Kamelia Spassova
Mimetic Machines in the Uncanny Valley

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Abstract: *Uncanny valley* (不 気 味 の 谷) is a notion introduced by the Japanese robotics professor Masahiro Mori in 1970. The basic claim of his hypothesis states that the anthropomorphic machines cause uncanny effect due to their imperfect resemblance to the human. Humanoids seem almost like people, but exactly the distance of this *almost* provokes hot debates. There are two trends in robotics, animation, architecture, and computer games. The first trend seeks to overcome the uncanny valley, constructing such an incredible machine that perfectly mimics human actions. The second trend – Masahiro Mori takes this side – consciously constructs non-anthropomorphic machines. The machine's appearance, structure, shape, proportion of the parts, and motion must be visibly different from the human ones. The term *uncanny valley* appears in a European context soon after its introduction, due to Jasia Reichardt's translation in 1978. She is an art critic and curator who is interested in the role of cybernetics in art. The joint between the uncanny valley in robotics and the legacy of Freud and Jentsch is established with this translation at the intersection point between aesthetics and science. This link opens new fields to theoretical and aesthetic imagination.

1. The Automaton-seer: Something Hidden has Become Visible

"All figures of this sort," said Lewis, "which can scarcely be said to counterfeit humanity so much as to travesty it-mere images of living death or inanimate life-are most distasteful to me. When I was a little boy, I ran away crying from a wax-work exhibition I was taken to, and even to this day I never can enter a place of the sort without a horrible, eerie, shuddery feeling [**ohne von einem unheimlichen** grauenhaften Gefühl ergriffen zu werden]. [...] The fact of any human being's doing anything in association with those lifeless figures which counterfeit the appearance and movements of humanity has always, to me, something fearful, unnatural, I may say terrible, about it [etwas Drückendes, **Unheimliches**, ja Entsetzliches].[1]

The preceding reflections on mimesis and the uncanny are delivered by Ludwig the musician, a character in E. T. A. Hoffmann's short story *The Automata*. The story was first published in 1814 (in the literary magazine *Zeitung für die elegante Welt*) and again five years later as part of his collection of novellas and fairy-tales, *The Serapion Brethren*. The thoughts were prompted by the machine music created by professor X's anthropomorphic automata. One of these robots is the

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[1] E. T. A. Hoffmann, *The Best Tales of Hoffmann*, ed. E. F. Bleiler, trans. Alexander Ewing (New York: Dover Publications, 1967), 81, 95; E. T. A. Hoffmann, "Die Automate," in *Gesammelte Werke* (Null Papier Verlag, 2013).

enigmatic Talking Turk who "reads" people's unconscious and foretells their destiny. Unlike Wolfgang von Kempelen's historical machine, constructed in 1769, which got burned in a fire in 1854, and which mercilessly defeated all of its opponents on the chess board, Hoffmann's automaton, the Turk, is not a chess player but a fortune teller. His character makes the problem of free will central to most of Hofmann's novellas. This constitutes the old question of whether fate can be intentionally and freely determined or if it is under the control of automatic, uncontrolled forces. Hoffmann marks a key change in the image of the fortune teller — from the realm of the religious and the mystical to the realm of the logical and the mechanical. The enigmatic connection between the *living* and the *automatic*, as well as the *imitation game* between the two appear in the works of both Kempelen and Hoffmann. This riddle is a generally shared contextual mystery in the transitional period between the Age of Enlightenment and Romanticism.

The non-human figures — wax sculptures, dolls, puppets, anthropomorphic automata, and all types of mimetic machines in general— can trigger a feeling of inexplicable horror in us, they can cause us to experience the uncanny effect and can evoke a feeling of trouble and anxiousness in any human creature, for there is something about their resemblance to humans that *just isn't right*. The automatism of a box's secret compartment that pops-up is central for the uncanny effect which corresponds to Freud's idea of *unheimlich* . Be it the dwarf hidden inside the machine (as is the case for Kempelen's Turk) or the very opposite — the machine hidden inside the human (the automatism of the unconscious repetition), there is something that is valid for both — the algorithm of something hidden that suddenly emerges and disturbs us with its untimely appearance.

Similarly to the utterances of ancient oracles, while answering the questions that are directed to him, Hoffmann's automaton the Turk exposes all secret incentives and hidden desires and, ultimately, a fatalistic predestination. He reveals the fate of the questioner and lays it out on the chess board. The Turk's head is a perfect reproduction of a human one. He rolls his eyes, turns his head, stamps his feet, and out of his mouth comes a stream of air, the product of an acoustic illusion. But the characters in the story suspect that a human being with supernatural powers is hidden inside of him that can "read" the questioner's unconscious.

The short story *The Automata*, together with the set of problems that surround the topic of a subject that is divided in two, and the peculiar connection between the living and the mechanical, the contingent and the fateful, the visible form and the hidden grounds, between free will and instrumentality, between the figure of the inventor and his creation, the automaton, raises another question, that of what machines should look like. Only it is a question of aesthetics and not of substance.

2. Mimesis and *Unheimlich* as Coordinates in the Uncanny Valley

A third concept can be added to the history of the notions of *mimesis* and *unheimlich* (uncanny) that acts as an edge and a point of intersection between the two. That is namely the notion of 不気味の 谷現象 (*Bukimi no Tani Genshō*), or *the uncanny valley phenomenon.*

Mimesis and *unheimlich* are part of the *Dictionary of Untranslatables*, their genealogy is rooted in Ancient Greek and German, languages that have created these very concepts, as well as the episteme, which they are part of.[2] The history of their translations in other European languages through the years is not just an interesting story and a colorful contextual cross section, but it also introduces the slow transition, the long-term migration of concepts and traditions, the gradual shift of paradigms: not through rebellion but through translation. They serve as instruments for working with the incomprehensible, but there is something in their very definition that cannot be fully mastered through conceptualization. This unstable limitation of their definition is a result of negativity and non-self-correspondence, of their inner changeability, all of which are crucial when it comes to contemplating these concepts.

