PROFESSOR: Before we move on to the rest of the topics, maybe just some administrative stuff about the next assignment. So the idea is to model a system, right? So the idea is to pick some sort of dual system.

In the past people have picked stuff like applying for college because they knew all about that. People have talked about any type of idea, you know, running a nuclear reactor or something. Specifically there's a-- but hey, any of you nuclear science majors?-- oh, perfect.

One of my favorite Apple II games was actually nuclear reactor simulation, and it always melted down. That's why it was fun. But pick a real world system to start modeling.

Obviously, you're trying to find the fun. Obviously, you're trying to make something that people are going to enjoy playing. But the idea is to start from a slightly different place from where we had in the first assignment.

Now a couple of you guys already did that for the first assignment, though. I mean things like picking up girls at a party. You know, modeling real systems and things. Still haven't played yet, a genealogy game yet. So, we're going to play next March. So [UNINTELLIGIBLE].

The survival horror game, I would say it's not a real world system. It was a system. Horror, wizards, trolls. So, yeah, pick something within games negotiating around-- like negotiating greenhouse gas emissions, that was one which was really, really cutthroat. That's what probably you imagine.

Actually I'll try to get that team to come in later in the semester. They did this and like talk about their card game. It was a freshman team on Terrascope. Let's see, On Wednesday, we're going to do the usual brainstorming inside of the second half of the upper-class. You know, everybody throw out your ideas. Come in with a bunch of ideas, we'll try to build on that.

But this time around you're allowed to actually pre-build your team. You're allowed to ask people, hey, you guys want to work together? You don't actually have to figure it out on the

spot if you don't want to. I don't really care how you do it, as long as by Friday you know who your team is. And who's on your team. Team sizes are the same. So, any questions?

AUDIENCE: Are we allowed to simulate things that aren't from this era?

PROFESSOR: Yeah, like normal history?

AUDIENCE: Yeah.

PROFESSOR: OK, not from like the future.

[INTERPOSING VOICES]

PROFESSOR: Yeah, I'm serious. This is how I think [INAUDIBLE]. OK, yes, absolutely there are no historical stuff-- but you do have some liberties. I'm not saying that your game has to be a faithful simulation. You can even build your model simulation [INAUDIBLE]. But it doesn't have to be a faithful simulation, that's certainly a poor design.

But, you know, in a sense you're trying to capture the spirit of it. If the point is, I'm running a nuclear reactor. And you can sort of capture the, oh my God, it's so dangerous , or the, oh my God, it's so boring aspect of it. Have you actually put the nuclear reactor--

AUDIENCE: : Well, like, what's there. And I know the mechanics of it, I think, were there.

PROFESSOR: I have been told it's not necessarily the most exciting job in the world.

AUDIENCE: No, you just sit there and do your homework. And every once in a while you look up. Very reasonable. And you get paid for it. Like $12 or $13 an hour.

PROFESSOR: So if your whole idea of the game is let's try to get as much homework done without letting [INAUDIBLE]. That might be more entertaining than just looking [INAUDIBLE]. But I got my problems in then.

AUDIENCE: [UNINTELLIGIBLE]. You have to do [UNINTELLIGIBLE].

[INTERPOSING VOICES]

PROFESSOR: And besides, I think we still have a time limit, like half an hour. It's not [INAUDIBLE] homework, it's really easy homework. Really not homework.

Let's see, just a reminder for everyone who has been falling off on the foreign posts, please

make sure that you keep up on your foreign posts. Those things actually do affect your grade. [UNINTELLIGIBLE] one person, not one team.

If you have any-- since we're in between reading assignments right now, you can write about the assignment. But if you wrote up something, let's say a reflection on how the class assignment went, that's fine. We're not expecting more than one foreign post a week. Of course, feel free to comment on other people's foreign posts as well.

If a discussion or a point has been raised that's kind of interesting, you want to kind of develop on that. Put some thought into it. Write something interesting you're going to keep on the compilation, that counts too. And that's fine.

OK, so puzzles. So Brenda's, before we start with Brenda's, let's start with Scott's. What were some of the definitions, or some of the things that Scott's game was mentioning, that were good for puzzle design

AUDIENCE: The book or not in the book?

PROFESSOR: This was on the web page.

[INTERPOSING VOICES]

AUDIENCE: --and had the right answer. [UNINTELLIGIBLE].

PROFESSOR: He didn't really differentiate between puzzles that could be generated like a pseudo-GUI or something, where you kind of have an algorithm that lets you create multiple puzzles. But as long as that particular iteration had one answer. So that was really there. Anything else you remember?

AUDIENCE: Tactical difficulty. Make it accessible but not super easy. I think targeting a specific audience. It was also the ability to change difficulty, it was dynamic difficulty. So some areas may actually be easier settings, and then actually what they want to be is harder settings.

PROFESSOR: I think that was Brenda's. But, yeah, am I wrong?

AUDIENCE: There's also the distinction between types of difficulty. Things where, you know, the letter puzzle you had at the beginning where it requires thinking about it, figuring it out. It was patients versus something else. I can't remember what the editor used.

But then you have things like mazes and locations where you have to be very careful, and separate your way through.

PROFESSOR: And sometimes they bring in information from other domains. From outside the puzzle, it's not just like all the information that you currently need in the puzzle. But the interesting thing about the puzzle that he particularly shows, is that he shows a range of different ways to actually solve it. None of which are actually satisfying except for the final answer. Which irritated me, I'm telling you. I'm not giving you another puzzle. [UNINTELLIGIBLE]

But it's kind of interesting to think about, actually, what audience it's for those kinds of specific puzzles. I mean, there are magazines out of there like Games magazine in particular, but sometimes you see stuff nestled into magazines that are not just about games.

You see stuff like crossword puzzles in newspapers and things like that. And now things like Sudoku and all that are way more popular that are meant to be really in mass audience. Whereas a magazine that is specifically targeted at puzzle enthusiasts can be super hardcore. With puzzles through the whole magazine then you can have a whole range of different difficulties in there. The assumption that you can solve something not so hard.

AUDIENCE: I'm kind of interested, does anybody know how people in newspapers generate crossword puzzles and Sudoku puzzles? Does anybody know what the actual process behind that is?

I mean, I can imagine how you might do it. You might start with the filled out thing and then remove bits to get your Sudoku. Or you might brute force, dictionary search to come up with words which fit together in order to form a crossword.

AUDIENCE: What they do with Sudoku now is, they have some computer algorithm-- and it has scales of difficulty-- and it generates a random Sudoku puzzle from your input.

AUDIENCE: Sudoku is solved enough that you can actually just algorithmically generate [INAUDIBLE]. An actual numerical difficulty. You scale it from 1 to 10, 10 being where where there's like literally only one step to take in each point.

AUDIENCE: The one that took them three months to solve.

AUDIENCE: But like crosswords, there's people who actually just get paid to sit down and generate those.

