Grey Goo

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COGITO ERGO

Jordan Kaplan

From our first stories of Prometheus, stealing fire from the gods to fashion life, to *Blade Runner*'s Tyrell, whose replicant, prodigal progeny comes home to confront his master, the promise of artificially crafting life, of playing God the Maker, seems always to have carried with it the threat of suffering, perhaps even damnation. Are we of the Nietzschean God is Dead camp now ready to consider the Next Industrial Revolution without fear of divine retribution? Or do we still need to trot out Asimov's Three Laws of Robotics as the commandments for this, our Brave New Millennium? Nietzsche, as though anticipating Oppenheimer, asks,

Who gave us the sponge to wipe away the entire horizon? What did we do when we unchained the earth from its sun?... Is not the greatness of this deed too great for us? Must we not ourselves become gods simply to be worthy of it? [1]

The son of a Lutheran minister, refuting the very existence of God in a new world order shaped by scientific investigation and the application of rational thought, Nietzsche questioned humanity's ability to exist without gods – even mortal ones. Had not science, the pursuit of order amid theories of chaos, become our new religion? And, in its turn, does this now accepted system of beliefs find itself threatened by the New Age of individualised and introspective holism and the on–demand bleatings of the emotionally indulged, media–fattened Jerry Springer generation?

As a culture we are now far more likely to contest the advice of doctors, researchers and government, especially if such information is passed to us via the media. But our refutation of 'fact' is often based more on personal sentiment than empiric evidence; containing within it the zeitgeist of an age characterised by self–absorbed, isolationist Neo Conservatism masquerading as socially engaged quasi–liberalism. Stem cell research has all but ceased in the US; take up of the MMR vaccine has bottomed at 80% in the UK. Down with GM crops! Up with organic shampoo! We scream our preposterous feelings into the wind – almost in spite of the research our placards endorse.

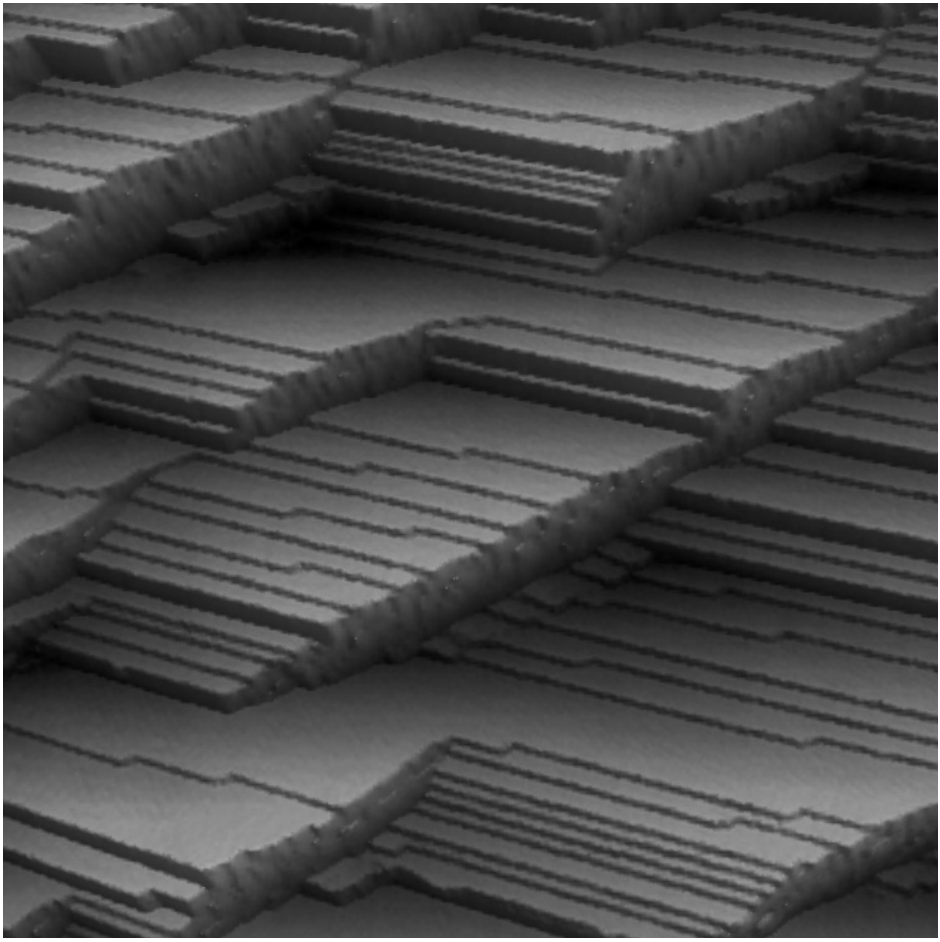
This is a media–saturated society; happy to re–visit the 'expert' parents of Alder Hey each time the loaded subject of organ donation crops up. Alder Hey parents, like anti–MMR pressure groups, have demonstrated a particular proficiency in surviving trauma that makes their testimony too personal, too authentic for the rest of us to question. And although these people are not normally research scientists or paediatricians, their voices have become stronger, louder and more recognisable than those of the communities they openly question. The line dividing gut reaction from considered ethics is being blurred when we most urgently need it: no amount of arguing the 'badness' of Saddam Hussein can wipe away the illegality of invading Iraq.

Accustomed to living with almost routine scientific breakthroughs, we have yet to come to terms with the fact that the most compelling 21st century technologies – robotics, genetic engineering and nanotechnology – pose a different threat than the technologies that have come before. Specifically, robots, engineered organisms, and nanobots share a dangerous amplifying factor: they can self–replicate.[2]

The prospect of developing machines capable of building new machines requiring neither human intervention nor permission is a scary one. It's also an extremely unlikely one. But the improbable nature of this scenario doesn't stop our collective imagination. Like parents doubting the judgment of impetuous, pubescent children who threaten to run amok the minute our backs are turned, we the public balk at the idea of giving control over to technology itself. A favourite bogey monster over the past fifty years, the self–replicator we cannot switch off has been spun into box office gold in the form of The *Terminator* and *The Matrix* series.

'The principle of mass production at last applied to biology'[3]

The nano is the scale of atoms and molecules, with one nanometre measuring a billionth of a metre. Working at a virtually unimaginable scale, where "the size difference between a nanometre and a person is roughly the same as the size difference between a person and the orbit of the moon"[4], nanotechnology suggests profound differences for humanity and our environment over the



An image of the steps on the surface of a crystal of Iron Silicide. The smallest steps are exactly one atom in height. Such images demonstrate the complexity of crystal surfaces that, on the scale that we can see with our eyes, appear beautifully polished and flat.

coming years. But this new technology, no matter how drastically it can alter our environment or construct for us an ability to live without end, will not change who we are: the means of operation will remain constant, regardless of the paraphernalia we surround ourselves with. Certainly the minority who can afford to purchase the promise of machines able to 'eat' cancers may be "fitter, healthier and more productive [like] a pig in a cage on antibiotics"[5]. But the bulk of the world's population? Throughout South America, Asia and Africa, millions are *today* in need of anti retrovirals. Their governments must battle the pharmaceutical giants and research labs for the right to purchase generic, life–saving drugs. No amount of tinkering with technology will halt omnivorous greed.

