

Research Article

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Sensational Interfaces and the Aesthetics of Space Apps

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Abstract: As the momentum of space exploration unfolds, our planetary exterior is increasingly transformed into a site of capitalist production and destruction. Grounded within infrastructures, processes and practices of mediation, our technological acquisition of space is also entwined back into the ambits of global media cultures down on Earth. The currents of this enculturation are indexed by the upsurge and emerging variety of "space apps" which use techno-scientific data and creative visualisation to offer assorted digital experiences of outer space—from maps and tours of planets, stars and galaxies, to real-time observation of celestial events and phenomena. To provide some measure of this inclination, we consider the ways in which these apps sculpt our collective techno-aesthetic relations with extraplanetary space. Framing their digital renderings as the sensational interface of capitalism, we suggest that they offer a glimpse into the ongoing manipulations of economies of attention and the appropriations of affect that undergird its high-tech progress in the space age.

Keywords: outer space, capitalism, spectacle, sensation, attention, space apps, technology, aesthetics

Introduction

Just a bit over a half century into the space age, and our planetary exterior is steadily incorporated into the circuits of global capitalism. Space exploration involves the massive mobilisation and investment of military-industrial complexes—an unabashed display of political and economic power that unfolds as a spectacular demonstration of the full potential of techno-science and its capacity to radically extend the generation of knowledge and wealth. And not only are our daily lives already dependent upon space technologies-consider for instance, the array of satellites that supports global communication and surveillance networks, sustaining services from GPS and Google Maps, to maintenance of ballistic missile ranges—our technological means of capturing and relating to the world extend well-beyond the Earth, onto myriad other celestial bodies and regions. As we continue to design more powerful rockets, speculate about mining asteroids, aspire to space travel and tourism and consider terraforming and settlement, extraterrestrial riches become increasingly central to the logics of expansion that characterise capitalism and the ongoing technological evolution of its explorative and exploitative processes. Outer space, however, is an odd place. Its vast, inhuman environment is not merely one more region where we seek to be present and establish ourselves; rather, it is an "unearthly" space that calls for particular re-arrangements of our world-making strategies and their technological apparatus. In the perceived and apparent bareness of outer space—where environments are extreme, technologies necessary and life scarce—the exploitative logics of capitalism do continue—but in a form that is stripped back, intensified, and marked by the progression of its own technological character.

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As our technological advances in space progressively alter the ways in which we conduct its physical occupation, scientific examination and its social absorption, all our extraplanetary activities are enculturated, drawn back down, through and into, the muddle and confusion of global media and popular imaginaries from which they arise. This incorporation has itself undergone its own evolution, beginning with the militarised imaginations of rocket science and the futuristic fashions of life beyond Earth (Benjamin, Rocket Dreams; Rosenberg, "Far Out"; Bell and Parker, Space Travel and Culture; Parker, "Capitalists in Space"; Geppert, Imagining Outer Space), and spreading onto the online and interactive content through which contemporary creative and media industries have further domesticated outer space. Such assimilation of the cosmos has become part of a continuum of earthly activities along which our "material relations and historical processes ... extend into, unfold within and structure this extraterritorial domain" (Parks, "Mapping Orbit" 64). And as many have begun to observe (Harris, "The Influence of Culture on Space Developments"; Ormrod and Dickens, The Palgrave Handbook of Society, Culture and Outer Space), these processes also involve reshaping, restructuring and redefining the imagination, visualisation and occupation of space. And of course, the enculturation of outer space feeds back, returning to Earth as a series of slow but seemingly fundamental transformations to the practices through which the human species inhabits, interrelates and attends to what is outside. All our interest, interaction and imaging stretch far out into space, drawing its distant reaches back into our own tiny universes and social spheres. While the attention and activity we collectively direct towards outer space might solidify a sense of global citizenry and revisions of shared planetary collectivities, it is also what allows our darker tendencies toward domination, conquest and consumption to be transported outward, onboard our extraplanetary progress.

Although expressions of the "cosmic" expansion of capitalism can be found in all manner of products and enterprises on Earth, perhaps the most symptomatic expression of an ongoing convergence of technoscientific, military-industrial and socio-cultural interfaces is the rise of space apps. The data-driven processes of capitalism's calculative ordering come together in software which offers myriad space environments and events for mass consumption by media literate and techno-savvy audiences. One needs only to look as far as the large collection offered by NASA within its NASA Apps For Smartphones, Tablets and Digital Media Players portal to appreciate their variety, potential and scope. Space apps package the data gathered through space exploration and observation into digital "experiences." Taking up and reflecting advances in the rendering of video game environments (Galloway, Gaming; Lammes, "Spatial Regimes of the Digital Playground") and perpetuating the mass-production of virtual tourism (Damjanov and Crouch, "Extra-Planetary Mobilities"), they make these experiences part of everyday life.