AUDIENCE: I know that Premiere takes submissions from other people and they're edited by [INAUDIBLE].

And then people submit that and he kind of like steps it up.

AUDIENCE: So he kind of crowdsources crossword puzzles.

[INTERPOSING VOICES]

PROFESSOR: But the difficulty in a crossword puzzles isn't just in the geometrically how the words go. The specific clues that they give you can be more or less obfuscated in some ways. And New York Times, in particular, is super irritating with this. They'll give you two words with no grammatical context about how they're supposed to fit in.

So you can actually compare it to see how they're difficulty scaling just by looking at the clues. Not even looking at the puzzle itself. And I thought the other thing about crosswords is, just to bring up a point that we talked about in the earlier class, the crosswords, [UNINTELLIGIBLE] that these are dependent upon the redundancy of the English language.

You don't see every single letter of a word in order to figure out what the word is. So that if it's a word that you couldn't otherwise have gotten from a clue, you can still get just by seeing the letters that are available. Because the English language is kind of about [INAUDIBLE], redundant information. If you dropped every single vowel in a sentence, you could probably still make out what that sentence is. And you don't necessarily get that with Chinese.

How many folks here have, [INAUDIBLE]. There are probably other languages here where like every single character means a word or something like that.

AUDIENCE: Hebrew has no vowels, right?

AUDIENCE: Well, they do up until third grade and we start dropping them after that. So it's basically, because it is understandable without vowels, you eventually just stop using them.

PROFESSOR: So that's interesting. If you had a crossword in Hebrew, where you were expected to write in the words with vowels, you probably could actually do one very similar to an English one.

AUDIENCE: It's difficult because the vowels in Hebrew are attached to a letter, not a separate character. They're just down at the bottom of the lower letter.

[INTERPOSING VOICES]

AUDIENCE: Another thing, in a crossword the letter can make a different sound in both.

[INTERPOSING VOICES]

AUDIENCE: Because a "v" could be vo, or va, or ve, you don't know. You only know by context. [UNINTELLIGIBLE] like "c" could be sss or ca. Like a hard or soft c. Or "g" could be ga or ja.

PROFESSOR: That is true, but although in English in particular the phonetic meaning, the way how a certain word is pronounced isn't necessarily essential for solving a crossword puzzle. Unless the clues happen to be phonetic clues. You know, sounds like a fish. So that may not come in so much to play when it comes to finishing a part of it. Jason, you had your hand up earlier about Sudoku.

JASON: It was a comment about the algorithmic [INAUDIBLE].

PROFESSOR: Also, one thing about algorithmic, about Sudoku difficulty, a lot of it comes from the selected removal of numbers. There's not what is the final pattern going to look like that's actually the difficulty. It's how do we remove the numbers in a way that gives multiple possible answers or multiple possible dead ends, because really there's only one solution.

I'm not actually familiar with the algorithm with which it does so. But it seems to be very clear that there are at least two algorithms. One of which is very easy, which is just provide a legitimate Sudoku solution. And then the one that is slightly harder is now which number is to be removed so that's it's still solvable.

PROFESSOR: : Have you all played Picross? Someone want to describe it for the folks who aren't familiar with it? We can use the white board if-- sure.

AUDIENCE: I think the green one works better. I remember green is better than black.

NICK: I'm really only familiar with the [INAUDIBLE] 3D [UNINTELLIGIBLE].

AUDIENCE: : Sorry to put you on the spot Nick, as always.

NICK: [UNINTELLIGIBLE] Here you'll have written poems. And then they all have something [INAUDIBLE].

AUDIENCE: Oh, this. This one where you spell in the blocks.

NICK: And then given bits of information, we have to work out which of these blocks is built and which can be removed. So the idea is the number tells you the number of blocks in that row or

column which has a filled block in it.

So in this case, nothing is in it's column. This column and that column have nothing in it. And this is probably not actually a very good example because I just pulled the numbers out of my head.

AUDIENCE: Then you have the sums are not the same.

NICK: So it's not going to work, but you get the idea. And things can get more complicated, traditionally there's just, I think, three that are names. That's there a connected block of three. So, for instance, this, that, and that. And I thought it had to be broken.

But if there's a three which, I think, is in a square or something along these lines, that means there are three in that column. But there's a gap in there somewhere. And then if it's like a three inch circle or something else complicated like that. Then that means that there are three but they all have gaps between them.

AUDIENCE: But I've also seen versions where they have just a list of numbers. And those are the-- there are [INAUDIBLE] blocks of that length.

PROFESSOR: So if there's four in a column you might say two, three, five. Which means there is a block of two, followed by a block of three, followed by a block of five.

AUDIENCE: And they have to have a gap between them.

PROFESSOR: And they will have to have a gap in between them. So it's not like you can actually get a block of eight in there somewhere. But the whole idea is that you've got this information that is actually redundant.

You've got more information in there than you necessarily need to be able to figure out which box and the situation to be filled in. Whether this should be empty. But it's presented to you in this obfuscated way.

The evidence, the clues that are given to you in a way that requires you to perform these algorithms in order to figure out which ones should be changed. And usually that's an algorithm you can use to solve. Although, I think Kim was the one that was talking about pattern matching.

But eventually as you get good at these things, you start to recognize patterns right of the bat.

Like, that's a zero. So that entire row is empty. That's the sort of thing that I do that becomes automatic for you.

AUDIENCE: So, let's see. I don't have much left more to talk about Scott [INAUDIBLE]. Now these are, these are more generated stuff. [UNINTELLIGIBLE]. So this basically is along the lines of what Scott [? Pim ?] is talking about. But obviously this is more physical not the pen and paper kind of thing.

AUDIENCE: Will you print up a copy?

PROFESSOR: Oh, you want the copy? No, because I just want you to look at this. Look at this first, don't look at that. Don't look at that.

So the basic idea is, let me just start with one, you get a card that is actually a puzzle. I wish we were doing these outside now, because we're going to zoom this out. But the puzzle basically just tells you how you are supposed to set up your board initially. So, there's a-- oops wrong [INAUDIBLE].

There's a green guy there. There's a green guy there. This is supposed to be an easy puzzle, I hope it is. Because I'm getting bad at this. Red guy go to [INAUDIBLE] I think. Yeah, and that's the puzzle. And there's one little square on it, and that you have to check.

So the basic idea is you tip over the pieces so that the guy moves. And you don't want to be tipping over the pieces in a way where the white guy can't move anymore.

AUDIENCE: Yeah, so you're tipping over things to make a path that he can walk along, right.

AUDIENCE: If I make a closed loop, he has to touch every piece?

AUDIENCE: I think he just has to get to this one.

PROFESSOR: Yeah, you have to get to the red one.

AUDIENCE: There's a plus mark.

[INTERPOSING VOICES]

PROFESSOR: I'm not exactly sure how to solve this one.

AUDIENCE: Yellow that way, green, yellow that way.

AUDIENCE: Wait, you're allowed to tip him over? How do you die?

