GDC 2008 Presentation

i-fi: Immersive Fidelity in Games

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PART I: Intro

Hi, thanks for coming.

My name is Clint Hocking, and I'm here to talk to you today about Immersion.

Why Immersion? Well, about three years ago now, I started work on **Far Cry 2** with a small conception team and one of our first tasks was to figure out what would be the core of the game.

After a couple weeks of brainstorming with that small team we had identified a half dozen **pillars** that would be the sort of foundation for the project. We remember these pillars using the mnemonic '**FORMIDable**' – which in French, translates to '**formidable**'… and thereby yields the double advantage of not only working as a bilingual mnemonic, but also satisfying the criteria of **Canada's French Language Charter – Bill 101.**

Anyway – the mnemonic is this:

Freedom of Gameplay – by which we mean the ability of the player to play the game the way he chooses – to formulate his own strategies and develop his own tactics in resolving the challenges of the game.

Open World – by which we mean our game world will be a fully open, continuous world with no loading at any time, where the player is free to go where he chooses, when he chooses.

Realism – by which we mean the game will be set in credible real world locales and deal with believable real world challenges – no mutants, no monsters, no magic.

Meaning – by which we mean the game will have something to say – it won't merely be escapist entertainment – but it will offer the player an opportunity to examine and question himself and his worldview.

Dynamism – by which we mean – to the greatest extent possible – that the assets of the game world will not be static. This includes everything from vegetation and weather interacting in a simulated ecosystem, to human and animal AI that are driven by needs, to a dynamic narrative that uses drama management to reconfigure the plot in response to player input.

And finally, **Immersion**.

Now why – out of these six topics did I choose immersion? And why do I sometimes wish the Mnemonic for our game was **DRFMO** instead?

Well, I chose immersion because back when it was time to submit proposals for the conference, I was grinding pretty hard to get the game ready for a March ship date and I figured by now the **gold master** would be in duplication and distribution, but I would be **on vacation**. Uh… **on vacation**.

I figured I had a pretty good understanding of immersion and how to make a game that was highly immersive and that that would be an easy topic for this talk.

This is **Niels Bohr**. Along with Werner **Heisenberg** and Max **Planck** he's considered to be the father of Quantum Mechanics. I suppose if anything should have more than one father it's Quantum Mechanics.

Anyway, Bohr once said,

> "if you think you understand quantum mechanics, you've missed something".

Well turns out the same goes for Immersion.

What I thought would be an easy topic turned out to be a complex and multi-facetted subject that I knew basically nothing about. On top of that, it turned out that aside from being complex – it's actually fairly divisive and there are some very smart people who have very contradictory opinions about what immersion is and what role it has in the development of our medium.

PART II: Immersion – The Basics

Well let's start with the basics and ask simply – **what is Immersion**?

The most important thing that I think we need to understand is that immersion not a property of a game. It is a player state. Immersion is not something we create and put in a game – it is something we invoke in a player.

We can think of it as we think of any other state we try to activate and/or detect in the dynamic system of a game. We could label it as:

PlayerImmersed=True
PlayerImmersed=False

Furthermore, it seems to not have an **analogue range**. Either I am immersed in an experience or I am not immersed. I fundamentally do not believe a player can be partially immersed anymore than he can be partially dead. There are even **exceptions to the latter**, but I don't believe there are exceptions to the former.

I'll talk about it more in detail later - but if you're resisting the idea and thinking we can be partially immersed, I'll suggest that what can – and does happen – is that we are able to very **rapidly switch in and out** of an immersed state – but partial immersion is just out.

So if immersion is a state – what mechanisms allow us to reach into **the player's brain** and draw him in to an immersed state?

Well, I think there are two primary approaches. For lack of a better way of looking at it, I think we can immerse the player **via the left brain**, or **via the right**.

Invoking an immersive state via the left brain is essentially drawing the player in using his **rational, logical faculties**. Drawing him in via the right brain is done by appealing to his **sensory or emotional faculties**.

