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Introduction: Unpredictable Play

Few games are fully deterministic – which is to say, games where a player performing a given action knows precisely what the outcome of that action will be upon the field of play. The player who moves a piece in chess knows where that piece will end up and whether it will take an opposing piece in the process; the player who places their stone at a particular vertex in Go knows whether it will make a group of stones alive, dead or unsettled, and whether or not it might result in a *ko fight*; the player considering their next move in draughts can always see how many captures are possible in a single sequence. The chess piece cannot be sometimes defeated by the piece it tries to capture; a Go stone cannot switch to the other colour upon a lucky roll of a die; draughts pieces cannot fail to capture the piece they jump over. The same action repeated across multiple instances[1] of play is guaranteed to result in the same outcome each time.

The encyclopaedia of such games is, however, modest compared to the great compendium of those which include at least one non-deterministic game mechanic – the rolling of a die, the flipping of a coin, the generation of a world map, the drawing of lots to determine which team plays first, randomized damage outputs, percentage-based drop rates, unpredictable artificial intelligence decisions, the shuffling of cards, virtual weapons without perfect aim, spawn point selection in multiplayer games, randomized placement of enemies and items, the drawing of unseen cards or tiles and many others besides. In all of these cases one similarity may be divined – a player performs a given action, but that action is no longer universally and inseparably shackled to a given outcome. Instead actions lead to a possibility space of potential outcomes, which may be small – a flipped coin effectively has two potential outcomes, discounting the obvious but unlikely third outcome – or large, as in the procedural generation of a world map which might have billions of possible forms. The input is given, and one possible outcome is 'selected' (a word which, as we shall see, rather masks the complexity of this process in most cases), and that particular outcome could not have been predicted before the act of selection is carried out. This

core experience, of being unable to predict the outcome for a given input, is one with profound importance for the study of game-playing experience, for it problematizes a wide constellation of related elements: the triviality or seriousness of play, player agency, notions of fairness, having something 'at stake' in play, the role (if any) of skill and many more besides.

Let us consequently define 'unpredictability' as descriptive of the category of game action which can yield multiple outcomes for identical inputs, and that the 'selected' outcome from the possibility space of potential outcomes cannot be foreseen. Now take three gameplay scenarios in which this unpredictability unfolds: in the first, one loads up the latest iteration of the grand strategy nation-building *Civilization* (1991–present) franchise and starts a new game – the world map is procedurally generated by the game and the player's nation is placed at an unpredictable location on this map, and this location then serves as the inescapable 'starting point' of the player's civilization during all subsequent play. In the second, one is in the midst of playing a role-playing game (RPG), and upon slaying a powerful 'boss' enemy, the player wonders: will this foe drop the item I know they can drop *x per cent* of the time, or will I get nothing for my effort, again, as the last *y* times I've defeated them? In the third scenario, one walks into a casino and finds a slot machine to play, sits upon the stool, places a coin in the slot, pulls the lever and watches the wheels whirl towards their indeterminate denouement. To describe all of these unpredictable gameplay experiences we use the same unexamined appellations. We call them *randomness*, *luck* or *chance* – yet we surely cannot analytically justify using a given term – 'luck', for instance – to describe the unpredictable map creation for a twenty-hour game of complex strategy with thousands of individual steps and decisions, each of which is in some way dependent on the generation of the world map upon which they play out, and then apply *that same term* also to a heartbeat encounter with a one-armed bandit where player skill and thought play no role.

This book is therefore concerned with a single task: to guide us in an escape from this obfuscating synonymy by identifying analytically distinct forms of unpredictability in game systems, and by developing a typology based upon these observations – one with both theoretical depth and practical application. This is the task of the first five chapters. Having done so, the book will then examine three particular case studies of unpredictability, their navigation by players and the player *experience* thereof: procedural content generation (PCG), replay value and grinding, and player practices designed towards the deliberate and directed negation of unpredictability. These will allow us to move from the theoretical to the empirical and carry out a broader analysis of where the elements of unpredictability arise in the vast milieu we currently term 'games', the perception (or rejection) of identity and difference between multiple acts of gameplay in unpredictable games, how players navigate and reflect upon games of unpredictability which can be opaque and even seemingly unfair and how we might develop

a comprehensive experiential understanding of ludic unpredictability from these enquiries. First, however, it is useful to address the history of games that feature unpredictable systems, consider some of the broad shifts in the design and social embedding of these games up to the present day and as a result begin to unpick some of the roles that unpredictability plays in modern game design.

The era of outcomes and the era of systems

In the ancient Mesoamerican game of Patolli players were expected to bring with them six items and possessions they were willing to gamble, each item being represented by a piece on the board, and all items being taken by the eventual victor. Patolli was a 'race game' of both skill and chance – beans were thrown to determine how many moves a player's piece may make around the cross-shaped board, while players had the choice over which of their pieces they advance, aiming to reach the end positions assigned to them. Playing the game was an event of immense importance, both because of the significant wagers required by both sides – especially if the players were not nobles and might have their material lives seriously impacted by a loss – and the game's status as communion with the gods Macuilxochitl and Ometochtli. Popular belief held that the player favoured by the gods would emerge victorious – thereby transferring divine cachet into an improvement in their material status by the acquisition of items wagered by their opponent (one Mayan codex explicitly states that the winnings are a 'gift' from Macuilxochitl) – the victory having been achieved primarily through the gods' largesse. One cannot speculate now as to the role ascribed by Patolli's players to skill – were players seen to possess skill inherently, or was skill seen as something bestowed or loaned out by the gods (so if a good player wins through skill, not fortune, that is still seen as god-given fortune of a contrasting species) – but nevertheless this conflation of fortune, the ambiguous role of skill, and the notoriety and recognition (divine and worldly) accrued through victory in such games, is apparent.

These intertwined themes repeat themselves visibly throughout the history of games, and many civilizations have believed that players of unpredictable games have received supernatural favour or disfavour through the act of play.[2] The Royal Game of Ur (dating from before 2500 BCE) has been proposed as possessing a dual status as both play and divination;[3] in the ancient Egyptian game of Senet, some anthropologists propose that the successful player was seen as victorious only under the benevolent aegis of several gods;[4] ancient Greeks and Romans believed the gods could determine success in games,[5] while Greek religion recorded the distribution of the world between the gods via the outcome of a game;[6] Zuñi Native

Americans worshipped gods of war, associated each with a specific game and invoked them when gambling upon that game;[7] the Sanskrit text *Atharvaveda* composed in perhaps 1100 BCE contains hymns to the gods for a range of purposes, including successful gambling.[8] Equally, we can also appreciate moments of divination that could, outside of their cultural context, be readily mistaken for the play of games. The classical Western world saw the casting of small bones within a religious temple context to seek answers from the gods,[9] although this divine will can be interpreted as arbitrary, rather than agential and deliberate;[10] in the Tibetan Empire (600–800 CE) the rolls of dice were commonly used to resolve legal disputes via, it seems, reference to divination texts;[11] and numerous belief systems today continue to use the drawing and dealing of cards to prognosticate on the future,[12] or invoke contests and games in their broader mythical narratives.[13] The broader relationship between divination and games of chance remains contested, especially with regard to the causality or flow of ideas between the two,[14] but they undeniably share 'notions of the unknown, mystery, and fate, as well as imagery of suddenly receiving something of great value that changes life for the better',[15] exhibiting an 'amazing parallelism'[16] in their commonalities: being formal systems, entailing the modelling of reality, the parcelling of time into 'sessions', the spatial restriction of the game or holy place, and so forth.

In early games of this unpredictable sort we therefore readily perceive a strange conflation: games of unpredictability have often been seen as having predetermined outcomes, and therefore what we now see as moments of mathematical indeterminacy were instead perceived as moments of theistic fatalism and certitude. Actions in these games were seen not as unpredictable per se, but simply unpredictable by humans – the outcome was always going to be the outcome, for the player blessed by the gods was destined to emerge victorious, even if the identity of the fortunate player could not be ascertained without channelling the will of the divine through the numinous moment of gameplay. In this regard it is not unreasonable to even ascribe a sacerdotal role to games – priests do not have a monopoly on interpreting the will of the gods when a game board can achieve the very same. Simultaneously, by ontologically positioning terrestrial non-determinism and non-knowledge as echoes of empyrean determinism and divine knowledge, the game's outcomes rather than the game's systems are emphasized: each instance of play gains character and noteworthiness beyond the mere abilities of its players through claiming to represent and illustrate the will of the heavens. The difference in outcome was what mattered, not the system (mathematical or spiritual) which underpinned it.

However, this results-focused orientation to games of unpredictability, informed by a belief that understanding the outcomes was beyond human ken, was not to last. Many subsequent societal developments each shifted the discourse of unpredictable games further and further away from their

spiritual and results-oriented beginnings. Although a full exploration of this process would merit a book in its own right, here I wish to look at three. These are the Enlightenment and the beginnings of a deeper mathematical understanding of ludic unpredictability, the global emergence of casinos and the formalization of gambling games, and the development of game theory as a scholarly discipline. I certainly do not propose that these are a conclusive history of unpredictability in gameplay, or anything close to it, and there are many other events I elide from this brief summary; nor do I adhere to 'grand narrative' theories of history. However, I believe these three points in particular (three of many) *do* highlight some extremely important developments in how we think about game unpredictability, how players use (or deal with) unpredictability in their play experiences, and the relationship between our perception of game unpredictability and our understanding of the fundamental mechanics of a given game. The goal of relating these moments is therefore to start the process of thinking about how even the most basic non-deterministic systems such as coins and dice can lead to extremely complex cultural or ideological associations.[17] These historical moments serve as valuable examples that highlight the themes and the kinds of meaning that can be assigned to playing such unpredictable games – themes and meanings, as I will show throughout the present work, which are in many cases still very much alive to the present day.