In short, *mimesis* and *unheimlich* are concepts about the incomprehensible and unidentical. Looking into them, and the grid of concepts around them, is an indispensable condition when entering the uncanny valley, as long as the main coordinates are *imitating* the human on one hand, and the *uncanny effect* on the other. In the function known in the field of robotics as *Bukimi no Tani*, or *uncanny valley*, the mimetic is located on the x-axis and the uncanny on the y-axis. All this considered, the fact that the uncanny valley

[2] Barbara Cassin et al., eds., *Dictionary of Untranslatables: A Philosophical Lexicon* (Princeton: Princeton University Press, 2014).

could be illustrated with mathematical precision doesn't eliminate the mystery and the magnetism that arises from it. How should we approach it? As a concept, as an idea, or simply the way we would approach any other contemporary myth?

Putting the hypothesis of *Bukimi no Tani* between the seriousness of its scientific argumentation and the casual rejection of it as a myth is a historical experience that resembles the fate of the concepts of *mimesis* and *unheimlich*. The attempt to walk through the *uncanny valley* should outline the wagers of the anthropomorphic (human-like) and non-anthropomorphic (unhuman-like) trends, led by the problem of the machines' appearance.
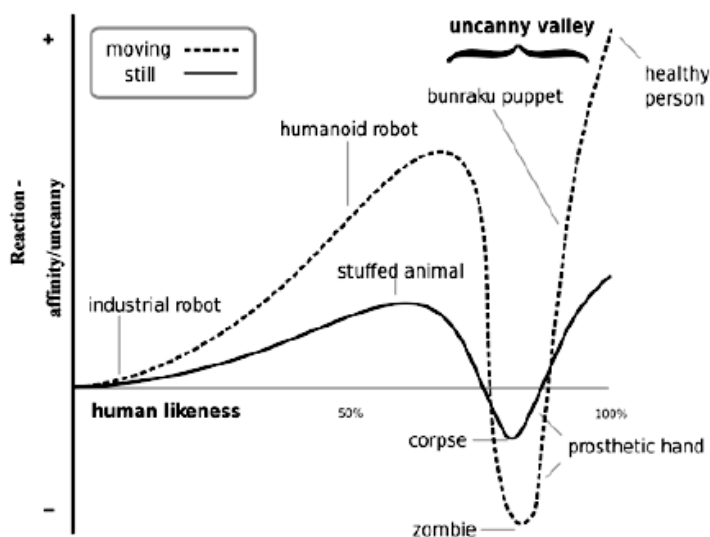
3. Human Care and Unhuman Design

Fig. 1

Bukimi no Tani (不気味の谷現象; *uncanny valley*) is an idea introduced by Japanese robotics professor Masahiro Mori in the year 1970.[3] Mori's hypothesis can be reduced to the proposition that an-

thropomorphic machines trigger an uncanny effect with their imperfect resemblance to humans. Humanoids look almost the same as people but this distance of *almost like* provoked heated debates. Two trends then arose in the field of cybernetics, animation, architecture, and video games that discuss the effects of the uncanny valley. One of them tries to overcome the *uncanny valley* by creating a machine that perfectly imitates humans. The other one, to which Mori's hypothesis belongs, takes the path of consciously constructing non-anthropomorphic machines — their appearance, structure, form, and the proportion of their elements must be different than those of humans.

In his article, Mori shares a prophetic thought: "In fact I predict it is possible to create a safe level of affinity by deliberately pursuing a nonhuman design. I ask designers to ponder this."[4] The concern shared by Masahiro Mori along with his hypothesis of the valley is that the machines' human appearance should consciously be designed with non-human forms in order to provoke sympathy in people instead of an uncanny feeling. Something should be hyperbolized, disproportionate, deformed, in order to definitively set a boundary and create a distancing effect, so that it would be clear from first sight which one is the human and which one the machine.

The uncanny valley was first defined by Mori as a function that is not continuously increasing, or, where the increasing of *x* doesn't necessarily cause *y* to increase as well. In other words, the function should mark the lack of symmetry. Such a relation doesn't exist: the more human-like the machines get, the more heartedly embraced they are by people. Mori compared the non-monotonic function to mountain climbing where the hills and valleys, highlands and lowlands do not stand in a dependency relation with the distance to the top of the hill or with the fulfilment of the goal. This comparison is also where the spatial metaphor in the uncanny valley's name comes from, since it represents an area of rapid descent where the automata become *almost* indistinguishable from humans by appearance but instead of provoking sympathy, they scare us.

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[3] The article was published in 1970 in Japanese magazine *Energy* and for a long time did not draw a lot of attention: Masahiro Mori, "Bukimi No Tani [the Uncanny Valley]," trans. Karl F. MacDorman and T. Minato, *Energy* 7 (1970): 33–35. Its latest English translation that stimulated current discus-

sions around the concept, came out in 2012, as this time, the translation was authorized by Mori himself: Masahiro Mori, 'The Uncanny Valley', trans. Karl F. MacDorman and Norri Kageki, IEEE Robotics & Automation Magazine 19:2 (2012): 98–100, http://goo.gl/iskzXb.

[4] Masahiro Mori, "The Uncanny Valley," trans. Karl F. MacDorman and Norri Kageki, *IEEE Robotics & Automation Magazine* 19:2 (2012), 99. See: http://goo.gl/iskzXb.

Industrial robots for instance do not fall inside the valley's reach because of the metallic materiality of their design that gives humans a sense of distance with respect to their appearance.[5] They do not resemble humans and do not cause fear because the line between human and unhuman remains uncrossed. Their appearance is subordinated to their functionality. They are simply perfected work instruments that help humans. On the other hand, the attempts to create artificial intelligence in the field of robotics are "dressed" in a more and more anthropomorphic design: the automata begin to look *as if* they were people. This resemblance becomes disturbing. It is what marks the moment of losing the sense of sympathy. This is the zone of the uncanny valley: where the mimetic machines trigger an incomprehensible anxiety. This is precisely the axis of affinity that marks a rapid decline or the causing of the uncanny (*unheimlich*) effect when the resemblance on the human likeness axis increases. The zone of the uncanny valley represents this inverse relationship — greater human likeness, and yet, people's attitude towards robots is that of anxiety and fear.

