The achievement of animals: an ethology of AI in videogames [draft]

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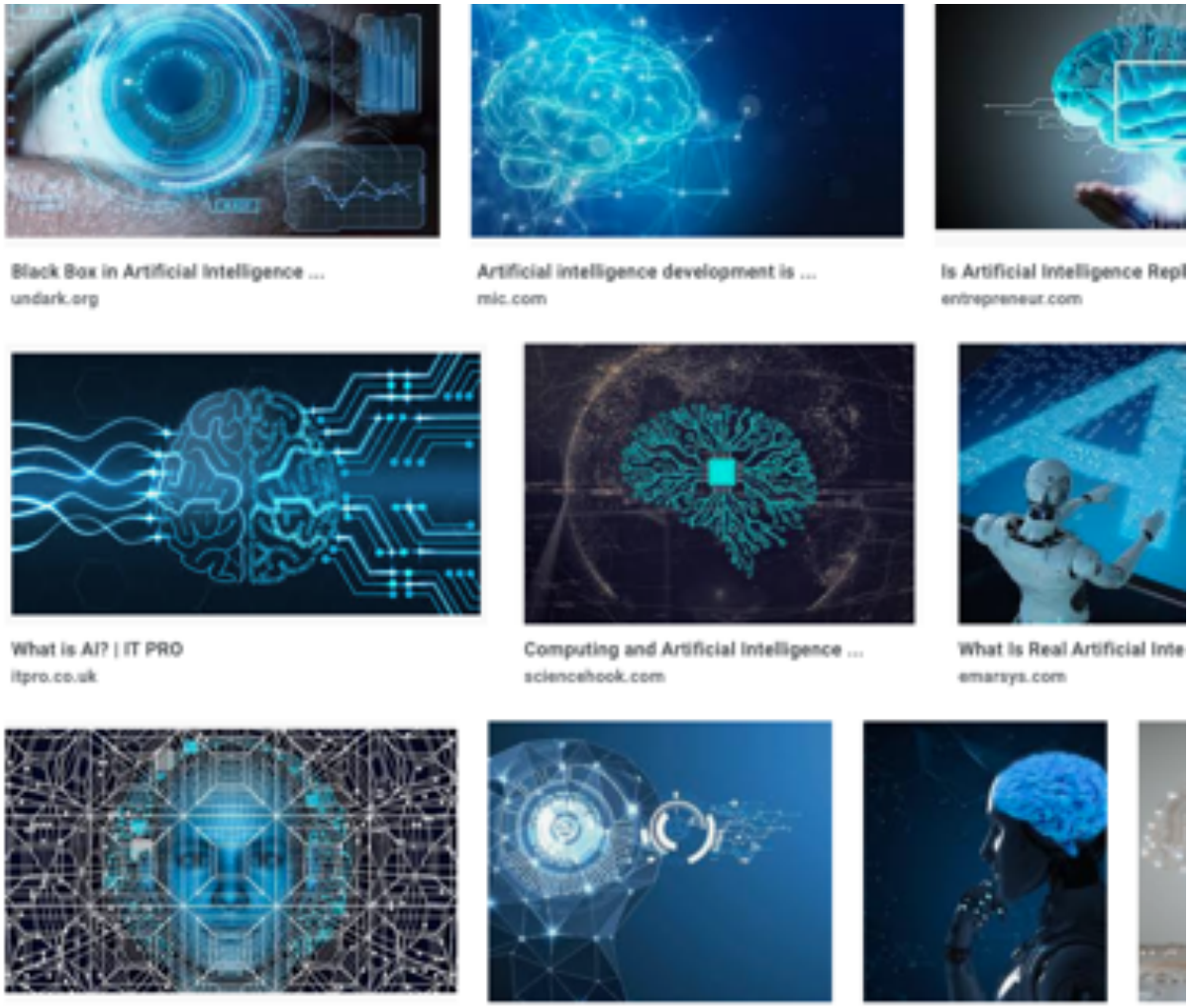
Seth Giddings, Winchester School of Art, University of Southampton

Amidst the excitement, predictions, investment and fear that have attended the development and application of artificial intelligence in recent decades, an important factor has been largely overlooked. Since the late 1970s popular media culture and its lived experience have brought AI into the everyday spaces of commercial and domestic leisure. Software agents, figured as monsters, aliens and racing cars have tracked A* algorithmic paths across arcade screens, finite state machines sensing and responding to their players' movements and actions. And with less graphical flair, conversational agents played out a million ludic Turing tests, parsing simple commands in the navigation of text-based adventures, tracking through dialogue trees, and conducting talking therapy as simulated psychotherapists. A-Life evolutionary algorithms and simulated insect colonies have migrated into the everyday through games such as *Creatures* and *SimAnt* (Kember 2003, Parikka 2010a). Yet games *as* games feature in the grand narrative of AI and robotics only as a small set of systems that mark certain thresholds in cognition and complexity, waymarkers towards a putative Artificial General Intelligence (AGI) or even Singularity. DeepBlue, AlphaGo and the Atari-playing DQN algorithm are the three most celebrated examples. That nearly all other games, the cultural and lived contexts of their playing, and the procedures and cultures of play in itself are overlooked hints at some telling assumptions and omissions in dominant discourses and predictions for AI. Game AI offers an alternative, less-linear and teleological trajectory for the emergence of cognitive and creative possibilities, bringing to the fore dynamics and ecologies of distributed agency, relationality and processuality in emerging cultural and material environments that could be described as intelligent (Suchman 2007), posthuman (Hayles 1999), or postnatural[i]. To do this, I will focus on the simulation of animals in particular. If game AI unsettles the prevailing teleological assumption of the ever-more convincing simulation of human intelligence, then artificial animal-like - or zoomorphic - movement and behaviour further destabilise anthropomorphic dreams and nightmares of AGI. It suggests an alternative way of grasping existing and emergent human-nonhuman relationality, an ethology of new kinds of behaviour that are shaping the creative and political possibilities of the postnatural environment.

Why look at animals?

AI presents itself in a variety of forms. Popular articles on the subject are illustrated with photographs or drawings of SF robots or human brains overlaid with electronic circuitry, lights or the ones and zeros of binary code - lit with a ubiquitous electric blue glow.



