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Science Fictions: Art and Science Hybrids
Dr. Charissa N. Terranova
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OUTER SPACES

Arthur C. Clarke [1917-2008]

- 1941 to 1946 Clarke served in the Royal Air Force as a radar specialist
- involved in the early warning radar defense system, which contributed to the RAF's success during the Battle of Britain
- Clarke spent most of his wartime service working on Ground Controlled Approach (GCA) radar, as documented in the semi-autobiographical *Glide Path*, his only non-science-fiction novel
- Although GCA did not see much practical use during the war, it proved vital to the Berlin Airlift of 1948–1949 after several years of development.
- After WWII, Clarke attained a first-class degree in mathematics and physics from King's College London
- After this he worked as Assistant Editor at Physics Abstracts.
- Clarke then served as Chairman of the British Interplanetary Society from 1946 to 1947 and again from 1951 to 1953.
- Although he was not the originator of the concept of geostationary satellites, one of his most important contributions may be his idea that they would be ideal telecommunications relays.
- He advanced this idea in a paper privately circulated among the core technical members of the BIS in 1945.
- The concept was published in *Wireless World* in October of that year
- Clarke also wrote a number of non-fiction books describing the technical details and societal implications of rocketry and space flight. The most notable of these may be *Interplanetary Flight* (1950), *The Exploration of Space* (1951) and *The Promise of Space* (1968).


CHOPPER

Wireless World

Radio and Electronics

35th YEAR OF PUBLICATION

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EXTRA-TERRESTRIAL RELAYS

Can Rocket Stations Give World-wide Radio Coverage?

ALTHOUGH it is possible, by a suitable choice of frequencies and routes, to provide telephony circuits between any two points or regions of the earth for a large part of the time, long-distance communication is greatly hampered by the peculiarities of the ionosphere, and there are even occasions when it may be impossible. A true broadcast service, giving constant field strength at all times over the whole globe would be invaluable, not to say indispensable, in a world society.

Unsatisfactory though the telephony and telegraph position is, that of television is far worse, since ionospheric transmission cannot be employed at all. The service area of a television station, even on a very good site, is only about a hundred miles across. To cover a small country such as Great Britain would require a network of transmitters, connected by coaxial lines, waveguides or VHF relay links. A recent theoretical study[1] has shown that such a system would require repeaters at intervals of fifty miles or less. A system of this kind could provide television coverage, at a very considerable cost, over the whole of a small country. It would be out of the question to provide a large continent with such a service, and only the main centres of population could be included in the network.

The problem is equally serious when an attempt is made to link television services in different parts of the globe. A relay chain several thousand miles long would cost millions, and transoceanic services would still be impossible. Similar considerations apply to the provision of wide-band frequency modulation and other services, such as high-speed facsimile which are by their nature restricted to the ultra-high-frequencies.

Many may consider the solution proposed in this discussion too far-fetched to be taken very seriously. Such an attitude is unreasonable, as everything envisaged here is a logical extension of developments in the last ten years—in particular the perfection of the long-range rocket of which V2 was the prototype. While this article was being written, it was announced that the Germans were considering a similar project, which they believed possible within fifty to a hundred years.

Before proceeding further, it is necessary to discuss briefly certain fundamental laws of rocket propulsion and "astronautics." A rocket which achieved a sufficiently great speed in flight outside the earh's atmosphere would never return. This "orbital" velocity is 8 km per sec. (5 miles per sec), and a rocket which attained it would become an artificial satellite, circling the world for ever with no expenditure of power—a second moon, in fact. The German transatlantic rocket A10 would have reached more than half this velocity.

It will be possible in a few more years to build radio controlled rockets which can be steered into such orbits beyond the limits of the atmosphere and left to broadcast scientific information back to the earth. A little later, manned rockets will be able to make similar flights with sufficient excess power to break the orbit and return to earth.

There are an infinite number of possible stable orbits, circular and elliptical, in which a rocket would remain if the initial conditions were correct. The velocity of 8 km/sec. applies only to the closest possible orbit, one just outside the atmosphere, and the period of revolution would be about 90 minutes. As the radius of the orbit increases the velocity decreases, since gravity is diminishing and less centrifugal force is needed to balance it. Fig. 1 shows this graphically. The moon, of course, is a particular case and would lie on the curves of Fig. 1 if they were produced. The proposed German space-stations would have a period of about four and a half hours.

It will be observed that one orbit, with a radius of 42,000 km, has a period of exactly 24 hours. A body in such an orbit, if its plane coincided with that of the

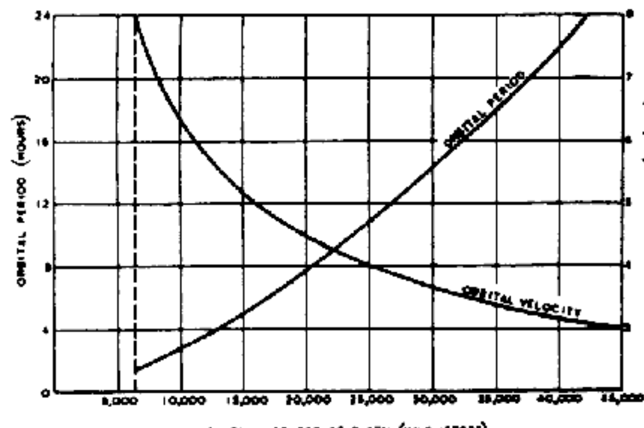


Fig. 1. Variation of orbital period and velocity with distance from the centre of the earth.