Marketed largely as a leisure activity, the allure and availability of space apps might suggest yet another opiate for the masses, an antidote—or more precisely, a placebo—for our limited progress and presence in space. Yet they also offer a unique blend of coetaneous tensions: their mix of the raw data generated by multibillion-dollar technologies, procedures of computation and creative visualisation, the commodification of data and the aestheticisation of information, results in ways of making sense of space that are forged from both the politico-economic drive to expand and exploit, and the socio-cultural need to absorb and relate. Indicative of the distinctly techno-social modes that capitalism takes on in order to maintain its expansion into outer space, space apps become part of an appropriation of our collective relational activity, attention and aspirations.

¹ Harris suggests our engagement with the cosmos should be considered from the perspective of "cultural anthropology and cross-cultural psychology, as well as a systems approach and micromanagement" (12), while Ormrod and Dickens point out the long, changing relationship between terrestrial societies and outer space and collect perspectives on the enculturation of outer space that range from "geography, economics, history, political science, sociology, philosophy, science and technology studies, law, cultural astronomy, anthropology, media studies, literature, psychosocial studies and art" (26).

² The range of NASA Apps For Smartphones, Tablets and Digital Media Players includes: Solar System, 3D Sun, Asteroid Redirect Mission (ARM), Cassini, Comet Quest, Curiosity, Go StarGaze, MESSENGER: Orbiting Mercury, Moon Tours, NASA Be A Martian, NASA Space Weather App, NASA Visualization Explorer, Space Communications and Navigation, Spacecraft 3D, Space Junk Sammy, Space Place Prime, Universe, Hubble site, Night Sky Network, NASA Science: A Journey of Discovery, Space365, Space Images, Space Place Prime, NASA Space Weather Media Viewer, and X-Ray Universe.

The exploitation of outer space thus first becomes a matter of manipulating the activity and interest we take in things outside the planet—a matter of managing how we see, sense, experience and understand an inhuman space wholly mediated by technical devices. Through the work of culture and the interfaces of digital media, large-scale, all-encompassing organisational systems such as capitalism assert their own extraplanetary extension. In lieu of moon mining, Martian settlement or other hard forms of resource extraction, outer space has become a productive domain for harnessing the attention of the mass through affective interfaces which provide a range of simulated spectacles and the sensorial experiences of being "out there." The extraplanetary in this sense emerges as an arena of conquest dominated by strategies of mediation and techniques of representation. Through various combinations of media saturation and influence, the incorporation of outer space into our cultural fabrics has become what Galloway describes as the "interface" of high-tech-capitalism, serving not only as a screen-based manifestation of its reach but as a set of effects that suggest its operations out of sight. In this way, structures of power and control that are ever-more grounded within registers of media and informatics proliferate within and through the design and dissemination of "cosmic commodities" (Cubitt, *Digital Aesthetics*)—becoming a matter of market rationalities but also of aesthetic sensations and relationalities.

As such, the interfaces of space apps extend the scale and scope not only of how we perceive the cosmos but of the problematics of framing "devices" themselves. Both entrenched in and at the far edge of a still-emerging dynamics of screen spaces, they indicate the extraplanetary operation of what James Ash dubs "the interface envelope"—and thus the techniques of manipulation that cognitive capitalism continues to evolve, even in our absence. Stimulating collective perceptions of what is other and outside, these apps reflect both a greater human immersion in digital interfaces (an extraplanetary form of the media "envelopment" which increasingly conditions and modulates human sensation and experience), and the "envelope power" (Ash, *The Interface Envelope*) through which political economies assert control and maintain cycles of production and profit through manipulating and shaping perception and reception. Just as attention is captured and contained in "gamic vision" (Galloway, *Gaming* 62) and in the "foldings of space and time" (Ash, *The Interface Envelope* 139) of digital games, it is likewise enveloped in the experience of outer space offered through these apps, which are also "designed to modulate user action with the aim, hope and promise of producing desirable outcomes for those that own and operate" them (Ash, et al. "Unit, Vibration, Tone" 168), while directing our interactions and relational systems through the stimulation of affective experience.

