Green Computer and Video Games: An Introduction

Alenda Chang
University of California, Santa Barbara, USA
achang@filmandmedia.ucsb.edu

John Parham
University of Worcester, UK
j.parham@worc.ac.uk

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Whether framed as environmental communication, 'sustainable media', 'eco-media', or 'green popular culture' environmental media and cultural studies constitutes an embryonic but rapidly developing body of research. The vibrant, multi-layered engagements of the eight essays collected here demonstrate not only that green gaming engages with all of the issues addressed in that research but also that games and game studies can expand the range of this incipient green media and cultural studies. This volume of *Ecozon@* is the first collection of essays to focus exclusively on the topic of 'Green Computer and Video Games'. Working from these essays, we will demonstrate in Part I of this introduction how attributes specific to gaming might address and expand our understanding of environments and ecological relations; and, in Part II, how these essays might help develop green game studies itself.

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Part I: Locating Games in Green Media and Cultural Studies

Ecocritical work has gradually begun to address all dimensions of media and cultural studies, in effect adopting the "macrosociological approach" advocated by Richard Maxwell and Toby Miller. That approach encompasses "physical" production, ideology and political economy, text, and what they call "anthropological" questions such as access to cultural production, patterns of consumption and reception, and the generation of meaning (17-18). Addressing a rich ecology of media, culture, humanity, nature, and nonhuman life, the essays collected here consider numerous types of game and gaming and varied ecological perspectives. Collectively they examine the potential of digital games to raise environmental awareness, even to foster action, while engaging candidly with how games and gamers may be complicit in, or at least uncomfortably close to, legitimating unsustainable practices whether at a political or sociological level. We will begin this introduction by relating game studies to the broader field of eco-

media studies and go on to highlight a rich ecological potential of digital games that is more than evident in this issue.

The first of Maxwell and Miller's "macrosociological" elements is addressed in a recent spate of work around what Nicole Starosielski and Janet Walker in *Sustainable Media* (2016) call "resource media", the material realities that accompany the manufacturing processes and resource usage through which popular cultural texts and their host media (televisions, computers, etc.) are produced, distributed, exhibited, consumed, or disposed of. The commentary focuses principally on energy use and matter (see Cubitt 10). As many have pointed out, ICTs and digital media—the platforms and environments in which computer games operate—are important subjects for such considerations (Maxwell and Miller 1-4; Cubitt 13); indeed, as Serenella Iovino notes in her editorial to this issue, in the "striking contradiction between the planned obsolescence of their forms and the "deep time" of their matter," computers embody much of the current discourse around the concept of an Anthropocene epoch defined by humanity's indelible mark on the Earth.

In relation first to matter, concerns have long been expressed about the difficulties of recycling the numerous, varied minerals and metals from which computers are manufactured and about the toxic chemicals—mercury and lead in circuit boards; cadmium in batteries, ink, cables and screens—that can contaminate groundwater, pollute air, or, in the case of cadmium, precipitate kidney, bone, or lung disease (see Mazurek 53-63; ewasteguide.info). Such concerns have been exacerbated by instances of social-environmental justice relating to the "offshoring" of e-waste and the recycling of toxic matter in developing countries, with perilous human and environmental consequences (Rust 92-5; Maxwell and Miller ch.4; Urry). Correspondingly, in terms of energy use, carbon emissions, and, ultimately, climate change, Cubitt notes that, while cloud computing has been lauded as a greener alternative to "ecologically destructive" hardware, the relentless move to media rich, interactive, and unendingly networked content that it helps serve is giving rise to demands which can only be met by vast and numerous server farms which are exponentially increasing energy use. For example, Cubitt reports that Blizzard, the company behind the globally popular massively multiplayer online role-playing game (MMORPG) *World of Warcraft* is estimated to have around five hundred servers in the US and beyond supporting its 7.7 million subscribers (17).

Consequently, habitual use of computer hardware and software and participation in digital and online networks integrates us all into wider and seemingly unsustainable levels of resource and energy consumption, a point addressed in Josef Nguyen's essay here on how games can attend to their own material conditions. Such matters make any articulation of green gaming questionable and, even worse, potentially complicit in mystifying "its own material context" (Milburn 203). Nevertheless, while making this point Colin Milburn has argued that we ought at least to consider whether, in recompense, gaming can engender the "ecological awareness" and "cognitive resources" to address environmental risk and even to encourage us to do something about it (203-4). To consider such possibilities requires, in the first place, focusing on a further

"macrosociological" dimension to green media and cultural studies, the economic and political organization of media forms and technologies and the ideology (or ideologies) that underpin this.