Google image search 'Artificial Intelligence' 24/3/20

The simulation of intelligence in synthetic human heads, faces and bodies (for example Cynthia Breazeal's Kismet or Stelarc's Prosthetic Head) capture the imagination, as do the disembodied avatars of the various types of conversational agents and other software robots or bots that animate digital networks with human-like communication, from the more or less benign virtual assistants to the automated trolls of Twitter. Even the vast, complex and intangible networks and operations of big data processing and machine learning in surveillance, financial markets and consumer tracking are understood as anthropomorphic in the sense of human or superhuman consciousness if not in bodily form. The idea being that these systems will become so complicated, distributed and

interconnected that they might spontaneously and independently develop self-awareness and intentional autonomy - Skynet, not the Terminator[ii]. Underpinning this allegorisation then is a prevalent, and thoroughly gendered, assumption that the value of AI, its emerging form and agency - whether promising or threatening - lies in an anthropomorphic teleology (Suchman 2007: 228). The grand narrative of AGI traces a steady, incremental progression towards greater cognitive complexity, reasoning power, capacity for learning and, ultimately, the Singularity, the putative point at which machines overtake human abilities and attain autonomy from human control. In this evolutionary line the simulation of animal intelligence and behaviour is a mere step towards the android goal. First cellular automata and simulated ant colonies, then - maybe - simple vertebrates, to mammals, primates, then - inevitably - Man.

To conduct ethology in the artificial animal kingdom then is to challenge the humanist dream/nightmare of AGI. Just as in the natural world all organisms are not necessarily evolving towards greater complexity and intelligence but rather adapting their forms, capabilities and behaviours to fit within changing environments, so too we have a virtual ecosystem worthy of study (and play) in its own right. From dodging the barrels thrown by Donkey Kong to caring for needy Nintendogs and voracious Tamagotchi, to exploring the reaches of Hyrule on horseback and conversing with the amicable denizens of *Animal Crossing*, AI-driven virtual animals offer analytical insights into living with, working with, and playing with animate machines in the here-and-now. Importantly, these little machines are often zoomorphic in behaviour as well as in appearance, and as such they initiate and sustain models of relationality that have proved hugely productive in AI and A-Life research concerned with self-organisation, distributed cognition, neural networks and swarm robotics (Parikka 2010a: 153-6). As well as antagonists for ludic combat and resources for virtual survival, these thriving animal-environments model dynamics of self-organisation and cooperation, nurture and care, training and discipline. Importantly, as I will argue here, these relationships are not one-way: virtual animals nurture, train and discipline their human players, AI as integral to complex and nonlinear but human-animal, actual-virtual becomings.

What are animals?

My argument is premised on an assertion that at first glance seems absurd: synthetic animals *are* animals. Or, more precisely, that there are sufficient non-trivial similarities between zoomorphic non-player characters and robot/smart toys, as encountered in use or play, to describe such encounters in terms of animality, human-nonhuman animal relationality, and of a natural-machinic environment. These creatures roam their virtual territories, driven both by the procedural instincts

coded by the game software and the fight-or-flight (or nurture) stimuli of player input. Or they thrive too in the actual world, as toys and marketing images, more or less smart, more or less automatic in robotic behaviour. They are therefore unstable creatures, at times mere game tokens arbitrary in species and affordance, at others intangible software agents, at other times invested with deeply affective intentionality and attachments over time and through imaginative play. They resist coherent taxonomy: at times they function as familiar species - a dog, a horse, a pack of wolves - at others they are anthropomorphic in the tradition of animal characters in cartoons, speciation less significant than characterisation. Yet others, as I'll explain later, are fundamentally ambiguous in their zoontology (Wolfe 2003). To assert that synthetic animals are animals then would appear to violate the first principles of both media studies and game studies, that is, for media studies' semiotic theory, that screen representations are precisely *not* their referent - a picture of a dog does not, of course, bark. In game studies the remove between sign and referent is at least doubled: the screen image as sprite is distinct from its code, a layer of images animated by the program but symbolically arbitrary of its abstract procedural and algorithmic motive force (Aarseth 1997).

How does it make any sense then to consider virtual animals as animal in any serious way? Both the naturalistically-rendered wolves of *Legend of Zelda: the breath of the wild* and the chatty anthropomorphised citizens of the *Animal Crossing* games are inorganic abstractions, assemblages of animated drawings, behavioural algorithms and audio clips. Their material substrates - digital/electronic and biological/organic are quite different, and their algorithmic instantiation and operations are fundamentally alien to actual animals' existence and behaviour. For example, as Tom Tyler points out, each instance of an animal type or species in a videogame is an expression of code, and hence identical to all others of that type or species. Their appearance, behaviour and vocalisations are determined by the same code. Unlike natural fauna with their genetic, epigenetic and environmental adaptations between individuals and across generations, virtual animals are clones 'rendered entirely interchangeable, bare exemplars of their species being [...] triumphs of artifice' (Tyler 2014: 38). They are clearly not animals, but to paraphrase Gregory Bateson, they are not *not* animals (Bateson 1972). Bateson was referring to the baby-ness of a child's doll - in moments of imaginative play or intimate affection the doll becomes more than an inert representation, it has life breathed into it, animated in the hands and imagination. Unlike Pinocchio it will never become an actual child but in play it is in the open-ended state of *becoming* one. Following this simulacral logic, in concrete instances of videogame play virtual animals are in a process of becoming-animal. Or more precisely, the gameplay event *achieves* a complex instantiation of relationships and behaviours between human players, virtual animals and their

synthetic environment from which human-nonhuman animal relationality emerges. As Tyler argues, though any particular virtual animal is an identical specimen of an abstract ideal, in particular moments or events of play it resolves into a distinct individual. It becomes less *not* an animal:

> In the frenzied moment of battle, as combatants clash and the possibility of virtual death at the tusk or paw of a specific opponent presses hard, there is no sense of a transcendent Platonic presence. The effect or capacity of each animal, their personal strength, speed and ferocity perhaps, reveals them to be an ally or adversary whose particular powers work to our immediate benefit or detriment… (Tyler 2014: 38).

The salience of these animals *as* animals consists in these iterative, contingent and unstable events of achievement. They are *figured* and in turn they *configure*: technologies 'are forms of materialised figuration; that is, they bring together assemblages of stuff and meaning into more and less stable arrangements. These arrangements imply in turn particular ways of associating humans and machines' (Suchman 2007: 227). Here Lucy Suchman is drawing on Haraway to interpret the material-semiotic dynamics of the design and testing of experimental robots and A-Life systems. Like game characters these agents are the products of their relationships with the human users/players, their virtual and actual systems and environments and their own semiotic and procedural characteristics and behaviours. As I'll argue this argument can be reversed, human players are also configured in and as animal / animal relationality.

