

Elon Musk

Elon Reeve Musk FRS (/ˈiːlɒn/; born June 28, 1971) is an engineer, industrial designer, technology entrepreneur and philanthropist.^{[2][3][4][5]} He is a citizen of South Africa, Canada, and the United States. He is the founder, CEO and chief engineer/designer of SpaceX;^[6] early

investor,^{[7][note 2]} CEO and product architect of Tesla, Inc.;^{[10][11]} founder of The Boring Company;^[12] co-founder of Neuralink; and co-founder and initial co-chairman of OpenAI.^[13] He was elected a Fellow of the Royal Society (FRS) in 2018.^{[14][15]} In December 2016, he was ranked 21st on the Forbes list of The World's Most Powerful People,^[16] and was ranked joint-first on the *Forbes* list of the Most Innovative Leaders of 2019.^[17] A self-made billionaire, as of June 2020 his net

worth was estimated at \$38.8 billion and he is listed by *Forbes* as the 31st-richest person in the world.^{[18][1]} He is the longest tenured CEO of any automotive manufacturer globally.^[19]

Elon Musk

FRS



Elon Musk holding a model of Starship at the
Royal Society in London

Born

Elon Reeve Musk

	<p>June 28, 1971</p> <p><u>Pretoria, South Africa</u></p>
Citizenship	<p>South Africa (1971 – present)</p> <p>Canada (1971 – present)</p> <p>United States (2002 – present)</p>
Education	<p><u>University of Pretoria</u></p> <p><u>Queen's University</u></p> <p><u>University of Pennsylvania</u> (<u>BA</u>, <u>BS</u>)</p>
Occupation	<p>Engineer •</p>

	<div> <div>industrial designer •</div> <div>entrepreneur</div> </div>
Years active	1995–present
Home town	<div> <div><u>Hillsborough</u>,</div> <div><u>California</u>, <u>United</u></div> <div><u>States</u>^[note 1]</div> </div>
Net worth	<u>US\$</u> 41.5 billion (June 2020) ^[1]
Title	<div> <div>Founder, CEO, Lead</div> <div>Designer of <u>SpaceX</u></div> <div>CEO, Product</div> <div>Architect of <u>Tesla, Inc.</u></div> </div>

Founder of The Boring Company and X.com
(now PayPal)

Co-founder of
Neuralink, OpenAI,
and Zip2

Spouse(s)

Chairman of SolarCity.
Justine Wilson

(m. 2000; div. 2008)

Talulah Riley

(m. 2010; div. 2012)

(m. 2013; div. 2016)

Partner(s)

Grimes (2018–

Children	present) 6 (+ 1 deceased)
Parents	Errol Musk (father) <u>Maye Musk</u> (mother)
Relatives	<u>Kimbal Musk</u> (brother) <u>Tosca Musk</u> (sister) <u>Lyndon Rive</u> (cousin)
Signature	
	

Born to a Canadian mother and South African father, Musk was born and raised

in Pretoria, South Africa. He briefly attended the University of Pretoria before moving to Canada when he was 17 to attend Queen's University. He transferred to the University of Pennsylvania two years later, where he received a bachelor's degree in economics from the Wharton School and a bachelor's degree in physics from the College of Arts and Sciences. He moved to California in 1995 to begin a Ph.D. in applied physics and material sciences at Stanford University, but

decided to pursue a business career instead of enrolling.^[20] He subsequently co-founded (with his brother Kimbal) Zip2, a web software company, which was acquired by Compaq for \$340 million in 1999. Musk then founded X.com, an online bank. It merged with Confinity in 2000, which had launched PayPal the previous year and was subsequently bought by eBay for \$1.5 billion in October 2002.^{[10][21][22][23]}

In May 2002, Musk founded SpaceX, an aerospace manufacturer and space transport services company, of which he is CEO and lead designer. He joined Tesla Motors, Inc. (now Tesla, Inc.), an electric vehicle manufacturer, in 2004, the year after it was founded,^[10] and became its CEO and product architect. In 2006, he helped create SolarCity, a solar energy services company (now a subsidiary of Tesla). In 2015, Musk co-founded OpenAI, a nonprofit research company that aims to

promote friendly artificial intelligence. In July 2016, he co-founded Neuralink, a neurotechnology company focused on developing brain-computer interfaces. In December 2016, Musk founded The Boring Company, an infrastructure and tunnel construction company focused on tunnels optimized for electric vehicles.

In addition to his primary business pursuits, Musk has envisioned a high-speed transportation system known as the Hyperloop. Musk has said the goals of

SpaceX, Tesla, and SolarCity revolve around his vision to "change the world and help humanity".^[24] His goals include reducing global warming through sustainable energy production and consumption and lessening the risk of human extinction by establishing a human colony on Mars.^{[25][26]}

Early life

Elon Musk was born on June 28, 1971, in Pretoria, Transvaal, South Africa,^{[27][28]} the

son of Maye Musk (née Haldeman), a model and dietitian born in Saskatchewan, Canada^{[29][30][31]} and raised in South Africa, and Errol Musk, a South African electromechanical engineer, pilot, and sailor.^[32] He has a younger brother, Kimbal (born 1972), and a younger sister, Tosca (born 1974).^{[36][31]}

His maternal grandfather, Dr. Joshua Haldeman, was an American-born Canadian.^[37] His paternal grandmother was British, and he also has Pennsylvania

Dutch ancestry.^{[38][39]} After his parents divorced in 1980, Musk lived mostly with his father in the suburbs of Pretoria,^[38] a choice he made two years after his parents separated but which he subsequently regretted.^[40] Musk is estranged from his father, whom he has referred to as "a terrible human being."^[40] He also has a half-sister^[41] and a half-brother.^[42]

During his childhood, Musk was an avid reader.^[43] At the age of 10, he developed

an interest in computing while using the Commodore VIC-20.^[44] He learned computer programming using a manual and, by the age of 12, sold the code of a BASIC-based video game he created called *Blastar* to *PC and Office Technology* magazine for approximately \$500.^{[45][46]} His childhood reading included Isaac Asimov's *Foundation* series, from which he drew the lesson that "you should try to take the set of actions that are likely to prolong civilization, minimize the

probability of a dark age and reduce the length of a dark age if there is one".^[40]

Musk was severely bullied throughout his childhood and was once hospitalized after a group of boys threw him down a flight of stairs.^{[40][43][47][48]} He attended Waterkloof House Preparatory School and Bryanston High School^[47] before graduating from Pretoria Boys High School.^[48]

Although Musk's father insisted that Elon go to college in Pretoria, Musk became

determined to move to the United States, saying "I remember thinking and seeing that America is where great things are possible, more than any other country in the world."^[49] Musk knew it would be easier to get to the United States from Canada and moved there against his father's wishes in June 1989, just before his 18th birthday,^{[50][51]} after obtaining a Canadian passport through his Canadian-born mother.^{[52][53]}

Education

While awaiting Canadian documentation, Musk attended the University of Pretoria for five months.^[54] Once in Canada, Musk entered Queen's University in 1989, avoiding mandatory service in the South African military.^[55] He left in 1992 to study economics and physics at the University of Pennsylvania; he graduated in 1997 with a Bachelor of Arts degree in economics from Wharton and a Bachelor of Science

degree in physics from the College of Arts and Sciences.^{[56][57][58][59][60]}

In 1994, Musk held two internships in Silicon Valley during the summer: at an energy storage start-up called Pinnacle Research Institute, which researched electrolytic ultracapacitors for energy storage, and at the Palo Alto-based start-up Rocket Science Games.^[61] Bruce Leak, the former lead engineer behind Apple's QuickTime who had hired Musk, noted: "He had boundless energy. Kids these days

have no idea about hardware or how stuff works, but he had a PC hacker background and was not afraid to just go figure things out."^[62]

In 1995, Musk was accepted to a PhD program in energy_physics/materials science at Stanford University in California.^[20] Eager to pursue opportunities in the internet boom, however, he decided to instead launch his first company, Zip2 Corporation.

