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Difficulties

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When the videogame developer Valve came to create the sequel to their highly successful shooter *Half-Life* (Valve, 1998), work began on a new character model for Gordon Freeman, the game's protagonist. For Freeman's face, photographs of four different Valve employees--David Speyrer, Eric Kirchmer, Greg Coomer and Kelly Bailey--were combined to produce a rather generic-looking composite[1]. In the final design, Freeman is a bearded, bespectacled, unexceptional individual in his late twenties. During the events of *Half-Life*, Freeman was the unwitting cause of a catastrophic accident at the high-security Black Mesa Research Facility, resulting in the opening of an interdimensional portal. From the rift a slew of hostile, nightmarish creatures emerged, against which Freeman was forced to do battle. The events of *Half-Life 2* (Valve, 2004) and further entries in the series--*Half-Life 2: Episode One* (Valve, 2006), *Half-Life 2: Episode Two* (Valve, 2007), and *Half-Life: Alyx* (Valve, 2020)--take place some time later in a dystopian future, following Earth's subjugation by a brutal alien empire known as the Combine. In *Half-Life 2,* Freeman joins a ragtag resistance who are fighting back against their extra-terrestrial oppressors, and now finds himself charged with the task of liberating humanity[2]. Despite this fantastical narrative, and the monumental challenges with which he must deal, Freeman is a mere academic, a scientist with no training or experience in combat or derring-do. He is, it has often been suggested, a clear example of an everyman hero, caught up in extraordinary events[3]. The Oxford English Dictionary succinctly defines an

everyman as 'an ordinary or typical human being'[4]. Though the term has been applied to real individuals, it is perhaps most often used of those fictional characters who embody an undistinguished but sympathetic presence in a novel or film, with whom an audience is invited to identify. The unassuming regular Joes typically played by actors such as James Stewart or Tom Hanks have, for instance, frequently been described as everymen[5]. In terms both of visual design and character background, then, Gordon Freeman certainly fits the mould of a classic everyman, as that figure is traditionally conceived.

Half-Life and its sequels have been critically acclaimed as ground-breaking games and as enormously influential entries in the first-person shooter genre[6]. Famously, despite the games' attention to plot and the quality of the dialogue between non-player characters, Gordon Freeman himself is a wholly silent protagonist, uttering not a word during the course of the games, unlike the wise-cracking leads of so many similar titles. Additionally, there are no pre-rendered cutscenes, third-person cinematic sequences that depict a game's hero engaged in some complex sequence of actions, which are often included to advance the narrative. The decision to omit cutscenes was largely a requirement of constraints on time and resources during the game's development[7], but the result was significant: players' control of Freeman, from a first-person perspective, is never once interrupted. Contemporary reviews, as well as subsequent assessments of the games' far-reaching impact, frequently cite these features as crucial to cementing players' identification with Freeman and creating a game world that was immersive to an unprecedented degree[8]. As Marc Laidlaw, the main writer working on the *Half-Life* games, put it, 'Players create their own Gordon Freeman--a character they can identify with completely. There is nothing to jar you out of Gordon, once you're in the game. He never says anything

stupid that you would never say in a million years. He never does anything you wouldn't do--since you are behind all his actions. He becomes a hollow receptacle into which every player pours himself'[9]. Every player, it seems, can be this everyman.

As an unspeaking, free-roaming everyman, Gordon Freeman is, in effect, an entirely characterless place-holder. As such, players do not get to choose or modify his class or appearance at the beginning of a game, no experience points or levels are accrued as play proceeds, and there is no option to select or upgrade different skills and abilities. The closest that the *Half-Life* games come to character customisation, and the sole input that players have with regard to the kind of experience that awaits Freeman, is the choice of difficulty level. *Half-Life 2* and subsequent episodes have three settings: Easy, Normal and Hard. The *Half-Life 2 Official Game Guide* explains the Easy and Hard settings relative to Normal: on Easy, players receive help with aiming, their weapons do more damage, more ammunition is available in the game's environments, and enemies are weaker. The Hard setting, on the other hand, provides no help with aiming, offers up less powerful weapons and reduced ammunition, and has tougher enemies[10]. Normal is the default setting when players launch the game, from which they must deviate if they desire an easier or a more demanding experience.

Half-Life 2's three difficulty levels take succinct, baldly descriptive names. Such has not always been the case in the genre of first-person shooters. World War II-themed *Wolfenstein 3D* (id Software, 1992), for instance, gave players four settings to choose from:

> Can I play, Daddy?
>
> Don't hurt me

Bring 'em on!

I am Death incarnate!

The first, easiest option is accompanied by an image of the game's protagonist, Nazi-fighting William 'B.J.' Blazkowicz, wearing a baby's bonnet and sucking on a pacifier. Similarly, sci-fi shooter *DOOM* (id Software, 1993) presents players with:

I'm too young to die

Hey, not too rough

Hurt me plenty

Ultra-Violence

Nightmare!

Subsequent games in both long-lived series retain essentially the same sets of labels. On offer here are not just graduated difficulties, but implicit expectations about which setting players should select and how they should perform. The terms are judgemental, suggesting that those who pick 'Can I play, Daddy?' or 'Hey, not too rough' lack both ambition and expertise, compared to those admirable masters of destruction who are properly recognised as 'Death incarnate.' Couched within throwaway humour, the terms are shaming or celebratory. They exemplify, in short, what communications scholar Christopher A. Paul has called the toxic meritocratic rhetoric that permeates videogames, which would attribute an individual's success, or lack thereof, entirely to their individual talent and commitment. Such rhetoric, Paul argues, fails to acknowledge the significance of wide ranging societal inequalities, and the importance of access to resources, which will also impact a player's performance[11].

The seemingly innocuous terms used for the difficulty settings of *Half-Life 2* traffic in this same dubious rhetoric. In *Extraordinary Bodies*, Rosemarie Garland Thomson explores how cultural and literary representations work to attach 'meanings to bodies,' specifically those forms of corporeal otherness characterised variously as monstrosity, mutilation, deformation and physical disability[12]. She argues that the understanding of what is normal inevitably depends on that which is seen to deviate from it. The extra-ordinary bodies she considers--of the freak, the invalid, the cripple, the grotesque or ugly--are produced, she contends, from the raw materials of corporeal variation 'by way of legal, medical, political, cultural, and literary narratives that comprise an exclusionary discourse'[13]. Deviance is not so much a property of bodies, she argues, 'as a product of cultural rules about what bodies should be or do'[14]. Disability and able-bodiedness, extra-ordinariness and ordinariness, are governed by the ways that bodies conform, or not, to social expectations, and definitions of disability come to depend on 'unstated but determining norms'[15]. 'The narrative of deviance surrounding bodies considered different is paralleled by a narrative of universality surrounding bodies that correspond to notions of the ordinary or the superlative'[16]. Those unmarked as extraordinary 'are sheltered in the neutral space of normalcy'[17]. To signal this mutual constitution of the deviant figure and the normal figure, Garland Thomson employs the term *normate* to identify and defamiliarize the latter. The normate is 'the corporeal incarnation of culture's collective, unmarked, normative characteristics'[18]. This neologism names, she says, 'the veiled subject position of cultural self, the figure outlined by the array of deviant others whose marked bodies shore up the normate's boundaries. The term *normate* usefully designates the social figure through which people can represent themselves as definitive human beings'[19].

