Mobility Industry Insights by Michael L. Sena THE DISPATCHER

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# THE DECEMBER 2024 ISSUE IN BRIEF

THERE IS A THREAD running through all the articles in this issue. This thread is summed up in the subtitle to this month's Musings. With a little bit of extra time and thought, we <u>can</u> actually imagine the consequences of what we invent. Whether it is twenty-story cruise ships or cars that run on electricity, we can, if we simply contemplate human nature or sit down and work on the numbers, figure out that twenty-story cruise ships do not solve a real problem, and generating the juice for every car – and every other device we use-running on the Planet cannot depend on whether the sun shines and the wind blows. There are running debates on whether the inventors of artificial general intelligence should take a break in their invention task so they can make time to figure out good ways to control their eventual invention. Those who object to taking a breather say that not everyone will pause. "There will be cheaters," they say, "and if we stop our work, the cheaters will have an advantage that we will never be able to overcome. But once we have finished our inventions and can show how well they work – and, of course, benefit from all the money we are going to make - then we can stop new development and decide how we can control them." To take a small, trivial example of how this works, look at electric scooters. They are unsafe to ride, they terrorize pedestrians, they are left by both the scooter companies and their riders all over the streets and sidewalks, and their battery packs explode while charging, burning down houses and apartment blocks. All of these problems were foreseeable.

We are therefore we invent. If we did not, we would be where our earlier ancestors are today, nowhere to be found except in the ground. Yuval Harari, in his first major book, <u>Sapiens</u>, explains all of this, and in his follow-up major work, <u>Homo Deus</u>, he gives his view on where we are heading, which is building our successor species. He is among those who are asking: Do we really want to travel to where that train is going? Is there a better destination, and a better way to get there? I believe there is.

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# **THE DISPATCHER**

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# Feature: Automotive Artificial Intelligence

Feature Articles The real case for driverless mobility

Vehicle-related telecommunications



The business of delivering transport systems

People and transport – the effects of how and where we live, work, and recreate on our requirements for transport

Standardization and regulation of transport systems

# Automotive AI does not run on thin air

I HAVE THE same premonition about AUTOMOTIVE AI as I had about battery electric vehicles when everyone, except consumers, was pushing for the immediate replacement of internal combustion engine vehicles with BEVs. It was the only way to stop global warming, BEV supporters said. We need to subsidize their purchase and the conversion of petrol pumps to electric charging stations, these people claimed. Once we make all the nests for the special geese, they will begin to lay their golden eggs, just like in Aesop's Fable. Consumers cooperated, but not at a pace that was satisfactory for the BEV supporters and impatient (just stop oil) climate change protesters. And just like in the <u>Goose that Laid</u> the Golden Eggs fable, they wanted to kill the old goose that had been laying golden eggs in the form of ICE vehicles so they could get at the gold in the BEV geese much more quickly. What we have now are two almostdead geese and no gold.

The preconditions for a viable BEV industry are batteries and electricity that are price-competitive with fossil fuel-burning vehicles and fossil fuel for ICE vehicles, or fossil fuel and internally rechargeable batteries for hybrid electric vehicles. China can meet those preconditions because its government-owned and governmentbacked companies own the battery production process from raw materials to finished product, and it burns whatever it needs, including coal, to produce the electricity for producing the batteries and the cars, as well as charging them. These preconditions are not met outside China. Despite climate activists' denialism, there is not enough electricity to fuel all vehicles if they were all BEVs, and the only way western car companies are going to produce all cars as BEVs is to purchase most of their batteries from Chinese companies.

The preconditions for introducing automotive artificial intelligence (AAI) into any and all vehicles are perhaps even more demanding than those for BEVs: 1) the software must be equal to or better than the human brain; 2) the cost of the hardware in the vehicle and in the data centers must be costand performance-competitive with a human driver; 3) there must be enough electricity to run the data centers, and the hardware and software in the vehicles; and 4) we must be prepared for the cost of developing and using the AAI because the more powerful the AI models get, the more they cost to train and to run. I want to address precondition number three, but first, let us first answer the even bigger question: What is the Golden Egg? What are we really trying to achieve with AAI?

AAI's Golden Egg, according to the fable that Google/Alphabet has penned, and which is exemplified by its gosling Waymo's mission statement, is that its driverless vehicles enabled by AAI will be much safer than vehicles driven by humans.

Every year, 1.4 million lives are lost to traffic crashes around the world. The status quo is not acceptable. Waymo is committed to holding safety to a higher standard. Because when we do, we make space for people to get around in a whole new way. On this path, we aim to offer freedom of movement for all, create a sustainable, efficient transportation ecosystem, and make the planet better than we found it.

I received another Golden Egg story from faithful reader and fellow Scrantonian, Mike McGurrin. He asked ChapGPT for "a poem about autonomous vehicles in the style of E.E. Cummings".<sup>1</sup> The result is that one robot thinks that other robots will save humanity from chaos and bring about a more serene transportation environment:

> ChatGPT in the style of E.E. Cummings: autonomous vehicles glide through streets once filled with noise cityscapes now serene as machines take the wheel

<sup>&</sup>lt;sup>1</sup> "While some of E.E. Cummings' poetry is free verse (and not beheld to rhyme or meter), many of his sonnets follow an intricate rhyme scheme, and often employ pararhyme." (Cureton, Richard D. (2020). "Pararhyme in E. E. Cummings' "Sonnets – Realities"". University of Michigan.)

no more honking horns no more rushing feet just quiet hums of tires on the street thanks to technology our roads are free from the chaos of humanity and all its quirks long live the machines that bring us peace) and make our lives just a little bit sweeter

The Waymo software engineer who added the honking function to Waymo vehicles as a parking lot safety measure probably felt that adding a bit of humanity's chaos to Waymo's humanless driven cars would be a good thing.<sup>2</sup>

Alain Kornhauser and I believe that the Golden Egg of AAIenabled driverless vehicles is delivering affordable rides. This is what we wrote in <u>The Real Case for Driverless Vehi-</u> <u>cles</u>. The main advantage of removing the human driver is eliminating the major cost of delivering the ride, which is the cost of the driver, and that is around 60% of what the rider pays for a bus or rail ticket. It's more for a taxi ride.

# The focus must be on keeping running costs low

Replacing human drivers with AAI must be done in a way that the total operating costs of the driverless vehicles are significantly less that human-driven vehicles, otherwise there is no point to the exercise. <u>What we are seeing today</u> with driverless car developments is a complete lack of interest in constraining the costs of hardware and software. The prevailing attitude among developers and investors is that buyers of driverless vehicles will pay a premium for the convenience of being chauffeured and will pay for the (unproven) additional safety benefits.

I say "unproven" despite the presentation of peer reviewed papers describing Waymo's statistics on the safety of their vehicles. Waymo is using expensive (Jaguar) new vehicles that are equipped with the latest advanced driver assistance systems that are then further augmented by

<sup>&</sup>lt;sup>2</sup> https://www.theverge.com/2024/8/11/24218134/waymo-parking-lot-livestream-honking-4am-san-francisco

expensive sensors. They are estimated to cost \$150,000 a pop when they hit the road. The vehicles are constantly monitored by remote staff. The vehicles are programmed to travel at or below the stated speed limits on roads which have been documented to the highest level of detail. In its research analyses, it compares the involvement of its vehicles in accidents to the incidence of accidents in the entire vehicle park. It is well documented that the majority of accidents are the result of drivers who are driving under the influence of alcohol and/or drugs, are driving over the speed limits or disobeying other rules of the road (e.g. passing on solid lines) and are either under the age of 24 or over the age of 70.

It is counterproductive to replace the costs of the driver with expensive hardware, software, back-office services, and, most of all, super expensive artificial intelligence data processing. Here are some of the un-talked about financial realities of simple AI and how they apply to automotive artificial intelligence.

## Driverless cars will add to electricity demand

Processing AI queries takes prodigious quantities of electricity. Ask MICROSOFT. In September of this year, the company signed an agreement with the owner of Unit 1 at the THREE MILE ISLAND NUCLEAR POWER PLANT in Pennsylvania to purchase the plant's entire electricity generating capacity during the coming twenty years once it is back in operation in 2028. THREE MILE ISLAND will be remembered as the nuclear power plant that suffered a partial meltdown in 1979. It was the plant's other unit, Unit 2, that had the meltdown. Unit 1 was offline at the time for refueling, and Unit 2 had only been in operation for a few months when the partial meltdown occurred. Unit 2 was put out of commission after the incident, but Unit 1 continued to operate until 2019. The plant closed for economic reasons. It could not compete with cheap natural gas and heavily subsidized wind power.

MICROSOFT will be receiving 800 Megawatts (*see sidebar: What's a Watt*) of power per year, and all of it will be used by MICROSOFT to meet the surging demand for power created by AI. An average U.S. home requires 10,791 kWh per year of electricity, so MICROSOFT's annual usage would be enough to provide electricity to around 75,000 homes.<sup>3</sup> The

#### What's a Watt

A Watt (W) is the standard unit of power in the International System of Units (SI). Named after the Scottish inventor James Watt, the term is widely used in everyday life to describe the power consumption of items like light bulbs and the power output of engines and heaters. It is technically defined as one joule per second. This unit measures the rate of energy transfer. In simpler terms, a Watt quantifies how quickly energy is used or generated.

For example, a device rated at 100 Watts uses 100 joules of energy per second. Understanding Watts is crucial in assessing the efficiency and energy consumption of electrical devices, thereby playing a key role in energy management and conservation efforts. A Watt-hour (Wh) is a unit of energy that measures the total amount of work done or energy used over a period of time. It is commonly used to quantify the energy consumption of electrical devices. One watt-hour represents the energy consumed by a device that uses one watt of power for one hour. For example, if a light bulb is rated at 10 watts and it is used for 5 hours, it will consume 50 watt-hours of energy (10 watts x 5 hours = 50 watt-hours). This unit is particularly useful for understanding and calculating the energy usage of appliances and electronic devices over time, which is essential for managing energy costs and efficiency. It is also a key metric in understanding the capacity and usage of batteries and power storage systems, where the total energy capacity is often expressed in watt-hours or kilowatt-hours (1,000 watt-hours).