In the 1970s Mori observed a trend in the field of cybernetics towards spending a much greater effort into robots' appearance than into their functionality, as if the path towards conscious machines goes through the creation of humanoids that perfectly resemble the human form. But this very pattern of imitating external appearance is what will place them inside the uncanny valley — instead of becoming affinitive to humans they will become *unheimlich*. In this way they cast the shadow of anxiety over the notion of what is human.

The example which Mori used to mark the entering of machines into the uncanny valley is the prosthetic hand. Just like Ludwig, the protagonist in Hoffmann's *The Automata*, Mori admits that he never liked looking at wax figures because they looked creepy to him.[6] The prosthetic hand has had the same disturbing effect on him, as the creepy feeling intensifies if the hand starts to move, as is the case with myoelectric prosthetics. A key factor in the artificial hand's indistinguishability from a real human hand is that it is designed to be covered with skin instead of bolts and metal cylinders. The anthropomorphic trend focuses on the machines' skin.

Therefore, Masahiro Mori's hypothesis suggests that in the increase of similarity between human and machine, a certain point comes where telling the two apart becomes difficult, and it is this very moment that triggers the negative (*unheimlich*) effect of uncanniness, repulsion, terror, and anxiety. The factors for increasing the uncanny feeling are *movement* and *imitating the human*.

The methods of counteraction against this *unheimlich* effect include deautomatization, estrangement, and consciously designed dissimilarity. This is also where Mori's call to unhuman design in robotics stems from — instead of creating humanoids, he designs *swarm robots* that interact with each other in an autonomous system. Mori proposed that the models for wooden hand prosthetics shouldn't resemble human hands, but instead, those of Buddha's statues, because those ones don't leave fingerprints. This example with Buddha is no coincidence. Mori believes that robots' imitation of humans shouldn't be identical and symmetrical, rather, it should be directed towards a third entity, like the idea of the Buddha. Four years after the hypothesis of the uncanny valley, Mori developed the concept concerning transcendental imitation in his book *The Buddha in the Robot*, where he tried to solve the mystery of human consciousness through the concepts of Buddhism.[7] But one can recognize Mori's concern which analyzes the human both through the perspective of robotics and the Zen philosophy as early as in the uncanny valley hypothesis with the instability of the progressive function, with the non-monotonical rhythm of ascents and descents.[8]

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[5] A good example for this can be taken out of the TV series *Battlestar Galactica* – the industrial robots, or *the Toasters* do not trigger the effect of anxiety, they do not fall into the uncanny valley as opposed to the twelve humanoid model Cylons that are an almost perfect human reproduction. They are the ones who undermine the line between human and unhuman. Questioning the notion of the human in light of "the ungraspable phantom of the vanishing difference between the humans and the machines" is excellently picked up by the fine analysis of TV series *Battlestar Galactica* in: Miglena Nikolchina, "An Unfinished Project: Man as Comedy," in *Lost Unicorns of the Velvet Revolutions: Heterotopias of the Seminar* (Fordham University Press, 2013), 107.

[6] N. Kageki, "An Uncanny Mind: An Interview with M. Mori," *IEEE Robotics Automation Magazine* 19:2 (2012), 102–8, https://doi.org/10.1109/MRA.2012.2192819.

[7] Masahiro Mori, *The Buddha in the Robot: A Robot Engineer's Thoughts on Science and Religion (1974)*, trans. Charles S. Terry (Tokyo: Kosei Publishing Co., 1981).

[8] About the link between the uncanny valley and the book *The Buddha in the Robot* as Mori's general philosophy, see: W.A. Borody, "The Japanese Roboticist Masahiro Mori's Buddhist Inspired Concept of The Uncanny Valley" (Bukimi No Tani Genshō, 不気味の谷現象)," *Journal of Evolution and Technology* 23:1 (2013), 31–44. See: https://jetpress.org/v23/borody.htm.

4. Hiroshi Ishiguro's Doppelgänger on the Way to Overcoming the Valley

Fig. 2

It is key to name another Japanese professor on the scene of current trends in robotics — that of Hiroshi Ishiguro. He continues to study the uncanny valley but with the goal of overcoming it: the robots will look like humans, but they will no longer scare us. His effort is contrary to that of Masahiro Mori. While the latter maintains that there should be estranging elements in the robots' appearance, the former aims to create the perfect humanoid robot. Thus, the two Japanese professors represent the two diametrically opposite trends in robotics: Mori maintains the *anti-anthropomorphic* principle, while Ishiguro defends the *anthropomorphic* one. Concerned about the disturbing closeness between man and robot, Mori seeks a transcendent way for juxtaposing the two, while Ishiguro focuses on studying the matter of *human likeness* with regards to the design of the perfect androids.

"The good disciple," Ishiguro, extended his teacher Mori's thesis about the uncanny valley in a critical perspective, but his aim, opposite Mori, is a greater effectiveness in bringing robots' design clos-

er to the human appearance. He views the automata's appearance and the similarities between man and robot as a complex navigation system. The robots' movements are no longer just mechanically constructed, but also reconstructed with regards to more precise operators of imitation — mimics, gestures, speed of movement, and gracefulness. The perfect machine which will successfully overcome the uncanny valley should, according to Ishiguro, imitate man not just statically but with motion — with certain gestures and mimics. Robots are not simply dressed in human skin, they are set up with a program for gesticulation, they mimic unconscious movements of the hands and eyes, they exhibit parasitic body movements, and they present certain *gestus*. Yes, mimetic machines are the perfect mimes. Hiroshi Ishiguro set out to design robotic Doppelgängers.

Ishiguro is the director of a robotics laboratory in Osaka University that develops *actroids*, a type of androids or humanoid robots produced by Japanese company *Kokoro*. The first female *actroid*, — Repliee Q1, appeared in January of 2004. The improved version from July of 2005 could now blink constantly. She had a whole range of gestures that were copied from her human prototype Ayako Fuji. The way the robot was trained to imitate natural movements was through the placement of numerous special sensors across key points on the prototype's body and face so that the whole of its physiognomics got copied and installed into the robot. Scientists in the fields of anatomy, neurology, cognitive science, computer science, cybernetics, design, and animation took part in this project that aimed to overcome the uncanny valley. Once they get switched on, the androids start to constantly move, shake their heads, and blink; parasitic body movements that resemble neurological activity were programed into them, a simulacrum of a biomimetic mechanism. The female android is just like Olympia from Hoffmann's *The Sandman* — she constantly nods, blinks affirmatively, and spontaneously sighs "Ah! Ah!"