The era we now call the Enlightenment saw the rise of a new approach to thinking about unpredictability, and unpredictability in a ludic context. In 1654 Blaise Pascal and Pierre de Fermat, following a discussion of an age-old gambling problem set to them by the French writer Antoine Gombaud, laid out the foundations of modern probability theory as the underpinnings of their reply. In the process they came to the fundamental realization that *unpredictable* events nevertheless occur in probabilistic distributions, even if those values may be extremely challenging to ascertain in complex systems, and therefore *events which are yet to come may be predicted*. This was a fundamental shift from the dominant 'pre-modern' orientation towards game unpredictability, which posited and enacted an epistemological divide between human reasoning and ludic outcomes. This conceptualization of unpredictability marked the beginning of the end of what we might call the era of outcomes (where little appeared predictable by humans), and the gradual dawn of the era of systems (where all seemed predictable by humans), a rationale that has continued in all detailed enquiry of unpredictable gameplay and game-like systems up to the present day. The expanding empirical rationalist episteme gave impetus to this mathematical research, which soon bifurcated – the questions explored by the new field of probability expanded outside the realms of the game, while also opening up new avenues of potential enquiry into specifically game-based systems whose depth was starting to be uncovered. In *New Essays on Human Understanding*, German polymath Gottfried Leibniz (an avid game player)

stressed the value of developing a comprehensive logic of probabilities in order to 'pursue the investigation of games of chance',[18] and suggested the value of creating an 'Academy of Games' for the study of games of both unpredictability and skill, emphasizing that such games give the most realistic account of human life, and therefore merit the closest examination.[19] Probability theory thereby 'found its first and still paradigmatic elaboration in relation to games of chance', for in games mathematicians saw a 'form of human activity *regulated* by chance and not simply (as all human activity) subject to uncertainty' (emphasis in original).[20] In games, natural philosophers could readily see a duplicate copy of the newly scientific world now surrounding them; the appreciation of unpredictability thus began to shift away from the outcome, and towards the system that creates it.

A second macro-level social change of interest to our enquiry was the growth and subsequent institutionalization of gambling games devoid of explicit religious content (although superstition remained) and the casinos in which they were played. Naturally humans have always gambled on games of chance, but it was in the seventeenth century in Europe that gambling games became a site of '*scientific*, rather than sacred, dramas' (emphasis in original).[21] Within the wider context of a growing mercantile society that boosted both affluence and the value of thinking about mathematics, statistics and finance,[22] gambling games became a point of probabilistic study par excellence. In such games, the skilled player 'weighs the stakes against the odds, or calculates the risks involved, at the same time predicting which play strategies are more likely, or unlikely, to pay off'[23] – as in any form of investment or trade. As de Goede notes, both finance and gambling are strategies for dealing with and facing up against uncertainty, and lacked, in early-modern Europe, their now-clear divide.[24] Subsequently, what we might call 'true' casinos, which is to say the structures and institutions we now recognize as such, emerged in the second half of the nineteenth century.[25] These not only further reified the non-religious spaces such play would take place in, but also contributed to the now-clear divide between finance (as a legitimate pursuit) and gambling (as a deviant practice). These changes are noteworthy here not for their social or economic effects, but rather for perspective on unpredictable games adopted by a small, but over time increasingly significant volume of players. While 'gamblers' continued to lose, a new breed of player emerged – one that looked to the long term, understood in great detail both the mathematical permutations underpinning the games and the psychological decisions made by their opponents, and was able to conceive methods of overcoming the unpredictability of these games to produce statistically consistent victories.[26] At this point systems thus became identified as not just something of mathematical interest, but also as the definitive site of cultural meaning and noteworthiness in such forms of play (even if the manipulation of the system was designed to induce the production of desirable outcomes), rather than that status being afforded

to the outcomes, which were almost secondary. The outcomes were only of interest insofar as being the manifestation and validation of the strengths, or weaknesses, of careful gameplay strategy. The highly public rise of gambling games marked a new visibility of unpredictable play, a wide expansion in their potentially profitable play for those skilled enough to navigate their unpredictability (whether through legitimate or illegitimate means), and arguably marked their formal emergence and clearest codification into secular, rather than religious, society, beyond the writings of intellectuals and scholars. These developments marked new occurrences in not just the ways of thinking about unpredictability, but also in terms of who engaged with unpredictability, how they engaged and why.

This growing arithmetic perspective on unpredictable games achieved its zenith with the third historical moment (of many more than this in the grand historical progression of games and unpredictability) I highlight here – the advent of game theory as an intellectual discipline. Game theory, entailing the study of cooperation and competition between actors, was formalized as a field by John von Neumann, both through a paper in 1928[27] and more substantially in the 1944 'Theory of Games and Economic Behaviour'.[28] Before too long, it became apparent that several of the 'games' considered by this new branch of mathematics had striking applications to real-world strategic situations, such as the growing nuclear stand-off between the Cold War's two superpowers. Understanding the behaviours of unpredictable actors, and designing strategies to respond optimally to all possible unpredictable behaviours, became essential to the high-stakes 'game' of global brinksmanship. Forms of thinking and reasoning about the outcomes of unpredictable scenarios which began around a board scratched in the dirt now came to determine the nuclear annihilation, or otherwise, of the human race – with the worrying conclusion that the correct move was almost always, strategically speaking, to up the stakes. Within the intellectual domain of game theory, almost anything within the natural or social world might be modelled as a game-like system;[29] the mathematical approach to understanding unpredictable game systems now grew beyond its initial limits, pushed by a fundamental metaphorical claim of the practical parity between 'games' (as a leisure activity) and 'games' (meaning any system of interactions between actors). Contemporary game theory maintains significant relevance and research in economics, computer science, political science and a number of other related sub-fields where strategic decision-making remains of paramount relevance; such disciplines have consequently become dominated by an understanding of systems and all their possible outcomes. In this episteme, unpredictability is seen as being indicative of a possibility space, and one through which supposedly rational choices can be made to secure the best outcomes, no matter the outcomes of unpredictable processes (whether mechanical unpredictability or through the uncertain actions of other actors).

We can therefore reasonably identify two discrete historical epochs in regards to unpredictable games, although the shift from one to the other was certainly slow and piecemeal, not rapid and binary, and nor has it been all-encompassing or complete. The players of the first epoch were concerned with the outcomes of such games; the players of the second with the systems which generated these outcomes and how those systems might be understood and mastered (even if such enquiry was seen as a way to control the outcomes). Players of the first epoch emphasized belief in the externality of unpredictable outcomes; players of the second epoch sought to examine the internality of these same outcomes. Players of the first regarded each instance of play as possessing its own distinction and identity, while players of the second looked at unpredictable games through the longer lens of hundreds, thousands or tens of thousands of iterations, seeking to identify commonalities, numerical underpinnings and optimal decisions. These eras are not mutually exclusive, absolutist distinctions – there remain many contemporary gamblers who place superstitious weight on the outcome of a die roll, and it seems deeply insulting to the intelligence of people from the past to suggest that Patolli players would not have consciously strategized over a game which counted so much towards their material conditions in life – but this broad change in the emphasis placed on the two central components of unpredictable games and the analytic focus of any who examined or observed such games is apparent.

What, therefore, is missing from this picture? Our contemporary intellectual environment compels us to think of unpredictable games first and foremost as systems, and in doing so we have become less interested in the *experience* of unpredictability and the experience of the *particular* outcome that emerges through a single iteration. In the first era there were deep meanings assigned to individual gameplay outcomes; modernizing this emphasis, we might valuably look to consider the meanings players now append to individual outcomes, given the far larger range of unpredictable games we now enjoy. However, a return to the first era seems untenable, for such understandings were inextricably linked to supernatural conceptions of causality and complexity, which – although fascinating as the subject of study – have little place in building a critical scholarship. A new method needs to be found to address the *experience* of playing unpredictable games, without recourse to religious factors. Indeed, going further, such a new method would ideally integrate and shed light on a number of additional elements traditionally omitted from examinations of this first era, which tend to stress the meanings assigned to only the *outcomes* of games. What is it *like* to play an unpredictable game, knowing that your present situation is one of dozens, hundreds or millions or more? How do players treat one iteration of a game from the next, and might one iteration inform another? How will different kinds of unpredictability shape a game's play experience? Outcomes are not the only site of meaning or significance in

such games, and a new critical engagement to the experience of playing unpredictable games could instead develop a framework for all elements of game unpredictability. Doing so would explore a topic that the analysis of game systems as mathematical models can never capture: what players actually experience when playing these games. Given that unpredictability ranges across almost the complete range of digital, board and card games, both contemporary and historical, this is an important building block in any analysis of what players actually do and feel when they play, and how these experiences shape their interactions with games themselves.[30]

I hope to answer these questions through the development of a four-part typology of game unpredictability. I will term these 'randomness', for unpredictable initial starting conditions of a game; 'chance', for unpredictability during the play of a game; and 'luck', for unpredictability regarding the final outcome of a game. Although these terms have naturally been used elsewhere in game scholarship, and scholarship more generally, I seek to justify new definitions assigned to these words within the specific context of the experienced unpredictability from formal game systems. These particular words have rich sets of broader cultural associations assigned to them I will draw on in this process, and offer us a typology that is both immediately linguistically familiar and more detailed and specific than before. Then, addressing the fact that these three cover intended unpredictability in game designs without exploring unintended unpredictability, I will propose the existence of *instability*, through which games can gain unpredictability unplanned and unanticipated by their designers, which can quite fundamentally reshape the play experience. Each of these I understand as being a different 'location' or 'place' of unpredictability, moving beyond sweeping terms like 'games of chance' to see how different implementations of unpredictability lead to very different kinds of player experience. The location of unpredictability refers to the temporal stage of gameplay where unpredictability manifests – beginning, middle or end – and is central to unpicking the wide variety of game unpredictability, and its navigation by game players.