The normate functions as a kind of model or template, then, with which individuals are supposed to conform[20]. Actual instances of the normate, however, can be hard to find. Garland Thomson quotes sociologist Erving Goffman's wry observation that 'there is only one complete unblushing male in America: a young, married, white, urban, northern, heterosexual, Protestant father of college education, fully employed, of good complexion, weight and height, and a recent record in sports'[21]. The sheer multiplicity of norms that must be met disqualifies most people from being normal[22]. Gordon Freeman, nonetheless, is a fine example of an individual who can pass as normate. Though we know nothing of his sexuality or sports record, and he remains unmarried throughout the games, he manages to meet the majority of the expectations on Goffman's list. But, for that very reason, he is not, of course, an ordinary or typical human being. Most individuals are not male and white and urban and fully employed, and capable of conforming to each of the items on a lengthy inventory of preferred characteristics. Like those unassuming individuals played by James Stewart and Tom Hanks[23], Gordon Freeman is, in fact, peculiarly atypical[24]. In short, there is, and can be, no everyman, no regular Joe who is uniformly and consistently ordinary. Rather, there are those who have been described as everymen, a tiny subset of the population who have been cast as definitive human beings. This is the quiet, inconspicuous power of normativity. Those who are positioned, or can position themselves as normate, if only temporarily, stand to reap the benefits and privileges that unmarked identity bestows[25]. The normate 'is the constructed identity of those who, by way of the bodily configurations and cultural capital they assume, can step into a position of authority and wield the power it grants them'[26].

Whilst Gordon Freeman embodies an everyman hero--the quintessence of the figure of the normate--within *Half-Life 2*'s narrative, the terms used for the game's three difficulty settings work to normalise expectations of the players who would assume his role. 'Easy,' 'Normal' and 'Hard' are not as immediately offensive as the labels used in *Wolfenstein 3D* or *DOOM*, it is true, and this simple convention, or variations thereon, has been employed in diverse game genres, beyond the first-person shooter. Players can choose from Easy, Normal and Hard options in the supernatural hack-and-slash game *Bayonetta* (PlatinumGames, 2009); in the superhero action-adventure game *Batman: Arkham Origins* (WB Games Montréal, 2013); in the sandbox exploration and building game *Minecraft* (Mojang, 2011); and even in the "brain training" puzzle game *Big Brain Academy* (Nintendo, 2005), to name just a few. But the term 'Normal' in any videogame, as elsewhere, is loaded. Whilst it undoubtedly indicates a mid-point on some continuum of increasing challenge, it cannot help but carry, in addition, evaluative connotations[27]. It signposts what players should be able to do. 'Normal' difficulty is the one that players *ought* to select, at the minimum. Choosing anything less is, implicitly, to fail the test of adequacy before the game has even begun. The 'Easy' setting should require of players no real effort, whilst 'Hard' suggests superlative skills exercised beyond the usual call of duty. Players should find 'Normal' difficulty just right, however. 'Normal' difficulty, in short, is the setting expected of players who would be normate.

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In fact, videogames have experimented with a number of ways of adjusting the degree of challenge that faces players. Whilst *Half-Life 2*'s three difficulty levels each modify several variables in predetermined ways--weapon accuracy and damage, availability of ammunition, the

power of adversaries--some games allow players to tweak or fine-tune individual elements. In the virtual reality rhythm game *Beat Saber* (Beat Games, 2019), for instance, songs can be speeded up or slowed down, obstacles and bombs can be turned on or off, missed beats can be set to result in instant failure or no penalty at all, and more. When games offer some means of varying the difficulty, players can most often choose their preferred setting, but some games will assign or suggest a difficulty level at the beginning of play, based on an assessment of the player's skills during a training sequence, as does the military shooter *Call of Duty: Modern Warfare 2* (Infinity Ward, 2009). In all cases, once chosen or assigned, difficulties may be set for the entirety of a game, as in the horror-themed action-adventure game *Alan Wake* (Remedy Entertainment, 2010), or, alternatively, can be changed at a later point if the player would prefer an easier or a harder challenge, as is the case with the literature-themed typing game *Epistory* (Fishing Cactus. 2016). Certain games incorporate some form of 'gating,' whereby more demanding areas are placed behind some impenetrable obstacle until the player has achieved a certain level of proficiency or acquired an item or ability that will unlock the content, as does the science fiction action-adventure game *Metroid* (Nintendo, 1986). Many games implement some form of dynamic difficulty adjustment, whereby key elements are adapted during play in response to the player's ongoing performance[28], exemplified, for example, by the varying size and power of enemy fleets in the space combat strategy game *Homeworld 2* (Relic Entertainment, 2003)[29]. Alternatively, it is not uncommon to offer a perk or power-up when players seem to be struggling with a particular section of a game, like the invincibility leaf of *Super Mario 3D World* (Nintendo, 2013), or even to allow them to skip a level or mission altogether if they fail it repeatedly, as is the case in *Grand Theft Auto V* (Rockstar North, 2013).

The inclusion of these different ways of modifying the difficulty of a game addresses a key issue in game design that has preoccupied developers and researchers alike, which is to say the importance of balancing the demands that are visited upon players. Variable difficulty settings can allow players with different degrees of skill and experience to enjoy a game, and afford them, it is hoped, a suitable challenge, so that the game seems neither boringly easy nor frustratingly hard[30]. 'The best games,' scholar-designers Katie Salen and Eric Zimmerman suggest, 'manage to scale their challenge to the player … providing an appropriate degree of challenge for beginners and advanced players alike'[31]. Including some means of changing a game's difficulty is one way of helping players to find that appropriate degree of challenge. Beyond this question of individual pleasure, though, providing a way to adjust the degree of challenge presented by a game also increases the potential number of players who will be able to engage with it at all. The broader the range of difficulty settings, the greater the chance that any given would-be-player will be able to cope with the game's demands. Variable difficulty settings in games point toward the possibility of inviting *everyone* to play, which harks back to the role played by the original Everyman.

