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February 2021

Telematics Industry
Insights by
Michael L. Sena

THE DISPATCHER

IN THIS ISSUE

4TH ANNUAL PRINCETON SMARTDRIVINGCAR SUMMIT
17 DECEMBER 2020 – 15 APRIL 2021

This year's summit was originally scheduled to be held in May. It is now be a virtual event spread over a number of weeks. See the program and register at:

https://orfe.princeton.edu/conferences/sdc/

*The focus of the **4th Annual Princeton SmartDrivingCar Summit** will address the challenges of commercialization and the delivery of tangible value to communities. Conference organizer Professor Alain L. Kornhauser says: "We've made enormous progress with the technology. We're doing the investment, however this investment delivers value only if is commercialized, made available and used by consumers in large numbers to deliver value that is commensurate with the magnitude of the investment made to-date."*

THE SYMPOSIUM ON THE FUTURE NETWORKED CAR 2021
A VIRTUAL EVENT - 22–25 MARCH 2021.

The 2020 Future Networked Car Symposium was a hybrid event, held just before COVID-19 caused most of the world to enter a period of restricted travel and remote working. Previous events had always been held in conjunction and co-located with the Geneva International Motor Show. Due to the cancellation of the Motor Show, the event was moved to FNC headquarters where some of the Symposium's participants and attendees gathered, and the remainder took part online.

*With the 2021 Motor Show cancelled, FNC and UNECE have decided that the **FNC 2021 Symposium** will be totally virtual. It will be held on four successive days in March, each day consisting of three-hour sessions dedicated to one of four important topics. The complete program is now ready. See 20 program at: https://www.itu.int/en/fnc/2021/Pages/default.aspx*

THE DISPATCHER

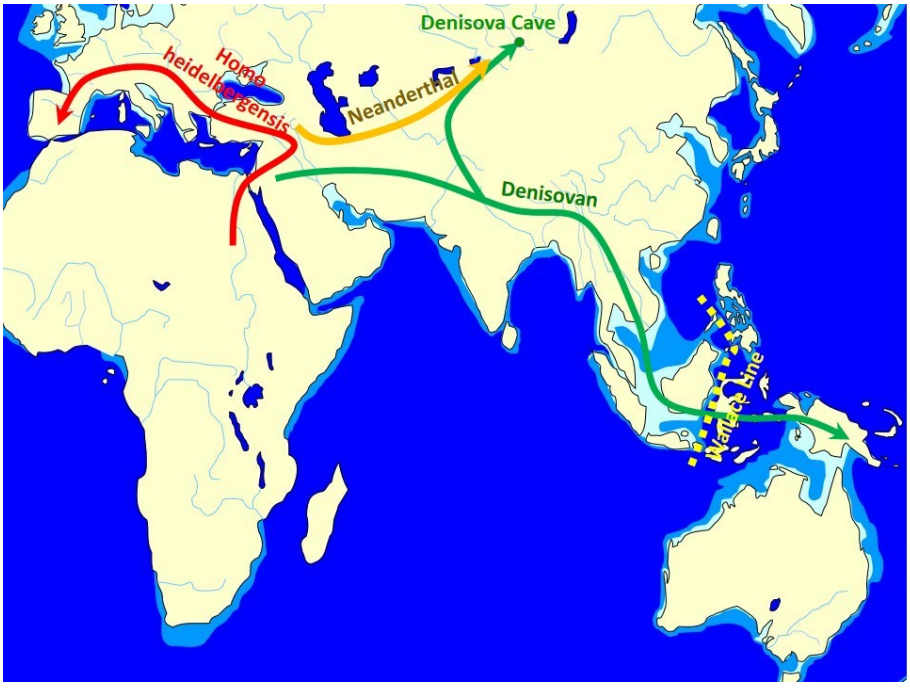
Telematics Industry Insights by Michael L. Sena
February 2021 – Volume 8, Issue 4

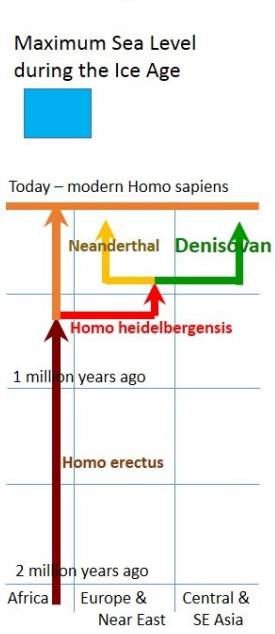
Spatial Cognizance: How We Learned to Find Our Way

And how to teach a new dog old tricks[1]

The 'new dog' is a driverless car. The 'old tricks' are the skills we humans have developed to find our way to places we know exist but have never been to before and then to find our way home. It took us several thousand millennia to acquire these skills. Some of us are better at it than others. If cars are going to drive themselves then they will have to be at least as good at it as the worst of us.

THE CURRENT NARRATIVE of *Homo sapiens* is that we evolved in Africa and left to find greener fields and fresher waters when our evolving had gotten to the point of where we are today. We weren't the first to leave. It is said that we share with the other *Homo* variants, *heidelbergensis*, *neanderthalensis* and *denisova*, a common ancestor, *Homo erectus*, who lived 800,000 years ago. The split among the groups occurred between 500,000 to 300,000 years ago. *Homo heidelbergensis, t*he forerunner of both *Homo neanderthalis* and *Homo denisova,* was apparently more precocious than *Homo sapiens* and decided to seek his fortune beyond the African continent, while our forerunners, *sapiens*, stayed behind until we had





1. *Adagia* (singular *Adagium*) is the title of an annotated collection of Greek and Latin proverbs compiled during the Renaissance by Dutch humanist **Desiderius Erasmus Roterodamus**. Erasmus' collection of proverbs is "one of the most monumental ... ever assembled" (Speroni, 1964, p. 1). One of those proverbs is the equivalent of 'You can't teach an old do new tricks'.

completed our evolving. *Heidelbergenians* wandered into Europe and Asia and evolved into what we know as Neanderthal and Denisovan. There is fossil evidence that this took place as much as 400,000 years ago.[2]

The first *Homo sapiens* left Africa around 180,000 years ago, which is 40,000 years earlier than was thought up until the remains of a *sapiens*' jaw was discovered in 2018 in the Misliya Cave on Mount Carmel in northern Israel. As far as we can tell, it did not go so well for these first wanderers. They either were subsumed within the Neanderthal or Denisovan populations, died out or found their way back home to Africa.