<sup>&</sup>lt;sup>3</sup> This figure is obtained from the U.S. Energy Information Administration. It is an average based on the amount of electricity sold to a U.S. residential electric utility customer in 2022. It includes all homes, irrespective of whether they are heated by electricity or other fuels.

average electricity needed during a year to charge a battery electric vehicle is 4,900 kWh, so if the electricity MICROSOFT is buying would be used to power BEVs, it could keep around 163,000 of them rolling for a year. MICROSOFT could try to buy electricity from the grid, but it admitted earlier this year that its emissions had risen by almost 30% since 2020 because it cannot purchase enough emissions-free power. MICROSOFT is not alone in this conundrum. Google said its GGEs (greenhouse gas emissions) rose by almost 50% during the past five years, AI data centers.<sup>4</sup> It has signed a contract with KAIROS POWER to use their mini reactor this decade for 500 MWs annually and bring more online by 2035.

Why is AI increasing electricity usage? One ChatGPT query uses ten times as many watt-hours of electricity as a simple search query, 3 watt-hours versus 0.3 watt-hours. The best answer I have found to why this is the case is that AI queries employing large language models (LLMs) use huge datasets that have billions of parameters.<sup>5</sup> Car companies are adding ChatGPT queries in their infotainment systems, but these are so far just adding to the load on remote servers.<sup>6</sup> Driverless cars are not yet being used to process ChatGPT queries for the actual driving task, but their onboard computers must process data that are being fed to them from sensors (cameras, radar, lidar, maps, among others) which pass this data to the algorithms, which in turn generate instructions to the driving systems. In 2023, an MIT research group built a statistical model to study this problem.<sup>7</sup>

#### Electricity overload with AAI

The MIT group modeled the workload of a driverless vehicle using a 'multitask deep neural network' that is used by many of the teams developing driverless solutions. The researchers studied how much energy this deep neural network would consume if it were processing many high-

<sup>&</sup>lt;sup>4</sup> National Public Radio. Morning Edition. Artificial intelligence's thirst for electricity. (July 10, 2024)

<sup>&</sup>lt;sup>5</sup> https://www.scientificamerican.com/article/the-ai-boom-could-usea-shocking-amount-of-electricity/

<sup>&</sup>lt;sup>6</sup> Volkswagen is one of the first automakers to add ChatGPT to its infotainment system, working with the voice recognition company Cerence.
<sup>7</sup> https://sustainability.mit.edu/article/computers-power-self-driving-

cars-could-be-huge-driver-global-carbon-emissions

resolution inputs simultaneously from many cameras with high frame rates (typically, over 24 frames per second). They calculated the amount of processing required for 10 deep neural networks reviewing images from 10 cameras and came up with 21.6 million inferences for every one hour of driving, or 6,000 inferences per second. The team translated this into the consumption of 840 watts, or 0.84 kilowatts per hour (0.84 kWhs). Over the course of a year, if a car is driven an average of 14,000 miles at an average speed of 40 miles per hour, it would be on the road for 350 hours. At 0.84 kWhs, that means 294 kWhs would added to power the driverless data processing systems during the year, or approximately 6% of the amount of energy needed to power the car for a year.

The researchers claimed that in order to keep emissions from spiraling out of control, each vehicle needs to consume less than 1.2 kilowatts of energy for computing. (They did not explain how they produced this limit.) That translates into 1.2 kWhs or 420 kWhs per year, around 10% of the year's charging. They worried that with the increasing processing requirements resulting from developers trying to do more to deliver a safer and more comfortable riding experience, energy usage would double every three years. So, 294 kWhs becomes 588 kWs, and then we are off to the races.

I took the energy consumed by an *Nvidia Pegasus* with two Xavier chips and two GPUs, which is being used on some automotive platforms. It can process 320 trillion operations per second that require 500 watts, or 0.5 kilowatts.<sup>8</sup> So, for one hour of processing time, which would mean 1,800 kWhs or 1.8 MWhs. That is fifteen hundred times more than the limit let by the MIT researchers. If it is operating in driverless mode all those hours, it would require 630,000 kWhs for a year of processing, which is 130 times higher than just charging the car for a year. There is obviously a large disconnect somewhere.

I dug deeper and found a quote from NVIDIA's VP of Automotive, Danny Shapiro, in a *WIRED* interview from 2018<sup>9</sup> in

<sup>&</sup>lt;sup>8</sup> https://nvidianews.nvidia.com/news/nvidia-announces-world-sfirst-ai-computer-to-make-robotaxis-a-reality

<sup>&</sup>lt;sup>9</sup> https://www.wired.com/story/self-driving-cars-power-consumption-nvidia-chip/

which he said that NVIDIA can deliver "30 trillion operations per second on a single system on chip (SOC) that consumes 30 watts of energy", but this still results in 108 kWhs and 38,000 kWhs for the year. The author of the article states that the 30 trillion operations per second is not good enoughwhich is why NVIDIA developed the Nvidia Pegasus described above. So, it must be the case that these mobile supercomputers are not processing data every second, or the information on energy use is not correct.

What can be said with the information we have is that if a battery electric vehicle is fitted with sensors and runs algorithms like the ones used in the MIT test described above, the distance the BEV can travel (its range) will be reduced by 6-10%. As the driverless functions are improved and as more inferences are required, the drain on the battery will increase and the range will decrease. If the same functionality were added to an ICE vehicle, more fuel would be needed to keep the battery charged, so the vehicle would also suffer range limits.

## Just the tip of the electricityberg

A 2018 paper in IEEE Spectrum, titled "Exposing the Power Vampires in Self-Driving Cars"<sup>10</sup> did not include any references to automotive AI, but it did include a detailed discussion of all the other electricity drains that we can expect from driverless cars. The article reported on a study performed by University of Michigan Center for Sustainable Science  $\mathcal{E}$ TECHNOLOGY and FORD MOTOR researchers. "We knew there was going to be a tradeoff in terms of the energy and greenhouse gas emissions associated with the equipment and the benefits gained from operational efficiency. I was surprised that it was so *significant,"* said Greg Keoleian, senior author of the paper.

The researchers modeled both conventional ICE and battery electric versions of a Ford Focus sedan fitted with equipment and software for driverless functionality. They also modeled a Waymo Chrysler Pacifica minivan test bed, which at the time looked like the one in the sidebar on the previous page. Below it is a photo of a current Waymo vehicle for purposes of comparison. What they found was that the driverless functionality added 2.8-4.0% of additional energy



2018 Waymo Chrysler Pacifica



2022 Waymo Jaguar I-Pace

<sup>10</sup> https://spectrum.ieee.org/exposing-the-power-vampires-in-selfdriving-cars

consumption to the *Ford Focus* platform, and that the distribution of that additional energy usage was according to the pie chart shown in the sidebar. For example, 41% went to running the onboard computer, 15% was added to pull the extra weight of the equipment (which was 17-22 kilograms), and 10% was needed to compensate for the increased drag from the appendages installed on the vehicle. The ICE and the BEV models showed "comparable" results, but the Waymo vehicle's larger equipment added another 5% to the total.



Sources of added energy consumption from Ford Fusion's autonomy system. Image: University of Michigan

One area of uncertainty for the research team was the amount of real-time updating of high-definition maps that would be needed to augment driverless functionality. Higher bandwidth data transmission could significantly increase power consumption. For an example of this, watch your battery charge percent drop while using a mapping application on your smartphone. Some companies, including MOBILEYE and QUALCOMM, are working on methods to minimize the amount of map data transferred, so it is possible that it will not add a further drain on the battery.

# It is not just doom and gloom, brownouts and blackouts

The world is paying a price for coal- and diesel-fired trains, ships, and motors; coal- and gas-fired electric generation plants; and gasoline- and diesel-fired automobile engines.

Humanity's story has been to invent first and then figure out how to "accentuate the positive, eliminate the negative, latch on to the affirmative, and don't mess with Mr. In-between," as song writer Johnny Mercer so aptly put it. From the standpoints of health and welfare, the world is a significantly better place than it was two or three hundred years ago. If we could only put the requirements we use for making our inventions in the correct order, we would be in much better shape than we are right now. (Please have a look at Musings in this issue for my thoughts on this subject.)

Before we take anything more than baby steps with driverless vehicles using automotive artificial intelligence, we should find ways to reduce the amount of electricity needed to power them. Make reduced power usage an absolute requirement, not something that can be sacrificed in favor of higher performance. That will mean less negative to eliminate later on. Make the motto: "Don't waste a watt for AAI."



# **Dispatch Central**

The topics covered in Dispatch Central are newsworthy, but I leave it to others to deliver them "as they break". I give them a little time to settle in, and try to provide an analysis of their impact.

#### America went to the polls on 5 November '24

A U.S. PRESIDENTIAL ELECTION is a competition. This distinguishes it from presidential elections in countries like China and Russia, where the result is a foregone conclusion. In the U.S., it is like a relay race with two runners on each team representing a political party.<sup>11</sup> One of the runners is the candidate for president, and the other is his or her running mate, the candidate for vice-president. There is only one winning team, and there are no prizes for coming in second or third. In the 2024 election there were nine teams (political parties) running, including the Democratic Party, the Republican Party, the Libertarian Party, the Green Party, the Party for Socialism and Liberation, two parties that call themselves the Independent Party, and the American Solidarity Party. Unlike a real relay race, the teams do not actually run. They stand on the start line, and all the people who are eligible to vote<sup>12</sup> do the equivalent of buying a horse racing derby ticket with the name of the team they believe would win the race if they did actually run. Eligible voters in each of the fifty states and Washington, DC (territories like Puerto Rico are not allowed to vote in the presidential election) must buy their ticket (vote/cast their ballot) in the state where they are registered, and the team that gets the most votes in each state or DC wins all the points (*Electoral College* votes) that state has to give.<sup>13</sup> Then, all the states and DC add up the votes that each team has won, and the team that has over 270 of the total 538 is the winner.

The words *Electoral College* conjure up so many question marks in people's heads. Unless you majored in American political history in college and have done a deep dive into the history of the founding of the United States, the whole *Electoral College* thing is bewildering,

<sup>&</sup>lt;sup>11</sup> Before 1804, when the 12<sup>th</sup> Amendment to the Constitution was ratified, the vice president was the runner-up in the presidential election, so in our example, it was not a relay race, but an individual race, and there was a prize for coming in second.

<sup>&</sup>lt;sup>12</sup> See <u>https://www.usa.gov/who-can-vote</u> for who is eligible to vote.