In July of 2006, after creating his very own Olympia, Professor Hiroshi Ishiguro designed the robot Geminoid-HI-1 in his own image and likeness. Ishiguro literally calls him *my Doppelgänger*. In a series of interviews, television shows and videos on the Internet, Professor Ishiguro talks about the convenience of having one's robotic

Doppelgänger.[9] For instance, while he is at a conference in Kyoto, his Doppelgänger could easily teach his classes in Osaka University. Ishiguro's double presence became part of a media campaign of sorts that aimed at overcoming the uncanny valley, i.e., rejecting Mori's theses about the fear of mimetic machines. Ishiguro stands proudly next to his Doppelgänger as a living proof that, after all, it is not so scary.

Naturally, Ishiguro's team performed a series of experiments behind the scenes with the goal of scientifically identifying the limits of the uncanny valley. In the 2009 article *My Robotic Doppelgänger*[10], Ishiguro and his three co-authors critically reviewed the hypothesis of the uncanny valley through an experiment that was conducted among 19 male and 13 female participants with the average age of the participants being 20 years old. The participants were seated in a room one by one facing either Hiroshi Ishiguro or his Doppelgänger. They had to look at each other for some time and then begin to discuss the following three questions: How old are you? What university do you go to? What is your name? The machine was not equipped with an autonomous dialogue system and therefore the conversation had to be as formal as possible. The aim of the experiment was to determine how long it takes the participant to figure out if he or she is talking to the human Ishiguro or his robotic Doppelgänger. The outcome revealed that the recognition requires no longer than two seconds, the first impression is, as a rule, crucial (as is the case with love, Ishiguro adds, and refers to some studies according to which the outcome of any love encounter is usually determined in the first 30 seconds). Following this "conversation" with the human/robot the participants in the experiment had to fill out a questionnaire with the purpose of measuring their sense of *affinity/uncanny* (*heimlich/unheimlich*). The scale used seven factors to identify the kind of feeling that was experienced: unnatural/natural; machine-like/human-like; unconscious/conscious; artificial/organic; stiff movement/smooth movement. The observation was made that "anthropomorphism is a complex phenomenon involving multiple dimensions. Not only the appearance but also the behaviour of a robot can have

a considerable influence on anthropomorphism."[11] Ishiguro believes that reducing the study of human likeness (the mimetic operator) down to just two factors — *affinity/uncanny* and *likeness/unlikeness*, as M. Mori does in the graph of the uncanny valley, is too limiting. The main conclusion of the experiment was that finer degrees and levels of anthropomorphism exist. The key aspects in a robot's capability of attraction and naturalness are undoubtedly gracefulness and the smoothness of their movements. According to Ishiguro, this disproves Mori's hypothesis that moving androids are creepier.

The theoretical argument in the article *My Robotic Doppelgänger* is once again a linguistic one — this time regarding the untranslatability of the Japanese word *shinwakan* (親和感). Robotic engineers asked some Japanese linguists, and the results are in — the word cannot be properly translated and therefore a full consensus on its translation cannot be reached. Ishiguro proposed that *shinwakan* not be translated with the established *familiarity* and *affinity* but with the much more suitable term *likability*. In order to demonstrate the complexity of *shinwakan,* he invented a more sophisticated scale than the one with seven factors for detecting empathy or antipathy towards robots. *Shinwakan* is a feeling of something familiar, kindred, homelike, affinitive — all that attracts, and, consequently, the negative levels on the scale are a perfect opposite of that feeling — the unpleasant effect of repulsion, horrification and petrification — *bukimi*. However, the adjective *shinwateki* (親和的) can also mean *synchronous*, i.e., the specific closeness and synchronicity between man and machine, the gemination, simultaneity and parallelism between them.[12]

Theoretically, in his attempt to overcome the uncanny valley, Hiroshi Ishiguro widened the complexity of Mori's scheme to the point where he practically created an android Doppelgänger. These mimetic machines helped him shorten the distance between man and robot, which served the ambition of making robots *almost like humans,* but the mystery of the *almost* remained unsolved. In its attempts to make machines like humans, Ishiguro's laboratory found itself facing the question of what likeness actually is.[13]

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[9] See for instance "Humanoid Robot - Gemonoid HI-1 Android Prototype." See: https://www.youtube.com/watch?v=uD1CdjlrTBM

[10] Hiroshi Ishiguro et al., "My Robotic Doppelgänger - a Critical Look at the Uncanny Valley," *The 18th IEEE International Symposium on Robot and Human Interactive Communication (*Toyama, 2009), 269–76, https://doi.org/10.1109/ROMAN.2009.5326351.

[11] Ishiguro et al., 274.

[12] With gratitude to Futoshi Hoshino for his notes and explanations about *shinwakan* in the context of the synchronicity effect.

[13] The question about likeness and imitation in the sense of *mimesis* has been repetitively both-

What Ishiguro failed to translate in his previously discussed article is, namely, the European tradition of identifying the notion of *unheimlich* with that of *bukimi*. A similar "translation" appeared in the two conferences on robotics in 2013 — in Germany and Japan, where among the engineers and robotics specialists, humanities scholars also took part who easily associated the European tradition of theoretical psychoanalysis with Japanese robotics.[14] M. Mori and H. Ishiguro participated side by side in the conference in Tokyo — one of them continued to insist on building unhuman robots, while the other methodologically laid out step by step how the uncanny valley will be overcome: the mimetic machines, these ever more perfect imitators of the human, will no longer be bothering us.

The businesses, from another perspective, observes that there are two trends in the field of robotics — the anthropomorphic and the non-anthropomorphic, and, without choosing one of the options, bravely sell human, as well as unhuman robots. At the reception of the "Hen-na" hotel ("Strange hotel"[15]), close to Nagasaki, which first opened in 2015 and was marketed as being serviced exclusively by robots, visitors can bravely choose to be accommodated by the human-like female android or by the friendly dinosaur. It is up to the random client of the "Hen-na" hotel to decide which one of them is creepier, which one is less human-like or... which one is more comical.