PROFESSOR: My understanding is that he needs to fall onto another piece, actually. So let me just confirm I set this up right, actually. Yeah, I did.

AUDIENCE: No, so you push the yellow that way. And then the green that way. And the other green that way.

AUDIENCE: So put the yellow ones first?

AUDIENCE: So do the green ones first.

AUDIENCE: Yeah, I don't actually have the rules for the guy.

[INTERPOSING VOICES]

AUDIENCE: How does he fall?

[INTERPOSING VOICES]

PROFESSOR: He's actually allowed to move on anything that's contiguously connected. So, as long as you can continuously connect up to this, you're fine. [INTERPOSING VOICES]

AUDIENCE: 10: So tip that first green. No, other one. And then form a path, right now, if you tip that. Oh, there's a hole.

AUDIENCE: 11: Are you sure tip them over means more brown spot and not--

AUDIENCE: 12: Well, if doesn't then you can't reach the red after it.

PROFESSOR: Yeah, I am absolutely sure it means that you're supposed to tip it over in a way that--

[INTERPOSING VOICES]

AUDIENCE: 13: Tip the yellow one first. Then move the guy out to the green. Then tip over the green.

[INTERPOSING VOICES]

PROFESSOR: That is why it's supposed to begin a [UNINTELLIGIBLE]. You can actually do it. This is why this is puzzle one.

AUDIENCE: 14: You can even fall on top of anything? That's bizarre.

[INTERPOSING VOICES]

PROFESSOR: But, you know, this is not entirely unlike the kind of puzzle that Scott does. I mean, sure, this is one particular piece of plastic that the game is designed to work with. But basically it's just like a book, right? It's like a book of puzzles. So there are also solutions in here, but I find the solutions harder to read.

AUDIENCE: The [UNINTELLIGIBLE] was in the book.

PROFESSOR: It was in Brenda's book?

AUDIENCE: Yeah.

PROFESSOR: So, actually, that's probably a good excuse to switch over to Brenda's. Well, actually, before that I want to take a look at the tangrams. Everyone play the tangrams?

So, the basic idea is you've got these shapes. Does this one get in, like this? You've got these shapes, and if you assemble them right as is usually described on the side of the box somewhere. Where the heck?

AUDIENCE: It's on the inside.

PROFESSOR: I've got a big picture on the side. Is that you can actually fit all of these shapes inside that square. So these are basically just a square that's been divided in a specific way. So once I've got this assembled everyone can just pass this around. Anyone who has already seen it can pass it on. That one doesn't fit very well, but it works.

Hey, that's, ta da. OK, so this is the basic side. Now this is how it's been sold, at least, is that this is actually a calendar. So every day you get a different shape. It's a cute little thing. It's a pretty rudimentary geometrical shape.

Some of them have, I think this is supposed to be a sphynx or something. It looks like a frog. This looks like a Pac Man thing. So the idea is that you rearrange those particular shapes into all of these different shapes. And you could play the game without getting these puzzle solutions, right?

And it talks a lot about, if you've got a toy that's worth playing with, you've got the beginning of

something that might make a good game. The nice thing about tipover is that it's kind of fun to tip over things. And the thing about tangrams is that I actually had more fun playing with tangrams than trying to solve specific problems just by just trying to rearrange these. Who hasn't seen these before?

[INTERPOSING VOICES]

AUDIENCE: Kind of embarrassing.

AUDIENCE: You should be ashamed of yourself. And all the work that you did is gone.

PROFESSOR: But the thing is, as a toy it doesn't really matter, right? Because it's just a certain piece of anything. And you kind of want to take it apart and make new shapes with it, like a little house.

So if you've got something that's kind of fun to fiddle with to begin with, you've got possibly the beginning of a game in general. But the way how Scott was talking about it, there's this intermediate step where it's a puzzle. It's a toy with a specific solution that you're trying to get to.

And a game is kind of one step beyond that where now there is multiple solutions and competitive. At least, that's how he's describing it. He's not really a game theorist. He just works with puzzles.

AUDIENCE: He talks about it in terms of a goal, right? So then with a toy that you don't have a goal with them. With a puzzle, you have one goal with no interaction. And then a game is with interaction.

PROFESSOR: And possibly multiple goals as well. But again it becomes more and more directed as toys are very free form. So there are people who describe games, like the Sims for instance, as actually toys. In the same way that you describe a doll house as a toy, they're saying it's kind of like a digital doll house.

But later versions of the Sims added more and more specific goals. Like now you have to throw a party with at least five people in it. Or you have to attain career level five or something like that.

I can't remember exactly how they measured it. But that kind of has a goal. We are going to give more and more specific things for you to work towards.

But the Sims is very careful not to lose it's toy sense. This adds up. If you really want to just dick around with these guys, go right ahead. Just play around with them and see what happens.

AUDIENCE: Why is there a distinction for physical objects between toys and games, but for like video games-- like Mindcraft it is technically still a game but--

PROFESSOR: It kind of has different modes. Yeah.

AUDIENCE: I guess it has different modes, but it's more of a toy, I think.

PROFESSOR: I would say that's entirely marketing. The only reason is people haven't figured out how to sell digital toys. And there are games aisles in like Best Buy and so, well, this is a fun thing we're going to put it into the game section. Everyone starts calling it games.

And that's kind of the same thing with the Sims. It's that really the Sims should be it's own genre, but you can't sell it's own genre that well. [INAUDIBLE] Was there a hand over here?

OK, so let's start with Brenda's-- if it stops reading, so let's just move on to Brenda's. And she's very specific about the kinds of puzzles that she's talking about. Is that these things that get in the way of a very specific narrative experience that a game wants to guide you through.

She describes them more as roadblocks than anything else. But, you know, things to make the challenge higher, but possibly so high that no one is going to be able to get past them. Some of her examples are things that come up as, sort of, intermittent but optional mechanics like hacking in Bio Shop.

And sometimes there are things that you have to solve, especially in adventure games. There's this, you have to combine this object with that object and bring it to a specific location. And then now you can proceed with whatever narrative they've got.

AUDIENCE: She had this specific axe to grind against puzzles having meaningful rewards or not being completely bought in. So, for instance, she says you should never have a puzzle being required to open a door. She said, solve a puzzle and then get some kind of tangible reward like loot or something.

This is after I just spent the bus ride to New York City playing Professor Layton's. Which was nonstop, with on the door, it's got a lock on it, looks like a puzzle. So I wasn't entirely to sure

what to make of that. I thought that my Professor Layton experience was fine, and I didn't need to get fat Layton loot from some [INAUDIBLE].

PROFESSOR: That's actually something, and there's a really good article actually written by Clara over in our lab. Actually, it wasn't an article, it was the transcript of a talk that she gave at Austin University-- I'll send on the link to everyone-- about how you can integrate, and why you should integrate, puzzles really, really well into the narrative. It's like really why is there a puzzle in your game at all unless it's been integrated into the narrative?