It is still believed that the major migration of *sapiens* started about 60,000 years ago, and this one was successful. Both the earliest and the later *sapiens* to leave Africa enountered Neanderthals and Denisovans and interbred with them before these two other species became extinct between 30,000 and 40,000 years ago. The early exodus appears to have been via the northern route, in the area known as the Levant, now Egypt and the Northern Sinai and Israel. This is the route shown on the map above. The later exodus was via the so-called Southern Route, across the Red Sea at the Bab-el-Mandeb strait and into the Arabian peninsula as shown in the map to the right. Maybe the water level was lower so there was a land bridge. Maybe they built boats. However they did it, they got across.

The Southern Route of human migration out of Africa

Have you ever wondered what possessed the first of the *Homo* genus, *heidelbergensis,* to leave what had been their home for hundreds of thousands of years and venture into new and uncharted territory? Think of where they headed: the hot, dry desert that is the Sinai Peninsula. Evidently, it was that old bugbear[3] climate change caused by the earth getting a bit too close to the sun.[4] Apparently, the Sinai at the time of the migration was more inviting than it is now, and where the wanderers were, in eastern Africa, had become less habitable. That is why they moved. But they didn't know where they were going or what they would find when they got beyond the area they knew. If it got too scary, they could use the navigation skills they already had and retrace their steps home to Africa.

Try to be home for dinner, dear

The folks that walked out of Africa did not need their navigation skills to make their journey. They weren't going somewhere in particular. It's not as if they said to each other, "Let's walk to San

2. https://www.ancient-origins.net/news-evolution-human-origins/monsoon-migration-0012917

3. Bugbear: an object or source of dread; a continuing source of irritation (Merriam-Webster).

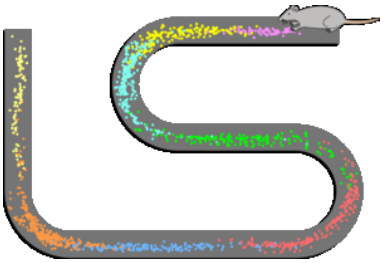
4. *https://www.smithsonianmag.com/history/the-great-human-migration-13561/*

Francisco. If we keep up a good pace we should make it into Alaska while the Bering Land Bridge is still there." They were wandering into uncharted lands. They walked eastward, toward the horizon where the sun rose. For them, it was like my family's Sunday drives. We would pile into the car and Dad would start driving without having any particular destination in mind. His goal was simply to find a new place where we had never been to before. He wasn't navigating; he was just wandering. After a few hours it was time to go back home, and this is where the navigation skills came into play. I should say, my mother's navigation skills.

A painting by Heinrich Harder showing an aurochs fighting off a wolf pack.

It was the same for the wanderers once they stopped and set up camp. They needed to find food, gather wood for their fire (fire had invented by then) which they used for cooking and protection against whatever predators might be around. Once they had found what they needed, they had to get back to the base camp. They used their navigation skills to do so, and they also devoted some time to making a mental chart of where they had found firewood and located a herd of aurochs so they could save time the next time they had to go out and refill the larder and wood box. How they were able to do this was explained by the recipients of the *2014 Nobel Prize in Physiology or Medicine*.

John O'Keefe, May-Britt Moser and Edvard Moser answered three questions that had occupied scientists and philosophers since there were scientists and philosophers: How do we know where we are; how can we find the way from one place to another; and, how can we store this information in such a way that we can immediately find the way the next time we trace the same path? What they discovered at different times was that humans have an internal positioning system in the brain that makes it possible to orient ourselves in space.

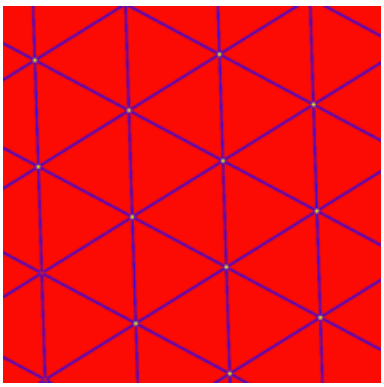


Spatial firing patterns of 8 place cells recorded from the CA1 layer of a rat. The rat ran back and forth along an elevated track, stopping at each end to eat a small food reward. Dots indicate positions where action potentials were recorded, with color indicating which neuron emitted that action potential.

It was in 1971 that John O'Keefe, using neurophysiological methods, discovered the first piece in the puzzle. He found that there is a nerve cell in the area of the brain called the *hippocampus* that was always activated when a rat was at a certain place in a room, and that other nerve cells were activated with the rat was at other places. He could demonstrate that these 'place cells' were not merely registering visual input, but were building up an inner map of the environment. O'Keefe concluded that the *hippocampus* generates numerous maps, represented by the collective activity of 'place cells' that are activated in different environments. Therefore, he concluded, the memory of an

environment can be stored as a specific combination of place cell activities in the *hippocampus*.

May-Britt and Edvard Moser, who are a married couple, discovered the second piece in 2005. They identified another type of nerve cell in the brain's *medial entorhinal cortex*, which they called 'grid cells' that generate a coordinate system and allow for precise positioning and pathfinding. The arrangement of spatial firing fields, all at equal distances from their neighbors, led to a hypothesis that these cells encode a neural representation of Euclidean space. The discovery also suggested a mechanism for dynamic computation of self-position based on continuously updated information about position and direction.



A grid cell is a type of neuron within the entorhinal cortex that fires at regular intervals as an animal navigates an open area, allowing it to understand its position in space by storing and integrating information about location, distance, and direction. Grid cells have been found in many animals, including rats, mice, bats, monkeys, and humans.

Birds, fish, insects—expecially the dung beetle—all have highly developed positioning and navigation skills. As it turns out, so do humans. More importantly, we are using these skills on a constant basis, not just to find our way to hotel in a strange city. We use them when we are walking and when we are maneuvering a motorized vehicle. When those parts of the brain that O'Keefe and the Moser's identified are put out of commission, as is the case when a person is afflicted by Alzheimer's disease, that person cannot find his way home if he wanders off from his care givers, or he cannot find the toilet in a house he has lived in most of his life. Anyone who has lived with someone with Alzheimer's disease knows this and also knows the agony experienced by the person who is afflicted and has lost his or her ability to navigate.

Pick up milk, lottery ticket, dry cleaning and the kid

Unlike our early ancestors, those of us who are living in the industrialized part of the world do not spend our days gathering food, water and fuel for fires. We do not patrol the borders of our defensible space against intruders and ensure that our shelters will withstand the extreme forces of the weather. We do other things. Chores, errands, visiting, walking or bicycling for exercise. What we do not do on a regular basis is wander into uncharted territory. We also do not just go from one place (e.g., our home) to one other place (e.g., work, school). We do stuff along the way, like stopping for coffee and a doughnut or dropping off or picking up the kid. The U.S. National Household Travel Survey Daily Travel Quick Facts confirms this. 87% of daily trips are taken in personal vehicles; 45% of those trips are for shopping and errands, 27% are for social and recreational purposes, and 15% are for commuting. Americans take most of their trips on Fridays and the least number of trips on Sundays, and they travel most

between noon and 1:00 p.m.

