Volume - Issue
08-10
September 2021

Telematics Industry
Insights by
Michael L. Sena

THE DISPATCHER

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October's Theme: Hubris

A good friend sent me an article that was in the July issue of the FINANCIAL TIMES. He thought I would appreciate reading it. He was right. The title of the article is "Robotaxis: have Google and Amazon backed the wrong technology?" The author, Patrick McGee, a correspondent for the newspaper based in San Francisco, decided that Karl Iagnemma would be his chief source of information. Karl is CEO of MOTIONAL, which is a joint venture between Hyundai and Aptiv that is developing advanced driver assistance systems and working on developing driverless solutions based on ADAS. Karl says this is a bottom-up approach that companies like APTIV, BOSCH, CONTINENTAL and others are pursuing. He compares this with the 'moonshot' path being followed by Waymo, CRUISE, AURORA and companies like AMAZON are backing, which is to go directly for driverless with no other functionality built in.

Chris Urmson, head of AURORA, is quoted in the article as saying in 2015: "Conventional wisdom would say that we'll just take these driver assistance systems and we'll kind of push them and…over time, they'll turn into self-driving cars. Well, that's like me saying that if I work really hard at jumping, one day I'll be able to fly." Karl commented thusly on Urmson's 2015 opinion.:"In 2015, every intelligent observer in the industry believed that (moonshot) was the right path forward."
I guess Karl was either not reading what I was writing in 2015 in these pages, or he did and dismissed me as not being intelligent. Either way, he is now of the opinion that Urmson and his crew will not experience liftoff. It also does not appear that Urmson has done his homework on the subject of flying. THE HITCHHIKER'S GUIDE TO THE GALAXY explains precisely how a human achieves flight. It is by falling and missing the ground. A little more respect for people who have been working on car technology for a very long time and a little less arrogance would go a long way, Chris. Less hubris.

THE DISPATCHER

Telematics Industry Insights by Michael L. Sena
September 2021 – Volume 8, Issue 10

Not So Easy to Pop a Top Hat on a BEV Skateboard

Top Hat

In automotive design, the top hat is one or more vehicle upper body structures that can share a common frame. The upper body could vary from crossover to a sedan or coupe thereby creating economies of scale and product differentiation objects.

Kevin M. Kelly (January 1, 2009). *"Ford: Putting on the Top Hat".* Automotive Design and Production.

1. Market caps of major companies as of 30 June 2021 (billions): Ford - $60.63; GM - $82.71; Stellantis -$60.90; BMW - $68.4; Daimler - $94.78; Toyota - $251.22.

2. HAAH Automotive Holdings tried for seven years to import Chinese vehicles into the U.S. and sell them through a dedicated U.S. dealership network. It gave up on its failed effort in July of this year and filed for bankruptcy. HAAH's business plan consisted of the company purchasing finished vehicles from Chery Automobile Co. through a joint venture and another Chinese automaker, Zotye Automobile Co. and distributing them to U.S. dealers. The dealers would pay HAAH a flat rate for the vehicles depending on the model and trim, then sell the vehicles to consumers at a no-haggle price. Founder and CEO of HAAH, Duke Hale, said the reason the venture failed was the deteriorating trade relationship between China and the U.S., and investor fears that Americans would not purchase Chinese-made cars because of negative sentiment toward China due to COVID-19.

It turns out that a car is not an e-scooter

SUDDENLY, THERE WERE a dozen or more companies, mostly Chinese but also from other far-flung places, claiming to have a ready-for-market battery electric vehicle (BEV). This was, of course, after TESLA had showed the world that it could be done. Even before these new BEVmakers delivered their first car, they were listing themselves on stock markets in China and the U.S. and achieving market capitalization values that were far in excess of established car manufacturers like Ford, GM and Stellantis.[1] Every one of them was the 'next Tesla', or the 'real disrupter'.

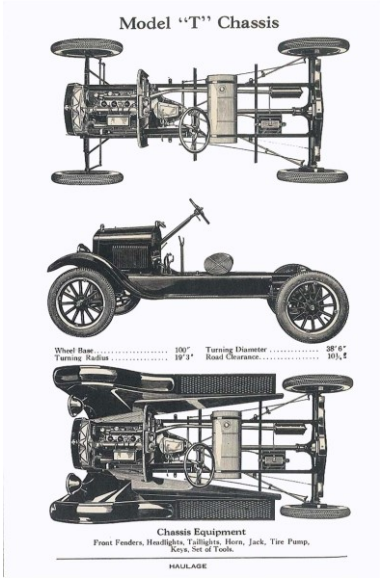
How does a start-up automobile manufacturer have even the remotest of chances of competing with established companies like Toyota, GM, Ford, VW, BMW, Daimler and the dozen-or-so others that have been building and selling cars for decades, have the sales, service and financing infrastructures in place and a loyal band of brand followers? How can newly started companies building cars in China hope to sell their cars in the U.S. and Europe when Chinese companies that have been manufacturing cars for decades have been unable to get their cars approved for sale by the safety certification authorities and have not been able to interest dealers in carrying them?[2] The BEVmakers and their financial backers believed they had discovered the two secrets to success: electric skateboard platforms and the Internet as a sales channel.