The doomsday scenario suggested by the words grey goo involves a mutated and uncontrollable self–replication of assemblers capable of out–competing organic material for resources, resulting in the extinction of life as we know it via replicators that K Eric Drexler refers to as potentially "less inspiring than a single species of crabgrass".[6] Drexler's seminal *Engines of Creation* deals in part with the potential threat inherent in such technology. Suggesting such miniaturised machines are the only sensible way forward for the evolution of nanotechnology (a position Drexler recanted earlier this year), he draws attention to the problem of gathering up enough material to build both a replicating system and the system it will one day build itself. The sheer (nano) scale of such an undertaking recalls one of Borges' famous tall tales:

...In that Empire, the Art of Cartography achieved such Perfection that the Map of one single Province occupied the whole of a City, and the Map of the Empire, the whole of a Province. In time, those Disproportionate maps failed to satisfy and the Schools of Cartography sketched a Map of the Empire which was of the size of the Empire and coincided at every point with it...[7]

The idea that somehow the map is at its best when most specific (to the point of absurdity) is one of the keys to this story. The people of Borges' Empire come to consider the representation as more real

than the land it represents. When the parchment is at last worn away, revealing the neglected earth below, it is the loss of the drawing and the reality with which it was infused which are mourned. The rediscovery of the real – the land the map was once drawn in homage to – does not become a celebration.

Such a worldview is the encapsulation of a meme – a human–selected replicated mental pattern that, like a gene, can reproduce and evolve. Societal memes can (and do) include philosophical cheek–turning, hygiene and dietary laws and fear of the dark. But memes, again like genes, are neither benign nor malevolent: the agenda they are attached to concerns survival, nothing else. So, rather dramatically, a meme can be of the 'suicide bomber' strain, surviving and being passed on to future generations through the annihilation of its now dead (but successfully martyred) human host. Richard Dawkins, who coined the word in 1976 with *The Selfish Gene*, points to the highly contagious nature of memes,

With so many mindbytes to be downloaded, so many mental codons to be replicated, it is no wonder that child brains are gullible, open to almost any suggestion, vulnerable to subversion, easy prey to Moonies, Scientologists and nuns. Like immune–deficient patients, children are wide open to mental infections that adults might brush off without effort. [8]

Applying such 'memetic' logic to the darkest imaginings of nanotech, the possibility of what is informally known as red goo emerges. Unlike grey, this red variety is of an altogether deliberate design: an intentional device in which assemblers bent on carrying out acts of nanoterrorism are released into an existing environment, whether mechanical or biological. And unlike existing weapons of mass destruction, red goo possesses the potential to target one's enemy with specificity – whether a rival tribe known to have a distinctive genetic characteristic or a single person whose coding is unique to themselves. None of the 'materials' required to build such a genetic weapon would be as difficult to get hold of as enriched uranium, certainly they would not be 'detectable' under our current understanding of weapons inspections as practised by the UN.

Of course the threat of accusation should not be ignored: claiming an adversary has developed a molecule–sized assassin that cannot be located could lead to a pre–emptive biological strike based solely on hearsay. A neat and tidy way to dispose of one's enemies, especially if they happen to possess a genetic characteristic that will single them out, leaving your troops safe and their resources, buildings and infrastructures intact. Why, even their priceless antiquities, now recognised as being of 'world heritage' importance, can remain safe – no pesky looters or protesters to worry the peace now. Who would want to produce such a weapon? Legitimate states, rogue states, perhaps stateless states that exist more as an empathetic group of individuals whose cause, however abstracted, leads us all into a new era of Nanarchy, for which a War on Nanarchy, complete with a massive budget, will no doubt be declared.

Thus, the damage done by the lay or religious ideologies that were the doctrines of totalitarian regimes is about to give way to the damage done by thought technologies capable, if we are not careful, of ending in madness, in the crazed love of excess, as the suicidal character of some contemporary actions tends to prove...[9]

Surely it is this new weapon, this love of madness Paul Virilio has coined 'philanoia' which, like the prophetic rumblings of red goo, is set to challenge our survival. Never in our creative, violent, utterly human history have we been so vulnerable – Virilio is right, this insane love affair drags us closer to the abyss.This is not technology's fault. How could it be? Grey goo is the stuff of childish fantasy, and it is now time for us to put away childish things. No, it is the deliberate nature of Arrogance and Greed – those ill–begotten children of Hate – that will destroy us, if anything does. Never before in our history have we seen so much vitriolic ideology backed up by so much hardware. To triumph over our technology, we must first conquer our hate.

Either way, it is perhaps comforting in a nihilistic, existential sort of way to look back to HG Wells' 1897 short story, 'The Star', in which a meteor passes (but neglects to hit and destroy) Earth. The melting of the polar ice

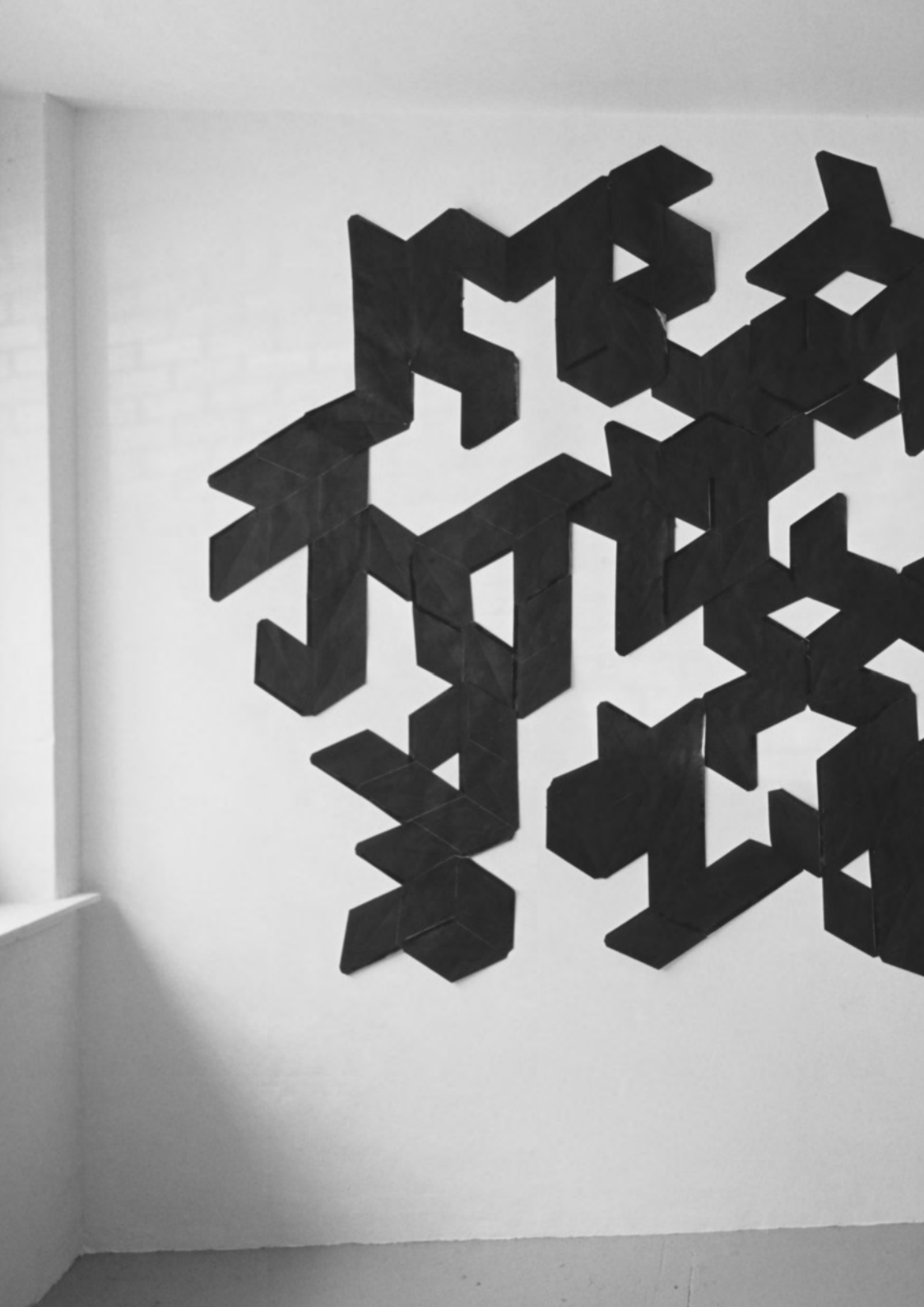
caps, tidal waves, unbearable heat, earthquakes and volcanic eruptions kill almost everything on our happy planet while astronomers on Mars observe:

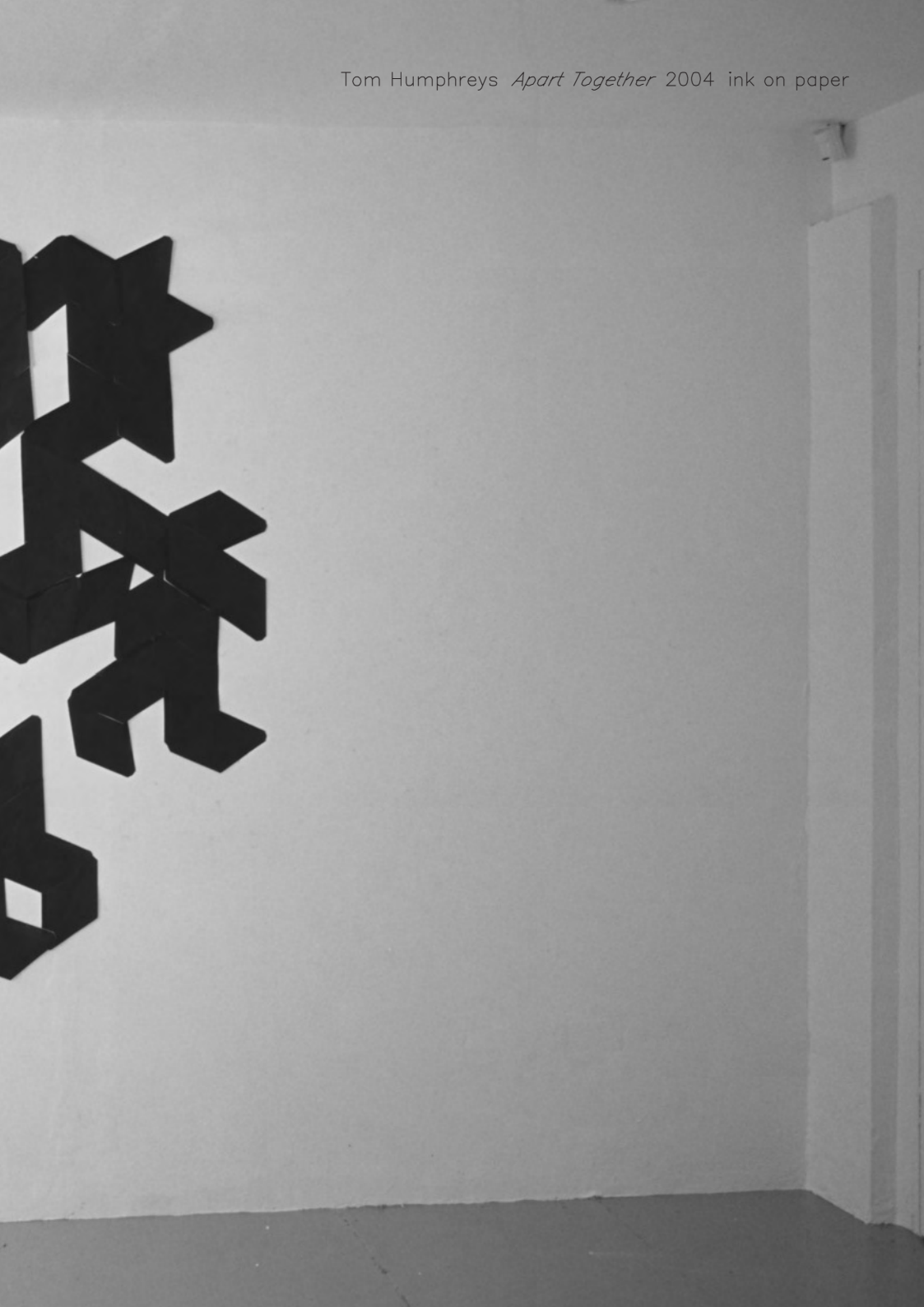
'Considering the mass and temperature of the missile that was flung through our solar system into the sun...it is astonishing what a little damage the earth, which it missed so narrowly, has sustained. All the familiar continental markings and the masses of the seas remain intact, and indeed the only difference seems to be a shrinkage of the white discoloration (supposed to be frozen water) round either pole.' Which only shows how small the vastest of human catastrophes may seem, at a distance of a few million miles.