The term *everyman* originates in *The Summoning of Everyman*, an anonymous morality play composed in the late fifteenth or early sixteenth century. Morality plays were allegorical dramas dealing with themes of temptation, transgression and salvation, which is to say an individual's capacity to choose freely between virtue and vice, and thus the degree of control that they have over their ultimate fate. The protagonist of such plays, a representative of all humanity, meets personifications of abstract qualities and attributes such as Mercy and Mischief, Folly, Pleasure, the seven deadly sins, the virtues, and others[32]. In *The Summoning of Everyman*, God sends

Death to call Everyman to a final, dreadful reckoning, where he must account for his life. A reluctant Everyman appeals for support to a series of characters on whom he thought he could count--including Fellowship, worldly Goods, Beauty and Strength--but none will accompany him to the end, save Good Deeds. Ultimately Everyman sinks into his grave alone, and the audience is reminded that 'after death amends may no man make'[33]. Over the course of the play, we learn nothing concrete about Everyman's character, experiences or circumstances. This theatrical Everyman is an abstraction, a universal figure representing each and every human being. Everyman instantiates in a single person all of humanity. Both the medieval Everyman and the modern everyman, then, are emblematic figures who function within dramatic contexts to invite an audience's identification. But where Everyman does so in the form of an all-encompassing, allegorical abstraction who represents the whole of humanity, the everyman of contemporary film and literature represents instead that division of individuals who are deemed ordinary or typical.

A problem for any dramatic representation of Everyman is that it will be unavoidably specific: the Everyman we see will always be played by a certain actor and take a particular form, endangering the archetype's requisite universality. The names of any medieval players have been lost to us, but in modern adaptations Everyman has been represented on stage by Curd Jürgens, Klaus Maria Brandauer and Chiwetel Ejiofor, amongst many others[34]. The very term itself is prejudicially gendered: it directs us to consider every *man*. In fact, *The Summoning of Everyman* is a translation of an earlier Dutch play, *Elckerlijc*, which literally means 'every person,' and women have taken the title role on both stage and screen: when the play was first revived in 1901, May Douglas Reynolds took the lead, and the earliest cinematic versions starred

Linda Arvidson and Constance Crawley[35]. Here, too, of course, the problem of particularity persists, however. A game such as *Half-Life 2*, on the other hand, promises, as a function of its first-person perspective, an entirely empty, and therefore universal, protagonist. Admittedly, as we saw, Gordon Freeman is depicted as a very particular individual: he is addressed by his undeniably male name throughout the games, and Laidlaw seems to assume that his players will all be male. Further, we are, in fact, shown what Freeman looks like in the game's box art, game guides, and promotional materials: white, bearded, of good complexion, weight and height, and so on. But once we are playing the game, for the whole of the time we actually take on this role of reluctant hero, we do not see Freeman, but always see *through* and *as* Freeman. The imposed subjective perspective, combined with the fact that we are granted absolute control over this unconstrained 'free man,' suggests that, in principle at least, Gordon Freeman provides players with a completely 'hollow receptacle.' He is not, as it turns out, an everyman, so much as a ludic relative of Everyman. As an unseen avatar we can play, as opposed to a character we observe, Freeman seems to embody Everyplayer, an abstract, universal figure who represents each and every human being, into which all players can pour themselves.

Further, in providing a range of difficulty settings, *Half-Life 2* moves closer to the practical goal of enabling everyone to play the game. Gordon Freeman may well be presented as an undifferentiated place-holder with whom players can identify, but the inclusion of three distinct levels of difficulty is a concession to the fact that the individuals who actually arrive at the game will not be uniformly capable. Freeman is not an empty vessel into which every player can unproblematically decant themselves, but an avatar whose control requires very particular skills and competences. The player of Freeman must cause him, by means of keyboard or controller,

to look around and dash in different directions, to jump over obstacles and onto ledges, and to target and slay opponents with a variety of different weapons, frequently at speed and whilst under attack. Providing the option to play an easy, normal or hard version of the game is an attempt to acknowledge and accommodate, then, the significant differences that exist between players in their capacity to pull off these tasks. Variable difficulty settings by their very nature cater not just for the 'normal' player, for the typical or ordinary player, whom we might think of as a supposed 'everyplayer.' Rather, the provision of difficulty levels, of modifiable gameplay, of investigative training levels, of gates, of dynamic difficulty adjustment, of perks and power-ups and skippable missions, acknowledges the inevitable diversity in player competences. Whatever individual difficulty settings might be called, and regardless of the disparaging or normalizing connotations of particular terms, providing the means to alter a game's challenges works toward greater inclusivity. Difficulty settings do not just invite to play a presumed everyplayer, but work toward the possibility of welcoming Everyplayer.

The figure of Everyplayer is not without its problems, however. It presents difficulties, in fact, for thinking effectively about the very issue of the difficulty of playing videogames. We can see this most clearly if we contrast Everyplayer with what games scholar Espen Aarseth has called the 'implied player.' In a short essay titled 'I Fought the Law: Transgressive Play and the Implied Player,' Aarseth argues that, in consenting to play a game, individuals subject themselves to the rules and structures of that game, an act which thereby defines them, *qua* player, as 'no longer a complete, free subject with the power to decide what to do next'[36]. Within this context, he suggests, games are thus best regarded as 'facilitators that structure player behaviour'[37]. Aarseth coins the term *implied player* to describe the part offered to potential

game-players, after literary theorist Wolfgang Iser's notion of the implied reader. Iser's concern is to understand 'the effects caused and the responses elicited by literary works'[38]. To this end, he posits the idea of an implied reader, who 'embodies all those predispositions necessary for a literary work to exercise its effect'[39]. The concept of the implied reader designates a textual structure, which anticipates the presence of any actual reader. 'No matter who or what he may be, the real reader is always offered a particular role to play, and it is this role that constitutes the concept of the implied reader'[40]. On this model, then, Aarseth's implied *player* is to be seen 'as a role made for the player by the game, a set of expectations that a player must fulfil for the game to "exercise its effect"'[41]. Whilst playing the fantasy-themed, free-roaming action game *The Elder Scrolls IV: Oblivion* (Bethesda Game Studios, 2006), for instance, and despite the enormously complex and detailed world of adventures that it offers[42], players are nonetheless required, of course, to confine their activities to those that the game makes possible. Ultimately, Aarseth argues, the implied player is best understood as 'a boundary imposed on the player-subject by the game, a limitation to the playing person's freedom of movement and choice'[43].

