Pacific Rim **Notes**

THE FILM

- It's funny how it starts with dictionary definitions/etymologies of the words "kaiju" and "jaeger." I think it's because of this film that "kaiju" is now a loanword in English.
- This prologue is a series of films or TV series waiting to happen. The anime trilogy copied this.
- This film is an ending to a long story.
- "To fight monsters, we created monsters of our own." Wow!
- How very much like wartime: we make the warriors into celebrities.
- Did he just quote *Star Wars*?! "Hey, kid, don't get cocky!"
- The concept of these robots is so cool! The hemispheres, drifting, drift compatibility. Very anime.
- This has one of the best movie soundtracks of the last decade. FIGHT ME!
- The worldbuilding and attention to detail are some of del Toro's trademarks. This is by far my favorite of his commercial films—if not all of his films.
    - There are a lot of details that are only mentioned in passing. Some say that's bad writing. I say the opposite.
- "The deeper the bond, the better you fight." Thematic statement.
- The Jaegers and Kaiju have some of the coolest names *ever*.
- "When you're in a Jaeger, you can fight the hurricane. You can win." Thematic statement.
    - Kaiju are natural disasters (very Japanese), and are categorized like hurricane or tornados.
- The film handles the loads of exposition very nicely. It gets most of it out of the way within ten minutes. Then it shows us the rest.
    - We also get some exposition during the Drift.
- I don't even want to think about the phantom pain of losing an arm. Or the agony of feeling your brother's death.
- The film is great at showing scale by having humans or easy reference objects around the huge things.
- Thematic statement: build walls in the hopes of keeping the enemy out. It fails.
- Idris Elba is such an intense guy. I love it! He'll just as soon be your best friends as your worst enemy. He communicates a books-worth of character without even talking.
- Oh, Mako. You're an anime girl come to life. Of course there would be a Japanese in this film.
- Gottlieb and Newt. I used to be on a podcast where my cohost and I were like them.
    - "Kaiju Groupie." Ha! Now I know where Michael got it.
- The Jaegers are full of personality. They're very indicative of their home countries.
    - Of course the Russian Jaeger is the only Mark I still active.
    - Gypsy Danger was intentionally designed to walk with a gunfighter's gait. It made her look trustworthy and heroic.

- Is Raleigh and Mako's relationship romantic? It seems to be because I detect some sexual tension, especially when she secretly watches him when he's shirtless. I'm glad they didn't kiss at the end, though. They're two people who cut themselves off from people who have to learn to connect with each other.
- Pilots are called "Rangers." And they pilot giant robots. Of course.
- Jaeger piloting, as illustrated in the training fight, is like a ballroom dance: each partner has to do their part to make it work. It works best with highly compatible partners.
    - Raleigh even leads most of the time in the cockpit as the more experienced pilot.
- Another theme: risk taking. Raleigh had a rep for taking plenty. Newt takes one drifting with a kaiju brain. Pentecost takes one by defying his superiors with one final assault.
- Even minor characters have plenty of character. One operator has suspenders, a bowtie, and a greaser haircut.
- The Precursors' plan is spelled out here, and it's contradicted by the sequel.
- There's a lot of great practical effects here—like the Kaiju bits—to complement the CGI.
- I've heard some complain that there are too many scenes at night with rain. Maybe they are hiding imperfections in the effects—but it also helps set the mood. It's atmospheric.
- How is Gipsy analog?
- This was a blockbuster with lots of color when color was being drained from even superhero films.
- Ron Pearlman steals every scene he's in as Hannibal Chow.
- The Hong Kong fight is pure tokusatsu. It's Ultraman, it's Godzilla, it's all of it! The set pieces are clever. You can follow everything.
    - (I love how the bird never flies away until its perch is barely tapped).
    - Double tap. Smart, Raleigh.
    - As big and bombastic as this film gets, del Toro also knows when to use silence (no music when Gipsy gets thrown, before the Kaiju digs in to the shelter).
    - Otachi looks like any of the snail kaiju from the Ultra series.
    - Otachi flying into orbit is absurd—but I don't care.
    - Sadly, the Hong Kong fight is the best action scene in the film. The finale couldn't equal it, even with a bigger Kaiju.
    - Although the moment where the nuke blows the water away for a second was really cool.
- They go inside a Kaiju. *Gamera vs. Jiger*, anyone?
- I'm amazed Hannibal survived. That was a scene added later because he resounded with test audiences.
- The "Canceling the Apocalypse" speech always makes me smile.
- So, why didn't Gottlieb betray the human race, too, in the sequel? He drifted with a Kaiju brain, too.
- Raleigh gets his other arm ripped off!
- This is a film devoid of cynicism. It's earnest. It's about simple heroism.
- Passing through the Breach gives me *Star Trek: The Motion Picture* vibes.