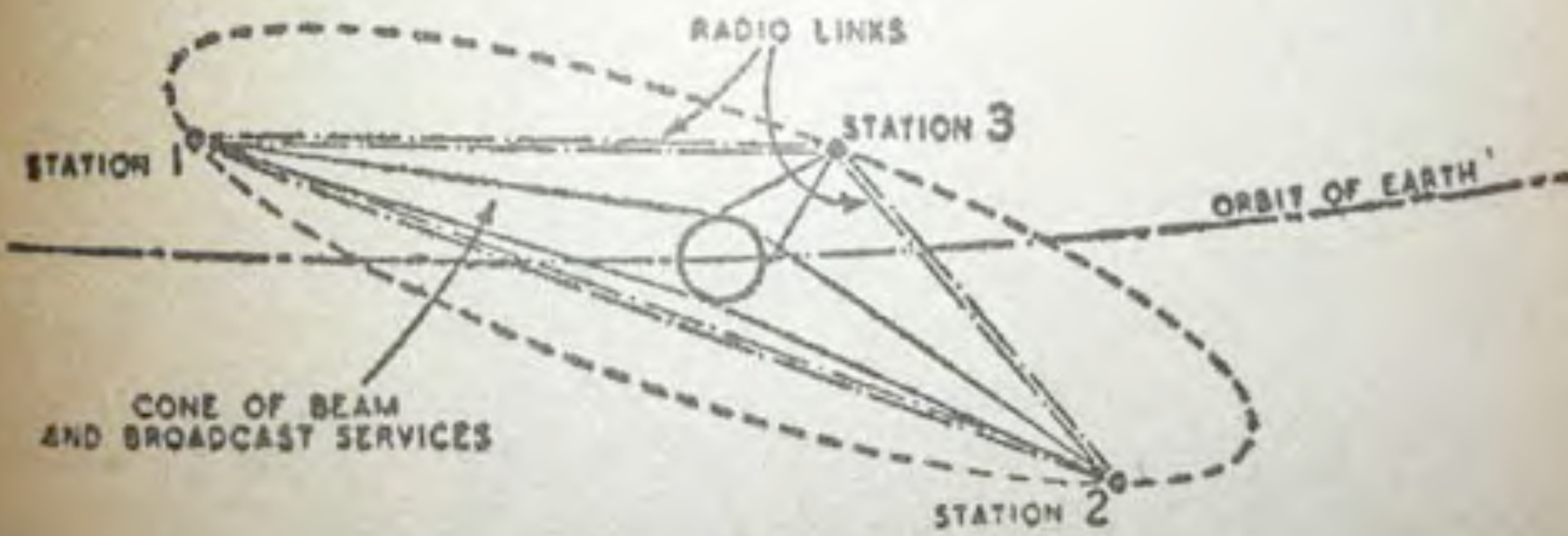
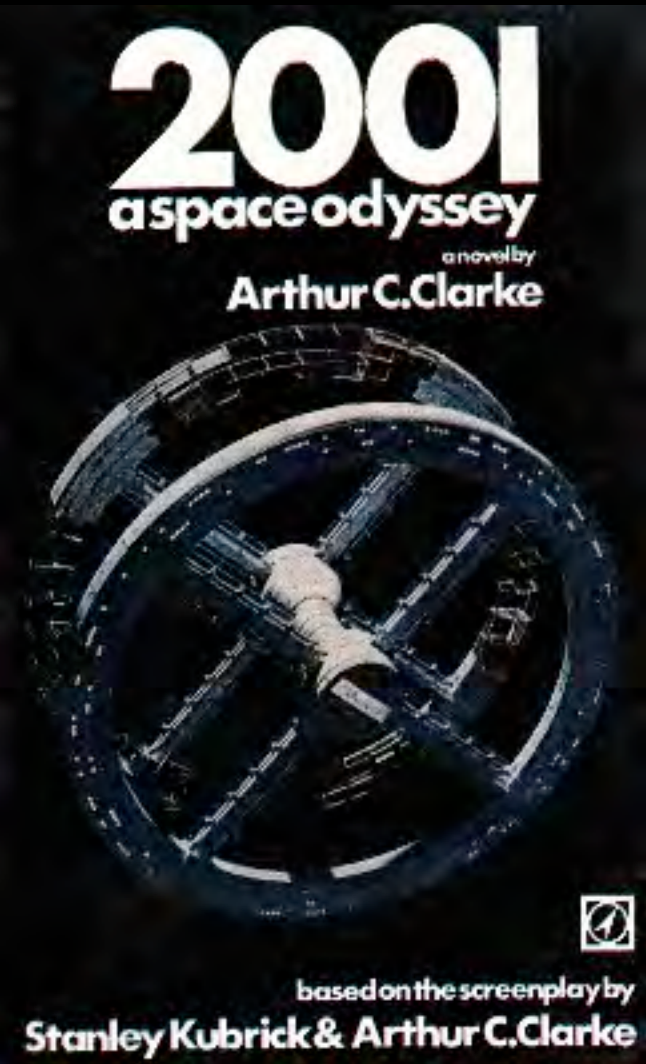