In his account of the implied player, Aarseth's own interest is principally in the kinds of actions that games expect and encourage players to perform and, particularly in the latter part of his essay, with those that are unexpected: the remarkable, unanticipated events that arise from the interaction of the game's complex elements, or the glitches and exploits that allow players to pull off spectacular feats unintended by the designers. He recounts a series of extraordinary incidents that have occurred in *Oblivion*. A player was able to cause, by means of a game bug, hundreds of watermelons to rain down on oblivious citizens. On another occasion, following a complicated, unscripted battle between non-player characters, Aarseth's own avatar managed to

make off with the silver claymore belonging to the near-invincible Captain of the City Watch[44]. Aarseth calls these spectacular, memorable episodes 'wondrous acts of transgression,' which momentarily rebel against 'the tyranny of the game'[45]. They offer, he says, 'a counterweight to the implied player position, the prison-house of regulated play'[46]. 'The games rule us,' says Aarseth, and these marginal events are important because they remind us that, however briefly, 'it is possible to regain control'[47]. As he develops the concept, the implied player becomes, for Aarseth, not just a boundary or limitation which curbs the free movement and choice of players, but a prison which dominates them[48].

In Iser's account, his implied reader is by no means so tightly controlled. His chosen term is intended to refer to the prestructuring of a text's potential meaning, to be sure, but also to the active nature of the reader's engagement in the reading process[49]. According to Iser, any given text will present its reader with a set of textually structured perspectives, whilst leaving undetermined the specific mental images and ideational activity that are thereby stimulated[50]. Indeed, the text brings about a standpoint 'from which the reader will be able to view things that would never have come into focus as long as his own habitual dispositions were determining his orientation'[51]. By the same token, games are facilitators, as Aarseth himself says[52], whose rules and conventions make a particular type of play possible at all. As such, the player who summons a shower of watermelons or steals a sword, even one that belongs to the Captain of the City Watch, is not engaging in acts of transgression or breaking out of a prison-house that held them. They have not fought the law. These actions and events may not have been intended by the designers, but they are entirely consistent, of course, with the given structures of the game, and, though unlikely or unusual, were nonetheless implied by it. The notion of the implied player

remains instructive, however, when we consider the question of the challenge that any given game presents to players.

Variable difficulty settings in a game seem to invite every player to take part, to present, in fact, the figure of Everyplayer. But, whatever the means of varying a game's difficulty, and regardless of the level of challenge that is selected or imposed, every game implies a particular degree of competence on the part of the player. A game will expect a certain proficiency of its player, in order that it can exercise its effect. Players become most aware of these expectations, of course, when they fail to meet them. Even the most accomplished player of *Half-Life 2* has, at least temporarily, found themselves unable to slay a certain adversary, jump onto a particular platform, or step down from an unaccountably sticky ladder. The player of Gordon Freeman discovers that their actions--their capacity to choose freely, their control over their fate--are restricted not just by what the mechanisms of the game permit them to do. Freeman is limited, too, by what a particular player is capable of. The difficulty of every game implies a player, then, by setting up expectations regarding what a player must be able to do. And the player whose lack of proficiency means that they consistently cannot meet the game's expectations at any given difficulty level will be unable to continue with it, and will be forced to forgo the rest of its environments, combat, puzzles, interactions, narrative, and so on, or, put another way, all of the effects that the game might have caused and the responses that it might have elicited. Dropping the difficulty level, should that option be available, only defers the problem, of course.

All of which is to say that, as facilitators of structured behaviour, games are enabling as well as delimiting. But they are enabling only for those who are in a position to meet their demands.

They are, in other words, *dis*-abling for a great many people, too. This is not simply a matter of appreciating the significant impact that the design of games, and of the hardware on which they run, will have on their accessibility, a point that is explored by a wide literature on games and disability[53]. Nor is it merely a recognition that advances in accessibility offer benefits for all gamers, not just for those who have been most immediately prevented from playing[54]. Rather, it is to acknowledge that every game is, by its nature, inherently exclusionary. The concept of the implied player is best understood not as a means of accounting for the restrictions that are placed by a game on the movement and choices of some free subject who would otherwise have the power to decide what to do next[55]. Rather, Aarseth's insight helps to highlight the constraints that govern who can play at all. To the extent that every game offers up a particular set of challenges, and thereby implies a particular set of competences in its players, someone will always be prevented from taking up the role that is thereby proffered. For each and every game, there is, and can be, no Everyplayer.

The demise of Everyplayer at this point of ultimate reckoning is no bad thing, however, given that there is, in fact, no Game for this imagined figure to play. When addressing the importance of providing a suitable degree of challenge for beginner and expert players alike, pioneering developer Chris Crawford suggested that 'the game designer must create not one game but a series of related games. Each game must be intrinsically interesting and challenging to the level of player for which it is targeted'[56]. *Half-Life 2*'s Easy, Normal and Hard difficulty settings exemplify just such a series of related but distinct games. The self-identity of the game that is called *Half-Life 2* is challenged by other factors, too. Even with a consistent difficulty setting, *Half-Life 2* will perform differently on computers with varying hardware configurations, for

instance those that meet the minimum system requirements (1.7 GHz CPU, 512 MB RAM) compared to those that satisfy or exceed the recommended specification (3.0 Ghz CPU, 1 GB RAM). Screen resolutions, graphic settings and the sound capabilities of individual machines will further affect the player's experience, as will the particular keyboard and mouse used for input. Versions of *Half-Life 2* were released not just for the Windows operating system, but also for Mac, Linux, and even Android, each of which inevitably differed from the others. Ports for the Xbox 360 and PlayStation 3 consoles, which come with their own distinct controllers, were different again. An arcade version of the game called *Half-Life 2: Survivor* was released, which omitted much of the story and all of the game's puzzles, and required players to control Gordon Freeman using joysticks and, in seated versions of the cabinet, pedals[57]. Ultimately, it is impossible to enumerate definitively the distinct configurations, versions and iterations of *Half-Life 2*. It is tempting to suggest that *Half-Life 2*, in fact, is not a single game, or even a series of games, but rather, a family of overlapping artifacts and experiences, each of which resembles the others to a greater or lesser degree[58]. But, in the present context, it is perhaps better to say that there is no standard or default *Half-Life 2*, with a single set of expectations. Just as there is no definitive human being, or player, so there is no definitive game.

Recognising this fact opens up the possibility of summoning a rather different incarnation of Everyplayer. In the same way that it is inappropriate to imagine there is a single game--an essential, definitive version of *Half-Life 2* or any other title--so it is unhelpful to conceive Everyplayer as a single, abstracted figure which represents all humanity, as a role with whom everyone can identify, or a receptacle into which everyone can pour themselves. The fundamental diversity of players must be understood simultaneously with the diversity that is

intrinsic to any game that they play. There are a great many ways that a game's expectations of its players might be, and often have been, varied. These include the numerous techniques for scaling its difficulty, but extend also to: customising the game's controllers, for instance with alternative buttons, joysticks, switches and other input devices[59]; modifying or enhancing the game's interface, for instance with alternative colour schemes or subtitles[60]; providing the option to skip not just missions, but also cutscenes, combat, or any other aspect of the game[61]; including innovative game modes, which allow players, for example, simply to explore a world, without the demands of narrative, puzzles or conflict[62]; and many more[63]. It is inappropriate to regard these innumerable variations as attempts to accommodate those who are unable to play the core game as it ought to be played, which is to say as concessions to gamers who fail to pass as normate. Rather, they are a consequence of the fact that a game is an inevitably undefined object, which cannot help but imply a multitude of different players. And so, just as our focus shifts from a supposedly universal Everyman to the particular actors who take that role, so we must move in our thinking from a hollow Everyplayer to the particular gamers, in all their varied specificity, who wilfully subject themselves to the difficulties of playing a game. We must account not for Everyplayer but for every player.