Even though I am certain that were are always doing both at once, I am going to first talk about them separately, and I'm going to start with **immersion invoked via the right brain.**

PART III: Sensual Immersion

An immersive state that we achieve in the player via the right brain is a kind of **passionate**, emotionally focused kind of immersion.

In her book **Hamlet on the Holodeck**, Janet Murray presented perhaps the first formal definition of Immersion.

She defined four fundamental properties of digital environments – she said that digital environments were **procedural, participatory, spatial and encyclopedic.**

She grouped procedural and participatory together and said that these two properties were what we were talking about when we used the word **'interactive'**, then she grouped spatial and encyclopedic together and stated that that was what we meant when we talked about '**immersion'.**

Later in the book, Murray expands on this notion with a more specific definition.

She says:

> *Immersion is a metaphorical term derived from the experience of being submerged in water. We seek the same thing from a psychologically immersive experience that we do from a plunge in the ocean or a swimming pool - the sensation of being surrounded by a completely other reality - as different as water is from air – that takes over all of our attention - our whole perceptual apparatus.*

Essentially, Murray is painting immersion as a sensual experience – and this gels fairly well with our lay definition of the idea.

We imagine ourselves being immersed in a film when we sit in a comfy padded chair in a sound proof **movie theatre**, block out all outside audiovisual stimulus and fill our field of vision with moving images and bombard our ears with music, dialogue and the sounds of the world we are watching.

We're essentially severing the connection between our senses and the real world, and receiving sensory input from another, imaginary world.

In fact, when faced with expert enough craft, any one of our senses can effectively override our sensual reality and immerse us via the right brain.

If you've ever stood in front of a master painting like this **Turner**, you quickly find the world around you disappears and you are immersed through purely visual stimulus.

Listening to a great jazz performer like **Miles Davis** will overwhelm your sense of hearing until you are immersed in the aural landscape of his music

I would expect half the people in this room would testify to the ability of **pure chocolate** to immerse them completely in their sense of taste - even if only for a few fleeting moments.

Sex is nothing if not total immersion in the tactile

And while humans have notoriously poor senses of smell, we still often use **incense** to facilitate deeper states of immersion during meditation or physical therapy.

And for those who find this last example a bit dubious, I suggest you **take a dog for a walk** sometime… I promise you will see how powerfully the sense of smell can immerse a dog into its own private world.

Now, knowing what this kind of sensory immersion is, and knowing how to achieve it are two different things. What specifically are we trying to achieve when attempting to draw the player into an immersive state?

Ultimately, what I think we're trying to do when we attempt to immerse the player is that we're attempting to **close the gap between the player, his avatar and the game world.**

Now I want to be carefully here – this is one of the reasons talking about immersion is tricky.

As soon as I say ‘player, avatar and game world’ I start to imply something about the kinds of games this discussion is applicable to.

I don’t mean to do that.

I could say we are trying to close the gap between the **player** and the **game pieces that are his agents** in the game systems and **the systems themselves**, because ultimately that’s what I mean, but because I am talking about a physical, sensual sort of immersion, I want to talk about concrete things, not abstract things.

I’ll talk about abstract things soon enough.

Anyway, as I said, when we attempt to immerse the player I think what we’re really trying to do is to close the gap between the player, his avatar and the game world….

How do we do it? Well – it should be immediately apparent to anyone that the answers to this question can be found in **Trespasser.**

Executive Produced by Xbox daddy **Seamus Blackley**, developed by **DreamWorks Interactive** and published by **EA**, the much anticipated ‘interactive expansion’ of the **Jurassic Park** universe launched ten years ago to a considerable thrashing by fans and critics.

Trespasser’s promise was that it would be the most immersive game ever. In support of this promise, a range of features were developed

At the lowest level, the game was busting apart at the seams with graphical rendering and **engine innovations** that took years to become standardized, including the implementation of normal and specular maps, the use of height maps for terrain and the use of sprite imposters to optimize 3d objects in the distance. Trespasser was in several cases the first game to offer the features that are standard in any **large scale outdoor** or open-world game today.