And Brenda seems to be, sort of, providing a cautionary tale of the-- But if you do it badly, no one can get on with the story. No one can enjoy the rest of the game. It becomes this one thing that prevents you from proceeding? Is there anyone who had that moment? Yeah.

AUDIENCE: About five minutes into Mist. I don't know. It had some sort of cool live action video and stuff. And it looked like it could be an interesting story. That's kind using technological prowess of integrating video into 3D. And then suddenly I looked in to the picture and I was on an island. And then there was nothing happening and I had to turn things to face each other. And I couldn't figure it out.

AUDIENCE: When I originally played The Legend of Zelda. The original one. So they don't tell you anything pretty much. And so the temples, you just walk around the sun, then it's like, OK, there's a tree and a forest.

You're supposed to burn [INAUDIBLE] and there's the entrance to this temple that you can't proceed until you do this thing. And so, it's just like, how am I supposed to know that I'm supposed to burn this particular tree in the middle of this huge map?

PROFESSOR: Did you beat any of the other--

AUDIENCE: Yeah, and they didn't say anything.

PROFESSOR: No, I mean the other Zeldas?

AUDIENCE: Yeah, actually yesterday we [INAUDIBLE].

AUDIENCE: I was just saying, so the interesting thing is most people nowadays they end up playing, like the Ocarina of Time, Majora's Mask, they are moving backwards. So they end up playing the first Zelda after having played these old ones. So you sort of know that you're expected to do

these random things to get like across. So I feel like it's easier for people, but then--

AUDIENCE: But with the original Zelda-- you know how in new ones they have, let's say, a wall that you can blow up. It's discolored or something. In this one every tree looks exactly the same. They use the same stripes.

AUDIENCE: If I remember correctly, though, it's placed such that it's in the center of your screen, right? So it does look a little bit different.

AUDIENCE: No, it was just a random tree. It was just a whole bunch of trees. And so you just really have to get, whatever a type of thing to burn it-- a specific one-- and burn it.

AUDIENCE: I remember it was a little suspicious. Because I think there was a one tile column, you kind of navigate around just this loop. You just entered and--

AUDIENCE: That's suspicious.

AUDIENCE: And I'll feel very frustrated by games that require walk-throughs in order to play them.

PROFESSOR: Sure, and that was the other thing that she suggested some game designers do. They put the solution in the Prima Guide. So that you have to buy the Prima Guide in order to [INAUDIBLE].

AUDIENCE: Does Prima have a deal with the--

PROFESSOR: Oh, they must have.

AUDIENCE: They say "official" on the top for a reason.

AUDIENCE: It's also ironic, because modern Zelda games, it's very obvious that you have to use this or that item.

AUDIENCE: You've got a key. Use this key to open.

AUDIENCE: Oh, you got this item in the dungeon. You have to use this item to kill the boss. That sort of thing. It's blatant.

AUDIENCE: Well, for people who are really, really hopeless, there's that little fairy.

[INTERPOSING VOICES]

PROFESSOR: They're usually less useful than you think. So one big difference between the old Zelda games

and the new Zelda games is just this continual refinement in their user interface. And it goes all the way from little things like the notes that you hear when you find a new dungeon.

And exactly when, precisely, you hear the sound of, you know, too da loo-- at least I think that's how it sounds. You know, as a clue that now you have opened a door. That's one of those things that, if you look at post [INAUDIBLE] Ocarina of Time. I think there's a couple on Gamasutra, exactly when that sounds plays is a decision that was very carefully designed.

And it seems to me that in digital puzzles those kinds of, especially in some sort of narrative structure like in Ocarina, that's the big problem that you have to solve. You have to give enough clues. You have to give enough UI feedback. And you have to think about your UI so hard in a way that is going to make it possible so that we get all the information [INAUDIBLE].

So, say that burning fire tree situation, if there is nowhere else in the world where you can get that information, then it's back inside puzzle. If there is a guy in-- I can't remember Zelda I-- but there is a guy who actually tells you that that's the tree that you need to burn. But if it's not obvious, especially for someone who hasn't encountered that guy, that that's where you get that information it's still a bad designed puzzle. Even though now there's a solution.

But thinking about, and some examples will be in a lot of tech space adventures as well as text heavy graphical adventures. You have a, I can't solve this puzzle, but what my character says to the player about why you can't solve the puzzle is itself a clue. It's like, hm, I must not have the right item. Maybe there's something else I can use. That's a huge clue.

AUDIENCE: I feel like digital popular games have gotten really good at integrating hint systems in recent years. But I can't think of any physical puzzles that I've come across that may just not have quite been up to speed with crossword puzzles. That have that kind of not totally revealing the solution but giving you a gradual hint which can help you figure it out.

AUDIENCE: Well, mystery puzzles kind of do that.

[INTERPOSING VOICES]

PROFESSOR: Describe the mystery puzzle for folks who don't have--

AUDIENCE: It's basically, it's a competition run by MIT over IAP where teams of people compete to solve a bunch of puzzles, like 70 puzzles, that kind of build on each other. So you have, say, 20 base puzzles. And if you solve those 20 puzzles you get 20 words as solutions. And then those 20

words become a new puzzle, and that's the meta-puzzle. And it kind of keeps them like that for a couple layers.

But the point is the winning team from the previous year writes the next year's mystery hunt. So you get all kinds of varying puzzles of varying difficulties and styles. A very well-designed puzzle actually does that, because you have this thing called, flavor-- Oh, I guess I should say that the puzzles aren't like Sudoku or crosswords.

You literally just get something on a screen or something on a piece of paper, and you have to figure out what to do with it. You're not given any instructions for how to solve it whatsoever. And the only clues you get are either by the title of the puzzle, by the group of puzzles that it's in, or by this thing called flavor text.

Which is like, they say some kind of random phrase that seems to not have anything to do with anything. But that kind of gives you a clue about what to do in the thick of this puzzle. So that's kind of like what you were describing.

AUDIENCE: That's interesting, because it's really challenging when you don't have any mechanism for giving feedback to the person who is working a puzzle. In Zelda, or what have you, you can see that they've spent a long time dicking around.

PROFESSOR: It's kind of a double-edged sword, in that particular case, because you have so many mechanisms and now you're expected to use all of them in a game like that. You use sound, you have to use contextual buttons, you have to use the inventory. The position of the player matters or something.

I've seen games where the main clues is what is the character looking at, for instance. And you walk around, why does my character keep looking that way every time something happens? Oh, that's because-- you know.

So, yeah, as far as of a lot of physical stuff, I would say that one of the reasons is they're just starting to build these physical games from toys. A lot of the importance is, a lot of things you could possibly do, are kind of built into the physical object. And if you're building a puzzle based on what you could do with these things as a toy, then you're necessarily already using the constraints of what you can do with it as a toy in order to create the puzzle.