Career

Zip2

In 1995, Musk and his brother, Kimbal, started Zip2, a web software company, with money raised from a small group of angel investors.^[40] The company developed and marketed an internet city guide for the newspaper publishing industry, with maps, directions and yellow pages,^[63] with the vector graphics mapping and direction code being

implemented by Musk in Java.^[64] Musk obtained contracts with The New York Times and the Chicago Tribune,^{[65][66]} and persuaded the board of directors to abandon plans for a merger with CitySearch.^[67] Musk's attempts to become CEO were thwarted by the board.^[43] Compaq acquired Zip2 for US\$307 million in cash^{[43]:109} in February 1999.^[68] Musk received US\$22 million for his 7 percent share from the sale.^{[65][43]:109[66]}

X.com and PayPal

In March 1999, Musk co-founded X.com, an online financial services and e-mail payment company, with US\$10 million from the sale of Zip2.^{[67][66]} One year later, the company merged with Confinity,^{[65][69]} which had a money-transfer service called PayPal.^[66] The merged company focused on the PayPal service and was renamed PayPal in 2001.^[70] Musk was ousted in October 2000 from his role as CEO (although he remained on the board) due

to disagreements with other company executives over his desire to move PayPal's Unix-based infrastructure to a Microsoft one.^[71] In October 2002, PayPal was acquired by eBay for US\$1.5 billion in stock, of which Musk received US\$165 million. Before its sale, Musk, who was the company's largest shareholder, owned 11.7% of PayPal's shares.^[72]

In July 2017, Musk purchased the domain X.com from PayPal for an undisclosed

amount, stating that it has sentimental value to him.^[73]

SpaceX

In 2001, Musk conceived Mars Oasis, an idea to land a miniature experimental greenhouse on Mars, containing food crops growing on Martian regolith, in an attempt to reawaken public interest in space exploration.^{[74][75]} In October 2001, Musk traveled to Moscow with Jim

Cantrell (an aerospace supplies fixer), and Adeo Ressi (his best friend from college), to buy refurbished Dnepr Intercontinental ballistic missiles (ICBMs) that could send the envisioned payloads into space. The group met with companies such as NPO Lavochkin and Kosmotras; however, according to Cantrell, Musk was seen as a novice and was consequently spat on by one of the Russian chief designers.^[76] The group returned to the United States empty-handed. In February 2002, the group

returned to Russia to look for three ICBMs, bringing along Mike Griffin. Griffin had worked for the CIA's venture capital arm, In-Q-Tel, as well as NASA's Jet Propulsion Laboratory, and was just leaving Orbital Sciences, a maker of satellites and spacecraft. The group had another meeting with Kosmotras and were offered one rocket for US\$8 million. Musk considered the price too high, and stormed out of the meeting. On the flight back from Moscow, Musk realized that he could start

a company that could build the affordable rockets he needed.^[76] According to early Tesla and SpaceX investor Steve Jurvetson,^[77] Musk calculated that the raw materials for building a rocket were only 3 percent of the sales price of a rocket at the time. It was concluded that, in theory, by applying vertical integration and the modular approach employed in software engineering, SpaceX could cut launch price by a factor of ten and still enjoy a 70-percent gross margin.^[78] Ultimately, Musk

ended up founding SpaceX with the long-term goal of creating a true spacefaring civilization.^[79]



Musk and President Barack Obama at the Falcon 9 launch site in 2010

With US\$100 million of his early fortune,^[80] Musk founded Space Exploration Technologies Corp., traded as SpaceX, in May 2002.^[81] Musk is chief executive officer (CEO) and chief technology officer (CTO) of the Hawthorne, California-based company. By 2016, Musk's private trust held 54% of SpaceX stock, equivalent to 78% of voting shares.^[82]

SpaceX develops and manufactures space launch vehicles with a focus on advancing the state of rocket technology. The

company's first two launch vehicles were the Falcon 1 and Falcon 9 rockets (a nod to Star Wars' *Millennium Falcon*), and its first spacecraft was the Dragon (a nod to *Puff the Magic Dragon*).^[83] SpaceX designed a family of launch vehicles and the Dragon multipurpose spacecraft over a span of seven years. In September 2008, SpaceX's Falcon 1 rocket became the first privately funded liquid-fueled vehicle to put a satellite into Earth orbit.^[43]

SpaceX is both the largest private producer of rocket engines in the world and holder of the record for the highest thrust-to-weight ratio for a rocket engine (the Merlin 1D).^{[84][85]} SpaceX has produced more than 100 operational Merlin 1D engines. According to SpaceX, each Merlin 1D engine can vertically lift the weight of 40 average family cars, and in combination, the 9 Merlin engines in the Falcon 9 first stage produce anywhere from 5.8 to 6.7 MN (1.3 to 1.5 million

pounds) of thrust, depending on
altitude.^[86]



NASA Administrator Charles Bolden congratulates Musk in front of the Dragon capsule in 2012, following the first successful mission by a private company to carry supplies to the International Space Station

In 2006, NASA announced that the company was one of two selected to provide crew and cargo resupply demonstration contracts to the International Space Station,^[87] followed by a US\$1.6 billion Commercial Resupply Services program contract on December 23, 2008, for 12 flights of its Falcon 9 rocket and Dragon spacecraft to the Space Station, replacing the US Space Shuttle after it retired in 2011.^[88] On May 25, 2012,

the SpaceX Dragon vehicle berthed with
the ISS, making history as the first
commercial company to launch and berth
a vehicle to the International Space
Station.^[89]

Starting in 2011, SpaceX received funding
under NASA's Commercial Crew
Development program, to develop the
Dragon 2 crew capsule.^[90] A contract to
provide crew flights to the ISS was
awarded in 2014.^[91]

Musk believed the key to making space travel affordable was to make rockets reusable, though space industry experts believed reusable rockets were impossible or infeasible.^[92] On December 22, 2015, SpaceX successfully landed the first stage of its Falcon rocket back at the launch pad, the first time this had been achieved by an orbital rocket.^[93] The first stage recovery was replicated several times in 2016 by landing on an autonomous spaceport drone ship, an ocean-based recovery

platform,^[94] and by the end of 2017, SpaceX had landed and recovered the first stage on 16 consecutive missions where a landing and recovery were attempted, including all 14 attempts in 2017. Twenty out of 42 first stage Falcon 9 boosters have been recovered overall since the Falcon 9 maiden flight in 2010.^[95]

In 2017 SpaceX launched 18 successful missions, more than doubling their highest previous year of 8.^[96]



Musk's Tesla Roadster in orbit after the Falcon Heavy test flight in 2018

On February 6, 2018, SpaceX successfully launched the Falcon Heavy, the fourth-highest capacity rocket ever built (after Saturn V, Energia and N1) and the most powerful rocket in operation as of 2018. The inaugural mission carried a Tesla

Roadster belonging to Musk as a dummy payload.^{[97][98]}

SpaceX began development of the Starlink constellation of low Earth orbit satellites in 2015 to provide satellite Internet access, with the first two prototype test-flight satellites launched in February 2018. A second set of test satellites and the first large deployment of a piece of the constellation occurred on May 24, 2019 UTC when the first 60 operational satellites were launched.^{[99][100]} The total

cost of the decade-long project to design, build, and deploy the constellation was estimated by SpaceX in May 2018 to be about US\$10 billion.^[101]

Musk was influenced by Isaac Asimov's *Foundation* series^[102] and views space exploration as an important step in preserving and expanding the consciousness of human life.^[103] Musk said that multiplanetary life may serve as a hedge against threats to the survival of the human species:



SpaceX DM-1 preflight. Musk (furthest left) with members of NASA, March 2019

An asteroid or a super volcano could destroy us, and we face risks the dinosaurs never saw: an engineered virus, inadvertent creation of a micro black hole,

catastrophic global warming or some as-yet-unknown technology could spell the end of us. Humankind evolved over millions of years, but in the last sixty years, atomic weaponry created the potential to extinguish ourselves. Sooner or later, we must expand life beyond this green and blue ball—or go extinct.