Trespasser boasted a (barely functional) **needs driven AI**, meaning the dinosaurs were autonomous agents that would seek to rest when tired, eat when hungry, or fight or flee other dinosaurs based on whether or not they were predator or prey. Again, we often see this feature promised, but it was only much more recently that it was **truly achieved** in a way that actually improved a game.

The game promised a complete and robust **physical simulation**, wherein every object in the game world would be a physical object, and would be able to be grabbed, picked up and used by the physically simulated arm of the avatar. The arm proved to be a terrible, terrible bane on the game, and even the game that

decisively solved the problem of ubiquitous physical simulation used a clever bit of fiction to dispel the need for an arm altogether.

Now aside from these and many other innovations, there are two more important innovations **Trespasser** reached for that I want to talk about specifically and in a bit more detail.

One was its **IK-driven animation system** and the other was its complete **removal of an on-screen HUD**.

I want to talk about these two design approaches in particular because I think they illuminate what we are often striving to accomplish when we are trying to increase the sensually immersive qualities of a game.

Trespasser's **animation system** was very ambitious for its time. Rather than having animations for the avatar and the dinosaurs to queue up and play as we normally do, Trespasser promised a completely IK-driven animation system. Just as the arm was a physically simulated arm, the body of the avatar was promised to be entirely simulated and driven using full IK.

Similarly, the dinosaurs in the game were not supposed to be animated – but were instead supposed to be driven by this same procedural animation system. Despite the near total failure of the system, it is worth noting that it was another decade before **a game would truly succeed at this** in a compelling way. And while the many horrible failures of the system not only fail to increase the immersive qualities of the game – they shatter them outright – asserting their failure doesn't enlighten us much. We need to look at why those original decisions were made, and consider whether a proper implementation of those systems would make a more sensually immersive game.

What were the goals of Trespasser's animation system?

The first seems to have been to create a **1:1 relationship** between player input and avatar response. The idea is that the raw immediacy and complete range of motion afforded by such an animation system is superior to a system where relatively low fidelity canned animations are 'queued' up by sequential button presses.

In fact – the system is **more procedural**, and therefore can be said to rely on qualities of inherent value to our medium – instead of being a content driven system that is only more sophisticated by degrees that **this kind of crap**.

By extension we can say the success of **the Wii** has a lot to do with this kind of parallelism between input and action. Having to perform a **specific canned motion** with the controller in order to trigger a canned response from an avatar feels bad.

On the other hand in **games where my input is comparatively direct** I feel much more immersed. These games achieve a 1:1 correspondence between the action the player takes and the action the avatar performs in the world.

I believe that similar ideals probably pushed for the inclusion of trigger-like buttons on the **Xbox and Xbox 360 controllers**, and that the multiple input-side innovations in EA Sports titles from **Tiger Woods Golf** to **Fight Night** to **skate.** have been driven by this goal.

Probably the best way to say it is that playing **Guitar Hero** using the direct input of a guitar-like controller affords a rich and powerful sense of immersion into a state of rock-godhood but that playing Guitar Hero on a gamepad is actually even shittier than playing **Simon**.

So specifically in terms of **closing the gap between the player and the avatar**, I think the Trespasser animation system is doing two things – first it's attempting to **increase the immediacy and the responsiveness** of animation, and second, it is striving to **achieve a 1:1 correspondence** between the player input and the avatar actions.

Is there anything in the Trespasser animation system acting to **close the gap between the player and the game world**, or between the avatar and the game world?

Back when I was working on **Chaos Theory** – I have this very vivid memory of the first time I ever held out my virtual hand in co-op mode and had another player reach out and take that hand in a perfectly synchronized animation – I honestly felt as through I had physically extended **my hand through the screen** over the network and out the other side to touch another person.

It is the most vivid feeling of physical presence I have ever had in a game, and while Chaos Theory used a more conventional system of canned and queued animations, the point is that a **fully procedural system** potentially affords solutions that ensure that **the hand always grabs the hand**, the feet always touch the floor.