Donna Haraway has explored intricacies of human-animal relationships and mutual becoming through the example of her experience of training and performing agility challenges with her pet dog. Haraway uses the term "companion animal" to encompass the range of productive and affective relationships between humans and animals, including pets (Haraway 2003, 2008). The application of Haraway's work on companion species to artificial nonhumans will be considered later in this chapter. For now I would note the salience for my argument of Haraway's earlier work on the politics and cultural politics of technoscience (Haraway 1991), particularly her sustained enquiry into human/nonhuman otherness and affinity, and her attention to the discourses and materiality of cybernetics as systems of control. The 'lively machines' she identifies as agents of an emergent post-natural global order underpin my ethology of living with playful automata. Haraway's work is central to a strong tradition within critical posthumanism that overlaps with animal studies in its critique of the entrenched philosophical insistence on human exceptionalism. The question of the exceptional human subject is posed from this overlapping zone: has he ever existed? Note Darwin's unseating of

homo sapiens as the pinnacle of nature, or the co-existence and co-constitution of human settlement with domestic animals. Just as dogs, cattle, poultry and horses have been adapted, manufactured, from wild ancestors for sustenance, labour and companionship over millennia, so too has human culture been shaped spatially, technically and symbolically by hunting, husbandry and animal-focused ritual.

What then are the implications of taking the animality of AI and A-Life entities as real and not metaphorical or symbolic? This question in turn demands ontological questions of the synthetic animal itself: what kinds of speciation gives rise to it, what habitats and what kinds of behaviour shape its existence, and how might the status of *animal* be achieved from the assemblage of code, digital hardware, animated imagery, lived popular culture, bodies and minds in play? And what does this posthuman or postnatural ethology offer to the critical understanding of artificial intelligence itself, artificial animals gnaw on the soft underbelly of the humanist dream/nightmare of conscious machines? I would address these questions through four overlapping lines of enquiry. Firstly, at the very least, attention to zoomorphic AI and robotics leads us away from the persistent imaginary of AI as human-like in behaviour and cognition. They are a persistent reminder of the painful truth that the evolution of an analogue to human intelligence has barely left the primordial soup: in terms of neural complexity and autonomy even the most advanced AI research is still modelling insect-level intelligence or mapping subsections of rat brains (Boden 2018: 138-9)[iii].

Second, the study of synthetic and biological animals also draws our attention to the huge and productive sweep of research and development - philosophy and anthropology - of robotics and AI informed by animals, not as a points on the Singularity's evolutionary lineage, but as vital and productive models for all sorts of machines and systems in their own right. These range from the evolutionary algorithms and cellular automata of A-Life research to therapeutic, toy and companion robots modelled on dogs and seals, and from forms of movement and sensing inspired by the behaviour and capabilities of individual animals to modes of sociality and collective action driving flocking simulations and swarm robotics (Parikka 2010a). Third, attention to animals can bring us back to videogames and digital toys, not as trivial phenomena peripheral to the significant advances in technoscience but as the innovation in, and dissemination and domestication of modes of being with, animate machines. Zoomorphic AI, A-Life and robotics as everyday media-technocultural experiences, from *Tamagotchi* to *Nintendogs*, offer both a rich resource for the aesthetic, kinaesthetic and lived instantiation of synthetic life and cues or heuristics for the examination of AI in its wider global environments. Fourth, attention to animals both biological and manufactured

illuminates the *environmental* dimensions of their behaviour. Against the idealised, transcendent and disembodied brain of the Artificial General Intelligence, we see creatures in social and environmental milieu. In fact, just as when we dig down into, say, the soil of a forest with its insects, worms, fungi and bacteria the distinction between organism and environment ceases to be significant, so too in a virtual gameworld the coded animal and its coded environment are materially indistinct. As in the study of the biosphere, it is the ecological dynamics that are salient not any particular species. This environmental character of animal AI in the events and milieus of its operation and instantiation highlights the fundamental relationality of technical nonhuman behaviour and cognition - again not idealised and transcendent but fully part of and generative of the human and nonhuman networks and activities.

AI, red in tooth and claw

Horizon Zero Dawn (Guerilla Games 2017)

> The avatar - Aloy - crouches in tall grass, her matted red hair caught by the breeze. In the middle distance to the right two tall animals can be seen. In outline and in their grazing behaviour reminiscent of the larger ruminants - deer, gazelles or particularly lithe camels. One creature looks around, scanning its environment, the other appears to be grazing, its head bent to the ground - though an unnatural blue light glows from between the head and the sandy earth, a small cloud of dust suggesting some more mechanical operation. Nearer,

> to the left and glimpsed through the swaying grass, a tighter group of animals wanders. Some are the same deer-like species, but they are accompanied by a different creature, slightly smaller and moving on its strong hind legs, body balanced horizontally in a schema like that of the avian dinosaurs. It has a stubby-fronted blank head, again lit in blue. Aloy runs, still crouching, jumps a narrow fast-flowing stream and up and over rocks into undergrowth near this mixed group. Her vision, and ours as the player, is augmented by a head-up display indicating directions and identifying nearby plants as well as the animals. The HUD flashes up the dinosaur-like animal's name - Watcher - apt as it is constantly on the alert. The HUD also displays lines of blue arrows across the terrain and around rocks and larger clumps of foliage. The arrows trace the predicted paths of the animals as they wander to and fro, grazing and checking their environment for danger. The Watcher senses the human avatar as she strays beyond the protective cover of the grass. It lets out a siren-like shriek, alerting the ruminoid herd which turns and flees. It spins then to face Aloy and mounts an attack[iv].

The behaviours and action in this account of an event in the game *Horizon Zero Dawn* are driven by modes of videogame AI that are almost as old as the medium itself. A* algorithms calculate the NPCs' route through the virtual world, establishing waypoints and calculating routes between them and around intervening obstacles (Johnson 2014). *Horizon Zero Dawn* renders these paths explicit in the HUD's arrow paths. The animal NPCs have cones of vision or sensing, detecting player / avatar activity according to distance / orientation, positioning (crouching, standing), intervening cover and other environmental conditions. Once it has sensed danger, the animal's default behavioural state (grazing, scanning) changes to flight or fight. The game is one celebrated example of advanced game AI, and it illustrates some of the main forms of game AI in general. For all its vivid action and sense of a complex and lively pseudo-natural world, it is important to note that much of the 'intelligence' even in *Horizon Zero Dawn*, let alone other less ambitious games is rudimentary in its capabilities and character. Often it is little more than pre-set paths of movement through the game environment and parameters for reaction to the player's movement and actions, the NPCs finite state machines which act based on continual assessment of their 'internal' knowledge of their own states and 'external' stimuli from the gameworld (Johnson 2014). Complexity is built up through the interaction of different modes of character and environmental AI. For instance, state changes are rendered more complex through combination with other NPC behaviour and through actions determined by decision trees:

> For a state machine, the initial state would be to monitor an area for the player. If the NPC spots or thinks it has spotted the player, the NPC's state changes. Any number of target states can be programmed as decisions such as search for the player in area spotted, sound an alarm, alert other NPCs and wait for reinforcements before moving to the area, flee, and so on [...] If the character has to find more ammo or heal before monitoring can begin, that state machine (search for ammo/health) would supersede the monitoring state [...] Any number of subsequent decisions can be added to the decision tree, depending on the game (Johnson 2014: 13).