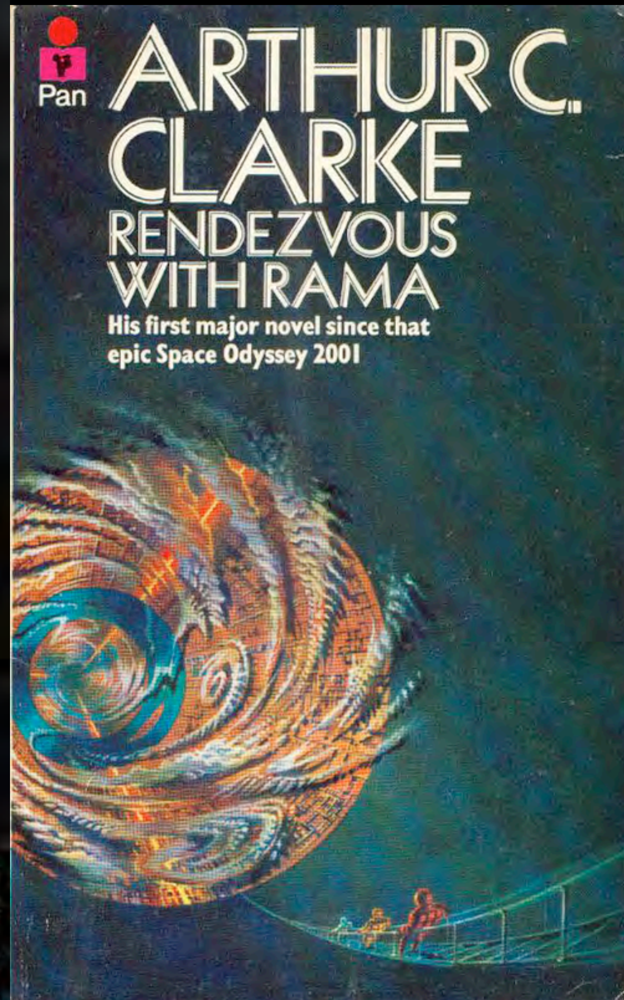
FIG. 3. Three satellite stations would insure complete coverage of the globe.

30 E—Africa and Europe
150 E—China and Oceana
90 W—The Americas

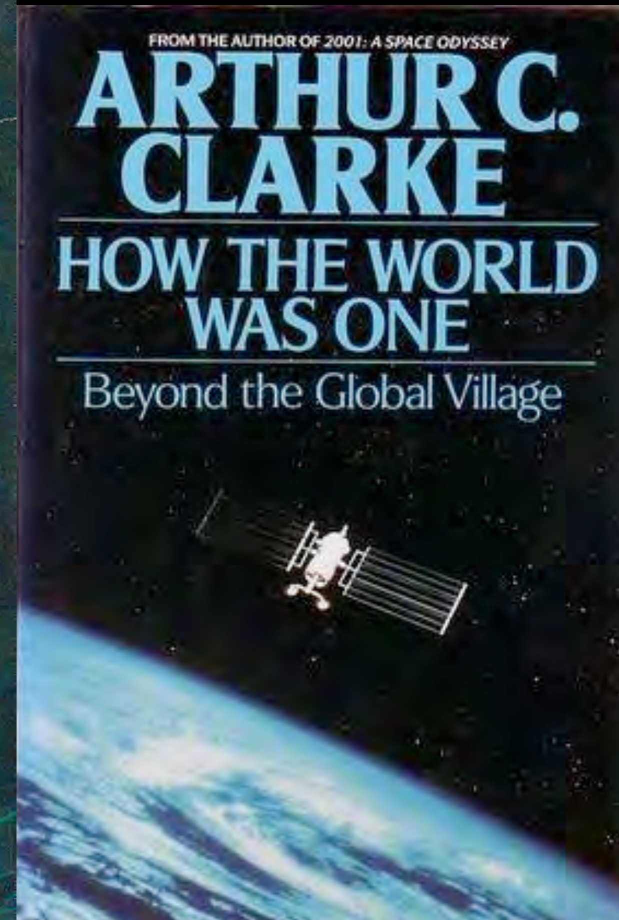
Clarke's proposal for satellites: From Wireless World *Volume LI Number 10, October 1945*