This might be a good exercise actually, if time-- we could take a shot at this. And just by, you know, trying to come up with a puzzle and see. But instead of imagining one in a digital space,

try to imagine one in a physical space. Because I suspect what you actually get is, you get a free language with physical puzzles. Because things physically have interactions that we [INAUDIBLE] from a digital puzzle.

ADAM: I feel like Coral Reef or something, and that's a game where like the puzzle-- I mean obviously it's still a digital game-- but the puzzles are very much physical puzzles. Like you kind of have an idea about what-- has Patrick played Portal, of course? Or know the idea?

I mean, you have these two portals and you understand what the physics is going to be like. So the puzzles aren't frustrating in the sense that it's like, oh, you realize there's this random statue here. And if you pull the lever it raises the water level or something like that. But it's very intuitive. It feels like a physical puzzle in a sense that I know what will happen if I do this. And I just figure out how to put the pieces together.

And also Portal what I think it does a really good job of, as well as some physical puzzles do, is having a learning curve. Like Tangram will have some basic puzzles, or I'm sure the falling thing, a lot of them do it.

Physical puzzle things where you like, I don't know, how to jump over pieces or whatever, have basic levels-- basic boards-- where they show you various techniques. And you only have to figure out one technique, and it's very obvious what you have to do. And later on you have to use those techniques.

PROFESSOR: Well in Tickle Her, this particular example does something that multiple portals does really well. Is that the very first puzzle that we did earlier only has one solution. And you do not get that solution unless you understand all the mechanics of the game.

But we tried to solve it a whole bunch of different times. And it's like because we didn't quite understand the rules, we couldn't get it until we understood the mechanics of the game. Now we can suddenly solve it.

So from puzzle number two onwards, we can't be confident unless you know it. *Portal,* and even-- actually just about any well-designed game-- but I would say *Portal* is a fine example-- if you've beaten a game, you can play through the game again with developer commentary. And when you show that, you actually realize that every single fairly intuitive physical thing that you pick up in the game had to be taught to you. And they've designed the level very clearly.

So right in the beginning of the game, if folks can't remember, you're trapped in the middle cell. And the GlaDOS talk to you, and a portal opens and you can walk through it. What do you see out of the first portal that opens?

AUDIENCE: You see yourself going into the other one.

PROFESSOR: You see yourself going through the other portal. And it's like, they force you to have to look at what the basic game mechanic is going to be before you can do anything else that's productive in the game. You know, you can pick up the radio, but--

So that was a design decision. They could have decided not to make it. They could have just made you go through that into a different room, and the learning opportunity would have dissolved right there.

So if you've got a copy of Portal, I would suggest go back and page through the commentaries because they are hilarious. And you're also rereading good form, demonstrating in this room, this is what we had to do in order to make people get it.

I'm also thinking of games like Mario World I where you don't get very far on this kind of basic game mechanics now. But they make it really gentle in that I don't think there are any hits that instantly kill you.

AUDIENCE: That's exactly what I was thinking in Mario. In the first Gamasutra article we read on late-game abstractions, we read about a Mario world. He's like, we expect the same kind of actions, key the system, all the time-jumping. And I guess you can kind of look at different things there, like double-jumping. And things like that in a specific puzzle. And the physical [INAUDIBLE] also.

PROFESSOR: I mean a lot of Mario's worlds are laid out basically as spatial puzzles, right? It's like you know you have to get there, but you don't know exactly how you're going to use all of the mechanics that you've got.

AUDIENCE: In Mario 64, I think their way of solving the impasse problem of not locking up all the content in the game because of the one puzzle you can't get, they're giving you so much to do that even if they don't really tell you-- even if a good 30%, 40% are going to remain mysterious to you, you're not really going to figure them out-- there's so much [INAUDIBLE] between, you never walked off with a significant amount of content.

PROFESSOR: So if you've got a hub-like structure you can do any one of five different things at any given

time. Plus you have some secondary solutions, like you can always go back to a world that you've been to before and try to collect all the stars, for instance. I think that's kind of what Brenda was kind of indicating.

You don't necessarily want, if you're putting puzzles in your game, she was advocating for-- Brenda and Ian were advocating for-- something that wouldn't necessarily progress on to the next one. But I think that's not a requirement. I think that's a, if you want to make your life easier, this is what you do.

If you decide that you're up to the task, you can achieve some really amazing effects by having your puzzles narratively incorporate it. Has anyone heard of the game called Eternal Darkness? It's a sort of Lovecraftian horror game on the GameCube.

I'll sort of describe it, but basically the whole basic idea is that you have four gods all warring against each other. Three of them hate one of them, but then those three also hate each other. And most of the puzzles are just sort of understanding that there is this mystical object. One god defeats another god defeats another god in a rock, paper, scissors circle. And all of them hate this one other [INAUDIBLE].

So early on in the game there is actually a puzzle, there are actually a number of different puzzles, where you see the symbols of these gods. And you have to kind of rearrange them in the correct order. And the rest of the game is all going to be variations of understanding what these gods do to each other. So those are all puzzles that inform you of how the world works.

And that kind of works in two ways. One, information that you've already gathered about the world-- about how this world works-- gives you clues on how to beat the puzzles. Beating the puzzles, finding the solutions for the clues, gives you information about how the world works. And that's kind of like the holy grail for a puzzle designer in a digital game, is that you're going to design a puzzle that's going to reinforce how the world works.

There's a chap-- who gave a talk, and I believe his name is Jeff Howard. He came to Camp [INAUDIBLE] and gave a talk last year. And he makes this case that games, and the logic that you present in games, do basically the equivalent of what magic systems actually do in the real world.

What people like cultists or astrologers do is they basically give you logics that explain how the world is going to work. And while that may not necessarily be obvious, but if it is viewed as a

whole knowledge you'll be able to understand how it's [INAUDIBLE] in you. But more importantly you'd be able to do things in the world that allow you to accomplish things that you wouldn't otherwise do.

Learning a game is very much like that, it's like I don't know how this world works but if I understood these particular rules I could be able to accomplish greater things. And puzzles can be one of those things where it becomes a test. And it becomes a test of, just exactly how well do you understand this?

Even if it is like in a combat game like Quake or God of War or something. I can understand how the combat system basically works if I just keep mashing the x button or something. Or just shoot everything with rockets.

But if I really, really understand the combat system, I might be able to hit something that I wouldn't necessarily be able to hit. I might be able to take down a horde of enemies instead of hitting them down one at a time. I might be able to beat a boss. And actually a lot of boss battles in digital games are actually puzzles.

There's not, how well do you generally react, it's can you figure out the pattern. But that pattern doesn't mean anything unless [INAUDIBLE] how all your other combat skills work. So a boss battle in Zelda only makes sense if you figured out how that one item that you picked up in that dungeon works really, really well.

OK, it shoots fire. That means that not only does it hurt them from distance, it also lights some of the things on fire. And that's what I'll tell the boss, basically, is combining this leaders ability to hook up. Like everything else that you've done before into taking it out. That's why boss battles, that always kind of puzzled me.