Now imagine if we had to program our car's navigation system or smartphone with all of the locations we needed to visit to complete our daily errands—every day. Go back a dozen or so years and think about how often you pulled out a map to get somewhere, even if it was outside of your immediate neighborhood. You didn't. Once you had become familiar with your surroundings, your movements while walking and driving are automatic. When we are children, we know where everything is in our home and in the vicinity of our home where we are allowed to play. As we grow older and are allowed to venture further afield, we build more complex mental maps of where the school, playing fields, candy story, our friends' homes and other important destinations are located. When I moved to Göteborg, it took me a year of walking every day during lunchtime, always along different routes, before I could drive my car in the city without any assistance from maps and without the nervousness that one has when driving in a totally unfamiliar place.

Now stretch your imagination and try to see yourself instructing a robotic car to take you on your daily trips. What is automatic and second nature to you must be translated into instructions that are clear to the machine that will carry them out. We humans don't need to have our cars equipped with several hundred thousand dollars worth of sensors and communications equipment, massive amounts of 3D data on the environs,[5] highly accurate road data to keep the vehicle on track and a crew of back-up drivers to take over if we get our stars crossed. We climb into our car, hop on our bike, tie up our walking shoes and make the rounds. Milk, lottery ticket, dry cleaning and the kid. Piece of cake.

Speaking of stars, we humans have plenty of competition for the limelight. The little dung beetle can move its ball of poo in a straight line without the need of a GPS receiver and s- -t-loads of data storage powered by rechargable batteries. It simply checks the stars. A 2013 study revealed that they apparently see the brighter, wide band of light that the Milky Way draws across the night sky. In experiments with the dung beetle (*Scarabaeus satyrus*) under the simulated night sky of the Johannesburg planetarium, researchers found that the Milky Way's path could steer the insects' course, making dung beetles the first known animals capable of orienting themselves using this aid.[6]

5. Autonomous control systems that use LIDAR scans to create massive, complex maps take roughly 4 terabytes of data just for a single city like San Francisco.

6. "Tiny brains can solve fantastic tasks," says neurobiologist Marie Dacke of Lund University in Sweden, one of a small cadre of researchers who have worked for years, often as a team, to piece together the tricks the insects use to roll balls in their eerily straight lines. https://www.smithsonianmag.com/science-nature/how-dung-beetles-roll-their-food-straight-line-180976667/

Should we wait for robot drivers to evolve?

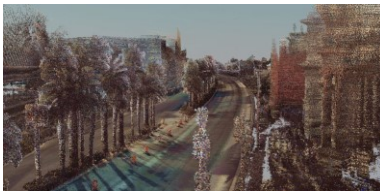
Nick Bostrom in his super book Superintelligence: Paths, Dangers, Strategies, explores different ways that a 'superintelligence' could be developed. He uses the following definition of 'superintelligence': *any intellect that greatly exceeds the cognitive performance of humans in virtually all domains of interst*.[7] When a robotic car can drive, chew gum, carry on a normal conversation with a co-passenger about subjects ranging from the biblical basis for the sermon in church on Sunday to the statistical probability of the Little League baseball game being rained out on Saturday while a gaggle of kids scream in the back seat, and can do this while not crashing 99.9999% of the time, that robot would be classified as having pretty high human intelligence. Get the not-crashing average to 100% and it would be superintelligent. Bostrom explores how to get there.

7. Bostrom, Nick. Superintelligence: Paths, Dangers, Strategies. Oxford University Press (2014). P. 26.

Nick Bostrom was born Niklas Boström in Sweden in 1973. After studies at Gothenburg University and Stockholm University, he completed a M.Sc. at Kings College London and a Ph.D. at London School of Economics. He is currently teaching at Oxford University.

There are basically two paths to superintelligence, according to Bostrom. The first path is the one being followed by robotics experts, which involves essentially creating a new form of machine life. The second is to develop methods of enhancing humans, so instead of developing robots we would make humans as smart as what we think superintelligent robots would be once we developed them. One possibility for human enhancing is biological cognition in which humans would be selectively bred for achieving superhuman IQs. This would take a very long time, and, unless the level for everyone was raised, there would be many who would be left behind. Another approach to enhancing humans is brain-computer interfaces, an option that is being developed by one of Elon Musk's companies, NEURALINK. The advantage of the human-enhancing approach is that we can take advantage of all the skills we have evolved, not the least import one being our ability to naturally navigate.

If we are going to take what Bostrom calls the 'good old-fashioned artificial intelligence' approach to creating super-great robotic drivers by making supersmart machines, which is the path that DARPA set the robotics doyens (search hard for females < doyenne> in those early group photos) on back in 2004, we would do well to start applying those navigation skills that humans have, rather than ignoring them and creating super-complex and super-expensive methods of building parallel worlds with robots in one and humans in the other doing the work that one human could perform perfectly adequately on his or her own.



The super-expensive and super-complex method of getting a car to drive itself. Here is a sample of a DeepMap image created with LiDAR technology.

Alan Turing's suggestion on how to create a superintelligence might be a good place to start. He thought we should begin with a child robot. "*Instead of trying to produce a program to simulate the adult mind, why not rather try to produce one which simulates the child's? If this were then subjected to an appropriate course of education one would obtain the adult brain*."[8]

I can drive with ease in those places where I have lived or spent a considerable amout of time in, like Scranton, Central New Jersey, Boston/Cambridge, Stockholm and London. It took time to develop the knowledge of those places and to store that knowledge in my *hippocampus.* Drop me in Toronto, Los Angeles, Berlin or Singapore, and I would be lost, just like a child in a house he is visiting for the first time, or just like a London Black Cab driver who is transported to Tokyo: He's got ***The Knowledge*** for Greater London but not for Greater Tokyo.

If we are going to continue this quest to develop self-driving cars because a large enough people with money and influence believe they are safer and cheaper than cars driven by humans, I suggest that we need to take a fresh look at how we are going about this task. There may be times when the rider wants to take a Sunday afternoon drive, to do the equivalent of wandering out of Africa. There will be times when the rider wants to get from her home to the train station for the commute to work. But the majority of trips will be of the 'Pick up milk, lottery ticket, dry cleaning and the kid' kind. Those humans sitting in the vehicle that is being driven by a robot will have a pretty good sense of where all the places are located that need to be visited, unless they have been chauffeured their entire lives and have no navigation skills whatsoever (which will eventually be the case once all trips are chauffeured by robots). If the human rider's location sensors are firing and the robot is wandering or taking an A-to-B approach to driving, there will be an anxiety-creating mismatch between the human's expectations and what the robot drivers deliver.