1. Friedrich Nietzsche, *The Gay Science*, 1882
2. Bill Joy, 'Why the Future Doesn't Need Us', 2000
3. Aldous Huxley, *Brave New World*, 1932
4. Mark & Daniel Ratner, *Nanotechnology: A Gentle Introduction to the Next Big Idea*, 2003
5. Radiohead, 'Fitter Happier', *OK Computer*, 1997
6. K Eric Drexler, *Engines of Creation*, 1986
7. Adolfo Bioy–Casares & Jorge Luis Borges, *Extraordinary Tales*, 1955 (trans 1971)
8. Richard Dawkins, 'Viruses of the Mind', 1991
9. Paul Virilio, 'Unknown Quantity', 2003

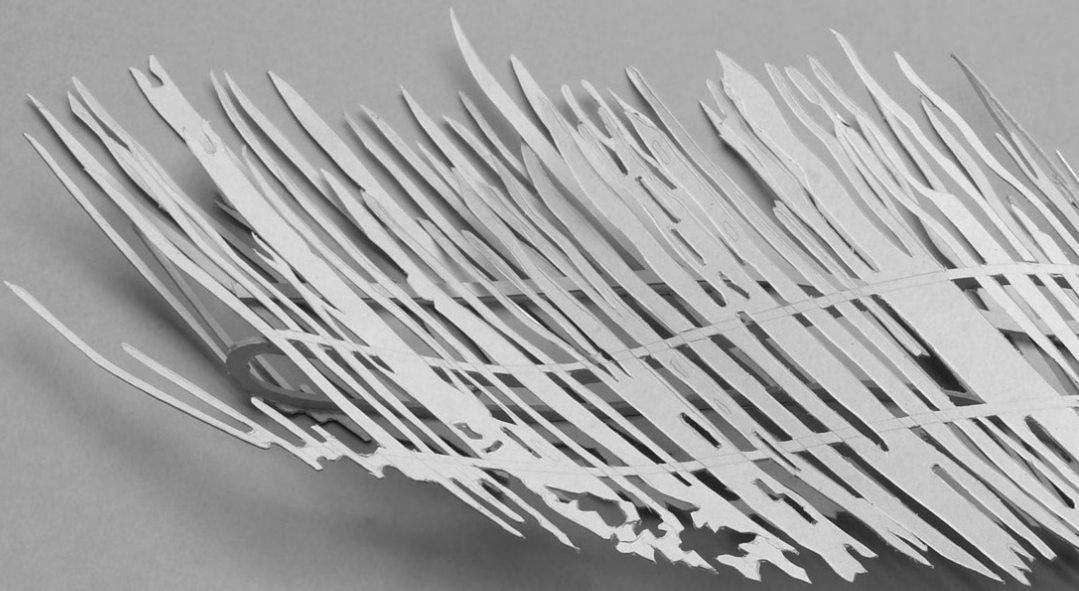
Kinke Kooi *Sunny Day, Happy Moment* // 2003 acrylic on photograph

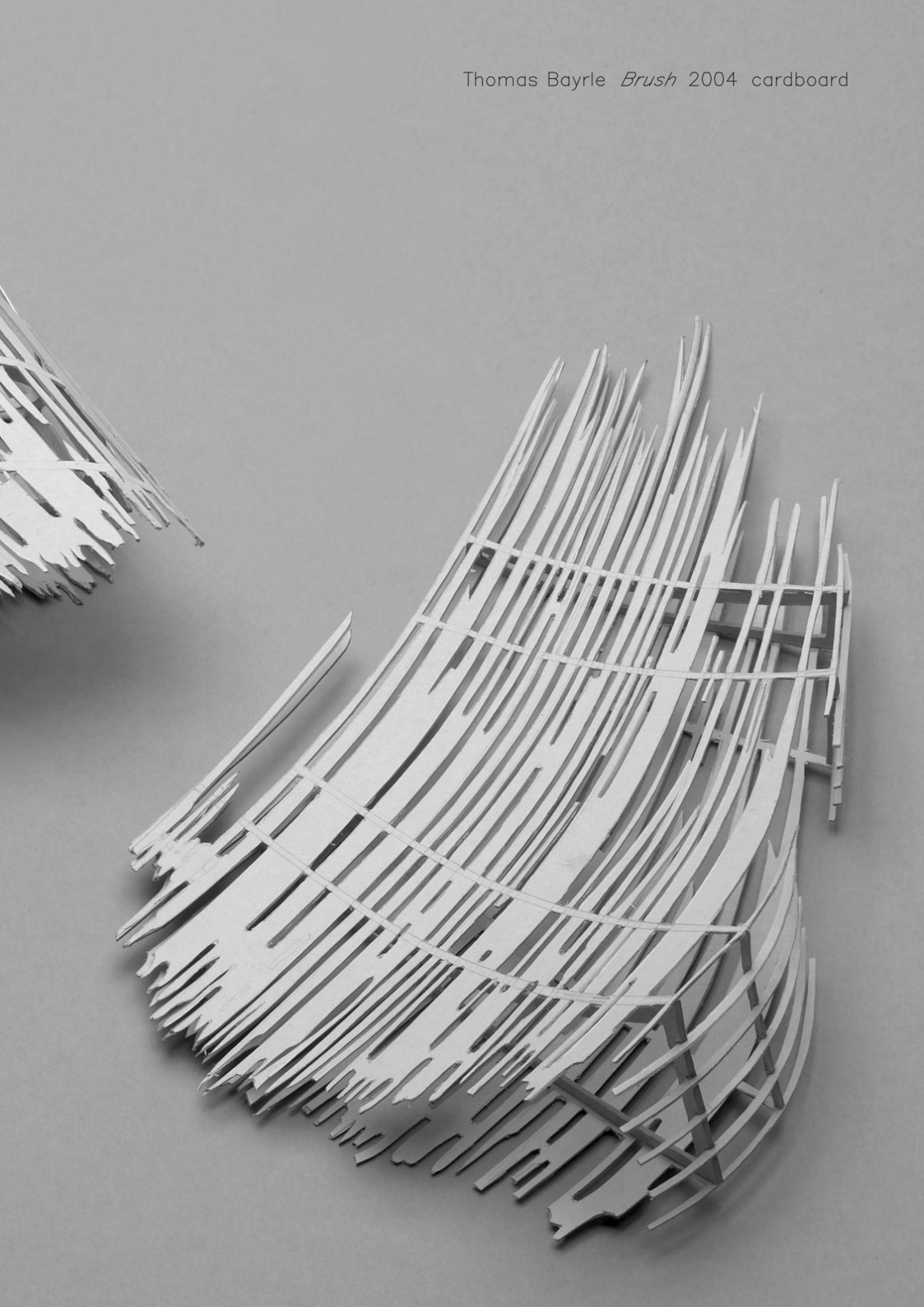
Tommy Støckel *It's Never Forever* (detail) 2004 paper



