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## ARTICLE

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# The Self-Driving Car: A Media Machine for Posthumans?

**Erkki Huhtamo**

University of California, Los Angeles

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## Abstract

This article discusses the self-driving car as a media machine, thinking about its character and broader implications from media archaeological and posthumanist perspectives. Self-driving or autonomous vehicles challenge traditional ideas about agency. Car culture has usually been considered human-centered. While there have been concerns about the “human factor” and the consequences of poor and distracted driving, the human behind the steering wheel has also been considered a guarantee of safety. The introduction of the self-driving car displaces the human from an active role as an agent and introduces forms of material agency as a replacement. This shift has huge consequences, which will be explored from various perspectives. The study will also situate the self-driving car historically within plans about automated highways, also discussing their discursive manifestations within popular media culture. The study introduces the idea of “traffic dispositive”, which it applies on multiple levels. One of the basic points underlying the discussion is that the autonomous car can never be fully autonomous. It is linked with data networks and other frameworks of factors that affect its uses and also its potential passengers. We must ask: How will the potential adoption of self-driving cars affect the human/posthuman relationship?

**Keywords**

Self-driving car, autonomous car, car culture, posthumanism, theories of agency, media archaeology, data networks, artificial intelligence, Internet of Things, automated highways, smart technology

*El coche con conducción autónoma: ¿una máquina mediática para posthumanos?***Resumen**

*Este artículo quiere reflexionar sobre el coche con conducción autónoma como una máquina multimedia, centrándose en su carácter y sus implicaciones más amplias desde las perspectivas arqueológicas y posthumanistas de los medios de comunicación. Los vehículos con conducción autónoma desafían la concepción tradicional sobre la acción. La cultura automovilística generalmente se ha centrado en el ser humano. Si bien se ha tenido en cuenta el "factor humano" y las consecuencias de una conducción mala y distraída, el humano al volante también se ha considerado una garantía de seguridad. La introducción del automóvil autónomo desplaza al ser humano como agente con papel activo y lo sustituye con formas de acción material. Este cambio tiene consecuencias significativas que se explorarán desde diferentes perspectivas. El estudio también sitúa históricamente el automóvil autónomo dentro de los planes sobre autopistas automatizadas, y reflexiona sobre sus manifestaciones discursivas dentro de la cultura popular de los medios de comunicación. El estudio introduce la idea de "dispositivo de tráfico", que se aplica en múltiples niveles. Uno de los puntos básicos que subyacen en la discusión es que el automóvil con conducción autónoma nunca puede ser completamente autónomo. Está vinculado a redes de datos y otros marcos de factores que afectan tanto su uso como sus pasajeros potenciales. Tenemos que preguntarnos: ¿Cómo afectará la adopción de automóviles autónomos a la relación humano/posthumano?*

**Palabras clave**

*Vehículos con conducción autónoma, automóvil autónomo, cultura automovilística, posthumanismo, teorías de agencia, arqueología de medios, redes de datos, inteligencia artificial, Internet de las cosas, autopistas automatizadas, tecnología inteligente*

By its suddenness and global reach, the COVID-19 pandemic put both short-term and long-term futuristic predictions into jeopardy. Topics that were hotly debated in the news media and at online forums only yesterday have been put on hold, at least for now. One of the indicators used to epitomize where the world was heading was the autonomous or self-driving car (sometimes called robot car). Powered by computers, sensors and actuators, LI-DARs and radars, AI, and omnipresent data networks, yet operating on traditional streets and roads with intersections, zebra crossings, traffic lights and unpredictable humans and animals, the self-driving car promised to fulfil the old dream of full automation. No longer would we need to strain our nerves behind the steering wheel, our feet ready to push the brake pedal; from now on, we could take it easy, biding our time with social media, games, empty gossip or casual sex while waiting for the car to deliver us to our destination. Everything would be effortless - the world of work and stress pushed further and further away from our minds. The self-driving

car promised a hedonistic do-nothing capsule in motion, leaving from our doorsteps and bringing us back again. You would step into a vehicle, set a menu, push a button, and the car would do the rest.

Most of those who gave the idea any serious thought understood that it would never be that simple. All kinds of 'road blocks' were singled out. Unexpected problems can occur when 'smart' technology becomes embedded in a 'dumb' environment. *Accidents Will Happen*, sings Elvis Costello. Even if an autonomous vehicle managed to make sense of its environment, it might end up in a situation where it has to make a rapid decision about life and death. This has led to speculations about 'posthuman ethics'. If a self-driving car has to decide between harming several pedestrians and one passerby, one pedestrian and its own passenger, or several pedestrians and its own passenger, what should it do?<sup>1</sup> Who would be responsible for the decision and its legal consequences? The car's owner, the company that built it or marketed it, the passenger, or the authorities who

1. Jean-François Bonnefon, Azim Shariff, Iyad Rahwan, "The social dilemma of autonomous vehicles", *Science*, Vol. 352, No. 6293 (24 June 2016), 1574 (article 1573-1576).

authorized such a mode of transportation? This reminds us of the fact that a self-driving car can never be autonomous in the proper sense of the word: it can avoid neither road systems and data networks nor laws, commercial lures, and various social formations. Control may be delegated from humans to computerized systems for mapping and sensing, but they do not operate in a vacuum.

There has been much talk and speculation about the self-driving car in recent years, but less research that would look beyond marketing, engineering and legalities into social and cultural implications, parallels and divergences. What is the identity of the autonomous car if we put it in a mediatic context? Mobilities (modes of being in motion) are increasingly tied with automated control systems.<sup>2</sup> It can be suggested that the self-driving car is a token of the convergence of mobilities and communications, and as such a valid topic of research for media studies. I will suggest that it can be analyzed as a *media machine* which has links with the past, but also features that separate it from the media machines seen so far. This is partly so, because it can be described as a 'posthuman subject'. That leads to another question: What is the role of mobilities in a 'posthuman' media culture? Yet another issue concerns agency. Where is the line between human and nonhuman agency, including what Andy Pickering and others have called 'material agency'? Pickering writes: "Most obviously, it seems to me that machines do things that unaided human minds and bodies cannot. Machines, that is, are performative agents in a sense precisely analogous to disciplined human agents. Less obviously, perhaps, I think that we need to let agency rise to the surface in our understanding of science, technology, and society."<sup>3</sup> How does this apply to the relationship between driving humans and autonomous vehicles?

## From Controlling to Eliminating the "Human Factor"

It is worth beginning by having a brief look at the etymology of the word 'automobile', which comes from the Greek *autos* ('self') and the French *mobile* ('mobile'). The latter was derived from the Latin

*mobilis* ('movable'). The French *automobile* was translated into English as 'self-propelled motor vehicle'. A similar idea is expressed by the modern Greek word that denotes the car, *autokineto* ('moved of itself'). Concepts like these imply that the car is an 'autonomous' entity, but as another early term, 'horseless carriage', indicates, it only means that it is independent from the horse, not from the human driving it.<sup>4</sup> A carriage had to be attached to a harnessed horse, which functioned as its 'engine', whereas an automobile includes its own source of motive power.<sup>5</sup> In this sense it is a self-supporting entity as another early term, 'motor car', indicates. In the early days of automobiles around 1900, it was not uncommon to detect a continuity rather than a rupture between the two modes of transportation.<sup>6</sup> This situation was expressed in a report of a first time experience published in the appropriately named *Horseless Age: The Automobile Trade Magazine* in 1897:

In search of a new sensation not inconsistent with a proper observation of Lent, I went yesterday and rode [sic] in a horseless carriage. I don't regret the experiment. After the first flush of the thing, and barring the familiar aspect of the dashboard, the harness and the horse, it was not unlike riding in an ordinary hansom, for all the carriages in the place that I went to are built on the hansom plan, which is to say that they are the homeliest vehicles that were ever invented.<sup>7</sup>