Clarke's 2001: A Space Odyssey (1968)



Clarke's Rendezvous with Rama (1973)



Clarke's book on the cabling of The Earth, How the World Was One (1992)

2001: A Space Odyssey, The Dawn of Man, Directed by Stanley Kubrick (1968)

http://www.youtube.com/watch?v=ML1OZCHixR0

Gilbert Simondon
Technology and Individuation

- Technical Individuation
- Associated milieu
- Ensemble of technical forms
- Axiological value (p. 70)
- Self-regulation
- Autopoesis
- Mechanology

Interview with Gilbert Simondon by Jean Le Moyne – On Mechanology

Q: How did you go from your concern with the problem of individuation to the study of mechanology, of the technical object as such?

S: There is an element of chance. But there is in fact a real relation, as a technical object constitutes itself as a unity, a solid unity. It is an intermediary between the world and man, perhaps also between two technical objects. The first phase of its development is a phase of the constitution of its unity, a phase of the constitution of its solidity. What is essential in a tool? It is a relation between the body of its operator and the thing it acts upon. Let's take the mosr elementary example, given by Leroi-Gourhan (of a handheld implement such as an axe or a hammer). To be a good tool it must have a firmly fit handle (or haft), it must be well constituted (example of a fit by collar, socket, snap etc). There are several solutions appropriate to different types of wood used, but each is rational if we bear in mind the two constituents of metal head and wooden handle., and the function of the tool – to establish a constant and non-fallacious relation between the body of the operator and the object he acts on. There is an individuality, but it is an internally consistent individuality of the object itself, of the tool.

Q: Let's go on to the machine. The same principle of individuation can be found, but dialectised.

S: Yes, the almost necessary beginning point is the resolution of a problem by the appearance of an intermediary, which is often a new machine part. The wheelfor example is a new part, perhaps beginning as a roll or log, but intervening essentially when it has an axle, when it is fixed in relation to a chassis while still rolling on the ground. For this intermediary to be viable, it must be solid, a single block. It must be assembled, and the technique of assembling is the artisanal technique of solidity, making a single block out of several. This is the first phase, that of individuation and stability: a wheel must be ***a*** wheel, one object and not several.

Q: Does the same principle apply no matter what the complexity of the technical object e.g. to a complexly constituted machine?

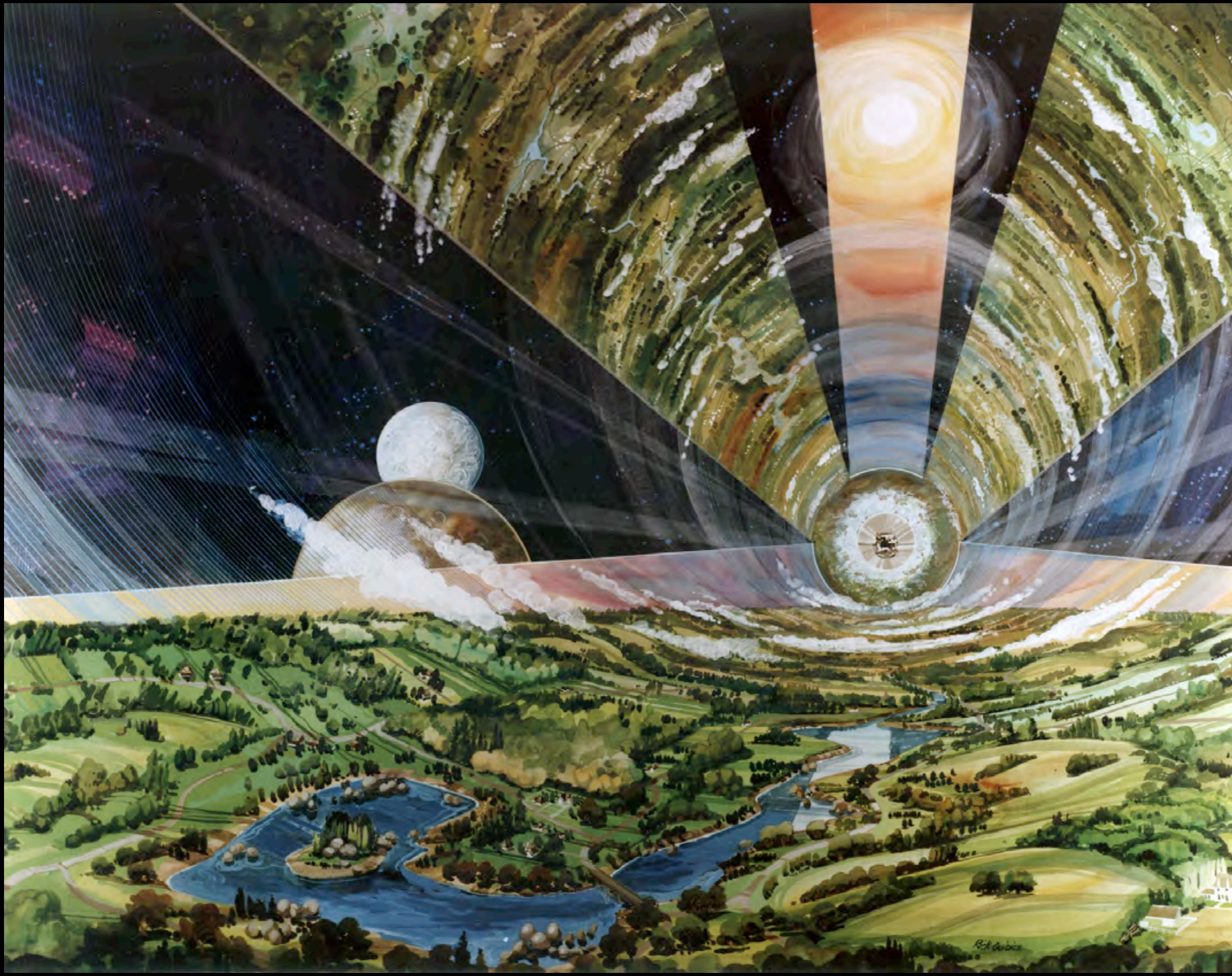
S: For a machine to exist, it must first be viable – non-auto-destructive, the site of exchanges that make it stable. imagine a lamp that would catch fire, it would not be stable, not viable because self-destructive. Unity of functioning, stability of functioning, internal coherence are the condition of existence of any technical object, and any machine. Example: the first Diesel motor was self-destructive since it exploded, the second motor was better constituted and didn't. The difference being in the moment of introduction of fuel into the air before compression in the first case, and after compression in the second.