If you want to understand how it will feel, think about a time you were in a taxi and you knew exactly which route you would have taken to get to where you wanted to go, but the taxi driver was taking a completely different route. Did you say, "Excuse me, but are you taking me for a ride?" Or did you sit quietly, let him keep driving and pay him his fare with a smaller tip than you would have given him if he had taken your route? I once did the former and got booted out of the taxi far from my destination in Queens, NY. Imagine what an affronted robot might do. 🕮

8. Alan Mathison Turing OBE FRS (23 June 1912–7 June 1954) was an English mathematician, computer scientist, logician, cryptanalyst, philosopher, and theoretical biologist. Turing was highly influential in the development of theoretical computer science, providing a formalization of the concepts of algorithm and computation with the Turing machine, which can be considered a model of a general-purpose computer. Turing is widely considered to be the father of theoretical computer science and artificial intelligence.
A. M. Turing (1950) Computing Machinery and Intelligence. Mind 49: 433-460.
https://www.csee.umbc.edu/courses/471/papers/turing.pdf

Dispatch Central

Is this why the principal manufacturer of Apple iPhones wants to build the Byton BEV SUV?

Electric Vehicle News

Why would Foxconn want to build Byton's BEVs

IT WAS JUST recently, in September 2020, when I wrote about BYTON under the headline *Chinese BEV maker Byton bites the dust, maybe*. I wrote then that BYTON announced in April that it had furloughed around one-half of the 450 employees in its U.S. headquarters, and then followed that up with a statement that it had suspended production during a six-month period "for a reorganization," starting on the 1st of July 2020. That suspension has now been extended until June 2021.

On the 4th of January of this year BYTON announced that it had signed a strategic cooperation agreement with FOXCONN TECHNOLOGY GROUP[9] which will result in the Taiwan-based company investing in BYTON by providing "advanced manufacturing technology, operation management expertise and supply chain resources." This has been interpreted as FOXCONN serving as the manufacturer of BYTON vehicles, and this interpretation has not been denied by either BYTON or FOXCONN. The companies will supposedly be aided by the Nanjing Economic and Technological Development Zone, and aim to start mass production of the *Byton M-Byte* by the first quarter of 2022, according to January 4th press release.

In October 2020, FOXCONN unveiled its first BEV chassis as well as a software platform that is aimed at helping BEV makers deliver models to the market faster. It will start shipping its first developer kit in April 2021. The FOXCONN group has been supplying parts to other major automakers including TESLA. At the end of 2021, Chairman Young Liu said at a company event in Taipei last month that "the electric vehicle-related business will be very good in the first half of 2021."

On the 13th of January, FOXCONN had another announcement. This one said it said it would team up with GEELY, which seems to be teaming up with everyone. FOXCONN Chairman Young Liu called the alliance "a milestone in cooperation between the automotive and information and communication technology industries". He continued:

9. HON HAI PRECISION INDUSTRY CO., LTD., trading as FOXCONN TECHNOLOGY GROUP and better known as FOXCONN, is a Taiwanese multinational electronics contract manufacturer with its headquarters in Tucheng, New Taipei City, Taiwan. In 2010, it was the world's largest provider of electronics manufacturing services and the third-largest technology company by revenue. The company is the largest private employer in Taiwan and one of the largest employers worldwide.

"With Foxconn's globally leading R&D technologies, intelligent manufacturing, and hardware-software integration capabilities, the two parties form a highly complementary partnership which allows us to better serve and meet the diverse needs of different customers, and offer the most advanced, fastest, cost-effective full value-chain vehicle production service platform," He wrapped up by adding that the partnership "will result in tremendous change in the development of the automotive industry".

FOXCONN is in the electronics products business. Those products include the BlackBerry, iPad, iPhone, iPod, Kindle, Nintendo 3DS, PlayStation 3, PlayStation 4, Xbox 360, Xbox One and many, many more. It has not built any cars. Is the BYTON deal a way of gearing up to build APPLE's car (see next article)? Is the GEELY deal a way of being able to get some quick insights into what an automobile factory floor looks like so it can build its own? Or maybe getting closer to GEELY is a way of deciding whether it makes sense to simply buy up the entire GEELY automotive mini-empire, keeping the pieces it needs to build APPLE's and other electronics companies' cars and discarding the pieces it doesn't need (e.g., VOLVO CARS, PROTON, LOTUS). Or maybe FOXCONN wants to deliver the skateboards to GEELY and any or all other automobile manufacturers so that these other companies can plop on the bodies.[10]

10. See the March 2020 issue of The Dispatcher for more on BEV skateboards.

Or is FOXCONN just looking for a way to get out of the iPhone contract manufacturing business because of the razor-thin margins? I'm not sure they are going to be any fatter in the car business.

Will Apple build its car after all?

APPLE'S FIRST CAR project, which was started in 2014, hinted that it would result in a self-driving car, but APPLE did not release any initial design sketches. This caused many of us to conjure up comparisons to Google's entry. I wrote that it looked like a knock-off of the *Fiat 500*. Some thought it looked like an egg, others thought it was definitely breast-like, nipple and all. Would the Apple Car look like an iPhone or iWatch? The APPLE initiative was dubbed *Project Titan* with 1,000 employees working at a not-so-secret location in Sunnyvale, CA. APPLE quietly closed its project a few years later, or at least that's what we were all led to believe.

Will Apple's entry into the battery electric vehicle market be as anthropomorphic as Google's prototype? I sincerely hope not.

What actually happened was that APPLE management figured out this was not going to be a walk in the park. They were getting themselves into a totally new business area, one they knew absolutely nothing about. It was time to slow down, and if there is one thing that has distinguished APPLE under Tim Cook's stewardship

is its ability to carefully analyze the impacts of investments in new business areas on the company's bottom line. While we all thought *Project Titan* was dead, APPLE was looking for the right person to lead the effort and a more opportune time to open the shutters on the skunk works. It changed leadership several times and hundreds of employees were laid off during the course of development. Direction of the project has now been given to John Giannandrea, APPLE's AI and machine learning chief, who took over the reins from Bob Mansfield after Mansfield retired in 2020.

The company is still being pretty tight-lipped about what it is up to, but a few pieces of information have slipped through to the public. First, Apple has registered three auto-related top-level Internet domain names: apple.car; apple.cars; and apple.auto. Second, in 2016 Apple invested $1 billion in Didi Chuxing, then an equivalent to Uber. That same year, Uber merged its operations in China with Didi Chuxing. Apple still holds the investment. Third, Apple has continued to test self-driving vehicles on public roads in California using 2015 Lexus RX450h SUVs leased from Hertz. In June 2019, Apple purchased Drive.ai, a self-driving vehicle start-up and hired a number of its employees.