Space X's goal is to reduce the cost of human spaceflight by a factor of 10.^[104] In a 2011 interview, he said he hopes to send humans to Mars' surface within 10–20 years.^[105] In Ashlee Vance's biography, Musk stated that he wants to establish a Mars colony by 2040, with a population of 80,000.^[44] Musk stated that, since Mars' atmosphere lacks oxygen, all transportation would have to be electric (electric cars, electric trains, Hyperloop, electric aircraft). Musk stated in June

2016 that the first uncrewed flight of the larger Interplanetary Spaceship was aimed for departure to the red planet in 2022, to be followed by the first crewed ITS Mars flight departing in 2024.^[106] In September 2016, Musk revealed details of his architecture to explore and colonize Mars.^[107]



Musk explains the planned capabilities of Starship to NORAD and Air Force Space Command in April 2019

In late 2017, SpaceX unveiled the design for its next-generation launch vehicle and spacecraft system, Big Falcon Rocket (BFR), that would support all SpaceX

launch service provider capabilities with a single set of very large vehicles: Earth-orbit, Lunar-orbit, interplanetary missions, and even intercontinental passenger transport on Earth, and totally replace the Falcon 9, Falcon Heavy and Dragon vehicles in the 2020s. Starship will have a 9-meter (30 ft) core diameter. Significant development on the vehicles began in 2017, with an initial prototype unveiled in September 2019,^[108] while the new rocket engine (Raptor) development began in

2012,^{[109][110]} with a first test flight performed in August 2019.^[111]

In a September 2018 announcement of a planned 2023 lunar circumnavigation mission, a private flight called #dearMoon project,^[112] Musk showed a redesigned concept for the BFR second stage and spaceship with three rear fins and two front canard fins added for atmospheric entry, replacing the previous delta wing and split flaps shown a year earlier. The revised BFR design was to use seven

identically-sized Raptor engines in the second stage; the same engine model as would be used on the first stage. The second stage design had two small actuating canard fins near the nose of the ship, and three large fins at the base, two of which would actuate, with all three serving as landing legs.^[113] Additionally, SpaceX also stated later that September that they were "no longer planning to upgrade Falcon 9 second stage for reusability."^[114] The two major parts of the

re-designed BFR were given descriptive names in November: "Starship" for the upper stage^[a] and "Super Heavy" for the booster stage, which Musk said was "needed to escape Earth's deep gravity well (not needed for other planets or moons)."^[115]

On May 30, 2020, SpaceX launched its first manned flight called Demo-2 becoming the first private company to both place a person into orbit and to eventually dock a manned space-craft with the ISS.^[116]

Further, the launch was the first time since the end of the Shuttle Program that an American Astronaut has been launched from American soil on an American rocket.^[117]

Tesla

Tesla, Inc. (originally Tesla Motors) was incorporated in July 2003 by Martin Eberhard and Marc Tarpenning, who financed the company until the Series A

round of funding.^[118] Both men played active roles in the company's early development prior to Elon Musk's involvement.^[119] Musk led the Series A round of investment in February 2004, joining Tesla's board of directors as its chairman.^{[120][121][21][122]} According to Musk, all three, along with J. B. Straubel, were inspired by the earlier AC Propulsion tzero electric roadster prototype.^[123] Musk took an active role within the company and oversaw Roadster product design at a

detailed level, but was not deeply involved in day-to-day business operations.^[124]

Following the financial crisis in 2008 and after a series of escalating conflicts in 2007, Eberhard was ousted from the firm.^{[92][125]} Musk assumed leadership of the company as CEO and product architect in 2008, positions he still holds today. As of 2019, Elon Musk is the longest tenured CEO of any automotive manufacturer globally.^[19]

Tesla's "master plan", as iterated by Musk in 2006^[126] was:

Build sports car. Use that money to build an affordable car. Use that money to build an even more affordable car. While doing above, also provide zero-emission electric power generation options.

Tesla Motors first built an electric sports car, the Tesla Roadster, in 2008, with sales of about 2,500 vehicles to 31 countries. Tesla began delivery of its four-door Model S sedan on June 22, 2012. It unveiled its third product, the Model X, aimed at the SUV/minivan market, on February 9, 2012; however, the Model X launch was delayed until September 2015.^{[127][128][129]} In addition to its own cars, Tesla sold electric powertrain systems to Daimler for the Smart EV,

Mercedes B-Class Electric Drive and Mercedes A Class, and to Toyota for the RAV4 EV. Musk was able to bring in both companies as long-term investors in Tesla.^[130]



Musk and Senator Dianne Feinstein next to
a Tesla Model S at the opening of the
Tesla Factory. (2010)



Musk observing an assembly demo at the reopening of the NUMMI plant, now known as the Tesla Factory (Fremont, California) in 2010



Musk standing in front of a Tesla Model S
in 2011

Musk favored building a more affordable Tesla model; this led to the Model 3 that was unveiled in 2016, with a planned base price of US\$35,000.^[126] Initial deliveries

began in 2017, with the US\$35,000 base model becoming available in February 2019.^{[131][132]} Musk originally intended to name the model 3 as the model E but was blocked by Ford which held the trademark, with Musk concluding that "Ford was killing SEX".^[133]

Several mainstream publications have compared him with Henry Ford for his work on advanced vehicle powertrains.^[134] Musk has named the fastest acceleration modes of their vehicles after the

Spaceballs' starship speeds (Ludicrous Speed, Plaid Speed).^{[135][136]}

In a May 2013 interview with All Things Digital, Musk said that to overcome the range limitations of electric cars, Tesla planned to expand its network of supercharger stations, tripling the number on the East and West coasts of the U.S. that June, with plans for more expansion across North America, including Canada, throughout the year.^[137]

In 2014, Musk announced that Tesla would allow its technology patents to be used by anyone in good faith in a bid to entice automobile manufacturers to speed up the development of electric cars. "The unfortunate reality is electric car programs (or programs for any vehicle that doesn't burn hydrocarbons) at the major manufacturers are small to non-existent, constituting an average of far less than 1% of their total vehicle sales," Musk said.^[138]

In February 2016, Musk announced that he had acquired the Tesla.com domain name from Stu Grossman, who had owned it since 1992, and changed Tesla's homepage to that domain.^[139]



Musk with Indian Prime Minister Narendra Modi in San Jose, California, on September 26, 2015

Anticipating that the global lithium-ion battery supply was insufficient for their planned electric car output, a lithium-ion battery factory that would more than double existing global output was planned.^[140] On July 29, 2016 the first phase of Gigafactory 1, a lithium-ion battery and electric vehicle subassembly factory, was officially opened near Reno, Nevada, by Tesla in partnership with Panasonic.^{[141][142]} Gigafactory 1 currently produces 35 GWh/yr of batteries.

In July 2016, Musk released Tesla's
"master plan part 2":^[143]

Create stunning solar roofs with seamlessly integrated battery storage. Expand the electric vehicle product line to address all major segments [including small SUV and pickup truck]. Develop a self-driving capability that is 10X safer than manual

via massive fleet learning.

*Enable your car to make money
for you when you aren't using it.*

In July 2016, Tesla commenced developing their autopilot hardware and software in-house, ending their previous partnership with Mobileye.^[144]

In September 2017, Musk arranged a contract with the government of South Australia for Tesla Energy to install what

would then be the world's largest lithium ion battery pack, to help alleviate energy blackouts in the state. Famously, Musk arranged this on Twitter, with the guarantee that it would be installed in 100 days or would be free.^[145] This deadline was achieved^[146] and the resulting battery exceeded expected performance and returns,^[147] despite skepticism from Australian federal politicians.^{[148][149]}

In September 2018, Musk was sued by the U.S. Securities and Exchange Commission

for a tweet claiming that funding had been secured for potentially taking Tesla private. The lawsuit claimed that verbal discussions Musk held with foreign investors in July 2018 did not confirm key deal terms^[150] and thus characterized the tweet as false, misleading, and damaging to investors, and sought to bar Musk from serving as CEO on publicly traded companies.^{[151][152]} Musk called the allegations unjustified and that he had never compromised his integrity.^[153] Two

days later, Musk reached a settlement with the SEC, without admitting or denying the SEC's allegations. As a result, Musk and Tesla were fined \$20 million each, and Musk was forced to step down temporarily as Tesla chairman, while remaining Tesla's CEO.^[154] Musk also proclaimed in several interviews since that he does not regret sending the tweet that triggered the SEC investigation. According to Reuters, Musk said the tweet was "Worth It".^[155]

According to ABC News, "As recently as

Oct. 4 2018, Musk issued a sarcastic tweet, describing the agency [SEC] as the 'Shortseller Enrichment Commission,' despite having agreed to settlement terms a week earlier that his company, Tesla, would monitor his tweets and other communications."^[156] In a December 2018 interview with CBS's *60 Minutes*, Musk stated, "I want to be clear. I do not respect the SEC."^[157] On February 19, 2019, according to *Forbes*, Musk stated in a tweet that Tesla would build half a million

cars in 2019.^[158] The SEC reacted to Musk's tweet by filing in court, initially asking the court to hold him in contempt for violating the terms of a settlement agreement with such a tweet, which was disputed by Musk. This was eventually settled by a joint agreement between Musk and the SEC clarifying the previous agreement details.^[159] The agreement included a list of topics that Musk would need preclearance before tweeting about.^[160]

In January 2019, Musk traveled to China for the groundbreaking of Tesla's Shanghai Gigafactory, which is the company's first large-scale plant outside the U.S.^[161] Part of his visit to China, Musk also met the Chinese premier Li Keqiang. During their exchange, Musk expressed his admiration for China and wished he could visit China more often, to which the Chinese premier was quoted as saying "We can issue you a Chinese green card if that helps."^{[162][163]} The time from the initial ground-breaking

to production of first cars at the Shanghai Gigafactory was achieved in under one year.^[164]