Conversational agents in games (and non-game) applications are often interfaces to simple forking branches of information and options. These primitive agents and their operations *become* intelligent in and through their use and interactions, both within their own immediate software environment and in the wider circumstances of their everyday application. AI here consists not only in the code but in the myriad events of instantiation - it is distributed, and its instantiation is the *achievement* of this distribution.

Robin Johnson's explanation of game AI takes human-like NPCs as its examples, such as antagonists in first person shooters, individuals or squads simulating combat readiness and action. Ballistic weapons aside, the AI-driven behaviour - and the complementary behaviour demanded of the player-avatar - are broadly similar to that of the zoomorphic creatures in *Horizon Zero Dawn*. Initial states are generally the programmatic following of short A* paths or circuits, with speciation (human, ruminant, etc.) established through character design and a simple repertoire of movement, sounds and gestures (pointing, grazing, etc.). State changes are triggered by proximity mediated by contingencies of lines or cones of vision, simulated hearing, and environmental obstacles. Subsequent flight or attack behaviours are animated according to species and the aesthetics of the specific gameworld (gunfire, hand-to-hand or hand-to-fang combat, etc.). For formal game analysis then it could be argued that the differences between species are broadly trivial. Just as the substitution of traditional chess men with abstract or media-themed pieces has no effect on the game of chess as a system of rules and a mode of play, the design and animation of antagonists in a first-person shooter or open world adventure game might be eye-catching but are more or less redundant in their salience for the game-in-play. We might instead sketch out an alternative ludological taxonomy in which game creatures (humanoid and zoomorphic) are classified according to their role and significance in the abstract value and behavioural systems of the game: as *antagonist* (to be destroyed to allow progression, realise points, etc.), *assistant* (offering

information, directions, useful items), *resource* (to be destroyed to realise accrue health points), and so on.

Other species

Whilst I argue that the aesthetic depiction and behavioural simulation of animals, animal species - and 'animality' more generally - *is* a significant dimension of both videogames and AI, the character of this speciation then is ambiguous and nebulous. Like AI in general, animality is not a given, it is an achievement and a significant aspect of that achievement is its instrumental role with game systems. The animals of *Horizon Zero Dawn* hint at this ambiguity. In the game's storyworld they are robots, known as 'machines', and built by an extinct technologically advanced civilisation and now hunted for parts. The fictional designers and engineers in the game's backstory also learnt from the appearance, capabilities and behaviours of actual animals (now extinct) in the design of these automata. And it seems that like the actual game designers they felt free to push and mutate these appearances, abilities and behaviours away from their biological models. As such the creatures are artificially intelligent both diegetically (as autonomous robots) and actually (as game NPCs), with aspects of their AI-ness made explicit (notably the visualisation of their A* paths in the diegetic HUD). In the flow and behavioural variety of play we might encounter and comprehend them as animal at some points (watching them grazing from a distance for example), as robots at others (when harvesting them for specific parts, or when close up and confronted by their mechanical design), and at other times (in close combat for instance) all questions of speciation, aesthetics and diegesis go out of the window. Thus animality (and animal-AI as integral to this animality) is realised not only through the articulation of visual and audio aesthetics, animation and algorithmic processes, it is achieved in different shifting ways in various events and behaviours of play. The animal-AI layering in *Horizon Zero Dawn* flags up the complex character of the achievement of animals. Graphics, sound, AI routines, environment, animation, response and interaction - all these artificial and discrete machinic elements collude with the player in an experience of non-naturalistic but compelling animal encounters.

I will illustrate this argument with another recent example of an action role-playing game. As in *Horizon Zero Dawn*, the animals in *The Legend of Zelda: Breath of the Wild* function as both resources and antagonists. The animals are presented *as* animals in the game's diegesis[v]:

> The avatar Link encounters a group of animals on a green, grassy hillside, beautifully animated in the rich landscape. Large birds, and a wild boar, promise meat if successfully

hunted. As the player-avatar approaches, carefully, to within range of his bow and arrow he spots a wolf tracking a wide A* path through the immediate environment. Proximity triggers a change in the wolf's finite state machine, like the Watcher in *Horizon: Zero Dawn* it signals - howling - to sound the alert. It turns to face Link. However its warning did not trigger flight in its pack, which were close by, though out of Link's immediate frame of vision. They join their companion in a coordinated and effective attack. The lead wolf does not attack directly but circles slowly outside the range of the avatar's sword, drawing the player's attention. Another wolf attacks from behind, another approaches and threatens from the flank as Link- the player spin to defend themselves. As soon as one wolf is killed the others will flee. In a particularly marked state change the dispatched wolf transforms into a chunk of raw meat to be collected for later sustenance.

For the first few such bloody encounters the player's sense is very much one of a dynamic and naturalistic conflict, consistent with the actual world behaviour of wolves as intelligent pack predators, working together tightly and effectively. Thereafter however the player will begin to identify a simple pattern behind this group behaviour. Each wolf has its set responses and actions in relation to the avatar. One circles slowly in front but not getting too close. Another attacks directly from the flank, whilst a third will attack from behind, unseen and highly effective. Learning, or reverse engineering, this pattern the player can easily anticipate the attack, either by avoiding it altogether by skirting round the wolves outside their programmed sensate range or by shooting one of the wolves from a distance. Or if detected and combat engaged, but anticipating the rear attack, spinning with sword ready[vi]. As the player incorporates this procedural experience the encounter shifts from a naturalistic and hence unpredictable encounter to an exercise of learning the dynamics of proximity and range, relative movement, hand-eye coordination and predictable outcomes. The wolf attack is an iterative challenge by the game system to the player's progress through which the wolves teach the player their individual and group behaviour, and in response the player configures their own sensorimotor algorithms, something like *trigger state change - spin to defend against rear attack - dispatch nearest wolf - collect meat*.