Behind designs that capture and direct attention toward the cosmos—unfixed foci that offer the illusion of freedom and visual control, immersion and endless movement—capitalism operates at the thresholds and portals, manipulating the affective states of those that access these interfaces in order to promote an outward-looking orientation, a commodification of perception and perspective that stabilises, settles and coheres outer space as a site for further production, extraction and exchange. Considered through the lens of space apps, the extraplanetary spread of capitalism involves more than merely staking claim to new and unexploited territories or establishing physical outposts. It involves a blending of technological infrastructures and networks, the purviews of state-corporate sectors and research institutions, rearrangements of communication and exchange, the orders of play and data, mathematics and leisure—all of which appears to increasingly condition our experience of the world. The interfaces of space apps transform kinds of raw extraplanetary material into digital forms of human sensation—and not only do these sensations intensify the affect of outer space, they repeat it over and over; like GIFS, they are both a "demonstration of cultural knowledge" (Miltner and Highfield, "Analyzing the Cultural Significance of the Animated GIF" 3), and a way of sustaining it in the public eye.

An example of the contortions and recalibrations of contemporary capitalism as it transpires beyond the globe, space apps are tiny registers of its larger techno-aesthetic choreographies that seek to control how spaces and relations are seen and sensed, understood and embraced. Detaching them momentarily from the many other arrangements of extraplanetary enculturation, we examine how the aestheticised data, images and information of these digital interfaces—the spectacle and sensation of space exploration—becomes a set of mediated relations that are exploited by the calculative ordering of capitalism and its direction of affective, interactive and participatory dispositions. This essay argues that space apps help illustrate

a meeting point between the "society of the spectacle" (Debord) and "the society of control" (Deleuze), a point sharpened and given form in emerging economies of extraplanetary attention—offering a glimpse into the evolving aesthetic order and sensational effects of high-tech capitalism in its space age.

Sensation, Simulation and the Smoothness of Interfaces

A great many space apps are currently in circulation. Designed for desktop and mobile media devices, they encompass various extraterrestrial locations through an assortment of formats, from interactive maps and images to pocket planetaria and complex AR and VR simulations.

Combining spectacular design with hard-science, they are often rigorously precise; the multiple assortment of NASA Apps For Smartphones, Tablets and Digital Media Players, for instance, stem straight from the world's most well-funded hub of space exploration. Space apps offer different forms of digital sensation, exacting depictions based in optics, graphics and interface exchanges, images and maps layered with signs, interactive information, god-like perspectives, and manipulable objects. They allow one to "zoom into" a galaxy or traverse a 3D Martian landscape, inspect the lunar landing sites, screenshot a trip to Saturn's moon, ride with comets, scrutinise the exoplanets, or cross the Milky Way, apprehending cosmic geographies, topographies and movements and representing (in its numerous senses) the past, present and future in outer space. Developed and distributed by space agencies, research institutes, private companies, and independent producers, they cater for, stimulate and market a wide range of interests and perspectives and provide diverse aesthetic experiences of cosmic locations. NASA, as one of the biggest producers of such content, claims to bring space exploration to everyone and anyone—freely releasing elements of its data and media content to be used, employed or disbursed by all. And yet, by offering "space exploration for everyone," they compress the wastes of outer space with the distractions of digital cultures, appropriate the attention of the masses with sensation and simulation, and begin to posit a very particular perspective which guides our collective outlook; they start shaping, in other words, an extraplanetary identity for the species.

The Moon Tours app, a mobile version of the NASA's Lunar Mapping and Modeling Portal, allows one "to conduct detailed explorations of the lunar surface" and provides access to a repository of "geospatial lunar data products and imagery from historical and current lunar missions" for "scientists, mission planners, students, and the public" (NASA, Moon Tours). It includes "imagery ranging from the Apollo missions to the latest data from the Lunar Reconnaissance Orbiter" (NASA, Moon Tours) overlaid with a wealth of associated information. The curious can, for example, delve deeper into the rich digital surface maps and images, read an abstract about "a particular data layer" or peruse "a longer document providing detailed information about the layer with citations and references to relevant scientific papers" (NASA, Moon Tours). Alternatively, a more casual viewer of Moon Tours is directed by a "curated list of interesting sites on the lunar surface" (NASA, Moon Tours). Here the lack of actual exploration or real presence—the rush of first discovery—is offset by the experience of a potentially infinite vortex of images and information. The attention of the audience is held and ordered by the offer of pre-prepared views, and pre-arranged tours that frame particular sites from particular angles, their guiding perspectives providing ways of seeing and valuing that are embedded in the codes of their programming architecture. Drawn from databases and made to sparkle with informatics, space apps enliven cosmic environments and make a detailed spectacle of outer space. Yet as the synthetic impressions of prior mediatic surveillance and investigation, they also present places in space as environments that have already been conquered, studied and laid bare. In this form, space apps simulate exploration as the labour of science, the navigation of data and the operation of still-further interfaces.