As automobile design began 'steering' away from the 'hansom plan', such attitudes changed, producing - at times at least - a genuine sense of rupture. A major role was played by speed, which soon far exceeded the trotting of the horse. It also changed the relationship between the automobile 'riders' and the landscape.<sup>8</sup> We could speculate that horse-drawn passengers felt themselves part of the landscape (as pedestrians did), whereas the automobile driver became separated from it through a kind of inverse motion trope - the surrounding scenery seemed to glide by.<sup>9</sup> This was clearest in the context of car racing, where observing the scenery was out of question. Streamlining, which became a catchword for American industrial design in the 1930s, emphasized the split between the speeding object and its environment. Early car culture is dotted with evidence about the exhilarating sensation of driving at high speed, epitomized by F. T. Marinetti's words from *The*

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- Mobilities include, according to John Urry, "various kinds and temporalities of physical movement, ranging from standing, lounging, walking, climbing, dancing, to those enhanced by technologies, of bikes, buses, cars, trains, ships, planes, wheelchairs, crutches." See his *Mobilities* (Cambridge, UK: Polity, 2008), 8.
  - Andy Pickering, "Cyborg History and the World War II Regime", *Perspectives on Science*, Vol. 3, No. 1 (1995), 3.
  - 'Horsepower' expresses the transfer of agency from animals to machines. The word is usually credited to James Watt, who used it to describe the power of his steam engines in the late eighteenth century. It came to be applied to other types of engines, turbines and motors as well.
  - In a way the motor car opened up a chasm between the human and the animal, but the issue is complex. Horses had been enslaved in transportation, but they were displaced from one of their leading social roles by the automobile. This issue has relevance for work on the relationships between humans and animals. See Donna Haraway, *Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago: Chicago University Press, 2003).
  - The habit of calling the railway engine (locomotive) an 'iron horse' is interesting. Obviously it was conceived as separate from the carriages it was dragging along the rails. Horse-drawn street cars vs. electric ones are worth remembering in this context.
  - "A Chappie and a Horseman Try the New Horseless Carriage", *Horseless Age: The Automobile Trade Magazine* (New York), Vol. II, No. 5 (March, 1897), 15.
  - Catherine Gudis, *Buyways: Billboards, Automobiles, and the American Landscape* (New York: Routledge, 2004).
  - It is worth comparing this with observations by early train passengers. Wolfgang Schivelbusch, *The Railway Journey: The Industrialization of Time and Space in the Nineteenth Century*, translation (Berkeley: University of California Press, 2014), Ch. 3 (Railroad Space and Railroad Time); Claude Pichois, *Vitesse et vision du monde* (Neuchâtel: Éditions de la Baconnière, 1973), 21-33.

*First Manifesto of Futurism* (1909): "We declare that the splendor of the world has been enriched by a new beauty - the beauty of speed. [...] A roaring racing car, rattling along like a machine gun, is more beautiful than the winged victory of Samothrace." For Marinetti, the risk of speed was part of the thrill, whereas there were others for whom it represented a dangerous 'mental derangement' - *speed mania*, *speed madness* or *speed craze*.<sup>10</sup> In 1912, the Iowa-based The Cedar Rapids Foundry & Machine Co. saw this as an opportunity to promote its products:

The World is Speed Crazy. Limited Trains, automobiles, aeroplanes and even the people are rushing wildly about. Well we can't control this speed but we can control the speed of your cream separator, washing machine or other light machinery. We will do it with the Cedar Rapids Speed Governor.<sup>11</sup>

As Sarah Redshaw has shown, driving was considered a human-centered activity from the beginning.<sup>12</sup> The driver was expected to be in control. Concentration, consistency and perseverance were supreme virtues, but it soon became evident that many drivers did not live up to these ideals. The mental effort was not constant; it drifted during a single ride and changed over time. Driving tends to become 'automated': the driver does it without thinking about it. More experience did not necessarily mean becoming a better driver; it could lead to negligence. *Harper's Weekly* wrote: "If we carefully examine the criminaloids who are given to dashing madly along the roads in motorcars we shall find that in every case their mania arises from an overweening sense of their own importance, accompanied by very slight capacity for self-restraint. The type of man who motors at dangerous speed is the same type that speculates in more stocks than he is able to carry, eats and drinks more than he can assimilate, covers himself with gaudy jewels, makes an objectionable exhibition of himself on every possible occasion."<sup>13</sup> The Futurists worshipped excess questioning of the norms of the bourgeois society, but for the authorities such attitudes were a thing to eradicate.

The debates on dangerous driving increased concerns about the 'human factor'.<sup>14</sup> The authorities called for mastery at the steering wheel, reinstating the ideal of responsible human agency. The efforts

to control negligent or undisciplined drivers led to rules and regulations. As motor cars accumulated it became evident that the existing roads, made for horse-based traffic, were inadequate too. The narrow city streets could not accommodate large numbers of cars, which caused traffic jams, parking problems, and accidents. These developments led to the emergence of 'traffic dispositives'.<sup>15</sup> By this concept I understand descriptions of systems of relationships, which attempt to anticipate the conditions of mobility in a certain time and place.<sup>16</sup> The features include the networks of streets and roads with lanes, intersections and traffic signs, and also the drivers, pedestrians, traffic police and other human agents supposed to use them. Possible situations, speeds, continuities, stops, left and right turns, etc. can be probed by urban developers and researchers alike almost like playing a classic war game.<sup>17</sup> The important thing to realize is that although they are derived from cultural and historical facts, they are abstractions. The actual situations where mobilities take place, including contingencies like collisions, do not always correspond with such prescriptive scenarios. The elements of traffic dispositives are negotiated and 'tested' by agents who end up in unprecedented realities in realworld situations.

When Max Horkheimer assessed the transition from horse-based to automobile-based traffic in the 1940s, he related it to changes in the nature and quantity of human freedom:

Quite different degrees of freedom are involved in driving a horse and in driving a modern automobile. Aside from the fact that the automobile is available to a much larger percentage of the population than the carriage was, the automobile is faster and more efficient, requires less care, and is perhaps more manageable. However, the accretion of freedom has brought about a change in the character of freedom. It is as if the innumerable laws, regulations, and directions with which we must comply were driving the car, not we. There are speed limits, warnings to drive slowly, to stop, to stay within certain lanes, and even diagrams showing the shape of the curve ahead. We must keep our eyes on the road and be ready at each instant to react with the right motion. Our spontaneity has been replaced by a frame of mind which compels us to discard every emotion or idea that might impair our alertness to the impersonal demands assailing us.<sup>18</sup>

10. "One Hundred are Sacrificed to Automobile Speed Mania in June, the Month of Deaths", *The Spokesman*, Vol. XXX, No. 7 (July 1914), 310. See also Vol. XXX, No. 10 (Oct. 1914), 501. The magazine represented the carriage building industry, which was under threat, so there may have been a bias. Discussed as a 'mental derangement' from a phrenological perspective, see E. Favary, "The Evolution of the Automobile", *The Phrenological Journal and the Science of Health*, Vol. 121, No. 1, Whole No. 826 (Jan. 1908), 14-18.

11. "The World is Speed Crazy," advertisement in *Gas Power*, Vol. 10, No. 5 (Nov. 1912), 11.

12. Sarah Redshaw, *In the Company of Cars. Driving as a Social and Cultural Practice* (London: Routledge, 2016 [orig. Ashgate, 2008]).

13. Henry Underwood, "Speed Mania and How to Cure It", *Harper's Weekly*, Vol. LI, No. 2623 (March 30, 1907), 470. See also "Psychology and Pathology of the Automobile", *The Christian Advocate*, Vol. LXXXII, No. 30 (July 25, 1907), 1166. The writer considers speed mania "almost epidemic".