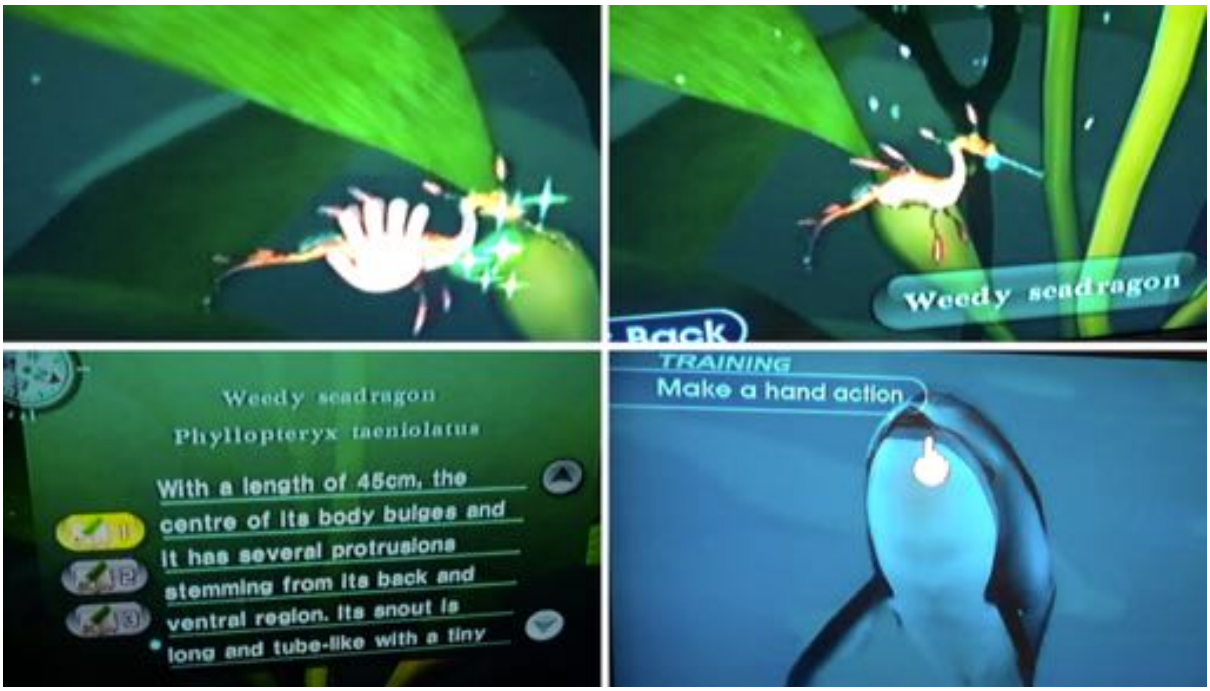
Legend of Zelda: breath of the wild (Nintendo 2017).

This ludic AI even returns us to the question, what kind of animality is at play here? If wolf attack events become, after a few iterations, a predictable sensorimotor challenge to ease progress and gain resources then do these antagonists fall from vivid animalhood to more or less abstract animated tokens to be solved with a well-rehearsed repertoire of button presses? To return to Tyler's argument, do the tusks or paws of specific opponent press less hard with ludic repetition? After all, Wolves and Watchers could be replaced with anthropomorphic or abstract entities without significantly affecting the mechanical action and ludic challenge. My argument that the animality of these creatures is not trivial, that are *not not* animals, rests on four factors in gameplay events: the significance of nonhuman algorithmic behaviour; the highly contingent and oscillating importance of imagery and sound in the depiction of on-screen game characters and environments; the character of gameworlds themselves as environmental; and the mechanical, semiotic and affective relationships between player, technology and media. I will now explain these four factors through an expanded notion of *species*.

Hungry Babies Mania (Storm8 2015).

The Linnean system of classifying species is not much help here. A dog in *Legend of Zelda: the breath of the wild* is a very different creature to the decorative and hyper-cute puppies of the smartphone 'match-three' game *Hungry Babies Mania*, though both are depicted as canine. The *Hungry Babies* dogs would be more usefully categorised as media characters, drawn from the stylised and exaggerated aesthetics of cartoon animation. As they line up to be fed, the hungry baby animals are diverse actual species (bird, dog, fox, elephant) but in their scale, behaviour, cute characteristics (outsized heads and huge human-like blue eyes) they are operationally exactly the same. In behavioural terms they are barely animal at all - they arrive at the top of the screen, are fed as the player clears icons of fruit and vegetables from the abstract gameworld and with a minimum of

character animation, depart once ‘full’. Conversely, though the *Breath of the Wild* dog seems closer to the more realistically rendered and animated dogs of *Sims Pets* or *Nintendogs*, its role within its virtual environment, its capabilities and behaviours are quite different again. Within the *Horizon Zero Dawn* diegesis Grazers are robots and as such ontologically identical to Watchers, yet in the dynamics of the game, and their inherent coded instincts, and in players’ knowledge of actual world animals, they are experienced as distinct albeit ill-defined species. The GameCube game *Endless Ocean* offers the gentle exploration of a tropical marine environment and is ostensibly predicated on a conventional identification of animal and plant species. A simulation of scientific discovery through scuba diving, the player explores the sea bed and reefs to encounter and document new fish and crustacea, creatures which offer up both their species name and a text box of information about their diet and life cycle. Yet as entities within a synthetic and ludic environment their import is encountered and divided up differently. For instance, most of the creatures the player encounters do little. They swim into view, their species initially a mystery. The player approaches, touches or strokes them with a disembodied cursor-hand until information about their species and life cycle is revealed in a window of text. On this level then they are not only animals but also elements of an interface to a database of educational information, buttons to be clicked, or tickled, to reveal information and to be added to an inventory of facts. The player is guided in her exploration by a dolphin companion. The behaviour of the dolphin is more sophisticated as it moves in relation to the movement of the diver avatar but with a degree of autonomy. It will swim a little away from the player, encouraging but not insisting on movement towards interesting areas of the environment and new species. So the game offers numerous species to be tracked down and documented (or revealed) and collected, but ethologically speaking - that is, taking modes of behaviour and capacities as the salient defining category - there are only three species: the avatar - a (human) diver; the diver’s (dolphin) companion which acts as a guide in the game / world; and all the rest which in behavioural terms exist only to be stroked and illuminated - the buttons and badges of the reward systems of videogames and gamification applications.