Gilbert Simondon
Technology and Individuation

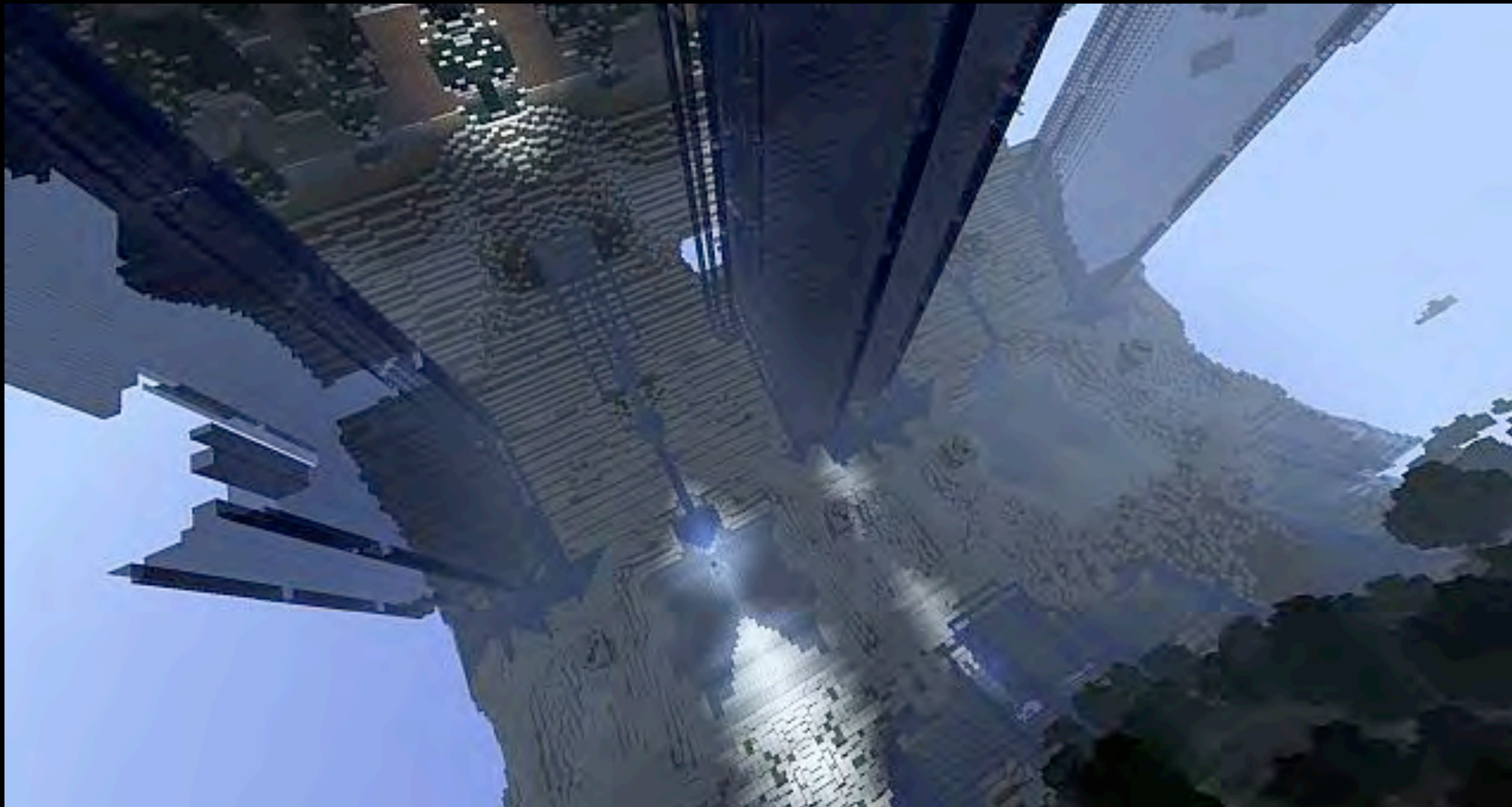
- Individual as essence
- Individual in terms of hylomorphism
- Temporality of individualization?
- Ontogenesis in reverse
- Haecceity
- Clinamen
- Atomism
- Hylomorphic Theory
- Being versus Becoming
- Physics: metastability
- Transduction (p. 313)
- Form replaced by information (p. 315)