14. Xenophon P. Huddy, "Dangerous Automobile Driving," *The Horseless Age*, Vol. 21, No. 18 (April 29, 1908), 503-504.

15. This term is derived from the newly formulated dispositive theory of François Albera and Maria Tortajada. See their "Introduction to an Epistemology of Viewing and Listening Dispositives", in: *Cinema Beyond Film. Media Epistemology in the Modern Era*, eds. Albera and Tortajada. (Amsterdam: Amsterdam University Press, 2010), 10-12; *Cine-Dispositives. Essays in Epistemology Across Media*, eds. Albera and Tortajada (Amsterdam: Amsterdam University Press, 2015).

16. Urry talks about "mobility systems" that "make possible movement: they provide 'spaces of anticipation' that the journey can be made, that the message will get through, that the parcel will arrive. Systems permit predictable and relatively risk-free repetition of the movement in question." *Mobilities*, 13.

17. Society simulator games like *Sim City* could also be mentioned as a point of comparison.

18. Max Horkheimer, *Eclipse of Reason* (New York: Oxford University Press, 1947), 98.

However, in spite of the modernist arrogance and anti-passéiste rhetoric of the Futurists, it is important to point out that Marinetti's stance emerged from the humanist tradition. The driver's (or aviator's) body, identified as masculine, was augmented with a prosthesis which gave it almost superhuman qualities, but the aggressive and self-important male turning the steering wheel (or pulling the trigger of a machine gun) was still a human. The discourse on the self-driving car goes to a radically different direction, because it displaces the human from the role of an active protagonist. Agency is handed over to a machinic system, a non-human entity. When did such a notion develop? There has been a tendency in popular media to see it as very recent. The aggressive nationalism and militarism that rose in the latter decades of the nineteenth century still believed in human agency augmented by the products of the industrial revolution. However, fantasies about automation and its effects on society were presented.<sup>19</sup> Cartoonists depicted steam-powered spanking machines and other 'things automatic' - restaurants, amusement parlors, barbershops, dentists, even arbitration. Such concoctions included seeds of self-acting technology. Instead of offering themselves as tools or extensions of the body, they did things for passive and hedonistic humans, who only had to put a coin in a slot.<sup>20</sup> The discourse was paralleled by a dystopian variant, where humans became enslaved and even annihilated by the machinic monsters of their own making.

## Going Driverless in Fact and Fiction

As a handful of pioneering scholars have demonstrated, the earliest concrete experiments with driverless vehicles took place in the 1920s and the 1930s.<sup>21</sup> They were inspired by advances in military

technology, aviation and radio engineering. Gyroscopic airplane stabilizers, predecessors of today's autopilots, were introduced in the 1910s. Pioneers of wireless telegraphy had experimented with remote-controlled boats, torpedoes, aircraft, and even ground vehicles; why not with automobiles?<sup>22</sup> Public demonstrations that were organized were widely noted, although we cannot speak about true autonomy: the cars seemed to move on their own, but were controlled remotely by a trained human driver from another vehicle close behind.<sup>23</sup> Such experiments were organized as part of 'safety parades' in American cities. They therefore emphasized rather than effaced the role of a skilful driver. The 'human factor' was recognized as a traffic risk, but human presence was also invoked as a guarantee of safety.<sup>24</sup> The attention then turned to 'smart' infrastructures: roads powered by technology, meant to communicate with vehicles and to control them. They are known as 'automated highway systems' (AHS). This happened parallel with early developments in normal highways, which had, as James Wetmore explains, governmental interest.<sup>25</sup> Popular cultural discourses eagerly reported and fantasized about AHS.

In the United States, the director of Harvard University's Bureau for Street Traffic Research, Dr. Miller McClintock, was quoted in 1938 by *Popular Science* and also by the star industrial designer Norman Bel Geddes in his book *Magic Motorways* (1940). McClintock promoted "foolproof roads on which the minimum of human judgment was required."<sup>26</sup> A 1938 article in *Life*, for which he was interviewed, stated that "[t]he car of the future will all but ride on rail-road tracks".<sup>27</sup> *Popular Science* presented the basic scenario, which was repeated many times over the years with relatively minor variations.<sup>28</sup> Electric cables were to be buried under the lanes. A "set of electromagnetic

19. Erkki Huhtamo, "Slots of Fun, Slots of Trouble. Toward an Archaeology of Electronic Gaming", in: *Handbook of Computer Games Studies*, eds. Joost Raessens & Jeffrey Goldstein (Cambridge, Mass.: The MIT Press, 2005), 1-21. The long history of automata, or self-acting mechanical wonders, belongs to the archaeology of the self-driving car, but cannot be discussed here.

20. Nic Costa, *Automatic Pleasures: The History of The Coin Machine* (London: Kevin Francis Publishing, 1988) is rich in examples. It should be kept in mind that the word 'automation' was used in different senses. It often referred to "self-service" devices. Automats, self-service restaurants, were a famous example.

21. Jameson M. Wetmore, "Driving the Dream: The History and Motivations Behind 60 Years of Automated Highway Systems in America", *Automotive History Review* (Summer 2003), 4-13; "Reflecting on the Dream of Automated Vehicles: Visions of Hands Free Driving over the past 80 years", *TG Technikgeschichte* (forthcoming 2020); Erik Lee Stayton, "Driverless Dreams: Technological Narratives and the Shape of the Automated Car", M.S. Thesis, MIT, Comparative Media Studies (unprinted), 2015; "Sensing, Seeing, and Knowing: The Human and the Self-Driving Car", in: "Technologies of Knowing", eds. Sonia Misra and Maria Zalewska, *Spectator*, Vol. 36, No. 1 (Spring 2016), 8-24; Fabian Kröger, "Automated Driving and Its Social, Historical and Cultural Contexts", in: *Autonomous Driving: Technical, Legal and Social Aspects*, eds. Markus Maurer, J.Christian Gerdes, Barbara Lenz, Hermann Winner (Berlin & Heidelberg: Springer-Verlag, 2016), 41-68.

22. H. R. Everett, *Unmanned Systems of World Wars I and II* (Cambridge, Mass.: The MIT Press 2015), Ch. 5 ("Unmanned Ground Vehicles").

23. The most famous demonstration was staged by the former US Army electrical engineer Francis P. Houdina in 1925 with a radio-operated automobile called The American Wonder. It has been called "Linrrican Wonder" because of faulty OCR scanning of the article "Science: Radio Auto", *Time*, Aug. 10, 1925. The mistake was corrected by Kröger, "Automated Driving", 43, n. 2.

24. An educational film, *The Safest Place* (General Motors, 1935), suggested that a fully automated car would be the safest, because the human driver's unpredictable behavior and vagaries would be eliminated. Watch: <https://www.youtube.com/watch?v=DGCrgf9LMI4>.

25. Wetmore, "Driving the Dream."

26. "The Traffic Problem: Its Best Solution Lies in Foolproof Highways which Reduced Driver Judgment to a Minimum", *Life*, Vol. 5, No. 1 (July 4, 1938), 43. These roads were also called the "limited way".

27. *Ibid.*, 45.

28. E. W. Murtfeldt, "Highways of the Future", *Popular Science*, May 1938, 27-29, 118-119. Compare with: George W. Gibson, "Why don't we have... Crash-Proof Highways?," *Mechanix Illustrated*, June 1953, 73-75, 184. In addition to McClintock, Senator Robert J. Bulkley from Ohio was said to have presented "a spectacular highway plan".

impulses” was said to control the car’s speed, while another set would “lock its steering gear against any attempt to make a dangerous turn from one lane to another”. Eventually the cable system would be “adapted to take over steering altogether - allowing the driver to release the wheel, sit back, and make himself comfortable until he chooses to switch back again to manual control”. McClintock advised Bel Geddes when he designed a model of *The City of the Tomorrow* for Shell Oil Company’s advertising campaign in 1937.<sup>29</sup> Bel Geddes developed the idea further and managed to sell it to Albert Sloan at General Motors. The result was the famous *Futurama* attraction exhibited in GM’s *Highways and Horizons* Pavilion at the New York World’s Fair of 1939-1940.<sup>30</sup>

*Futurama* was a ‘diorama’ on an enormous scale.<sup>31</sup> It centered on a huge physical three-dimensional miniature model depicting areas of America as it was expected to look in 1960.<sup>32</sup> The scenery was observed from above from a dedicated mobility system - a long row of seats placed side by side on a moving conveyor belt that circled around the exhibit. This simulated a view from a passenger airplane.<sup>33</sup> Natural environments and urban areas were connected by superhighways with multiple lanes; thousands of cars (miniatures) were seen moving safely at standardized speeds under radio control. Although Bel Geddes elaborated on the concept and its future prospects in a companion book titled *Magic Motorways*, he did not explain how the idea would have been technically realized.<sup>34</sup> Control towers would be erected at regular intervals by the roadside. Their officers would have complete authority over the traffic passing them and could communicate with any car “with their instruments”. *Futurama* was as much about the present as it was about the future - an advertising venture for raising interest

in General Motors’s (non-automated) cars. After the spectacle, the spectators ended up in a multi-level real-size urban intersection of 1960. From an elevated platform they could see the company’s current car models on display on the street below.