Unpredictability so far

There have been several important attempts to date, coming from a range of disciplinary backgrounds and epistemological foundations, and with a range of objectives and justifications, at attempting to codify – depending on how we define them – unpredictability, uncertainty, indeterminacy, randomness, chance, luck and instability in games. These will be referred to when relevant throughout this work in order to build upon these previous engagements, identify commonalities and differences across these conceptualizations and typologies, and attempt to draw out in greater depth the range of forms that non-anticipated events in gameplay can take. However, before outlining the

foundation of this work in the metaphysics of Gilles Deleuze, it is valuable to give a brief overview of the field. Doing so will identify immediately the diversity in the major works in the area, note one prior engagement in particular that I see this work as building upon and developing into new analytic territory (video games as opposed to, or alongside, gambling games), and make clear the centrality that thinking through unpredictability has had for thinking through games of almost all kinds, both historically and within contemporary game studies and a number of cognate disciplines.

From the earliest days of the then-nascent field of 'game studies', questions of unpredictability (going by many names) have been present. Johan Huizinga's *Homo Ludens* (1938) has relatively little to say on games of chance, although he does argue that the tension felt by a player of chance is rarely communicated to onlookers (although any ethnographic engagement with a casino floor or betting shop would be enough to dismiss that claim), and that gambling games are fundamentally 'unproductive' in a cultural sense, 'sterile [and] adding nothing to life or the mind'[31] – as opposed to games of 'skill', which Huizinga defines and praises. By contrast, Roger Caillois in his *Man, Play and Games* (1958) allows 'chance', or 'alea', to occupy one part of his four-part typology. As he puts it, 'alea' encompasses 'all games that are based on a decision independent of the player, an outcome over which he has no control, and in which winning is the result of fate rather than triumphing over an adversary'; the exercise of alea in gameplay thereby 'negates work, patience, experience and qualifications',[32] but can be thrilling and compelling to the player who lets themselves go and gives themselves over to the externalizing of play outcomes.[33] More recently, arguably the first game studies book to focus on this topic was *Uncertainty in Games*, by game designer Greg Costikyan (2013). He explores a wide range of forms of 'uncertainty' – uncertainty over what to do, knowledge of the game, the player's performance, the accuracy of one's puzzle solution, hidden information, analytic complexity and others – but situates these valuable design analyses within overly broad summaries of society, culture and history, causing the work to overlook some of the most interesting elements of the embedding of these elements in the life of a game-playing subject.

From beyond the discipline of game studies, meanwhile, have come numerous analyses based on gambling studies, and cognate domains which take gambling to be their object of study (if not their subject of study). Thomas M Malaby's *Gambling Life* (2003) examines how the unpredictability of gambling games is closely related to unpredictable non-gambling elements of players' lives – death, business, romantic interest – and the flow of ideas and coping strategies between the two, arguing that unpredictability can be a beneficial and positive element of social life, rather than something to be feared and acted against. Natasha Schüll's *Addiction by Design* (2012) investigates the phenomenology of playing slot machines, focusing on how

the complex deployment of unpredictability through different temporal rhythms, aesthetics, and technologies shapes the play of these devices, and how this play can exploit human reactions to unpredictability and become addictive and damaging in the process. Fiona Nicoll's *Gambling In Everyday Life* (forthcoming) and the wider emerging project of 'critical gambling studies' she is leading aim to move beyond the problematization of playing games for money to instead interrogate gambling and its politics across cultures, regions, jurisdictions, historical moments and the crucial yet oft-overlooked dimension of *play*, fun, leisure and enjoyment.

Lastly, we cannot also exclude the range of work into these areas coming from domains outside of game studies and gambling studies, which are concerned with unpredictability and come from a tremendous range of disciplinary backgrounds, and writing styles that may be academic, journalistic or popular. Specifically, two other scholars should be considered. First, in *After Virtue*,[34] moral philosopher Alasdair MacIntyre uses the term 'systematic unpredictability' to refer to four phenomena. First, the emergence of true innovations, such as 'the wheel', in contexts in which it did not exist, and could not have been predicted, for the moment it is predicted it has, in a sense, been invented; secondly, how the unpredictability of an individual's choices creates unpredictability in the wider social world of others; thirdly, elements of social life that cannot be adequately modelled in a game-theoretic manner, such as vagueness and uncertainty over who and what is playing a certain 'game', the risk of infinite regression in trying to predict the actions of others, and the role of imperfect knowledge in the real world; and fourthly what he terms 'contingency', the complex and unpredictable, yet powerful and influential, ways that seemingly unrelated events can exhibit shared causation. In this regard I use the term 'unpredictability' in a manner closest to his first and fourth definitions; his work is obviously not primarily concerned with games, but brings up concepts surrounding originality and causation relevant to the discussion presented here. Equally, theorist of optimal experience 'flow' Mihaly Csikszentmihalyi has also on occasion examined similar topics. For example, he suggests that cultures and cultural practices are 'defensive constructions against chaos',[35] designed to help us handle and contain the vicissitudes of unpredictability through developing and preserving norms and standards. In doing so they 'rule out many alternatives' and 'limit possibilities';[36] in this we see something of an introduction to some of the later discussion in this work regarding gaming cultures that seek to contain, constrain or control the unpredictability in many games.

Finally, arguably most important in the last domain of popular or journalistic writing is the work of Nassim Nicholas Taleb, risk analyst turned philosopher, with books such as *Fooled by Randomness* (2001) and *The Black Swan* (2007) committed to examining the psychological tricks played by randomness on the human mind, how individuals struggle to understand

a number of situations of unpredictability, and the effects and potential for anticipation of what he calls 'Black Swan Events' – events vastly outside of the norm of expected behaviour in a given system. All of these works offers valuable insights which will be returned to throughout this book, whether via conceptual developments, empirical examples or observations about player engagements with unpredictability in a range of personal and social contexts. We also note that game scholars agree – and simply playing a game twice confirms this observation – that games are *indeterminate*, which is to say their outcomes in a broad sense are not known when play begins, but this is a very different matter from what I aim to explore in this book. The work that comes closest to my project here, however, is Gerda Reith's comprehensive monograph *The Age of Chance* (1999), the final two chapters of which are committed to examining, in her words, 'what is it *like* to play at games of chance?'[37] – note the close terminological similarity to what I propose in this work. Reith examines in detail the thrill of playing unpredictable games, the shifts of player identity in the 'vertigo' of playing for long periods with unpredictable outcomes, the perception of time for such players (which she argues is centred on the present, the immediate gamble, where antecedent plays are irrelevant and future plays unknown), and what she calls the 'metaphysical significance' of victory or loss in games of this sort.

However, there are two elements of this work which, I believe, open the door to further examinations of this experiential question. First, *The Age of Chance* is focused on games that include wagering, betting or otherwise the deployment of money: as she states, 'money must be present in games of chance'[38] in order for the 'generation of the affective tension – the excitement – in games of chance';[39] it is therefore suggested that the 'anxious moment of wagering is altogether more essential than the outcome of the play'.[40] In the present work I follow this analysis by moving beyond 'games of chance' on which people *wager money* in order to include, and indeed focus on, video games that include elements of unpredictability, and in doing so demonstrate that one need not have money at stake to generate this excitement: the risking of time, effort, potential stress and social status are very capable of generating that same compelling affective tension (and generate quite different cultural practices, player experiences, critical responses and so forth). Jesper Juul proposes the act of play as an 'emotional gamble' where we invest 'time and self-esteem' in our play activities,[41] just as Thomas M Malaby notes that the 'social status of the participants'[42] is also embroiled in games; it is these observations I wish to develop further, alongside and without excluding the central role of money in many unpredictable games. Secondly, I want to unpick in greater detail the category described in *The Age of Chance* as 'games of chance'. Reith rightly notes that 'the heterogeneity of games is matched by the heterogeneity of players and motives',[43] acknowledging the tremendous variety of games, those who play them and the ways in

which they are played, but throughout 'games of chance' are treated as a single category – contingent, in part, on wagering – and are not unpicked in greater detail. This is a broader observation which applies to most work in this area: the category of 'games of chance' is never unpicked to identify different forms of games within that broader heading. This is not always an issue in scholarly works with other intellectual objectives, such as Reith's, but does highlight the opportunity for a new and deeper exploration of what precisely the games in this category look like, and how they differ.

With these prior examinations acknowledged, how should we begin to consider unpredictability in game systems, the *locations* of that unpredictability and the creation of an unpredictable-game-playing subject?