In March 2019, the model Y small SUV/CUV was unveiled.^[165] First deliveries were in March 2020.^[166] Later that year in November, Musk unveiled the Tesla Cybertruck, an all-electric battery-powered pickup truck. The reveal was in Los Angeles—the same month, year and location that the movie *Blade Runner*, which was a design inspiration, was set

in.^[167]^[168] To be manufactured in three variants of Single Motor RWD, Dual Motor AWD and Triple Motor AWD, the Cybertruck is expected to start commercial production in late 2021.^[169]

As of January 29, 2016, Musk owned about 28.9 million Tesla shares, which equates to about 22% of the company.^[170]^[171] In January 2018, Musk was granted an option to buy up to 20.3 million shares if Tesla's market value were to rise to \$650 billion. Majority shareholder

approval for this package was approved in March 2018.^[172] The grant was also meant to end speculation about Musk's potential departure from Tesla to devote more time to his other business ventures.^[173] A report by advisory firm Glass Lewis & Co. to its clients argued against granting the options.^[174]

SolarCity

Musk provided the initial concept and financial capital for SolarCity, which was then co-founded in 2006 by his cousins Lyndon and Peter Rive.^{[175][176]} By 2013, SolarCity was the second largest provider of solar power systems in the United States.^[177] SolarCity was acquired by Tesla, Inc. in November 2016 and is currently a wholly owned subsidiary of Tesla.^{[178][179][180]}

The underlying motivation for funding both SolarCity and Tesla was to help combat

global warming.^{[181][182]} In 2012, Musk announced that SolarCity and Tesla would collaborate to use electric vehicle batteries to smooth the impact of rooftop solar on the power grid, with the program going live in 2013.^[183]

On June 17, 2014, Musk committed to building a SolarCity advanced production facility in Buffalo, New York, that would triple the size of the largest solar plant in the United States. Musk stated the plant will be "one of the single largest solar

panel production plants in the world," and it will be followed by one or more even bigger facilities in subsequent years.^[184]

The Tesla Gigafactory 2 is a photovoltaic (PV) cell factory, leased by Tesla subsidiary SolarCity in Buffalo, New York. Construction on the factory started in 2014 and was completed in 2017.^[185]

Tesla accepted \$750 million in public funds from New York Governor Andrew Cuomo as part of the Buffalo Billion project—a plan to invest money to help the

economy of the Buffalo, New York area—to build the factory and infrastructure.^[186]

Hyperloop

On August 12, 2013, Musk unveiled a concept for a high-speed transportation system incorporating reduced-pressure tubes in which pressurized capsules ride on an air cushion driven by linear induction motors and air compressors.^[187] The mechanism for releasing the concept was

an alpha-design document that, in addition to scoping out the technology, outlined a notional route where such a transport system might be built: between the Greater Los Angeles Area and the San Francisco Bay Area.^[188]

After earlier envisioning Hyperloop, Musk assigned a dozen engineers from Tesla and SpaceX who worked for nine months, establishing the conceptual foundations and creating the designs for the transportation system.^{[189][190]} An early

design for the system was then published in a whitepaper posted to the Tesla and SpaceX blogs.^{[191][192][193]} Musk's proposal, if technologically feasible at the costs he has cited, would make Hyperloop travel cheaper than any other mode of transport for such long distances. The alpha design was proposed to use a partial vacuum to reduce aerodynamic drag, which it is theorized would allow for high-speed travel with relatively low power, with certain other features like air-bearing

skis and an inlet compressor to reduce freestream flow. The document of alpha design estimated the total cost of an LA-to-SF Hyperloop system at US\$6 billion, but this amount is speculative.^[194]

In June 2015, Musk announced a design competition for students and others to build Hyperloop pods to operate on a SpaceX-sponsored mile-long track in a 2015–2017 Hyperloop pod competition. The track was used in January 2017, and Musk also started building a tunnel.^[195]

Hyperloop One, a company unaffiliated with Musk, had announced that it had done its first successful test run on its DevLoop track in Nevada on July 13, 2017. It was on May 12, 2017, at 12:02 a.m. and had lasted 5.3 seconds, reaching a top speed of 70 mph.^[196]

On July 20, 2017, Elon Musk said that he had received what he described as "verbal government approval" to build a hyperloop from New York City to Washington, D.C.,

stopping in both Philadelphia and Baltimore.^[197]

OpenAI

In December 2015, Musk announced the creation of OpenAI, a not-for-profit artificial intelligence (AI) research company.

OpenAI aims to develop artificial general intelligence in a way that is safe and beneficial to humanity.^[198]

By making AI available to everyone, OpenAI wants to "counteract large corporations who may gain too much power by owning super-intelligence systems devoted to profits, as well as governments which may use AI to gain power and even oppress their citizenry."^[199] Musk has stated he wants to counteract the concentration of power.^[40] In 2018 Musk left the OpenAI board to avoid possible future conflicts with his role as CEO of Tesla as Tesla increasingly

became involved in AI through Tesla Autopilot.^[200]

In an interview with Joe Rogan in September 2018, Musk expressed his concerns about the dangers of developing artificial intelligence indiscriminately. In January 2019 Mark Harris of The Guardian noted that on January 23, 2019 the Musk foundation "added a line to its website, stating its support for the "development of safe artificial intelligence to benefit humanity"". ^[201]

Neuralink

In 2016, Musk co-founded Neuralink, a neurotechnology startup company to integrate the human brain with artificial intelligence. The company is centered on creating devices that can be implanted in the human brain, with the eventual purpose of helping human beings merge with software and keep pace with advancements in artificial intelligence. These enhancements could improve

memory or allow more direct interfacing with computing devices.^[202]

Musk sees Neuralink and OpenAI as related: "OpenAI is a nonprofit dedicated to minimizing the dangers of artificial intelligence, while Neuralink is working on ways to implant technology into our brains to create mind-computer interfaces."^[40]

The Boring Company



Musk discussing The Boring Company at TED 2017

On December 17, 2016, while stuck in traffic, Musk tweeted "[I] am going to build a tunnel boring machine and just start digging ..." The company was named 'The Boring Company' (TBC).^[203] On January 21, 2017, Musk tweeted "Exciting progress on the tunnel front. Plan to start digging in

a month or so."^[204] As of January 26, 2017, discussions with regulatory bodies had begun.^[205]

In February 2017, the company began digging a 30-foot (9.1 m) wide, 50-foot (15 m) long, and 15-foot (4.6 m) deep "test trench" on the premises of Space X's offices in Los Angeles, since the construction requires no permits.^{[206][207]}

Musk had said in early 2017 that a 10-fold decrease in tunnel boring cost per mile is necessary for economic feasibility of the

proposed tunnel network.^[208] According to Tesla and SpaceX board member Steve Jurvets, the tunnel width is optimized for electric vehicles only, which avoids complications of exhaust venting with internal combustion engines.^[209]

By late 2018, TBC had active construction, approved plans in place, or an operational tunnel in several areas of the United States: Baltimore,^[210] Chicago^[211] and Los Angeles. TBC provided an update on the state of their technology and product line

when they opened to the public their first mile-long test tunnel in Hawthorne, California, on December 18, 2018, saying it has been a proof-of-concept for the technology.^{[212][213]} TBC has claimed that design is complete for their next tunnel boring machine (TBM), *Prufrock*, and that assembly and engineering testing would begin in 2019.^{[212]:15:18–15:45} In February 2020 TBC released images of a working Prufrock prototype.^[214]

As merchandising, Musk said the company sold 2,000 "flamethrowers" in 2018,^{[215][216]} inspired by the movie Spaceballs.^{[217][218]}

Tham Luang cave rescue

In July 2018, Musk attempted to provide assistance to rescuers during the Tham Luang cave rescue by arranging for his employees to build a small rescue pod.