- The song that plays during the credits is a duet between Pearlman's daughter and the RZA.
- The film is, appropriately, dedicated to Ray Harryhausen and Ishiro Honda.

Commentary by del Toro

- This wasn't intended to be a nostalgic cash grab but a tribute to tokusatsu, kaiju, and mecha.
- He wanted the prologue to have a "found footage" feel, but he wasn't good at that, so he hired it out. Del Toro did storyboard it, though. It also develops a glossary of terms and then starts the story.
- He knows the characters are "types" and need to be established quickly.
- Worldbuilding requires texture and detail. He show the launch in detail once, and then you don't have to show it again. It isn't just big details: it's the small details, too.
    - Gipsy Danger is designed to resemble a WWII fighter and has a "John Wayne gait."
    - He doesn't make "eye candy" but "eye protein." 50% of a film's story is in audio-visual detail.
    - Everything is designed to look damaged, used. He calls it "goth tech."
    - He would select shots, especially in the first fight, that could've been taken by real cameras as opposed to selecting what would look "cool." He wanted to create a sense of childlike awe.
- He describes the first Jaeger launch as the "Thunderbirds launch." That inspiration for him and, he says, for Tsuburaya.
- He wanted it to be romantic and operatic. That's why he used a lot of water and rain.
- Raleigh and Mako have the fewest lines, but their story is told in visual details.
- Del Toro watched sports movies, not action movies, to make this. Raleigh is a returning star. There's also a hotshot star.
- This is a global movie with aliens attacking everywhere. "The world saving the world." "We are all inside the same robot." It's a movie about togetherness. The pilots will see the best and worst about each other in their memories and learn to trust each other.
- Mako's color is blue. She has blue in her hair because she was stained by her past (Kaiju blue).
- The Shatterdome is designed to be a hangar and a cathedral.
- The dominant pilot is the right pilot.
- The cast are parts of one singular character: humanity.
- The Kaiju are much like wrestlers.
- He says the kaiju genre is a gift that happened by accident.
- He strove for what he called "the Nakajima Factor": he wanted it to be possible to make in the '60s with suits.
- The training fight is where Mako and Raleigh connect; he shot it like a courtship, like a dance.

- He told the Kikuchi and Hunnam that he wanted “effortless heroism.” It was supposed to be a throwback to old-fashioned adventure movies. He wanted a humanistic movie, not a militaristic movie. They come together despite or because of their flaws.
- The scene where Newt recounts what he saw in the brain, del Toro made Day do 20 takes and literally had him shaking and crying because he kept demanding more emotion from him.
- The Japanese don’t have the fear of technology the West does. Kaiju came to symbolize Japan itself, a symbol of healing. Mecha became mythical heroes. Mecha are giant suits of armor. Super robots have their own personalities.
- The Battle of Hong Kong is the scene he’s most proud of, but he had to build to it with Newt and Pentecost and then Newt and Chow.
- His favorite scene is the one where Mako disappears into her memories. The “blue” of little Mako’s clothes stains her hair and heart. It’s very theatrical. She’s like a princess being saved by a knight in shining armor.
- They created several blocks of futuristic Hong Kong for the film—and destroyed them. It allowed del Toro to use crazy anime-esque colors. Del Toro and his production designer spent months designing his wardrobe.
- People like William Gibson, Takashi Miike, and Hideyo Kojima, among others, loved the film.
    - Gibson: The movie is unabashedly itself, and anyone who doesn’t like it, doesn’t like it for being itself.
- It’s a mistake to evaluate each character as an individual. They have to be taken as a group.
- Del Toro and Beechem created a 300-page bible that included what would happen if a Kaiju fell. It dealt with real estate and religion.
- There are two schools of Kaiju design: Akira Watanabe (realistic) and Toru Norita (surreal and outlandish).
- His favorite shot is the Kaiju leaping out of the water on Crimson Typhoon.
- He uses natural, in-universe lighting. When Leatherback fight Gipsy, it’s lit by a helicopter so it’s like a boxing match.
- He intentionally made each fight different visually and tonally. Humor doesn’t come in until the Hong Kong fight. He even made a “visual pun” with the ramp in the kaiju shelter that has lights as eyes and a claw as a tongue.
- They used maquettes and miniatures to make it feel old-fashioned. Del Toro believes in combining all techniques.
- Tull and del Toro wanted to make sure that Mako always had the big moment with the sword, especially when it would normally go to the male character. “For my family!” = the family she lost and the family she gained with her comrades.
- Del Toro says this is the closest he came to “painting” with film.
- Del Toro says are lies that become believable thanks to details.
- Del Toro told Elba to not turn around at first but to slowly do it as a powerful gesture. He wouldn’t print until he got a take where the crew applauded. He made this on faith and