After the hiatus of World War II, very similar ideas again appeared in the 1950s. General Motors and the radio empire RCA built a scale model of a highway system to be used as a test environment.<sup>35</sup> Five years later, they tested actual cars on a closed track applying technology developed by the TV pioneer Vladimir Zworykin.<sup>36</sup> These experiments led to further promotional stunts, like the musical short film *Key to the Future*, which was featured in General Motors’ touring *Motorama* exhibit in 1956. A standard white nuclear family (with teenage children) is first seen stuck in a traffic jam, singing of their frustration. By turning a dial on the car radio they are magically transported to the “safety autoway” in 1976. The family’s Firebird II (a concept car inspired by fighter plane design) is first driven manually and then sent to an automated high-speed lane with an ‘electronic control strip’. A checklist is inspected with a control tower operator by radio. ‘Automatic control’ and ‘hands-off steering’ can then be activated, and the family relaxes by smoking, chatting, drinking juice and eating ice cream. The tower operator later recommends for them a place for staying overnight, sending a promo clip to the dashboard screen.<sup>37</sup> The communication with the tower has been directly inspired by air traffic control. In the film the family’s Firebird mostly cruises alone on a desert(ed) highway, but in dense road traffic the proposed solution would be impractical, even impossible. Using “electronic brains” as a replacement for the human controller had already been suggested, but mainframe computers were still in their infancy and full industrial automation still gaining strength.<sup>38</sup>

29. The campaign featured Bel Geddes as an “authority on future trends”. The futuristic projections presented in his book *Horizons* (Boston: Little, Brown, and Company, 1932) do not include highways, although chapter 2 is dedicated to “Speed - Tomorrow.” Bel Geddes likely picked the topic from McClintock, or from politicians in the US Congress.

30. Bel Geddes claimed that already during the summer 1939, five million saw it. The figure should be taken with skepticism. Norman Bel Geddes, *Magic Motorways* (New York: Random House, 1940), 3.

31. Diorama originally meant something else. About the changes of its meaning, see Erkki Huhtamo, “The Diorama Revisited”, in: *Sonic Acts XIII – The Poetics of Space, Spatial Explorations in Art, Science, Music & Technology*, eds. Arie Altena & Sonic Acts (Amsterdam: Sonic Acts Press / Paradiso, 2010), 207-228. *Futurama* was often characterized as a ‘diorama’, but it was really an animated ‘panstereorama’. Patrick Ellis, “The Panstereorama: City Models in the Balloon Era”, *Imago Mundi*, Vol. 70, No. 1 (2018), 79-93.

32. It recalls Chris Burden’s kinetic sculpture *Metropolis II* (2011) on permanent display at the Los Angeles County Museum of Art. The over a thousand miniature cars seen in motion are provided with magnets for traction, which still does not prevent them from falling over from time to time. Burden’s is a postmodern version without Bel Geddes’s modernist and capitalist idealism. *Metropolis II* can also be viewed from above from a viewing balcony.

33. Adnan Morshed, “The Aesthetics of Ascension in Norman Bel Geddes’s *Futurama*”, *JSAH*, Vol. 63, No. 1 (March 2004), 74-99. As Morshed shows, Bel Geddes deliberately applied the idea of the “airplane eye” (77).

34. Bel Geddes, *Magic Motorways*, 76-82. Three-dimensional ‘dioramas’ were a hot topic in the 1930s among American exhibition designers. See Edward Heckler Burdick, “Lilliput Outgrows Gulliver”, *Popular Mechanics*, Vol. 71, No. 5 (May 1939), 657-664. Burdick was the president of the Diorama Corporation of America. *Futurama* was not mentioned.

35. Wetmore, “Driving the Dream”. In “Reflecting on the Dream of Automated Vehicles”, Wetmore discusses these developments in even greater detail. The model had been built by 1953.

36. Martin Mann, “The Car that Drives Itself”, *Popular Science*, Vol. 172, No. 5 (May 1958), 75-79, 226-227.

37. A lady directly addresses the travelers, singing the praises of the Sunset Inn, which offers “push button living” and “automated sleep control in every bed”. Whether it is a prerecorded film or a live television / video phone transmission is left unclear.

38. In *Magic Motorways*, Bel Geddes discussed various ideas for automated electronic control, but also evoked systems that allowed one man to control train traffic from a centralized control board (73-75).

Isolated tests with self-driving vehicles continued. The prospect of the automated highway was kept alive, yet its permanent implementation was considered unrealistic. Many reasons contributed, including unreliable technology, the human factor, the prohibitive cost of constructing or converting large scale infrastructures, and safety concerns.<sup>39</sup> Still, in 1991 the United States Congress commissioned an R&D-based study about its feasibility. The National Automated Highway System Consortium, with governmental, industrial and academic partners, was formed and assigned the task. It made a demonstration in August 1997 on a converted 11-kilometers -long stretch of the I-15 freeway near San Diego, California.<sup>40</sup> Scenarios such as the “platooning of vehicles” were demonstrated. Closely coordinated groups of cars were “linked together with a wireless local communications network, which could continuously exchange information about speed, acceleration, braking, obstacles and the like”.<sup>41</sup> Applying the old scenario, magnets were embedded in the road and magnetometers installed in the cars. As a nod to the future, digital equipment installed by the roadside communicated with radars, sensors, and two-way radio systems in the cars. The project led to no concrete results. The attention of the R&D community began turning to self-driving cars that would operate on existing streets and roads.

To give incentives for developing autonomous vehicles (no doubt for military uses), the U.S. Defense Advanced Research Projects Agency (DARPA) organized two “Grand Challenges” (2004-2005), followed by an “Urban Challenge” (2017). The response was overwhelming.<sup>42</sup> Sebastian Thrun, whose Stanford University team won the second challenge, was recruited by Google X, the company’s newly founded “Moonshot Factory”, to lead its effort to develop a self-driving car. The secretive project was much hyped, but Google was not alone. In the past several years extensive research, development and road testing has taken place at both traditional car companies like Mercedes Benz (Germany) and Toyota (Japan) and at newcomers like Tesla (founded

in 2003). In 2016 Google’s self-driving car project was turned into Waymo, a division of Google’s parent company Alphabet, Inc. Possibly as a global first, toward the end of 2018 it launched Waymo One, a self-driving taxi service operating in the Phoenix area in Arizona. Safety drivers were on board and the service was limited to customers signed up with Waymo’s early rider program.<sup>43</sup> By March 2020, when the COVID-19 pandemic made Waymo halt its service, it was operating about 600 taxis; most still had the safety driver on board.<sup>44</sup> In 2018, another company named Nuro started testing unmanned delivery vehicles in the same area.<sup>45</sup> All this does not mean that self-driving cars would be crowding the streets and roads any time soon.