All extraterrestrial encounters in space apps are pre-selected, pre-arranged and minutely calculated; the explorations of arm-chair astronauts are pre-plotted, and even invitations to wander freely in off-world environments are undercut by the conditioning of code and algorithm—and more widely, they are passively synthesised as if they were the experience of outer space. Not only how we see but also how we understand the universe is increasingly coloured by the palettes of imaging software and our collective consideration of the cosmos channelled according to the needs of capital and industry. According to Crogan and Kinsley, the "attention economy" is a "contemporary bio-political reality," a "commodification of human capacities of attention" that involves the "economisation of cognitive capacities" (2). And when directed (with even more systematic and mediatic emphasis and range) into outer space, the scope and spectrum of the "program industries" (Stiegler, *For a New Critique of Political Economy, Taking Care of Youth and the Generations*) are radically extended—drawn-out through the image and the possibility of the species in the universe. The influence and programmatic power of these attentional "space cultures" is thus still emerging, but already they exhibit tendencies to impact across social and political relations, spatial negotiations and identity formations.

Deeply entrenched in ambits of media culture which appear to increasingly revolve around the commodification and exchange of digital experience and sensations, space apps themselves are a result of the way we use technologies to *make sense* of our world. Part of the production, distribution and consumption of images, spectacles and affects, their creation is grounded within the processes and practices of reticulated collective sensation through which the exploitative forces of contemporary capitalism seek to contain and cultivate human senses and sensibilities. The data which determines their content is collected through activities that involve the literal sensing of a space environment through sophisticated mediatic technologies, remotely or in-situ—and this is then processed into the spectacular experiences they offer to their users.

While space apps might open up the extraterrestrial domain to our collective gaze, at the same time they enable its collective surveillance, and perhaps more particularly, authorise only a very particular image of ourselves in space—one dominated by the apparatus and techniques through which we gather, organise and process that same data. By rendering the extraplanetary a place for the manufacture and circulation of "cosmic commodities" (Cubitt, *Digital Aesthetics*), its otherness is not only exploited; it is transformed into a field to play out specific fantasies. And this reflects the broader tensions within a merging of science and creative industry, a blurring between the state and private sectors, and an overall entanglement of reality with technologic systems and information infrastructures. Through an exploitation of the simple curiosity and rudimentary desire to explore and expand beyond the immediate environment (the organic, species-based impulse to extend ourselves outward)—and through the shapes of knowledge that this produces—audiences in outer space are drawn in to participate in processes of both its exploration and exploitation. And in this sense, the interfaces of space apps become evidence of the cognitive purviews of capitalism in its space age.

The portals and programming of these apps shape user engagement and experiences. Just as the digital interface has become a basic "form of relation"—a form characterised by "processes of separation and augmentation, of maintaining distinction" (Hookway, *Interface* 4)—space apps are likewise composed through the inclusion and exclusion of certain choices, activities and information, all the while maintaining the fantasy that they reach everywhere and provide unsurpassed access to everything. And if the interface, in general, has become, as Hookway suggests, this "liminal" condition that delineates space for "a kind of inhabitation," then the interfaces of outer space apps perhaps more than any other, can "open up" what are "otherwise unavailable phenomena, conditions, situations, and territories for exploration, use, participation, and exploration" (Hookway, *Interface* 5). Thus they might also indicate certain arrangements of our technologic occupation of space and the particular means by which its unearthly conditions, aesthetic effects, its revision and assertion of separations and distinctions, are used as either a form of exploitation or resistance.