Rendezvous with Rama

SPACE/ OUTER SPACES



http://www.youtube.com/watch?v=DRUrIYKP944



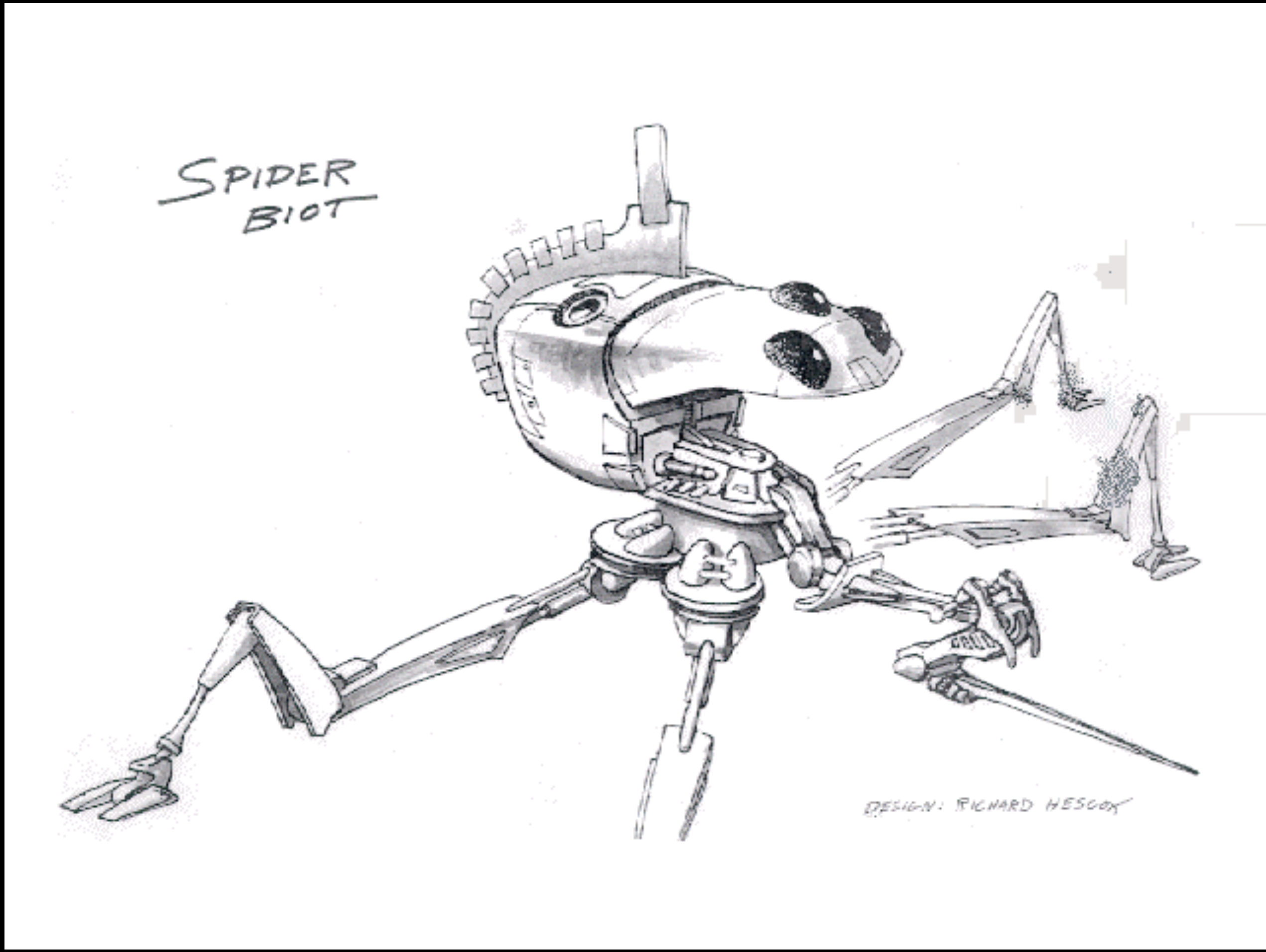
As he bounded up the steps, three or four at a stride, Mercer agreed that Calvert had been perfectly correct; these stairs were built to be walked up, not down. As long as one did not look back, and ignored the – vertiginous steepeness of the ascending curve, the climb was a delightful experience. Pg. 35