## Driverless Driving, the Human and the Posthuman

The self-driving car fuses real with imaginary, the present with the absent.<sup>46</sup> It exists and yet it doesn’t. The most intriguing issue is its relationship to humans as drivers and passengers. There are many variations of the traffic dispositive around the world, but humans - as drivers, cyclists, pedestrians, mopedists, tuk-tuk runners, e-scooter users, etc. - have central roles in all. The fully autonomous vehicle is an intruder, which will necessarily upset fragile balances. Despite all official and unofficial efforts, traffic remains a chaotic, unstable and unpredictable realm, a space where decisions and actions are constantly negotiated, where things can go wrong in an instant. Could self-driving cars change that or add yet another element of uncertainty? Incorporating an alien element into a preexisting system, which is rooted in inherited habits, conventions and beliefs, is not easy. It is likely that ‘vehicle autonomy’ will be introduced gradually. Cars already have automated features like power steering, automatic transmission, and cruise control, which work in concert with the

39. Additional problems, like institutional conservatism and environmental concerns, have been discussed by Wetmore, “Driving the Dream”.

40. James H. Rillings, “Automated Highways”, *Scientific American*, Vol. 277, No. 4 (October 1997), 80-85 (special issue on “The Future of Transportation.”); Corinna Wu, “Look Ma, No Hands”, *Science News*, Vol. 152, No. 11 (Sept. 13, 1997), 168-169. The project was based on the Intermodal Surface Transportation Efficiency Act (ISTEA, 1991) and was commissioned by the U.S. Department of Transportation. Robert A. Ferlis, “The Dream of an Automated Highway”, *Public Roads*, Vol. 71, No. 1 (Jul/Aug. 2007). The AHS program ended with the 1997 San Diego demonstration.

41. *Ibid.*, 82.

42. Sebastian Thrun, “Toward Robotic Cars”, *Communications of the ACM*, Vol. 53, No. 4 (April 2010), 99-106; James M. Anderson et al., *Autonomous Vehicle Technology: A Guide for Policymakers* (RAND Corporation, 2014), Ch. 4, “Brief History and Current State of Autonomous vehicles” (55-74).

43. Ride-hailing companies like Uber and Lyft are developing self-driving vehicles for obvious reasons: since they use smartphone apps to do business with the riders, it makes sense to get rid of human drivers and use fully autonomous vehicles.

44. The safety drivers are employed by the French company Transdev North America, which has created tensions. Andrew J. Hawkins, “Waymo drivers say they’re being discouraged from canceling robotaxi rides during coronavirus outbreak”, *The Verge*, posted March 13, 2020, available at [www.theverge.com](http://www.theverge.com). On March 20, 2020, it was reported Waymo would stop all Arizona operations because of the pandemic. Limited fully autonomous rides for signed up customers began in the summer of 2019.

45. In April 2020 it was announced that Nuro had received a permission to conduct road tests in selected Bay Area neighborhoods in California. All its tests were halted because of the COVID-19 pandemic. Andrew J. Hawkins, “Nuro gets the green light to test driverless delivery robots in California”, *The Verge*, posted April 7, 2020. Available at [www.theverge.com](http://www.theverge.com).

46. For fantasies of autonomous vehicles in movies, see Kröger, “Automated Driving”.

driver.<sup>47</sup> Navigation systems follow a similar principle: instead of taking control of the vehicle, they provide information and suggestions that help the driver to make choices, for example to avoid a congested route. Still, they can be considered a step toward a situation, where the driver will surrender one's active role and let the system take over.

The National Highway Traffic Safety Administration (NHTSA) of the United States has created a five-level chart to describe the relations between human-driven vehicles and autonomous vehicles.<sup>48</sup> One extreme (level 0) is a system where there is no automation whatsoever: the driver is fully responsible, as in the T-Model Ford era. The other extreme (level 4) is full automation: "The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip."<sup>49</sup> In between there are various levels of hybridity between the driver's control and automated operation. Closest to level 4 is the limited self-driving automation (level 3), where the driver may "cede full control of all safety-critical functions under certain traffic or environmental conditions, and in those conditions to rely heavily on the vehicle to monitor for changes in those conditions requiring transition back to driver". The driver must be available for "occasional control, but with sufficiently comfortable transition time". This level recalls the use of the autopilot and other automated features in commercial jetliners. It is this level of automation, which is often seen as the desirable solution for trucks and buses serving long-distance transportation.<sup>50</sup>

The chart is interesting, because it unintentionally encapsulates bigger issues such as the human/machine relationship. The early mass-produced automobile was an outcome of the mechanization of factory work. Henry Ford's Highland Park factory in Detroit used Taylorized workers performing repetitive tasks by an assembly line. The T-Model Ford was put together of interchangeable parts. The driver bought a highly standardized product, which to an extent resonated with the manual tasks of the workers - except, of course, that driving in traffic cannot be compared with the monotonous pre-

dictability of standing by the assembly line. Driving requires human initiative to which the car responds. It includes a low-level interactive relationship. Full automation became a buzzword after World War II. It was applied not only to data processing but also to consumer devices like washing machines, associated with push button operations. The early development of automated vehicles was roughly in line with this development. The emergence of interactivity and interactive media since the 1960s onward matched the increase of features on the dashboard, which invited the driver to intensify 'conversations' with the vehicle. The recent interest in self-driving cars may point to a reaction against this. The driver ceases to be an interactor; a smart system is allowed to take over. The human's attention can be turned to something else.

An equally interesting issue is the assumed transition to a posthuman condition. This issue is understood differently depending on the academic discipline or theory culture where it is being discussed. In an overly general sense it refers to a "person or entity that exists in a state beyond being human", like cloned human.<sup>51</sup> The related notion 'posthumanism' has been defined as an umbrella term for "analytic stances that grant agency to nonhuman entities and that downplay the differences between human and nonhuman agency."<sup>52</sup> Large pools - or whirlpools - of ideas developed around these and neighboring terms like 'antihumanism' and 'transhumanism'.<sup>53</sup> Posthuman theorizing is engaged in rethinking agency. As a capacity and intention to take action, to influence things, and to reflect on the strategies and consequences of one's (and others') acts, agency has traditionally been attributed to the 'intelligent' human beings only.<sup>54</sup> Other forms of consequential act(ion)s have been either seen as mental projections of the human mind or as somehow incomplete, driven by instincts, gut reactions, or causal chains of events. Do animals have agency? Stones? Rivers? Wind? Thunderstorms? Human-made artefacts? Software agents, machines? Some scholars answer yes to at least some of these questions, sparking objections.<sup>55</sup>

Can the human be considered posthuman? At the risk of sounding trivial, we can refer to the cyborg in its original 1960 sense coined

47. Tesla's electric cars go a step further. They have an "Autopilot", which "enables your car to steer, accelerate and brake automatically within its lane." The company website adds: "Current Autopilot features require active driver supervision and do not make the vehicle autonomous." [www.tesla.com/autopilot](http://www.tesla.com/autopilot). Last accessed April 13, 2020.

48. Anderson et al., *Autonomous Vehicle Technology*, 2-3.

49. NHTSA, quot. Anderson et al., *Autonomous Vehicle Technology*, 3.

50. The "guided bus" services operating in some countries are based on collaboration between a driver and automated features. There are several different systems. See [https://en.wikipedia.org/wiki/Guided\\_bus](https://en.wikipedia.org/wiki/Guided_bus)

51. From a confusing entry in Wikipedia.

52. Andrew B. Kipnis, "Agency between humanism and posthumanism: Latour and his opponents", *HAU: Journal of Ethnographic Theory*, Vol. 5, No. 2 (2015), 44. A focal point in the debate on agency has been the work of Bruno Latour and his contributions to the Actor Network Theory (ANT). The complexities of this debate cannot be revisited here. Latour links his ideas to the Anthropocene in "Agency at the time of the Anthropocene", *New Literary History*, Vol. 45 (2014), 1-18.

53. Francesca Ferrando, "Posthumanism, Transhumanism, Antihumanism, Metahumanism, and New Materialisms: Differences and Relations", *Existenz*, Vol. 8, No. 2 (Fall 2013), 26-32; for further clarification, see *Posthuman Glossary*, eds. Rosi Braidotti and Maria Hlavajova (London: Bloomsbury Academic, 2018).