Deleuze and game studies

To do so, the scholar who affords us the most complete ontology of difference (and the attendant *experience* of difference) is Gilles Deleuze (1925–95). There have been a number of prior explorations of Deleuze in relation to games,[44] but Deleuze cannot be considered (as of yet) an integral part of the game studies theoretical canon. Nevertheless, as Colin Cremin has argued, 'Deleuze's work particularly lends itself to video game analysis with his focus on nonrepresentation, affect, and movement.'[45] Cremin's recent monograph on the topic, for example, takes a wide look over a range of games and political questions surrounding games, such as the games industry, and the relationship between players and the games they play.[46] In Nick Dyer-Witheford and Greig de Peuter's *Games of Empire* (2009), Deleuze and Guattari (1930–92) are drawn upon to theorize the actions of 'minority' participants in gaming spaces, the relationships between global capital and the video games industry and how computer simulations can offer the opportunity for alternative, possible worlds. In a similar vein, Tauel Harper examines the emergence of political communities around play, utilizing the work of Deleuze and Guattari to consider the emancipatory potential of games which is not inherent to their play, but can emerge from playing particular games in particular manners.[47] The doctoral thesis of game designer Tom Betts, meanwhile, examines processes and phenomena of emergence in generative systems. Deleuze, he notes, 'frequently discusses themes of repetition, permutation, emergence and the virtual',[48] making him an ideal theorist for exploring such ideas in a video game context. Coming at Deleuze from a different angle, Chiel Kattenbelt and Joost Raessens draw upon Deleuze's work on cinema and different kinds of cinematic image to explore the variety of the phenomenological experiences that players encounter in computer games.[49] Across all of these studies and many others, Deleuze's individual work and that written alongside Felix Guattari have been put to numerous tasks in the study of games and play: their aesthetic

dimension, their political dimensions and their social dimensions. However, I believe the present work will be the first game studies book to put Deleuze to work exploring unpredictability, in doing so hopefully bring to light more fully the importance of this thinker to understanding the ontological and experiential components of gameplay.

It will be helpful to set out here the Deleuzean terminology which will be used in our examination of gameplay unpredictability. Deleuze has been universally noted as a thinker whose work is highly challenging to read;[50] for being almost 'wilfully obstructive'[51] to the reader's progress; for producing texts of distinct difficulty and a lack of clarity;[52] for having a 'love of provocation';[53] for displaying a noted 'terminological exuberance'[54] in his ever-changing use of language; and much else besides.[55] I consequently present here my own readings of key terms, and brief summaries of their intended relevance to this work. Most of these are drawn from *Difference and Repetition* (2014 [1968]), which is the primary Deleuzean text relevant to the present enquiry, although *The Logic of Sense* (2004 [1969]) and small segments of his collaboration with Felix Guattari *A Thousand Plateaus* (2004 [1974]) will also be utilized when appropriate (insofar as my reading of them does not offer a conflict with Deleuze's original ontology of difference as outlined in *Difference and Repetition*). Although I have endeavoured to outline this vocabulary in a logical sequence, some definitions inevitably point to other definitions later in the list, but Deleuze's densely interwoven thought rendered this unavoidable. Nevertheless, a subjective consideration of such games and such forms of play is of great interest irrespective of any 'rightness' or 'wrongness' vis-à-vis an underlying generative system;[56] thinking of human action only in terms of modelled rationality or self-interest can only 'lead to a limited picture of human life' when tackling what I call unpredictability.[57] By contrast, Deleuze's focus on subjectivity opens a door to a more thorough understanding of the play experiences which unpredictability creates, which have been all but ubiquitous throughout the history of play. Given the conceptual density of Deleuze's work I have sought to make this summary as succinct as possible, but it is important to establish many of his ideas up-front, as I will be drawing heavily upon them in the remainder of the work.

Repetition and Generality: Deleuze opens *Difference and Repetition* defining what he calls generality and repetition. These two concepts will be integral to understanding gameplay unpredictability. He states that 'generality presents two major orders: the qualitative order of resemblances and the quantitative order of equivalences'.[58] To identify a generality, Deleuze states that 'resemblances are unpacked in order to discover an equality'[59] – this equality allows for the exchange of terms or things (such as bodies of water) that are defined as being subject to the same laws. What Deleuze calls repetition, by contrast, is not repetition of the same, of an 'original self-identical thing',[60] but rather the repetition *of* difference.[61] Far

from repetition being the observation of when matters are the same, as in traditional philosophy, Deleuzean repetition takes place when matters are not the same,[62] but something new is created from a shared source or origin. As Deleuze puts it, 'To repeat is to behave in a *certain manner*, but *in relation* to something unique or singular which has no equal or equivalent.'[63] James Williams gives a clear example of this – the boundaries of the territory that an animal prowls are only defined by the repeated prowling of that territory, although each act of patrol is different; the territory does not exist prior to the repeating,[64] but rather the repeater and the repetitions emerge from what Tom Betts calls a 'self-reflexive feedback loop which underlies the construction of meaning'. The animal behaves in a manner in relation to something singular – its territory – which is created through these repetitions. Things cannot repeat without something that causes this repetition,[65] such as – at the risk of anticipating future analysis – someone shuffling a deck of cards, running a procedural generation system or flipping a coin (or patrolling a territory). In this way repetitions repeat similar things (e.g. a deal of cards), but do not reproduce the same thing (a particular deal), since there must always be difference in order for a repetition to take place. Whereas traditional philosophical repetition presupposes the concept that is being repeated, for Deleuze, the concept being repeated is *produced* through the repetitions.[66] As I will argue in this work, this is crucial for our understanding of how game-playing subjects construct their understandings of the game being played, the nature and pattern of its unpredictability, and how that unpredictability is consequently experienced.

Identity and Difference: Deleuze seeks to challenge existing Hegelian[67] and Aristotelian[68] emphases on the pre-existing transcendent identities of things. Deleuze instead proposes that 'all identities are only simulated, produced as an optical "effect" by the more profound game of difference and repetition'.[69] By this he means that identity is never inherent, and such a model of thought detracts from the unique *specificity* of lived experiences by attempting to force all phenomena into pre-existing models. He argues that we must 'take seriously the nature of the world as it is perceived'[70] because there is nothing 'behind' the world (as in a Platonic perspective founded upon pre-formed identities). Rather than supposing that difference is only found when perceiving that two objects have identities and that these two are not the *same* identity, Deleuze inverts this causality and asserts that we only perceive identity through an endless sequence of differences between all sensible objects: 'Resemblance and identity are only functional effects of that difference which alone is originary within the system.'[71]

Difference is consequently Deleuze's term for the 'emergence of form, which cannot be captured within the structure of the already formed'.[72] If we are therefore to seriously study the gameplay of unpredictable games in a Deleuzean sense, 'every object, every thing, must see its own identity swallowed up in difference, each being no more than a difference between

differences',[73] and such a position allows us to examine unpredictability through the perceptions and assessments and subjectivity of the player, not through the underlying mathematics (except insofar as the player considers those). The repetition of difference is, I will argue, the process through which players experience unpredictable games, and a crucial theoretical turning point for understanding how players become subjects that play unpredictable games, and understand and experience those games in particular ways.

Possible, Real, Virtual and Actual: Deleuze draws two important distinctions between what he calls the possible and the real, and the virtual and the actual.[74] The possible is everything that might be – I might play poker today or tomorrow – and the real is what actually takes place and exists (e.g. I played poker today).[75] The real and possible are therefore of the same sort, even if the number of things in the real is miniscule compared with the number of things in the possible. The virtual and the actual, however, are different. The virtual is an aspect of reality which is not physicality instantiated, but is nevertheless real – a meaning of a word, for example. Virtuality 'contains only the rules for the production of objects'[76] which might be actualized; whereas the possible resembles the real, the actual does *not* resemble the virtual and the two are instead quite different. Deleuze proposes that we should not define something according to its already-actualized forms but rather by also understanding the virtual – we cannot understand what it is for a deck of cards to be dealt by only looking at previously dealt permutations. The virtual content of a deck of cards would include the system for the production of every possible deal, for the full set of possible deals defines what kind of deck it is, even if most have never physically occurred (been actualized), but it does *not* contain possible deals from decks of cards which contain different kinds of cards. As James Williams puts it, the properties of an actualized thing are virtual, but when you touch or otherwise engage with it, there is 'something of all the other things'[77] with that same virtual content; exploring one dungeon has *something* of all the other dungeons that the player has experienced, and the other dungeons that might have been, and might still be in the future. Deleuze's understandings of virtual and actual will further contribute to a rich toolkit for exploring game unpredictability, specifically vis-à-vis the relationship between multiple different instances of one unpredictable game, how players think about the possibilities of those unpredictable games that were and were not actualized in a particular playthrough, and how we think about the formative systems that underlie unpredictable games.

Ideas/Multiplicities and Singularities: Deleuze uses the terms 'Ideas' and 'multiplicities' to refer to the same things.[78] I find *multiplicity* to be both the most descriptive and least abstract of these two terms – and one that seems highly appropriate to structures like decks of cards or procedural generation systems – and will therefore use multiplicity throughout this work rather than Idea. A multiplicity is 'pure virtuality'.[79] A multiplicity can only be

perceived by an individual subject through regarding the actualized forms that emerge from it and in the differences between it and other multiplicities. A multiplicity consists[80] of differential elements (such as dungeon rooms or enemies), differential relations (how those rooms might be arranged or how enemies might be placed) and the potential for resultant 'singularities' (noteworthy combinations of actualized elements and relations, such as a very challenging enemy placed in a challenging room which results in a gameplay situation far more challenging than either of those on their own). These distinctive permutations that emerge from a multiplicity – the singularities – have particular importance for a Deleuzean study of games. Singularities 'emanate from that aleatory point which every time condenses the whole of chance into one time'[81] – by this Deleuze means that an aleatory ('contingent') point is the intersection of elements and relations in a way that produces a noteworthy result (e.g. a challenging enemy in a challenging room), while the singularity is the result itself that emerges from that point (e.g. a very high level of difficulty).