Fig. 3.

5. 不気味の谷現象 to Uncanny Valley: Synchronizing Traditions

The dynamics of the German word pair *heimlich/unheimlich* make it suitable for the translation of the Japanese antonyms *shinwateki/bukimi*. *Bukimi* is the Japanese translation of the title of Sigmund Freud's essay *Das Unheimliche* (1919), where he makes a broad linguistic remark about the ambivalence of the adjective *unheimlich*. The translation of *unheimlich* as *bukimi* in Japan appeared even before the publication of Mori's hypothesis about the uncanny valley. With his works in the field of robotics, Mori is well placed within the European line of interpretation of the *unheimlich* phenomenon: from Hoffmann's romanticist short stories, to Jean Paul and Mary Shelley, and through the establishment of the notion of *unheimlich* in Sigmund Freud and Ernst Jentsch's works as a category on the edge of aesthetics and psychoanalysis, to the numerous lines of interpretation in post-Structuralist theory about the automatism of the return of the repressed and about the intersection between *repetition* and *negation*. This comes to show that, without the need of additional speculation about whether Masahiro Mori took inspiration from Freud, or whether he specifically read and was familiar with Jentsch's article (most probably not), that there are clearly too many parallels and coincidences present between the phenomena of *unheimlich* in Jentsch and Freud's works and *bukimi no tani* in

ering philosophers as early as Plato. The book *Modern Mimesis* is dedicated to part of these concerns in the context of literature and its self-reflexive function.

[14] The conferences are: IEEE International Conference on Robotics and Automation, Karlsruhe, Germany, May 10, 2013 и IEEE/RSJ International Conference on Robots and Intelligent Systems (IROS), Tokyo International Exhibition Center, Room 703, Nov 6, 2013.

[15] Henn-na Hotel, 変なホテル – the name "Strange hotel" clearly refers to *the uncanny valley*, therefore we can assume that such a link is deliberate: url=http://www.h-n-h.jp/en/. The cost for one night in a room for two in October of 2021 is approximately 100 euros.

Mori's to be ignored. Furthermore, it was precisely in the 1970s when Freud's essay was rediscovered by the French theoretical scene and heated conceptual debates sparked around it.[16]

The polish curator, Jasia Reichardt, who takes great interest in cybernetics' significance in art, played a key role in the synchronization between the European and Japanese traditions. The term *uncanny valley* emerged shortly after Mori brought it into the Japanese context and it was done so by virtue of Reichardt's 1978 translation. This is when it was established that *the uncanny valley* and Freud's and Jentsch's heritage in the European scene connect at the point of intersection between aesthetics, psychoanalysis, technology, and science. This connection uncovered new paths of development for theoretical and aesthetic imagination.

During the time when she was the director of London's Institute for Contemporary Arts (ICA), Jasia Reichardt curated the exhibition *Cybernetic Serendipity* (1968) — one of the early and greatly influential exhibitions of generated art.[17] In the exhibition the robots are the ones who paint, write poetry, and create music. The people who programmed them now call themselves 'digital artists' and a year after the exhibition they founded The Computer Arts Society (CAS) whose scientific profile is the interaction between science, cybernetics, and art.

Besides curating such an emblematic exhibition, Jasia Reichardt also wrote the book: *Robots: Facts, Fiction, and Prediction.* One of the chapters in her book addresses Mori's valley. Its title is *Human reactions to imitation humans, or Masahiro Mori's Uncanny Valley.*[18] Here, Jasia Reichardt lays out Mori's hypothesis of the valley and introduces the translation *uncanny valley*. Without explicitly referring to Jentsch and Freud, this connection is already a working one, since the established English translation of Freud's notable essay *Das Unheimliche* (1919) is precisely *The Uncanny* (1925).[19]

Mori's *bukimi no tani* can only benefit from the recognition of the heritage of the European humanities, from references to the observations made by Freud and Jentsch, to the authors who comment on them throughout the 20th century. The extremities of experiencing a sense of empathy and its rapid disruption caused by the increasing affinity between man and machine synchronize well with the paradoxes of *the uncanny*. The affinitive, comfortable, and homelike suddenly become unfamiliar. Our hidden fears pop-up right in front of us, embodied in flesh and blood, our hidden fears. There, on the very edge, where it's difficult to tell apart the living from the non-living, the organic from the mechanical, and the human from the non-human.

6. Negative *Anagnorisis* and *Unheimlich*: Jentsch and Freud

The whole debate about *unheimlich* started from one of Jentsch's articles from 1906, while Freud and Otto Rank later revise, critique, develop and adapt Jentsch's ideas.[20] Jentsch's theory is directly linked to the concept of the automata, and the *unheimlich* effect is, according to his perception, a result of intellectual uncertainty, of not being able to tell if the thing in front of you is living or non-living, organic or mechanical, a human or an automaton.

> In storytelling, one of the most reliable artistic devices for producing uncanny effects easily is to leave the reader **in uncertainty as to whether he has a human person or rather an automaton before him in the case of a particular character.** This is done in such a way that the uncertainty does not appear directly at the focal point of his attention, so that he is not given the occasion to investigate and clarify the matter straight away; for the particular emotional effect, as we said, would hereby be quickly dissipated. In his works of fantasy, E. T. A. Hoffmann has repeatedly made use of this psychological artifice with success.[21]

This is the very excerpt from Jentsch that Freud cites in his essay *Das Unheimliche*, as he goes on to claim that he's solving his colleague's

[16] See more in: Anneleen Masschelein, *The Unconcept: The Freudian Uncanny in Late-Twentieth-Century Theory*, (New York: SUNY Press, 2011).

[17] Jasia Reichardt, *Cybernetic Serendipity: The Computer and the Arts*, Exhibition Catalog. Exhibition Organized At the Institute of Contemporary Arts, Nash House, London, August 2-October 20, 1968 (Praeger, 1969).
A recording that lays out Jasia Reichardt's concept, as well as footage from the exhibition and the generated art of the machines can be found here: https://www.youtube.com/watch?v=n8T-Jx8n9UsA .