So the third way the Trespasser animation system was intended to tighten this circle was to greatly **increase the connectivity of animation**, allowing the player to almost touch the world. This would ensure that the avatars animations – which are already responsive and correspond closely to the player's inputs – also connect perfectly with the world itself.

So if that's what the animation systems in Trespasser were trying to accomplish, what were the developers trying to achieve by **removing the HUD**. Obviously, HUD in a shooter provides a great deal of important information that the player

needs access to on a moment to moment basis – like **how much ammo or health I have** for example. How did the developers get around this problem?

Well, to start with the amount of ammunition the player had in his weapon was indicated and updated vocally by the voice of the avatar Anne – played by **Minnie Driver**. Again, a technique not used effectively again until **8 years later**. And in the unfortunately classic example, Health was illustrated by a **tattoo on Anne's left breast.**

As an aside, I sometimes can't help but wonder if this unfortunate solution to what turns out to be a rather difficult problem contributes to the argument that the creation of more immersive games is an ill-founded juvenile fantasy. It seems a bit off the mark to me when the reality is that most media wouldn't hesitate to show you **Minnie Drivers tits** and give you a **health meter**, and an ammo counter to boot.

No, I think the trespasser team took the hard path. The fact that they failed isn't something to be mocked, its something to be learned from.

What were they trying to do?

Again – I think all the thinking that goes into removing the HUD is directed at **closing this gap**. And here's how I think they wanted it to work.

Every game needs to communicate the moment to moment state of the game to the player. In **chess** or **Pac Man**, the player can see every piece on the board at any given time, he always knows the precise game state.

A game like **Civilization** reveals some of the game state, but the player still needs to explore the world and move units out from his base to scout and station outlying units to lift what we refer to as the **Fog of War**. The fact that the player can only see a part of the world at any given time means that he is constantly making decisions about what elements of the game state he needs to know now. Typically, he is most concerned with combat.

When making a **first person game**, we are intentionally choosing what might be the most limiting possible game camera, and thus we are massively limiting the amount of information that the player can have about the game state. For example – if an enemy takes cover outside a door, the player does not even know whether or not that enemy is reloading his weapon.

We compensate for this limiting of information in a variety of ways. An enemy crouching behind cover to reload my **shout out 'reloading'** – doing it this way has the dual effect of making it seem as though the enemy is communicating with his allies – but really what it is doing it telling the player **"now is your chance – charge the unit and destroy it before it reloads"**

The idea – I think – is that the developers are trying to 'convert' to the greatest extent possible – **every meter and gauge** in the complex interconnected state machine of the game – into something that is perceived directly via the player's senses.

By allowing the player to directly sense the gamestate rather than sensing it through the mediating elements of a HUD we facilitate a sensory immersion and we **strengthen the connection between the player and the world**.

So now I've looked at some of the tools used by **Trespasser** and the games that succeeded where Trespasser failed – to immersive the player **via his right brain**. But what about this other idea of immersing the player **via the left brain**?

Remember back when I talked about **Murray** and how she defined immersiveness as a property of a digital environment?

Well – that's the breaking point right there. Any examination of the immersiveness of games as **digital environments** is really – ultimately a discussion of games as digital environments – it's not fundamentally a discussion of the immersiveness of games as – well – **games**.

What do I mean by that? Clearly games have digital environments that can be as powerfully immersive, and in many ways moreso than films.

Bioshock with its arresting visual style, compelling sense of place, gorgeous graphics, exemplary audio, and superlative script is as immersive or moreso than the majority of **films you'll find on the shelves at your local video store**, I promise you that...

Unfortunately, when we make that comparison, there is a problem, because while it's true that Bioshock is immersive, the kinds of immersion we are talking about are not the kinds of immersive qualities that are unique to games. We're talking about 'games as film', and we're talking about being immersed in the audio-visual aspects of the game.