Perhaps because of the relationship of gaming to corporate media conglomerates, political, economic, and ideological dimensions have been prominent in green game studies. Allison Carruth has noted, for instance, how long-standing utopian connotations around ICT and the internet and, specifically, the "ethereal" metaphor of the "cloud" mask not only the "energy-intensive and massively industrial infrastructure" of "servers, wires, undersea cables, microwave towers, satellites, data centers, and water and energy resources" but also the manoeuvrings of the corporate bodies that produce, operate, sell, profit, and mine individual data from networked systems (342-3, 359-60; Parks and Starosielski). However, the more political emphasis taken by green game studies is also partly due to the influence of one heavily cited book, Nick Dyer-Witheford and Greig de Peuter's *Games of Empire: Global Capitalism and Video Games* (2009).

Dyer-Witheford and de Peuter incorporate games within what Michael Hardt and Antonio Negri call the 'Empire' of consumer capitalism, an empire that extends from economic power to an ideological, cultural, and affective capacity to permeate everything. Consequently, computer games encompass, they argue, mass market economics (in the sales of games, consoles, associated merchandise, film franchises, etc.), political struggles between labour and capital, the cultural transformation of free play into a commodity, and a training that games allegedly offer in preparation for the capitalist market—"virtual play trains flexible personalities for flexible jobs" (see xv-xix, xxix-xxx, 36). Additionally, they argue, while the interactivity unique, in many ways, to computer games "seems to break with the passivity" traditionally attributed to media consumption, that interactivity might actually intensify the internalisation of a game's ideological message. This isn't, though, their entire argument. For while deeply implicated in networked capitalist power, computer games also harbour powerful possibilities within what they call the sporadic "upsurges" which occur in the empire of capitalism (xxi). Hence, Dyer-Witheford and de Peuter develop a second category, 'games of multitude', which, as described below, are games that act against the prevailing ideology and/or offer a creative, sometimes 'dissonant' force within it. Alexander Galloway has similarly argued that although games epitomise managerial bureaucracy and Deleuzian forms of informatic control, they also lend themselves to artistic appropriation and the resistance of the 'multitude' through what he calls 'countergaming'. These more emancipatory possibilities can be placed in context by considering two further dimensions of green media and cultural studies: modes of communication; and the conceptualisation of a ground-level green popular culture.

Stephen Rust, Salma Monani, and Sean Cubitt's collection of essays, *Ecomedia: Key Issues* (2016) attempts to untangle the complex interrelationship of media, society, and environment. In particular, the book carefully balances how popular media texts treat nature as a material and ideological resource against their potential to promote a new, ecological "commons sense" around the "profound belief that we share the world in common with one another and with other non-human organisms and processes" (1-2).

To achieve this, the editors divide the book into three sections, each focused on a key paradigm in communication studies—frames, flow, and convergence (6).

Media *framing* has recently been a substantive focus for examination of how the media diverts ostensibly environmentalist subject matter into ideologically motivated frames such as national security or cost (see Hulme 229). In *Ecomedia*, conversely, Carter Soles and Kiu-Wai Chu's 'Overview' essay on frames explores how evolving theories such as Karen Barad's materialist notion of human-nonhuman 'intra-action' and Ursula Heise's eco-cosmopolitanism facilitate the construction of more ecologically inflected frames in visual media. These are realised, in a more literal sense, by aesthetic frames: the art photography of Edward Burtynsky's *Manufactured Landscapes* series renders the ceaseless, damaging, industrial-scale, human transformation of the environment into static and, by implication, permanent images; correspondingly, a tension between sequential narrative frames in comics and the "gutters" (empty space) that separate them constitutes a perfect form for exploring the ambiguities and mystery of (say) our posthuman sense of simultaneous alienation from/affinity with other species. As one might expect, the essays in this issue invariably deploy similarly adventurous theoretical paradigms to think, in new ways, about how computer games frame meaning in ecological ways—from Backe's deployment of Miguel Sicart's ethics-based framework for games to Lehner's use of Hubert Zapf's 'cultural ecology', and from Bianchi's expansion of Donna Haraway's 'Chthulucene' to Rivera-Dundas's creative application of Anna Tsing's concept of "noticing".