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The implied reader, Iser suggested, is a role to be played, which is offered to the real readers who take up a literary work[64]. Similarly, the implied player, Aarseth maintained, is a role made for the player by a game[65]. This role of implied player, I have argued, is best understood not as a prison-house which rules and regulates the activities of those otherwise free subjects who take it on[66], but rather as a structure which makes possible certain types of action, though only for

certain types of player. The concept of the implied player, in other words, should be taken as directing our attention toward the competences that are required of the would-be-players of any given game. Games set expectations of their players, which cannot be met by everyone: the challenges and difficulties they present are both enabling and disabling. From this vantage, we can see that the notion of the everyplayer, which takes it cue from the everyman, is inauspiciously normative: it posits an ordinary or typical player, who plays a game in the 'normal' way. At the same time, the notion of Everyplayer, which follows the lead of Everyman, is similarly prescriptive: it posits an empty vessel into which every player should be able to insert themselves. Thus, in their different ways, both the everyplayer and Everyplayer evoke the normate figure of the 'definitive human being'[67].

Understood in terms of the logic of the everyplayer, those who cannot cope with a game's normal difficulty setting, or, for whatever reason, opt to play on a lower setting, are not 'normal': they are, we are encouraged to infer, subhuman players. And according to the logic of the universal Everyplayer, those who are unable to play in any way are not human at all. All these particular individuals, these real players, fail to be definitive, normate human beings. Or, rather, they bring into difficulty the very notions of the everyplayer, of Everyplayer, and indeed of the human being. They confound expectations of what a human being should be and do. In fact, the concept of the implied player helps us to appreciate that the part offered to players by a game is not a human role at all, definitive or otherwise. Beyond those who do not play normally, and those who cannot play at all, there is another group of extra-ordinary individuals who have defied expectations regarding the definitive human player. These other-than-human players are the many animals who have taken up keyboard or controller, or otherwise found themselves

playing videogames. These numerous creatures can be best considered under three broad headings.

A great many *companion animals* have been provided with the opportunity to play a videogame, sometimes with the explicit objective of enhancing their interactions with owners and caregivers, or of relieving boredom and stress, and sometimes for reasons that are not entirely clear. A bearded dragon lizard called Crunch, for instance, became briefly famous in 2011 when she was filmed crushing virtual insects with her tongue on the mobile game *Ant Smasher* (Best Cool & Fun Games, 2011)[68]. Beyond such opportunist play by particular pets, a number of games have been designed specifically for different companion species. A raft of games for touch-screen devices have been developed for cats, usually featuring fast-moving mice, fish, birds, insects or laser dots which beg to be swatted, including several promotional apps produced by a pet food manufacturer[69]. More substantially, the multi-player mode of the game *Cat Cat Revolution* allows an iPhone user to control the movements of a virtual mouse, which appears on a networked iPad and is carefully rendered in colours selected to be clearly perceptible to a feline chaser[70]. Similarly, the tablet game *Felino* facilitates interspecific play by providing a virtual aquarium which holds not only free-swimming fish, who release spheres when pawed, but also a crab who can be controlled manually and used to collect the spheres[71]. The Canine Amusement and Training (CAT) project at the University of Central Florida, meanwhile, made use of Wiimotes and projectors to construct a set of mini-games--*Calm*, *Stay*, *Come* and even a version of *Twister*--whose collective objective was the cultivation of 'happy and well-trained canines and humans'[72]. In Israel, researchers provided Becky, a poodle, and Jam, a terrier, with a pair of tablet games which required them to catch virtual balls and rats[73]. And the mixed reality game

Metazoa Ludens, developed at the National University of Singapore, allows a human and a hamster to play a classic chase game with one another, even when apart, by representing both parties together in a virtual environment[74].

In addition to the apps and apparatuses provided to companion animals, there have been long-standing initiatives to get *captive animals* playing digital games, most often as a form of environmental enrichment. As early as the 1970s, computer consoles were installed at Portland zoo, which allowed the resident mandrills to play a simple reaction game against those human visitors willing to part with a dime: the winner was the first to press one of three lights which illuminated randomly, with the results tallied on a large scoreboard. At the same facility, a 'microprocessor-based system' allowed orangutans to play tic-tac-toe against a computer opponent[75]. The variety of games played by captive orangutans expanded significantly with the advent of touch screens. At Zoo Atlanta, orangutans were given the opportunity to play image matching games and paint tasks using a touch screen embedded in a large artificial tree[76], whilst at Indianapolis Zoo they can play a memory game and a symbolic association game, and, against human opponents, a ball-passing game and a version of *Pong*[77]. The *Apps for Apes* project, run by the conservation charity Orangutan Outreach, provides chimpanzees and orangutans kept in zoos and sanctuaries with iPads in order to make available 'unlimited enrichment opportunities' in the form of multiple apps, including games such as *iFishPond* (John Moffett, 2010), *Flick Kick Football* (PikPok, 2010) and even some of those games designed for cats[78]. The Touch project has explored ways of involving rescued Bornean orangutans in the game design process, attending to their preferred ways of interacting with play objects of all kinds, including touchscreens and tablets, which can involve licking, biting and stroking screens with legs, feet,

shoulders and other body parts[79]. Magellanic penguins at Aquarium of the Pacific in California have played *Game for Cats* (Little Hiccup, 2010), pecking surprisingly effectively at the darting mouse on screen[80]. Initiatives to employ digital games as a form of environmental enrichment have not been confined to zoos and rescue centres. The collaborative game *Pig Chase*, which was taken to the prototype stage by researchers and designers in the Netherlands, was intended to connect a human player operating a tablet with farmed pigs, who were provided with a large touch screen, and required them to work together to guide with finger and snout a ball of light through a triangular goal, triggering a colourful display of fireworks[81].