If we want to talk about a kind of immersion that is fundamental to games – what does that even mean?

PART IV: Formal Immersion

This is where I'm going to examine the **other kind of immersion**. This is like the **logical, rational kind of immersion**. What's important to point out is that where the sensory sort of immersion I was talking about before is an import tool, the fact is that that sort of immersion is not fundamental to games.

Chess is a game.

Do we think that chess is not immersive because it does not fundamentally take hold of our senses?

Chess has no smell, no sound, no taste.

We could argue that there are **tactile and visual elements in chess**. But is that true? After all you can play chess like **this**.

So chess must not be immersive then – **right**? Damn.

Okay so chess is immersive. In fact chess is just as powerfully immersive – perhaps moreso – than most experiences that rely on overriding our senses.

How can that be?

What is it about chess – or more generally – what is it about GAMES that immerses us?

To understand this kind of rational, logical immersion, I think we need to understand what **our rational, logical brain** is.

I'm not a brain scientist like **this freaky person**, but I think brains are pattern recognition machines. In fact I think they are the most powerful pattern matching machines in the known universe and they are so good at identifying patterns and sorting things, that brains have in fact constructed in their likeness the **second most powerful pattern matching machines** in the known universe.

All you need to do to start a brain pattern matching is present it with **any set large enough to be sorted** and say **sort, sort, sort**. We just do it automatically.

I think the way that games immerse us via our left brains is by drawing them into particular kinds of patterns. When I sort through **Stars, Apples and Gold Bars** we learn pretty much everything there is about the patterns between them in a few moments.

Games – on the other hand – at last good games – present problems that are not only larger and more complex – but that are recursive.

By recursive I mean that in a game – whenever we **identify a pattern**, we simultaneously identify **newer patterns nested deeper** and ever deeper within it. As we identify more and more patterns, we see patterns becoming **more and more complex.** Every step we take not only opens up **new paths forward** into

uncharted areas of the game, but also **new paths deeper** into previously examined areas of the game.

Exploring a game aimlessly without direction is simply looking for patterns. Actively playing a game is a process of seeking good patterns. Good patterns persist, optimal patterns win.

This is why in chess we arrive at **standard openings** – these are highly optimized patterns that have been thoroughly recursed and have had their variants rigorously investigated.

But chess is a spectacularly complicated game, and for good examples of how immersion is achieved via the left brain, I need to look at a something simpler.

Let's look at **Guitar Hero** – which by any reckoning is a fairly simple game. In Guitar Hero we see excellent and clear examples of the immersive power of recursive patterns.

Guitar Hero – and I think all games – draw the left brain into an immersed state by using patterns that express qualities that can be defined on **three axes**.

I had a hard time naming these axes, but I'll call them **Implication, Complexity, and Tolerance.**

What do each of these axes represent?

By **implication**, I mean the number of elements implicated in the pattern. In Guitar Hero, implication is literally the number of frets used – such that the patterns have higher degrees of implication – and thus higher difficulty – the more frets are implicated in the pattern.

At the **Easy** level of difficulty, we only use the Green, Red and Yellow frets.
At **Medium**, we increase the implication by adding the Blue fret.
At **Hard** and Expert we increase the implication again by adding the Orange Fret.

To extend the example to another game – the level of implication in a **chess pattern** would literally be the number of pieces involved in that pattern. The Anastasia's Mate pattern implicates no fewer than 4 pieces.

By **Complexity**, I am referring broadly to what it is the player must be able to do with each of the implied elements.

For example in **Guitar Hero** at the **Easy** level of difficulty, I usually only have to use one implicated element at a time, I have to hold a few sustains and I rarely have to play chords.

At the **Medium** level, chords and sustains are much more common and frequently combined, and I occasionally have to move up and down the fret board to select which elements are implicated

At the **Hard** level, I play mostly chords, sustains are frequently juxtaposed with rapid plucking of individual notes, and rapid movement up and down the fretboard is required.