Musk, responding to requests for help from Twitter users,^[219] offered help; his The Boring Company contacted the Thai government.^[220] He then arranged for engineers from two of his companies to design a child-sized submarine to help the rescue effort and documented the process via Twitter.^{[221][222]} Richard Stanton, leader of the international rescue diving team, also urged Musk to continue construction of the mini-submarine as a back-up, in case flooding worsened.^[223] Engineers at

Musk's companies SpaceX and The Boring Company built the mini-submarine out of a Falcon 9 liquid oxygen transfer tube^[224] in 8 hours and personally delivered it to Thailand.^[225]

Named "Wild Boar" after the children's soccer team,^[226] its design, based on dive team feedback, was a five-foot (1.5 m)-long, twelve-inch (300 mm)-inch wide sealed tube weighing about 90 pounds (41 kg) propelled manually by divers in the front and back with segmented

compartments to place diver weights to adjust buoyancy,^{[225][227]} intended to solve the problem of safely transporting the children who might have had difficulty learning the scuba skills required to exit the cave on their own without panicking. In case the mini-submarine could not fit through the cave system, Elon Musk also requested Wing Inflatables, a California-based inflatable boat manufacturer, to build inflatable escape pods. The pods were designed, fabricated, and tested in

one day before being flown to Thailand.^{[228][229]}

By this time, eight of the twelve children had already been rescued (using full face masks and oxygen under anesthesia^{[230][231][232]}) and Thai authorities decided not to use the submarine.^{[233][234][235]}

Elon Musk was later one of the 187 people awarded a Member of the Order of the Direkgunabhorn (fifth class) by the King of

Thailand in March 2019 for his and his team's contributions to the rescue mission.^[236]

Device viability and backlash

The supervisor of the rescue operation Narongsak Osatanakorn stated that the submarine was "technologically sophisticated, [but] it doesn't fit with our mission to go in the cave".^{[237][238]} Vernon Unsworth, a recreational caver who had been exploring the cave for the previous

six years and who had played a key advisory role in the rescue, criticized the submarine on CNN as amounting to nothing more than a public relations effort with no chance of success, and that Musk "had no conception of what the cave passage was like"^{[239][240][241]} and "can stick his submarine where it hurts". Musk asserted on Twitter that the device would have worked and referred to Unsworth as "pedo guy", causing backlash against Musk.^{[242][243]} He subsequently deleted the

tweets, along with an earlier tweet in which he told another critic of the device, "Stay tuned jackass."^[243] On July 16, Unsworth stated that he was considering legal action in relation to Musk's comments.^{[244][245]}

Two days later, Musk issued an apology for his remarks.^{[246][247][248][249]} On August 28, 2018, in response to criticism from a writer on Twitter, Musk tweeted "You don't think it's strange he hasn't sued me?"^[250] The following day, a letter from L. Lin

Wood, the rescuer's attorney, dated August 6, emerged, showing that he had been making preparations for a libel lawsuit.^{[251][252]}

At some point, a self-proclaimed private investigator emailed Musk with an offer to "dig deep" into Unsworth's past, which Musk accepted in August 2018;^[253] the investigator was later revealed to be a convicted felon with multiple counts of fraud.^[254] On August 30, using details produced during the alleged

investigation,^{[255][256]} Musk sent a BuzzFeed News reporter who had written about the controversy an email prefaced "off the record". It claimed that Unsworth is a "single white guy from England who's been traveling to or living in Thailand for 30 to 40 years ... until moving to Chiang Rai for a child bride who was about 12 years old at the time" (later stated by Unsworth's partner to be false). On September 5, the reporter tweeted a screenshot of the email, saying that "Off

the record is a two-party agreement," which he "did not agree to".^[257]

In mid-September, Unsworth filed a defamation suit in Los Angeles federal court.^{[258][259]} In his defense, Musk has argued that in slang usage "'pedo guy' was a common insult used in South Africa when I was growing up ... synonymous with 'creepy old man' and is used to insult a person's appearance and demeanor."^[260]

The defamation case began on December 4, 2019, in Los Angeles, with Unsworth seeking \$190 million in damages.^[261]

During the trial Musk apologized to Unsworth again for the initial tweet. On December 6 the jury found in favor of Musk and ruled he was not liable; Musk commented: "My faith in humanity is restored."^[262] Unsworth's lawyer, L. Lin Wood, stated: "The truth vindicated Musk and Unsworth. Our system of justice worked".^[263]

Teslaquila

Elon Musk teased a Tesla-branded tequila in 2018 as part of an April Fool's joke on Instagram. The proposed Tesla-branded tequila appeared to become closer to reality in October 2018 as Tesla filed an "intent to use" trademark application with the U.S. Patent and Trademark Office.^[264] The trademark is for distilled agave liquor. Musk reaffirmed his intention to release the product with a tweet, featuring a

mockup of the bottle, on October 12, 2018.^[265]

Mexico's Tequila Regulatory Council (CRT) publicly replied, "If it wants to make Teslaquila viable as a tequila it would have to associate itself with an authorized tequila producer, comply with certain standards and request authorization from Mexico's Industrial Property Institute."^[266]

Music

On March 30, 2019, Musk released a rap track, "RIP Harambe", on SoundCloud under the name "Emo G Records".^[267] The track was performed by Yung Jake, written by Yung Jake and Caroline Polachek, and produced by BloodPop.^{[268][269]} On January 30, 2020, Musk released an EDM track, "Don't Doubt Ur Vibe", featuring his own lyrics and vocals.^[270] While Guardian critic Alexi Petridis described it as "indistinguishable ... from umpteen competent but unthrilling bits of bedroom

electronica posted elsewhere on Soundcloud",^[271] TechCrunch said it was "not a bad representation of the genre".^[270]

Views

Financial

Musk has openly spoken about short-selling and how he believes the practice should be illegal.^[272] Musk has also been vocal about his lack of respect for the SEC jokingly calling them the "short-seller

enrichment committee"^[273] following a settlement agreement.^[157] He has also commented on the price of Tesla stock when it was around \$700, saying on Twitter it was "too high imo;"^[274] then again when it crossed \$1000 simply tweeting "lol" and following that tweet up with "stonks" stating that his website stankmemes.com predicted it.^[275] He responded to an earlier version of this Wikipedia entry describing him as an investor, saying that he does not consider

himself one and does almost "zero investing."^[276]

Political



Musk speaking alongside former Irish Taoiseach (Prime Minister) Enda Kenny in 2013

Politically, Musk has described himself as "half Democrat, half Republican" and "I'm somewhere in the middle, socially liberal and fiscally conservative."^[277] In 2018, he stated that he was "not a conservative. I'm registered independent [and] politically moderate."^[278] Prompted by the emergence of artificial intelligence, Musk has voiced support for a universal basic income;^[279] he additionally backs direct democracy and has stated he thinks the government on Mars will be a direct

democracy.^{[280][281]} He has described himself as a "socialist", but "not the kind that shifts resources from most productive to least productive, pretending to do good, while actually causing harm"—arguing instead, "true socialism seeks greatest good for all."^[282] He supports targeting an inclusive tax rate of 40%, prefers consumption taxes to income taxes, and supports the estate tax, as the "probability of progeny being equally excellent at capital allocation is not high."^[283]

Musk has described the United States as "[inarguably] the greatest country that has ever existed on Earth," describing it as "the greatest force for good of any country that's ever been." Musk believes democracy would not exist any longer if not for the United States, saying that it prevented this disappearance on three occasions through its participation in World War I, World War II and the Cold War. Musk also stated that he thinks "it would be a mistake to say the United

States is perfect, it certainly is not. There have been many foolish things the United States has done and bad things the United States has done."^[284]

Before the election of Donald Trump as President of the United States, Musk criticized candidate Trump by saying: "I feel a bit stronger that he is probably not the right guy. He doesn't seem to have the sort of character that reflects well on the United States."^[285] Following Donald Trump's inauguration, Musk expressed

approval of Trump's choice of Rex Tillerson as Secretary of State and accepted an invitation to participate in two councils advising President Trump.^{[286][287]} Regarding his cooperation with Trump, Musk has subsequently commented: "The more voices of reason that the President hears, the better."^[288] He subsequently resigned from both business advisory councils in June 2017, in protest at Trump's decision to withdraw the United States from the Paris Agreement on

climate change, stating: "Climate change is real. Leaving Paris is not good for America or the world".^{[289][290]} In May 2020, amidst Musk's restarting of Tesla assembly plant production during the COVID-19 pandemic, Trump tweeted in support of Musk, which Musk welcomed and publicly thanked him for on Twitter.^{[291][292]}

In August 2019, Musk came out on Twitter in support of the 2020 Democratic presidential candidate Andrew Yang,

whose platform revolves around the ongoing problem of job displacement through technological automation and artificial intelligence. Musk said in a tweet that universal basic income, which Yang supports, is "obviously needed."^[293]

Lobbying



Musk with Vice President Mike Pence on May 27,

2020

In an interview with *The Washington Post*, Musk stated he was a "significant (though not top-tier) donor to Democrats," but that he also gives heavily to Republicans. Musk further stated that political contributions are a requirement in order to have a voice in the United States government.^{[294][295]}