<sup>&</sup>lt;sup>13</sup> There are two exceptions to this 'winner-takes-all' process. In Maine and Nebraska, some votes are allocated to voting districts based on the majority winner in those districts.

perplexing, confusing, confounding, and simply baffling. Let's try to lift the veils. In 1787, after the United States had won its freedom from Great Britain in the Revolutionary War (called the American War of Independence by the British) and was in the process of establishing the rules by which it would be governed, the founders debated how to elect the president. Some wanted to have a simple majority of the popular vote, while others argued that the president should be selected by the representatives and senators in Congress. The *Electoral College* was the compromise. This is a temporary group with members called 'electors' created every four years coinciding with the presidential election. The number of electors a state has (in our example, representing the number of points a state may use to pick the winner of the relay race) is today based, more or less, on the number of people living in that state. It is exactly equal to the total number of representatives that the state has in Congress (members of the House and Senate combined). States with smaller populations have a larger number of points (votes) on a per capita basis than the larger states. For example, California, the most populous U.S. state with a population of approximately 39 million, has 54 points (votes), which is 0.0011 per capita, while Wyoming, the least populous state with a population of 586,485, has 3 points (votes), which is 0.0051 capita. (See the spreadsheet at the end of this article.)

The 23<sup>rd</sup> Amendment of the U.S. Constitution, adopted in 1961, entitles the District of Columbia (DC) to three electoral votes in the election of the president and vice president.

We need to return to the founding days to look at how the populations of states were determined and why it mattered. One of the main bones of contention at the Continental Congress between the representatives of the states was how they should be represented. The smaller states wanted equal representation, independent of their population, while the larger states wanted the opposite (i.e., the number of representatives based on the number of people living in the state). If population were to be the determining factor, then the states in the south wanted to count all their slaves, even though they would not allow the slaves to vote, as well as free women and children, who could also not vote. The northern states held that free women and children should be



Benjamin Franklin, painted by Joseph Siffred Duplessis (c.1785). Exhibited in the National Portrait Gallery, Smithsonian Institution. Benjamin. Born in 1706 in Boston, lived most of his life in Philadelphia,, Pennsylvania, where he was a non-Quaker among Quakers. He was one of the signers of he Declaration of Independence in 1776, and one of the signers of the Constitution in 1787. He died at the age of 81.

counted, but should not vote, but argued that if an adult person could not vote because they were a slave, they should not be counted at all in determining a state's representatives. Virginia, the largest state in 1787, had a total population of 692,000 with slaves comprising 288,000 of that number. Pennsylvania's total population was 434,000 with slaves being 3,737 of the population. So, Pennsylvania would have more votes than Virginia if the population excluded slaves.

Debate led to compromise (something that is in short supply in today's Congress). It was agreed that a non-free man, woman, or child would be counted as three-fifths of a person. This compromise is used today by 'progressives' to criticize the founders-all of them-as racists, devaluing the worth of black human beings. This is completely wrongheaded. Northern states wanted slavery abolished, and some of them wanted women to vote, but they wanted more than anything to put a government together that would allow their new country to start operating. The compromise was the bicameral Congress with two national legislatures: 1) a House of Representatives based on the population of non-enslaved men, women, and children, and three-fifths of the enslaved men, women, and children; and 2) a Senate with each state having two representatives regardless of the state's population. Initially, Senators were selected by state legislatures, but in 1913 the 17th Amendment changed this so that Senators are elected by the people directly.

The 15<sup>th</sup> Amendment, which sought to protect the voting rights of black men after the Civil War, was adopted into the U.S. Constitution in 1870. Despite the amendment, within a few years numerous discriminatory practices were used to prevent black citizens from exercising their right to vote, especially in the South. It wasn't until the Voting Rights Act of 1965 that legal barriers were outlawed at the state and local levels if they denied any Americans their right to vote under the 15<sup>th</sup> Amendment.<sup>14</sup>

Washington, D.C. is the nation's capital district. Although D.C. has a larger population than the two states of Vermont and Wyoming, the District is not one of the fifty states and so has no senators in the Senate. It has a representative in the House of Representatives who is a delegate with limited voting privileges. (See chart at end of article for electoral votes.)

<sup>&</sup>lt;sup>14</sup> https://www.history.com/topics/black-history/fifteenth-amendment

Here is something that most people do not know about the electors in the *Electoral College*.<sup>15</sup> The final slate of electors in each state are representatives of the party that has won the popular vote in that state. Those electors were either selected by the state's party, voted for by the voters in the state along with the presidential and vice-presidential candidate (and their names might appear on the ballot), or selected by the presidential candidate. Therefore, each party has a team of electors equal to the number of electoral votes the state has to cast. That means that in 2024, there were nine teams of electors in each state ready to be called upon to vote. The electors representing the party of the candidate who wins the popular vote in the state are the only ones who cast their votes, and they are all expected to cast their votes for the candidate of the party those electors represent. Although there is no constitutional provision or federal law requiring electors to vote in accordance with the election results in their state, electors typically vote for their state's popular vote winner. Some states have provisions permitting the disqualification and replacement of what is called a 'faithless elector', which is an elector whose vote deviates from the state's popular vote. There were no faithless electors in 2020.

#### Alea iacta est: How Americans voted in 2024

There are 240 million eligible voters in the U.S. out of a total population of 334.9 million. Of the 240 million eligible voters, there are 161.4 registered voters, and of those, as of 14 November, 142.9 actually voted. (You cannot vote if you are not registered to vote.) So, 62% of eligible voters voted on or before (with mail-in ballots) the 5<sup>th</sup> of November. Your editor mailed his "absentee ballot" on the 2<sup>nd</sup> of October to the Seminole County Supervisor of Elections in Sanford, Florida, which is the county and state in which he was last registered to vote before moving to Sweden at the end of December 1992. Certification of the election results must be completed by the 11th of December for electors to gather in state capitals and officially cast their votes on the 17th of December. On the 6th of January 2025, the electoral votes will be counted in Congress and the winner finally declared. Vice President Harris will be presiding, just as Vice President Pence presided four years previously when the Capital was

<sup>&</sup>lt;sup>15</sup> https://www.archives.gov/electoral-college/electors

assaulted by Trump supporters, many of whom are now in jail. On Monday, the 20<sup>th</sup> of January, the 47<sup>th</sup> president of the United States will be sworn in at the U.S. Capitol building in Washington, D.C. Unless something happens between now and then, the 47<sup>th</sup> president will be Donald J. Trump.

In a presidential election, there is no point in asking: Why did (s)he lose? Unless a candidate is credibly accused the day before the election of a great crime or misdemeanor, most voters have decided which one of the candidates they will vote for long before election day. Voters have their motivations, and they have their beliefs about which one of the candidates will best satisfy their wishes. As *NEW YORK TIMES* reporter Patrick Healy put it so well, "voters choose between what affects them and what offends them". Apparently, more voters felt they would be positively affected and were less offended by Donald Trump.

Most voters know that presidents do not rule like presidents of dictatorships. They know there is a Congress and a Supreme Court that will uphold the Constitution. The president has some latitude to lead with so-called 'executive orders', but it is the Congress that passes the laws, including laws that nullify executive orders. Republicans won majorities in both the House and the Senate, a so-called 'trifecta', just as was the case when Barack Obama, Bill Clinton, and Donald Trump, among others, were first elected. This gives both the president and the Congress more control over passing legislation, but these trifectas do not usually last past the first midterm election.

There is a great deal of speculation about what a second Trump presidency will mean for business, social welfare, relations between countries, impact on current conflicts, approaches to climate change, and everything else. With Trump, we have his first term to use as guide to what we all can expect. At his early Wednesday morning gathering in Palm Beach, Florida to thank everyone on his staff and in his family for their hard work on getting him re-elected, he was wearing the same suit, tie, and hat he had on when he exited the White House in January 2021. There is one difference. He did not have Elon Musk supporting him in 2016. It will be interesting to see what that will mean for both men after the inauguration in January. Hold on to your hats.

<b>United States</b>	2024 Pres	idential E	Electior	ı	
Pop - Population of the State					
EVs - Electoral Votes					
Evs/Cap - Electoral Vo	otes per Capita				
	1	0 Largest		2024	Evs
State/District*	Рор	EVs	Evs/Cap	Democrat	Republican
1. California	38 965,2	54	0,0014	54	
2. Texas	30 503,3	40	0,0013		40
3. Florida	22610,7	30	0,0013		30
4. New York	19571,2	28	0,0014	28	
5. Pennsylvania	12961,7	19	0,0015		19
6. Illinois	12 549,7	19	0,0015	19	
7. Ohio	11785,9	17	0,0014		17
8. Georgia	11029,2	16	0,0015		16
9. North Carolina	10 835,5	16	0,0015		16
10. Michigan	10 037,3	15	0,0015		15
Sub-Total	180 849,7	254	0,0014	101	153

	15 Next Largest			2024	Evs
State/District*	Рор	EVs	Evs/Cap	Democrat	Republican
11. New Jersey	9 2 9 0, 9	14	0,0015	14	
12. Virginia	8 715,7	13	0,0015	13	
13. Washington	7 812,9	12	0,0015	12	
14. Arizona	7 431,3	11	0,0015		11
15. Tennessee	7 126,5	11	0,0015		11
16. Massachusetts	7 001,4	11	0,0016	11	
17. Indiana	6 862,2	11	0,0016		11
18. Missouri	6 196,2	10	0,0016		10
19. Maryland	6 180,2	10	0,0016	10	
20. Wisconsin	5911,0	10	0,0017		10
21. Colorado	5 877,6	10	0,0017	10	
22. Minnesota	5 737,9	10	0,0017	10	
23. South Carolina	5 373,6	9	0,0017		9
24. Alabama	5 108,5	9	0,0018		9
25. Louisiana	4 573,8	8	0,0017		8
Sub-total	99 199,7	159	0,0016	80	79

	26 Smallest			2024	Evs
State/District*	Рор	EVs	Evs/Cap	Democrat	Republican
26. Kentucky	4 526,2	8	0,0018		8
27. Oregon	4 233,4	8	0,0019	8	
28. Oklahoma	4 053,8	7	0,0017		7
29. Connecticut	3 617,2	7	0,0019	7	
30. Utah	3 417,7	6	0,0018		6
31. Iowa	3 207,0	6	0,0019		6
32. Nevada	3 194,2	6	0,0019		6
33. Arkasas	3 067,7	6	0,0020		6
34. Kansas	2940,5	6	0,0020		6
35. Mississippi	2 939,7	6	0,0020		6
36. New Mexico	2 114,4	5	0,0024	5	
37. Nebraska**	1978,4	5	0,0025	1	4
38. Idaho	1964,7	4	0,0020		4
39. West Virginia	1770,1	4	0,0023		4
40. Hawaii	1 435,2	4	0,0028	4	
41. New Hampshire	1 402,1	4	0,0029	4	
42. Maine***	1 395,7	4	0,0029	3	1
43. Montana	1 132,8	4	0,0035		4
44. Rhode Island	1 096,0	4	0,0036	4	
45. Delaware	1 0 3 1,9	3	0,0029	3	
46. South Dakota	919,3	3	0,0033		3
47. North Dakota	783,9	3	0,0038		3
48. Alaska	733,4	3	0,0041		3
49. District of Col.	679,0	3	0,0044	3	
50. Vermont	647,5	3	0,0046	3	
51. Wyoming	586,2	3	0,0051		3
Sub-total	54 868,0	125	0,0023	45	80
Total	334 917,4	538		226	312
* The United States cu	rrently occupies	s over 14 territ	ories and		
commonwealths, five of which are permanently inhabited -					
Puerto Rico, Guam, American Samoa, the Northern Mariana					

Puerto Rico, Guam, American Samoa, the Northern Mariana Islands, and the U.S. Virgin Islands. Residents of U.S. territories and commonwealths cannot vote in U.S.

presidential elections and do not elect voting representatives or senators to U.S. Congress.