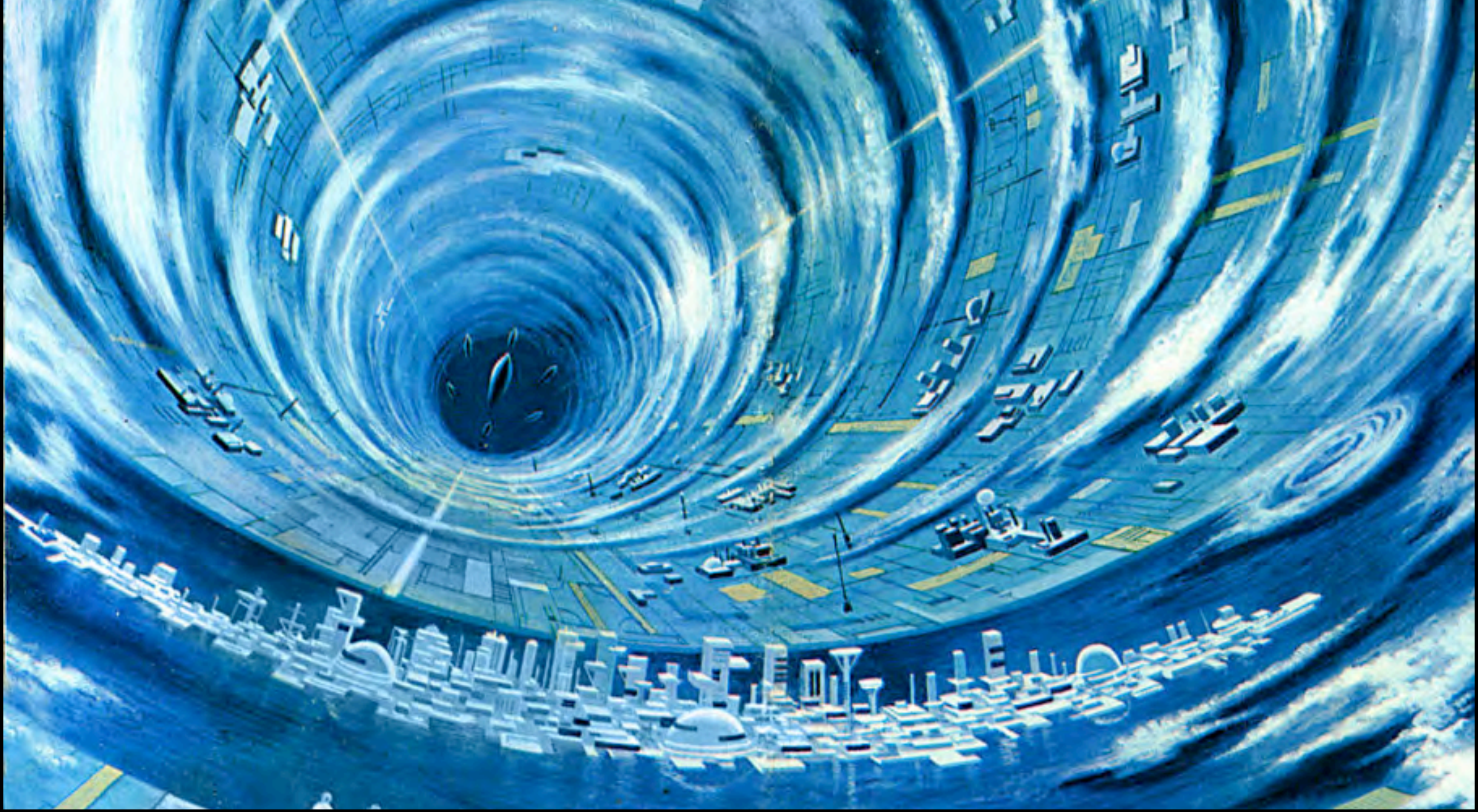
Everything happened in less than a second. In a soundless concussion of light, dawn burst upon Rama.

One could endure the sight for only a few seconds. It was not the glare that was intolerable—one could grow accustomed to that—but the awesome spectacle of Rama, now seen for the first time in its entirety.

In almost every way the far end of Rama differed completely. Here was no triad of stairways, no series of narrow, concentric plateaus. Instead, there was an immense central spike, more than five kilometers long, extending along the axis. Six smaller ones, half the size, were equally spaced around it. Linking these slender, tapering towers, and curving down from them to merge eventually in the Central Plain, were flying buttresses that looked massive enough to bear the weight of the world.