In December, it was confirmed that Apple is still working on an Apple-branded car for consumers, and that it is developing a new battery 'monocell' design. In January of this year, Hyundai's stock shot up when rumors spread that it was in negotiations with Apple to build its car. Hyundai confirmed that it is talking to Apple, stating that "we are receiving proposals for cooperation from various companies, but no decision has been made yet". Apple has not made any public comments on possible partners. We'll leave the speculation here for the time being.

Magna Steyr slated to build Fisker's Ocean Electric SUV

On October 15, 2020, FISKER INC announced it would be outsourcing vehicle production of its *Fisker Ocean electric SUV* to *Magna Steyr*, an Austrian operating unit of MAGNA INTERNATIONAL[11] that specializes in contract manufacturing. Magna Steyr was founded in 2001 by MAGNA INTERNATIONAL. Magna Steyr was previously part of the STEYR-DAIMLER-PUCH conglomerate. It developed Mercedes-Benz's 4Matic all-wheel drive (AWD) system, and was the sole manufacturer of all *E-Class 4Matic* models between 1996 and 2006. It helped to develop the *BMW X3* and manufactured all original X3s. Other the many other cars it helped to develop and manufacture were the *Audi TT, Fiat Bravo* and *Peugeot RCZ*. With an annual production capacity of approximately 200,000 vehicles

Fisker Ocean electric SUV

11. The history of Magna International - In 1957, Frank Stronach founded Multimatic Investments Ltd in Toronto, Canada. Its first automotive industry contract for metal sun visor brackets was with General Motors in 1959. By the late 1960s, the company was operating in eight plants. Stronach took Multimatic Investments public in 1969 through a merger with Magna Electronics Corporation, an aerospace, defense and industrial components company, and became known as Magna International in 1973. By 1981, Magna had sold its aerospace and defense operations to focus on the automotive industry. It began decentralizing major systems into independent, publicly-traded companies during the 1990s, while expanding into Asia.

Magna Steyr AG & Co KG was founded in 2001 after Magna International Inc. acquired a majority shareholding in Steyr-Daimler-Puch AG three years earlier.

Magna began designing automotive rearview cameras for Hummers in 2005 on its production line in Michigan, which were not a federal requirement at the time. It was one of the first to develop rearview cameras for automakers, and had a 350,000 unit contract by 2007. The company has produced more than 46 million components and opened a $66.5 million plant to produce cameras and driver-assistance components.

as of 2018, it is the largest contract manufacturer for automobiles worldwide. The company has several manufacturing sites, with its main car production in Graz in Austria.

To further tighten the bond between FISKER and MAGNA, on January 4th, Fisker and Magna International announced that MAGNA would develop and advanced driver assistance system (ADAS) for the Ocean SUV, which is expected to launch in late 2022. The ADAS technology uses digital imaging radar in addition to cameras and ultrasonic sensors. A Texas-based startup called UHNDER is the radar supplier. MAGNA says of UHNDER that it is the "first digital imaging, single-chip radar solution for the automotive marketplace". The system being developed for FISKER will not use LiDAR because of the cost.

Swamy Kotagiri, MAGNA's CEO, says of the collaboration with FISKER: *"One of our strategic goals is to pursue new business in areas where Magna's unique strengths can be deployed with an advantage compared to our peers. Our collaboration with Fisker is a great example. We can provide a new OEM like Fisker with a flexible and scalable EV platform, complete ADAS package, joint vehicle engineering and manufacturing*."

Kotagiri continues: "Magna now has all the fundamental building blocks to bring EVs to market for startups or established automakers." To strengthen their offer, Magna agreed in December with South Korea's LG ELECTRONICS INC to form a joint venture to produce electric motors, inverters and other electric drive technology.

How long will it be before MAGNA with Magna Steyr decide to offer their own car to the market, rather than building them under contract to OEMs?

Aurora and Uber

UBER'S BRILLIANT IDEA was to create an international taxi company. It followed up with a clever business model based on a platform that can be used by people who need rides to find drivers who can deliver those rides for an agreed price. The platform is then used by the riders to pay and by the drivers to receive payment with UBER retaining a percentage for operating the platform. Investors flocked to the company. Founded in March 2009, it went public in May 2019 with a market cap of $69.9 billion. In January 2021 it was up to $105 billion.

The company is extremely unprofitable profitable because it spends more money than it takes in. It lost $8.5 billion in 2019. Part of its business idea is to undercut traditional taxi charges by 25-30%. It started by taking 25% per ride as its fee, but that is now up to 35% as it attempts to lose less money. Since the drivers pay all the costs for their cars, that extra 10% comes out of their income. Drivers have complained and have also tried to be designated as employees. In California, they managed to push through a ballot initiative in November last year to make their demand a law, but it was defeated by the voters who apparently were worried that their costs would rise.

UBER has made no secret of their desire to reduce to a minimum and eventually eliminate driver costs. The fact that the human drivers were paying all the costs for the vehicles that carried the riders who were paying for the rides seems to have escaped attention. To eliminate driver costs, UBER's management came up with the not-so-brilliant idea to use a large portion of the money that was pouring in from investors to develop its own solution to removing human drivers from the cost side of their business. In 2015, it launched the aptly-named Advanced Technologies Group in Pittsburgh, Pennsylvania, hiring away from CARNEGIE MELLOW UNIVERSITY many of its AI researchers. It did not go all that well. One of its test vehicles ran over and killed a pedestrian in Phoenix, Arizona suburb. The pedestrian was crossing a night-darkened street while the vehicle equipped with its self-driving hardware and software was in self-driving mode, and the person behind the wheel did not react quickly enough to take back control of the vehicle. That was in 2018.

On December 7th 2020, UBER announced that AURORA INNOVATION would acquire ATG.[12] AURORA is reportedly paying £3 billion for ATG while UBER is investing $400 million in AURORA giving it a 26% stake in the company. Dara Khosrowshahi, CEO of UBER, will join AURORA's board. Newspapers reporting on the deal with UBER, including *THE ECONOMIST* (December 12th 2020), describe Aurora as a 'startup'. I wrote about AURORA in the September 2019 issue of *THE DISPATCHER*, so you can refer to that article for more details. It was founded in 2016, so it's a rather old 'startup'. One of its co-founders, Chris Urmson, worked for Google on its self-driving car team from 2009 until 2016 when he left to co-found AURORA. Another co-founder, Drew Bagnell, headed the autonomy and perception team at UBER's ATG. A third co-founder, Sterling Anderson

12. Uber is also selling its *Jump* electric bike division to Lime, and in December it announced that it would sell its *Elevate* flying-car project to a company called Joby Aviation.

worked at TESLA and was involved in the design and launch of the Model X.