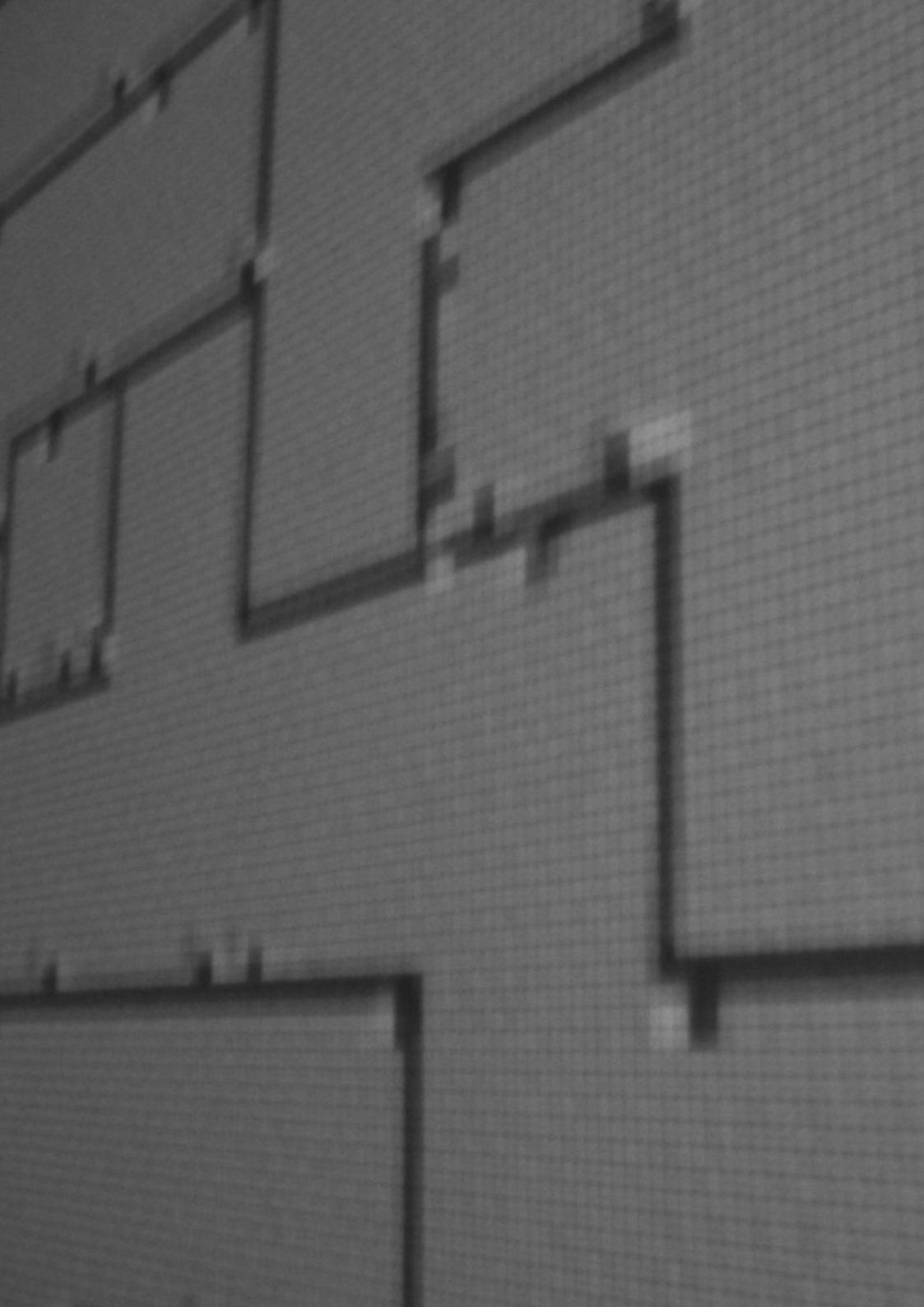


Tom Humphreys *Apart Together* 2004 ink on paper

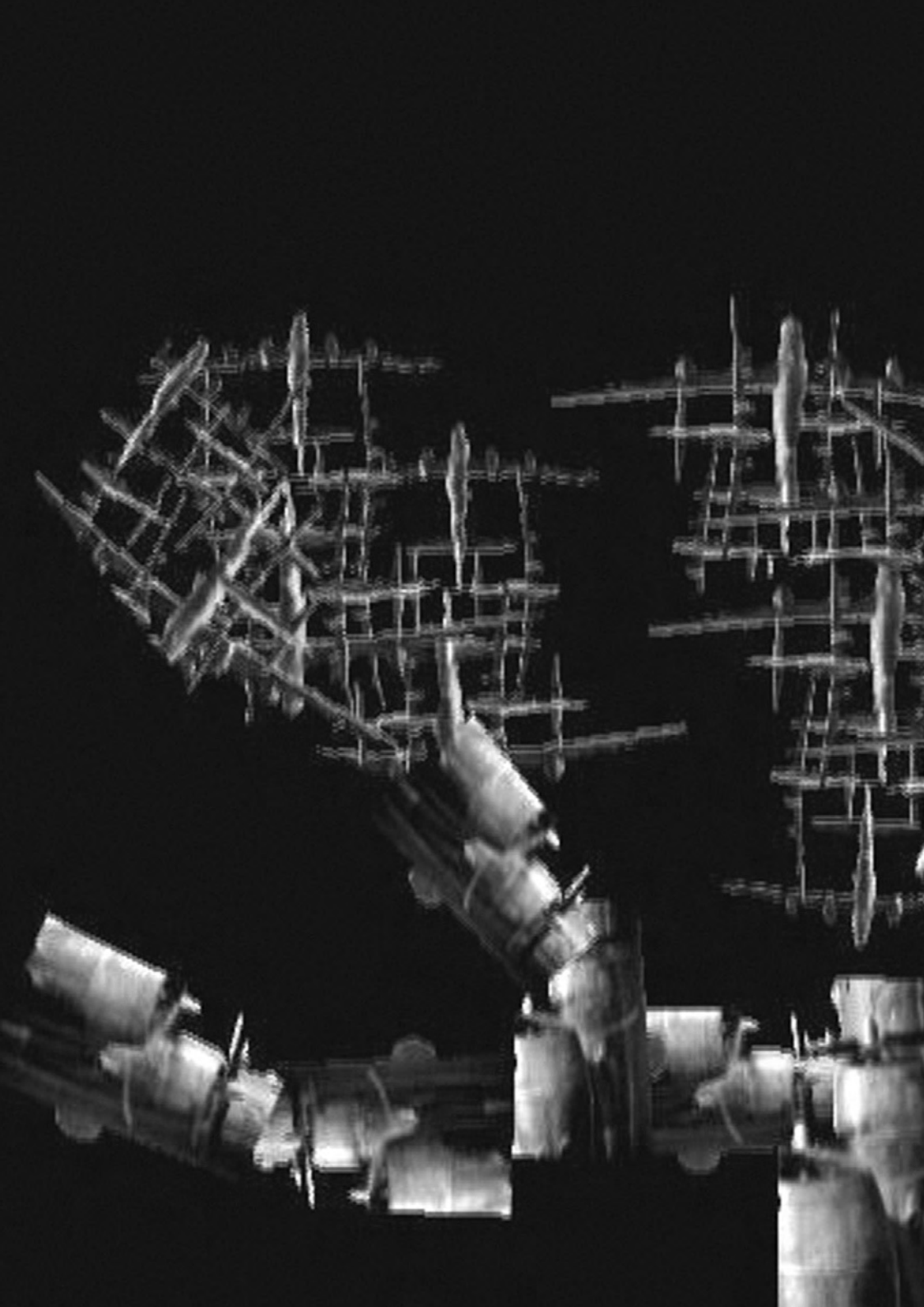




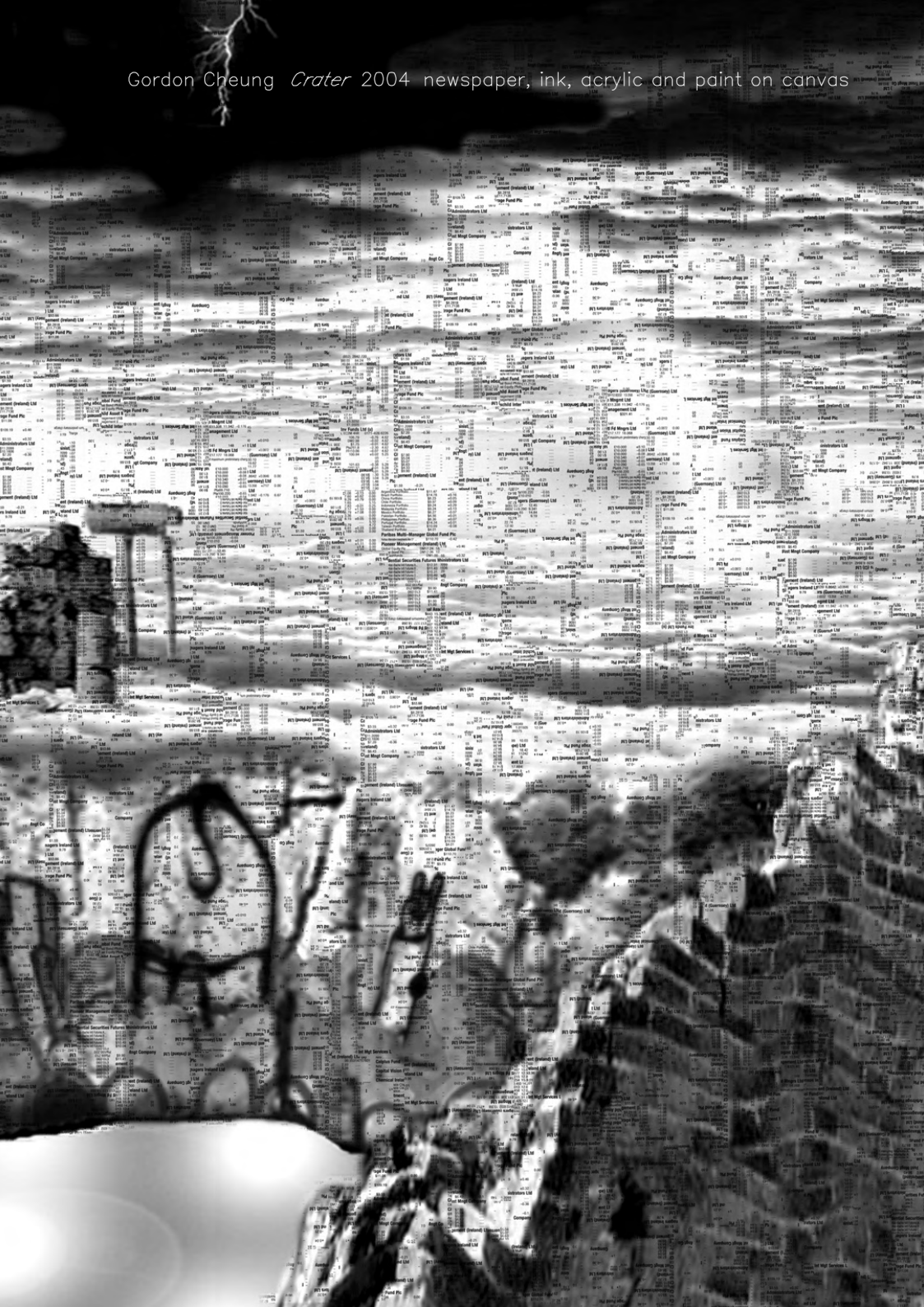
Thomas Bayrle *Brush* 2004 cardboard



David Cotterrell *God's Eye View III* 2004 computer generated projection



Pil and Galia Kollectiv *Europe After the Rain* 2004 video still



Gordon Cheung *Crater* 2004 newspaper, ink, acrylic and paint on canvas

Bloodnation / Fleshland
Pil and Galia Kollectiv

Colourful forms gleam in the dim sunlight; half crystalline, half organic shapes that intimate a posthuman world growing from our leftovers. Man's presence in this landscape inevitably signifies his own demise. The painting doesn't tell us whether they are perfectly still, cliff–like, or whether they pulsate and move. We are in *Europe after the Rain*, Max Ernst's depiction of a world regenerating from mass destruction, sprouting new life forms from decaying bodies and weapons, and we know that the goo has always been with us, even if it may not have always been grey. Landscape painting often evokes the Romantic horror of a violent nature that threatens to overshadow the man–made world. Surrounded by a nature that is too big to comprehend, whose interplay of moonlight and tide dictates the logic of the composition, the tiny black boats in Turner's stormy landscapes are completely overwhelmed by this untamed monster. Ernst's Europe, by contrast, is a world in which a peaceful balance between culture and nature has been restored through the dialectic of destruction and growth. Here, there is no room for the Romantic sublime. Adapting Dominguez' Declomania technique, the application of paper or glass to a painted surface and pulling it away, Ernst revealed hidden mutations of human and animal forms, jungles, cities and forests. The resulting horizon is constructed entirely from within the human psyche, like pieces of reality that drift to the hazy shore of dreams. When there is no longer any need to differentiate between artifice and nature, inside the human body and the outside or even between dreams and wakefulness, everything becomes simply an endlessly complex chain of atoms, proteins fused with minerals, all equivalent and interchangeable. A landscape covered with the leftovers of human intervention, both organic and technological, haunts the modern imagination, a final destabalising of the antithesis between culture and nature.

In *Grey World, Green Heart*, Robert L Thayer suggests that the landscape has always functioned as an arena of compromise between nature and artifice. But as both our perception of nature and our technologies grow increasingly abstract and become less visible – from string theory to nanotechnology – its role as mediator declines. Greg Bear's fictional account