Flow is more difficult to treat ecocritically. Stephen Rust's overview chapter extends the classic meaning bequeathed to media studies through the work of Raymond Williams. Williams formulated flow in terms of "the layering of discourses and meaning produced by viewers' collective and continuous experience of television programming" in the process of watching television or listening to radio over weeks, months, or years (Rust 88). Rust couches his ecocritical conceptualisation of flow mainly as a shift from "figurative concept" to materialist, resource ecology, that is as an understanding "that the flow of information and images on the internet cannot be detached from material conditions" (91). Attempting to translate this back—to Milburn's emphasis on whether games can engender ecological awareness—perhaps the nearest we get in game studies are theories of immersion and flow and the question of whether "game worlds" reinforce or counteract dominant ideology. What games do is, in at least two senses, more complex. In the first place, Gordon Callejo argues, while games transport us to other worlds, this is not so much 'immersion' as 'incorporation.' Identifying factors central to the experience of game playing, Callejo's seven point model for incorporation amalgamates factors beyond immersion (or inhabitation) of a virtual environment (e.g. narrative, aesthetics, and the rules, goals or procedures of the game) while also emphasizing, in further components such as other players and our own *kinesthetic involvement* (the individual player's movement), that the nature of game play is intrinsically more interactive than a concept such as televisual flow allows for. In fact in game scholarship, flow generally refers less to Williams's flow or even the transnational flows proposed by sociologist Manuel Castells than the positive psychological notion of

flow developed by Mihály Csíkszentmihályi, which describes an engrossed, almost transcendent state where in ludic terms a player's ability is appropriately met by a game's level of difficulty (Chen). Secondly, Eugénie Shinkle has argued, more adventurous games that draw on the disruptive visual patterns of new media replace the conventionalised gamespace by "dispers[ing] attention across multiple contexts." Consequently, the "continuous flow of meaning" becomes "a constant stream of possibilities" leading, as discussed below, to an (intrinsically ecological) recognition of change and flux as essential properties of life and, ultimately, to possible new political conceptualisations (169-70).

The conventional emphasis within media and communication studies on flows of ideologically reinforcing content produced by media organisations may seem, therefore, less applicable to computer game aesthetics. However, that more orthodox understanding might still apply in two senses. First, in understanding the cumulative ideological impact of battalions of mass market computer games harboring likely anti-ecological values; but also, more positively, in the possibilities of countercultural manifestations of flow. This is explored in Sean Cubitt's essay in *Ecomedia*. This discusses how environmental themes emerged out of the alternative content flows of the more specialised FM, pirate, and free radio broadcasting that arose in the 1960s and 70s. On this understanding, we can expand the concept of the individual "game-world" to the possibility of game worlds created by acts of modding (i.e. player-created modifications to (e.g.) the design or functionality of games, as considered in this issue by Bohunicky), or by countercultural 'indie games' companies and/or participatory game communities, an understanding that brings us to a final concept, convergence.

A conventional understanding of media *convergence* focuses on how, by working across platforms, industries, corporations, and audiences, large media organisations can sustain or optimise their profits and how, simultaneously, convergence strengthens the ideological grip enacted through media frames and content flow (see Dwyer 2-3, 27). Nonetheless, in his *Ecomedia* essay Anthony Lioi rightly argues that "media convergence is environed but not limited by the economic logic of the global marketplace. Convergence culture in ecomedia performs both a pragmatic, market-based function and a liberatory, political function in the digital public sphere" (173-4). Subsequently, Lioi works an analysis around Henry Jenkins' identification of three forms of 'Convergence Culture' in his book of that name (2008): *media convergence*, as described above, but qualified by Jenkins to take into account the unpredictable reception patterns of audiences; *participatory culture*, which Lioi defines as "the intervention of fans in the production of popular culture" (168); and *collective intelligence*, where an accumulation of the skills and knowledge of those intervening or participating in popular media converge (writes Lioi) in "networks of action" (see 166-9). Without dismissing the enduring economic and ideological power of media industries, Lioi sees in 'collective intelligence' the potential for a new ecological politics. For collective intelligence presents a helpful bridge between theories of grassroots media culture put forward by the likes of Jenkins and the growing body of work on alternate-reality gaming (ARG), which traces collective intelligence back to the cyberutopian proposals of French

philosopher Pierre Lévy (McGonigal). Both suggest that new socially progressive permutations may emerge from individuals working in concert toward a common goal. Accordingly, it is in the 'Convergence' section of *Ecomedia* that an essay on computer games, by Lauren Woolbright (one of the contributors to this volume) and Thaiane Oliveira, describes how, in Latin America, a range of interactive, multimedia ARGs have kindled a convergence between environmentally-themed metafictional narratives and real-life environmental protest.