\*\* Nebraska awards twoelectoral votes from the state at

large, and one each from the three congressional districts.

\*\*\* Maine awards two electoral votes based on the statewide vote, and one vote each for its two congressional districts.

# Tesla's Robotaxi show underwhelms

TESLA FINALLY PRESENTED its so-called "robotaxi" on the 10<sup>th</sup> of October at the WARNER BROS studio in Burbank, California. Elon Musk, TESLA's CEO, has been baiting both the public and investors with the robotaxi promise for the past five years, beginning in 2019. Musk said then that the company would launch a robotaxi network using "autonomous" *Teslas* starting in 2020 and have one million of them on the roads by the end of that year. He said the car would be considerably less expensive than the *Model 3*. The years passed with the robotaxi a no-show. Then, in April 2024, Musk said it would be unveiled in August. As August neared, the event, dubbed "We, Robot", was delayed until October. Musk said the delay was due to changes he felt were important.

The company calls it a *Cybercab*, continuing the nomenclature it started with its *Cybertruck*. What TESLA showed was a two-door, two-seater battery electric vehicle with no driver controls. It had no plug because it is designed to be charged inductively.<sup>16</sup> There were 20 of the vehicles at the event giving short rides to attendees. In addition to the *Cybercab*, TESLA had a slew of robots and a 20-seater van, called *Robovan* (which Musk insisted on pronouncing "ruh-BOWvin", much to the amusement of media commentators. "Sounds like a medication for herpes," said one of them. "Looks like a bread toaster," quipped another.

#### Not much beef in the bun

MORGAN STANLEY analyst Adam Jonas, who is a regular participant in the annual *PRINCETON SMARTDRIVINGCARS SUM-MIT*, was invited to attend the event — an invitation that was not extended to either me or Alain Kornhauser, organizer of the *SDC SUMMIT* and co-author with me of <u>The Real Case for</u> <u>Driverless Mobility</u>. Jonas said the event "was a disappointment overall because of a lack of data regarding the rate-of-change on Full Self-Driving tech, ride-share economics, and the company's go-to-market strategy for the Cybercab". Jonas said TESLA had walked into the event "with a number of expectations of what the market might learn that it felt was consequential to the









Tesla Cybertruck



The Ruhbowvin



<sup>&</sup>lt;sup>16</sup> Inductive charging (also known as wireless charging or cordless charging) is a type of wireless power transfer. It uses electromagnetic induction to provide electricity to devices. The device is placed near a charging station or inductive pad without needing to be precisely aligned or make electrical contact with a dock or plug.

direction and debate around the stock. Other than the mention of inductive charging, there was no detailed discussion about the capabilities of Cybercab including technology (Inference hardware? Sensor suite? Lidar? L4/L5?), range, safety, utility, flexibility/configurations, etc.". Many have remarked that it looks like the 'Model 2' prototype repackaged as an autonomous vehicle," Jonas noted.

Elon Musk knows that TESLA's stratospheric valuation, which is in the vicinity of \$700 billion and equal to almost all of the other automakers combined, is based on delivering a driverless vehicle before anyone else. This is why he keeps promising that it is just around the corner. In Burbank, he said *Cybercabs* would start to be delivered next year for a price of less than \$30,000. No one believed him. TESLA's stock tanked on its opening the next day. It was down 8% or \$40 billion. It did not help that the robots walking around talking with guests and handing out drinks and canapes were discovered to be controlled by handlers behind the curtains. But, hey, it was a show. What do you expect? TESLA's stock had already risen 45% since it made the announcement of the event in April, so no one who owned TESLA stock really cared that it was all smoke and mirrors.

Elon wasn't just taking a beating from analysts the day following the big show. His newly found best buddy, whose presidential campaign Elon is funding with his personal fortune, declared at a speech in Detroit that he would "stop selfdriving cars from operating" if he was elected in November. "Do you like autonomous? Does anybody like an autonomous vehicle?" he asked rhetorically. "Know what that is? Right? When you see a car driving along? Some people do, I don't know. A little concerning to me, but the autonomous vehicles we're going to stop them from operating." A bit hard to follow, but you get the gist.

#### Investors and the developers are still missing the point

While Musk opened the show touting the number of lives that would be saved with his driverless vehicles, the hot button he pushed for driverless technology in general was personal time saving. "You don't have to waste time driving," is his mantra. There was absolutely no mention of what it takes to operate a taxi business, whether there is a human in the driver's seat or not. A taxi service is one of several types of for-hire services. The word 'taxi' is a contraction of the word 'taximeter', which was a clockwork mechanism to measure fares for delivering rides. It was invented in 1891 by Wilhelm Bruhn, a German, and the word comes from the German word *taxe*, meaning 'charge' or 'levy', and 'meter' from the Greek µĖτρον (*metron*), meaning 'measure'. 'Cab' comes from the Hansom Cab, a two-wheeled horse-drawn cart that was designed and patented in 1834 by Joseph Hansom, an Englishman. It had a low center of gravity for safe cornering and replaced the four-wheeled hackney carriage as the preferred vehicle for hire. The hackney carriage first went into service in 1636, and Hackney Carriage is still the official British term used to describe taxis for regulatory purposes. Cyberhackney maybe does not have the ring Elon was looking for.

Vehicles that transport passengers from one place to another for a fee evolved simultaneously with the business models employed to deliver the rides and the laws regulating how those rides should be delivered and paid for. Ride delivery services are usually licensed by the local jurisdiction in which they operate, and the local jurisdictions most often do so within the legal authority established by the State. There have been two types of regulations governing ride delivery businesses, particularly regarding taxis. One set of regulations were intended to ensure safety of riders, drivers and pedestrians, control the impact of taxis on the level of congestion, and make sure that there was no discrimination of potential riders on the basis of race, place of residence, or any other factors. The other set of regulations were meant to prevent "destructive competition" with too many vehicles competing for too few customers, resulting in poor service and under-maintained vehicles.

Elon Musk, and his TESLA team, are surely aware that most taxi trips, around 70-90%, are made with a single passenger, so a two-seater cab is not that impractical. Also, the first taxis in New York City were actually battery electric vehicles like the horseless Hansom Cab in the sidebar right. However, as Adam Jonas pointed out, Musk and his team do not appear to have spent any time looking at what running a taxi business means. What he showed is a small *Tesla* model which will be less expensive than TESLA's other models because it is smaller. It's a car a *Model X* owner could give to her son



A two-seater Hansom Cab



A two-seater horseless Hansom Cab by Electric Carriage and Wagon Company, founded in 1896. (Source: By New-York tribune - New-York tribune November 30, 1919, Public Domain, https://commons.wikimedia.org/w/index.php?curid=84536780)

for his 18<sup>th</sup> birthday. If it is delivered within the coming few years, it will have driver controls. It's a *Mazda Miata* without the panache. It is a *1954 Ford Thunderbird* without the super styling. A taxi that will have all the flexible features it will need to provide rides for those who really need them at an affordable cost it is not.

## Elon Musk's just a guy, you know

Jill Lepore wrote a piece called *The X-Man* in the September 18, 2023 issue of THE NEW YORKER. The subtitle is How Elon Musk became a superhero and then a supervillain. She packed Walter Isaacson's biography, Elon Musk, into four pages. For those who are not familiar with Dr. Jill Lepore, the David Woods Kemper '41 Professor of American History at HAR-VARD UNIVERSITY, author of <u>These Truths: A History of the</u> United States, and a staff writer at *The New Yorker* since 2005, if anyone can sum it up and dish it out, it is Ms. Lepore. The piece is mainly focused on how Musk's personality and character influenced his purchase of TWITTER and then his subsequent handling of the firm. She quotes one of Musk's ex-wives, Clair Boucher, known as Grimes, about why they named one of their children "Y", or "Why?" or just "?". "It is from The Hitchhiker's Guide to the Galaxy (Douglas Adams)," she explained. "It's a book about how knowing the question is more important than knowing the answer." Maybe Musk knows the question his Cybercab was meant to answer, but all he has given us is the answer. He could have named it 42.

Musk plans to call his Mars expedition ship *Heart of Gold*, a spaceship in <u>Hitchhiker</u> fueled by an Improbability Drive. But maybe Elon or Clair haven't actually read the books, or did not get all the way to the end of the last one. At the end of the series, Zaphod Beeblebrox, President of the Galaxy, is in the *Heart of Gold*, which he has stolen. A Vogon Fleet is preparing to blast the ship out of the sky and render Zaphod into intergalactic debris. Zaphod's brain care specialist is on the Vogon ship that will do the dirty deed. He muses: "*It will be a pity to lose him, but, well, Zaphod's just this guy, you know?*" I suggest we stop trying to make Musk into a superhero or act like he is the President of the Galaxy. He's just a guy who doesn't have all the answers – or all the questions.