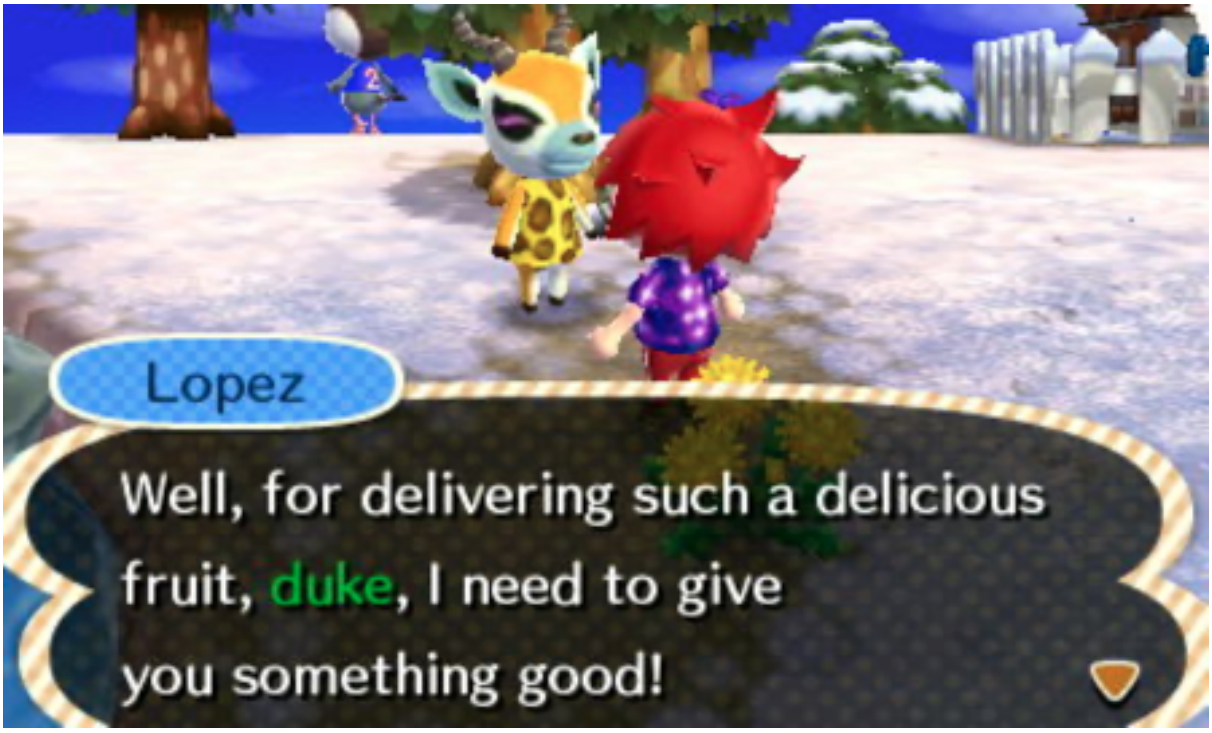


Endless Ocean (Nintendo 2007)

Ethology, creatures

In tracking these non-taxonomical connections across diverse creatures I am working in the spirit of Gilles Deleuze and Felix Guattari's insistence that we know bodies not by any genetic essence but by their affectual relationality. For them a carthorse is less like a racehorse than it is an ox. Workhorses have similar affects to oxen in their constitution within human-nonhuman relationships of work: each move slowly and reliably, trained and disciplined to pull vehicles or ploughs. Racehorses as bodies, despite their genetic identity to the workhorse, display quite different behaviours, very different 'relationships of speed and slowness.' (Deleuze and Guattari 2004: 283)[vii]. Yet this example is modest, since all three of these types are actual animals, and all are similar in scale, biology (mammals) and environment (the domestic milieu of fields, stables and barns). If we pick up the Spinozan emphasis on affect and behaviour however all sorts of alternative filiation can be traced - particularly across the great biological and synthetic kingdoms. The word 'animal' has its root in the Latin *anima* or 'breath', thus an animal is something that has breath, or - to follow a parallel etymological line - an animal is something *animated*, a mode of being that includes animated film and all kinds of artificial self-moving entities from cellular automata to robots. Alternatively, a 'creature' is anything living or existing. From *creare* - to produce, and the root also of *creativity* - it might denote the artificial creation as well as the biological. These expansive notions of *animal* and *creature* allow for both the reality of NPCs as affective and semi-autonomous beings, and for more interesting affinities beyond representational and taxonomical categories. The object of my ethology

then is the relationships between creatures within the gameworld environment, and with the player and their environment in particular durations of play, their affects, capacities, behaviours and emergent relationality. From this perspective human-shaped characters are no less creaturely than their zoomorphic associates, and their anthropomorphic image often distracts from characteristics and behaviour that are very similar to those of animal characters.



Animal Crossing: New Leaf (Nintendo: 2012)

For instance, the *Animal Crossing* series of games have none of the naturalism and little of the educational aims of *Endless Ocean*, and their animal denizens, strictly speaking, do not have to be animals at all. The species or family that any particular character belongs to has no relationship to its behaviour and characteristics. Birds, dogs, giraffes are all the same scale and rough body schema as the humanoid avatar, and speak and behave similarly. Any mimetic relationship with biological animals is arbitrary. However, they make animal sense in the environment of the game both in its microcosmic, rather dreamlike, diegesis and in its broader environment of children's popular screen media. These animals are hybrids - chimerical even - a mix of post-Disney cartoon aesthetics and particular modes of AI. They follow short A* paths through the world, in this case more complicated paths than those of the robot animals in *Horizon Zero Dawn*, as they wander the village, visit shops or other NPCs. Unlike all the artificial animals I have mentioned so far however, they can talk, and conversations between the player and the animals is a core aspect of the game. As such these creatures can trace a quite different AI lineage, having evolved as a species of conversational agent

or chatbot. An animal might ask the player to deliver a gift to another NPC, with its response and subsequent actions dependent on the player's acceptance of the request. The player 'says' nothing as such, merely selecting from two or three options at each conversational turn, their input is limited to the decision to talk (or listen to the animal talk) or to accept the request. These conversational decision trees are similar to finite state machines in their assessment of game states and determination of subsequent actions (Johnson 2014: 12). Often these encounters merely offer two variations of the same answer, an illusion of or play with agency within games that Sonia Fizek describes as 'interpassivity' (Fizek 2018). Why does this work as at once an entertaining screen media experience, the sustenance of a satisfying relationship with a nonhuman entity, *and* an effective instantiation of AI? Partly this achievement is as a popular media experience due to the quirkiness and charm of the writing and characterisation. More importantly though it works because these simple interactions constitute and build towards rich and complex social-affectual relationality with overlapping temporal dimensions of exchange, challenge, and collection of resources. The animals' AI is rudimentary, but in their environments - the gameworld itself, the broader aesthetic semioscapes of children's media and toy culture, and the expectations, conventions and practices of everyday videogame play, they are smarter - far smarter than the player / avatar. Intelligence is distributed across the simple algorithms of movement and dialog trees, the game environment and mechanics, and the imaginations, media cultures and ludic attitudes of players. It is in this sense the product of relationships and environments, human and nonhuman agents, it is an achievement.