Overall, the possibilities identified in Rust et al.'s analysis of frames, flows, and convergence—new insights realised through re-framing; new broadcasting ecologies stimulating new content flows; and participatory cultures intervening in popular culture to engender new forms and collective action—offer the foundation for, and increase the likelihood of, a genuinely 'green' popular culture. A range of possibilities for this, including how those possibilities might be realised in computer and video games, is outlined in a further recent contribution to the field, John Parham's *Green Media and Popular Culture* (2016). Parham, in effect, substitutes the somewhat linear, purposeful metaphor of flow with the open-ended and recognisably cultural studies paradigm of a "circuit of culture". Paul du Gay argues that that paradigm replaces an understanding of the "mode of production of a cultural artefact" as "the prime determinant" of its meaning (the underlying assumption of media flow) by stressing "a number of distinct processes whose interaction can and does lead to variable and contingent outcomes" (3). Encompassing "production", "consumption", and "regulation", but also "representation" and "identity", those processes reach toward the "anthropological" dimension mentioned by Maxwell and Miller. They are woven together by Parham to posit popular media as a complex network of competing ideologies which emerges in the interplay of producers and audiences, global and local, or industrial mass culture with popular folk cultures, subcultures, and countercultures.

Each of these interplays can be illustrated via games. For example, the interplay between media effect and audience resistance takes shape in the "simulation gap" between the virtual world of the game and the subjectivity, experience and worldview of the player, a theme addressed here in the dissenting possibilities of game-playing suggested, for example, by Backe, Lehner, or Rivera-Dundas. Rivera-Dundas, for instance, suggests that while Dyer-Witheford and de Peuter have argued that playing a game on a console means "plug[ging] oneself into a network of techno-human relations, which even as it offers cognitive skills and affective thrills also inserts subjects into a commodity web," there is also the possibility, in more ecological games, that the creation of what they call "machinic subjectivities" might be replaced by a sense of being constituted by nonhuman things. Such discussions indicate the possible world of alternative games that underpins Dyer-Witheford and de Peuter's countering taxonomy of "Games of Multitude." These encompass, amongst others, *tactical games*, "designed by activists to disseminate radical social critique" and what they call *dissonant development* (the existence of critical content in mainstream games) (191).

This issue of *Ecozon@* considers an array of different types of game: mainstream and countercultural, independent and corporate games; rule-based 'ludic' games and

more meditative, immersive games; online, PC, console, and mobile games. Linking that diversity to the range of 'eco-media' perspectives detailed above, we can develop a foundational understanding of what categories might constitute the study of green computer games. This would include:

- "Contradictory" ecocritical readings and playthroughs of games produced within mainstream, industrial (mass) culture. Here we can apply an argument of Andrew Hageman's: that even where popular media is "bathed" in ideologies of capitalism, because ideology never stands still, and is itself negotiable, there are always opportunities to "glimpse and [...] imagine an ecology without capital" (65-6). Where such contradiction is most productive, we get scenarios that can confront a player starkly with the resilience of his/her ethically environmental stance, such as the achievement award granted (notes Backe) in *Red Dead Redemption* (Rockstar, 2010) for hunting the endangered buffalo to extinction.
- Analyses of environmentally educational 'serious' games (categorised by Dyer-Witheford and de Peuter as *polity simulators*) which, because they are produced in social institutions, tend to exist in the borderlines between 'empire' and 'multitude.' We find this, for example, in Smith's comparison of *Fate of the World* with policy tools such as the UK Department for Energy and Climate Change's *2050 Calculator*.
- Fan interventions, subcultures, and participatory communities developed around games, whether commercial or non-commercial. As we see from the essays here, this could take various "metagaming" (Boluk and Lemieux) forms: "modding" (examined here by Bohunicky, as a means of intervention in games' flattened environmental representations, or ideological agendas); or forms of "emancipatory" or "expansive play" which resist or reinterpret games' procedural rhetoric (Bogost) while perhaps developing unanticipated environmentalist perspectives. The latter is found, for instance, by Lehner in *Shadow of the Colossus* and by Smith in the perhaps unlikely example of *Minecraft*.
- "Tactical" and/or countercultural gaming: from immersive games designed to return us to nature (e.g. David O'Reilly's *Mountain*, Ed Key and David Kanaga's *Proteus*) to eco-politically critical games. Here, for example, Nguyen addresses the mobile/online game *Phone Story* (2011), created by Molleindustria artist Paolo Pedercini and whose stated aims encompass "the reappropriation of video games" and "the radicalisation of popular culture".
- "Dissonant" games developed in a symbiosis between mainstream media and alternative games companies, like thatgamecompany's *Flower* (2009). This includes surprisingly critical content published in conventional, even triple-A (high budget) games, whether anti-industrial, back-to-the-farm games (Chang, "Back") or (say) in the anti-capitalist, dystopian themes of *Bioshock* (Irrational Games, 2007).