In this article, I will explore the skateboard platform theory. For background, I recommend re-reading the March 2020 THE DISPATCHER, which was totally devoted to the impending threat to the U.S. and European vehicle industries by Chinese battery electric vehicle competition. It now seems that the threat is not only to the Western car and truck producers, but to their customers, who will end up with inferior products unless the Western car companies stop giving away half of their value and can convince both the certifying authorities and their customers that a car is not an e-scooter.

Body-on-Frame, Unibody and the Eternal Question

It was when my car mechanic, Fritz, took the body off my 1964 VW Type 1 revealing its chassis that I understood what a flimsy structural foundation these cars had. This was my second Type 1, more commonly known as a Beetle. The first was a '61. When I blew the first one's engine for the second time and took it to Fritz for repair, he explained that it was *kaputt*. I drove out of his shop with the '64 that was now lying in pieces on his workshop floor. Its bodywork (the 'top hat') attached with eighteen bolts to the nearly flat platform chassis which featured a central structural tunnel. This was a classic 'body-on-frame' design.

Body-on-frame was the original method of building automobiles. With it, a separate body (coach) is mounted on a strong, rigid vehicle frame (chassis) that carries the engine and drivetrain (powertrain) and to which the wheels and their suspension, brakes, steering and fuel tank are mounted. It was a carry-over from the days of wagons pulled by horses. In the late 19th century, the first cars' frames were made of wood reinforced by steel plates, just like the wagons they replaced. In the early 20th century, steel ladder frames became the standard, like the FORD Model T in the sidebar. Most manufacturers built the chassis and sent them to a coachbuilder to add the body, interior and upholstery, often to a customer's specific specifications. Those who grew up with U.S. cars are familiar with the *Body by Fisher* plate that was part of every GM car up until the mid-1990s. VW's Type 1 differs little from FORD's Model T.



Body-on-frame had some compelling advantages in the early days. Automakers could just update the sheet metal, add a fin, make the windows larger and, voilà, a new model appeared in

September in the show rooms without having to make major investments in drivetrain or suspension. They were also easier and cheaper to repair. Either the body parts or the frame could be swapped out, depending on what was damaged. One major advantage, and the reason body-on-frame continues to be used for trucks, pickup trucks and large SUVs, is that ladder frame designs are resistant to twisting when subjected to high torque loads.

Unibody construction is the other type of chassis that is used by the automotive industry. The terms 'unibody' and 'unit-body' are short for 'unitized body' or 'unitary construction'. It is defined as a type of body/frame construction in which the body of the vehicle, its floor plan and chassis form a single structure. It is generally lighter and more rigid than a vehicle having a separate frame and body.[3]

3. Unibody is also referred to as *monocoque*, which is defined as a type of vehicle construction in which the body is integral with the chassis.

Unibody designs were first developed by European manufacturers in the late 1920s. The 1934 CITROËN *Traction Avant* pictured right was the world's first car to be mass-produced with front-wheel drive, four-wheel independent suspension and uni-body construction, omitting a separate chassis, and instead using the body of the car itself as its main load-bearing structure. It was not until the 1950s that unibody construction was used by U.S. manufacturers. There is a higher cost for designing and developing the unibody structures, and a higher cost for the specialized machinery that is needed to make the large pressings. But the advantages of unibody over body-on-frame are significant, which is why unibody has become the industry standard except for pickup trucks and large SUVs.

1934 CITROËN Traction Avant

One advantage of unibody is weight savings. Every part of the body is critical to the car's structural integrity so there is no need to add a dedicated frame. Weight savings translate directly into fuel savings. Second, there is the big advantage in passenger

safety. Unibody design makes it much easier to direct crash energy away from the cabin and to incorporate crumple zones. Thirdly, there is much more flexibility in producing unique designs that also provide better use of space for interiors and storage.

Which one is better? Until now, the answer has been easy. If you want your car to be a truck, that is, to tow or haul stuff and to go off-road, you want the advantages that a body-on-frame design provides. If you want a car to drive you and your family around, the improved safety, fuel economy, handling and design flexibility of unibody makes it a better choice. If you want to do both with the same vehicle, then you compromise.

Is There a Difference Between a Chassis and a Platform?

Yes. The term 'platform' does not refer to a specific part of the car. A car 'platform' is a set of shared design and manufacturing elements that can be used in multiple models by changing the body trim and interiors. Cost and time savings are the main reasons for developing a platform comprising the frame, suspension, engine, exhaust and transmission. A platform can be either a body-on-frame or unibody. An example of the former is GM's SUVs, the Chevy Suburban, Cadillac Escalade and GMC Yukon among others, that are all built on the same GMT T1XX platform. VW Group's MQB unibody platform is shared among all Group companies.

Forward to the past with BEV skateboards

There was a sense of *déjà vu* when I saw the TESLA frame for the first time. It took a while for it to come to me. Then I saw my '64 Beetle's frame sitting on Fritz's workshop floor with its body lying next to it. Below is a Model S body hovering above a TESLA chassis.