By contrast, Complexity in **chess** would have something to do with maintaining comprehension of the simultaneous offensive and defensive nature of a piece or a collection of pieces, and knowing how to strengthen or reinforce areas of the board, liberate pieces, or shift easily from attack to defense as needed.

I think it's really about understanding – for each piece – how it is implicated for you, as well as how it is implicated for your opponent.

And finally, **tolerance**. Tolerance in Guitar Hero is simply the requirement of precision and accuracy.

In fact – this one is super easy to talk about, because Guitar Hero literally has an onscreen meter for tolerance. **It's right there.**

At the **Easy** level, Guitar Hero fills your rock meter quickly with every correct note, and drains it very slowly for every missed note.

At **Medium**, it drains and fills the rock meter an average amount whether you miss or hit the note.

At **Hard**, the cost of missing a note is very high and the gain from hitting a note is small forcing higher and higher degrees of precision and accuracy,

In **chess** – tolerance is literally the competence of your opponent.

I am a tolerant opponent for Garry Kasparov. If he plays against me, he will not be punished at all for making mistakes. **Deep Blue** however was a very intolerant opponent, and a single mistake could – **in fact did** – cost the match.

So that's what these three axes of **Implication, Complexity, and Tolerance** mean, but how do these things – well used – immerse me in **Guitar Hero via the left brain**?

What happens to my brain when I play Guitar Hero?

Well, I start on **Easy**, and I see patterns of notes.

The designers put all kinds of different patterns in each song. Within any given song, I'll tackle different **variations on a theme**.

For the four or five songs unlocked within a **given level**, I experience **different themes**, but each of them more or less demand the same implication, have more or less the same complexity and the same tolerance.

As I unlock new songs progressing trough the venues of Easy mode, I see slight **increases in Complexity** – but not much change in implication or tolerance.

In other words, I will sometimes see **additional elements implicated**, or a few more sustains, or slightly more frequent chords, but the **Tolerance on the Rock Meter** never changes.

When I finally **switch from Easy to Medium**, the **implication** immediately jumps, and the tolerance immediately becomes harsher.

With a given song, again, I have **variations on a theme**.

I iterate through the songs on Medium, again moving deeper and deeper and exploring more and more **Complexity** within and among the variations.

And the whole pattern recurses again through the Hard and Expert difficulty levels – but instead of explaining it a third time, I'll just show this fucking awesome picture of **Eddie Van Halen.**

Anyway – all the time I am playing Guitar Hero – as I move **down the song list**, and **up through the difficultly levels**, I am recursing through the same patterns and experiencing increasing Complexity and Implication, and finer and finer Tolerances.

It is these **well tuned** forces acting in concert that **immerse my left brain** into the game.

And – most importantly – unlike with the sensual sorts of immersion of games like **Trespasser**, this form of immersion is universal to games.

So – where does this leave us?

PART V: Immersion Arena

Well, the problem now is that we have identified two different kinds of immersion. We have a **fundamental rational sort of immersion** in the gameness of a game, and we have the non-fundamental **emotional sort of immersion** into the surface elements of some games.

Which one is better? Which one is more important?

Clearly **they must fight**.

Critics of Sensual Immersion have suggested that because it is **not fundamental to games** it should at best be considered only a supporting aesthetic goal and not a central one, where **Murray** – even in the **choice of her title** – seems to imply that total sensual immersion itself is a critical **convergence point** that game development is **tumbling inevitably toward.**

Critics of Formal Immersion on the other hand suggest that the kind of recursion of patterns we experience playing **Guitar Hero** or chess - while delightful - are not very mass market. You might be able to get **Gramma to play Guitar Hero** on Thanksgiving, but she doesn't recurse it. People want **love, fear, doubt, sacrifice**, not challenges of dexterity, pattern matching, precision and optimization. People wanna feel like a **Rock God** – not like a **Simon expert** – and it is not the **Formally Immersive qualities** of Guitar Hero that yield that. It's **the skin**.

Compounding this problem there are a couple of business imperatives.