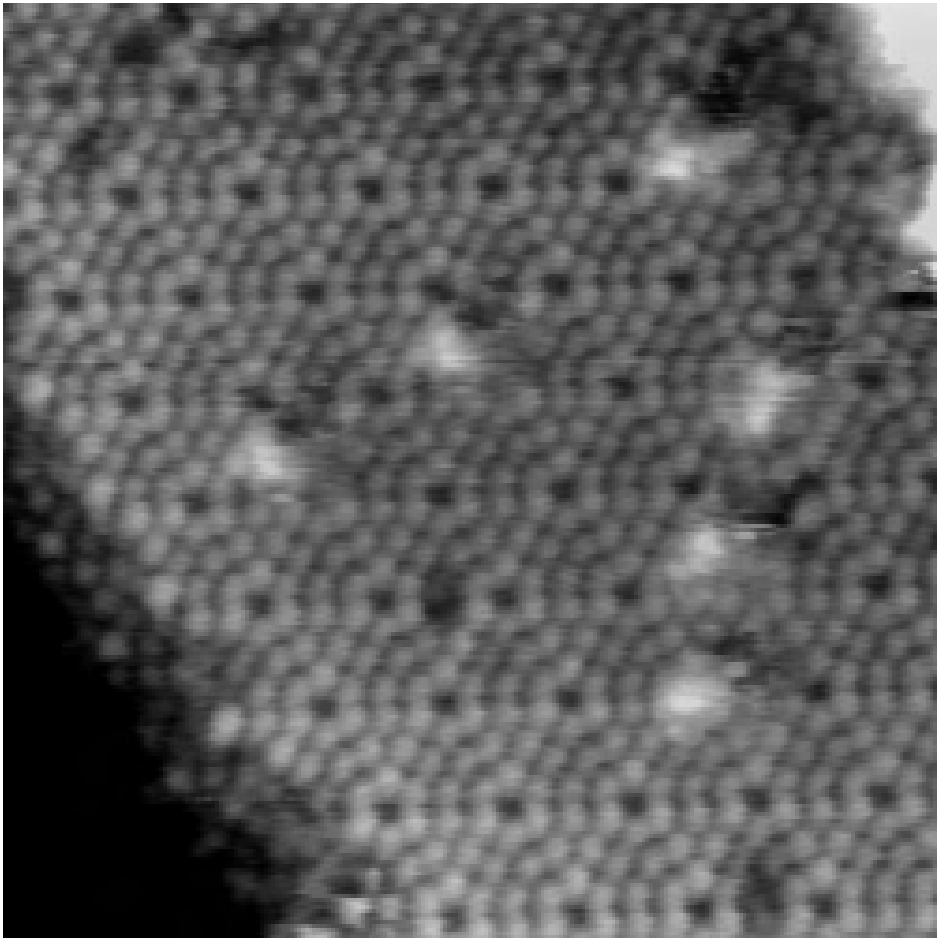
of a nanotechnological catastrophe in his 1985 novel *Blood Music* attempts to bridge this visual gap by bringing the threat of the dissolution of the landscape to its most extreme conclusion. In the book, lab researcher Vergil Ulam is instructed to terminate a pioneering experiment, just as he is on the verge of developing intelligent DNA processing biochips. Rather than destroy his work, he decides to inject himself with the modified cellular material, which at first enhances his physical abilities in a typical Jake 2.0—style superhero scenario. Of course, these intelligent 'noocytes', having mastered the complexities of the human body, proceed to encompass the brain, and as soon as they realise that Vergil Ulam is not the limit of the universe, it's only a matter of time before they venture out, at first sending scouts, finally merging several bodies and asserting the superiority of their consciousness over the human mind, the ultimate selfish gene finally disposing of mammalian co—dependency. But where most conventional science fiction would choose to end the story, *Blood Music* continues, describing the transformation of the world's populace into the world's surface, a thin film of pinkish—brown flesh spread over the American continent, threatening to leak out, connecting everyone in a shared consciousness, a kind of cyberspace – or 'Noosphere' – made physical through a complex nervous system. This is Drexler's grey goo nightmare taken to the extreme: the landscape is not just destroyed or abused by mankind, it is turned into mankind, or vice versa – the distinction collapses, humanity embarks on its next evolutionary stage.

However, there is more to the grey goo scenario than this type of body horror. In *The Reproductive System*, John Sladek envisages the world's resources absorbed through the limitless growth of a useless piece of technology run amok. His little grey metal boxes built simply to reproduce for no reason other than to obtain a government research grant, are designed to communicate with each other, learn, defend themselves against potential dangers and ultimately use any resources in their immediate environment to grow exponentially. Despite obvious similarities, Bear and Sladek's books present ultimately two different visions of grey goo as a cultural metaphor. Bear's biological catastrophe signifies the end of society as a construct based on individual thought, where "nothing is lost, nothing is forgotten. It was in the blood, in the flesh, and now it is forever". In Sladek's post—hippie

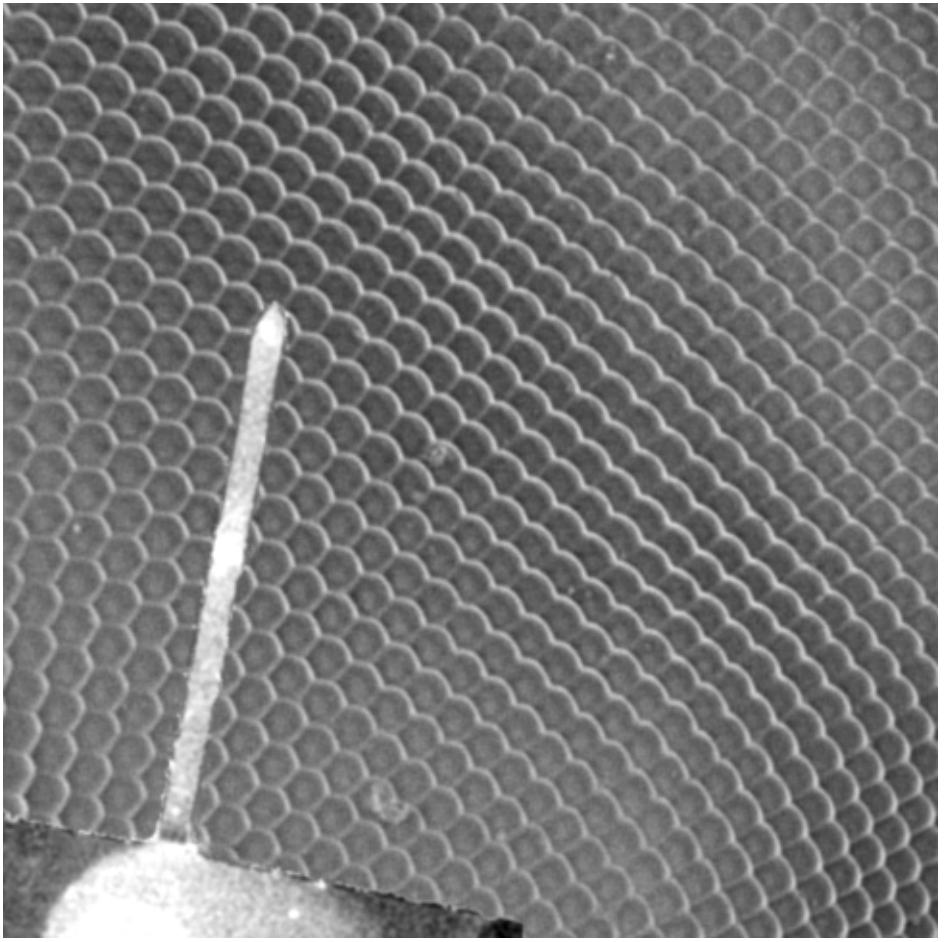
novel (written almost 20 years before Bear's or Drexler's, in 1968), the globally–spreading menace of thinking metal boxes is like a perfect Marxist formulation of how Capitalism works: capital whose only purpose is to produce surplus, a regulated system of expansion whose only goal is growth. Interestingly, by the end of the book, *The Reproductive System* brings to an end the Cold War, a prophetic realisation that the logic of surplus capital is mightier than any ideology.