Popular media has "potentially finer antennae" for detecting environmental attitudes because of its broad consumption and appeal (Rust, Monani and Cubitt 4) and because it exists both in a complex media ecology and a circuitous, complex cultural ecology. Hence, the enormous popularity of computer games can tell us much about the resilience that environmentalist ideas may or may not have within a mainstream

popular culture. But ultimately, connecting the popularity of games to any potential to nurture ecological awareness is less about thematic elements and more about whether their unique formal, aesthetic, and in particular interactive properties can engage audiences in this direction. We can consider that question through one last dimension of emergent green media and cultural studies, 'affect'.

In *Ecologies of the Moving Image: Cinema, Affect, Nature*, Adrian Ivakhiv extends the theories described above by considering "three ecologies"—the material, social, and perceptual. These, he argues, constitute our understanding of the world (5). In relation to them, film, for example, can encourage a cohesive ecological sense of the world by working across three dimensions: the geomorphic (cinema takes us to places which, nevertheless, hold some relationship to the audience's here and now i.e. existing spaces); the animamorphic (whereby films develop a sense of other living forms and our relation to them); and the anthropomorphic which, distinct from its conventional definition, that of ascribing human characteristics to nonhuman being, Ivakhiv defines as positing certain qualities as distinctively human, in the process creating the human as something distinct from the animal and the inanimate world (8-11). A perceptual ecology, in a cultural context, refers therefore to how (in film) images and sounds are deployed as affective forms in ways that allow us to see, hear, and feel this world in which we are, partially separate, but ultimately enmeshed in relations with the nonhuman. This is a useful model for understanding also a potential typography of 'green games.' To take examples: games examined in this issue geomorphically explore simulated "more-than-human" environments as is the case, for example, with *Flower* (Lehner), *Proteus*, *Islands: Non-Places* (both Rivera-Dundas), and *Mountain* (Smith); Backe similarly registers an enormous range of playable animal characters in games or games where animals are subject to the agency of human avatars. In that context, when he subsequently writes that the nature of play is that "it appropriates and changes its objects", one can see how the interactivity of computer games might correspondingly enact animamorphic reflection on how we live alongside other beings, something explored in detail when, working from Haraway, Melissa Bianchi explores how games cultivate multispecies relations. Finally, anthropomorphic games that entice us to address the human ecologies in which we live appear throughout these pages—from the social realist *Little Inferno* and *Phone Story* (Nguyen), to the fantastical or dystopian, as in *The Elder Scrolls V: Skyrim* (Bohunicky) and *Dishonoured* (Backe). Smith makes the crosscurrents Ivakhiv describes explicit in the movement of his essay from grid-based resource management games which, he argues, "encode a set of narratives in which nature is the location of resources to be extracted and used" to an alternative art game like *Mountain*. Hence, 'affect' introduces a new realm into green media and cultural studies, one that focuses on how we are influenced, connected, and encouraged towards action not only by evidence, argumentative logic, and the structural oppositions intrinsic (Ivakhiv argues) to critical theory, but also by emotional triggers and "affective dynamics" (4).

This theme is further developed in Alexa Weik von Mossner's careful reading of affect theory in relation to cognitive science and psychology in *Affective Ecologies:*

Empathy, Emotion, and Environmental Narrative (2017). Overlapping with Ivakhiv's three morphological realms, Mossner offers two main arguments concerning the role of affective dynamics in engendering ecological consciousness: firstly, affect theory's concentration on "circulations between narratives, bodies, and environments" and its "conceptual unwillingness to accept boundaries of any kind" (11) corresponds to ecological thinking; secondly, she suggests that a relating of affect to "cognitive narratology" can furnish tools for understanding how texts engender environmental values. Specifically, they highlight both "the importance of [...] environments for plot and character" and the ways in which film and literary texts might create "immersive environments for readers" (12). Turning to film, Weik von Mossner argues that it affects us in two principal ways: the *motion* intrinsic within a "motion picture" simulates embodiment and gently pulls viewers into the environment of the text (Ivakhiv's "geomorphic"); and, correspondingly, narrative, which can touch us emotionally and potentially instigate (depending on the text) either the animamorphic or the anthropomorphic relationships on which ecological consciousness rests, or both.

This model is even more applicable, we argue, to computer and video games (as Weik von Mossner indicates in her book's conclusion). Games, too, immerse us in environments while narrating ecological interrelationship. Yet the linkage between body, environment, and narrative forged in motion pictures is intensified by the interactive nature of playing a computer or video game, a point that Shinkle has stressed. Referring to the long tradition of linear or Albertian perspective in forms of visual culture which themselves enact objectivity, Shinkle laments a focus in studies of computer game play on structural elements – semiotics, semantics, narrative, rhetoric, ideology—rather than affect, which in gaming, she argues, "is key to the perception of images, and to the notion of meaningful interaction with them" (22). What we lose as a result is not just an understanding of the experience of gaming, but a full appreciation of how the affective dynamics of games can have personal and ideological importance. Analogously, while developing his model of the perceptual Ivakhiv cites computer and video games as part of a pervasive "visual world". Here, ever-expanding visual technologies—photography, cinema, games, data graphs—simultaneously objectify the world, giving human observers an illusion of knowledge and power over nature, but can also destabilize by defying obvious meaning or by triggering an emotional response (2013: 3-4).