# Fare and road toll evasion in New York City

NYC'S METROPOLITAN TRANSPORTATION AUTHORITY pulled the emergency cord in 2023 when transit fare and tunnel and bridge toll evasion reached crisis levels. Revenue losses from unpaid fares and tolls on buses, subways, commuter rail, bridges and tunnels totaled over \$690 million in 2022. This included \$315 million in <u>fare evasion</u> losses on buses, \$285 million on subways, and \$44 million on commuter rail, and \$46 million <u>toll evasion</u> losses on bridges and tunnels. "We estimate 30 to 35% of our bus customers are getting off free every day, which means 66% of New Yorkers who are paying their fare are getting a raw deal," said NYC TRANSIT President Rich Davey in August 2023.

A "Blue-Ribbon" panel was established by the MTA board of directors with a mandate to "lead a deep and strategic review of fare and toll evasion".<sup>17</sup> The Report, released in May 2023, opened with the following introduction:

"The evidence is alarming: Fare and toll evasion have reached crisis levels in New York – with revenue losses approaching record levels of nearly \$700 million – threatening the public transit system and tearing at the social fabric of New York. It is time to take action to forcefully combat evasion before its impacts become irreversible. Based on consultation with dozens of stakeholders, this report recommends fresh thinking, targeted investment, and a comprehensive new approach that balances community needs, equity concerns and enforcement priorities to tackle a worsening challenge. All New Yorkers urgently need to get back on track, paying fares and tolls as a matter of course – and as a civic duty. Evasion hurts everyone – and it will take everyone working together to fix it."

Why am I reporting on this now, more than a year after the report was released? The first reason is that the MTA studied the report for a year and began in August of this year implementing some of its recommendations, including stronger enforcement. By this time, MTA reported that nearly one-half of the city's bus riders had evaded paying the fare during the first half of 2024. So instead of a \$690 in lost revenue, it was closer to \$1 billion. As an initial step taken to solve the problem, the MTA followed one of the Report's recommendations and began to deploy an additional 100 EAGLE (Evasion and Graffiti Lawlessness Eradication) MTA officers,



The sign on the right reads: "Hey there. Please pay the fare. It helps us run better service. It seems that the fellow jumping over the fare turnstile didn't have time to read the message. Quite a few of New York City transit riders are in a similar rush.

<sup>&</sup>lt;sup>17</sup> NYC MTA Blue Ribbon Report on Fare and Toll Evasion https://new.mta.info/document/111531

who are uniformed but unarmed. They will add strength to the existing force responsible for enforcement of fare payment, but they will also add around \$15 million in costs.

My second reason for reporting on this now is related to my September 2024 article in THE DISPATCHER on the proposal for establishing a "congestion charging" zone in lower and midtown Manhattan that would charge drivers a \$15 toll for entering or leaving Manhattan south of 61st Street. The purported purpose of this charge is to raise \$1 billion to pay for investments in the city's transit system. New York Governor Kathy Hochul "paused" the plan in June when it appeared to all that it was a done deal, but it seemed clear that the pause was going to last only until November 6th, the day after election day. Governor Hochul and the rest of the New York State and New York City Democratic leadership wanted to avoid at all costs a backlash from potential Democratic voters who would be negatively affected by the toll. The toll plan will certainly be back in play after the election and will most likely be implemented. (See sidebar.) But it looks like the new money from the lower Manhattan tolls will have to cover more than improvements to the system; it will have to help cover the hole left by fare jumpers, toll scofflaws, and all the new personnel and equipment that will be put into place to stop the evasions from occurring.

*Is this really the best way to run the nation's biggest transit system?* Let's look at the the revenue and cost sides of the NYC transit equation. The chart below shows the sources of all funds that



were used in 2023 to cover the total costs of running New York City's transit system and its bridges and tunnels, which was \$19.235 billion. This total includes \$11.5 billion for labor costs, \$4.6 billion for non-labor costs, \$3.1 billion for debt

On the 14<sup>th</sup> of November, nine days after the election that gave Republicans the White House and majorities in both the Senate and House of Representatives, Governor Hochul announced that the Manhattan toll plan was back on the table with discounted rates. service, and \$100 million for "below-the-line adjustments.<sup>18</sup> Fares and tolls comprise 37% of total budgeted revenue. The remaining 63% comes from taxes and subsidies from the federal, state, and local government. The FEMA/ARPA (American Rescue Plan Act) federal aid is from the 2021 law signed into law by President Biden as a stimulus package to help recover form the effects of COVID-19.

IF the MTA will continue to charge riders fares for riding transit and drivers tolls for using bridges and tunnels, revenue lost due to fare and toll evasion, which is now over \$1 billion, will have to be covered, either by increasing taxes and subsidies, by increasing surveillance and enforcement, or by producing a new source of revenue. More surveillance and enforcement has had little effect. Then-interim NYC Transit President Demetrius Crichlow, said paid ridership was 4.6% higher on routes where the agency deployed extra fare-enforcement agents, compared to the rest of the bus system. He said the increase covered the first two weeks of the MTA's enforcement blitz that launched in late August, a month after the MTA reported that nearly half the city's bus riders evaded the fare during the first half of 2024. (Crichlow was made permanent President in May, replacing Richard Davey, who had been on the job for just two years. Davey left to return to Boston and become the MBTA's new CEO at a base salary of \$420,000.)

Fares could be raised, but this is likely to result in more evasion. There does not seem to be any specific group who avoid paying fares on either the buses or trains. Economic hardship is one of the reasons people of all ages avoid paying fares, but there are a score of other reasons for this behavior. Buses have automatic passenger counters (APCs) on all doors who track the number of people getting on and off, and the number of people paying. Bus drivers are instructed not to challenge non-payers for security reasons, so those who pay do it as an obligation. Periodic checks by EAGLEs result in fines, but apparently they have little effect. Evasion on the subways occurs both at stations where there are fare-taking personnel and at unmanned stations. With the current design of turnstiles, it is easy to crouch under, hop over, or slide in





<sup>&</sup>lt;sup>18</sup> https://council.nyc.gov/budget/wp-content/uploads/sites/54/2023/03/MTA-Prelim-Report.pdf

with someone. Unmanned stations have turned into a source of income for the criminals. They jam the pay machines, stand at the emergency gate, and collect fares. MTA estimates the number of fares lost by placing plain clothes personnel at these stations and counting the number of people who pay versus those who do not. About 600 one-hour surveys are conducted each quarter. The checkers make a count of all unpaid entries during each hour.

The Blue-Ribbon Report recommended four strategies "diving down evasion", the Four Es Strategy, which are based on the idea that new anti-evasion strategies should respond to the reasons why people evade in the first place:

- Education communicate the importance of paying
- Environment use new technologies to make payment easier and evasion harder
- Equity provide more financial support for more people who need help to pay transit fares
- Enforcement -more enforcement

There is not a single word about the costs of implementing the Report's recommendations except the following:

"The cost of implementing the recommendations of this report will be calculated over time. In many cases, this report calls for pilots and controlled experiments to ensure that our suggestions actually work before they are implemented across the massive MTA system. We encourage it to pay close attention to the "return on investment", or ROI, for these experiments: Is the cost of the initiative reasonable, when measured against the reductions in evasion – or other benefits – being achieved?"

# We all know how this story is going to end

There will be handwringing and speeches and new appointments of people who are judged to be able to really tackle the problem. There will be budget increase proposals and personnel cuts to pay for the new enforcement systems and tax increases. But the evasion problem will not go away.

What would happen if the MTA took away all the turnstiles and payment boxes and payment enforcement personnel and tolling systems and the entire infrastructure for taking fares and tolls, handing out citations and collecting fines? How much would it save in costs it would not have to pay for maintaining these systems? My guess is that it would in the neighborhood of the amount of fares and tolls it is losing at present. How much would it avoid having to pay for all the new systems and personnel to make a real dent in the lost fares and tolls? Probably it will be close to all the income it has budgeted to receive from fares and tolls. Why not just decriminalize fare and toll evasion by making the entire system free. Imagine how the emergency gate watchers, the real criminals, would feel when their income source was removed. Imagine how the hot shot kids who brag about beating the system would feel when any kid can jump on a bus or pass through a turnstile without paying. Almost 70% of the costs of running the system are already coming from other sources. Eliminating the fares and tolls also eliminates the cost of collecting them.

# What's happened with EU-eCall?

EUROPEAN PUBLIC ECALL went into effect on the 31<sup>st</sup> of March 2018.<sup>19</sup> From that point forward, all new type approved passenger and light commercial vehicles sold within the EU and in countries that comply with certain EU regulations (e.g., Switzerland and Norway), were required to have installed a certified EU eCall system.<sup>20</sup> During the previous twenty years, car manufacturers in Europe and North America had been installing private emergency services systems, beginning with the GENERAL MOTORS *OnStar* system that was introduced in the U.S. in 1996. VOLVO CARS began delivering its first *Volvo On Call* service in 2001 in Sweden, and during the next twenty years rolled it out in all of Europe, North America, China, and even Brazil.<sup>21</sup>

The EU eCall system provides for either automated or manual operation. In case of a road crash, the in-vehicle eCall device is triggered by activation of the vehicle's sensors and establishes an emergency call carrying both voice and data directly to the nearest emergency services, normally the nearest 112 Public Safety Answering Point (PSAP). The



Anders Fagerholt sent me this picture of himself in front of a steam engine at Steamtown National Park in Central City Scranton. Anders was in Northeastern Pennsylvania visiting his son and his son's family this past summer. They decided to spend a day in Scranton, a place that has been in the news quite a bit since President Joe Biden entered the White House, first as Vice President in 2008, and then as President in 2020. Anders, in his position as Program Manager for Telematics at Ericsson, was a voice of reason during the period that the European Commission was pushing for an inband modem-based eCall solution. He was tireless in presenting the advantages of using cellular messaging rather than a text message embedded in a phone call, a leftover from analog telephony.

<sup>&</sup>lt;sup>19</sup> Regulation (EU) 2015/758 of the European Parliament and of the Council of 29 April 2015 concerning type-approval requirements for the deployment of the eCall in-vehicle system based on the 112 service and amending Directive 2007/46/EC

<sup>&</sup>lt;sup>20</sup> This rule applies both to cars with no more than 8 seats and light commercial vehicles. Anyone who owns a car which is already registered prior to the 31<sup>st</sup> of March 2018, they are not obliged to retrofit an eCall device. There are exemptions for low volume models.