Towards an ethology of the postanimal

In the discussion and examples above, AI animality is achieved in part, and at times, through screen images and sound files, but largely through animal-like behaviour and relationality within the gameworld environment. As I have suggested throughout this chapter, a puppy in *Hungry Babies* or a Tamagotchi toy, a doglike denizen of *Animal Crossing*, the aggressive Doberman Pinschers of *Resident Evil*, and a pet dog in *The Sims* are quite different in their processual structuring of gameplay, they demand of the player very different relationships and modes of behaviour. I would now like to turn attention to the nature of these relationships in themselves, partly to further illuminate AI in videogame play and partly to open up this enquiry to consider the contribution this zoomorphic enquiry might make to a broader study of living with and relating to AI and other synthetic nonhuman agents.

Taking a cue from *Horizon Zero Dawn*'s Watchers, creatures named after their active behavioural trait - their primary affect, these dogs might respectively be recategorised as Feeder (*Hungry Babies*,

Tamagotchi), Companion/Associate (*Animal Crossing*), Attacker (*Resident Evil*), and Pet or Trainee (*The Sims*). Each of these behaviours is relational of course, the player character is as rigidly and algorithmically configured as, say, Provider of Food or Antagonist. Reciprocity is key here: there is no such thing as a solitary Companion, the Attacker needs a Victim, a Pet an Owner, a Trainee a Trainer.

The player / avatar feeds animals but also kills and feeds on them. There is no wilderness in virtual worlds, all animals are constituted only in relation to the player, are always already domesticated - even if figured as wild - bred to be companions, labour, ludic combatants or resource. In a gameworld, combat with and the killing of virtual animals is reminiscent of other bloody modes of formalised or ritual play with animals: dog-, bull- and cock-fighting, fox hunting and so on. We might loosely separate this broad, antagonistic mode from a similarly broad category of cooperative relationality. Whilst the former, if taken as a model for AI-human relationality globally and historically, resonates with SF dramas of malicious machine sentience and robot supremacy, I would argue that both offer alternative imaginative and empirical resources for figuring and developing the postnatural intelligent environment[viii]. 'Cooperative' is a loose term here, sweeping together heterogeneous behaviours and relationality. These range from the rudimentary attentional mechanics of Tamagotchi to the vehicular pairings of mounts and avatar in *World of Warcraft* and *Legend of Zelda*, the potlatch economics of *Animal Crossing* to the morally-charged training of *Black & White*. Describing particular examples of cooperative virtual animal-human relationships demonstrates this diversity and as throughout this chapter, the underlying rudimentary, algorithmic and ludic mechanics that collude with symbolic material and player motor and cognitive activity to realise and achieve synthetic companion-animal relationality or 'petness' (Wrye 2009). I will take two examples to illustrate this and open it up for consideration in relation to broader questions of human-machine relationality in the AI-augmented technoculture.

Sims 3: Pets (EA: 2011)

The Sims 3: Pets is predicated on the sophisticated simulation of domestic animals, mainly dogs and cats. Pets in a simulation of everyday home life, they are animated naturalistically, moving and responding to the human characters with familiar actions and vocalisations: demanding food, attention, comfort and play. As AI agents within a behavioural system however they are animated by drives that only partially overlap with this diegesis. Their primary gameplay role is to be *trained* rather than nurtured per se. Just like their virtual owners - the Sims themselves, these creatures must be directed and rewarded in their adoption of broad game goals (to not starve, to increase 'sociality' as a quantitative register, to not soil the domestic environment, etc.) and looser, more contingent, player-determined actions or challenges.

With closer attention even this relatively simple symbolic-processual mechanic threatens to destablise ostensibly familiar entities and activities. Feline and canine affects aside, these are soft robots - bundles of pre-programmed characteristics, degrees of latitude or autonomy in their behaviour, and capacities to learn. However, not only are the animals robots, in the collusional and nonlinear dynamics of *Sims* play it becomes apparent that the virtual animals and virtual humans are operationally the same species. Both are semi-autonomous agents to configured, guided, and trained by the player. In terms of a key element of the game's progression / reward system - the 'Social' rating - the achievements of each are registered mechanically and visually in the same manner. At most the animals add another layer to a recursive system of discipline/being disciplined: the player must train the anthropomorphic Sims to train their pets.

> [A]nimality and technology should be approached as two already entangled domains, rather than clearly demarcated categories (Apperley and Heber 2015: 159).

In her book on robots and communication, Eleanor Sandry draws on Haraway's work on companion species to question anthropomorphic assumptions and teleologies in the design of mechanical robots, arguing that they overlook 'the fact that many humans interact on a regular basis with nonhuman others in the form of animals', pointing out that animal others often 'interact with humans directly and, at times, communicate with them such that humans and animals work together to complete tasks that neither could accomplish on their own' (Sandry 2015: 32). The training of dogs for work or playful activities such as agility courses entails not an anthropomorphising of the animals' intentions or pleasures, she argues, but it does demand 'recognising them as social subjects' (Sandry 2105: 38), not human, but still a 'person' in these actions. Sandry acknowledges the huge material and behavioural differences between actual animals and zoomorphic robots, but notes that the design and programming of behaviours and relational potential in the latter can learn a great deal from actual human-animal communication. Again the social and developmental dynamics of training are paradigmatic here:

> [t]raining together is not just about learning the technical requirements to complete the various elements on the course: it is also an essential part of learning how to communicate across the significant difference between species (Sandry 2015: 41).

Though neither Haraway nor Sandry reflect on this directly, I would argue that is not incidental that the key examples of human-animal communication, sociality and co-constitution they describe are playful. As well as training, play is one of the grounds on which inter-species relationships are most vividly realised - from domestic dogs and cats playing together to canine agility events, and from *Animal Crossing* to AlphaGo.

Reciprocal, collusional relationality in the simulated environments of videogames then hint at existing, emergent and potential modes of being and becoming in the natural-artificial environment of post-natural modernity. As with everything playful it is ambivalent however. The relationality of the Sims' pets (and the Sims themselves) in play, along with Tamagotchi and *Nintendogs*, is achieved through caring and nurturing behaviour in the game mechanic and in many instances of children's imaginative play no doubt these animals and their wellbeing are cared for in significant ways.