Is buying UBER's ATG a good move for AURORA? It's probably better that they keep it out of the hands of an existing or potential competitor. They're both principally in Pittsburgh, so the community, business and institutional ties can be strengthened. Does it help AURORA get a robust driverless product to market more quickly? If UBER's ATG investors, including TOYOTA and DENSO, move smoothly and seamlessly into AURORA's camp, that would be a plus. I see the noise in this deal as UBER's continued involvement with a seat at AURORA's boardroom table.

When It's Time to Call It Quits

U.S. TRANSPORTATION SECRETARY Elaine Chao announced her resignation from then-President Donald Trump's cabinet after terrorist supporters of the president breached the U.S. Capitol on Wednesday, the 6th of January, a day that will live in infamy.[13]

13. Infamy - evil reputation brought about by something grossly criminal, shocking, or brutal (Merriam-Webster).

"Yesterday, our country experienced a traumatic and entirely avoidable event as supporters of the president stormed the Capitol building following a rally he addressed," Chao said in a statement. *"As I'm sure is the case with many of you it has deeply troubled me in a way that I simply cannot set aside."*

Chao's husband is Senator Mitch McConnell and formerly Senate Majority Leader whose life was threatened along with other Senators, Representatives and staff in the Capitol at the time it was invaded. Chao said in her statement that she was resigning as of the 11th of January, and would help her announced successor, former South Bend, Indiana, Mayor Pete Buttigieg, who was nominated by President Joe Biden to be the new U.S. Transportation Secretary.

In another break with the now former President, THE NATIONAL ASSOCIATION OF MANUFACTURERS urged Vice President Mike Pence and the Cabinet to invoke the 25th Amendment and remove Trump from office. Two of the group's members are the ALLIANCE FOR AUTOMOTIVE INNOVATION (which I wrote about in the January issue of The Dispatcher) and the MOTOR AND EQUIPMENT MANUFACTURERS ASSOCIATION.

"This is not law and order. This is chaos. It is mob rule. It is dangerous. This is sedition and should be treated as such," NATIONAL ASSOCIATION OF MANUFACTURERS CEO Jay Timmons said in a statement. *"The outgoing president incited violence in an attempt to retain*

power, and any elected leader defending him is violating their oath to the Constitution and rejecting democracy in favor of anarchy."

U.S. Attorney Matthew Schneider of Michigan, the federal prosecutor who has presided over the UAW corruption cases in Detroit, issued this statement: *"The violent protesters at the U.S. Capitol right now are committing crimes, and they must stop immediately. Our Constitution protects peaceful protests — not this. Just as the violence in our cities this summer was prosecuted, this violence should be treated the same under the law."*

When You Can't Reach Stretch Goals By a Date

MOVE THE DATE. When Håkan Samuelsson was appointed President and Chief Executive Officer of VOLVO CARS in October 2012, VOLVO CARS was on its way to sell a total of 421,951 cars for the year. That was 6% lower than the previous year. Samuelsson was given a stretch goal by his new boss, Li Shufu: Sell 800,000 cars in 2020. He got to 705,000 in 2019. He was never going to make it all the way to 800,000 in 2020 even if COVID-19 had not struck. The total for 2020 came in at 661,713, a reduction of 6.2% on 2019.

The tie clip was a departing gift to me from my boss at Volvo Technology Corporation. The watch was a gift from a great friend. While they are not gold, they are precious to me.

On the plus side, recovering from a crash of 21% during the first six months could be described as almost miraculous. VOLVO sold more cars in the second half of the year than it ever sold during a one-half-year period—ever! So now the goal is back. Sell a total of at least 800,000 in 2021, which would be a 20% increase over 2019. Can it do it? Sales in Europe last year were down 15.5%. The U.S. managed a slight increase, up 1.8%. It was China that pulled it out of the deep hole it was in after the first six months, up 7.5% for the year. The model that sold best overall was the *XC60* with 191,696 cars sold.

VOLVO finished the year on an up note. Global sales in December were up 6% overall, with a 15% increase in the U.S. and 10% in China. Speaking of ending on an up note, Håkan Samuelsson extended his tenure when the company did not make it to the stock market in 2018. His plan was to retire when that milestone was reached. He also said he would stay until the goal of 800,000 was achieved. We hope he is celebrating at this time next year at his retirement party with his glass of champagne and his gold watch for distinguished service.

CES Experience Without the Las Vegas Buzz

CES

The Consumer Electronics Show (now known as CES) was first held in June 1967 in New York City. It was a spinoff from the Chicago Music Show, which, until then, had served as the main event for exhibiting consumer electronics. The event had 17,500 attenders and over 100 exhibitors. Between 1978 and 1994, CES was held twice each year, once in January in Las Vegas (known as the Winter Consumer Electronics Show, and once in June in Chicago, known as the Summer Consumer Electronics Show. In 1998, the show changed to a once-a-year format with Las Vegas as the only venue.

CES showcases companies including manufacturers, developers and suppliers of consumer technology hardware, content, technology delivery systems and more. It also includes a conference program where invited speakers address the industry's issues.

IN THE LEAD-UP to this year's CES (formally known as the Consumer Electronics Show), the question I asked myself was whether such an event that is so heavily dependent on attracting close to 200,000 visitors and nearly 5,000 exhibitors during its four days could be held virtually. Could a series of video presentations live up to the expectations that the owners and producers of CES, the CONSUMER TECHNOLOGY ASSOCIATION, set for themselves? They say about their event:

"CES® is the most influential tech event in the world — the proving ground for breakthrough technologies and global innovators. This is where the world's biggest brands do business and meet new partners, and the sharpest innovators hit the stage."

I agree with their estimation of the importance of their event. During the past ten years it has become the number one place for the automotive industry to show what it is doing in applying advanced electronics to enhancing the driving task and improving driver and passenger comfort with connected services. I recall hearing at the 2009 Show a Mercedes-Benz North America executive who was attending the Show for the first time asking the team from Sindelfingen why M-B did have a presence while its principal competitors, BMW and Audi, were grabbing the limelight. M-B has had a major presence beginning the following year. Coverage on TV, in the printed and digital press has expanded as participation by the automotive industry has increased, and this is not just in trade publications and programs but in the general press as well.

CES organizers decided that CES 2021 would be a full-digital event due to the COVID-19 pandemic. They could have done what the GSMA did with their annual Mobile World Congress (MWC) in Barcelona, which was to move it from its traditional February date to June. That might have given CES a chance to see if the pandemic was tailing off after the winter and spring vaccination program. CES apparently decided that the January date was sacred, so virtual it would be. The show ran from January 11th to 14th.