Finally, a number of animals have come to play games as *experimental subjects* in varied forms of scientific research. At Yerkes Primate Research Center, for instance, a pair of rhesus monkeys named Abel and Baker learned to play a series of games on an early Zenith personal computer: in *Side Targets* they had to use a joystick to move a virtual ball onto a red target on one edge of the screen; in *Chase*, they had to catch the target as it moved away and bounced around the screen; and in *Pursuit*, they had to maintain contact with the target as it moved[82]. Animal scientists at Pennsylvania State University investigating cognitive skills and communication later adapted the games, and had a number of pigs play them--initially two named Hamlet and Omelette, later supplanted by a pair called Ebony and Ivory--using their snouts and a substantially reinforced joystick[83]. At Georgia State University, psychologists pursuing maze studies found that four rhesus monkeys were adept at locating large blue and orange marbles within computer generated 3D mazes[84]. At Princeton, neuroscientists investigating spatial information and navigation in the brain had a virtual environment constructed using the *Quake II* game engine (id Software, 1997). A mouse placed on a large

spherical treadmill, with head restrained, navigated the maze-like space projected around them, and was rewarded with water through a lick tube when they reached particular zones[85]. Experiments conducted at the Howard Hughes Medical Institute in Virginia had mice moving down similar virtual corridors using their whiskers to navigate, whilst the neurons firing in their brains were monitored through a small window cut into their skulls[86]. Lastly, the bonobo Kanzi, famous for the decades-long language studies in which he has been a subject at Georgia State University and the Ape Cognition and Conservation Initiative in Iowa, is a proficient player of *Ms. Pac-Man* (General Computer Corporation, 1982), though he is not, in fact, especially keen on the game[87].

Countless animals, beyond these few examples, have played digital games in some form or other[88]. Frequently, the games played have been developed for a certain species, with careful attention paid by researchers and designers to the animals' physical and perceptual capabilities[89]. The creators of *Cat Cat Revolution* and *Felino* were mindful of the visual capacities of cats; the Touch project deliberately accommodated the existing play preferences of orangutans; and the Princeton mice navigated the virtual maze in which they were placed by running atop a treadmill of just the right size. In each of these games, inhuman players are explicitly and purposely implied. But not all of the animal players reviewed were engaged with games that had been created for them: apes and penguins played *Games for Cats*; pigs played games originally designed for monkeys; and Crunch and Kanzi, a bearded dragon and a bonobo, played *Ant Smasher* and *Ms Pac-Man* respectively, both of which were made with humans in mind. The players here were also inhuman, though the designers of their games had never envisaged members of these different species taking part. The player implied by a game, the structured role

that a game makes available, exceeds anything that might be intended by that game's designers. This is not to say that the competences of players are not relevant. On the contrary, it is to the central importance of these competences that the concept of the implied player would have us attend. But the competences expected of players are not aligned with the supposed capacities and capabilities of any particular species. The role offered by a game can be taken up by anyone who is in a position to fill it: icons and environments optimised for feline vision can be seen by other eyes; screens that register an orangutan tongue will respond to licks and flicks from altogether different creatures, too; and ants can be smashed, or ghosts evaded, using any appendage or organ that will do the job. To understand fully the species-agnosticism of the implied player, as well as the unfortunate tendency to construe this role in anthroponormative terms[90], it will be instructive to consider one final example of extraordinary, inhuman players of games.

The Ai Project at Kyoto University's Primate Research Institute investigates the perceptual and cognitive capabilities of chimpanzees, particularly by assessing their interactions with a variety of computer-based tasks, and comparing these with the results achieved by humans. The project's principal subject for several decades was Ai, a female chimpanzee born and captured in the Guinean forests of West Africa in 1976, and brought to the institute a year later[91]. Over the years, Ai, whose name means 'love' (アイ), has played numerous games using keyboards and touch screens, including maze puzzles[92], colour matching tasks[93], shape construction and matching challenges[94], games that have involved chasing or hitting targets with a ball[95], and more. Many of the tasks designed for Ai have focused on numeracy[96], and it is one of these that warrants particular attention. Having learned the use of Arabic numerals, Ai was tested with a

'masking task.' A random selection of five numbers were presented in a scattered pattern across the screen. Having looked at them all, when Ai touched the lowest number, the rest were covered over with white squares. Ai had to remember the masked numbers, and select them in ascending order. She was good at the game, and performed as well, or better, than preschool human children[97].

When two other chimpanzees kept at the Research Institute, Chloe and Pan, played a version of the game with just four numerals they did fairly well, too, though not as well as Ai. All three, however, were soon surpassed by their young offspring. Ayumu, Cleo and Pal had all been born at the Institute in 2000 and trained alongside their mothers. With six or seven numerals, or even more, these juveniles continued to score highly. Ai, the best adult player, and her son Ayumu, the best of the young players, were then selected to try a more difficult version of the game called 'limited-hold memory task.' On pressing a start button, five numbers appeared on screen for just a fraction of a second before they were all covered over. Ai did respectably, though her scores did drop compared to the easier masking task. Despite the very limited time he now had to memorise the numbers, however, Ayumu's performance was almost unaffected. In fact, he consistently outperformed all nine human players of the game in terms both of speed and accuracy: when eight numerals were flashed up for just 210 milliseconds, the fastest setting, Ayumu achieved a score of 80%, whereas human players managed less than 40% with only five numerals[98].

The games *masking task* and *limited-hold memory task* were designed to compare the capabilities of chimpanzees and humans. As such, the player implied by each game was neither chimpanzee

nor human, and the role in each case was taken on by real members of both species. But the playing of these games by both chimpanzees and humans points toward two further conclusions that we can draw, in closing, which take us beyond this question of the inhuman nature of the implied player. It was a chimpanzee who consistently excelled at *limited-hold memory task*, even when playing at what we might consider the 'Nightmare!' difficulty setting. There is a temptation, then, to claim that 'chimpanzees have a better memory than humans,' at least for quickly capturing visual stimuli[99], or that in certain circumstances 'chimpanzee memory may…be superior to human memory'[100]. These assertions draw us into the trap of positing a generalised chimpanzee, a simian equivalent of the characterless human Everyman. They deliver us an abstract idea of a normal chimpanzee, a normate model of a chimpanzee, with uniform, exemplary capabilities. But the very fact that Ai, talented though she was compared to her peers, trailed behind the younger chimps, amongst whom Ayumu, in turn, shone, lays the lie to this figure of 'the chimpanzee' in the general singular[101]. Further, these six individual chimpanzees who, alone, were presented with one or both of these games at Kyoto University's Primate Research Institute, were, it turned out, *able* to play, albeit at different difficulty settings. There are chimpanzees elsewhere in the world, in laboratories and zoos, in sanctuaries and rainforests, whose deviant, marked bodies shore up the normate's boundaries, and who would not be able to meet these games' expectations at all[102]. By the same token, the figure of a normate cat for whom *Cat Cat Revolution* and *Felino* were designed is a fiction, as is the normate hamster of *Metazoa Ludens*, the normate pig of *Pig Chase*, the normate mouse for whom a variety of virtual mazes have been created, and so on. Just as, within the context of game design and play, we do well to eschew the notion of a normate human being modelled on the everyman or Everyman, so

might we avoid questionable characterisations of other species archetypes: the everychimp or Everycat.