<sup>&</sup>lt;sup>21</sup> Except for Brazil, I served as project manager for all of the Volvo On Call country roll-ousts between 1996 and 2015.

vehicle's driver or passengers can also initiate an eCall by pushing an emergency button, like the one in our 2023 *Toyota RAV4* pictured right. With both the automated and manual operation, a voice call is established with the eCall operator, and at the same time a minimum set of data is sent to the operator receiving the voice call using in-band modem technology. The message contains information about the incident, including time, precise location, vehicle identification, eCall status (at a minimum, indication if eCall has been manually or automatically triggered) and information about a possible service provider.<sup>22</sup>

As part of the EU eCall regulation, private services (referred to as 'third-party services') like those offered by VOLVO CARS and most other European vehicle manufacturers are allowed to continue to operate in parallel with the public service, both in the legacy vehicles introduced prior to the start of the EU eCall mandate, and in the new type approved vehicles. The customer has the right to decide whether to accept the private service, which may or may not have a fee associated with it, or to accept the free EU eCall. With the private services, customers are able to obtain both emergency services and roadside assistance (e.g., tire puncture, engine malfunction), as well as other travel assistance. With EU eCall, only emergency services can be provided.

It has been over six years since the EU eCall regulation went into effect. What is the reported results of this effort, which took sixteen years to implement, from the time it was first proposed by the European Commission in 2002 until the first cars were sold to customers? There have been no reports from the European Commission on the benefits of EU eCall that I have been able to find. Below is what TRANSPORT ANALYSIS says about EU eCall. TRANSPORT ANALYSIS is a Swedish government agency "charged with providing decision-makers in the sphere of transport policy with sound and relevant policy advice".

In general, there is a lack of evidence-based studies on the effects of eCall on road traffic accidents and their outcomes . Impact studies and costbenefit analyses were carried out before the EU regulation came into



*The standard-fit European eCall button in a 2023 Toyota RAV4 (Photo by Author)* 

<sup>&</sup>lt;sup>22</sup> https://road-safety.transport.ec.europa.eu/european-road-safety-observatory/statistics-and-analysis-archive/esafety/ecall\_en

force. Since then, we have seen no systematic follow-ups or evaluations. Thus, there is a need for further investigation and research. Transport Analysis – Risk analysis of eCall systems 2028<sup>23</sup>

As TRANSPORT ANALYSIS points out, during the *COMMIS-SION*'s push to implement EU eCall (which was opposed by many EU countries, including Germany and France, due to the *COMMISSION*'s insistence on not allowing third-party services, and was only agreed to after the *COMMISSION* relented on this point) there were plenty of predictions about the number of lives that would be saved with EU eCall, compared with no emergency systems—but not with private systems—but the *COMMISSION* has been silent on this topic since the systems were required to be installed.

I believe the reason for this silence is that the *COMMISSION* realized even before EU eCall was introduced that it was going to have a short life as it was implemented, with an inband modem. Even before April 2018, work began on what is termed *Next Generation eCall* (*NG eCall*). Mobile network operators had warned that they would be phasing out their 2G/3G networks and transitioning to 4G/5G, making the in-band modem solution inoperable. Therefore, a new solution to eCall would be essential. Leadership for the work on the *Next Generation* design was assigned to the EUROPEAN EMERGENCY NUMBER ASSOCIATION (EENA), and it delivered its final report in October 2023.<sup>24</sup> I will discuss the recommendations delivered in this report in an future issue of *THE DISPATCHER*.

Is there anything that can be said about the impact of eCall on the number of calls being made to the 112 services? I have obtained a report from the Swedish 112 services, SOS ALARM. It has figures for four years, 2020 through 2023, for the number of EU eCalls from vehicles that required emergency medical assistance. (NB: These are not transfers of calls from the private third-party services, but EU eCalls directly from the vehicles equipped with EU eCall systems.) The percentages shown indicate when an ambulance or rescue vehicle was dispatched to a vehicle. Automatic indicates

<sup>23</sup> https://www.trafa.se/en/road-traffic/risk-analysis-of-ecall-systems-	
2028-14929/	

<sup>&</sup>lt;sup>24</sup> https://eena.org/wp-content/uploads/2023\_10\_19-NG-eCall-2023-PDF-FINAL.pdf

Percent of eCalls initiated from vehicles in Sweden that actually required emergency assistance

	Automatic	Manual
2020	23.1	1.0
2021	13.0	0.8
2022	25.0	0.6
2023	24.0	0.6

that the call was initiated by the triggering of the system by sensors, and Manual indicates that the driver or passenger pushed the SOS button. For example, in 2023, when an automatic alarm was triggered, emergency assistance was sent to the vehicle in 24% of the cases, so 76% of the cases were false alarms or not severe enough to warrant emergency assistance. When a manual alarm was pressed, assistance was sent to the vehicle in only .6% of the cases, meaning that in 99.4%, it was not an emergency. The exceptionally low percentages for Manual mean that the customers either required assistance that 112 does not deliver, such as roadside assistance, or the button was pushed by mistake, as a test to see if it actually worked, or as a prank. If a person pushes the button and does not require emergency assistance from medical or police services, the emergency personnel will simply inform the caller that they cannot provide assistance and close the call. This is the main advantage of having the private services. They can connect immediately to the emergency services when they are required, and they can deliver a full range of driver and passenger assistance services as well. Björn Skoglund, operations specialist and crisis preparedness director at SOS ALARM, stated in the report that SOS Alarm took 1,656 EU eCalls during 2023, of which 418 were real emergency calls that required an ambulance or other emergency services.

SOS ALARM highlights a problem that was not considered by the Commission when it mandated EU eCall for vehicles. This is the implementation of emergency alarms by mobile phone makers, like APPLE, and by mobile phone operating system developers, like *Google Android*. In 2018, at the same time as EU eCall was coming out, APPLE introduced a 'fall detection' function which detects when a user falls and sends a phone call to 112. In 2023, Apple put 'crash detection' on its iPhone 14 which supposedly can detect when a phone has been in a car which crashes. *Google Android* has similar features. SOS ALARM says that these additional services, which are fielded by the standard 112 operators, not the special EU eCall operators, has added significantly to the overall number of false alarms, thereby reducing the effectiveness of the services and causing delays in response.



# **Musings of a Dispatcher: Inventing Progress**



Ålesund, Norway along the North Sea coast.



A Bohuslän, Sweden decked fishing boat built around 1880. The drawing is in the Göteborg City Archive



Norwegian fishing row boats



A modern-day Norwegian commercial fishing vessel named Sea Salmon docked in Ålesund

# Unimaginable consequences are imaginable

DURING A WEEK in Norway while on a guided tour in which my wife and I joined nineteen other Swedes, I found myself musing about improvements to inventions and how those improvements often end up causing unintended and undreamed-of consequences. We sapiens have been inventing ever since we distinguished ourselves from archaic humans. You know the drill. Someone thinks up with the idea of using a hook and line as a better way to catch fish than trying to grab them with their hands or spear them. Then someone adds a barb to the hook so that the fish cannot slip off. Then someone else invents the fishing net to catch more fish at one time, even when the fisherman is home sleeping.

While we were staying in Ålesund, a picturesque Norwegian fishing seaport on the North Sea, our Swedish guide turned us over to a local guide for a morning tour. The guide told us that Norwegian fishermen owed Swedish boat designers a great debt of gratitude for inventing the boat deck. I thought I missed something in my translation of what she said in Norwegian, so I checked it when we returned to our hotel. Sure enough, in the 1800s, Swedish fishermen from Bohuslän on Sweden's west coast began showing up on the waters off Norway's coast with sea-going sailboats with decks. The boats were small enough to maneuver into a promising fishing spot, but large enough to carry the rowboats which would be used for the actual fishing, and space enough to carry several days' worth of fish back to their home ports. Decks covered the catch and sheltered the fishermen and provided a more stable and safer working surface.

The new method was quickly adopted by the Norwegian fishermen, allowing them to increase their catches and their exports of air-dried fish to the southern European countries where fish was a staple due to religionimposed meatless fasts. Sails were gradually replaced by steam and then diesel engines, hooks and handhauled nets were replaced by trawling nets pulled behind the moving vessels, and today we have giant factory ships that vacuum up fish all over the world, process the catches onboard, and return to ports when their holds are full. Smallscale coastal fishing, at least in Europe and North America, is a memory. Large-scale commercial fishing is responsible for having decimated the cod and wild Atlantic salmon numbers, and it is well on its way to eliminating the herring stocks in the Baltic Sea.

I wonder whether the Holy See saw, in its infinite wisdom, the consequences of dictating that its faithful members should eat fish and not eat warm-blooded animals on Fridays and days designated for fasting.<sup>25</sup> As early as the first century AD, Christians were fasting on Fridays to commemorate the day of the week on which Christ died. Besides eating less food, a fast meant abstaining from meat. Fish was the accepted alternative to meat. Lent, the forty-day lead up to Easter, added over a month of fasting. What could be caught and preserved in the warmer climates of Europe did not meet the demand. Eventually, cod caught by Norwegian fisherman and dried on racks in the air and on the rocks, salted and stacked, called *klippfisk*, did satisfy the demand. Ships from southern Europe sailed to Ålesund and other Nordic ports laden with wine, spices, flour, rice, grain, clothes, and jewelry, and returned with their holds full to the brim with dried cod.<sup>26</sup> Those of us who grew up in households with roots in Italy, Spain, or Portugal are familiar with dishes made with baccalà, a dried stick (from the Latin term baculus, meaning stick or staff) as their main ingredient.

Today, the North Sea and the area around Iceland are among the few remaining places where cod can be fished. Norwegian fishermen compete outside their territorial waters with fleets from all over the world. China's is the largest. The Chinese consume one-third of all fish taken from the seas and Chinese fishermen haul in more than twice as much tonnage than their closest competitors in Indonesia. The U.S. is in 8<sup>th</sup>



Unsalted cod drying on racks in Norway



The Atlantic cod fishery abruptly collapsed in 1993, following overfishing since the late-1950s, and an earlier partial collapse in the 1970s.

<sup>&</sup>lt;sup>25</sup> The Holy See, also called the See of Rome, Petrine See or Apostolic See, is the central governing body of the Catholic Church and the Vatican City State.