Body-on-frame was the only choice for TESLA designers unless they wanted to pack all of the batteries into a big box that would

take up the equivalent of a trunk or engine compartment in a unibody design and then to try to wrap a shield around it to keep it from exploding in case of a crash. Those lithium-ion batteries are extremely volatile. They are also very heavy. A Model S tips the scales at 4,647 pounds (2,107 kilograms), and 29% of that weight is in the batteries.[4] Those two battery-related factors, the need to protect them and their weight, led to the body-on-frame 'skateboard' design that prevails today.

Franz von Holzhausen, team leader for the TESLA Model S design, says that the Model S "is really similar to a skateboard. The floor of the vehicle is the battery pack, and the motor is between the rear wheels. Everything else is the opportunity space".[5] It was actually GM in its 2002 concept car, which was the company's dream of a hydrogen-powered car, that seems to hold the honor of skateboard inventor—if you don't count the Model T.

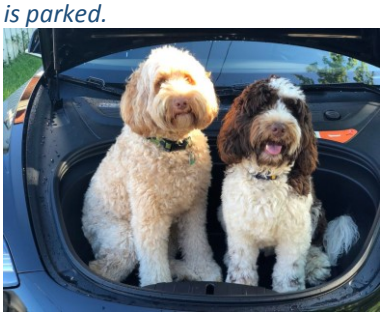
While the 'real' automotive industry sniffed at the old-fashioned frame-on-body design that they had relegated to trucks and heavy SUVs by the time TESLA introduced its concept, TESLA's spin masters were busy, as usual, turning their pig's ear into a silk purse. The necessity of keeping the heavy frame close to the ground, lowering the car's center of gravity so that it would not roll over in tight turns, became a cool feature which then requires another cool feature, auto-raising suspension. ('Cool' is a term TESLA likes.) This allows the low-riding TESLAs to drive around in places like Pittsburgh, San Francisco and Scranton that have very steep hills. The front trunk (*frunk*) highlighted the 'look Ma, no engine' factor that was such fun with Beetles. Then there is the 'Ludicrous Plus' driving mode that takes the occupants to 60 miles per hour in 2.4 seconds—which is hopefully performed on a straight stretch of road with no tree or barrier at the end.

TESLA was so convinced that its body-on-frame battery electric vehicle design was such a throwaway that it opened up its patents to all takers. Starting in 2014, TESLA's patents are open-source, meaning others are able to use and improve them. This was another brilliant Musk move. Lots of fish swimming around in an ocean attract more fisherman than a couple of fish swimming around in an aquarium. For companies that would never be able to compete with unibody design, particularly the Chinese car companies and start-ups everywhere, this was a gift from heaven.

4. For comparison, a Volvo S60 weighs a mere 3527 lbs. (1,600 kgs). A Chevy Silverado pickup weighs 4,520 lbs. (2050 kgs). A Toyota RAV4 ICE is 3,370 lbs. (1,528 kgs).

5. https://cleantechnica.com/2020/06/19/history-of-electric-cars-using-skateboard-platforms/

*Tesla displays its skateboard in its showrooms, promoting their simplicity. Two modest-sized dogs can squeeze into the **frunk**, hopefully just for frunny frotos while the car is parked.*



Business plans rolled in on skateboards

Shanghai-based NIO INC. is an example of a company surfing the BEV wave on a skateboard. It was founded in 2014 by someone who, like Elon Musk, had zero experience in the automobile design, manufacturing and distribution industry. William Li Bin's talent seems to be convincing people to invest money. To-date, NIO has sold 102,800 cars. Initially, it promised "TESLA range at Toyota cost", but that was naïve exuberance. JAC MOTORS, a Chinese state-owned automaker, manufacturers its cars. NIO's plans to build its own cars was dropped in 2019. It went public in 2018 on the New York Stock Exchange raising $1 billion. It has a market capitalization in July 2021 of $76.63, down from a peak of $96.57 in January 2021.

BYTON (NANJING ZHIXING NEW ENERGY VEHICLE TECHNOLOGY DEVELOPMENT CO.) is another Chinese BEV company built on a skateboard. It was founded in 2016 and is currently trying to file for bankruptcy while a creditor tries to block the move in a local court. Its principal investors are TENCENT HOLDINGS, FOXCONN TECHNOLOGY GROUP and Chinese automaker FAW GROUP CORP. FOXCONN had been planning to build the company's M-Byte SUV. Its unique selling point was the dashboard-long display screen.

FARADAY FUTURE lists its headquarters as Los Angeles. It is run by former BYTON CEO Carsten Breitfeld. It was founded in 2014 by Chinese businessman Jia Yueting. Its story is long and its future is uncertain, but on the 22nd of July of this year it got a re-start with a Nasdaq SPAC and $1 billion in new capital. The company's FF 91 crossover that will sell for $180,000 is shown next to its skateboard frame leaning up against a wall.