As an indication of what it means to hold such a major physical 'happening' as a fully-digital experience, it was the second day of this year's CES when I realized I was about to miss the entire Show. There had been nothing in the Swedish media, and nothing about it had shown up on my *NEW YORK TIMES, CNN, BBC or DAGENS INDUSTRI* feeds. I figured I'd better take quick action if I wasn't going to miss it entirely.

This year's show was a combination company presentations, on-line articles and panel discussions. As usual, automotive had its own topic area which included two sub-topics: self-driving cars and vehicle technology. The featured article was titled *Five Ways Self-Driving Vehicles Will Change City Living*. It was a quick read.

There were four so-called 'experience sessions' which were panel discussions lasting 30-40 minutes each. In one of them, *Self-Driving Vehicles Moving Forward: Who Will Set the Rules?*, representatives from the U.S. and UK transport departments shared the virtual stage with Waymo's government policy head and TOYOTA's director of technology and innovation policy. The panels were interesting, but they really did not have a place in what is known as being a futuristic, hype-filled happening. The biggest automotive news was Mercedes-Benz's DIGITAL WORLD PREMIER of its 56" Gorilla Glass MBUX Hyperscreen. I suppose experiencing this first-hand would have been worth the price of travel to Las Vegas.

This is the Mercedes-Benz 56" Gorilla Glass MBUX Hyperscreen.

Is there a future for a virtual CES?

CES is an opportunity to buy and sell. It is a time to inspire others with what you have developed and to be inspired by your competitors. It is a time to renew old friendships and to make new ones. Perhaps there are people who believe that all of this can be done on a Microsoft Teams or Zoom feed. I'm not one of those people. If CES is going to be an on-line event in the future, it is going to have to be something different from what this one was. Company pitches are fine for press conferences at the Show as long as you can visit the booth, see what has been presented for yourself and interrogate the sales people. If all you are getting is what you can see for yourself on the company web site, you don't need to register and pay a fee to participate. As far as the panel discussions are concerned, there are plenty of other virtual venues where one can listen and even participate, including the *SmartDrivingCars Summit* panels. I hope for the sake of the industry and all of us working in it that next year's CES will be back in Las Vegas and it will break attendance records.

Musings of a Dispatcher: The Safety Proposition

Princeton SmartDrivingCars Summit

This Musings was prepared as input to a panel discussion held on the 21st of January 2021 titled The Unique Selling Proposition for Cars with Automated Driver Assistance Systems.

PEOPLE BUY CARS for a great number of reasons, and those reasons have changed with the times over the past 135 years since the first car saw the light of day. Cars have made the journey from nice-to-have conveniences to must-have necessities in many parts of the world. They are the mode that accommodates over 80% of all types of daily trips in the United States. They help to make life more pleasurable and our daily tasks more convenient, but they are also a source of environmental destruction and the cause of injuries and deaths.

Automated driver assistance systems which take over certain driving tasks from the human driver are intended to perform those tasks better and more reliably than the human. These systems have been promoted as the best way to lower the rate of accidents and thereby reduce the numbers of deaths. The table below[14] shows the advanced driver assistance systems being offered today and the reduction in crashes that has resulted from their use.

14. List the automated driver assistance systems with their reduction in deaths/accidents is in *Analysis of the Field Effectiveness of General Motors Production Active Safety and Advanced Headlighting Systems, researched and written by University of Michigan Transportation Research Institute (September 2019). It was sponsored by General Motors.*

Crash Category and Safety System(s)	Percent Reduction in System-Relevent Crash
FRONTAL	
Camera-Based Forward Collision Alert (Camera FCA)	21%
Automatic Emergency Braking (AEB)	46%
FRONT PEDESTRIAN	
Front Pedestrian Braking (FPB)	13%
LANE DEPARTURE	
Lane Departure Warning (LDW)	10%
Lane Keep Assist (LKA) with LDW	20%
LANE CHANGE	
Side Blind Zone Alert (SBZA)	3%
Lane Change Alert (LCA) with SBZA	26%
Rear Camera Mirror (RCM) with LCA & SBZA	37%
BACKING	
Rear Vision Camera (RVC)	21%
Rear Park Assist (RPA, Front & Rear PA or Automatic Park Assist with Steering)	38%
Rear Cross Traffic Alert (RCTA) with RVC	52%
Reverse Automatic Braking (RAB) with RVC, RPA, & RCTA	81%
HEADLIGHTS (Nightime Vulnerable Road Users; versus Halogen)	
HID (High-Intensity Discharge)	21%
Articulating HID	17%
Intellibeam (can be offered with any of the above headlights)	35%

The question today is whether car buyers and car riders are willing to pay for increased safety or whether governments should be doing more to promote vehicle safety features, in the same way that they are providing generous subsidies for buying battery electric vehicles while at the same time greatly increasing the cost of ownership of non-electric vehicles and passing legislation that severely

punishes car manufacturers that do not sell electric vehicles, using the argument that electrification is the only or best way to lower emissions and stop climate change. Are there one or more unique selling propositions for cars with automated driver assistance systems, and if so, what are they?

Why do we buy our cars?

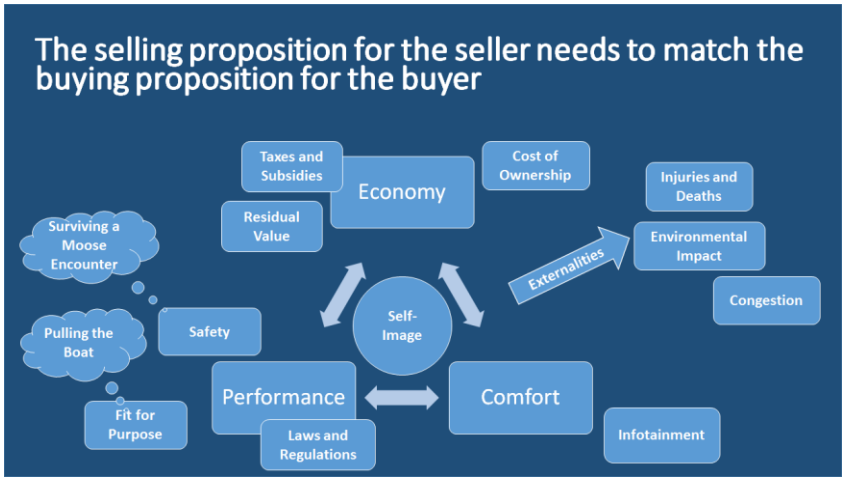
If you live in a country like Sweden where there can be a moose around every bend in any road outside of built-up areas, you want a car that can avoid hitting a moose, and if you do hit one, you want the car to help you survive the crash. If you are in a family car pool, you want a car that carries all the kids and all their gear safely. If you live in a city, you want a car that can get you to your job in the suburbs and then can fit into a tight parking spot when you return home in the evening.