Norton turned his head. Ten metres away was a slender-legged tripod surmounted by a spherical body no larger than a football. Set around the body were three large, expressionless eyes, apparently giving g60 degrees of vision, and trailing beneath it were three whiplike tendrils. The creature was not quite as tall as a man, and looked far too fragile to be dangerous, but that did no excuse their carelessness in letting it sneak up on them unawares. It reminded Norton of nothing so much as a three-legged spider, or daddy-long-legs, and he wondered hot it had solved the problem – never challenged by any creature on Earth – of tripedal locomotion. Pg. 126

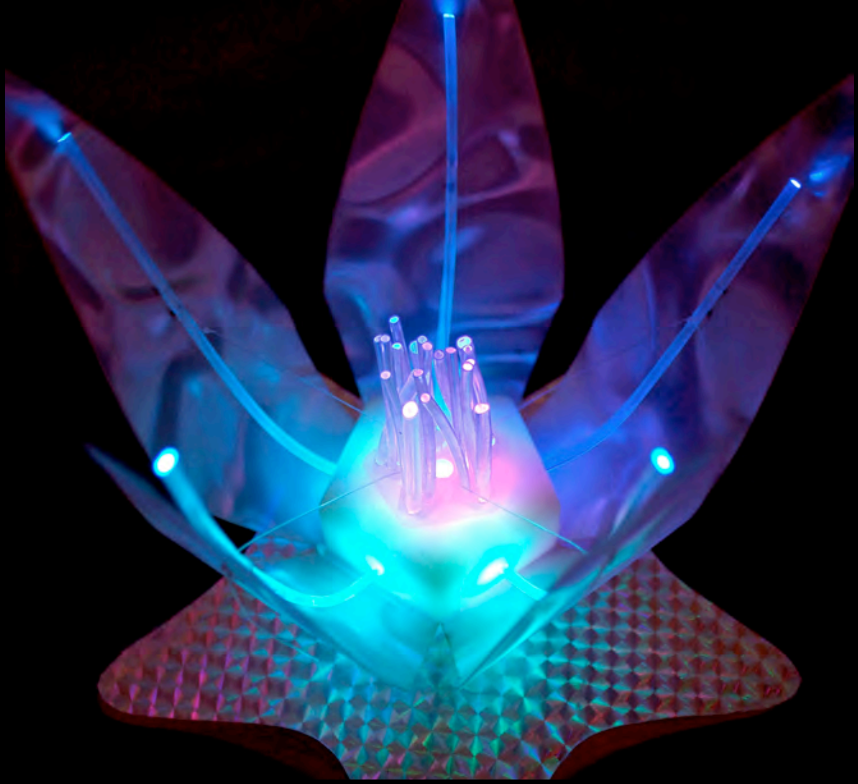




The most striking feature of the Central Plain is the ten-kilometre-wide dark band running completely round it at the half-way mark. It looks like ice, so we've christened it the Cylindrical Sea. Right out in the middle there's a large oval island, about ten kilometres long and three wide,a nd overed with tall structures. Because it reminds us of Old Manhattan, we've called it New York. Yet I don't think it 's a city; it seems more like an enormous factory an chemical plant. Pg. 24

“Very pretty,” said the practical Mercer, “but what does it mean? Who needs a forest of glass pillars?”… The columns were not transparent from every angle or under all illuminations. As one walked around them, objects would suddenly flash into view, apparently embedded in their depths like flies in amber – and would then disappear again. There were dozens of them, all different. They looked absolutely real and solid, yet many seemed to occupy the identical volume of space…. “Holograms,” said Calvert. “Just like a museum on Earth.” pg. 158

[Norton's] doubts grew as he examined the other columns, and conjured up the images stored in their interiors.



Hand-tools (though for huge and peculiar hands), containers, small machines with keyboards that appeared to have been made for more than five fingers, scientific instruments, startlingly conventional domestic utensils, including knives and plates which apart from their size would not have attracted a second glance on any terrestrial table…

they were all there, with hundreds of less identifiable objects, often jumbled up together in the same pillar. A museum, surely, would have some logical arrangement, some segregation o related items. This seemed to be a completely random collection of hardware. Pg. 159

Faster and faster Rama swept around the sun moving now more swiftly than any object that had ever travelled through the solar system. In less than two hours, its direction of motion had sung through more than ninety degrees, and it had give a final, almost contemptuous proof of its total lack of interest in all the worlds whose peace of mind it had so rudely disturbed.

It was dropping out of the Ecliptic, down into the southern sky, far below the plane in which all the planets move. Though that, surely, could not be its ultimate goal, it was aimed squarely at the Greater Magellanic Cloud, and the lonely gulfs beyond the Milky Way. Pg. 171

Arthur C. Clarke presents this unusual documentary on the mathematical discovery of the Mandelbrot Set (M-Set) in the visually spectacular world of fractal geometry.

http://www.youtube.com/watch?v=Lk6QU94xAb8