Faraday Future's FF 01 with skateboard frame.
https://www.cnbc.com/2021/07/22/embattled-ev-start-up-faraday-future-gets-second-act-with-nasdaq-spac-debut.html

All of these companies and many more that I have written about in *THE DISPATCHER* have the same basic concept that is based on the same vehicle design, the electric skateboard. They have spent their investors' money on trying to come up with body designs that have a WOW! effect of a Lamborghini copy or on desperately (and mostly unsuccessfully) trying to add all of the connectivity and ADAS functions that the 'real' car companies have developed and gradually built into their vehicles over decades.

They thought it was gold, but it was only glitter

What the skateboard wonders and their investors are learning is that a skateboard does not an automobile make. TESLA knew this, which is why it gave away its 'secrets'. TESLA's business model was and continues to be based on delivering electric charges (initially

free when on the road), better-than-average range to get to the charging stations and connectivity for infotainment and software updating. It's the parts that have not been part of the skateboard that make a modern automobile modern and deliver all the advantages that drive-by-wire offers.[6] This is the other distinguishing factor separating TESLA from the wannabes. As a vertically integrated car manufacturer, it controls all of the car's components and is able to adapt the parts of the skateboard that need to be adapted to deliver superior drive-by-wire performance. But, more importantly, it is what distinguishes the real car companies from the body-on-skateboarders.

HYUNDAI believed that it was going to be able to deliver electric cars more quickly and at lower prices by using CANOO's *Electric Drive System 2.0* skateboard rolling chassis, developed with ROBERT BOSCH. In February 2020, HYUNDAI and CANOO announced their agreement to cooperate. CANOO, based in Los Angeles, would provide engineering services to help develop a fully scalable, all-electric BEV platform to meet HYUNDAI and KIA specifications.[7]

"We were highly impressed by the speed and efficiency in which CANOO developed their innovative EV architecture, making them the perfect engineering partner for us as we transition to become a frontrunner in the future mobility industry," said Albert Biermann, Head of Research & Development, HYUNDAI MOTOR GROUP at the time of the announcement. "We will collaborate with CANOO engineers to develop a cost-effective HYUNDAI platform concept that is autonomous ready and suitable for mass adoption."

In August 2020, CANOO agreed to a deal to merge with special purpose acquisition company (SPAC) HENNESSY CAPITAL ACQUISITION CORP., with a market valuation of $2.4 billion. That occurred in December 2020. On March 29th, during the first investor call since the SPAC, CANOO's CEO, Ulrich Kranz, was absent from the call, and the company announced earlier in the day that its CFO had resigned to take another job, the second major departure in recent weeks following CANOO losing its head of corporate strategy. The company's board chairman, Tony Aquila, who would soon become the new CEO, announced that the board decided to "de-emphasize" its engineering services. That was effectively the end of the deal with HYUNDAI. In May, the U.S. Securities and Exchange Commission opened an investigation of the company. In June, a CANOO investor hit the electric vehicle maker's board members and executives with a derivative suit, alleging they made false

6. Drive-by-wire is a term that refers to electronic systems that either augment or replace traditional mechanical controls. Instead of using cables or hydraulic pressure to control a vehicle, drive-by-wire technology uses electronic systems to activate brakes, control steering, and power the engine.

7. CANOO started as EVELOZCITY in 2017, founded by former FARADAY FUTURE executives Stefan Krause and Ulrich Kranz. The company rebranded as CANOO in spring 2019 and debuted its first vehicle several months later. It was apparently this first vehicle, as well as CANOO's plan to offer it only as a subscription, that captured the attention of investors, companies and the media.

Canoo's flat skateboard platform developed in-house is at the heart of the company's growth strategy. It was intended to be the base for their own models, but it was intended to offer it to third parties, like Hyundai and Kia. "We wanted to showcase our skateboard's performance and prove that our rolling chassis is a truly self-contained unit with everything needed to drive built inside," said Ulrich Kranz, co-founder of Canoo who left the company in March. He said at the time that this would bring development time for new electric vehicles down to 18-24 months.

statements about its engineering business in connection with its $2.4 billion merger with a blank check company.

Another example of backing away from a skateboard deal is FORD with RIVIAN. In January 2020, FORD's Lincoln brand announced it had chosen to work with RIVIAN and to use RIVIAN's quad-motor skateboard for its new BEV. Half a year earlier, FORD had invested $500 million in the Michigan-based company. AMAZON is also an investor in RIVIAN. In April 2020, FORD canceled the vehicle that was going to use Rivian's skateboard, and since then has not committed to any further use of the frame. In June of this year FORD announced that it would develop a new, dedicated EV architecture that would underpin Explorer and Lincoln Aviators, as well as midsize pickups and rugged SUVs. No mention was made of RIVIAN.