A 2012 report from the Sunlight Foundation, a nonpartisan group that tracks government spending, found that

since 2002, SpaceX had spent more than US\$4 million on lobbying the United States Congress and more than US\$800,000 in political contributions to Democrats and Republicans. The same report said that "SpaceX's campaign to win political support has been systematic and sophisticated," and that "unlike most tech-startups, SpaceX has maintained a significant lobbying presence in Washington almost since day 1." and that "Musk himself has donated roughly

US\$725,000 to various campaigns since 2002. In 2004, he contributed US\$2,000 to President George W. Bush's reelection campaign, maxing out (over US\$100,000)^[296] to Barack Obama's reelection campaign and donated US\$5,000 to Republican Sen. Marco Rubio, who represents Florida, a state critical to the space industry. (...) All told, Musk and SpaceX gave out roughly US\$250,000 in the 2012 election cycle."^{[294][297]}

Additionally, SpaceX hired former

Republican Senate Majority Leader Trent Lott to represent the company, via the Washington-based lobbying group Patton Boggs LLP. Alongside Patton Boggs LLP, SpaceX uses several other outside lobbying firms, who work with SpaceX's own lobbyists.^[298]

Musk had been a supporter of the U.S. political action committee (PAC) FWD.us, which was started by fellow high-profile entrepreneur Mark Zuckerberg and advocates for immigration reform.

However, in May 2013, Musk publicly withdrew his support in protest of advertisements the PAC was running that supported causes like the Keystone Pipeline. Musk and other members, including David O. Sacks, pulled out, criticizing the strategy as "cynical."^[299] Musk further stated, "We shouldn't give in to the politics. If we give in to that, we'll get the political system we deserve."^[300]

In December 2013, Sean Becker of the media/political website Mic called Musk a

"complete hypocrite," stating that "[for] the 2014 election cycle, Musk has contributed to the Longhorn PAC and the National Republican Congressional Committee—both of which have funded the campaigns of anti-science, anti-environment candidates such as Rep. Michelle Bachman (R-Minn.)."^[300] Musk has directly contributed to Republican Sen. Marco Rubio, who has been accused of holding similar positions regarding climate change.

Subsidies

Musk has stated that he does not believe the U.S. government should provide subsidies to companies but should instead use a carbon tax to price in the negative externality of climate change and discourage poor behavior. Musk says that the free market would achieve the best solution, and that producing environmentally unfriendly vehicles should come with its own consequences.^[301]

Musk's statements have been criticized, with Stanford University Professor Fred Turner noting that "if you're an entrepreneur like Elon Musk, you will take the money where you can get it, but at the same time believe as a matter of faith that it's entrepreneurship and technology that are the sources of social change, not the state. It is not quite self-delusion, but there is a habit of thinking of oneself as a free-standing, independent agent, and of not acknowledging the subsidies that one

received. And this goes on all the time in Silicon Valley."^[302] Author Michael Shellenberger argued that "in the case of Musk, it is hard not to read that as a kind of defensiveness. And I think there is a business reason for it. They are dealing with a lot of investors for whom subsidies are not the basis for a long-term viable business, and they often want to exaggerate the speed with which they are going to be able to become independent." Shellenberger continues, "we would all be

better off if these entrepreneurs were a bit more grateful, a bit more humble." While journalist and author Jim Motavalli, who interviewed Musk for *High Voltage*, his 2011 book about the electric vehicle industry, speculated that "Elon is now looking at it from the point of view of a winner, and he doesn't want to see other people win because they get government money—I do think there is a tendency of people, once they have succeeded, to want to pull the ladder up after them."^[303]

In 2015, Musk's statements were subject to further scrutiny when an LA Times article claimed that SpaceX, Tesla, SolarCity and buyers of their products had or were projected to receive together an estimated US\$4.9 billion in government subsidies over twenty years. One example given is New York state, which is spending \$750 million to build a solar panel factory in Buffalo which will be leased to SolarCity for \$1 a year. The deal also includes no property taxes for a decade, an estimated

\$260 million valuation. Tesla's former vice president of business development and former U.S. State Department official, Diarmuid O'Connell, was the automaker's lead negotiator.^[304]^[305]

Media

After a string of negative press targeting Tesla caused Musk to become frustrated,^[306] specifically articles published by Reveal News criticizing Tesla

for its factory safety procedures,^[307] Musk announced on Twitter that he was planning on creating a website where users could rate the truthfulness of specific articles in addition to the credibility of journalists and publications.^[308] He suggested calling it "Pravda" after a Soviet Union-era Communist Party newspaper of the same name.

This caused backlash from many journalists, claiming that a platform where

any user could freely vote on an article's or a journalist's credibility could be prone to abuse.^[309]^[310]

After realizing the site "pravda.com" is used by the Ukrainian Internet newspaper Ukrayinska Pravda, Musk bought the site pravduh.com on May 25, 2018.^[311]

Destiny and religion

When asked whether he believed "there was some kind of destiny involved" in

humanity's transition to a multi-planetary species, rather than "just physics", Musk responded:

Well, I do. Do I think that there's some sort of master intelligence architecting all of this stuff? I think probably not because then you have to say: "Where does the master intelligence come from?" So it sort of begs the

question. So I think really you can explain this with the fundamental laws of physics. You know it's complex phenomenon from simple elements.^[312]

Musk has stated that he does not pray, or worship any being, although he asked "any entities that were listening" to "bless the launch" before an important Falcon 1

launch. When asked whether he thought science and religion could co-exist, Musk replied "Probably not."^[313]

Extraterrestrial life

Although Musk believes there could be simple life on other planets, he is unsure whether other intelligent life is likely.^[313]

Musk later said that he "hope[s] that there is other intelligent life in the known universe", and stated that it is "probably

more likely than not, but that's a complete guess."^[314]

Musk has also considered the simulation hypothesis as a potential solution to the Fermi paradox:

The absence of any noticeable life may be an argument in favour of us being in a simulation ... Like when you're playing an adventure game, and

you can see the stars in the background, but you can't ever get there. If it's not a simulation, then maybe we're in a lab and there's some advanced alien civilization that's just watching how we develop, out of curiosity, like mould in a Petri dish ... If you look at our current technology level, something strange has to happen to

civilizations, and I mean strange in a bad way. ... And it could be that there are a whole lot of dead, one-planet civilizations.^[315]

In June 2016, Musk was asked whether he thinks humans live in a computer simulation, to which he answered:

The strongest argument for us probably being in a simulation I

think is the following: 40 years ago we had Pong—two rectangles and a dot. That's where we were. Now 40 years later we have photorealistic, 3D simulations with millions of people playing simultaneously and it's getting better every year. And soon we'll have virtual reality, we'll have augmented reality. If you assume any rate of

improvement at all, then the games will become indistinguishable from reality, just indistinguishable. ^[316]

Artificial intelligence

Musk has frequently spoken about the potential dangers of artificial intelligence, calling it "the most serious threat to the survival of the human race". During a 2014 interview at the MIT AeroAstro Centennial

Symposium, Musk described AI as humanity's largest existential threat, further stating, "I'm increasingly inclined to think that there should be some regulatory oversight, maybe at the national and international level, just to make sure that we don't do something very foolish." Musk described the creation of artificial intelligence as "summoning the demon".^[317]^[318]

Despite this, Musk invested in DeepMind, an AI firm, and Vicarious, a company

working to improve machine intelligence.^[319] In January 2015, he donated \$10 million to the nonprofit Future of Life Institute, an organization focused on challenges posed by advanced technologies.^[320] He was previously the co-chairman of OpenAI, a nonprofit artificial intelligence research company.^[321]

Musk has said that his investments are "not from the standpoint of actually trying to make any investment return... I like to

just keep an eye on what's going on with artificial intelligence. I think there is potentially a dangerous outcome there. There have been movies about this, you know, like Terminator. There are some scary outcomes. And we should try to make sure the outcomes are good, not bad."^[319]

Musk's opinions about artificial intelligence have brought him some controversy. He and Facebook founder Mark Zuckerberg have clashed, with the

latter calling his warnings "pretty irresponsible".^[322] Musk responded to Zuckerberg's censure by saying that following a discussion he had about AI with Zuckerberg he was of the opinion that Mark had only a "limited understanding" of the subject. In 2014, Slate's Adam Elkus argued that current AIs were as intelligent as a toddler, and only in certain fields, going on to say that Musk's "summoning the demon" analogy may be harmful

because it could result in significant cuts to AI research budgets.^[323]