But grey goo is not just futurology, a post–catastrophic science fiction scenario – it is also prefigured in the recent past. Taking into consideration its two aspects as explored by Bear and Sladek, post–subjectivity ("What you think of as INDIVIDUAL may be spread throughout the 'totality'", explain Bear's intelligent cells) and exponential surplus production, grey goo theory is alarmingly similar to certain portrayals of European Fascism in the 20th century, especially the writing of Herbert Read and in Hannah Arendt's brilliant analysis of Nazism in 'The Origins of Totalitarianism'. Fascism has often been imagined as a biological entity, a cancerous cell spreading through the healthy body of the nation state, a viral threat to the idea of the autonomous individual in liberal democratic societies. Indeed fascists themselves were always fond of organic metaphors of growth and expansion. Herbert Read's study of the subject in 'The Cult of the Leader' proposes that at the heart of the attraction of Fascism lies a craving for "relatedness, for union..." and that man has always betrayed his freedom for "Religion and nationalism, as well as any custom and any belief, however absurd and degrading, if it only connects the individual with others...", as long as they offer temporary "refuges from what man most dreads: isolation". Read seems to suggest that the Fascist leader is merely a projection of mass hysteria onto a hollow image of authority and power.

Hannah Arendt similarly describes how Nazi officials operated without direct or even indirect orders, simply in anticipation of what they thought the Führer would have liked them to do. "The hierarchy is absolute... but it's not a dictatorship. I think they effectively have more freedom than we do. They vary in different ways than we do", says *Blood Music*'s mad scientist Vergil Ulam of his intelligent cells. "The point is that none of the organs of power was ever deprived of its right to pretend that it embodied the will of the leader. But not only was the will of the Leader so unstable that compared with it the whims



Six molecules sat on the surface of silicon. The regular pattern arises from the perfectly ordered rows of silicon atoms on the surface. The molecules are the triangular objects sat on top of the atoms. The images are taken at the same time by a very sharp needle that scans over the surface a little like an old–fashioned record player. A small electrical current flows between the needle and the surface and this current is used to produce the images. The difference between the two is that in one image the current flows into the surface, in the other it flows out of the surface. The fact that the images appear very different is because how materials such as silicon conduct electricity is very dependent upon the direction and size of the current – the very reason they are used to make computer chips.



An image of a tiny needle, the end of which is used to touch atoms on a surface. In the background is the eye of a housefly.

of Oriental despots are a shining example of steadfastness... the members of the ruling clique themselves could never be absolutely sure of their own position in the secret power hierarchy". In other words, the Fascist leader is like the elusive brain functions. Ultimately devoid of any real power, of the host body that Bear's 'noocytes' go to such pains to try to understand, "a supreme command cluster". This is also why these two systems, the ideological and the post–biological, are so effective: "The body politic of the country is shock–proof because of its shapelessness", concludes Arendt.

In terms of its unrestrained tendency towards expansion, the second determining quality of the grey goo scenario, the Fascist analogy is almost self–evident. In Arendt's formulation, since totalitarian regimes base their foreign policy on the assumption that there are 'natural' principals that precede international law and the boundaries of the nation–state, the entire world becomes no more than matter waiting to be converted into part of their shapeless system. "Evidence that totalitarian governments aspire to conquer the globe and bring all countries on earth under their domination can be found repeatedly in Nazi and Bolshevik literature... they consider no country as permanently foreign, but, on the contrary, every country as their potential territory." Vergil loses control over his lab creations once they realise the 'outside' (of his body) is made of the same matter as the inside, or that "OUTSIDE *share body structure* alike" , in their own terms. For totalitarian regimes the distinction between 'inside' (Germany, for example) and 'outside' is non–existent. Arendt writes that the Nazis "in case of victory... intended to extend their extermination policy to the ranks of 'racially unfit' Germans".

If the noocytes ever did enter the totalitarian body politic as formulated by Arendt, it is not unlikely that something like Star Trek's Borg would emerge. This alien race, governed by a collective hive mind, is actually comprised of various species assimilated with the aid of 'nanoprobes', molecular machines of the type described by Bear and Drexler. The Borg consciousness is itself a kind of viral parasite, invading the host bodies of various humanoids. The Nazis are actually mentioned in the series as "the Borg of their time", and on several occasions the Borg prompt the series protagonists to abandon their precious protocol and disobey the prime directive, which dictates that all life forms must be respected and no culture must be tampered with. The Borg obviously manifest the traditional red threat era B–movie fear

of de–individuation, but they are more than just technofascist commies. Their rhyzomatic empire's pursuit of perfection – a desire to accumulate as much technology as possible and rely on biology as little as possible – suggests that they fulfil an even more frightening role in relation to Star Fleet's centralised hierarchy. The Borg have no ranks or special tasks that can only be carried out by individuals, instead they have only designations, a relative placement aboard one of their perfectly de–centralised cube space ships: changing "the central requirement from preserving *function* to preserving *structure*" as Drexler describes his cellular repair machines. While the Borg's humanoid bodies provide a tangible anchor, an anthropomorphic visual that the viewer can latch onto, their attempts to overcome the mortal coil brings them closer to Bear's invisible heirs of mankind. Assimilation is more than a threat to liberal democratic notions of the self or a mirror of the way its globalising tactics merge cultures into thoughtless sameness, it is the end of ideology, a final fusion of nature and technology that does away with the conflicted human consciousness responsible for the distinction in the first place.

JG Ballard has often claimed that science fiction is simply a fictional projection of things that are already happening onto another time. Can we therefore be certain that grey goo lies safely in the past, part of the primordial ooze, a nightmare we have already awoken from, or that it only exists in a distant fantastical future? The fusion of technology and biology, a technological catastrophe that spreads like a virus, is a virus, the collapse of boundaries of individuals and communities are all already here, growing vertically like a jungle beneath our high rises and bypasses, a Max Ernst landscape crystallising under our feet that we are too slow to comprehend before noticing our feet have been subsumed by it. Evidence is be found everywhere. In the past few years, inspired by DIY shows, thousands of suburban home owners have transformed their back gardens into fashionable little retreats, sealing them with thick layers of concrete. This mass phenomena, which prevents water from soaking into the ground, was partly blamed for the recent floods in low areas in Britain – a natural catastrophe caused by nature's alteration through the continuum of a shared psyche, a symbolic virus of communication that spreads through the suburbs and psychically shapes this emergent blend of man and nature. Resistance, as the Borg would say, is futile – we have already been assimilated.

Pages 2 & 31: Waves of magnetism on the surface of a thin film of magnetic material. Although the surface of this material is physically very flat, by imaging the magnetic structure, waves of magnetism are revealed. Think of a simple bar magnet with North and South poles. The white waves correspond to North poles pointing out, the dark waves to South poles. There would be about 5,000 such waves in a millimetre.

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