To counter, fill-in and supplement the apparent inhuman qualities of the cosmos, space apps add information and curated lists of interesting sites, colour and movement, touch-ups, enhancement and manipulation. They are augmented to arouse affects that make space more accessible. The European Space Agency's app View Rosetta's Comet offers a 3D look at the 67P comet from all angles that is "derived from images taken with Rosetta's navigation camera" (View Rosetta's Comet). This "interactive tool" utilises a Malmer "shape model" to accentuate different regions of the comet's surface and simulate the different textures of their geological composition, combining varied visualisation techniques such as silhouette carving "for the dark southern hemisphere regions," stereo correlation for seeing "large scale variations"

and photoclinometry "for capturing fine details" (View Rosetta's Comet). Striving for accuracy, these advanced visualisation techniques nevertheless ultimately produce images which are digitally flattened, corrected, and made to fit a predetermined idea of what space should and can look like. And as our endeavour to picture the cosmic is largely incomplete, they often fill the gaps through creative computation. This is the case in the example of Rosetta, where cameras did not cover the entire surface of 67P, gaps were "smoothed out for aesthetic reasons" (View Rosetta's Comet). Here, the "aesthetic" of outer space here becomes the quest for its "realistic" representation—matters of value, and perhaps even beauty, defined by the *smoothness* of the interface. Users can themselves make adjustment to the viewing modes, by means of, for example, the "ambient light" function which emulates "the effect of sunlight incident from different azimuthal (theta) and polar (phi) angles" to "View "Rosetta's comet." Yet this control is ultimately illusory, incidental to the systemic intervention involved in a synthetic re-imagining of outer space that transforms its environment into a mere set of spectacular effects.

Often space apps will also attempt to personalise the experience by providing a first-person perspective and more immersive, realistic experiences. The Apollo 15 Moon Landing VR app available through Google Play, for example, re-enacts the 1971 lunar mission by using the archival footage to simulate it from the standpoint of the astronauts, including the recordings of the mission's radio communications as a soundtrack to further enhance sensation. A range of such audio-visual effects are used in space apps in order to appeal to the senses; the Hello Mars app, for example, similarly applies sound to augment the sensation and spectacle of the "7 minutes of terror" that it took for the Curiosity rover to travel from orbit onto the surface of Mars. Blurring with the borders of "space science," these "special effects," as Cubitt (Digital Aesthetics, 68) observes, have their own "political economy." Capitalism's contemporary intrusion into space belies a tendency to use mediated sensation and spectacle in combination with significant history and forms of immersive play, bifurcated through the orders of code and technology. Driven by informatics and entwining the objectivity of science into a realm of subjective affects and appeals, space apps become vet another means of appropriating changing ways of seeing, feeling and thinking and cultivating the emergent sensibilities that arise from the aesthetic conditioning of digital media.

While space apps forge the inhuman qualities of outer space into an array of consumable spectacles and experiences—some do little to make the cosmos more digestible; in the If the Moon Were Only 1 Pixel app, for example, interactive media designer Josh Worth presents a "tediously accurate scale map of the solar system that illustrates the mind-boggling amount of space between planets." It reproduces the incredible time and distance involved in outer space as the experience of scrolling and scrolling through a black emptiness interrupted only by a few small dots, the pinpoints of planets and moons. The app has received awards, been used as a teaching tool, linked to hundreds of websites, featured in museums and translated into numerous languages (Worth, "Portfolio"). Its popularity defies the fact that it reproduces the boring nothingness of outer space, that it is composed of little more than a series of lone pixels suspended in the unfathomable vastness of space. Here outer space is brought to the symbolic limits of a pixel as the basic representational unit, the smallest image element that can be "processed"—a vision of totalizing scientific accuracy that perhaps discloses nothing more than the (equally popular) "desert of the real" (Baudrillard, Simulacra and Simulation, 1; Žižek, Welcome to the Desert of the Real). As "Only 1 Pixel" suggests, capitalism has little to work with beyond the Earth; deprived of cosmic societies, it transforms the lifeless expanses of space into a theatre of and for human activity. At the same time, the real material conditions of space environments remain essentially unrepresentable and cannot be directly experienced by the masses.

Space apps are thus suggestive of the ways in which the technological involvement and spatial imbrication of capitalism asserts the distinct design and development of ever-more accurate visual capture, a greater mediatic precision, increased realism and more detailed data. They seize outer space through the screen, while what lies behind it—the calculative influences, codes and agendas that shape these effects, experiences and socio-scientific understandings—begin to determine how we view things outside Earth. By rendering a particular fantasy or way of seeing as "real," they begin to impose a very particular extraplanetary order as the intrinsic "reality" of outer space, a reality composed of complex and multiple forces that are simultaneously technologic, industrial, human, social, cultural and political. The digital interfaces which frame these realities (which are ultimately made from the same limited pool of data) manipulate users

through repetition and simulation—participants are seduced by the ever-enhanced smoothness of access points that are not only interactive, engaging and spectacular, but often have a whimsy and an "openness" calculated to inspire immersion, a freedom and fluidity that suggests multiple routes, and a continuity that implies the shapes of familiar landmarks.