love. He didn't want to be postmodern and ironic. **You make it for the kids who are gonna talk about it ten years from now. (We are those kids).**

- Family is very important in his films. "No matter how many times you drift with someone, you still have to say, 'I love you.'"
- The film wasn't filmed in 3-D, but del Toro shot it as 3-D-friendly (foreground objects, etc.). He supervised the 3-D conversion personally with advice from James Cameron.
- Raleigh's arc is embodied in his three fights: he loses a partner, he gains a partner, he saves the new partner. When he talks to Pentecost at the construction site, he's standing next to a "throne" with an incomplete circle. He comes full circle.
- He didn't want to do motion capture because he wanted the animators to bring their personalities to the characters/creatures.
- Gipsy going to the Precursors' world is a reversal: they have a giant monster invading their world. Religious symbolism with its extended arm?
- Del Toro came under budget. It allowed him to do a few days of reshoots.
- Humans are the smallest element (in scale) but the most important spiritually.
- The filmmakers loved Chow so much, they had to bring him back. Del Toro admitted he has a weird obsession with shoes, so he wanted Chow to get a conclusion to his shoe story.
- Del Toro said this was the best filmmaking experience he ever had.

Blu-ray special features:

- Disc 1: "A Film by Guolermo del Toro," "A Primer on Kaijus and Jaegers," "Intricacy of Robot Designs," "Honoring the Kaiju Tradition," "The Imprtance of Mass and Scale," "Shatterdome Ranger Roll Call," "Jaegers Echo Human Grace," "Inside the Drift," "Goth-Tech," "Mega Sized Sets," "Baby Kaiju Set Visit," "Tokyo Alley Set Visit," "Orchestral Sounds from the Anteverse."
- Disc 2:
- They started using frontier language: "riding a Jaeger," "Jaeger jockey." This was the Alamo, a last stand.
- Japanese kaiju aren't limited as much by biology like western monsters. They're almost ornamental.
- Del Toro described this as a "universe of toys."
- There is no tradition in the west of mecha.
- Del Toro was influenced by Tetsujin-28 and Space Giants for the Jaegers.
- Del Toro believes that people who love mecha and kaiju films, that love comes from somewhere pure. It reminds them of being a kid.
- Del Toro told his designers to never use reference. He wanted it to be based purely on what the machines needed in the PacRim universe. They started with silhouettes and designed on on top that.
    - Cherno Alpha was inspired by a tank and a nuclear reactor.
    - Striker Eureka was inspired by an ATV.
    - Crimson Typhoon had lots of red and gold.