Anthropologist of religion Katherine Swancutt defines Deleuze's aleatory points in a game context as being 'configurations [that] allow players to make a winning move',[82] but I believe a slightly broader definition is in order. These points could also include particular combinations of layouts and enemies which produce strikingly challenging, original, compelling or even amusing instances of gameplay, not just those with the potential for competitive ascendancy – they are gameplay permutations constructed from differential elements and relations that yield a unique and distinctive singularity. They are 'turning points and points of inflection; bottlenecks, knots, foyers, and centers; points of fusion, condensation, and boiling',[83] fundamentally antithetical to any notion of ordinariness or routine. Multiplicities therefore contain within them elements and relations and from these the potential for singularities, which are actualized in particular deals or particular generations when the elements and relations intersect in a noteworthy way. It must also be stressed again here that Deleuze's project is one of *subjectivity*, and therefore any multiplicity in question is the one *perceived* by the subject playing the game: for one person the multiplicity of the 'same' actual deck of cards will differ from what someone else sees in that deck. I will therefore use the term 'generative system' to refer to the material fabric of a game itself and the systems which yield and shape its unpredictability, and 'multiplicity' to mean the subjective perception of that system, slowly and gradually constructed, in the mind of a player.[84] Multiplicities represent the sum total of player *understanding* about a system of unpredictability – the very nature of what they think that system is and what they think it can produce – and are therefore crucial for the subsequent analysis in this work.

Differentiation and Differenciation: These two terms, although differing by only a single letter in their English translation, are crucial to Deleuze's

thought and to much of the discussion of this book (especially the latter – differenciation). Differentiation is the process by which the virtual content of one multiplicity is distinguished ('determined') from another – for example, every use of the term 'first-person shooter' (FPS) in relation to a particular context serves to differentiate the multiplicity of 'the FPS' from everything else in the world. In turn, we come to understand how FPS, RPG and real-time strategy (RTS) games are differentiated as distinct genres. Similarly, differentiation marks the boundary between 'dungeon' generators and 'world generators', or 'standard 52-card deck' against 'Tarot deck', or between board games and computer games. Differenciation, meanwhile, is the actualization of the virtual, resulting in (for example) a series of games all defined as 'FPS', the definition of which has been virtually differentiated from other genres. This results in a heterogeneous (but similar) series of things which take the form of repetition. This is not generality, because in each differenciation something new is created. Differenciation is therefore central to the following analysis of unpredictability, being predicated on the creation of varied outcomes from a generative system, while differentiation is of less value, but will nevertheless be useful in our consideration of the player's mental differentiating of concepts and aspects of unpredictable systems.

Rhizomes and Arborescence: These final two concepts are the only terms in this list drawn from Deleuze's later collaboration with Felix Guattari, the two-volume *Anti-Oedipus* (2004 [1972]) and *A Thousand Plateaus* (2004 [1974]). Systems, they propose, can be structured in a rhizomatic manner, or an arborescent one, drawing metaphorical relevance from cellular biology: arborescent systems are akin to trees, with a linear central trunk and all else being dependent on that trunk, while rhizomatic systems are more akin to colonies of fungi, or hive-building insects. 'Arborescences are hierarchical, stratified totalities which impose limited and regulated connections between their components', while rhizomes are 'non-hierarchical, horizontal multiplicities which cannot be subsumed within a unified structure, whose components form random, unregulated networks in which any element may be connected with any other element'.[85] The word 'random' is used here to refer to what I have termed 'unpredictability', as an overarching catch-all phrase for all phenomena of non-determinism or indeterminacy or stochasticity, rather than what I propose as *randomness*, but these definitions clearly highlight the distinction between these concepts. The concept of the rhizome 'allows for an autonomy of the "reading material" without having to organize the user in a restrictive way'[86] – which is to say, whereas games that lack unpredictable elements in their systems can only organize the user's behaviour in one way, the 'reading material' – the game – gains a certain quasi-autonomy when unpredictable elements are introduced, shaping itself in new and different ways and thereby enabling a greater range of possible interactions on the part of the user. Two rhizomes represent alternatives,

not opposition,[87] and can be switched out and replaced more easily than elements in a hierarchic, arborescent structure. Rhizomatic elements may therefore be alternated, exchanged; arborescent elements bifurcate and open up a range of options, through which (in most cases) rhizomatic elements are in turn distributed. The system that procedurally generates a world map is arborescent, while the elements it distributes into a final map are rhizomatic. These terms and the structuring and ordering of variables they imply will be of value particularly in the exploration of luck, as well as to a lesser extent in the exploration of the generation of what I will call 'significance' (important elements) in randomness and chance, for they help us conceptualize how unpredictable games distribute their elements, and how players move through those elements.

With this terminology and its relevance to games established, it is interesting to note that Deleuze does *himself* make references to games on several occasions including giving a prominent place to questions of what I term unpredictability. In *The Logic of Sense*, Deleuze proposes a definition of games, which importantly argues that 'rules determine hypotheses which divide and apportion chance, that is, hypotheses of loss or gain', and that such 'hypotheses organise the playing of the game according to a plurality of throws', each of which 'brings about a fixed distribution corresponding to one case or another'.[88] In these passages he understands games as being first and foremost what we might think of as vehicles for the distribution of outcomes, according to sets of rules. He, however, emphasizes the role of unpredictability in those rules, whereby players lose and gain through unpredictable processes that in the Deleuzean sense repeat, yet due to their core unpredictability, repeat difference with each throw, rather than repeating (in the traditional sense of the word) any form of generality. In *Difference and Repetition*, meanwhile, he suggests that when players are given a 'situation of chance or multiplicity', one seeks to 'impose limits upon it' and 'bring about the return of the same',[89] which is to say particular outcomes mentally noted as being desirable. In this Deleuze notes that we find ourselves immediately trying to reset or counter unpredictability whenever we find it – even if it is that same unpredictability which first compelled us to consider the game in question. This is a theme which runs throughout the present work: overcome by the opacity, confusion, apparent unfairness and capriciousness of unpredictable systems, players do much to change their gameplay practices, the discourses they understand their gameplay through or the very accepted design of the games they play. However, these are the limits of Deleuze's prior engagements with games and play, which more often take the form of metaphor or ideal system than an examination of real games played by real individuals; this is a gap which will be bridged by the present work.

Finally, before proceeding to the outline of the work, a crucial critique in my theoretical choice must be anticipated and addressed. Deleuze

acknowledges that it is impossible to ever fully list or conceptualize or hold in one's mind *all* the differences between two repetitions. In our consideration of games, this is certainly the case, for the player will be a little older each time, will have different experiences to draw on, the surrounding temperature might have changed, they might be more or less hungry, an ambulance might be driving by with its siren on, the gravitational pull of the earth might have shifted one iota – and so on. There is always an infinite set of other repetitions related to anything or any matter. Consequently, we cannot ever grasp the infinite set of differences between one thing and its relation to an infinite number of others, and another thing and its relation to that same infinite set of others: 'The difference is resistant to actual identification.'[90] In this regard, if we consider 'factors which change with each playthrough and affect play, even in the smallest way', what game scholars call the 'magic circle' – a separate space, 'either materially or ideally',[91] marked off for the play of games – becomes unfathomably huge,[92] and riddled with uncountable differences of every sort that divide each repetition from the next (just as all the external factors mutually shape the territory of the prowling animal).

Why, therefore, focus solely on differences and repetition written into the game's code (or formal rules and the actions of play, as in a card game)? The answer is that unlike the examples listed above which might affect gameplay in some sense, these repetitions are *central* to the play of these games: they are not incidental, they are fully 'within' the technical or formal fabric of the game, and do not exist outside it. They take place either from the game's fabric functioning as anticipated or expected, or in the case of what I later term 'instability', from that fabric functioning 'incorrectly'[93] in some manner; but they are nevertheless part of the game as an item, as an artefact, as a set of practices, as a way of mobilizing circuitry within a computer, as a way of giving meaning to fifty-two pieces of cardboard with pictures and symbols drawn on them. As a result, these forms of repetition and difference are actively regarded and considered and thought about by players; they are not incidental, outside things, which have an effect on the game but are not, except within a broad definition of the magic circle, part of the game. They enable players to take an in-game action, and be unsure – even with perfect knowledge – of the outcome. These elements make their contribution to gameplay experience distinct, and an appropriate analytic focus in their own right.

Outline of the work

As noted earlier, the purpose of this work is to create a (primarily experiential and ontological) framework for considering gameplay unpredictability, and to develop an understanding of the game-playing subject when confronted

with unpredictable games. It is concerned with clarifying the many forms unpredictability can take and subsequently proposing models to understand the player experience of engaging with unpredictable games. However, it is also interested in the more 'material' objective of *categorizing* overlooked aspects of game design and offering a framework for critically minded game designers seeking to understand the varied forms that unpredictability may take, identify which forms they wish to include in their games and develop systems (or avoid accidentally developing systems) of the sort explored in this book.

The second chapter identifies the first of the work's central three-part typology – that of 'randomness', defined as the unpredictability of initial starting conditions. It first analyses how games create differenciated starting conditions from a virtual multiplicity of possible elements and methods of element distribution. This leads to a discussion of the importance of the initial conditions of gameplay and the extent to which any one instance of these reverberate throughout a given instance of play. The chapter then explores the creation of significant elements through the distributions of unpredictable elements via unpredictable processes, all of which draw their importance from the other elements they are distributed alongside, with a particular focus on how the sets of possible interactions in unpredictable games are, themselves, unpredictable. It then introduces the concept of the 'granularity of interest' – the volume of unpredictable components that are interesting and the chance that they will form themselves into interesting constellations – as a method of assessing the extent to which the differential elements and differential relations in a particular system create (or fail to create) singularities as perceived by each individual player. The chapter concludes by examining how players perceive these differenciating processes via the assessment of perceptions, and how these assessments yield system knowledge (how elements are distributed) and variable knowledge (what elements are distributed).