<sup>&</sup>lt;sup>26</sup> https://www.norwegianamerican.com/when-the-fish-wentaway/#:~:text=Dried%20and%20salted%20cod%20(klipp%C2%ADfisk)%20from%20Norway%20was%20especially%20prized

place (4.2 million tons), followed by Norway (2.6 million tons). It is possible (imaginable) that if Christians had not been eating up all those fish during the past two thousand years, there might be enough for the Chinese and Indonesians to fill their plates today without worrying that all the seas will be emptied of their fish.

#### The first tourists were pilgrims. They usually walked

We toured Norway in a bus after we arrived in Oslo by train from Stockholm. There were twenty-three people on the bus, including our guide and the bus driver. The bus, a *Setra* made by EVOBUS, a subsidiary of DAIMLER, had a capacity of 40 passengers, which meant it was small enough to maneuver on the narrow, winding roads with hairpin turns that we would travel on during our week of wandering in the country's spectacular mountain and fjord regions. In some places we shared the road with sheep, wild reindeer, and musk oxen. Tour buses have been around for about 70 years, and *Setra* was one of the early producers. Except for all the new technology, little has changed with tour buses.

The same cannot be said of tour ships. That fact was brought home to me in jarring fashion when we arrived in Ålesund, which has a population 52,163. Two cruise ships, each one designed to carry over 5,000 passengers with the equivalent of sixteen stories above water level, were parked along the pier. The photo below shows just part of one of them seen from land. For the two days we were there, they completely blocked the ocean view from the city, and their passengers increased the population of the town by 20%.





Setra tour bus



The Troll Highway with seven hairpin, hair raising switchbacks

Musk ox (Ovibos moschatus) in Dovre National Park, Dovrefjell, Norway



Both giant ships were still there when we left on a small ferry (shown right) for a three-hour sail on three fjords with Geiranger (population 250) as our destination. Our bus was not on board our ferry; it would meet us after we had spent enough time in Geiranger to have lunch. We could hardly believe our eyes when we turned the last corner in the Geiranger Fjord. Instead of seeing a pristine little village, we saw the back end of another huge cruise ship. It was not as large as the two we left behind in Ålesund. It carries only 3,500 passengers. But if it disgorged all of its passengers at one time, the population of the little village would have increased by 1,400%!





Bringing one city to another city makes absolutely no sense at all Are these ships really necessary? We have seen, and been repelled by, the photos of the gigantic cruise ships moving through the lagoons of Venice, like the one on the right. They are as out of place in a village at the end of a Norwegian fjord as they are parked beside the *Punta della Dogana* and the church of *Santa Maria della Salute* in Venice. They were banned in 2021 by the City of Venice, and the city has since then instituted a tax on every tourist entering its city limits.

Already at the beginning of the 20<sup>th</sup> century, super-sized ships began appearing, but they were used as means of transportation, mostly across the Atlantic, not for pleasure cruising with many of their passengers never setting foot on land until they returned to their port of origin at the end of the cruise. The *Mauretania* in 1904 carried 2,165 passengers



This image is not Photo-shopped. This is what it looked like in Venice before the behemoths were banned in 2021.

and the *Titanic* in 1909 had room for 2,453 passengers and 874 crew. It was the ROYAL CARIBBEAN and its shipbuilder in Turku, Finland that led the way with the ocean-going sky-scrapers. In 1999, they built the *Voyager of the Seas* with a total capacity of 4,000 and the *Icon of the Seas* in 2016 with 7,600 passengers and 2,350 crew!

One can wonder how these cruise ships and cargo behemoths manage to stay afloat. Displacement. They displace the equivalent amount of water to their mass when they sit on the ocean. Their round-bottom hulls that look like rectangles with rounded edges help with the displacement. Is there any limit to how large they can be? No, except perhaps for the height of the bridges they have to pass under. Naval architects and shipping companies can keep on doing what they have been doing (i.e., inventing) until, finally, people get fed up with seeing the monsters or having them destroy their bridges. Then, just maybe, they will invent a way of making them invisible.

#### Fast, cheap, and high-capacity trains - You only get to pick two

One member of our tour group was a retired locomotive engineer (i.e., a train driver) who worked for the Swedish state rail service, SJ. His name, Ylon, is pronounced 'e-lon', yes, like Elon. He looks sort of like what Elon will probably look like at 70 if he doesn't have any cosmetic surgery. I had saved until the last day of our trip the question that had been troubling me since we received the final program, namely, why were we taking a train from Oslo to Göteborg, and then a train from Göteborg to Stockholm, turning a four-hour train ride home into an eight-hour one. I asked Åsa, our guide, and she said that we would have had to take a bus from Oslo for half of the trip due to repair work on the Swedish tracks, and we would have to leave in the morning to make the connection. That would mean missing out on the Oslo portion of the tour, and we would still arrive in Stockholm at around the same time as we would taking the Göteborg detour.

Fine, I thought. But now I had a chance to get an expert opinion on why all train service in Sweden had become such a mess. We took a taxi to Stockholm the day before we left for Oslo because we did not want to take a chance that our train from Strängnäs to Stockholm would be delayed or cancelled, like one out of three trains on our line was delayed or



The largest cargo ship, the MSC Irina sailing under the Liberian Flag

cancelled every time I have taken the train during the past five years. "Is it due to deregulation," I asked Ylon, "with private and other countries' state train operators allowed to deliver services? Is it due to the breaking up of the state rail service into an authority responsible for the tracks and electric power and a quasi-public company responsible for running a rail service along with other actors? Is it due to poor security that has resulted in rampant theft of copper in the electricity infrastructure? Why are so many trains delayed or cancelled?"

#### "*All of those reasons are part of the problem*," answered Ylon, "*but the big one is the invention of the* X2000s."

*"The X2000s!"* I exclaimed. *"I thought those were the best thing that happened to Sweden since wienerbröd<sup>27</sup> was invented."* The X2000 was Sweden's answer to the global race for the fastest high-speed train. It started with Japan's *Tōkaidō Shinkansen,* which began rail service in 1964 between Tokyo and Osaka. Its 'bullet train' could achieve sustained speeds of over 155 miles per hour. It comprised specialized rolling stock and dedicated, continuously welded tracks. In the U.S., the *Metroliner* came into service in 1969, running between Boston, New York City, and Washington, DC. It could attain speeds of up to 171 miles per hour, but only in limited areas.<sup>28</sup> France had its *Turbotrain;* Germany its *ICE (Inter-City Express);* Italy its *Direttissima;* and Sweden its *X2000,* which started a first class-only service in 1990, and added second class in 1995.

I have ridden in all of the high-speed trains listed above, but I enjoy the *X2000* most of all. It is the comfort and convenience of first class, including first class seats, the roominess in the cars and around the seats, the free coffee and fruit, and the food service that I appreciate. There is also a lounge car where everyone can purchase food and drinks of particularly good quality. What I did not realize, and what Ylon





The X2000 on a wintery day in 2007.

<sup>&</sup>lt;sup>27</sup> *Wienerbröd* is Sweden's best-tasting pastry, according to my own extensive taste tests.

<sup>&</sup>lt;sup>28</sup> I took the overnight Metroliner once a month during 1974 between Boston and DC instead of flying. I left Boston's South Station at 10.30 and arrived in DC's Union Station at 8.00 a.m. There was a layover in an underground tunnel in NYC during the night. Even with my own sleeping compartment, it was less expensive than the least expensive flight.

explained to me, were all of the down sides of the design of the X2000. He had been a train driver for fifteen years when work started on the X2000s, and he was among the first to drive them, so he knows what he is talking about. *"We were losing passengers to the airlines that were opening up commuter flights from the smaller cities, and more people were driving their cars. It was a way get people back on the trains,"* said Ylon.

There were two major requirements, explained Ylon: 1) the new trains and their infrastructure had to be cheap to build; and 2) they had to go fast. Sweden is a big country geographically, but with a relatively small population (8.5 million in 1990). It had built an extensive rail network over the previous one hundred years, and it could not afford to build a new one. Therefore, it was the first requirement, cheap to build, which determined most of the design. Making a train that could go fast was the easy part but making a train that could go fast on the curving, only slightly banked tracks that dominated in Sweden using overhead electric line equipment was the real challenge. *X2000*s would share the rails with other passenger traffic and freight trains as well.

The train's designers and manufacturers, ABB, ADTRANZ, and KALMAR VERKSTAD, came up with an ingenious solution: the tilting train. To keep the train on the rails around curves while maintaining a high speed, they tilted the train to simulate a banked railbed. As a passenger, it is a bit unsettling at first, but one quickly becomes accustomed to it. Problem one is that the combination of tilting and curving limited the length of the train to one locomotive and six cars in one set. Problem two was the pressure put on the tracks and the overhead line equipment to keep the trains on the tracks and connected to the overhead electricity caused higher wear and tear on both.

Standard train sets with one locomotive and twelve or more cars were common at the time the *X2000*s were introduced. Five years after their introduction, SJ added second class, with one car dedicated to first class. Over time, more *X2000*s were put into service, and to reach 1990 capacity, more train sets had to be added. More train sets added more stress on the tracks and the overhead lines and created a higher demand for both onboard personnel and engineers. Moreover, managing more train sets created logistics and scheduling



The X2000 tilting design.

problems that have multiplied as more riders are encouraged to ride the rails rather than driving or flying.

De-regulation just made the situation worse. It was in 1988 that the state divided STATENS JÄRNVÄGER (STATE RAILWAYS) SJ and created a new company BANVERKET (BV), which became the owner of the infrastructure. SJ runs trains and does so on a commercial basis without public subsidies. A decision was made in March 2009 to cancel the monopoly for SJ, so the competition for staff and logistics problems have increased. Heavy delays and canceled trains are the result that Swedes live with today. Sweden got cheap and sort of fast, but it never got capacity.

#### We are, therefore we invent

I said at the start of this *Musings* that I was thinking about how inventions and improvements to them often end up causing unintended and undreamed-of consequences. Some of those consequences are negative and some of them are positive. Boat decks, cod drying techniques and religious fasting laws led to overfishing and drastic reductions of entire species of fish, but they also led to more people being able to add protein-rich fish to their diets without having to slaughter animals that provided milk and eggs. The discovery of the law of displacement that resulted in the increasing size of ships, combined with our insatiable appetites for travel, led to the over exploitation of port cities all around the world, but they also have made it possible to transport large amounts of raw materials to places where they can more cheaply be turned into products and then shipped to all the places where those products are needed or desired. Tilting trains and nationalistic speed envy led to thousands of people in Sweden each day being late for work or school or missing because of delayed or cancelled trains, but highspeed train travel is proving to be an effective way of allowing people to separate where they live and where they work to their economic and social benefit.