- He didn't want this to be a reference or homage movie.
- The Kaiju are outlandish, but they strove to echo real animals (gorilla, shark, eel, etc.)
- The joy of kaiju is the same as a wrestling match: seeing Kaiju with different powers clashing.
- Del Toro didn't want naturalistic movements in the robots; he wanted them to be machine extensions.
- Pentecost is an anchor point, a father.
- The Russians are two former security guards who protected the border. Del Toro didn't give the actors many details so as to keep their relationship vague.
- As barriers between the characters fall, they become heroes.
- Del Toro wanted the stick fight to be as real as possible: no wires or stunt doubles. Kikuchi never held a stick in her life. She and Hunnam started from scratch.
- Beacham wanted the Drift to be an ethereal place where the pilots would see each other as ghosts. Del Toro simplified it to be memories.
- The transition from Mako in the cockpit to her memory was done entirely in camera, theatrically.
- Del Toro wanted a drab universe illuminated by colorful light.
- The sets had hydraulic system that would make everything on them bounce.
- Entering the Shatterdome is actually 8-9 walks by the actors on the same stage.
- Being in the Jaeger cockpit was the hardest thing any of the actors did. It was physically grueling. They were basically on an elliptical machine for 14 hours a day and getting thrashed around.
- Mako's memory scene had shots switching between a set and a real street. Del Toro had to direct a little actress with an interpreter. The girl was a determined professional.
- The composer made the theme for each category of Kaiju get and sound bigger. Brass heavy. Raleigh/Gipsy's theme had guitar and strings and sounded more modern.
- If del Toro had more money, he would've shown the inside of the Kaiju temple. He thought the bones inside of a mammal's nose looks like a cathedral.
- The sets in the beginning are much nicer and cleaner. It shows that people are winners and arrogant. The last time, according to del Toro, we had a clear understanding of heroism was WWII.
- Mako is bunched up and alone under her umbrella. He uses them symbolically.
- Del Toro calls John Knoll, the head of ILM, the hero of this movie.
- Del Toro supervised the VFX personally. He would meet with the artists and draw on a tablet.
- They had to make decisions as to when to cut to the pilots to act and when to let the robots do the acting.
- The Jaegers were meant to be like nukes but much more manageable. They were meant to minimize collateral damage.
- Del Toro worked hard to show how kaiju attacks would change the world economically, culturally, and societally.

- The pilots feeling pain when the Jaeger is damaged isn't a design flaw: fighters need the pain to know where their opponents are.
- Cherno Alpha's head looks like the top of a submarine. He's a Greco-Roman wrestler.
- Crimson Typhoon is a martial artist, agile, nimble.
- Striker Eureka is the newest one; a football jock; a jet fighter, a Ferrari; he's the brawler at a bar; kickboxer. Outback attitude: will fight with a toothpick.
- Gipsy is a locomotive. Her design was inspired by art deco, so architecture. "Old-fashioned values are reflected in its solid iron core."
- Theme: "We ae only complete when we are together."
- Some movies are about incredible disasters. This one is about incredible solutions.
- "It is the size of our spirit that lets us triumph over adversity."

Other sources

- https://pacificrim.fandom.com/wiki/Pacific_Rim_(film)
- https://www.imdb.com/title/tt1663662/
- https://en.wikipedia.org/wiki/Pacific_Rim_(film)
- "In February 2006, it was reported that del Toro would direct Travis Beacham's fantasy screenplay, Killing on Carnival Row, but the project never materialized.[6] Beacham conceived Pacific Rim the following year. While walking on the beach near Santa Monica Pier, the screenwriter imagined a giant robot and a giant monster fighting to the death. "They just sort of materialized out of the fog, these vast, godlike things." He later conceived the idea that each robot had two pilots, asking "what happens when one of those people dies?" Deciding this would be "a story about loss, moving on after loss, and dealing with survivor's guilt", Beacham commenced writing the film.[7] On May 28, 2010, it was reported that Legendary Pictures had purchased Beacham's detailed 25-page film treatment, now titled Pacific Rim.[8]"
- In 2010, del Toro pitched to Universal an adaptation of Lovecraft's *At the Mountains of Madness*, which would be produced by James Cameron and star Tom Cruise. Sadly, the project fell through because del Toro wouldn't compromise on a $150 million budget or an R rating. Del Toro was hurt by this. It happened Friday, but having head Beecham's idea for PacRim, he signed on for that Monday.
- "Del Toro cut approximately an hour of material from the film. The unused footage explored the characters and their arcs in greater detail, but the director felt it was necessary to strike a balance, stating: "We cannot pretend this is [Henrik] Ibsen with monsters and giant robots. I cannot pretend I'm doing a profound reflection on mankind." Each character's arc was edited down to its minimal requirements.[28] The director wanted to keep the film around two hours, particularly for younger viewers. Alejandro González Iñárritu and Alfonso Cuarón helped with the editing; Iñárritu removed ten minutes of footage, while Cuarón removed "a few minutes" and rearranged several scenes.[29] Iñárritu and Cuarón receive a "special thanks" in the film's credits, as do James Cameron and David Cronenberg."