Several discussions of the second chapter could be potentially placed in the third chapter (on *chance*), but studying the creation of significance, the granularity of interest and the acquisition of system and variable knowledge seem more usefully considered at this earlier point. Studying the creation of significance through the distribution of unpredictable variables is best positioned in a discussion of randomness, not chance, for in the former in most cases a vastly greater number of variables are distributed, and yield significance, at any one time (the start of the game) than in chance (ordinarily slowly, and bit by bit). In the case of the granularity of interest, randomness is generally of greater and longer-term consequence to the player, and creates sweeping structures of significance and importance rather than piecemeal interventions throughout play, making randomness an ideal point to examine the concept. In the third case, the notion a player builds up of randomness is ordinarily more complex than that of chance,

owing to the far greater potential for emergent phenomena and singularities in the former, thereby allowing us to explore how players gain knowledge of unpredictable systems in the greatest depth through considering it via randomness.

The third chapter identifies the second part of the central typology – 'chance', defined as unpredictability during ongoing gameplay. The chapter first assesses how moments of uncertainty are distributed throughout a game, and examines some of the dominant kinds of chance in games, utilizing illustrative case studies for each, before summarizing in a broader sense the overall purposes of introducing chance into the ongoing play of a game. These are broken down into four potentially overlapping categories: the distribution of outcomes which are qualitatively similar but quantitatively distinct; the distribution of outcomes which are qualitatively distinct; the distribution of outcomes which might include a null outcome that effects no change in the game world; and the potential for all outcomes to be positive for the player, all negative or a mixture. Focusing back on how players respond to unpredictability, the chapter concludes with an analysis of the concept of the 'Random Number God', a personification of the 'will' of systems that contain only mathematical differenciation that is invoked whenever moments of unpredictability, specifically chance, are perceived as having been unfairly cruel and ending or negatively affecting a player's experience. This sheds further light on how players therefore experience, and come to create narratives and internal psychological models of, in-game chance.

The fourth chapter identifies the third part of the work's typology – 'luck', defined as the unpredictability of the eventual outcomes of an instance of play, and therefore the extent to which player actively during gameplay can or cannot influence its resolution. I define luck as the existence of lines of arborescence that stem from unpredictability in a game and endure until the end of that instance of play. The chapter explores the use of luck in games as a means to levelling a playing field between game players of different skill levels, and unpicks both the motivation of this game design goal and its effects on player experience of unpredictability. This is closely related to questions of the long term and short term in gameplay, and so the chapter explores how games with tremendous luck in the short term might, over hundreds or as many as millions of moments, become dominated instead by skill. In addition, I posit that despite the strong presence of skill in many games of luck, randomness and chance are often mistaken for luck, and the chapter concludes by addressing this issue, exploring in detail a valuable case study – modern 'roguelike' game *FTL* (2012) – of this common player confusion. Unpicking the concept of luck thereby allows us to look more closely at the extent to which unpredictability does or does not shape gameplay, and the importance of considering luck as a distinct *location* of unpredictability from two others mentioned here.

The fifth chapter – on instability – distinguishes between intended and unintended unpredictability (identifying the existence of exploits and glitches in the latter), and then seeks to develop a critical separation between 'glitches' – a breakdown in a game's systems – and 'exploits' – the correct functioning of a game's systems, but in an aleatory point unanticipated by a game's designers. It also covers debates over the definitions of an 'exploit' and a 'strong strategy', noting that this line often blurs and that conclusions of such debates often come down to just how strong a strategy represented by a particular singularity is. The chapter then develops the concepts of 'tight coupling' and 'weak coupling' to describe games (tightly coupled) with a small number of simplistic rules and elements, which tend to be highly stable (such as draughts), and games with a large number of complex rules and elements (weakly coupled), which tend to be highly unstable (such as digital RPGs). I then note the existence of both 'internal' and 'external' instability – for example, the difference between a glitch in a video game, and someone stealing a chess piece from the board, when the non-game world intrudes into the game – and what these mean for player experience, and the restructuring of a player's multiplicity for the game they are playing. The chapter then concludes by examining how instability can be embraced by players, redefining and shifting the accepted rules of a game, and the enjoyment to be found exploring game instability.

The sixth chapter is the first of three chapters to apply this theoretical analysis to three practical cases, beginning with the consideration of 'procedural content generation'. Specifically, it focuses on some of the *experiences* that might be gained playing a PCG game which rarely, if ever, can be found in other games with randomness and chance, primarily due to the complexity of procedural generation systems and the tremendous range of gameplay purposes to which they have been put. To do so, the chapter focuses on a case study of 'roguelikes', the game genre most closely associated with procedural generation, and which deploy such processes in the greatest range of scenarios. Having outlined this genre, the discussion then proceeds to discussion of the relationship between three aspects I term *depth, length* and *co-dependency* in PCG, aiming to develop a toolkit through which we can examine some of the experiences that are almost, or entirely, exclusive to games with PCG. 'Depth' refers to the number of steps in a generative system that leads to its outcome; 'length' refers to the number of steps in a chain of connections and influences between multiple procedurally generated elements; 'co-dependency' refers to the extent to which factors in that chain are deeply, or loosely, causally interwoven. These aspects, in turn, allow for new experiences to be had by players: confusion and puzzlement, a sense of scope and scale, and a sense of grounding and realism, respectively. The chapter then concludes by exploring player *perception* of procedural generation by examining how players identify procedural from non-procedural elements in games, developing a notion of

a 'procedural aesthetic' in such games and considering how these judgements (whether accurate or inaccurate) affect player experiences across multiple playthroughs of a game.

The seventh chapter examines the notion of 'replay value' and the practice of 'grinding'. Both are contingent on the deployment of randomness and chance in a game design, and are brought into being through the game design use of these unpredictable elements in very particular ways. The chapter first defines each of these – 'replay value' is the notion that some of the 'value' in a game is contingent on being able to play it more than once, while 'grinding' entails performing repetitive in-game actions waiting for a fortunate roll of chance (or, less often, randomness). The chapter explores the values assigned to, and the impetuses towards, both of these practices, and how they intersect with the possibilities within specifically unpredictable game systems. I then consider the tension between ease and difficulty in grinding, specifically the existence in many games of systems to make grinding more palatable, without actually removing the practice altogether, and what this shows us about both player and developer expectations of grinding as a practice. It then explores the notion of 'completionism' – exhausting all the possibilities within a particular game – and what pursing the goal of completionism via replay within an unpredictable game means for player experience, and particularly a player's experience of *chance*.

The eighth chapter deals with what I term the 'negation of unpredictability', gameplay practices designed to force an unpredictable game into offering identical experiences to multiple players (or to the same player multiple times). The chapter explores three of the most well-used and well-tested methods for players wishing to transform unpredictable games into semi-deterministic or fully deterministic games: 'duplicate deals' used in some competitive card game competitions to mitigate the randomness of traditional shuffling and dealing, and thereby establish a shared baseline for play between teams; the practice of 'save scumming', which entails creating a backup of one's save in a game featuring 'permadeath' (the permanent loss of one's character upon death), and then restoring that save if one's character perishes or one is faced with a displeasing selection of unpredictably selected elements; and 'gameplay seeds', strings of numbers that allow more than one player to play a given unpredictable game in the exact same way in two different physical locations. The chapter concludes by summarizing the social and game design contexts surrounding such forms of luck-heavy play, and considers how the desire to negate unpredictability by altering the design of the games themselves shows the importance of wider setting, as well as individual experience, to player responses to unpredictability.

The ninth and final chapter summarizes the work's theoretical foundations, typological development and the case studies through which this four-part framework has been elucidated, and its value hopefully demonstrated. The chapter begins with an overview of the work before returning to the

Deleuzean foundations of the study, and recapping the definitions proposed of *randomness, chance, luck* and *instability*. It also notes why such a separation into four forms is necessary to explore in greater detail the wide range of gameplay experiences they create and underpin. The chapter concludes by highlighting the importance of studying the experience of unpredictability, some of the core findings of the work, and the overall range of present and future insights that might be gathered through the deployment of such a typology.

Before proceeding to these analyses, a couple of acknowledgements should be made about both the methodological and epistemological foundation of this work, and also the specific kinds of games the work primarily uses as its case studies. In the first case, it is usual in the discussion of many subjects for scholars for talk about 'you', 'one', 'we' or the 'imagined reader'. Addressing what exactly these terms mean in a work such as this is essential. It is of course correct to have a specific subject population in mind when discussing psychological or affective states: however, in this work my focus is the *conditions of possibility* for such states. For example, in talking about the rules of games as setting out the conditions for fear or excitement in players, a subsequent discussion would not look to attribute those states to *particular* players, but rather to possible players as a whole. I am not talking about a single subject, but rather about possible game-playing subjects, in many cases subjects whose particular perspectives are shared by large communities (see the discussions, topics, cultures and norms I cite later in this book). The adoption of a case studies approach throughout the work is thus especially valuable for helping show the reality, accuracy and commonality of many of the possible states subsequently explored. These principles and sources of knowledge therefore do not discount the obvious tremendous variety in player experiences, but rather offer a cumulative look at both common experiences and the wider range of experiences that players have in games.