The implied player is a role that individuals are invited to fill, comprised of a set of expectations. As we have seen, this role is not in any sense inherently or necessarily human. In fact, there have been multiple forms of inhumanity at play in the expectations at which we have looked, and which I have attempted to bring into difficulty. The terms often used of games' difficulty levels were seen to set up prejudicial, normalising expectations regarding players' skills and preferred ways of engaging with a game. And the expectations manifest in the requirements of games themselves, including the practical and technological means of engaging with them, were seen often to exclude from play those who did not measure up to a conception of some definitive, normate human being. But further, and finally, we can question not just expectations regarding player adequacy, and expectations regarding who is permitted to play, but also expectations that individuals should have to play at all. Experimental subjects like Ai and Ayumu, Chloe and Cleo, Pan and Pal, or Kanzi, or Abel and Baker, or Hamlet and Omelette, or Ebony and Ivory, or all the monkeys and mice and numberless other creatures kept in laboratories or research facilities around the world have, notwithstanding the room for manoeuvre that some few of them retain[103], had little choice but to play, in some cases over the course of decades-long scientific projects. Similarly, though captive animals in zoos and farms have been offered games as a form of enrichment, and are often free to choose when and whether to play, they have been able to do so only within impoverished environments where alternatives are limited. Even home-kept companion animals have been given the option to play, in some cases at least, precisely in order to relieve the boredom and anxiety of being left alone for hours at a time. It is vital that more

players be implied, that the range and variety of expectations be multiplied, but, at the same time, this expansion of the modes and means of play must include the real possibility that individuals *not* be expected to subject themselves to the challenges and difficulties of a game.

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Notes

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[1] Valve, *Half-Life 2: Raising the Bar*, 145.
[2] Valve, 142.
[3] Slater, 'The Top 10 Most Unlikely Videogame Heroes'; Bradford, 'Gaming's Greatest Everyman Heroes'; Stuart, 'Half-Life at 20'.
[4] 'Everyman, n.'
[5] Haglund, 'Tom Hanks Is Not an "Everyman"'; Lang, 'Tom Hanks Isn't "Everyman"'.
[6] Keighley, 'The Final Hours of Half-Life'; Stuart, 'Half-Life at 20'; O'Dwyer, *Unforseen Consequences*.
[7] Laidlaw, 'Mathoms from the Lambda Files (c. 1998)'.
[8] Dulin, 'Half-Life Review'; IGN, 'Half-Life Review'; Green, 'Half-Life'; Reed, 'Half-Life 2'; Cifaldi, 'The Gamasutra Quantum Leap Awards'; Sivak, 'Half-Life 2: Being Gordon Freeman'; Stuart, 'Half-Life at 20'; Farca, *Playing Dystopia*, 95–96; Cory Barlog in O'Dwyer, *Unforseen Consequences*, 11:17-11:40.
[9] Laidlaw, 'Writing For Half-Life'.
[10] Hodgson, *Half-Life 2: Prima Official Game Guide*, 3.
[11] Paul, *The Toxic Meritocracy of Video Games*.
[12] Garland Thomson, *Extraordinary Bodies*, 5.
[13] Garland Thomson, 6.
[14] Garland Thomson, 6.
[15] Garland Thomson, 6.
[16] Garland Thomson, 7.
[17] Garland Thomson, 8.
[18] Garland-Thomson, 'Integrating Disability, Transforming Feminist Theory', 10.
[19] Garland Thomson, *Extraordinary Bodies*, 8.
[20] Hamraie, *Building Access*, 19–39.
[21] Goffman, *Stigma*, 128; quoted in Garland Thomson, *Extraordinary Bodies*, 8.
[22] Goffman, *Stigma*, 128.
[23] Haglund, 'Tom Hanks Is Not an "Everyman"'; Lang, 'Tom Hanks Isn't "Everyman"'.
[24] As Garland Thomson notes, it is significant that 'Goffman takes for granted that femaleness has no part in his sketch of a normative human being' (8). On 'the default male,' see Criado Perez, *Invisible Women*.
[25] Dolmage, *Disability Rhetoric*, 19–30.
[26] Garland Thomson, *Extraordinary Bodies*, 8.

[27] Hacking, *The Taming of Chance*, 160–69; Davis, 'Constructing Normalcy'.
[28] Hunicke, 'The Case for Dynamic Difficulty Adjustment in Games'; Salen and Zimmerman, *Rules of Play*, 222–23.
[29] Caldwell-Gervais, *A Thorough Look at Homeworld*, 32:04-33:44.
[30] Crawford, 'Design Techniques and Ideals for Computer Games', 106; Braithwaite and Schreiber, *Challenges for Game Designers*, 99–100; Schell, *The Art of Game Design*, 207–9; Fullerton, *Game Design Workshop*, 331–33.
[31] Salen and Zimmerman, *Rules of Play*, 351.
[32] King, 'Morality Plays', 240–43.
[33] Cawley, 'The Moral Play of Everyman', l. 912.
[34] Reichmann, Emsbach, and Worschech, *Curd Jürgens*; Grunwald, 'The Sounds of Salzburg'; Billington, 'Everyman Review'.
[35] Davidson, Walsh, and Broos, *Everyman and Its Dutch Original, Elckerlijc*; Speaight, *William Poel and the Elizabethan Revival*, 163; Miles, *Everyman*; Maude, *Everyman*.
[36] Aarseth, 'I Fought the Law', 181.
[37] Aarseth, 181.
[38] Iser, *The Act of Reading*, 34.
[39] Iser, 34.
[40] Iser, 34–35.
[41] Aarseth, 'I Fought the Law', 184.
[42] Aarseth, 185.
[43] Aarseth, 184.
[44] Aarseth, 185–87.
[45] Aarseth, 188, 185.
[46] Aarseth, 188.
[47] Aarseth, 188.
[48] Farca, *Playing Dystopia*, 207–9; Tanenbaum, 'How I Learned to Stop Worrying and Love the Gamer'.
[49] Iser, *The Implied Reader*, xii.
[50] Iser, *The Act of Reading*, 35–36.
[51] Iser, 35.
[52] Aarseth, 'I Fought the Law', 181.
[53] Yuan, Folmer, and Harris Jr., 'Game Accessibility: A Survey'; Barlet and Spohn, *Includification*; Powers, Nguyen, and Frieden, 'Video Game Accessibility'; Heron, 'Special Issue on Game Accessibility'; Gandolfi, Calabria, and Ferdig, 'Digital Games for Special Needs'; Ellis, Kent, and Leaver, *Gaming Disability*.
[54] Heron, 'Inaccessible through Oversight', 32–33.
[55] Aarseth has since questioned the utility of the notion of the implied player on the grounds that it is a pleonasm: there is nothing *implied* about a game's player, he argues, explicitly defined as it is by the game's mechanics and user interface. It is perhaps better, he suggests, to consider diegetic games (those with a world and characters) as having not an implied player, but rather an explicit player function; Aarseth, 'Panel @ PCG2018'.
[56] Crawford, 'Design Techniques and Ideals for Computer Games', 106.
[57] 'Half-Life 2: Survivor'.
[58] Wittgenstein, *Philosophical Investigations*, §66-71.
[59] Dalgleish, 'There Are No Universal Interfaces'.