[18] Jasia Reichardt, "Human Reactions to Imitation Humans, or Masahiro Mori's Uncanny Valley," in *Robots – Fact, Fiction, Prediction* (New York: The Viking Press, 1978), 26–27.

[19] Sigmund Freud, "The Uncanny," in *The Standard Edition of the Complete Psychological Works of*

Sigmund Freud, Volume XVII (1917–1919), trans. Alix Strachey, 1925, 368–407.

[20] Ernst Jentsch, "Zur Psychologie Des Unheimlichen," *Psychiatrisch-Neurologische Wochenschrift*, 8:22 (1906), 203–5.

[21] Ernst Jentsch, "On the Psychology of the Uncanny (1906)," trans. Roy Sellars, *Angelaki* 2:1 (1 January 1997), 13, https://doi.org/10.1080/09697259708571910. (bold is mine).

mystery — this observation refers to, most of all, Hoffmann's *The Sandman*. Freud shares his disagreement with Jentsch's general thesis about intellectual uncertainty caused by moving automatons. What he especially takes interest in is the *example* of Hoffmann and his wax figures, dolls and automata. Freud uses the example of Hoffmann to explain the *unheimlich* phenomenon but attaches it to quite a different theory.[22]

The story of *The Sandman* illustrates the point of the gaze, the fear of going blind, the castration complex, the Oedipus complex, the redoubled father figure, and, generally, the Doppelgänger — all of which constitute central elements of Freud's method. Hoffmann's fairy-tale will later become a crucial example in the Austrian psychoanalyst's work on clarifying the operating mechanism of *unheimlich*: to negate and repeat at the same time. The *unheimlich* effect represses the familiar, domestic and affinitive that returns as unfamiliar, strange and uncanny. Thus an intimate core swoops into the gaze from the outside, as a foreign body (later Lacan will term it *extimité* in order to emphases the coincidence of inside and outside)[23].

Freud cites this excerpt from Jentsch's article and criticizes his theses in order to present his own. However, Jentsch's article also includes the following segment that Freud left out in his citation (every citation is inevitably a cropping or a castration since it always reduces and decontextualizes):

> This peculiar effect makes its appearance even more clearly when imitations of the human form not only reach one's perception, but when on top of everything they appear to be united with certain bodily or mental functions. This is where the impression easily produced by the automatic figures belongs that is so awkward for many people. Once again, those cases must here be discounted in which the objects are very small or very familiar in the course of daily usage. A doll which closes and opens its eyes by itself, or a small automatic toy, will cause no notable sensation of this kind, while on the other hand, for example, the life-size

machines that perform complicated tasks, blow trumpets, dance and so forth, very easily give one a feeling of unease. The finer the mechanism and the truer to nature the formal reproduction [naturgetreuer die gestaltliche Nachbildung wird], the more strongly will the special effect also make its appearance.[24]

If we go back to the excerpt from Hoffmann's *The Automata* in the beginning of this article, it becomes perfectly clear that, through his observations, Jentsch retells Ludwig's thoughts on the difference between the nice little doll and the anthropomorphic musical automata that evoke incomprehensible horror. Of course, *The Sandman*'s Olympia is an automaton as well, she is a pianist, which makes the reference clear, or, to be more exact, makes clear the contamination that Freud makes. The Austrian psychoanalyst doesn't just merge the automata from both *The Sandman* and *The Automata,* but he also shifts the focus in his interpretation from the automaton Olympia[25] to the character of the Sandman.[26]

However, Jentsch does not mention *The Sandman* anywhere in his article. If one was to make a comparison it could easily be noticed that he implicitly refers to Hoffmann's *The Automata*. Freud, on the other hand, believes that *The Sandman* is Hoffmann's major work, and it is namely through this example that he subverts Jentsch. Freud shifts the focus from the intellectual uncertainty caused by the automaton Olympia towards the repetition, duplication, and negation, and, above all, towards the return of the repressed and the castration complex. In his version, Hoffmann's story offers a series of Doppelgängers: Olympia-and-Nathaniel, Coppelius-and-Coppola, and the father-and-Spallanzani. This is how Freud develops his own theory. On a similar note, what Jentsch actually cites from Hoffmann (*The Automata*) and why Freud assumes that that the citation

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[22] Sigmund Freud, "Das Unheimliche," *Imago* 5 (1919), 297–324.

[23] More about Freud's *unheimlich* and Lacan's *extimité* in Maria Kalinova, "Exotopy: Mikhail Bakhtin and Jacques Lacan on the Outside Context of Discourse," *Slavica Tergestina* 20:1 (2018), 98–117, https://doi.org/10.13137/2283-5482/22384.

[24] Jentsch, "On the Psychology of the Uncanny," (1906), 12.

[25] It is interesting that Julia Mark – Hoffmann's young love in Bamberg – can be recognized not in the romanticist character of Olympia, but in the in the enlightened Clara (even in her name we can hear German Aufklärung), she does not want to be an automaton, even if this automaton would play music beautifully.

[26] About Freud's shift of focus towards *The Sandman*'s Olympia, as well as about the limits of his thesis between the offspring of the eyes and the offspring of the genitalia, see: Miglena Nikolchina, "Love and Automata: From Hoffmann to Lem and from Freud to Kristeva", *Contributions to the Study of Science Fiction and Fantasy* 65 (1995), 77–82; Sarah Kofman, "The Double Island the Devil. The Uncanniness of The Sandman," in *Freud and Fiction*, trans. Sarah Wykes (Cambridge: Polity Press, 1991), 121–62.

is from another story (*The Sandman*) — sheds light on the mechanism for constructing literary figures through exemplification, or, how the discourses of humanities fall under the spell and charm of certain literary examples. Together, Hoffmann's *The Sandman* and Freud's theory of *unheimlich* form a common enigmatic knot, they explain each other: Freud's theory evokes precisely this example and vice versa. Regardless of whether Freud's theory gets criticized (negated) or confirmed (repeated) over and over again, the ones who comment on it use this exact story in their arguments. This is because, ever since Freud, in the debates about what *unheimlich* is, it is no longer possible for one to not also look into *The Sandman* through the glass of new interpretations.[27]

The fascination with Freud and *The Sandman* in the 20th century leaves Jentsch's article in the background. I will come back to its goals with regards to the idea of anthropomorphic mimetic machines. Jentsch suggests in his hypothesis that the *unheimlich* effect has to do with two factors: 1. a zone of indistinguishability between the living and the non-living, between what is human and automatic, and 2. the animalization, setting in motion, or animation of the automata. These two factors are central in Mori's graph of the uncanny valley — the first one represents the mimetic operator (the x-axis), and the second represents the variation that occurs when motion ensues (the y-axis).