- “Del Toro, a self-described pacifist, avoided what he termed "car commercial aesthetics" or "army recruitment video aesthetics", and gave the characters Western ranks including "marshal" and "ranger" rather than military ranks such as "captain", "major" or "general". The director stated that he "avoided making any kind of message that says war is good. We have enough firepower in the world."[20] Del Toro wanted to break from the mass death and destruction featured in contemporary blockbuster films, and made a point of showing the streets and buildings being evacuated before Kaiju attacks, ensuring that the destruction depicted is "completely remorseless". The director stated: ‘I don't want people being crushed. I want the joy that I used to get seeing Godzilla toss a tank without having to think there are guys in the tank ... What I think is you could do nothing but echo the moment you're in. There is a global anxiety about how fragile the status quo is and the safety of citizens, but in my mind—honestly—this film is in another realm. There is no correlation to the real world. There is no fear of a copycat Kaiju attack because a Kaiju saw it on the news and said, "I'm going to destroy Seattle." In my case, I'm picking up a tradition. One that started right after World War II and was a coping mechanism, in a way, for Japan to heal the wounds of that war. And it's integral for a Kaiju to rampage in the city.[47]’”
- “According to Travis Beacham, in an earlier version of the script Mako and Raleigh spoke two different languages for a majority of the film. After connecting as pilots, they slowly began to understand one another, and before the end they heard each other speaking in their own respective languages. The only remnant of a language barrier is when Raleigh speaks to Mako in Japanese, and she is surprised he knows her home language.”
- “Ron Perlman kept the shoes he wore on this film. Later on, his wife had them melted down and converted into a pair of heels for herself.”
- “In the original story Pacific Rim (the story the movie was copied from), the name Gipsy Danger was taken the pilot's name. In the original story, the pilots of the robots named their robots after their last name. Alexander Gipsy was the main character in the original story. And since he was always taking risk, and could be dangerous, his robot was named Gipsy Danger.”
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<u>TOKU TOPIC: Cloning</u>

- Sources:
  - https://www.ncbi.nlm.nih.gov/books/NBK223960/
  - https://www.genome.gov/about-genomics/fact-sheets/Cloning-Fact-Sheet
  - https://en.wikipedia.org/wiki/Cloning
  - https://www.livescience.com/how-cloning-works
  - https://www.fda.gov/animal-veterinary/animal-cloning/myths-about-cloning
  - https://www.aaas.org/resources/american-association-advancement-science-statement-human-cloning
- “Reproductive cloning is defined as the deliberate production of genetically identical individuals. Each newly produced individual is a clone of the original. Monozygotic

(identical) twins are natural clones. Clones contain identical sets of genetic material in the nucleus—the compartment that contains the chromosomes—of every cell in their bodies. Thus, cells from two clones have the same DNA and the same genes in their nuclei."

- "All cells, including eggs, also contain some DNA in the energy-generating "factories" called mitochondria. These structures are in the cytoplasm, the region of a cell outside the nucleus. Mitochondria contain their own DNA and reproduce independently. True clones have identical DNA in both the nuclei and mitochondria, although the term clones is also used to refer to individuals that have identical nuclear DNA but different mitochondrial DNA."
- "…some plants and single-celled organisms, such as bacteria, produce genetically identical offspring through a process called asexual reproduction. In asexual reproduction, a new individual is generated from a copy of a single cell from the parent organism."
    - "Similarly, parthenogenesis is a unique biological phenomenon that results in the spontaneous creation of natural clones — it happens in some species of sharks, amphibians, lizards and snakes. In humans, every cell in the body is a clone of the first embryo cell created when the father's sperm fertilized the mother's egg, and identical twins are natural clones."
    - "Actually, cloning isn't new at all. In fact, we eat fruit from plant clones all the time, in the form of bananas and grafted fruits. We've been cloning plants for decades, except that we refer to it as "vegetative propagation." It takes about 30 years to breed a banana from seed, so, to speed the process of getting fruit to market, most bananas, potatoes, apples, grapes, pears, and peaches are from clones."
- "There are three different types of artificial cloning: gene cloning, reproductive cloning and therapeutic cloning.
    - "Gene cloning produces copies of genes or segments of DNA. Reproductive cloning produces copies of whole animals. Therapeutic cloning produces embryonic stem cells for experiments aimed at creating tissues to replace injured or diseased tissues.
    - "And perhaps the most medically applicable type of cloning for humans is therapeutic cloning, which creates cloned embryonic stem cells of a patient to create genetically identical cells that can treat a medical condition. "Therapeutic cloning refers to the use of embryonic stem cells that in our lab we derive from somatic cells from a patient's skin," Shoukhrat Mitalipov, an embryologist at Oregon Health & Science University in Portland, told LiveScience in an email. "In our research lab … we can develop [these cells] into different kinds of cells in the body such as neurons or cardiovascular cells.'"
    - "Gene cloning, also known as DNA cloning, is a very different process from reproductive and therapeutic cloning. Reproductive and therapeutic cloning share many of the same techniques, but are done for different purposes."
- "Researchers routinely use cloning techniques to make copies of genes that they wish to study. The procedure consists of inserting a gene from one organism, often referred to as