Second, given the nature of my topic, much of my discussion of unpredictable computer games focuses on a reasonably small number of genres: roguelikes, RPGs more generally and strategy games. In terms of analogue games, my focus is inevitably on card games, to a lesser extent where relevant, casino games and occasionally tabletop games. These games are the most common to use unpredictability (although rarer examples can be found in almost every game genre), they use unpredictability in the greatest range of ways and to the greater number of purposes, and they offer the most compelling and unusual case studies, a large number of which are developed throughout this work to illustrate and ground the broader theoretical and conceptual discussion. This is of course not an exhaustive summation of all games of all sorts, and not even all games which exhibit systemic unpredictability, but these selections offer us the greatest variety in the implementation and gameplay effects of unpredictability, the most

potential for detailed study, and in all of these games unpredictability is central instead of tangential. Much of what I aim to do here is unify our examination of these kinds of games from a Deleuzean perspective, highlighting their commonalities and differences, and the different gameplay experiences that emerge from the different 'locations' in which unpredictability might be found. My focus is on the lived experience of playing such games, the many different forms of unpredictability manifested within these games, and how we might come to understand and typify these forms and move towards a comprehensive typology of ludic unpredictability. This is the task I have set myself in this work.

Notes

1 Concepts of the 'beginning' and 'end' of play, distinctions we might draw between a 'session' and an 'instance' of play, and how players conceive of and understand their play activities through such structures, are ripe for further theorization. In the case of card games, we might understand an instance of play as a single hand of poker, the time spent playing without a break, the time spent playing including a break so long as the player considers themselves to be 'taking a break before returning to poker' rather than 'doing something else', or the time spent within a tournament or within a certain cash game regardless of external actions or occurrences. In video games, an instance of play might mean one attempt at navigating a section of that game, the period during which the controller is in one's hands, the period during which the games console is turned on, a single match in a multiplayer game and so forth. For the duration of this work, however, I proceed on the basis that an instance of play can be understood through a *systems* sense, identified by when the player finds themselves at the same part of a game twice at different times – two hands of poker, two procedural generations of a game world, clicking the 'New Game' button twice, reloading a game to attempt the same segment again, and so forth. This position seems especially valuable for considering unpredictable games, as these are games fundamentally informed by, as I argue in this work, the difference across instances of play.

2 John M. Roberts, Malcolm J. Arth and Robert R. Bush, 'Games in culture'. *American Anthropologist* 61, no. 4 (1959), 601.

3 Irving L. Finkel, 'On the rules for the Royal Game of Ur'. In *Ancient Board Games in Perspective: Papers from the 1990 British Museum Colloquium, with Additional Contributions*, edited by Irving L. Finkel (London: British Museum Publications Limited, 2007).

4 For discussion, see Peter A. Piccione, *In Search of the Meaning of Senet* (Boston and New York: Archaeological Institute of America, 1980), and W. John Tait, 'Were there gamesters in pharaonic Egypt?' In *Ancient Board Games in Perspective: Papers from the 1990 British Museum Colloquium,*

with Additional Contributions, edited by Irving L. Finkel (London: British Museum Publications Limited, 2007).

5 Roberts, Arth and Bush, 'Games in culture', 601–2.

6 D. S. Robertson, 'The Delphian succession in the opening of the Eumenides'. *The Classical Review* 55, no. 2 (1941), 69–70.

7 See Matilda Coxe Stevenson, 'Zuñi games'. *American Anthropologist* 5, no. 3 (1903), and Stewart Culin, *Games of the North American Indians* (Courier Corporation 1975 [1907]), 468–97.

8 Kenneth G. Zysk, *Asceticism and Healing in Ancient India: Medicine in the Buddhist Monastery*, vol. 2. (New Delhi: Motilal Banarsidass, 1998).

9 Florence Nightingale David, *Games, Gods and Gambling: The Origins and History of Probability and Statistical Ideas from the Earliest Times to the Newtonian Era* (New York: Hafner Publishing Company, 1962), 15.

10 Mihai Spariosu, *Dionysus Reborn: Play and the Aesthetic Dimension in Modern Philosophical and Scientific Discourse* (New York: Cornell University Press, 1989), 15.

11 Brandon Dotson, 'Divination and law in the Tibetan Empire: The role of dice in the legislation of loans, interest, marital law and troop conscription'. In *Contributions to the Cultural History of Early Tibet*, edited by Matthew Tom Kapstein and Brandon Dotson (Leiden, The Netherlands: Brill, 2007), 1–78.

12 Maya Burger, 'Drawing cards, playing destiny: Karma and play in new divinatory practices'. In *Religions in Play: Games, Rituals, and Virtual Worlds*, edited by Philippe Bornet and Maya Burger (Zürich: Theologischer Verlag Zürich, 2012).

13 René Girard, *Violence and the Sacred* (London and New York: Continuum, 2005), 99.

14 The most common proposition is that games of chance emerge out of practices which originally entail divination. However, this is not a universal perspective. For the argument that divination is the antecedent element of the two, see Mihaly Csikszentmihalyi and Stith Bennett, 'An Exploratory Model of Play'. *American Anthropologist* 73, no. 1 (1971), 45–58. For an argument that the two are more deeply interwoven, that board games have been converted into divination practices as well as divination practices yielding games, and that any kind of chronological organization is both highly challenging based on existing anthropological and archaeological evidence and might inevitably overlook deep geographical-cultural specificities, see Win M. J. Van Binsbergen, 'Time, space and history in African divination and board-games'. In *Time and Temporality in Intercultural Perspective*, vol. 4, edited by Douwe Tiemersma and Henk Oosterling (Amsterdam: Rodopi, 1996).

15 Per Binde, 'Gambling and religion: Histories of concord and conflict'. *Journal of Gambling Issues* 20 (2007), 145.

16 Van Binsbergen, 'African divination and board-games', 107.

17 Deborah J. Bennett, *Randomness* (Cambridge, MA: Harvard University Press, 1998), 11.

18 Gottfried Wilhelm Leibniz, *New Essays on Human Understanding*, translated and edited by Peter Remnant and Jonathan Bennett (Cambridge: Cambridge University Press, 1981 [1765]).

19 In Leibniz's essay 'An Odd Thought Concerning a New Sort of Exhibition' he describes a range of games and game-like, or at least playful, enterprises and contraptions and systems that would merit display to the public, through which public understanding of technologies and systems might be developed. Although war games are mentioned as an integral part, he notes that an 'Academy of Pleasures' might be more akin to what he had originally imagined, but would be less enticing to the public; from this we note an immediate contrast between the playful nature of games and the real-world purposes a game-like understanding of decision-making and complex systems can be put to, and his era, was already *being* put to. For more on this, see Philip P. Wiener, 'Leibniz's project of a public exhibition of scientific inventions'. *Journal of the History of Ideas* 1, no. 2 (1940), 237. In turn, Deleuze briefly addresses the notion of the 'academy of games', although he calls it a 'disturbing institution'; see Gilles Deleuze and Charles J. Stivale, 'Vincennes session of April 15, 1980, Leibniz seminar.' *Discourse* 20, no. 3 (1998), 77–97. This is because such an institution would inevitably serve a multiplicity of purposes, at least as Leibniz imagined it within the historical episteme he operated within (and co-constructed). As well as being akin to a 'zoological or botanical garden' where one might regard and consider ludic endeavours as one would a rare plant or exotic animal, such a place would also, Deleuze argues, resemble a 'police enterprise'. He declines to expand on this claim, but we see an echo in Lazardzig's claim that an academy of games would be a place which would portray 'strategic deception and illusions of perspective'; see Jan Lazardzig, 'The machine as spectacle: Function and admiration in seventeenth-century perspectives on machines'. In *Instruments in Art and Science: On the Architectonics of Cultural Boundaries in the 17th Century*, vol. 2, edited by Helmar Schramm, Ludger Schwarte and Jan Lazardzig (Berlin and Göttingen: Walter de Gruyter, 2008). An academy of games would inevitably teach its attendees how to control populations, make game-theoretic choices, regard society with a powerful mathematical and systemic eye and so forth; they might 'establish order', as noted in Wiener, 'Leibniz's project', 238. In all of these cases we see something of this tension between games as play and games as an understanding of complex worldly systems, and the purposes to which the latter might be put. For a broader and excellent investigation of Leibniz's greater role in the history of games, their ideological and mathematical foundations, and the proto-game-theoretic ways of viewing the world that early war games inculcated, see Philipp Von Hilgers, Philipp and Ross Benjamin, *War Games: A History of War on Paper* (Cambridge, MA: MIT Press, 2012).

20 Gerda Reith, *The Age of Chance* (London, USA and Canada: Routledge, 1999), xiv.

21 Reith, *Age of Chance*, 29.

22 Marieke De Goede, *Virtue, Fortune, and Faith: A Genealogy of Finance* (Minneapolis, MN: University of Minnesota Press), 2005.

23 Spariosu, *Dionysus Reborn*, 211.

24 De Goede, *Virtue, Fortune and Faith,* 50.

25 Reith, *Age of Chance*, 74.

26 For examinations of skilled gamblers, see Jeremiah Weinstock, Carrie E. Massura and Nancy M. Petry, 'Professional and Pathological Gamblers: Similarities and Differences'. *Journal of Gambling Studies* 29, no. 2 (2013) 205–16, and David M. Hayano, 'The professional gambler: Fame, fortune, and failure'. *The Annals of the American Academy of Political and Social Science* 474, no. 1 (1984), 157–67.

27 John Von Neumann, 'Zur theorie der gesellschaftsspiele'. *Mathematische Annalen* 100, no. 1 (1928), 295–320.

28 John Von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (Princeton, NJ: Princeton University Press, 2007 [1944]).