However, these games and relationships that can also be regarded, with barely a shift in critical focus, as characterised by discipline, training and control. As Apperley and Heber put it in relation to the game *Kinectimals*, '[t]he digital pet incorporates existing relations of power and dominance, and the algorithmic structure [...] dramatizes, regulates and instrumentalizes that relationship' (Apperley & Heber 2015: 159). The *Black & White* games make this tension a central feature of their gameplay and diegesis, driven by an adaptive AI system that uses machine learning to build on the player's decisions in punishing or rewarding their zoomorphic semi-autonomous avatar. The creature learns from the player's god-like behaviour in the diegetic world, a mediating force that becomes nurturing or malevolent depending on the example set by the player:

> The creature learns from the gameplay and from the player's rewarding or punishing actions. So depending on the player's actions, the creature will develop in unique and unexpected ways. For example, the player can choose to be a mean and hurtful god by throwing characters around or throwing rocks at them. The creature will observe this behaviour and adapt by doing similar hurtful things (Johnson 2014: 15).

The creature can be trained directly too, either stroked and petted by a hand-shaped cursor or held by a leash round its neck, roughly pulled around for punishment - a processual pedagogy in a Manichean virtual universe. These particular pet-like power relationships resonate with the more general 'agent imaginary' identified by Lucy Suchman in anthropomorphic figurations of AI and A-Life agents as butlers, servants, machines and women in contemporary robotics and commercial web interfaces (Suchman 2007: 220).

Moreover, following these chains of command and control out from the simulated world and game engine I would argue that the player's position as "Owner" or 'trainer" is similarly ambivalently and reciprocally configured. For effective play the player must learn what actions and sequences will most satisfactorily shape the Sims' behaviour in shaping the pets' behaviour, to most effectively build the diegetic owner-pet-relationship game progress state. Similarly the *Black & White* player-god must be trained by the game, through the medium of the animal avatar, how to train, and the Tamagotchi nurtures its carer through the process of its own care. As Apperley and Heber note, play with *Kinectimals* is 'not simply about training and playing with animals; at its core the game involved being entrained: becoming a competent user of a 'natural' user interface' (Apperley & Heber 2015: 149). The player is inculcated with these sequences, trained by the algorithms into their own

algorithmic processes, disciplined as they discipline. In the collusional and circular mechanics of ludic software, the player is the game's creature (Giddings & Kennedy 2008).

Black & White 2 (Lionhead: 2005)

Conclusion

I have tracked something of the confluences of AI and the animal in videogame creatures and I hope demonstrated their significance for the study of both AI as everyday media culture and for broader questions of the intelligent environments and the postnatural. Popular digital culture, notably videogame culture, has brought into everyday life intense material and imaginary relationships between the human and the technologies of AI. Against the as-yet-unfounded predictions and dreams of fully human-like Artificial General Intelligence and its ever-retreating horizon of Singularity, the *sort-of* cats and dogs, horses and fish of game worlds offer an alternative, ethological, approach to a postnatural present and future, one that is markedly more heterogeneous in its technical underpinnings and network infrastructure, its levels of technological sophistication, and its behaviours and relationalities. An unfolding environment populated by zoomorphic as well as

anthropomorphic cognitive and kinaesthetic agents. Both virtual animals in particular and ludic AI in general are unstable assemblages of heterogeneous elements of code and media. That the rudimentary algorithms of movement and response, and the often stylised and abstracted graphics realise animal-like and intelligent-like behaviour in play is an achievement of design, engineering, and of play itself. The distinct simplicity of these creatures' capabilities highlights AI at large as highly effective in some regards (data processing, board games) but stubbornly primitive in many others. These creatures are not animals and not intelligent, but they are not *not* animals and not *not* intelligent. They, and their players, are 'emergent entities' (Haraway 2008: 136), each are becoming-animal.

Throughout this chapter I have hinted at the broader significance of the everyday, playful achievement of AI in videogame play. The study of game AI is important in its own right, as a crucial aspect of everyday media technoculture. It is significant too in any critical attention to AI beyond the spheres of entertainment and the domestic, from day-to-day encounters with active interfaces and chatbots to the intangible global environments of big data processing, machine learning, automated surveillance and networked algorithmic agency. Relationships with virtual creatures are not mere microcosmic representations or metaphors of distributed and instrumental AI but rather they are synecdochal of it, distinct in their scale and intentionality but fully part of it both materially and behaviourally. As such, the modes of playful animal achievement - combat and extraction, phatic communication and play, care, discipline and the ambivalent circuits of control - offer a point of entry to the description and analysis - an ethology - of this emerging postnatural environment. The very artifice of the artificial animals and the relational, ambivalent and processual character of their achievement should alert us to relationality, contingency and processual character of the achievement of autonomous technics at all levels and scales.

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[i] I'm using the term 'postnatural' in a way analogous to the 'posthuman' of critical posthumanism. That is, it does not assume the *end* of the biosphere, rather it signals an emerging environment of biotechnology, climate change and (as in this chapter) prevalent artificial systems and entities that are *natural-like* in their affectual and experiential dimensions and that fundamentally challenge established distinctions between the natural and the artificial. On the other hand it acknowledges that human existence has always been predicated on the technical manipulation of the natural environment and, for at least 28,500 years, on the domestication, and hence transformation of animals. We have never - to coin a phrase - been natural.

[ii] See Boden 2018 for a clear, sceptical take on these assumptions.

[iii] Currently, the ways in which computers can outperform the human brain lie within a very narrow band of mathematical calculation, high-volume and high-speed data handling and analysis, and the calculation and prediction of moves in abstract board games. Full AGI, it is generally assumed, is predicated on symbolic processing, a phenomenon that has proved stubbornly resistant to simulation regardless of exponential increases in computer speeds and neural net complexity since it was first mooted in the 1960s.

[iv] Many thanks to Jo Giddings for walking and talking me through the storyworld and gameplay of *Horizon Zero Dawn.*

[v] Although the world is also populated with monsters that combine animality with human physical and cognitive abilities.

[vi] This achievement of dynamic and ludically balanced complexity from the interplay of game antagonists coded with very simple but complementary behaviours bears a marked similarity with some of the earliest game AI, notably the ghosts of *Pac-Man*. The experience of being hunted by the ghosts feels dynamic and responsive in the flow of play, yet their collective behaviour is the product of very simple individual actions: one chases Pac-Man directly, one is directed to a point immediately in front of Pac-Man, one moves at random, and so on (Mateas 2003).

[vii] For Deleuze and Guattari, drawing on Spinoza, this mode of description is ethological. I have applied this to the behaviour of software agents in everyday environments (Giddings 2009, 2014, and see also Parikka 2010b), in this chapter I am playing with the mainstream notion of ethology as the study of animal behaviour and character in particular.

[viii] I would resist any straightforward mapping of virtual / ludic behaviour onto actual world behaviour and ethics. Games are profoundly ambiguous and topsy-turvy: playful combat can be a hilarious and socially-enriching experience, cooperation can be rigid and hierarchical (see Giddings 2014: 145-157).