Should we have first invented a way of vetting inventions before we released them to the public? How likely would it have been that every group of Homo sapiens would have come up with the idea of establishing a tribunal for evaluating the eventual consequences of adding a barb to a hook? How would that have worked in the early days when there



This is the SpaceX Falcon 9 landing, not taking off.

were groups spread out across continents who did not communicate with each other? They would have all had to invent the *Invention Tribunal* at the same time if one group wasn't going to gain a competitive advantage over the others, and the tribunals would all have had to reach the same conclusions 100% of the time. If one group on one side of a river did not have an *Invention Tribunal* and one of their group added a barb to a hook and started to catch more fish, and then someone else came up with a way to preserve the fish so they had something to eat during the winter, and the other group on the other side of the river had an *Invention Tribunal* that said NO BARBS and NO FISH DRYING because in thirty thousand years all the fish would disappear, to which one of those groups do you think we would trace our ancestry today?

We not only invent things; we invent ways of doing things, and the Invention Tribunal would have been such an invention if it had been invented. Religions and governments are inventions, along with their fasting laws and inquisitions, electoral colleges, and supreme courts. The UNITED NATIONS and its predecessor, the LEAGUE OF NATIONS, were inventions. Following World War II, humankind's biggest challenge was preventing the preconditions for wars like the two world wars which had occurred during the thirty years prior to the establishment of the UNITED NATIONS, which combined to kill around 100 million human beings. It is highly unlikely that if the UN did not exist today, and the idea for such an organization were proposed today, that it would look even vaguely like what the nations following World War II invented. Would anyone agree to give five countries the power to veto any proposal brought before it, good or bad, especially if one of those countries was Russia?

#### Invention should follow function

A reusable space rocket launcher is an example of an invention that includes a requirement that should have been present when its predecessors were first built. NASA's space shuttle in 1981 was the first reusable spacecraft, but it took SPACEX with its Falcon 9 in 2015 to do the obvious, which was to build a space launch vehicle with a powered descent landing system that would return the launcher to its launch pad and be ready to launch again within a reasonable period of time. The person behind the requirement—not the inventors of the invention, who were real rocket scientists is the same person who said that if TESLA was going to succeed in selling electric cars it would first have to develop and deliver a way of charging them and updating them.

#### Any rocket scientist can build a Frankenstein

Today, humankind has two big challenges. The first is doing what the UN was established to do but has <u>not</u> done, which is to ensure world peace, and the second is to make sure that three of our biggest inventions (i.e., digital computing, the Internet, and the World Wide Web) do not combine to kill us all through another big invention, artificial general intelligence (AGI). What about climate change? Isn't that the single biggest challenge facing humankind? I believe that if we do not solve the two challenges I have listed we will be toast long before the sun fries or boils us, and the fact that we have not been able to invent an organization to effectively address climate change without leaving it in the hands of protesting kids to tell us what to do is an indication of our collective unwillingness to cooperate because we do not agree on the need or the urgency.

We are in a hurry to invent, and we applaud our inventions, but we are not in a hurry to think about the reasons for and the uses of the inventions we make. We are concerned about inhibiting creativity if we set limits and establish requirements that may be viewed as restrictive. We were not troubled with letting hundreds of millions of dollars worth of rocket launchers fall into the ocean.

On the 8<sup>th</sup> of October 2024, the NOBEL FOUNDATION awarded the *Nobel Prize in Physics* to two individuals, John Hopfield and Geoffrey Hinton, for their "foundational discoveries and inventions that enable machine learning with artificial neural networks, which paved the way for how artificial intelligence is used today". On the 9<sup>th</sup> of October 2024, the NOBEL FOUNDATION awarded the *Nobel Prize in Chemistry* to three individuals. Two are employed by Google's subsidiary, DeepMind, including one of the founders of DeepMind, Demis Hassabis, for developing an AI model to predict proteins' complex structure. The co-winner of the *Chemistry Prize*, David Baker, was selected for his discoveries about the molecular structure of proteins that have led to new medical therapies and new materials. This is the first time the NOBEL FOUNDATION has specifically recognized artificial intelligence as a subject of invention – not once, but twice.

There is currently no single country that is proposing that the world establish an *AGI Tribunal* to evaluate and decide whether to allow any form of AGI in the process of being invented to be released into the world. California, the state that often acts like a country within a country, had a chance to pass a so-called "AI safety bill", but its governor, Gavin Newsom, vetoed it. The proposed bill would have imposed regulations on the use of AI in California, including requiring AI models to undergo safety testing. These tests would have to show that the AI had a "kill switch", which would guarantee that they could be turned off by a human. Newsom said the effect of the bill would be to <u>stifle innovation</u> and cause companies to move out of the state, as TESLA has done due to other state regulations. Alphabet, OPENAI, and META had actively opposed the bill.

The EU is patting itself on the back for having passed its *Artificial Intelligence Act (AI Act)*, which entered into force on the 1<sup>st</sup> of August 2024. It had been proposed by the *EURO-PEAN COMMISSION* in 2021 and agreed to by the *EU PARLIA-MENT* and the *EU Council of Ministers* in December 2023. The EU aspires to being the world leader in AI regulation, just like it aspired to be the world leader in personal privacy protection with its *General Data Protection Regulation*. The *AI Act* is a legal framework for addressing the risks of AI, as shown in the figure to the right. It is a start, and the EU should be commended for having taken the first step. But it is currently clapping with one hand. At a minimum, the U.S. and China must have similar safeguards. Ideally, all countries should be signatories to a single agreement.

There are groups that support each side of the debate on whether to establish an *AGI Tribunal*. Those who are <u>opposed</u> to overseeing, slowing down, and limiting the development of AGI include companies that have a major economic stake in bringing it to life, such as Alphabet, AMAZON, NVIDIA, META, and MICROSOFT. Their argument against limiting research and development in the west is that it will hamper innovation and leave the field completely open to China and Russia. They ask: "Have we ever effectively stopped invention, and when we tried, did it have the



The 2024 EU AI Act Regulatory Framework defines four levels of risk

<u>Minimal risk</u>: most AI systems such as spam filters and AI-enabled video games face no obligation under the AI Act, but companies can voluntarily adopt additional codes of conduct.

<u>Specific transparency risk</u>: systems like chatbots must clearly inform users that they are interacting with a machine, while certain AI-generated content must be labelled as such.

<u>High risk</u>: high-risk AI systems such as AI-based medical software or AI systems used for recruitment must comply with strict requirements, including risk-mitigation systems, high-quality of data sets, clear user information, human oversight, etc.

<u>Unacceptable risk</u>: for example, AI systems that allow "social scoring" by governments or companies are considered a clear threat to people's fundamental rights and are therefore banned.

desired consequences?" For example, human cloning is formally banned in forty-six countries, but China and the United States are not among these countries, while Russia is. However, does anyone honestly believe that Russia—a country which invades its neighbors (e.g., Ukraine, among others), steals their land, destroys their infrastructure, and kills tens of thousands of their citizens with the stated purpose, in the case of Ukraine, of erasing any trace of it as an independent country—is capable of living up to any agreement it signs? Not I.

Those who are in favor of controlling AGI point to our history and ask: "Could we have prevented incidents of widespread death and suffering if we had effectively banned weapons of mass destruction, starting with dynamite?" Geoffrey Hinton says that artificial intelligence "will make things more efficient with huge improvements in productivity", but he is worried about a number of possible bad consequences, particularly "the threat of these things getting out of control". Hinton was one of the signers of the letter from the FUTURE OF LIFE INSTITUTE in March 2023 that called for "all AI labs to immediately pause for at least six months the training of AI systems". Other signers included Elon Musk, Steve Wozniak, and Yuval Noa Harari. There has been no pause.

#### What's the rush—We've got 4 billion years to find a new home

Alfred Nobel thought of all the good uses for his invention, dynamite.<sup>29</sup> Releasing coal from its seams was one of the most important of them at the time. We needed coal to power the steam engines driving progress, and then to power the electricity generation plants to light the factories. Blowing up homes in the suburbs of his native country of Sweden was not on his wish list. He could not have possibly imagined it. But it has happened. Dynamite has never been banned. We take the good and accept the bad. With overfishing, we close the barn door after the horses have run out. We ban fishing where there are no longer any fish. With giant cruise ships, they will die their own deaths for economic or

<sup>&</sup>lt;sup>29</sup> Dynamite is an explosive made of nitroglycerin, sorbents (such as powdered shells or clay), and stabilizers. It was invented by the Swedish chemist and engineer Alfred Nobel in Geesthacht, Northern Germany, and was patented in 1867.

changing lifestyle reasons, not because one or two cities ban them. The United Nations and its peace mission? Anyone who does not see its limitations is not looking with both eyes.

We need to control the development of artificial intelligence. It is not an issue for one or a few states in the U.S., nor for an individual country, or a supra-state like the EU. It is definitely not something to be turned over to the United Nations. There is absolutely no need to continue to rush headlong into the AGI black hole. At best—unless our planet is whacked by another large projectile like the one that doomed the dinosaurs, but this time blows the whole kit and caboodle to bits, or we do not manage to keep the Earth's temperature from rising—we have four billion years, give or take a few hundred million, before our Sun explodes and turns Earth into galactic dust. We are smart enough to think up the requirements, maybe even with a little help from AI. Think about it. Please. Our future really does depend on it.



# About Michael L. Sena

Through my writing, speaking and client work, I have attempted to bring clarity to an often-opaque world of highly automated and connected vehicles. I have not just studied the technologies and analyzed the services. I have developed and implemented them and have worked to shape visions and followed through to delivering them. What drives me—why do what I do—is my desire to move the industry forward: to see accident statistics fall because of safety improvements related to advanced driver assistance systems; to see congestion on all roads reduced because of better traffic information and improved route selection; to see global emissions from transport eliminated because of designing the most fuel-efficient vehicles.

This newsletter touches on the principal themes of the industry, highlighting what, how, and why developments are occurring so that you can develop your own strategies for the future. Most importantly, I put vehicles into their context. It's not just roads; it's communities, large and small. Vehicles are tools, and people use these tools to make their lives and the lives of their family members easier, more enjoyable, and safer. Businesses and services use these tools to deliver what people need. Transport is intertwined with the environment in which it operates, and the two must be developed in concert.



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