[60] Plothe, 'The Whose View of Hue?'.
[61] Hepler, 'Killer Women'; Paul, *The Toxic Meritocracy of Video Games*, 131–33.
[62] Walker, 'Assassin's Creed Origins'.
[63] 'Game Accessibility Guidelines'; AbleGamers Charity, 'Accessible Player Experiences (APX)'.
[64] Iser, *The Act of Reading*, 34–35.
[65] Aarseth, 'I Fought the Law', 184.
[66] Aarseth, 188, 181.
[67] Garland Thomson, *Extraordinary Bodies*, 8.
[68] Moses, 'Aussie Lizard Has Smartphone Game Licked'.
[69] Westerlaken, 'The Rise of the Cat-Games'; 'Apps for Cats'; 'Friskies Cat's Play'.
[70] An, *Cat Cat Revolution*; Noz and An, 'Cat Cat Revolution'.
[71] Westerlaken and Gualeni, 'Grounded Zoomorphism'; Westerlaken and Gualeni, 'Felino'.
[72] Wingrave et al., 'Early Explorations of CAT'.
[73] Baskin and Zamansky, 'The Player Is Chewing the Tablet!'.
[74] Tan et al., 'Metazoa Ludens'.
[75] Yanofsky and Markowitz, 'Changes in General Behavior of Two Mandrills (Papio Sphinx)'; Markowitz, 'Engineering Environments for Behavioral Opportunities in the Zoo', 40–41.
[76] Perdue et al., 'Technology at the Zoo'.
[77] Martin and Shumaker, 'Great Ape Touch-Panel Tasks'.
[78] 'Apps for Apes'; Crecente, 'These Orangutans Play with IPads'; Boostrom, 'Problem-Solving with Orangutans (Pongo Pygmaeus and Pongo Abelii) and Chimpanzees (Pan Traoglodytes)'.
[79] Wirman, 'Games for/with Strangers'; Wirman and Jørgensen, 'Designing for Intuitive Use for Non-Human Users'; Jørgensen and Wirman, 'Multispecies Methods, Technologies for Play'.
[80] Stefano, *Cool Hunting Video*; Westerlaken, 'The Playful Penguins of Long Beach, CA'.
[81] Driessen et al., 'What Could Playing with Pigs Do to Us?'
[82] Rumbaugh et al., 'Rhesus Monkeys (Macaca Mulatta)'.
[83] Martz, 'In a Pig's Eye'; Helft, 'Pig Video Arcades Critique Life in the Pen'; Dyson, 'Move Over "Babe"!'; Forest, 'Talking to Our Ancestors'; 'Pigs Use Computers To Share Feelings'.
[84] Washburn and Astur, 'Exploration of Virtual Mazes by Rhesus Monkeys (Macaca Mulatta)'.
[85] Harvey et al., 'Intracellular Dynamics of Hippocampal Place Cells during Virtual Navigation'; *Mouse in VR Maze*.
[86] Sofroniew et al., 'Natural Whisker-Guided Behavior by Head-Fixed Mice in Tactile Virtual Reality'; Flam, 'Virtual Reality for Mice Reveals the Workings of the Brain'.
[87] O'Neill and Savage-Rumbaugh, 'Words from the Wise'.
[88] Pons Tomás, Jaén Martínez, and Catalá Bolós, 'Envisioning Future Playful Interactive Environments for Animals'; Hirskyj-Douglas et al., 'Seven Years after the Manifesto'; Wirman, 'Ludus Animalis'; Baskina et al., 'Playful Animal Computer Interaction'; Westerlaken, 'Playful Encounters with Animals'.
[89] Mancini, 'Animal-Computer Interaction: A Manifesto'; Westerlaken and Gualeni, 'Digitally Complemented Zoomorphism'; Jørgensen and Wirman, 'Multispecies Methods, Technologies for Play'.
[90] Tyler, 'The Exception and the Norm: Dimensions of Anthropocentrism'.
[91] Matsuzawa, 'The Ai Project'; Matsuzawa, 'Symbolic Representation of Number in Chimpanzees'.
[92] Iversen and Matsuzawa, 'Acquisition of Navigation by Chimpanzees (Pan Troglodytes)'.

[93] Matsuzawa, 'Colour Naming and Classification in a Chimpanzee (Pan Troglodytes)'; Matsuno, Kawai, and Matsuzawa, 'Color Classification by Chimpanzees (Pan Troglodytes)'.
[94] Fujita and Matsuzawa, 'Delayed Figure Reconstruction by a Chimpanzee (Pan Troglodytes) and Humans (Homo Sapiens)'; Tomonaga and Matsuzawa, 'Perception of Complex Geometric Figures in Chimpanzees (Pan Troglodytes) and Humans (Homo Sapiens)'.
[95] Iversen and Matsuzawa, 'Development of Interception of Moving Targets by Chimpanzees (Pan Troglodytes)'.
[96] Biro and Matsuzawa, 'Numerical Ordering in a Chimpanzee (Pan Troglodytes)'; Tomonaga and Matsuzawa, 'Sequential Responding to Arabic Numerals'; Biro and Matsuzawa, 'Use of Numerical Symbols by the Chimpanzee (Pan Troglodytes)'; Tomonaga and Matsuzawa, 'Enumeration of Briefly Presented Items by the Chimpanzee (Pan Troglodytes) and Humans (Homo Sapiens)'.
[97] Kawai and Matsuzawa, 'Numerical Memory Span in a Chimpanzee'.
[98] Inoue and Matsuzawa, 'Working Memory of Numerals in Chimpanzees'; Matsuzawa, 'Symbolic Representation of Number in Chimpanzees', 94–96.
[99] Matsuzawa, 'Symbolic Representation of Number in Chimpanzees', 97.
[100] Inoue and Matsuzawa, 'Working Memory of Numerals in Chimpanzees', R1004.
[101] Tyler, 'A Singular of Boars'.
[102] On 'animal crips,' see Taylor, *Beasts of Burden*, chapter 3.
[103] Langlitz, 'Synthetic Primatology'.