"foreign DNA," into the genetic material of a carrier called a vector. Examples of vectors include bacteria, yeast cells, viruses or plasmids, which are small DNA circles carried by bacteria. After the gene is inserted, the vector is placed in laboratory conditions that prompt it to multiply, resulting in the gene being copied many times over."

- Two methods of cloning:
  - "In reproductive cloning, researchers remove a mature somatic cell, such as a skin cell, from an animal that they wish to copy. They then transfer the DNA of the donor animal's somatic cell into an egg cell, or oocyte, that has had its own DNA-containing nucleus removed.
  - "Researchers can add the DNA from the somatic cell to the empty egg in two different ways. In the first method, they remove the DNA-containing nucleus of the somatic cell with a needle and inject it into the empty egg. In the second approach, they use an electrical current to fuse the entire somatic cell with the empty egg.
  - "In both processes, the egg is allowed to develop into an early-stage embryo in the test-tube and then is implanted into the womb of an adult female animal.
  - "Ultimately, the adult female gives birth to an animal that has the same genetic make up as the animal that donated the somatic cell. This young animal is referred to as a clone. Reproductive cloning may require the use of a surrogate mother to allow development of the cloned embryo, as was the case for the most famous cloned organism, Dolly the sheep."
    - "To create Dolly, researchers needed to clone 277 embryos, 29 of those were healthy enough to implant, but only one survived until birth."
- Contrary to popular belief, genetically identical clones won't look and act the same. Genes aren't the only determining factor for this. Environment plays a huge role, including time and place. (I know a bit about that). "For example, the first cat to be cloned, named Cc, is a female calico cat that looks very different from her mother. The explanation for the difference is that the color and pattern of the coats of cats cannot be attributed exclusively to genes. A biological phenomenon involving inactivation of the X chromosome (See sex chromosome) in every cell of the female cat (which has two X chromosomes) determines which coat color genes are switched off and which are switched on. The distribution of X inactivation, which seems to occur randomly, determines the appearance of the cat's coat."
- Also, studies have shown that clones aren't weaker than the originals nor are they born pre-aged.
- What animals have been cloned:
  - "In 1979, researchers produced the first genetically identical mice by splitting mouse embryos in the test tube and then implanting the resulting embryos into the wombs of adult female mice. Shortly after that, researchers produced the first genetically identical cows, sheep and chickens by transferring the nucleus of a cell taken from an early embryo into an egg that had been emptied of its nucleus.
  - "It was not until 1996, however, that researchers succeeded in cloning the first mammal from a mature (somatic) cell taken from an adult animal. After 276

attempts, Scottish researchers finally produced Dolly, the lamb from the udder cell of a 6-year-old sheep. Two years later, researchers in Japan cloned eight calves from a single cow, but only four survived.

- "Besides cattle and sheep, other mammals that have been cloned from somatic cells include: cat, deer, dog, horse, mule, ox, rabbit and rat. In addition, a rhesus monkey has been cloned by embryo splitting."