Exploiting the ever-narrowing but never-closing gap between simulation and reality, the apps offer many unique locations which have the potential to be commodified and consumed over and over again through many different perspectives and ways of generating sensation, from the vertigo of 360-degree outlooks to 3D VR experiences. Variously engaging audiences in forms of online activity and interactivity, they increasingly offer more complex narratives, more elaborate fantasies of presence and interaction into which to be immersed. Allowing us to wander the cosmic wastes, these apps might suggest a freedom to gather and choose personal experiences of an infinite space, yet this freedom is essentially bound by their techno-aesthetic regimes. A space app will always limit how and where one can go: you can only ever move within its confines, and only roam as far as it allows. Any gestures towards the democratisation and "freedom" of space exploration that are conveyed through these apps are, at the same time, highly controlled. With no choice and little forms of resistance, our alienation from the extraplanetary is increasingly demotic, rather than democratic.

Collecting the Sensible

Required to contend with the apparently infinite albeit lifeless expanses of space, the outward expansion of capitalism operates almost unencumbered by the legal, political and economic gravities that underpin its spread on Earth. Yet its extraplanetary reach and routes are ultimately still restricted by technical affordances and also equally determined by its ongoing dependence upon the currents of social life as a resource for its further assertion. Space apps give a shape to this impetus, registering not only its technologic character but also indicating the still-emergent frameworks of its symbolic representation—the "systems logics" and "algorithmic aesthetics" (Stiny and Gips, *Algorithmic Aesthetics*)—that it deploys in order to socially organise and validate its incorporation of new territories. As evidence of the ongoing aesthetic renovation of our organising systems, space apps perhaps give a glimpse of what the "hyperindustrialisation" (Stiegler, *Symbolic Misery*) of our collective circumstances and relations might look like when projected into outer space.

While engaging individual users, exploiting their activity and playing upon their personal palate of senses, space apps nevertheless operate through the rationalities of shared sensations and variously deploy the symbolism of a lone species pitted together against outer space. In this respect, their design and affordances appear to make space exploration a form of collective consumption in more ways than one. Yet while they might make the cosmos appear endlessly accessible, interesting and expendable, as part of a trade in distinctive and unique spectacles and sensations, they might also begin to repeat, and their sense of difference, novelty or exotic "otherness" might falter and fade. And as such, space apps could indicate a far broader problematics of the "attention economy" (Stiegler, For a New Critique, What Makes Life, "Relational Ecology"), through which individuals are subsumed into the shared totality of our mediated exchanges. Out of sight and outside Earth, the extension of capitalism relies upon the same commodification of human cognitive capacities that undergirds both space exploration and digital interfaces; as part of the industrially produced image of outer space that organises and conditions viewer experiences, these apps determine the kinds of attention we direct toward the production of outer space. The social capital of their design (forms of description, interpretation and evaluation) is expressed in computational procedures of visualisation and automated symbolic ordering and increasingly monopolised as part of the regulation of cultural, political and social life—an exploitation of collective attention and conditioning of imagination on an industrial, but also extraplanetary, scale.

Designed to deepen or replace our real engagement with outer space, the interfaces of these apps reflect an attention economy in which experience itself is increasingly *produced*; aiming to add value to a global capitalist system, they strip human perception of active meaning and replace it with the consumption of

spectacle and sensation. As such, space apps are also an interface of power and struggle—inflected by the desire both to introduce and arrange a productive image of space, and to exploit all the animation and activity that occurs within it.

Collecting individuals together, aligning and positioning them within the affective and "attentiongrabbing" frame of the same spectacles and atmospheres, they open up competition over forms, styles and modes of representation—a contest that transforms and enhances, even embellishes, but perhaps also depresses, the story we tell of ourselves in space. And if, as Stiegler suggests, the highly informaticised and mediated modes of contemporary social organisation have indeed afforded capitalism free reign across all symbolic life and cultural and aesthetic frameworks of experience (For a New Critique of Political Economy, What Makes Life Worth Living, Symbolic Misery), then space apps might also indicate not only the standardisation but also the changing shape of such systems of "social engineering,"