Crucial for both Jentsch and Mori is the point of the lack of recognition — not being able to tell if something is living or lifeless; if it's imitation or not; if it's an illusion or not. The uncanny effect blurs the lines between self and non-self, and with such an erasure of the negation, the line itself becomes ambivalent, and well-established oppositions such as in/out, organic/mechanical, human/unhuman can potentially abruptly change their places.

The uncanny category indicates a division of the subject. This division can be historically analyzed, as Mladen Dolar outstandingly does in

the context of the Enlightenment, and its dark side, Romanticism, in order to develop the thesis that "there is a specific dimension of the uncanny that emerges with modernity."[28] He demonstrates a genealogy of the modern subject through the figure of the Doppelgänger and the aesthetic category of *unheimlich*. This is a category of the gap and division, the subject can be viewed as always divided and unidentical to itself (I = I +/- a).[29] And if the death drive is a repetition compulsion towards the very same thing, then *unheimlich* is the effect of the incapacity to be repeated without a slight divergence. A repetition where the limitations of (self)identity and identification are always undermined. What is crucial for creating a link between repetition and negation in the context of *unheimlich* is the point of unrecognizability. That is, not being able to tell on which side of the line the thing before you is standing — in or out, subject or object, human or unhuman. This point of the lack of recognition can be defined through Aristotle as *negative anagnorisis* or as a transition from knowing to unknowing.[30]

The Ljubljana school of psychoanalysis consistently deals with trying to distinguish between the tragic, the comical, and the uncanny through the operators of negation (Hegel), the figure of the Doppelgänger (Freud), and the notion of extimacy (Lacan). The recognition (*anagnorisis*), as Alenka Zupančič skilfully demonstrates, works either through the axis of the tragic as the logic of the sacrificial and the exceptional, or, through the axis of the comical as perpetual minimal difference between two similarities through a montage of them.[31] Therefore, this hypothesis suggests that the indistinguishability between the two axes, between the tragic and the comical logic, opens a gap which causes the *unheimlich* effect.

When illustrating the difference between the comical and the uncanny, Alenka Zupančič likes to give the example of the actor who

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[27] For the link between *The Sandman* and Freud with regards to the mystical anxiety from a family crypt and a buried enigma, see: Nicholas Rand and Maria Torok, "The Sandman Looks at "The Uncanny"", in *Speculations after Freud: Psychoanalysis, Philosophy, and Culture*, ed. Sonu Shamdasani and Michael Münchow (London and New York: Routledge, 1994), 185–204. On the subject of the aesthetic category of uncanny and its role in literature in the prism of the notions of setting, framework and point of view, as well as the ideas of mastery, control, and uncertainty, see: Darin Tenev and Enyo Stoyanov, "Literary Uncanny," in *The Sublime and the Uncanny*, ed. Futoshi Hoshino and Kamelia Spassova, *UTCP Booklet* 27 (Tokyo: UTCP, 2016), 41–65.

[28] Mladen Dolar, ""I Shall Be with You on Your Wedding-Night": Lacan and the Uncanny,"" *October* 58 (1991), 7, https://doi.org/10.2307/778795.
[29] The problem of the divided subject with regards to the Doppelgänger theory in literature (from German Romanticism to Postmodernism) and philosophy (from Kant and Fichte to Blanchot and Derrida), is further developed in: Dimitris Vardoulakis, *The Doppelgänger: Literature's Philosophy*, (New York: Fordham University Press, 2010).
[30] Maria Kalinova develops the idea of *negative anagnorisis*, see: Maria Kalinova, "Negative Anagnorisis: Notes on the Uncanny and the Metamorphosis in Kafka's *The Metamorphosis*," in *The Sublime and the Uncanny*, ed. Futoshi Hoshino and Kamelia Spassova, *UTCP Booklet* 27 (Tokyo: UTCP, 2016), 67–82.
[31] About the distinction between the logic of the tragic and the logic of the comical, see: Alenka Zupančič, "On Love as Comedy", *Identities: Journal for Politics, Gender and Culture* 2:1 (2003), 61–80.

played a dead body on stage and as he was pretending to be dead during the play, he sneezed. To the audience and the actors sneezing was comical, but for the characters that are part of a theatrical illusion, it would have been *unheimlich*: the dead character suddenly moves.[32] It is funny for a corpse to sneeze only if we know that he is not really a dead body but a living actor. The logic of the comedy always requires the metaposition of an audience that knows more than the characters. In order to laugh, one should be able to observe from aside or from above, separated from the action, whereas the logic of *unheimlich* is based upon the shift from knowing to unknowing, in which case the metainstance of a distance view is not present. It comes with the interiorized gaze and the uneasy self-reflexive work: is this alive, is this me?

If *unheimlich* is a point in time, then it is the point of unrecognizability; if *unheimlich* is a special category, it is the uncanny valley where the very notion of a separating line becomes ambivalent: the thing outside of the unexpected turns out to be the thing inside.