AUDIENCE: One thing I wanted to say, before I get going, you were asking about hints and a physical puzzle. The one thing that jumped to my mind was a couple years ago the weekly Day-- I don't know if anyone reads it, it's like a free Boston newspaper. And they always have crossword puzzles. For the longest time they were thematic, and so you would have a guest crossword.

The first one I ever did was Hulk Hogan. So all of the hints in the crossword puzzles are related to Hulk Hogan. So it's a question of, not what does this mean to me but what would it mean to Hulk Hogan? And they don't do it anymore, which is really depressing, because every week it was something different and it was like a built-in hand write as you went. You didn't just

pick them out literally, you have to kind of contextualize it.

PROFESSOR: You can think about all the things that come with the puzzle, that potential hook, [INAUDIBLE]. Like a title, like a data text-- as you were describing-- the fact that you get in puzzle and mystery crimes, they may be [UNINTELLIGIBLE] and they may be disillusioned but it lies on a different puzzle. Not the one I'm currently looking at right now, because that's how [UNINTELLIGIBLE].

Metal Gear Solid has a really, really bizarre one where--

AUDIENCE: Look in the back case.

PROFESSOR: Where they tell you, oh, there's a specific radio frequency that you need. It's written in the back of box. And it's like, the back of the box?

AUDIENCE: [INAUDIBLE] Anti-piracy.

PROFESSOR: Yes, but it's still a puzzle. And I was like, I know how to solve that. I mean, it was pretty obvious, because maybe it's just me, because it about half an hour to figure that one out. It took me some effort.

AUDIENCE: I mean Metal Gear Solid a lot of meta-puzzles like that. Like when you fought Psycho Mantis for the first time. Well, so the scene you had to do is you went to unplug your controller and plug it into the second port because he would read your movements. And it was this cool, physical layer of it where you're playing the game. Then you realize I have to interact with the physical world so that he can't see what I'm doing.

PROFESSOR: But that one [? cannot do, ?] because in that particular example that one gave you a very big clue because right at the beginning of that match that boss tells you to put your control on the ground. And he says, I'm going to control this controller with my mind. And actually, just [INAUDIBLE].

AUDIENCE: That's only if you have dualtech. So, because on PlayStation, if you didn't he just ignored that part. And you didn't get that clue at all.

PROFESSOR: Yeah, and that's a problem. But it's still very cool.

AUDIENCE: There were other clues, like you would talk about how you had been playing certain games by reading saves on your [INAUDIBLE]. At least not in Castlevania. I just remember being like--

[INAUDIBLE].

PROFESSOR: So basically it's giving you a clue that there's got to be something better about the way that you're currently playing. The funny thing about the radio channel is that one really did not give you any clue that there was something better. It just told you about the back of the box. It was like, it didn't tell you the back of the video game case, right. It's not going to be that specific.

AUDIENCE: It said CD case, specifically. I was really confused, because I think mine came in a slip of paper or something.

AUDIENCE: Yeah, if you buy it used or something.

PROFESSOR: Yeah, so it's anti-used game protection, as well. But yeah, mine was I think I actually said on the back of the CD case, but I was playing like a [INAUDIBLE] or something and that came in the DVD case. So I didn't make a connection.

But if you look at the back of it, you see what the radio frequency is in the screenshot. One of the eight screenshots that they show to demonstrate this is what the game is all about, there's the number and it's just right in there. And then key it in.

AUDIENCE: Has anyone played any of those breakout games? Where it's lock you in a room and you have to--

[INTERPOSING VOICES]

AUDIENCE: Yeah, you find the thing, you find a slip of paper and escape [INAUDIBLE].

PROFESSOR: So, actually who doesn't know what these are about? Escape the room. OK, so escape the room-- actually, could we bring up something on your computer?

AUDIENCE: I have to go grab the video thing.

PROFESSOR: Oh, the video cable.

AUDIENCE: It's back there in my office.

PROFESSOR: Oh, OK cool. Call [? Becky ?] to send it. Escape the room games are typically flash games. And they're kind of like adventure games because there's usually only one room, although sometimes you have multiple rooms. It's a much smaller world in most adventure games.

But the basic idea is the same. You pick up objects, you use objects in a room, and you try to make things happen. You know, if you haven't made anything, you are not progressing in the game. If you made something happen, you are almost always making forward progress in the game.

And there is, actually, a guide for playing adventure games written by Roberta Williams, who did the Original King's Quest series. And her guide is like, pick-up everything, go everywhere, use everything on everything. That's actually what escape the room really is.

But there's a little bit more to escape the room games, but there's just not that many things that you can explore. That's the idea is that you're stuck in a room. And basically it comes down to just use everything on everything until you figure out what comes up.

Rarely is it logical, often pretty entertaining, because they're animation heavy. So every time you do something right, you get some crazy animation. I put the fish into the mail slot and out appears an octopus. It's fun to watch.

For us, the kind of comparatively opposite of those are the Grow games. And they're a series of games called Grow. I think the guy who does them is called Eyezmaze.

And the whole basic idea is that imagine that you have a flower pot. And every time you add something to it something happens. But the order in which you are adding things to it makes different things happen. And there are solutions, basically, in making the optimal number of things happen if you do it right.

So what you can do is not a mystery at all. You have these six things that I could add to my pot. And I know those are the only six things I could add.

The question is what order do I do them? And doing them in different orders give you different results. And I feel that these two genres are kind of linked, but they're playing off very different things.

One of them is, I don't know what I'm going to do. But I know that whatever I do has got to leave this space. And the other one is very much, I know exactly what I can possibly do, I just don't know what order to do them in. So a couple of puzzles that you see online.

These are fairly encapsulated things. One game is one series of puzzles. There's not like a professor-made encyclopedia puzzle kind of thing. What time is it? OK, I think I'm actually

going to grab a few more puzzles and bring them in.

But I do actually want to try to see whether we can put together a list of the kinds of puzzles that we haven't talked about today. These could be physical puzzles, these could be puzzles that you've seen in a book by their genre. Logic puzzles, you know, of a certain kind that you either really, really like or you really, really loathe.

And just break up in groups of-- three, six, nine, Heather [INAUDIBLE], ten, eleven, twelve, seventeen people. Seventeen people? That doesn't divide at all. OK, two or three. Groups of two or three and just like--

AUDIENCE: Jason should be back.

PROFESSOR: OK, all right, then groups of three. How about we-- just like-- you know, just a couple of puzzles that we haven't discussed and a description about what they're like. And we'll quickly run through the class to sort of give everyone an idea of what--

As a toy, playing with a Rubik's Cube is more fun than the algorithm to solve it. That's not fun at all, in my opinion.

AUDIENCE: It's fascinating, you can also solve it. But it's [INAUDIBLE], very tempting when you look at it also.