29 Spariosu, *Dionysus Reborn*, 211.

30 Of course, many other things affect gameplay experience, and the individual player does not exist as an 'unencumbered self': they are not always alone (e.g. play with friends, with family, over live-streaming software), they play within institutions (e.g. competitive teams or guilds), and they sometimes play for a diverse range of reasons entangled with political economy (such as gold farming). Naturally these complications of context exist – and indeed, most of my scholarly work is actually *about* these issues – but these are not the focus of the present work. I am concerned instead with considering the experiences and thought processes of players when facing unpredictable games, and in the latter half of the book, the cultures, practices and norms that have arisen as a result of these interactions.

31 Johan Huizinga, *Homo Ludens: A Study of the Play-Element in Culture* (Kettering, OH: Angelico Press, 2016 [1938]), 48.

32 Roger Caillois, *Man, Play and Games* (USA: University of Illinois Press, 2001 [1958]), 17.

33 Caillois, *Man, Play and Games*, 78.

34 Alasdair MacIntyre, *After Virtue: A Study in Moral Philosophy* (Indiana: University of Notre Dame Press, 2007).

35 Mihaly Csikszentmihalyi and Isabella Selega Csikszentmihalyi, *Optimal Experience: Psychological Studies of Flow in Consciousness* (Cambridge, UK: Cambridge University Press, 1992), 185.

36 Csikszentmihalyi and Csikszentmihalyi, *Optimal Experience*, 185.

37 Reith, *Age of Chance*, 127.

38 Ibid., 147.

39 Ibid., 146.

40 Harvey Ferguson in Reith, *Age of Chance*, xvii.

41 Jesper Juul, *The Art of Failure*: *An Essay on the Pain of Playing Video Games* (Cambridge, MA: MIT Press, 2013), 14.

42 Thomas Malaby, *Gambling Life: Dealing in Contingency in a Greek City* (Champaign, IL: University of Illinois Press, 2010), 18.

43 Reith, *Age of Chance*, 126.

44 See Tauel Harper, 'The smooth spaces of play: Deleuze and the emancipative potential of games'. *symploke* 17, no. 1 (2009), 129–42; Colin Cremin, *Exploring Videogames with Deleuze and Guattari: Towards an Affective Theory of Form* (Oxford and New York: Routledge, 2015); Tom Betts, 'An investigation of the digital sublime in video game production' (PhD diss. University of Huddersfield, 2014); Chiel Kattenbelt and Joost Raessens, 'Computer games and the complexity of experience'. In *Level Up: Digital Games Research Conference*, edited by Marinka Copier and Joost Raessens (Utrecht: Faculty of Arts, Utrecht University, 2003); Nick Dyer-Witheford and Greig de Peuter, *Games of Empire: Global Capitalism and Video Games* (Minneapolis, MN: University of Minnesota, 2009); Ian G. R. Shaw and Barney Warf, 'Worlds of affect: Virtual geographies of video games'. *Environment and Planning A* 41, no. 6 (2009), 1332–43.

45 Colin Cremin, 'The formal qualities of the video game: An exploration of Super Mario Galaxy with Gilles Deleuze'. *Games and Culture* 7, no. 1 (2012), 73.

46 Cremin, *Exploring Videogames*.

47 Harper, 'The smooth spaces of play'.

48 Betts, 'Digital sublime', 32.

49 Kattenbelt and Raessens, 'Complexity of experience'.

50 Joe Hughes, *Deleuze's 'Difference and Repetition': A Reader's Guide* (London and New York: Bloomsbury Publishing, 2009), 14–15.

51 James Williams, *Gilles Deleuze's Difference and Repetition: A Critical Introduction and Guide* (Edinburgh: Edinburgh University Press, 2013), 2.

52 Henry Somers-Hall, *Deleuze's Difference and Repetition: An Edinburgh Philosophical Guide* (Edinburgh: Edinburgh University Press, 2013), 2–3.

53 John Protevi, 'Deleuze and life'. In *The Cambridge Companion to Deleuze*, edited by Daniel W. Smith and Henry Somers-Hall (Cambridge: Cambridge University Press, 2012), 239.

54 Manuel DeLanda, *Intensive Science and Virtual Philosophy* (London and New York: Bloomsbury Academic, 2013), 196.

55 I certainly do not claim a stronger handle on Deleuze than any of these scholars, but I believe the reading of his work I put forward – situated between a 'traditional' philosophical understanding and the primarily mathematical understanding proposed (or perhaps, developed) by Manuel DeLanda – gives as true a reading as any, and certainly the reading of most value to the project of this work.

56 John Cohen, *Chance, Skill, and Luck* (Wokin and London: Pelican, 1960), 7.

57 Malaby, *Gambling Life*, 10.

58 Gilles Deleuze, *Difference and Repetition* (London and New York: Bloomsbury Academic, 2014 [1968]), 1.

59 Deleuze, *Difference and Repetition*, 4.

60 IEP, 'Gilles Deleuze (1925–1995)'. *Internet Encyclopaedia of Philosophy*. Available at http://www.iep.utm.edu/deleuze/.

61 Clayton Crockett, *Deleuze Beyond Baidou: Ontology, Multiplicity, and Event* (New York: Columbia University Press, 2013), 53.

62 Daniel Smith and John Protevi, 'Gilles Deleuze'. In *The Stanford Encyclopedia of Philosophy* (2015). Available at http://plato.stanford.edu/archives/win2015/entries/deleuze/.

63 Deleuze, *Difference and Repetition*, 1, emphasis mine.

64 Williams, *Critical Introduction,* 12.

65 Deleuze, *Difference and Repetition,* 28.

66 Hughes, *Deleuze's Difference and Repetition,* 35.

67 Deleuze, *Difference and Repetition,* xix.

68 Ibid., 32.

69 Deleuze, *Difference and Repetition*, xv.

70 Cliff Stagoll, 'Difference'. In *Deleuze Dictionary Revised Edition*, edited by Adrian Parr (Edinburgh: Edinburgh University Press, 2010), 75.

71 Deleuze, *Difference and Repetition*, 159.

72 Somers-Hall, *Deleuze's Difference and Repetition*, 23.

73 Deleuze, *Difference and Repetition*, 71.

74 Ibid., 275.

75 Todd May, *Reconsidering Difference: Nancy, Derrida, Levinas, and Deleuze* (University Park, PA: Penn State Press, 1997), 186.

76 Hughes, *Deleuze's Difference and Repetition*, 142.

87 Williams, *Critical Introduction*, 7–8.

78 Deleuze, *Difference and Repetition*, 321; 364.

79 Ibid., 365.

80 Ibid., 364.

81 Ibid., 259.

82 Katherine Swancutt, 'The ontological spiral: Virtuosity and transparency in Mongolian games'. *Inner Asia* 9, no. 2 (2007), 249.

83 Gilles Deueze, *The Logic of Sense* (London and New York: Continuum, 2004 [1969]), 52.

84 In more recent Deleuzean work, such as that of Manuel DeLanda, multiplicities exist outside of perception if need be; multiplicities 'specify the structure of spaces of possibilities' (*Intensive Science*, 3), but can take the form of entirely physical processes without the necessary presence of a subject. As Joe Hughes puts it, DeLanda '"reconstructs" Deleuze entirely within the language of science and mathematics, and tends to ignore the fact that the whole of Difference and Repetition is a theory of subjectivity' (*Deleuze's Difference and Repetition*, 183). As such, in this work, although I find

DeLanda's reading highly valuable, I will adhere to the 'standard' Deleuzean reading: a multiplicity is the player's perception of the repeating generative system they are currently engaging with, through a 'progressive determination' based on new sensations and new uses of a game's system, and not the mathematical specifics of that system (although, of course, the perception of the former will hinge substantially) on the latter.

85 Ronald Bogue, *Deleuze and Guattari* (London: Routledge, 1989), 17.

86 Alice Van der Klei, 'Repeating the rhizome'. *SubStance* 31, no. 1 (2002), 51.

87 Damian Sutton and David Martin-Jones, *Deleuze Reframed: Interpreting Key Thinkers for the Arts* (London and New York: IB Tauris, 2008), 4.

88 Deleuze, *Logic of Sense*, 69.

89 Deleuze, *Difference and Repetition*, 147–8.

90 Williams, *Critical Introduction*, 12.

91 Huizinga, *Homo Ludens*, 10.

92 A note on the form of magic circle adopted in this work is useful here. As previously stated, I am specifically looking at games where, within the formal, material fabric of the game – the pieces, the code, the ruleset – unpredictability (the ability to put in one *input* and get a range of *outputs* as a result of mechanics or permutations within the game system) is present. This ability to get diverging outputs from identical inputs is what marks 'unpredictability', as I define it, out from other comparable concepts; for example, Costikyan's 'uncertainty' is focused on a player not knowing what will happen next, which might emerge from input–output variability, but also simply from not knowing what other players are thinking, or not understanding the meaning of some important in-game element. This is therefore different, and focuses us in on the interaction between the non-human elements of the game, in which we feed input and get outputs, and the human element that experiences this. This might appear to be an unduly narrow scope when game unpredictability – if defined differently – is a topic of tremendous scale. However, other scholars have covered most of the elements under a hypothetical wider umbrella already, while what I term unpredictability specifically in game systems, and its effects on players, has not. Thinking about this input–output unpredictability therefore gives us a new way to think about a major segment of this broader field of indeterminacy not yet fully examined. Games are of course not 'apart' from the wider world of their play, but those elements are not my focus, except where parts of the wider world – such as gaming cultures – are clearly influenced *by unpredictability*, which is the focus of the second part of the present work.

93 The notion of 'correct' or 'incorrect' functioning of a game is not fixed, but contested; this will be explored primarily in Chapter 5, which examines what I term 'instability', which is to say the unpredictable flexibility of acceptable game rules and the presence of unanticipated possibilities inherent within that game's differential relations and differential elements.