More and more apps are being developed around more and more space events and locations—and their audiences continue to track alongside them. From star-charts and sky maps to "cosmic watches," these packages of extraterrestrial experience are made part and parcel of everyday lives; mobile and accessible, they position the individual, and locate the collective, whilst remaining "live" and relevant. The "Eyes on Juno" app, for example, renders an impression of riding aboard the spacecraft in real-time during its entire Jupiter mission. But perhaps more significantly, Juno's journey has bred various forms of community interaction, such as the establishment of the JunoCam "community" hosted by the US-based Southwest Research Institute. This allows one to "actively participate in the mission" by uploading Juno's images of Jupiter to an "image processing gallery" or contributing to deciding "what points of interest" the spacecraft should photograph (JunoCam). Through positioning users not only as data-gathers but as real-time space explorers participating in a public event and enterprise, these apps suggest how networks of sharing and exchange can be underwritten and made part of the further production of cosmic commodities. As audiences are made explorers, they are effectively enlisted as free labour, and through capitalist modes and logics of exploitation, their collective knowledge and energy is thus directed and ordered. While only one element of a much larger process of knowledge-control, space apps such as Juno Cam and the community gathered around them suggest the importance of social and technological networks in aesthetic mobilisations and appropriations of common desires and aspirations.

And while there is seemingly much choice involved in which part or aspect of space one wishes to explore and participate in, in the end, space apps offer only certain, intensely controlled, experiences that are constructed from the same data sets, rendered with analogous graphics engines, accessed through equivalent "experience portals." They offer comparable combinations of display options, menus and perspectives, and in essence, differ only in terms of how much or how little of this data is applied; some might be better visualised, or more comprehensive, while some have more advanced algorithms that correct and smooth out discrepancies between data and real-time experiences. In this respect, space apps mirror a global digital condition in which audiences receive the same representations and sensations, consume the same images and the same spectacles—access the same perspective and the same moment (Stiegler, Symbolic Misery; Galloway, The Interface Effect). Despite competition and constant updates, the images offered by space apps tend toward their own orthodoxy; made from the same organisational logics, they already repeat themselves. What is perhaps more fundamental, however, is that this repetition of particular kinds of visualisation—be it of finance systems, global water supplies or sites in outer space—also becomes an assertion of a particular way of seeing and organising (Galloway, The Interface Effect), of interacting with space. Their proliferation of carefully undifferentiated images—lays down a canon of experiences and sensations that not only holds the attention but ultimately structures our aspirations.

Resistance to the aesthetic dominance that capital forms in space might nonetheless come in the shape of greater participation—through, for example, the greater ability to change the "parameters" of space exploration. These portals are made to be malleable and modular, to be rearranged and personalised, but they can also be hacked or broken. The interactive online app Galaxy Collider HD, for instance, essentially affords users the capacity to assert control over the entire universe—as the site suggests, "you can build your own galaxies and interactively visualise spectacular galaxy interactions." More pertinent, perhaps, is that audiences are not only invited to design galaxies but also to smash them together, to define the physical

parameters of two galaxies (including their radius, star count and rate of dispersion) and then produce a visual simulation of what occurs when one is flung at the other. This suggests both the violence required to resist dominant depictions of the universe and the fluid kinds of agency that undergird the emergence of new forms of attention and participation. Behind the hardware and software of such interfaces, there is more than the invisible operation of capitalism—while those using the app might have their agency shaped by its interface, they are also able to interpret it, replace it, "misuse" it or change how it behaves. Endlessly able to repeat and manipulate such visualisations of real places in space, the app is where the agency of the audience meets the manipulations of capital, and perhaps negotiates its control. Stiegler describes a "symbolic misery" associated with "the loss of participation in the production of symbols" and consequently, in both "intellectual life (concepts, ideas, theorems, knowledge)" and "sensible life (arts, know-how, mores)"—which can "only lead to a symbolic collapse, or collapse of desire ... to the decomposition of the social as such" (Symbolic Misery, vol. 1, 10). Yet, as Galaxy Collider HD indicates, if "the parameters of the simulation" can be "changed interactively to explore the infinite number of possible interactions," perhaps they can form part of the relational potential of a new aesthetics, and indicate a way towards the unordered and disordering practices of intersubjective exchange as a means of preventing social implosion.