The Information Technology and Innovation Foundation (ITIF), a Washington D.C. think-tank, awarded its Annual Luddite Award to "alarmists touting an artificial intelligence apocalypse"; its president, Robert D. Atkinson, complained that Musk and others say AI is the largest existential threat to humanity. Atkinson stated "That's not a very winning message if you want to get AI funding out of

Congress to the National Science Foundation."^[324]^[325]^[326] Nature, referring to the award said that "concerns over AI are not simply fear-mongering" and concluded: "It is crucial that progress in technology is matched by solid, well-funded research to anticipate the scenarios it could bring about ... If that is a Luddite perspective, then so be it."^[327]

Facebook's AI head, Jerome Persati, said that Elon Musk has "has no idea what he is talking about when he talks about AI", with

CNBC reporting that Musk is "not always looked upon favorably" by the AI research community.^{[328][329]}

Public transport

At a Tesla event on the sidelines of the Conference on Neural Information Processing Systems in December 2017, Musk stated that:

I think public transport is painful. It sucks. Why do you want to get on something with a lot of other people, that doesn't leave where [sic] you want it to leave, doesn't start where you want it to start, doesn't end where you want it to end? And it doesn't go all the time. ... It's a pain in the ass. That's why everyone doesn't like it. And

there's like a bunch of random strangers, one of who might be a serial killer, OK, great. And so that's why people like individualized transport, that goes where you want, when you want.^[330]

Afterwards, he dismissed an audience member's response that public transportation functioned effectively in Japan.^{[331][332]}

His comment sparked widespread criticism from both the public and transit experts. Urban planning expert Brent Toderian started the hashtag #GreatThingsThatHappenedonTransit which was widely adopted by Twitter users in order to dispel Musk's notion that everybody hated public transport.^{[331][333][334]} Yonah Freemark, an urbanist and journalist specializing in planning and transportation, summarized Musk's views on public transport as "It's

terrible. You might be killed. Japanese trains are awful. Individualized transport for everyone! Congestion? Induced demand? Climate change impacts? Unwalkable streets? Who cares!"^[330]

Jarrett Walker, a known public transport expert and consultant from Portland, said that "Musk's hatred of sharing space with strangers is a luxury (or pathology) that only the rich can afford", referring to the theory that planning a city around the preferences of a minority yields an

outcome that usually does not work for the majority.^{[335][336][337]} Musk responded with "You're an idiot", later saying "Sorry ... Meant to say 'sanctimonious idiot'."^{[338][339][340]} The exchange received a significant amount of media attention and prompted Nobel laureate Paul Krugman to comment on the controversy, saying that "You're an idiot" is "Elon Musk's idea of a cogent argument".^{[335][341]}

COVID-19

Musk has received criticism over his views on and actions related to the COVID-19 pandemic.^[342] On January 31, he likened some aspects of COVID-19 to the common cold and stated that "the coronavirus panic is dumb",^{[343][344]} and "danger of panic still far exceeds danger of corona imo. If we over-allocate medical resources to corona, it will come at expense of treating other illnesses".^{[345][346]} Musk has additionally been criticised for tweeting contentious claims on the disease, including that "Kids

are essentially immune, but elderly with existing conditions are vulnerable", which he accompanied with a graphic showing that no children had died in Italy by March 15^{[347][348][349]} and for saying "Based on current trends, probably close to zero new cases in US too by end of April."^{[350][342][351][352]} In addition, he promoted articles which suggested that healthcare companies were inflating COVID-19 case numbers for financial reasons, promoted a paper on the benefits

of chloroquine that was subsequently widely discredited and pulled down by Google, and retweeted a video calling for an immediate end to social distancing measures, adding "[d]ocs make good points".^{[353][354]}

When the Alameda County Sheriff ordered all non-essential businesses to shut down, Musk and Tesla initially refuted the order, arguing that vehicle manufacturing and energy infrastructure are critical sectors,

citing the U.S. Department of Homeland Security.^{[355][356][357]}

Musk called the lockdown 'fascist' on a Tesla earnings call stating:

If somebody wants to stay in their house, that's great. They should be allowed to stay in their house and should not be compelled to leave, but to say that they cannot leave their

house, and they will be arrested if they do, this is fascist, this is not democratic, this is not freedom. Give people back their goddamn freedom.^[358]

Musk later sent out numerous tweets opposing mandatory lockdowns such as "FREE AMERICA NOW".^[359]

On May 11, Musk reopened Tesla's Fremont production line in defiance of

Alameda County's orders however in compliance with California state health rules. The same day he tweeted "Tesla is restarting production today against Alameda County rules. I will be on the line with everyone else. If anyone is arrested, I ask that it only be me."^[360] Additionally Musk announced that Tesla would be moving headquarters to Texas or Nevada and that Tesla had filed a lawsuit against Alameda County challenging its "shutdown" of the Fremont factory, which

was subsequently withdrawn.^[361]^[362] The Alameda County Public Health Department explained it was waiting on a plan that the electric car company had promised to provide on May 11 that would walk through how it would protect workers' health during the coronavirus pandemic.^[363] An opening date of Monday, May 18 had been penciled in for Tesla pending approval—the same date that Fiat Chrysler, Ford Motor Company, and General Motors were also due to restart

production.^[363] On June 2, 2020, a Tesla worker tested positive for COVID-19 after the Tesla factory in Buffalo, New York reopened, the first such case since Tesla reopened its US factories.^[364]

Personal life

Philanthropy

Musk is chairman of the Musk Foundation, which states its purpose is to provide solar-power energy systems in disaster

areas as well as other goals.^[365]^[201] In 2010, the Musk Foundation collaborated with SolarCity to donate a 25 kW solar power system to the South Bay Community Alliance's hurricane response center in Coden, Alabama.^[366] In July 2011, the Musk Foundation donated US\$250,000 towards a solar power project in Sōma, Japan, a city that had been recently devastated by a tsunami.^[367]

In July 2014, Musk was asked by cartoonist Matthew Inman and William

Terbo, the grandnephew of Nikola Tesla, to donate US\$8 million toward the construction of the Tesla Science Center at Wardenclyffe.^[368] Ultimately, Musk agreed to donate US\$1 million toward the project and additionally pledged to build a Tesla Supercharger in the museum car park.^[369]

In January 2015, Musk donated US\$10 million to the Future of Life Institute to run a global research program aimed at

keeping artificial intelligence beneficial to humanity.^{[370][320][371]}

As of 2015, Musk is a trustee of the X Prize Foundation^[372] and a signatory of The Giving Pledge.^[373]

In October 2018, in an effort to help solve the Flint water crisis, Musk and the Musk Foundation donated over \$480,000 to install new water fountains with filtration systems for access to clean water at all Flint, Michigan schools.^[374] As of 2019,

approximately 30,000 children in all 12 area schools have free, safe drinking water from the water filtration systems.^[375]

Musk has been a top donor for the ACLU.^[376]

In October 2019, Musk donated US\$1 million to '#TeamTrees' a tree planting initiative to plant 20 million trees led by the YouTube community^[note 3] and in collaboration with Arbor Day Foundation.^{[377][378][379]}

Family

Tosca Musk, Elon's sister, is a filmmaker. She is the founder of Musk Entertainment and has produced various movies.^[380]

Musk met his first wife, Canadian author Justine Wilson, while both were students at Ontario's Queen's University. They married in 2000 and separated in 2008.^[381] Their first son, Nevada Alexander Musk, died of sudden infant death syndrome (SIDS) at the age of 10

weeks.^[382] They later had five sons through in vitro fertilization^[383]—twins in 2004 (Griffin and Xavier), followed by triplets in 2006 (Kai, Saxon, and Damian). They share custody of all five sons.^[384]

In 2008, Musk began dating English actress Talulah Riley, and in 2010, the couple married. In January 2012, Musk announced that he had ended his four-year relationship with Riley,^{[35][385]} tweeting to Riley, "It was an amazing four years. I will love you forever. You will make someone

very happy one day."^[386] In July 2013, Musk and Riley remarried. In December 2014, Musk filed for a second divorce from Riley; however, the action was withdrawn.^[387] The media announced in March 2016 that divorce proceedings were again underway, this time with Riley filing for divorce from Musk.^{[388][389]} The divorce was finalized in late 2016.^[390]

Musk began dating American actress Amber Heard in 2016, they split up after

one year due to their conflicting schedules.^{[391][392]}

On May 7, 2018, Musk and Canadian musician Grimes revealed that they had begun dating.^{[393][394][395]} On January 8, 2020, Grimes announced that she was pregnant with their first child.^{[396][397]}