I began working for VOLVO in January 1993. I learned quickly at VOLVO that building safe and affordable cars guided everything the company did. VOLVO started driving cars off cliffs around the time I joined to make its point, and it has been doing so ever since, like the XC40 to the right. Increased vehicle safety began to gain more attention from both governments and consumers in the mid-1990s. EURO NCAP was founded in 1996, and a 5-star rating has become a major selling point for a car. Driver-side air bags were introduced around this time and made mandatory in the US. Car companies and their suppliers understood that governments were going to start regulating for safety, and they started taking the necessary steps to introduce more post-crash safety features into their vehicles, including features like *GM's OnStar* and *Volvo On Call*.

Volvo has driven another car over a cliff to prove that you want to be in one of its cars if this ever happened to you.

The next step was to begin to look at crash mitigation, and this is where advanced driver assistance systems came in. At the beginning of the new Millennium, a group of car companies and suppliers, including my consulting company, founded the *ADAS Interface Specification Forum* to develop map-based advanced driver assistance systems. This was the start of active safety. European eCall started at the same time. Governments were now demanding safer cars and safer roads, and they were helping to offset some of the costs of research to find solutions to these problems, but they were neither subsidizing manufacturers to install the systems nor consumers to buy them, as they are now doing with electrification. In some countries, like Norway, where over 50% of cars sold in 2020 were a form of electric, people cannot afford to buy anything but a BEV or PHEV.

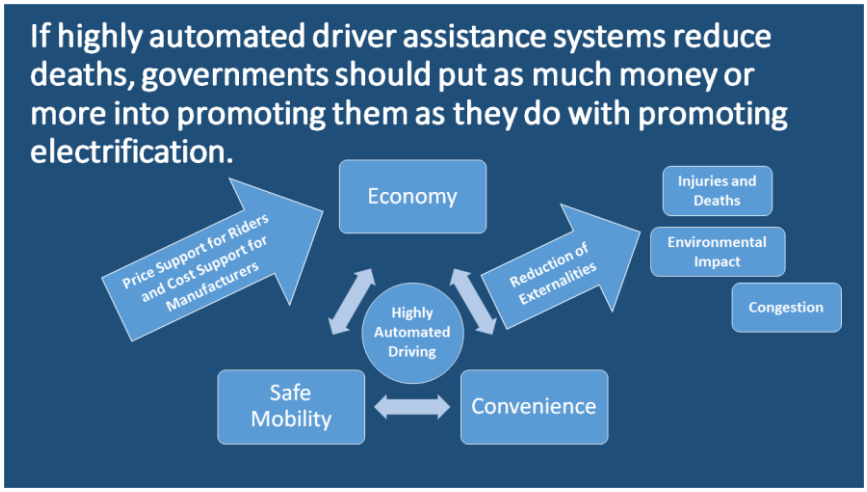
The selling proposition for the manufacturer and seller of cars needs to match the buying proposition for the buyer. It comes down to four factors: Economy, Performance; Comfort; and Image.



What can I buy with the money I have to spend that gives me the most of what I need. If governments, like those in Norway, Germany, Sweden and the U.S. are subsidizing the retail price of electric vehicles and charging a lower annual ownership tax, and then municipal governments are allowing you to park for free and drive on toll roads and across bridges for free, and on top of that, petrol and diesel fuel taxes are raised to sky-high levels, you have a really major disincentive to buy anything but an electric vehicle. But can it pull your camper, survive a crash with a moose, carry all the kids to hockey and skiing practice and have a residual value that is worth anything? Do you really want to put up with the hassles of charging your car? Countries are competing with each other to be a leader in the percentage of new cars sold with electric power trains to address the externality of environmental impacts of motorized vehicles, and they are doing this by financially incentivizing the sale of electric cars and the building of the charging network.

The main promise of highly automated driver assistance systems is that they will increase safety to the point that accidents and deaths on the roads will be a dim memory. They should also provide increased comfort and convenience, reducing the stress of driving on congested city roads and high-speed motorways. The question is whether consumers are willing or able to pay the price for this increased safety and convenience. Does the economic equation work when it is based on the individual's ability and willingness to pay, or should there be incentives, as there are for electrification, to reduce the externalities of driving?

I believe the main problem with selling safety is that you cannot see it until you need it. For the cost unconscious who couldn't care less if the price of diesel fuel is $10 a gallon, who have a Range Rover, Aston Martin and an M-B with a 56" Gorilla Glass MBUX Hyperscreen in the garage for the special trips and a Tesla to drive Emma to pre-school, it's image that matters. "Look at me. I'm clean. I'm doing my part for the climate." Thirty years ago a Chrysler Voyager signalled that you were doing your bit for the local community. How cool will it be when your kid shows up at the entrance to his grade school being chauffeured by a car with no driver. That's already happening in Chandler, Arizona with Waymo taxis.



People who market consumer products, like automobiles, use *motivator factors* to stimulate buyers. *Hygiene factors* must be present in sufficient quantity to prevent dissatisfaction, but they do not serve to motivate a person buy a particular brand or product.[15] Safety is often at the top of the list in consumer surveys as the most important factor when buying a car, but the expectation is that all cars sold by reputable manufacturers are safe. Safety is a hygiene factor. That is one reason sales of VOLVO's did not start to lift until after it started to design cars that got the heart pumping when looking at and driving them.

Governments, not the car OEMs or marketers or consumers, have established the base level of safety hygiene for cars. They've done this through regulation. Governments, not TESLA or marketers or consumers, have popularized electric vehicles. They have done this through economic incentives combined with fuel economy and emissions targets. TESLA would still be in the red if weren't for the fact that other OEMs are paying it millions for emissions credits so that they can avoid paying draconian fines to governments who use the money to dish out incentives to folks who can afford to buy any car they want.[16]

It should not be either/or. Climate change and global warming are real. It is just and proper that governments do as much as possible to encourage us to do our part to stop it. But deaths in car accidents are preventable, and governments can be doing much, much more to incentivize us to build and buy cars that save lives. It is time they do.

15. Frederick Herzberg's Motivational Theory, identified motivation and hygiene factors. His research studied why people strive to achieve 'hygiene' needs and what happens once those needs are satisfied , He found that people are not 'motivated' by addressing 'hygiene' needs, but by motivators, such as achievement, advancement, development, which represent a deeper level of meaning and fulfilment.

16. https://finance.yahoo.com/news/ev-regulatory-credits-why-tesla-113115520.html

About Michael L. Sena

Michael Sena, through his writing, speaking and client work, attempts to bring clarity to an often opaque world of vehicle telematics. He has not just studied the technologies and analyzed the services, he has developed and implemented them. He has shaped visions and followed through to delivering them. What drives him—why he does what he does—is his 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.

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