AUDIENCE: So, one of the things you were talking about was interactive fiction. Text adventures. And how sometimes they could be considered just like if you're playing a regular adventure game but just with text instead. And so the puzzle could be how you interact with the world, or it could be trying to figure out what actions are available to the user. Like sometimes not all actions are there.

But also in some games the nature of text gives you different ways to have a puzzle. Like in Lost Pig, because you're playing an orc he doesn't know English very well. Or doesn't have full control of language, so you're trying to decipher his words to figure out what he's actually seeing.

PROFESSOR: Do you have an example you can do? To give with that to make it clearer? Because I haven't played it.

AUDIENCE: In that game, there is one part where he's describing a box and it has a slot. And you put

something in it and then it gives you something out. But the way he's describing it, you don't really know what he's describing until you realize he's talking about a vending machine. He describes it as a tall box with a slot in it.

And another example we were talking about was the game Aisle, which is you're this guy in a grocery store. And it gives you this big prologue. And you have one action that you can do. So after you type in your one action, it tells you what happens and gives you an epilogue. And then the game starts over.

But then using the information from that epilogue, you have a different choice of actions that you can take and different key words to use. And so by playing it over and over you're uncovering more of the story until you get somewhere.

[INTERPOSING VOICES]

AUDIENCE: Aisle. A-I-S-L-E.

AUDIENCE: We also thought about puzzles that were games put into a very contrived scenario. Like bridge puzzles, or chess puzzles, or back when the Duelist magazine still existed they had Magic the Gathering puzzles.

PROFESSOR: So like chess puzzles are like, here's this board. What was the move that led to this board.

AUDIENCE: Or like, black to win in three moves. Something like that.

PROFESSOR: So that's like, you are now placing additional constraints on the game.

AUDIENCE: Yeah, exactly. It already puts you in a situation like, pretend you're in this game. Now, we promise you there's a way you can automatically win, you have to find it.

PROFESSOR: There's a number of computer games like *ChuChu Rocket* and everything where it does like completely separate modes. *ChuChu Rocket* is a frenetic both player--

AUDIENCE: It's a mice-herding game. You have to get them into rocket ships, so they go in space. It was for the Dreamcast. It's so good. The idea's really simple.

A bunch of mice wander around the streets, and each player gets to place three arrows. And when the mice run under the arrow they follow the arrow. So you want to get all your mice on your ship, and want to get the cats on the other ship so that they eat their mice.

PROFESSOR: In puzzle-mode, you have three arrows in these particular directions. But the way you place them, you have as much time as you want, but there's only one right answer. And that immediately shows you the difference between a game and puzzle. Right there. Even though they are all in the same package.

AUDIENCE: So, first off I don't like jigsaw puzzles, but Michelle loves them. And then we also talked about whodunit's. And I really love whodunit's because you have to pay attention to the detail in the stories.

Like the one thing that-- I guess the example that we were talking about is, if there's a mailman and it happens to be on a Sunday, he probably committed the crime. Because they don't have mail on Sundays. And it's like small details like that.

PROFESSOR: Are you talking about mystery books or just like little paragraphs?

AUDIENCE: Well, it's usually like a story. And they say, oh, here's the scenario, here's the background story, who is the murderer?

PROFESSOR: They compare it though, [INAUDIBLE].

AUDIENCE: People have parties like that, like full-on whodunit parties.

AUDIENCE: That's very true. I didn't see who was talking for a second. Who's talking?

AUDIENCE: Another puzzle we came up with, was the ones that you did in elementary school with like the big grid. And you would have someone's name, and maybe their favorite food, that you would give them a bunch of clues and you have to match them. Yes, with something like the checks and the xs and stuff.

PROFESSOR: So, that's just generally called logic puzzles, I believe. It's just you are given the incomplete set of information but enough constraints that you can figure out the rest of the information. And really the way to solve it is just write everybody's name, all the characters that you're given in the prose.

Write down all the characters on one column. Write down all the things you're trying to figure out, like who's wearing what colored shirt, for instance, so just write out all the colors on the other column. And just by the process of elimination, just figuring out, usually the answers are mutually exclusive. So if somebody is wearing a red shirt, can not be wearing a green shirt.

AUDIENCE: So part of the much harder ones are every fourth statement is false. Like you don't know if one statement is definitely false. And I've seen one where every statement is false except for one. And I can bring in my book and there's like [INAUDIBLE].

PROFESSOR: The worst version of it is figuring out how puzzles see people in the world.

AUDIENCE: They wouldn't fix it before because he pushed it out last week.

PROFESSOR: You guys want to throw in any?

AUDIENCE: Sure, we started by trying to think of all the puzzles that we really dislike. And we came up with a couple here. The sliding square puzzles, you know where you have like-- Basically just a variation on a jigsaw puzzle where the rules are more constrained. I don't like jigsaw puzzles either. So we're like-minded there.

And then John had a couple. I guess there's a Light's Out puzzle. Inside the image you touch certain areas and [INAUDIBLE].

PROFESSOR: So you've got like a grid of buttons and every button you push will invert all those neighboring buttons. Like implanting the top button, left and right, will-- [UNINTELLIGIBLE].

AUDIENCE: And then I guess I already described the concentric circle thing. Yeah, their puzzles are similar that we're taking an action on one item in the scene. These are incredibly difficult, the concentric circle ones, will have an effect on other things in the system.

And typically these are used in games where there will be a center podium with a pathway leading off. On one side of the podium, then there will be a concentric circle around the concentric ring with a pathway off of that ring and another interval. Then more and more circles to each side and you get to rotate individual circles and that will rotate the other circles different ways. And you need to create a pathway.

AUDIENCE: Every time I rotate one, something else is going to rotate.

AUDIENCE: Then it's always going right before you're [INAUDIBLE].

AUDIENCE: I guess three of those are examples of games where you have to take action on an environment, but your action has direct effects throughout the environment. And it's just really annoying figuring out how to optimize that.

PROFESSOR: But they are predictable effects. It's like every time I rotate this one left, that one's going to rotate right.

AUDIENCE: I think it's kind of funny how the context has a lot to do with whether these puzzles are annoying or not. Because I do enjoy Professor Layton quite a bit. And it's the most, through an arbitrary character in order to justifying that you're trying [INAUDIBLE]. It's just fun. Your intention on even playing the game is that you're going to be solving puzzles. Not as [INAUDIBLE].

[INTERPOSING VOICES]

AUDIENCE: Also, the way that is presented makes it funny in that as well, right. So the mafia goons come up to you and say, we're going to stop you from coming in here unless you solve this puzzle. Shouldn't you just shoot me? It would solve all your problems. No, no, solve this puzzle.

PROFESSOR: It's like they're making fun of themselves even. All right, cool.

AUDIENCE: I'm not sure if we really commented on what we liked or didn't like. But some things that we came up with that haven't been brought up yet are cryptics, which are kind of a combination between crosswords and riddles, riddles, combinatory games as a puzzle apparatus. Logic puzzles in general, not just like typical logic puzzles like that.