It was great fun, but it was just one of those things

Someone who should know the advantages and shortcomings of BEV skateboards is David Twohig. He was Chief Engineer at ALPINE CARS before being named chief technical officer for BYTON. He became a major evangelist for the skateboard concept, promoting it at conferences and in articles. Then he left BYTON and is now is now an independent automotive engineering consultant. He said in a June 1 2021 article in Automotive News Europe:

"The idea that customers can simply plug their own body on top of someone else's skateboard running chassis is simplistic in the extreme. It would compromise a range of key developmental areas such as crash protection, heating and ventilation, noise vibration, harshness and handling. The biggest hurdle would be integrating modern-day electronics and electrical architectures. It's massively complex and expensive, and most platform-sharing projects usually run into difficulty on the EE architectures, more than on the mechanical side."[8]

In an article David Twohig has written and posted on his own site, he discusses what I have considered to be the main problem with having a company that delivers cars to customers using a major component delivered by a third party, whether those customers are buying or leasing the car or paying for its use: who is responsible when things go wrong.[9] Dividing a car into a frame and a body allows maximum deniability to the two parties, which is always bad for the customer.

Is that annoying rattle in the body, in the frame or in the joint between the two? That joint, whether it is welded, bolted, riveted

8. https://europe.autonews.com/technology/why-its-reality-check-time-ev-skateboard-chassis

9. https://www.linkedin.com/pulse/skateboard-aint-platform-david-twohig?trk=public_profile_article_view

or glued, will be a problem from day one. I lived with the rattles in my AMERICAN MOTORS Jeep Cherokee body-on-frame, and welcomed the comparative silence with my first unibody Volvo 945, but it was AM that owned the squeaks, not an external frame supplier. What about warranty issues that involve a component that is part of the body, even a simple one like the external rear view mirrors? Let's say the spec developed by the body provider requires that the external mirrors fold in when the motor is turned off. If that operation fails, is it the feed from the power supply that is in the skateboard, or is it in the connection from the skateboard to the body, or is it a motor in the mirror?

Twohig gives an example that will be very well understood by anyone who has worked in a car company on the development of a new model. Someone in the company is in charge of delivering the whole vehicle. That person has end-to-end responsibility for every screw, solder joint, light bulb and key fob. It does not matter if a component is manufactured by the 'buck-stops-here' person's company or by a third-party supplier. Now, if 50% of the value of a vehicle is in the frame, and that frame is the responsibility of another person in another company, who's in charge?

This is what is left of a Tesla involved in a head-on collision with another car. Authorities have not released details of the accident other than that one of the occupants of one of the vehicles died and two occupants of one or the other vehicle were severely injured. It took 10,000 liters of water and eight hours to put out the fire in the Tesla. Tesla delivers body and frame, but who would be liable if there were two different suppliers?

Finally, there is the liability issue. Who pays for the recall work? Who pays when a class action suit is won by the plaintiff? From a legal standpoint, the entity that receives the money from the customer for the product owns the problems. That entity can and will turn around and sue the pants off its suppliers, but establishing culpability will be a nightmare. As HYUNDAI and FORD figured out before they got in too deeply with the skateboard-sourcing process, it's better to own the problems from the start rather than trying to figure out who owns them after they have occurred. With all of the quality and performance issues that body-on-frame designs have had, if a company decides to continue to use them, at least they can address the problems quietly in their own workshops.

The story does not end here. While it appears that the third-party skateboard supply model is severely flawed, there is a new order emerging for the auto industry. Tier one suppliers like MAGNA, BOSCH, CONTINENTAL and DENSO have gotten a taste of capturing more value of every sold car. They are girding themselves for what happens next. In the October issue of *THE DISPATCHER*, I will take up the topic of who will be best positioned to build future cars.

Dispatch Central

SOCRATES$^{2.0}$ was begun in October 2017 as a pan-European project that was intended to bring together road authorities, service providers and car manufacturers to set new standards to share and integrate traffic information. The motivation was to enable more effective traffic management and create innovative traffic information and navigation services. SOCRATES$^{2.0}$ also had the ambition to provide the essential building blocks to prepare Europe for the future of self-driving cars.

SOCRATES stands for 'System of Coordinated Roadside and Automotive Services for Traffic Efficiency and Safety'. The '2.0' indicates that it is a second SOCRATES project. The first was 'System Of Cellular Radio for Traffic Efficiency and Safety' which ran in the early 1990s. TANGO (Traffic information And Navigation for Gothenburg) was part of it, and it was in connection with this project that your author, then working for Volvo Technological Development, along with Torbjörn Biding of Vägverket, the city of Göteborg and the Swedish Land Survey worked with European Geographic Technologies to build the first navigable database in Sweden.

SOCRATES$^{2.0}$ submits final report

This is what I wrote for the Socrates$^{2.0}$ Digital Magazine as part of the final review.

There is no question that **SOCRATES$^{2.0}$** has made an extremely significant contribution to the practice of cooperative and integrated traffic management. What is unique about **SOCRATES$^{2.0}$** compared to many multi-country intelligent transport system projects is that it was initiated and has been guided by two insights. The first is the understanding that traffic management as it has been designed and operated by public authorities is not working. Command and control of thousands of independent drivers who are attempting to optimize their individual journeys is a thankless and impossible task. Public authorities have not had the means to reach all drivers with command information, and when information is received by drivers they must feel that what they are receiving will help them achieve their own goal—reaching their destination quickly and efficiently—and that their well-being will not be sacrificed for a greater good. The second insight is the acceptance that making traffic management work is not a matter of developing yet another technical solution, but of finding a way to create a workable method of cooperation between public road authorities who have useful static, temporal and real-time data and private companies manufacturing motorized road transport vehicles and delivering road-related services to those vehicles.