54. See for example Michael E. Bratman, *Structures of Agency* (New York: Oxford University Press, 2007).

55. Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, NC: Duke University Press, 2010).

by Manfred E. Clynes and Nathan S. Kline.<sup>56</sup> If the cyborg is “part human, part machine”, the technological element is posthuman, because it is added *a posteriori* to the organic body.<sup>57</sup> As a hybrid, the cyborg embodies a balance between incompatible things. The human is not only defined by the body, but also by the mind, as well as by human identity, a gradually acquired cultural construct. The posthuman therefore has wider cultural and ideological ramifications, as combative feminist scholars like Donna Haraway and Rosi Braidotti have argued. They have associated the posthuman with the struggle against the patriarchal construction of reality. Haraway’s idiosyncratic 1980s ‘cyborg’ was an utopian trickster breaking down *all kinds* of boundaries (not only technological), claimed to have been erected to demarcate the male-dominated world order.<sup>58</sup> For Braidotti, posthumanism represents a counteraction against humanism, a broad current associated with malecentrism, and epitomized by Leonardo da Vinci’s famous drawing of the ‘Vitruvian Man’.<sup>59</sup> Cutting corners, Braidotti makes the entire humanist tradition, with its links to capitalism, politics, industrial production, etc., accountable for the biases, injustices and catastrophes the Anthropocene era is struggling with.

Can the self-driving car be considered posthuman? We must follow a somewhat different trajectory here, taking the agency of non-living, especially artefactual, things into consideration. After having been given a destination and sent out on its route, a self-driving car operates independently of the will of the people on board. Neither is there an operator in a tower watching over its path. However, according to Erik Stayton, “‘autonomous’ vehicles, regardless of the role of the human, will be anything but autonomous in practice.”<sup>60</sup> The ‘decisions’ a self-driving car makes result from rapid-fire decisions made by matching data from multiple sources. The data is collected from near and far, from the car itself as well as from external sources. The car has been ‘trained’ to react to stimuli from the immediate surroundings, while adjusting its operations to information obtained via various mapping measures like GPS, and computer networks. A self-driving car does not have a ‘mind’. It cannot be considered ‘smart’ if smartness is related to independent reasoning and reflection. Its agency and ‘understanding’ of the realities to which it reacts by its

actions stem from *distributed* agency to which different types of agents contribute. The self-driving car is an appropriate subject for the actor-network theory (ANT) and related approaches.<sup>61</sup>

The traffic dispositive is a kind of actor network, which consists of both living and non-living, stationary and moving, material and semiotic elements. Efforts to predetermine actions are put to test in countless everyday situations. They are not only caused by absent-minded or reckless humans crossing streets in unexpected places or by wild animals outside their natural habitats. There are vagaries of weather and uncommon situations such as roadwork projects which may have led to the closure of lanes or intersections. Traffic lights may have gone dark, and road signs bumped into a ditch by a drunk driver or painted over by enterprising street artists. Relatively stable systemic information can be mastered without serious problems; correctly responding to the unexpected is much more demanding. The deviations from the expected are the great challenge, a hurdle that may prolong the mass adoption of the self-driving car. It cannot regret its deeds or learn about the consequences of its actions; it is devoid of ‘emotion tracking’. If we wanted to call it a posthuman subject, it should be understood not as an isolated and fixed one, but rather as a distributed entity without clearly defined borders. Its ‘identity’ is inextricably associated with the elements of a broader dynamic system with which it ‘converses’.

## The Self-Driving Car as a Media Machine

The self-driving car serves practical functions: to transport people and haul things (in the case of military vehicles, bombs). To accomplish that, it has to be configured as a media machine, more precisely, an array of convergent media machines. According to Stayton, autonomous vehicles will be “media technologies of the future, in the sense that they are interactive presenters and receivers of information, deeply enmeshed in issues of seeing and knowing.”<sup>62</sup> Although solutions differ, the existing self-driving vehicles, like those of Waymo and Uber, typically incorporate all or most of the following

56. Manfred E. Clynes and Nathan S. Kline, “Cyborgs and Space”, *Astronautics* (American Rocket Society, and the American Interplanetary Society), Vol. 5, No. 9 (Sept. 1960), 26-27, 74-76.

57. The transhumanists practise such augmentations deliberately, striving to use hard technology or biotechnology as a means to alleviate the body’s infections, including its mortality.

58. Donna J. Haraway, “A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s”, *Socialist Review*, Vol. 15, No. 2 (issue No. 80, March-April, 1985), 65-108. Better known in the revised version, “A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century”, in: *Simians, Cyborgs and Women: The Reinvention of Nature* (New York: Routledge, 1991), 149-181.

59. Rosi Braidotti, *The Posthuman* (Cambridge: Polity, 2013).

60. Stayton, “Sensing, Seeing, and Knowing”, 10.

61. The literature on ANT is huge. For discussing technological artefacts, Andrew Pickering’s work, although not explicitly about cars and mobilities, is particularly valuable. Some work has been done applying ANT to electric vehicles. See Johan Schot, Remco Hoogma, Boelie Elzen, “Strategies for shifting technological system. The case of the automobile system”, *Futures*, Vol. 26, No. 10 (Dec. 1994), 1060-1076; Benjamin K. Sovacool, “Experts, theories, and electric mobility transitions: Toward an integrated conceptual framework for the adoption of electric vehicles”, *Energy Research & Social Science*, Vol. 27 (May 2017), 78-95.

62. Stayton, “Sensing, Seeing, and Knowing”, 11.

equipment: multiple video cameras distributed around the body of the automobile, stereoscopic cameras functioning as the car's eyes, radio equipment and antennas to communicate with GPS satellites, radars to detect objects in rain, fog or snowfall, computers, and lidar systems. Lidars (from 'light detection and ranging') are among the most crucial elements. They are normally positioned on the roof, from where they continuously scan the surroundings by sending out huge quantities of laser beams to create 360-degree depth maps (as point clouds). From a media archaeological perspective, the lidar is the latest form of the panorama, which goes back to the late eighteenth century. Much like panorama painters, who created tools like glass cylinders to help them sketch the outlines of the surrounding landscape, lidars are posthuman machine artists occupied with scenic representation. The panoramas the lidar 'draws' are circular and in motion, combining two historical forms of the panorama.<sup>63</sup>

If the self-driving car is interpreted as a media machine, we must ask whom it serves. The first answer is simple: the car transmits media content to its passengers. There are information displays on the backs of the front row seats in Waymo's self-driving taxis. They keep the riders updated about the journey's progress by displaying a map of the route; an icon marks the car's current location. They can also be prompted to show "a schematic view of the car's surroundings, taken from a perspective above and behind the car," where "pedestrians, cars, buildings, and other significant objects are shown as simple geometric shapes. Every few seconds, a ghostly pulse briefly shows a more detailed view, with the outline of trees, lamp posts, and other nearby objects becoming visible."<sup>64</sup> The purpose is not to entertain, but to "boost passenger confidence that the car is fully aware of its surroundings." The passengers can compare what they see through the windows with what is displayed on the screen. When the car comes to a temporary stop, perhaps to let a pedestrian cross the street, the event is also depicted on the screen. The motifs behind these choices are pragmatic, meant to alleviate the fears and suspicions newcomers unfamiliar with the service may have. Theoretically a complex visual matching of the mediated and the unmediated, raw and transformed, continuous and contingent, is created.