Shinkle's argument is particularly applicable to an ecocritical reading of games for three reasons: firstly, she suggests that gaming's multisensory alliance between vision and affective properties such as touch, feel, and movement creates a phenomenological ontology that perceives incessant flux and our co-creative involvement in change as intrinsic to human being in the world (the linkage of anthro- and animamorphic of which Ivakhiv speaks) (26). In much the same vein, Milburn, drawing on Haraway's *When Species Meet*, argues that a sense of environmental responsibility rests on an aptitude to respond—"to affect, and be affected" by other people, other species, and "the otherness of our own planet." Notwithstanding the simulation gap, this can be "intensified", he argues, by the interactive nature of computer

games, by which games compel us to respond (212). Shinkle, secondly, expands affect beyond emotion to encompass the "'feel' or intensity of a game" as experienced by the player (22). Intensity refers, she says, to "the strength or duration of its effect, and the way this is embodied in autonomic relations like galvanic skin response, heartbeat, and breathing" (25). Several essays here make reference to how affect is created through the environment and/or controls in games. Backe mentions the audible scraping of bone and severing of the cartilage of animals in the survivalist game *Red Dead Redemption*; Lehner references the extensive use in *Flower* of the Sixaxis controller's gravitational sensor, an implementation which, he argues, can defamiliarize accustomed modes of control. Bianchi likewise suggests that the awkwardness of control schemes in games like *Octodad: Dadliest Catch* (Young Horses, 2014) can give us an insight into what it means to be other-than-human, whether to comic or poignant effect.

Lastly, Shinkle argues that the affective nature of computer games engenders a productive destabilization. This argument is not unlike that of the music theorist Jacques Attali, who suggests that music, because of its non-discursive and non-narrative qualities, not only escapes being bound up in philosophical, economic, and ideological conventions, but also expresses feelings, beliefs and aspirations lost or submerged in society (6). Moreover, music can prophesy change: "It makes audible the new world that will gradually become visible" (11). Influenced by Attali's translator, the theorist Brian Massumi, Shinkle correspondingly argues that the effects of computer games "make their way into the sociocultural realm in the form of the unexpected, the lateral, and the unquantifiable which rather than reaffirming ideology allow for potential, incipient new meanings to seep in" (23). If we lose a sense of the affective charge of games, then we lose these meanings and run the risk of erroneously dismissing them as frivolous, escapist, lowbrow, or violent entertainment.

This is where, ecocritically speaking, game studies comes into its own: games possess an affective quality, engendered by their uniquely interactive basis, which is captured in many of the key concepts of this still youthful field: immersion, interactivity, incorporation, identification, and agency; the ludic, ergodic, algorithmic, and machinic; play, platform, and procedurality; and so on.

Part II: Greening Game Studies

Although academic game studies is not even two decades old, the field has already developed noteworthy historical investments in narrative and game mechanics, cultural studies analyses of representations of race, gender, and sexuality, and ethnographic and social scientific research on player behavior and belief. Of course, games and play more generally have been topics of interest to researchers for far longer, as demonstrated by some of the most referenced antecedents to contemporary video game theory—the Dutch historian Johan Huizinga's *Homo ludens*, first published in 1938, and the French sociologist Roger Caillois's *Man, Play and Games*, originally published in 1961. However, as Espen Aarseth writes in the inaugural issue of the journal *Game Studies*, "2001 can be seen as the Year One of *Computer Game Studies* as an

emerging, viable, international, academic field." Early defining debates between the so-called narratologists, who saw video games as leveraging the storytelling techniques of older media like cinema and the stage, and the so-called ludologists (like Aarseth), who felt strongly that games needed to be treated as distinctive, process-based art forms, have since been supplemented by an ever-expanding gamut of interests, among them studies of platforms, software, and code, player ethics, queer game-making, the production cultures and political economies of the mainstream and indie game industries, and the unique challenges of preserving the "virtual worlds" of games and related paratexts.