What I feel is the most important contribution that **SOCRATES$^{2.0}$** has made to the field of enabling the flow of motorized transport vehicles on roadways is to redefine the relationship between the road builders and the vehicle builders. They are not adversaries with conflicting objectives. Both are providing the means for people who drive, and who pay for the roads they are using, to achieve their objective of reaching their destinations safely and efficiently. It is only through cooperation between the road and vehicle builders that both the needs of the individual driver can be reconciled with the needs of all drivers, pedestrians, property owners and the environment. Road

authorities, vehicle manufacturers and their service providers are all partners. They have different sources of funding and different 'business models', but their mission is the same: to enable safe, efficient and clean mobility.

The **SOCRATES$^{2.0}$** project team determined that there was not a single approach to how public and private companies can interact. In some cases, it may be sufficient to deliver timely data to service providers about short-term roadworks or the temporary closing of a road. In other cases, service providers and public authorities may want to deliver the same messages on navigation systems and variable message signs. Thirdly, there can be opportunities in which coordinated efforts of data exchange and information processing can lead to more optimum guidance and routing of traffic. Each of these cooperation approaches has different preconditions. Each of these approaches were to the test in four cities and as much information as possible was collected given the extremely difficult restrictions caused by COVID-19 pandemic.

	Exchanged data	Shared view	Coordinated approach
Level of communality	'wave'	'handshake'	'hug'
Main activity	Sharing data	Creating (and using) a common situational picture	Coordinating actions
What is common?	Exchange format	Situational picture	Approach strategy
Data	Standardisation of format	Enrichment of data content	Meaningful and impactful
Typical Scalable	European	National	Regional
SOCRATES2.0 Use cases	Speed and lane information	Roadworks and environmental zones	Optimizing network flow

SOCRATES$^{2.0}$ is an excellent new beginning. There must be a continuation with more vehicle manufacturers and service providers participating.

Germany and France say no to EU Commission

In the *Musings* section of the May 2021 issue of The Dispatcher, I said it would be up to Germany and France to rein in the bureaucrats at the European Commission who see their stint in Brussels as their one chance to achieve notoriety. It is now EU Climate Commissioner, Frans Timmermans, First Vice President of the European Commission and former Minister of Foreign Affairs for The Netherlands, who seeks pre-death beatification for pushing through a total ban within the EU on the selling of vehicles with internal combustion engines after 2035. (See sidebar next page)

Is this Timmermans' chance to get back at the countries that pushed him under the bus and gave 'his' job' to someone who didn't even want it? If so, Germany and France are not going to take it lying down.

According to an article in *12 July Automotive News Europe*, France and Germany are resisting the European Union proposing the phasing out of internal combustion engine (ICE) car sales by 2035. Both countries are advocating for a more lenient target for the end of the decade and allowance for plug-in hybrid models beyond 2035. The French government wants a target to reduce emissions from cars 55% by 2030 from 2021, instead of 65% as proposed by the Commission, an official in President Emmanuel Macron's office said. He commented after President Macron met with top executives at Stellantis and Renault, suppliers Valeo, Faurecia and Plastic Omnium, as well as labor representatives to discuss the transition to electric vehicles.

German Transport Minister Andreas Scheuer also warned the Commission against setting too strict targets for the auto industry. "I believe that all car and truck manufacturers are aware that stricter specifications are coming. But they have to be technically feasible," he told the German press agency DPA. Scheuer said he supported the shift to battery-powered drivetrains for passenger cars as ICE vehicles are phased out. For heavy trucks "there needs to be more focus on hydrogen," he said.

Le Plateforme Automobile (PFA), France's principal lobby group for the French automobile industry, has estimated that roughly 100,000 jobs will be lost in all auto-related industries with the proposed tightening of the regulations. This is because production of electric and fuel cell vehicles is less labor-intensive compared with hybrids and the ICE vehicles. Since France uses comparatively fewer robots in its vehicle industry than Germany, it is more vulnerable to job loss.

Germany and France have found themselves in an unusual position recently, one that has been reserved for Poland and Hungary. Europe's environmental groups have decided that they will use the European court system to force Germany and France to stop favoring their car industries in the same way that Europe's human rights watchdogs are using the same courts to force Poland and Hungary to lighten up on gay rights. The European Union's Court of Justice recently rebuked Germany for "consistently failing to clean up its dirty air in cities from Berlin to Cologne, endangering public health". It stated that "between 2010 and 2016, Germany systematically and persistently exceeded the limited values for nitrogen dioxide". Angela Merkel's deputy leader, Stephan Stracke, struck back by stating that the court's ruling "has been overtaken

It is useful to understand something about the history of **Frans Timmermans** at the European Commission. Between 1987 and 1994, he was in the Dutch Civil Service. In 1994 he became an assistant to European Commissioner Hans Van den Broek for one year and private secretary to the head of the Organization for Security and Co-operation in Europe (OSCE). In 1998, he was elected as a Member of the House of Representatives for the Labour Party. In the 2006 Dutch general election, Labour was part of the government coalition, and Timmermans received his first appointment as a member of government, Undersecretary of Foreign Affairs. He was back to Parliament between 2010 and 2012 when Labour was out, but then returned when Labour came back in. This time he became Minister of Foreign Affairs. He was part of the 2014 Nuclear Security Summit, he made an impassioned speech at the UN Security Council following the downing of Malaysia Airlines Flight 17 by Russia.