Another example is the interior of the Mercedes F 015 concept car (2015), which was dominated by large touch screens. Rather inconveniently, they covered the interior surfaces of the

side doors.<sup>65</sup> Although the seats (including the driver's) swiveled to create a 'social space', the company's promotional video depicted passengers awkwardly twisting their bodies to view and swipe the screens, instead of talking to each other. Compared with the screens, the side door windows were narrow, hardly suitable for scenic observation. Rather than as a media theater, the F 015's interior was conceptualized as a kind of media cocoon matching Jean Baudrillard's idea of the home as a spaceship ("in orbit").<sup>66</sup> In Baudrillard's vision domesticity was depicted, as Lynn Spigel has explained it, as "the product of an information society in which social relation are thoroughly produced by communication media, initially television but now by satellite technologies."<sup>67</sup> The spaceship analogy may be even more appropriate, because the cocoon moves and cannot be left at will. The displays of self-driving cars will surely compete for attention with smartphones, game consoles and laptop computers used by the passengers. This leads to questions about the ecology of attention. What will the passengers be doing during the ride? Will they follow the journey, the scenery, or the operations of the car? Will they be lost in mediated realms beyond the nearby and the immediate, navigating through remote and shared realms of (day)dreams?

The primary function of the media systems installed in a self-driving car is not to entertain the passengers or even to provide them information. The massive arrays of media technology communicate with local and remote software and map databases that provide feedback without actively involving any humans. The car itself is the driving subject that profits from the information it transmits and receives. It is not seeking diversion; it is just trying to perform a task. The idea of media machines that perform without hands-on actions by a human operator is not new. Already the daguerreotype camera recorded a view autonomously after the sensitized silver nitrate plate it contained had been exposed to light. An early cartoon depicts the daguerreotypist taking a nap while the camera is doing all the work (in 1839-40 it took a while).<sup>68</sup> In a somewhat similar way, a motorized sound recorder or film camera stores sounds or images on its own after a human has set the process in motion.<sup>69</sup> Mainframe computers performed calculations on their own after a coded task had been fed in. Likewise, the user of an automatic washing machine feeds in the laundry and the detergent, selects a program, and pushes a button.<sup>70</sup> The machine does the rest.

63. Erkki Huhtamo, *Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles* (Cambridge, Mass: The MIT Press, 2013).

64. Timothy B. Lee, "Waymo One, the groundbreaking self-driving taxi service, explained", *Ars Technica*, posted Dec. 5, 2018. Online at [www.arstechnica.com](http://www.arstechnica.com).

65. "Cars are becoming screens", wrote Stayton in: "Sensing, Seeing, and Knowing". 8.

66. Jean Baudrillard, "The Ecstasy of Communication", in: *The Anti-Aesthetic: Essays on Postmodern Culture*, ed. Hal Foster (Port Townsend, Wash.: Bay Press, 1983).

67. Lynn Spigel, *Welcome to the Dreamhouse: Popular Media and Postwar Suburbs* (Durham and London: Duke University Press, 2001), 101.

68. Gérard Fontallard, "Der Daguerrotypeur" (circa 1840), reprinted in: Rolf H. Krauss, *Die Fotografie in der Karikatur* (Seebuck am Chiemsee: Heering-Verlag, 1978), 15. As usual, the caricaturist exaggerated. The exposure times were at most a few minutes.

69. The media archaeologist Wolfgang Ernst has written extensively about the autonomous operations of various forms of media technology. See his *Digital Memory and the Archive*, ed. Jussi Parikka (Minneapolis and London: University of Minnesota Press, 2013).

70. Ellen Lupton, *Mechanical Brides: Women and Machines from Home to Office* (New York: Princeton Architectural Press, 1993).

George Eastman's slogan exhorted Kodak snapshot camera users: "You push the button, we do the rest" (c. 1889). The user held the camera, found a subject, and pushed a button to release the shutter. The company representatives were involved by selling cameras and film rolls, and offering developing and film reloading services. In 1958, when promoting its latest slide projector, George Eastman revived its old slogan in modified form: "New Kodak Cavalcade Projector changes slides by itself! *You turn it on ... it does the rest!*"<sup>71</sup> The strategy was to link the device to the wave of enthusiasm for automatic consumer technology. The text explained: "Imagine! A color slide projector that lets you relax and enjoy the show without touching a button ... that will project your slides perfectly even if you leave the room. The new Kodak Cavalcade Projector combines *all* the features you have ever wanted for the *easiest, smoothest* slide shows ever! For automatic operation, you simply set the timer for the interval you want. Turn on, focus the first slide, and your Cavalcade Projector does the rest."<sup>72</sup> Stressing that the device works even when there are no humans in the room anticipates posthuman media machines like the self-driving car, which can be made to cruise without anyone on board. Kodak's insistence that even low-level push button interactivity had been eliminated emphasized full automation, albeit rhetorically only.

This example resonates with the configuration of Waymo's customer experience. Like other ride-hailing services, it uses a smartphone app to define a pick-up and drop-off point and to order the ride. Once inside the Waymo taxi, the passenger encounters a push button interface, which offers four choices: help, lock/unlock, pull over, start ride (the last-mentioned button is blue, others black). This hardly differs from the controls of the washing machine. To make the self-driving car worth considering a posthuman subject, there should be more. Although it executes a task assigned by humans and serves their needs, it should do so in ways that match the modes of human perception and decision-making, perhaps exceeding them. This leads to complicated questions about agency. Does the self-driving car demonstrate traces of 'intelligence'? This connects it with debates about machine intelligence, and touches upon further topics like distributed artificial intelligence (decentralized AI, DAI), multi-agent systems, and the potential uses of artificial neural networks. AutoX, a company that applies on-board AI to drive its autonomous vehicles, has claimed that its "AI driver" is more reliable than a human driver.<sup>73</sup> Whether that is correct or not, it cannot operate in isolation. The 'intelligence' of the self-driving car is inextricably connected with the question about the 'intelligence' of networked applications and

systems that consider driverless cars as specialized nodes of the Internet of Things.

Whether the situation can be considered an intrusion into untraded territory or rather a modification of principles already in place in media culture is an issue that can profit from a media archaeological approach. Late nine-teenth- and early twentieth-century modernism often associated the potential of media technology with its ultra-human qualities. Media machines saw and heard more than the human could accomplish with the sensory apparatus of the body. This idea was manifested in Étienne-Jules Marey's and Eadweard Muybridge's chronophotography, X-ray imaging, and Dziga Vertov's theory of the Kino-Glaz (Cinema Eye), to mention just three wellknown examples. Mechanical eyes and ears penetrated into the invisible and the inaudible. The goals were in line with the pursuits of experimental science, although the results were also applied to entertainment and information for the 'masses'. All this happened before the impact of media convergence truly was felt. The digital processing of big data to visualize hidden data patterns operate on a scale and in a realm that are difficult to associate with the uses of media of a century ago, and yet they are not totally disconnected from a continuum associated with them.

But there is a difference. Even for Vertov, the human played a role. The movie camera was the camera operator's extension, as *The Man with the Movie Camera* (1929) demonstrates; the film editor added another human intervention. Humans were (and are still) also needed as spectators, and were indispensable as analysts of the revelations made by media machines. The aerial reconnaissance photography used during the World Wars is an example. No matter how accurate they may have been, the photographs taken from the skies revealed nothing as such. They needed the eyes of trained humans to disclose their information, which otherwise would have remained mere potential. Edward T. Hall's and Marshall McLuhan's ideas about media as extensions of the human sensorium had validity in such cases. The situation has got much more complex. Hybrid machinic-algorithmic systems are recording and identifying millions of humans automatically. Features of seemingly unrelated images are matched online by pattern recognition algorithms. Machine learning can go far beyond human capabilities, when it comes to detecting (ir)regularities in huge masses of data. All these possibilities are part of what makes self-driving cars possible. However, the question about the human element remains. What would be the worth of machines that only served other machines in an autonomous loop bypassing the humans? Left by the road-side, so to speak, how would we even know that such operations are happening?