7. Unblocking the Difference

The line of the artificial being in the humanities' ever-changing perception passes through like Ariadne's thread in Miglena Nikolchina's theoretical books. The aim of Nikolchina's works is to redefine the very notion of *difference*. In her revision she doesn't Hegelianly reduce the antinomies to instances of mediation, nor does she follow Agamben's zones of indifference. Agamben's thesis about the dysfunctionality of the anthropological machine is especially important. Nikolchina finds an antidote for its inoperativity. Agamben's thesis is based upon the peculiar logico-political structure of inclusion and exclusion. He maintains that the line between human and unhuman is the act of exclusion — the human is not an animal.[33] That which,

according to Agamben, gets stopped through the *animalization of the human* and *the humanization of the animal* is the anthropological machine's ability to establish an understanding of the human as a state of exception: the line between human and animal is erased.[34] The spot where Agamben suggests a zone of indifference,[35] is where Nikolchina attempts to find *differentia specifica* when defining the human. And she finds it in the automaton. Thus, she revalidates the separating line between human and unhuman but also transforms it. The figure of the unhuman shifts from the animal towards the robot. The line where one makes a distinction works, not through the exclusion operator, but through the montage of two different positions. In short, to be able to understand what a human is, we first have to understand what separates it from the machine. And if Agamben's anthropological machine is set in motion by the logic of the tragic, the sacrificial, and the exceptional, then Nikolchina proposes that the human be reconsidered by the logic of the edge between the comical and *unheimlich*:

> Frequently acting as a threat to humanity, robots deploy the paradox of the Doppelgänger, who can appear either as the comic twin or as the annihilating double, thus stalking the edge between comedy proper and the uncanny. The point in this case, however, is to single out the mechanism of reduplication that acts through montage and that posits an altogether different "anthropological machine". Instead of separating man from animal, this machine proliferates man's fake doubles.[36]

The robot can be a perfect copy of a human, his or her Doppelgänger (as Ishiguro proposes), a single virtual point, and yet, there is something that radically separates the human from the automaton. This *unheimlich* thing is definitive for what is human today— grasping it

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[32] Alenka Zupančič, *Why Psychoanalysis? Three Interventions* (Aarhus: Aarhus University Press, 2007), 49.

[33] Kolozova, after Marx and Laruelle, proposes another vision. She suggests we think of a dyadic structure of technology and the organic as an inhuman kernel that precedes the subject: "The inhuman is that which escapes rational conceptualization, that which has no meaning or reason for existence: senseless, brute existence, mere matter regardless of whether it is organic or artificially produced. [...] In other words, subjectivity is always already philosophical. It is nothing but the automaton of signification which represents the human or constitutes it as representation; what makes it (non)human is precisely its failure to fully represent." The place of this inhuman rupture beyond representation and conceptualization is the Real in Lacanian terms. Katerina Kolozova, "The Inhuman and the Automaton: Exploitation and the Exploited in the Era of Late Capitalism", in *Superpositions: Laruelle and the Humanities*, ed. Rocco Gangle, (London:

Rowman & Littlefield International, 2017), 92.

[34] Giorgio Agamben, *The Open: Man and Animal*, trans. Kevin Attell (Stanford: Stanford University Press, 2004), 36–37.

[35] Agamben's notion through which the paradigm of the exception is constructed, is often translated in English as "a zone of indifference", and as "a zone of indistinction". About the different effects between that and Deleuze and Guattari's concept "a zone of indiscernibility", see: Erinn Cunniff Gilson, "Zones of Indiscernibility: The Life of a Concept from Deleuze to Agamben," *Philosophy Today* 51, (2007), 98–106.

[36] Miglena Nikolchina, "An Unfinished Project: Man as Comedy," in *Lost Unicorns of the Velvet Revolutions: Heterotopias of the Seminar* (Fordham University Press, 2013), 107.

causes the difference.[37] In this turn, Nikolchina sees a shift of paradigms from the logic of the tragic (transcendent, in the dimension of desire) to the logic of the comical (immanent, in the dimension of the drive).

Why doesn't the perspective of man and machine becoming affinitive scare Nikolchina, how is it that she manages to not fall into the trap of the uncanny valley? It is important to point out that what some find *unheimlich,* others find comical. The comical arises from the possibility that the differences between two close perspectives is outlined, that the deceptive duplication of the heterotopic homonymies get recognized, and that the difference gets embedded into the process of heterogenesis itself. In other words, Nikolchina theoretically avoids the sacrificial-tragical logic, as well as the *unheimlich* logic which implies a point of indistinguishability that I here have presented here as negative *anagnorisis*.

The deautomatization of automatisms in the case of humans, as well as in that of machines, occurs in the critical act of recognizing, which induces heterogenesis and sees elements of various categories instead of a homonymous fusion. There is nothing fatalistic about Nikolchina's call to think of man as affinitive and distinguishable from the machines, but she insists that we do not stop to think of the human situation inside the context of the quickly changing field of technological innovation. After all, such an effort is to be made with the clear awareness that in the conversation between the strict sciences and the humanities, the latter have a lot more to say and have to be more creative when it comes to finding ways of being heard.

The whole story around the problem of M. Mori and H. Ishiguro's differing concepts in robotics can only confirm how important it is that the visions, such as that of Hoffmann, Jentsch, and Freud, be remembered. Masahiro Mori searches for an approach towards discovering artificial intelligence beyond the human form, while Professor Ishiguro focuses on overcoming the uncanny valley and designing the ever more flawless mimetic machines. The two robotics professors argue with one another imagining situations that have already been played out in fiction. To some extent, science simply carries out what has already been "invented" by literature, but there is a need for someone to remember, know about, and point out these links. These links need not be *liaisons dangereuses* as long as the possibility for a joint conversation is found. As it is now clear, coincidences should not scare us, they should prepare us for the task to critically analyse them, to distinguish between a number of similarities with the help of reflexive instruments and double vision which doesn't sublate the tension between heterogenic layers but expresses it.

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[37] On a related note, Vassil Vidinsky makes an observation about mimetic machines as a human historical impulse towards self-knowledge. He thinks about a machine intelligence that is different from that of a human through the hypothesis of imaginary non-algorithmic machines that can approach our human nature in a better way. Vidinsky proposes the figure of *Homo sapiens technicus* from the 17th century onwards (a reconceptualization of the Baconian program), as he contemplates the historical shift of the natural, Vassil Vidinsky, "(Post) Phenomenological Approach to Homo Sapiens Technicus," *Balkan Journal of Philosophy* 12:1 (2020), 31–36, https://doi.org/10.5840/bjp20201215.