginary. Science, engineering and computer science make great use of these formulations. It is only the public expression of the digital, which is so profoundly wedded to the grid of rule and wealth-extraction). The most modest enquiry into the living conditions of the vast majority of the world's inhabitants will demonstrate that the existing regime has failed, and fails hourly, to ameliorate poverty, hunger, pestilence and the destruction of human and

non-human environments alike. The wealth it produces is sham celebrity and cheap tin trays. The power it exercises is pure anxiety, risk-averse to the point of inaction, or it is purely destructive of forces that do strain to change the world. To this extent, it is not power at all: power is potential, the capability to act, to risk, to make a decision, to change the future here and now in the only moment when it can be changed. This is the second great facet of the ephemerality of digital media: they occupy a moment not only of apolitical stasis, but of the inevitable fading away of the old, the inevitable instability, the inevitable moment when we will have no choice but to act. The existing time-to-live of digital media is actually a Heideggerian being-towards-death. The vector politics of the new media is about becoming; about living the present as action in order to create the future as new.

A search for 'vector art' will get you little more than clip art and tutorials, most of numbing, generic, unambitious, commercial ordinariness. Many animators, I know, will disagree in my assessment of Pixar, and find their work, and 3D vector animation in general dull. Of the great icons of vector mathematics, we ISEA-niks are thoroughly bored with the Mandelbrot set. In fact, it is worse than that. The central tool for controlling the steps between keyframes in MPEG and indeed almost all other codecs is vector prediction. Born free, the vector is already in chains. I make a plea, here, rather than a prophecy, and mark out a job of work. The vector aesthetic does not belong to the grid. It orients towards unforeseeable futures. It is the descriptor of action, of becoming virtual and making new actions possible, new actualities, from which further and further changes can emerge. I suppose I am trying to describe the mathematics, and the engineering principles, of hope. This is what the vector is for: creating the time to live.