By inviting new forms of participatory activity and action, the interfaces of our extraplanetary endeavours could do more than dull the sensible with sensation, and instead, reenable the symbolic potential of the aesthetic in outer space. These apps might register the rise of a "relational ecology" (Stiegler) in which our technical provisions reanimate our attention. The dilemma, however is that our situation is one in which "industrial technology" arranges, infiltrates and undermines our symbolic order, a place where "aesthetic weapons play an essential role" (*Symbolic Misery*, vol. 1, 2) in the ongoing "transformation of the world into a market" (82)—a state of affairs in which "aesthetic conditioning has replaced aesthetic experience" (3). The interfaces of these apps not only disguise and reveal the otherwise invisible operations of capitalism and register the transformation of the politico-economic organisation of our collective desire, understanding and engagement, they are the conditioning which is substituted for experiences of, and presence in, space. In this sense, their aesthetic composition indicates both the stage and arsenal of this battle beyond the planet—but it also suggests the depths of our potential "misery" and the collective disintegration of our symbolic currencies as they leave Earth.

From this perspective space apps comprise part of a genealogy of the sensible (Stiegler, *Symbolic Misery*) that records a changing relationship between information and data, knowledge and its production, simulations and reality. Compressing the ongoing politico-aesthetic restructuring of what Rancière terms the "distribution of the sensible" (*The Politics of Aesthetics*) through the infrastructure of databases, algorithms and networks (Galloway, *The Interface Effects*), they are a nascent skirmish in a prospective struggle over the means of production, commodification and consumption that could take place "out there." An interface of high-tech capitalism in its space age, their proliferation is at once a result of and a resource for the expansion and multiplication of the aesthetic conditions surrounding the ongoing creation and destruction of human sensibilities.

Conclusion

As with many services and products in the present digital marketplace, user reviews of space apps are plentiful. They are rated according to scales provided by the platforms that group and host them, and comments are selectively included as part of the app's online storefront; these commentaries not only contribute to their social imbrication but also highlight the kinds of influence and hold that these ways of capturing the universe already have. Reviewers will often first remark upon the app's "accessible" and "engaging" design and its "easy navigation" and "interactivity" while praising the ease with which one can "view all information" (iTunes). As one reviewer of the NASA app suggested: "This app is wonderful and not only packed with resourceful info, but great organization" (iTunes). The inaccurate language enhances the accuracy of the observation: such space apps *do* operate by making information "resourceful," by making it

work independently, and at the same time indicate a movement towards an ill-defined "great organisation" of things.

Representative perhaps of a larger capitalist enterprise that seeks to subtend the technologicallyinflected transformation of human sensorial experience and mediated sense-making abilities, space apps might give new form to its evolving techno-aesthetics (Stiegler, Symbolic Misery). Yet set in outer space, the logics of sensation have little to work with—out in these extreme wastes, there is not much direct human experience to exploit, little matter or material activity to shackle. And in this, the techno-aesthetic underlining space apps is distinct; an interactive blend of technology, science, visualisation and storytelling that produces specific constructions of meaning—forms of description, evaluation, interpretation, which ultimately register in the larger operations of power and knowledge that seek to capitalise upon and control a widening arena of sensible life. Their communication of information about outer space in visual terms mobilise the interrelational and immersive potential of digital media in order to make appeals to the senses and to encourage an appreciation of particular perspectives, forms and functions—and in so doing, contribute to the ascendancy of human systems and sensibilities defined by the commerce of computation and code. Not merely involved in the commodification of outer space, these apps' combination of gratifying perception and programmatic, procedural visualisation both index and intensify capitalism's control over sense, bringing it to the extremes that this inhuman setting requires. If space apps are a technologic opiate of the masses generated from an increasing tendency toward control of mediated sensation, then their aesthetic might thus not only reflect their techno-capitalist context but also effect the ways in which we assemble ourselves as a spacefaring species in the digital age.

Framed through the spectacle of a species escaping their own planet, space apps may be no more than remedial, attention-seeking entertainments, rearranging forms of exploration, discovery, distraction, education, mobility and play. However, the extraplanetary enculturation that continues to occur through such interfaces also indicates the development of an "aesthetic take" on outer space. Space apps are only the extraplanetary evolution of processes and practices that seek to frame, direct and grow the arena of human sensibilities. And as we have suggested, the use of spectacle and sensation to control the social might imply a mutation of capitalism, but also a counter-productive deformation of how we "pay attention." Undergirding the aesthetic expression of capitalism, space apps might nevertheless "denude" its "apparatuses of power by showing the deep interconnectedness of business, government, and the elite" (Galloway 94); they might yet convey the extraplanetary progression of human sensibilities, serving as a new techno-aesthetic vehicle for articulating, valuing and making sense of our place in space.

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