In September 2014, the Dutch Government, with Mark Rutte as Prime Minister (NB: Rutte is the leader of the People's Party for Freedom and Democracy, not Labour), sent Timmermans to Brussels to become First Vice President in Jean-Claude Juncker's Commission. He became best known for his outspoken views about Poland's and Hungary's threats to the rule of law and his support for mandatory migrant quotas, which these countries opposed. This turned out to be his undoing in his quest to succeed Juncker as the President of the European Commission.

In October 2018, Frans Timmermans announced his candidacy for the office of President of the European Commission ahead of the 2019 European election. In December 2018, during the Congress of Lisbon, the Party of European Socialists acclaimed him as its candidate. He was formally nominated as the PES Common Candidate in Madrid in February 2019. There were two other candidates, Manfred Weber and Margrethe Vestager. The European Council was about to nominate Timmermans when Eastern Europe said 'No'. So the Council nominated someone who was not even a candidate, Ursala von der Leyen, and there we are.

by reality," and that Germany had achieved "a massive improvement in air quality in recent years". He went further, saying that Germany's policy was a great success that was achieved "without blanket driving bans, but with incentives for low-emissions vehicles, technical innovation and through retrofitting of local public transport".

French and German votes will be needed for any new regulations to be approved, just as the votes of Hungary and Poland are needed for proposed regulations on human rights. Germany and France will not allow their economies to be damaged, even in the name of the climate. We shall see how this battle develops.

Bits and pieces

Panasonic sold all its shares in Tesla

In 2010, PANASONIC CORP. bought 1.4 million TESLA shares at $21.15 per share, making it an investment worth around $30 million. This was at a time when TESLA needed both investment and a battery supplier. Both were in short supply back then for TESLA. It hasn't been a totally smooth ride. TESLA has done to PANASONIC what it has done to its other suppliers, pushed them on price and started to build its own, in-house capabilities. As a lead-up to the Model 3, TESLA and PANASONIC partnered on Gigafactory 1 in Nevada where PANASONIC produces the battery cells that TESLA assembles into battery packs, both at the same location.

The factory became the largest lithium-ion battery factory in the world. However, TESLA complained that PANASONIC was not producing enough battery cells to meet demand for the Model 3. PANASONIC's board began to see the relationship as one-sided, with PANASONIC giving and TESLA taking. PANASONIC wanted to see a larger return on the $1.6 billion investment in the Gigafactory. A major culture clash between Musk's "nano management" style and the Japanese-style consensus approach and his free-wheeling, social media communication versus face-to-face discussion method soured the relationship. Apparently, Musk's only friend at PANASONIC is the CEO, Kazuhiro Tsuga.

PANASONIC CORP. decided that now was a good time to sell its entire stake in TESLA as of March 2021. Just one year before, those shares were worth $730. In March 2021, they were worth $3.6 billion. Not a bad return over eleven years.

"The impact of crypto assets may have pushed TESLA's share price above its intrinsic value, making it a good time to sell," said Hideki Yasuda, an analyst at ACE RESEARCH INSTITUTE.

PANASONIC says that the stake sale will not affect the partnership with TESLA. It signed a major agreement with TESLA just a year ago that runs into 2022. But both companies are exploring new relationships. TESLA has struck deals with South Korea's LG ENERGY SOLUTION, a unit of LG CHEM, and China's CATL. CATL is planning a plant in Shanghai near the automaker's production base. PANASONIC has created a battery partnership with Toyota.

Rather than a partnership in which one of the partners is a major investor, the relationship will move to a buyer/supplier one. If a wall with a door that has locks on both sides has not already been installed between the respective company's teams at the Gigafactory 1 plant, it probably will be up soon.