- Human cloning:
  - "In 1998, scientists in South Korea claimed to have successfully cloned a human embryo, but said the experiment was interrupted very early when the clone was just a group of four cells. In 2002, Clonaid, part of a religious group that believes humans were created by extraterrestrials, held a news conference to announce the birth of what it claimed to be the first cloned human, a girl named Eve. However, despite repeated requests by the research community and the news media, Clonaid never provided any evidence to confirm the existence of this clone or the other 12 human clones it purportedly created.
  - "In 2004, a group led by Woo-Suk Hwang of Seoul National University in South Korea published a paper in the journal Science in which it claimed to have created a cloned human embryo in a test tube. However, an independent scientific committee later found no proof to support the claim and, in January 2006, Science announced that Hwang's paper had been retracted.
  - "From a technical perspective, cloning humans and other primates is more difficult than in other mammals. One reason is that two proteins essential to cell division, known as spindle proteins, are located very close to the chromosomes in primate eggs. Consequently, removal of the egg's nucleus to make room for the donor nucleus also removes the spindle proteins, interfering with cell division. In other mammals, such as cats, rabbits and mice, the two spindle proteins are spread throughout the egg. So, removal of the egg's nucleus does not result in loss of spindle proteins. In addition, some dyes and the ultraviolet light used to remove the egg's nucleus can damage the primate cell and prevent it from growing."
  - "The creation and destruction of human embryos is a sticking point for many major religions, and others worry about the potential diseases and conditions that this process might inflict on a cloned baby."
  - "For these reasons and more, many countries and U.S. states have put bans on human cloning experiments. In the U.S., there are no federal laws against cloning humans, but multiple states have laws prohibiting cloning for any purpose. Multiple others prohibit funding of human cloning. According to intellectual property attorneys Knobbe Martens, 10 states allow the creation of human cloned embryos but prevent them from being implanted — researchers can destroy them to create embryonic stem cell lines."
    - "More than 30 countries ban human cloning experiments, according to a 2007 review published by Rice University. In 15 countries, there are bans on human reproductive cloning but not on the creation of cloned

embryonic stem cells. Other countries do not have any specific legislation banning human cloning."

        - American Association for the Advancement of Science Statement on Human Cloning: https://www.aaas.org/resources/american-association-advancement-science-statement-human-cloning

- Applications of cloning:
    - It can be used to replicate desirable traits in livestock without the risk of the "genetic lottery."
    - "In principle, those people who might wish to produce children through human reproductive cloning [9] include: 1) Infertile couples who wish to have a child that is genetically identical with one of them, or with another nucleus donor. 2) Other individuals who wish to have a child that is genetically identical with them, or with another nucleus donor. 3) Parents who have lost a child and wish to have another, genetically identical child. 4) People who need a transplant (for example, of cord blood) to treat their own or their child's disease and who therefore wish to collect genetically identical tissue from a cloned fetus or newborn."
    - "For instance, the same Scottish researchers who cloned Dolly have cloned other sheep that have been genetically modified to produce milk that contains a human protein essential for blood clotting. The hope is that someday this protein can be purified from the milk and given to humans whose blood does not clot properly. Another possible use of cloned animals is for testing new drugs and treatment strategies. The great advantage of using cloned animals for drug testing is that they are all genetically identical, which means their responses to the drugs should be uniform rather than variable as seen in animals with different genetic make-ups."
        - "…the U.S. Food and Drug Administration (FDA) decided in January 2008 that meat and milk from cloned animals, such as cattle, pigs and goats, are as safe as those from non-cloned animals."
    - "Another application is to create clones to build populations of endangered, or possibly even extinct, species of animals. In 2001, researchers produced the first clone of an endangered species: a type of Asian ox known as a guar. Sadly, the baby guar, which had developed inside a surrogate cow mother, died just a few days after its birth. In 2003, another endangered type of ox, called the Banteg, was successfully cloned. Soon after, three African wildcats were cloned using frozen embryos as a source of DNA. Although some experts think cloning can save many species that would otherwise disappear, others argue that cloning produces a population of genetically identical individuals that lack the genetic variability necessary for species survival."
    - Some are also interested in cloning dead pets.
    - "The ability to create cloned embryonic stem cells using somatic nuclear transfer is also promising for developing therapies that a patient's immune system wouldn't reject. These clonal stem cell therapies could create new organs or cells for people that could replace damaged ones."