Given this ferment of scholarly activity, it is somewhat surprising that environmental criticism has been little represented in game studies thus far—a dearth that this issue of *Ecozon@* directly seeks to ameliorate. However, as Chang has elaborated across several essays, particularly the seminal article "Games as Environmental Texts," there are a number of reasons for the strange lack of congress between game studies and the environmental humanities, reasons that boil down to complementary blind spots and prejudices on the part of each set of disciplines. Like the proverbial oil and water, nature and technology do not mix well, or at least not without a vigorous shaking up! Environmental scientists and humanists would do well to move past both knee-jerk suspicion of media and technology and a friendlier instrumentalism, or seeing media like games as convenient if compromised vehicles of science communication. Games scholars meanwhile tend to fetishize the player and the act of play in a way that inevitably denigrates game content and context, even as gaming increasingly happens on the move or beyond the confines of basement, bedroom, or living room.

While environmental game scholarship is still relatively scarce, we would be remiss not to mention some promising recent seams. For instance, there is a growing body of writing on the political economy of game production that includes not only de Peuter and Dyer-Witheford's perspective on gaming and global capitalism, but also James Newman's detailed analysis of the game industry's rhetorics of obsolescence and supersession and Raiford Guins's concern with the afterlives of games, as seen in the storied excavation of Atari's failed game *E.T. the Extra-Terrestrial* from a landfill in Alamogordo, New Mexico. The 2014 "Digital Environments" special issue of *Green Letters* (vol. 18 no. 3) also contained game articles by two authors featured here, Melissa Bianchi and Kyle Bohunicky. Isolated but groundbreaking essays can likewise be found, with enough diligent searching, for example science and technology studies scholar Colin Milburn's typology of "green games," noted above, Matt Barton's 2008 *Game Studies* reflection on weather simulation, and Benjamin Abraham and Darshana Jayemanne's white paper on ecological representation in games from the proceedings of the 2015 Digital Games Research Association Australia conference (DiGRAA). And now the authors, editors, and references collected in this issue also constitute a resource detailing varied ecocritical perspectives on games while also pointing to exciting and as of yet untapped areas of inquiry.

Beginning this issue with an essay focused (broadly) on politics, ideology, and ethics, Josef Nguyen attends closely to questions of provenance and disposal, arguing that environmentally themed games ultimately fall short of real-world efficacy unless they call attention to the game industry's and technology manufacturers' complicity in unsustainable forms of resource extraction, toxic dumping, and energy use. Correspondingly, conjoining political economy with ethics, Hans-Joachim Backe demonstrates 'dissonant development' in his essay. He demonstrates how Miguel Sicart's user-centred and ethics-based perspective on games can be applied in mainstream computer games so as to identify glimpses of ecological engagement. Ethical conflicts emerge because the player is, in Sicart's words, "a living, breathing, culturally embodied, ethically and politically engaged being that plays not only for an ulterior purpose, but for *play*'s sake." Similarly, Alex Lehner suggests that aesthetically complex games which subvert established conventions in games (from non-anthropomorphic avatars to non-standard controls) 'emancipate' the player, freeing their imagination and their play, so as to facilitate a space for reflection on ecological co-existence.

We recognize that the term "green" means many things to many people, from corporate greenwashing and a kind of sunny environmentalism to sustainable practices and, as we tender, ecologically inflected media scholarship. Despite their obvious participation in unsustainable flows of global capital and labor, we join those who still find cause for hope in the mediation offered by games. In part, this is due to the medium's tendency to stress systems thinking, continuous feedback, and richly immersive experiences of diverse worlds, a fundamental similarity between games as informatic objects and ecology as a cybernetic science. Although interactivity is a notoriously slippery term, the scholars assembled here recognize that games offer distinctive and powerful opportunities for environmental meditation, action, and affect, even if not all of it is benign. In his essay, for example, Kyle Bohunicky turns to the practice of modding as evidence of creative player engagement with environmental issues as scaffolded within games like Bethesda Softworks' *The Elder Scrolls* series. Like Nguyen, Lauren Woolbright offers a more direct conduit between gameplay and design and environmental activism, suggesting that games might usefully subvert the didacticism and moralizing tone of much campaigning for environmental causes. Similarly, in Bradon Smith's essay we find both games such as *World Without Oil* that forge a form of "collective intelligence" in simulating experience of and action on ecological problems, and others like O'Reilly's *Mountain*, a powerfully affective and off-beat game-animation which strictly limits the agency of the player and thus forces a re-thinking of our ontological relationship with nonhuman nature, a theme picked up (as discussed shortly) in our final two essays.