Grimes gave birth to a son on May 4, 2020.^{[398][399]} According to Musk and Grimes, his name was "X Æ A-12" (pronounced "Ex Ash A Twelve"^[400] or "Ex Aye Eye"^[401]), however the name was

deemed illegal under California law, because it contained characters that are not in the modern English alphabet,^[402] and was then changed to "X Æ A-Xii", this drew confusion, as Æ is still not in the modern English alphabet.^[403]

Joe Rogan podcast appearance

On September 6, 2018, Musk appeared on The Joe Rogan Experience podcast and discussed various topics for over two

hours. Within five days, the appearance had accrued 10 million YouTube views.^[404] One of the highest profile and controversial aspects of the program was Musk's sampling a single puff from a cigar consisting, Rogan claimed, of tobacco laced with cannabis. To Rogan's inquiry on how often he smoked cannabis, Musk replied: "Almost never. I know a lot of people like weed and that's fine, but I don't find that is very good for productivity ... not for me." The Washington Post observed, "In

the media's hands, it became a story about Musk's growing instability ..."^[405] Tesla stock dropped after the incident, which coincided with the confirmation of the departure of Tesla's Vice President of Worldwide Finance Justin McAnear earlier that day.^[406] Fortune wondered if the cannabis use could have ramifications for SpaceX contracts with the United States Air Force, though a USAF spokesperson told The Verge that there was no investigation being carried out and that the

Air Force is still processing the situation.^[407]^[408] In an interview on *60 Minutes*, Musk said of the cannabis-smoking incident: "I do not smoke pot. As anybody who watched that podcast could tell, I have no idea how to smoke pot."^[409]

Awards and recognition

- In 2006, Musk served as a member of the United States National Academy of Sciences Aeronautics and Space Engineering Board.^[410]

- Inc. magazine Entrepreneur of the Year award for 2007 for his work on Tesla and SpaceX.^[63]
- 2007 Index Design award for his design of the Tesla Roadster.^[411] Global Green 2006 product design award for his design of the Tesla Roadster, presented by Mikhail Gorbachev.^[412]
- American Institute of Aeronautics and Astronautics George Low award for the most outstanding contribution in the field of space transportation in

2007/2008. Musk was recognized for his design of the Falcon 1, the first privately developed liquid-fuel rocket to reach orbit.^[413]

- National Wildlife Federation 2008
National Conservation Achievement award for Tesla and SolarCity. Other 2008 recipients include journalist Thomas Friedman, U.S. Senator Patrick Leahy (D-VT), and Florida Governor Charlie Crist.^[414]

- National Space Society's Von Braun Trophy in 2008/2009, given for leadership of the most significant achievement in space. Prior recipients include Burt Rutan and Steve Squyres.^[415]
- Listed as one of Time's 100 people who most affected the world in 2010.^[416]
- The world governing body for aerospace records, Fédération Aéronautique Internationale, presented Musk in 2010 with the highest award in air and space,

the FAI Gold Space Medal, for designing the first privately developed rocket to reach orbit. Prior recipients include Neil Armstrong, Burt Rutan of Scaled Composites and John Glenn.^[417]

- Named as one of the 75 most influential people of the 21st century by Esquire magazine.^[103]
- Recognized as a Living Legend of Aviation in 2010 by the Kitty Hawk Foundation for creating the successor to the Space Shuttle (Falcon 9 rocket

and Dragon spacecraft). Other recipients include Buzz Aldrin and Richard Branson.^[418]

- In February 2011, Forbes listed Musk as one of "America's 20 Most Powerful CEOs 40 And Under."^[419]
- In June 2011, Musk was awarded the US\$250,000 Heinlein Prize for Advances in Space Commercialization^[420]
- In 2012, Musk was awarded the Royal Aeronautical Society's highest award: a Gold Medal.^[421]

- In 2013, Musk was named the Fortune Businessperson of the year for SpaceX, SolarCity, and Tesla.^[422]
- Awarded the President's award for Exploration and Technology of the Explorers Club at the annual gala on March 16, 2014.^[423]
- In 2015, he was awarded IEEE Honorary Membership.^[424]
- In June 2016, Business Insider named Musk one of the "Top 10 Business Visionaries Creating Value for the World"

along with Mark Zuckerberg and Sal Khan.^[425]

- In December 2016, Musk was ranked 21st on Forbes list of The World's Most Powerful People.^[16]
- In May 2017, Musk was awarded the Oslo Business for Peace Award.^{[426][427][428][429][430][431]}
- Musk was elected a Fellow of the Royal Society (FRS) in 2018.^{[14][15]}
- Musk was awarded as member (fifth class) of the Most Admirable Order of

the Direkgunabhorn on March 4, 2019 for his contribution in the rescue at Tham Luang cave, Chiang Rai Province, Thailand.^[432]

- In 2019, Musk was awarded the Starmus Festival's Stephen Hawking Medal for Science Communication^{[433][434]}
- Musk was listed (co-) first on the Forbes list of the Most Innovative Leaders of 2019.^[17]

In popular media

In *Iron Man 2* (2010), Musk met Tony Stark (Robert Downey Jr.) in a restaurant, and had some brief lines regarding an "idea for an electric jet."^[435]

In January 2015, Musk made a guest appearance playing himself on *The Simpsons* in an episode titled "The Musk Who Fell to Earth"; the episode poked fun at many of Musk's ideas.^[436]

In November 2015, Musk appeared in an episode of *The Big Bang Theory*, as himself

volunteering at a soup kitchen with Wolowitz.^[437] Musk also appeared as himself in a November 2017 of *The Big Bang Theory* spin-off prequel series Young Sheldon. The successful first landing of a SpaceX Falcon 9 first stage on a drone ship is shown being covered by CNN. This is followed by a scene of Musk alone in his office with the notebook that young Sheldon mailed NASA in 1989 containing calculations detailing how this feat could be accomplished.^[438]

Musk was featured in the 2015 environmental documentary *Racing Extinction*, in which a custom Tesla Model S was designed to help project images of critically endangered species onto public buildings, including the Empire State Building and the Vatican.^[439]

Musk appeared in several episodes of South Park including the episode "Members Only." in November 2016, which was voiced by himself.

In 2016, Musk appeared as himself in the romantic comedy film Why Him? where he was briefly met by one of the main characters, Ned Flemming played by Bryan Cranston, in a bar at a party.^[440] In December 2016, Robby in New Girl refers to saving a life, and when asked who, responds "Do you know who Elon Musk is?"^[441] Also in 2016, Musk was referenced by Dr. Martin Stein on The CW time-travel TV show DC's Legends of Tomorrow. During time travel to the past, Stein meets

his younger self and introduced himself as Elon Musk, to disguise his own identity.^[442]

In October 2017, Musk was mentioned as a historic pioneer on the CBS All Access series *Star Trek: Discovery*. Set in the year 2256, Captain Gabriel Lorca attempts to motivate a scientist on his ship by asking him "How do you want to be remembered in history? Alongside the Wright Brothers, Elon Musk, Zefram Cochrane? Or as a failed fungus expert? A selfish little man who put the survival of his own ego before

the lives of others?"^[443]^[444] According to a TechCrunch article published the day after the episode aired, this mention is "also interesting because of its notable omission of Amazon and Blue Origin founder Jeff Bezos: This other space entrepreneur is such a big fan of Star Trek that he pitched and succeeded in landing a cameo in Star Trek Beyond as an alien being, but he doesn't rate a mention from Lorca among the spaceflight pantheon."^[445]

In February 2019, Musk co-hosted YouTuber PewDiePie's show "Meme Review" with Justin Roiland at the request of PewDiePie's fans.^{[446][447]} In October of the same year, Musk voiced an alternate reality version of himself with tusks, known as "Elon Tusk", in the season four *Rick and Morty* episode "One Crew over the Crewcoo's Morty".^[448]

Notes

1. *Primary residence has been in California since 1994; has lived most of his life in the United States (since 1992).*
2. *A lawsuit settlement agreed to by Eberhard and Tesla in September 2009 allows Musk to refer to himself as a co-founder of Tesla.*^{[8][9]}
3. *Notable YouTube creators collaborating include MrBeast, Mark Rober, iJustine, The Slow Mo Guys, Marques Brownlee, Hannah Stocking,*

*PewDiePie, The Try Guys,
AsapScience, Smarter Every Day, How
Ridiculous, Half as Interesting, Life
Noggin, It's Okay To Be Smart, and
HowToBasic*

- a. *The entire launch stack is also called
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