71. Published in *Popular Science*, May 1958, 211. Original italics.

72. Ibid. Original italics.

73. AutoX was founded in 2016 by Dr. Jianxiong Xiao from Princeton University. The goal is to create a system that supports the highest level 4 fully autonomous driving (NHTSA chart). The main investors are Chinese companies. See <https://www.autox.ai/en/>

## Autonomous Cars and the Question about the Human(s)

Identifying the self-driving car as a posthuman entity is counteracted by its promoters. There is nothing posthuman, alien or futuristic in the self-image of Waymo, one of the first companies to offer a product for the general public. It appeals to traditional human-centered values. After explaining that “driving requires a lot from us”, a soft female voice-over asks in its 2018 promotional video: “What if the world’s most experienced driver was at your fingertips?”<sup>74</sup> The image of a steering wheel ‘magically’ turning by itself cuts to a male fingering a smartphone. Young and early middle-aged passengers are shown engaged in activities inside Waymo taxis (using laptops or phones, writing a birthday card, playing an ukulele [!]), while the voice-over declares: “A ride designed for you. Giving you more time for the things that matter to you the most. What if getting there felt like being there?” By intercutting between scenes from the taxis and the destinations (birthday party, pub gathering to watch a game, etc.), the video sends a message: the space inside the taxi is not a non-place in Marc Augé’s sense of using the concept.<sup>75</sup> Instead of being downtime, the ride time can be productive and social (in the video no one watches the roadside scenery). A similar human-centred approach is featured in other videos on the Waymo website.

Interviews with members of Waymo’s early ride program (test users) provide slightly more variety.<sup>76</sup> Most praise the ease of the experience or the cautious driving by the cars, but some raise points resonating with posthuman arguments. A rider named Jordan is pleased he does not have to “talk to the person behind the wheel” and that “you don’t have to tip the car.” When the couple Roger and Sharon are asked about the car’s “personality”, they answer: “To us, it’s a quiet and calm personality that allows riders to sit back and relax.” Alex says: “When I am riding I like seeing how the car thinks and what it’s detecting. I try to figure out what’s going on through the computer’s mind when it makes every decision.” Such comments hardly represent what the ‘masses’ of casual future riders may think, but they provide some indications about the development of a posthuman mindset, an issue the popularity of smart speakers like Amazon Echo and Google Home seems to verify. Millions of people have opened their doors for ‘smart’ nonhuman personalities, virtual assistants like Alexa, Siri, Cor-

tana, or AliGenie. ‘Living’ inside a black box on a table or a shelf, they listen and are always ready to make comments and suggestions, as well as transmitting intimate information for their corporate masters. This development goes against the tenets of traditional humanism, its respect for individual freedom, privacy, and the understanding of the home as a safe haven separated from the world outside.

The history of the media’s influx into homes extends from the Victorian infatuation with stereoscopy to home telephony and radio and television broadcasting. Smart speakers go further: they invite nonhuman but *somehow* humanlike entities to join the household, functioning as their representatives and servants, perhaps one day as their peers. The self-driving car fits into this picture, whatever the promotional discourses try to say. Whether such a development should be welcomed or resisted is open for debate. In one of the best pieces of critical writing about self-driving cars to date, Erik Stayton emphasizes the fact that they are and will be networked. This will have consequences not only for the car, but for its passengers as well. Evoking Roger Clarke’s concept “dataveillance”, Stayton shows how the continuous two-way communications between an autonomous vehicle and data networks “stand to increase our present-day problems with mass surveillance and personal privacy”.<sup>77</sup> Not only may targeted advertising be beamed to the screens (as GM’s 1956 film *Key to the Future* already suggested), but by using facial recognition and other forms of biometric identification self-driving cars could be turned into mobile panopticons for observing and tracking the passengers. The functionality of the car could be taken into control by outsiders when required. In a suspected criminal case, the doors could be locked remotely, and the car directed to the police station. While someone might see this as welcome, for others it would no doubt represent a violation of basic freedoms.

Such alarming possibilities were not anticipated in the early fantasies about cruising in self-driving cars. The passengers, in line with the ideological and gender biases of the time, were stereotypical white nuclear families playing games and occasionally doing remote work.<sup>78</sup> A perfect example is *Magic Highway. U.S.A.*, an episode of *Disneyland TV*, which was broadcast on May 14, 1958.<sup>79</sup> Its final ten minutes depict fantasies about the future of road transportation, featuring autonomous cars and automated highways. Setting out on the road, the father “chooses the route

74. In April 2020, the welcome video on Waymo’s website is a computer animation, which explains Waymo One in similar terms, but adds Waymo Via, its transportation service. Waymo.com. Last accessed April 21, 2020.

75. Marc Augé, *Non-Places: Introduction to an Anthropology of Supermodernity*, trans. John Howe (London: Verso, 1995).

76. “Why I Ride Waymo”, [https://blog.waymo.com/search/label/waymo one](https://blog.waymo.com/search/label/waymo%20one). Last accessed April 21, 2020.

77. Stayton, “Sensing, Seeing, and Knowing”. 12.

78. The best -known example is an advertisement of “America’s Electric Light and Power Companies” titled “Power Companies Build for your New Electric Living”, published in *Saturday Evening Post* in 1957.

79. See video insert from YouTube with a commentary at *Paleofuture: The History of the Future*, <https://paleofuture.com/blog/2007/5/11/disneys-magic-highway-usa-1958.html>. Last accessed April 22, 2020. See also illustrations of future automated cars from the 1950s and 1960s on the same site, “Will People Work or Play During their Commutes When Driverless Cars Take Over?”, posted Feb. 17, 2014.

in advance on a push button selector” causing electronics to take over “complete control”. The progress is “accurately checked on a synchronized scanning map”. The family relaxes around a table, although the father also takes part in a business teleconference by television, sitting in front of a row of three displays. When the car reaches the city, it separates into two parts. The father’s part takes him to his office, whereas the mother and the son are transported to a shopping center to practice effortless window shopping on a moving sidewalk.<sup>80</sup> Conservative, white middle-class family togetherness dominates such fantasies.

In today’s world, where not only gender differences, but also many other boundaries, including racial identities and the fixity of sexual orientations are being actively questioned, such visions are - to paraphrase the title of a web-site dedicated to them - “paleofuturistic”. Whether the self-driving car is a viable goal to be reified into a general form of transportation, or whether it will remain an ideal only partially materialized, merged with current driving practices, we don’t know. However, its promoters must take changing social formations, demographics and cultural ideals seriously.<sup>81</sup> The self-driving vehicle may not become a ‘family car,’ or at least not exclusively that. The formulaic slur of the “woman as a driver” has been historically as common as it has been problematic. It is a biased discursive convention that has been used to confirm the patronizing attitudes of the

male-dominated society. When even ultraconservative societies like Saudi Arabia are gradually waking up to the necessity of dissolving such aberrations, it is becoming important to ask questions about women’s relationship to self-driving cars. Would they radically change women’s mobilities, social roles and idea(l)s? Should unaccompanied children’s access to road transportations be rethought? Could pet animals one day make trips without their ‘masters’, left behind at the family home? If indeed the self-driving car is a posthuman entity, it might just as well serve transformative social and ideological processes rather than support age-old hierarchies.

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80. On moving sidewalks as a form of mobilities, see Erkki Huhtamo, “(Un)walking at the Fair: About Mobile Visualities at the Paris Universal Exposition of 1900”, *Journal of Visual Culture*, Vol. 12, No. 1 (2013), 61-88.

81. An important contribution to this direction is a special section, “Degendering the Driver”, published in *Transfers*, Vol. 8, No. 1 (Spring 2018). As the editors Jutta Weber and Fabian Kröger explain in their introduction, the purpose is to explore “how gender intervenes in the potential shift from a driver-centered to a driverless car culture” (15). The issue of gender also concerns design features of self-driving cars, as several contributors point out.

## CV

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### Erkki Huhtamo

erhuhta@ucla.edu

University of California, Los Angeles

Erkki Huhtamo is Professor of Design Media Arts, and Film, Television, and Digital Media at UCLA, Los Angeles. He is internationally known as a pioneering media archaeologist. His most important book to date is *Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles* (The MIT Press, 2013). *How to Dismantle a Fairy Engine? Media Archaeology as Topos Studies* is forthcoming.