The cover of this issue relates to all of our essays in its staging of the impossibility of consequence-free play. It features concept art from the "global survival game" *Eco* (Strange Loop Games), which began as a successful Kickstarter project in August 2015 and has since been funded by the U.S. Department of Education. Like *Minecraft* but with a decidedly American Pacific Northwest feel, *Eco* is a resource-based multiplayer world sandbox, but it is fundamentally different in a crucial way--every action that players take

not only impacts the game world, but other players inhabiting that world. Mining produces toxic tailings, overhunting can lead to species extinction, and breaking the law can lead to fines and even arrest. Curiously, however, living lightly on the land and refusing to harvest resources is not designed to be a winning strategy. In *Eco*, the threat of an imminent meteor collision demands that players work together to collect, build, research a technological solution, and even legislate communal behavior. In other words, doing nothing and doing too much are equally unproductive routes. While the game's prescribed middle road may strike some as technological utopianism, the crucial point is that while players are markedly free to do as they please, it is within the bounds of a materially and temporally finite world in which hunger, pollution, food chains, hydrology, economy, ecology, and existential threat are all real and equally important. Still only in its alpha phase, *Eco* has already won the 2015 Curse PAX (Penny Arcade Expo) Prime award for "Best Use of Imagination in Gameplay" and the Climate Challenge at the 2016 Games for Change Festival in New York.

Figure 1. A likely home site in *Eco* circa 2015. Screenshot by A. Chang.

As playful experiments like *Eco* and *Mountain* indicate, games can offer deep, affective opportunities for environmental meditation. This, broadly, is the focus of our final two essays. Adena Rivera-Dundas's essay in effect illustrates Shinkle's main arguments. She demonstrates that games like *Proteus* and *Islands: Non-Places* deploy disorientating and destabilising interactive mechanics which, by introducing a lack of control over the games' virtual environments, inculcate an experience of flux and a compulsion to respond which can lead, she argues, to heightened environmental awareness. Melissa Bianchi helpfully elaborates on Donna Haraway's fleeting acknowledgment, in *Staying with the Trouble*, of the Inupiaq co-created game *Never Alone*. Informed by Haraway's concern for multispecies flourishing, Bianchi searches for

and finds evidence of creaturely games that exhibit "tentacular" and entangled ways of being with other lifeforms, among them the delightfully cephalopodian *Octodad: Dadliest Catch* and *Splatoon*.

While we believe firmly that such rich essays will advance 'green' game studies, given the rapidly developing state of the field it is inevitable that other potentially fertile areas meriting further investigation on the part of ecomedia scholars fall outside of the purview of this issue. These areas include biotic games (games played with living microorganisms), animal welfare games (like "zoo tech" games created for captive animals' enrichment), immersive virtual experiences (such as those created at the Virtual Human Interaction Lab at Stanford), augmented or alternate reality games, pervasive/locative games (such as those designed by Jane McGonigal and Kari Kraus, like *Superstruct* or *DUST*), and, indeed, studies of analog games such as board games, card games, and so on, many of which employ fascinating material mechanics. Chang has also recently co-edited a volume of the *Journal of Gaming and Virtual Worlds* with Braxton Soderman and Jesús Costantino, on permanent death or "permadeath" mechanics in games, including not only the irrevocable deaths of player characters, but also the demise of entire game worlds. Furthermore, as games increasingly move beyond the domestic interior, significant questions arise about the spaces and contextual practices of gaming, as well as perennial issues surrounding mobility, access, and the "magic circle" (Huizinga) of play and its inevitable porousness. Thinking about games as site-specific phenomena or about players fluidly adapting their gameplay among diverse actors and situations may thus benefit from early work by Anna McCarthy on television in public space or by sound-studies theorists who contemplated the Walkman, the iPod, and so on.

As Hollywood invests heavily in "worldbuilding" strategies rather than traditional scripts, and transmedia storytelling becomes the norm rather than the exception, we need to think about where games and gaming figure in the urgent quest to reconfigure human life on this planet into something ecologically sustainable, for us, other species, and the Earth itself. This is a particularly acute imperative given the worldwide game industry's massive reach, which far exceeds cinema and other media industries in terms of profits, but which also augurs the potential to reach younger generations who may be desensitized to or apathetic in the face of the staggering environmental challenges of the twenty-first century. In that context, perhaps the most radical conclusion offered by this collection of essays is Nguyen's notion that we must rethink our idea of fun—how we *have* fun, and what makes games such guilty pleasures, so as to confront our own complicity in the industry's undeniable ecological harm. For some, this might mean going analog, imposing bandwidth and processor-cycle limits on our computational devices, or even ceasing to play. Yet while we *must* remain mindful of these possibilities, the essays in this volume also demonstrate that some games may help us play our way to ecological consciousness (of co-existence with other species or of human society's ecological impact) or, even better, move us to acts of environmental responsibility.

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