Critics of Sensual Immersion seem to suggest that sensual immersion is the **domain of film**. If we truly want to compete with them for cultural dominance we should probably not attack them on their **home turf**. In terms of their raw power to sensually immerse their audiences, movies still have a considerable lead. Perhaps we should instead play to the innate strengths of our medium.

Critics of Formal Immersion suggest all of the recursions through game systems that we engage in have a divisive effect. They **separate players** by training up those who play a lot and leaving behind those who don't play. Consequently, as games become increasingly sophisticated, in order for them to appeal to proven audiences, they necessarily become decreasingly accessible.

Imagine if every single **mystery movie** you watched increased the capacity of your brain to follow the plot of a mystery into a deeper state of convolution. If that was how it worked, every mystery would have to be more convoluted than the previous one. In the fifty years since Alfred Hitchcock's **Psycho** mysteries would have evolved to include millions of characters and thousands of possible murderers traceable back through the most inaccessibly obtuse chains of practically imperceptible clues. No one would be able to watch mystery movies anymore.

Niels Bohr once said of Quantum Mechanics:

> "the opposite of one profound truth may very well be another profound truth."

And over a hundred years since **Einstein** published his theories of relativity and fifty years since we discovered quantum mechanics, the two truths are still **incompatible.**

And perhaps we are stuck with a similar incompatibility between these two kinds of immersion.

But I don't think so.

PART V: Reconciliation

I think there is a way to get these two forms of immersion to not only work together, but also to kind of **flirt**, without being insecure about their masculinity.

I think there are ways to mix the formally immersive elements of a game with its sensually immersive elements, and simultaneously to make the formal elements we recurse through play be about more than simple reflex honing.

Looking back at **Chess**… it's a beautiful game by itself and **powerfully formally immersive**. I could however, conceivably 'dress up' chess and make a videogame version of **the-scottish-play-that-I-think-I'm-not-allowed-to-name-because-I-am-technically-in-a-theatre**. The game already has the basic elements of the play – a struggle between **two rulers**, a **queen** protecting her king, the forward advance of **white's pawns** are Birnam Wood coming to Dunsinane. If we achieved this, we could then be **formally immersed in the rules of chess**, while also experiencing the horror and resultant shame of being unable to **wash the blood off of our hands**…

Games are already starting to do this

For example, **Bioshock leverages its sensual immersiveness** to put us in direct physical and psychological contact with the Little Sisters – then dares us to rip out their hearts.

At the same time **Bioshock leverages its formal immersiveness** to get us to recurse the pattern of harvesting versus rescuing and keeps us wondering to the very end if the optimization problem will flat-line to an equivalence.

I believe that building games this way will have the effect of enabling players to recurse through concepts of **love, fear, doubt, sacrifice** expressed not only in the surface audio visual qualities of games, but modeled deeply in their systems.

I believe that once we are able to **feel something like love** while immersed both sensually and formally in a game, we will be able to recurse through that experience.

Imagine if **instead of recursing mystery plots** to make them explode in complexity, we used the same idea to recurse our appreciation and understanding of the complex nuances of human emotion. Imagine if instead of training up brains at solving optimization problems, or **training up our fingers at playing notes**, we used the power of recursion to **bring people together.**

The evolution of our medium is neither an extrapolation into the **future of Sensory Immersion**, nor of an extrapolation into the **future of Formal Immersion** – it is the coming together of these two forms of immersion and the unprecedented potential therein to bring us together.

All media have the power to bring people together. And **each new medium**, on its **arrival** has **all but obliterated** the cultural dominance of the **preceding forms**.

I don't believe we are on the verge of narrowly edging out the **dominant cultural medium of film**… I believe that we have **only just started** and **when we are finished**, we will have **so totally overwritten** the **cultural landscape** that for our children and grandchildren, games will be to film what **film today** is to radio.

In my mind, what Immersion really promises is the coming together of two impressively powerful forces, which might create the **Genesis Effect** that makes the love **between two men** eternal.

Thank you.