You can have state machines, or Sudoku, or any type of numerical puzzle. We also want to differentiate that a lot of those games, or some of those games, are spatially oriented and some aren't. Which we thought was an important aspect, but not necessarily definitive of a completely different genre.

PROFESSOR: I'm not sure I've seen a state machine puzzle, actually, outside of a computer science textbook.

AUDIENCE: I know some.

PROFESSOR: I'll never ask you. I expect it's going to be more involved than we have time for. By combinatory puzzles you mean stuff like--

AUDIENCE: Combinatory games. All the games that fall under combinatory game theory.

AUDIENCE: Like Nim's. [INAUDIBLE]

AUDIENCE: These are sort of exploration, so games where you have to see everything around you to know what is available for use. On the [INAUDIBLE] so in the book they talked about actually Zelda, and just--

So a situation in a game that I didn't like is, you're playing a game and something happens you don't step too fast or something. And because of that, you get too inert. You're in a spot where you don't have the tools necessary to beat the enemy right in front of you. But you also are trapped and can't go back.

It happened to me one time. It was the Star Wars: Knights of the Old Republic. There's an enemy, you couldn't go forward, and there was a cliff so you couldn't get back up. And so, since I couldn't do anything I was forced to completely go back to the last save.

PROFESSOR: But is that a puzzle, or is that just a bug?

AUDIENCE: I mean, it's time worth expiration and it's an item use. So you need to get an item to go ahead. If you have this item, then the enemy that you-- I think it was like a Rancor or something-- you could beat the Rancor or at least put it to sleep and walk by it. But without it, you had to try and beat it or it would kill you.

PROFESSOR: OK, so it was a item that would have made combat easier, basically. But they kind of made it this one way with-- yeah. So you see a lot of puzzle games where they have easy reset, right. And it's like you can stop trying to solve it and you really screw up something along the way You hit reset and go right back to the beginning. Nice that the Republic has no easy reset. You live with the consequences, I guess that's what they were trying to go for.

AUDIENCE: All right, so we've also had a loathing sliding puzzles--

AUDIENCE: Either with numbers or pictures, both of them are equally annoying. But, on the other hand, Alec loves Rush Hour.

AUDIENCE: It's the traffic red light game where you have to fly cars out of the way to form a path.

AUDIENCE: In Professor Layton there are an awful lot of sliding puzzles that have differently shaped pieces, or oddly shaped pieces. Which is slightly more interesting, or less annoying than regular sliding puzzles but it's still incredibly frustrating.

AUDIENCE: Well, I think the difference there is that when you have differently sized pieces-- When you're

doing just like a sliding puzzle where you're trying to recreate an image there's definite patterns that you keep using over and over again, because you're just like a rotating spaces. So it's not actually interesting. Whereas Rush Hour you actually have to think about things fit together.

So one other puzzle type that we haven't really mentioned, that I actually really enjoy, is pictographic puzzles. Where it relies on sort of your association with visual images and wordplay and stuff. Like, for example, you'll have a puzzle that's just an image of an eyeball, a bumblebee, and a screen shot of Judi Dench in a James Bond movie. And the idea is it's IBM. So I love puzzles like that.

[INTERPOSING VOICES]

AUDIENCE: Yeah, so stuff like that where it relies on someone, like a human being, actually associating information with something visual. Rather than it being just a straight modern puzzle where you have this information and you use this to derive the rest of the information.

PROFESSOR: There's R-E-B-U-S, and of course those are very language focused even though they're image-based.

AUDIENCE: What one has the two lines and then [INAUDIBLE] in the middle?

AUDIENCE: Well, things like that, yeah.

PROFESSOR: You had Rebus where you are trying to basically reconstruct a sentence. And then I forget what's the classification of puzzles where you're given a certain lead of images and you're trying to write enough. But if I wrote it in-- this is not a good puzzle but just to give an example-- if I put [INAUDIBLE].

I think there is a specific word for these kind of things. But the whole idea is you're trying to reconstruct these sayings or these [INAUDIBLE] from individual theories. So I mean, these are usually spatial to begin with. I think there was a whole game show in the '80s that was just all--

[INTERPOSING VOICES]

AUDIENCE: Australia had a show called Catch Phrase which was--

AUDIENCE: Yeah, I think Catch Phrase was the show.

AUDIENCE: So we wrote a B-list of different types of puzzles, so let's just run through them. All right, we've got lots of different sliding puzzle variants. We've got hidden object finding, the variance on Where's Waldo and then it's kind of [INAUDIBLE].

We have riddles, various kinds of logic puzzles, particularly two of which we've mentioned before. Several people, witnesses, give statements. One of them is a liar, which one's the liar. So find the hidden sinister person. And then there's the figment property x is next to figment property y, what order are they sitting in? That kind of puzzle. There's a million of them in Professor Layton.

There's these kinds of unraveling, or reverse-engineering type, puzzles. Where some system has been permuted and you have to restore it to its original state. Which Rubik's Cube is like the canonical example, I guess. But then there's a bunch of other different good ones.

PROFESSOR: I mean that chess games is kind of in that category too.

AUDIENCE: There's tile rotation and swapping puzzles. One example of this is Bioshock hacking, but then there are 1 million other variations on exchanging tiles or swapping them around or this kind of thing. Lots of different kinds of math puzzles. This particular word transformation puzzle type that I used to see all the time when I was a kid, where by changing one letter or word per step, you had to transform one word into another.

Mazes, jigsaw puzzles, code breaking nobody mentioned yet. And then also, these kind of full experiment type puzzles. I don't know how else you categorize them.

PROFESSOR: Give us an example.

AUDIENCE: All right, so I'm trying to remember how this works but I think it is-- this one popped up on Day(9)s podcast the other day. I only give it because otherwise if I get it wrong then people will go oh my God, and try and puzzle it out. So it has to do with the piece of string and burning.

AUDIENCE: Oh, the 13 minutes?

AUDIENCE: Yeah, do you remember exactly how it goes?

AUDIENCE: OK, you have two pieces of string. You know that the whole string takes an hour to burn but it's not linear. You have an infinite supply of matches, how can you measure 15 minutes with this string?

AUDIENCE: One of those lateral thinking puzzles.

AUDIENCE: I would classify this under riddles, but--

[INTERPOSING VOICES]

AUDIENCE: Let them go, but they both take an hour-- [INAUDIBLE] but they both take an hour to burn, non-linearly.

AUDIENCE: Couldn't you just be lighting matches the entire time, and see how many matches you can burn an hour. After that, just take four to that number--

AUDIENCE: Then how are you going to measure that original hour? [INAUDIBLE]

AUDIENCE: But you know that the thing takes an hour to burn, yeah?

AUDIENCE: The whole thing.

PROFESSOR: It will take slightly longer than the amount of time it takes to get to class. We close by then. It would be nice to give people time to think about it too. So answer on Wednesday.