ISA: Map Data or cameras for speed limits – Neither good enough

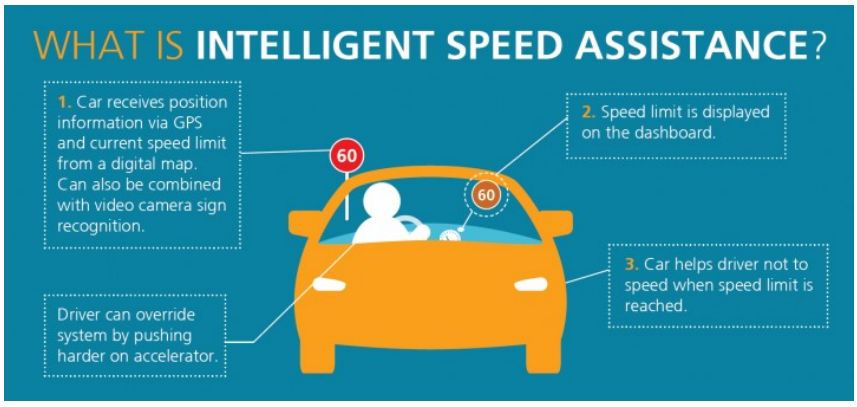
The *EUROPEAN TRANSPORT SAFETY COUNCIL* claims that "by next year, the European Union will have, by far, the most stringent vehicle safety standards in the world". The occasion for the claim was the announcement in May of the informal green light given to Intelligent Speed Adaptation (ISA) by the EU Member States. In addition to ISA, the EU will have mandatory Advanced Emergency Braking (AEB), Emergency Lane Keeping Assist (ELKS), drowsiness and distraction recognition. By 2024 every new car sold in the EU will need to be fitted with these technologies. Although final legislation has not been approved, acceptance by the Member States assures that it will be. The legislation makes ISA mandatory for all new vehicles starting in 2022, and mandatory for all existing carlines as of 2024. The legislation applies to all European cars, vans, trucks and buses (M and N categories).

ISA is part of the EU's vehicle safety regulation, known as the general safety regulation, that was passed in 2019.[10] For the past two years, detailed technical specifications were being finalized in consultation with all affected parties, including the car manufacturers. The technical proposal that was being strongly pushed by the Commission was one in which the engine power is cut once the vehicle reaches the legal speed limit. With this solution, an override would be allowed with the driver applying pressure to the accelerator pedal. This was not acceptable to the industry. Instead, they requested that the system simply provide an audible warning that starts a few moments after the vehicle exceeds the speed limit and continues to sound for a maximum of five seconds. This is what is being implemented, but advocates of the more stringent are not giving up. The draft requirements include a clause stating that carmakers will have to report aggregate,

10. New General Safety Regulation (EU) 2019/2144.

anonymous data on how ISA systems are being used, and if they are being switched off by drivers. Two years after the regulation comes into effect, an evaluation will be made by the Commission to determine which systems are most effective.

The system is only as good as the correct knowledge of the actual speed limits. There are three methods that are accepted. One is to use cameras to identify speed limits through traffic sign recog-



nition. The other is to depend solely on digital maps which reference the vehicle's position with the help of GNSS to the on-board digital map that contains the legal speed limits. The third method is to combine both, which is not specified but is not prohibited.

Both cameras and maps have their problems. Cameras have limited range, can be blinded by heavy rain or snow, and perform poorly when needing to recognize conditional and variable speed limits, such as speed limits for specific weather conditions or vehicle types. A camera system arriving in Sweden that is not familiar with the country's eccentric signage will have difficulty with the example to the right. 70 is the legal speed and 30 is recommended. This is a dirt road that dead ends at a farm. It is used as a walking path by those who live in the vicinity, like your editor. 70 is definitely too high a speed.

Digital maps can see when cameras cannot in all conditions, and they beyond camera range. But the data has to be accurate at all times. Some areas in the vicinity of beaches or camping areas change speed limits during summer months. It doesn't matter what the speed limit was yesterday when the change is made. Companies like TomTom and Here crowdsource speed limit and other data, but one of the crowd had to be there and taken the ticket so that the others could be safe. How fair is that?

Responsible road authorities know exactly what the speed limits are on every road at every time of year, exactly when they change

if they are seasonal and which ones are recommended only. This is the data that should be used in systems. Forget unreliable camera-based systems and crowdsourcing. If the EU Commission was doing its job properly, it would have delivered requirements making it mandatory for all countries to provide accurate speed limit data on all roads before the regulations came into force, and ensured that there were processes in place to deliver constant updates to the companies supplying data to the on-board ISA systems. **This is such a no-brainer that it boggles the mind that it has not even been mentioned**.

Some interesting statistics on world energy and BEVs

I could devote entire issues to energy and climate with material I am sent by Professor Fred Dryer, Professor Emeritus of Princeton University, where he was engaged in combustion research for more than fifty years. I have chosen the latest edition of the BP Statistical Review of World Energy, with data through 2020, where there are many interesting facts and one extremely interesting chart. Here are some of the report's highlights for 2020:[11]

1. Primary energy consumption fell by 4.5% in 2020. This was the largest decline since 1945. By country, the US, India, and Russia contributed the largest declines in energy consumption. China posted the largest increase (2.1%), one of only a handful of countries where energy demand grew last year.

2. Carbon emissions from energy use fell by 6.3%, to their lowest level since 2011. As with primary energy, this was the largest decline since the end of World War II.

3. Oil consumption fell by a record 9.1 million barrels per day (b/d), or 9.3%, to its lowest level since 2011. Oil demand fell most in the US (-2.3 million b/d), the EU (-1.5 million b/d), and India (-480,000 b/d). China was virtually the only country where consumption increased (220,000 b/d).

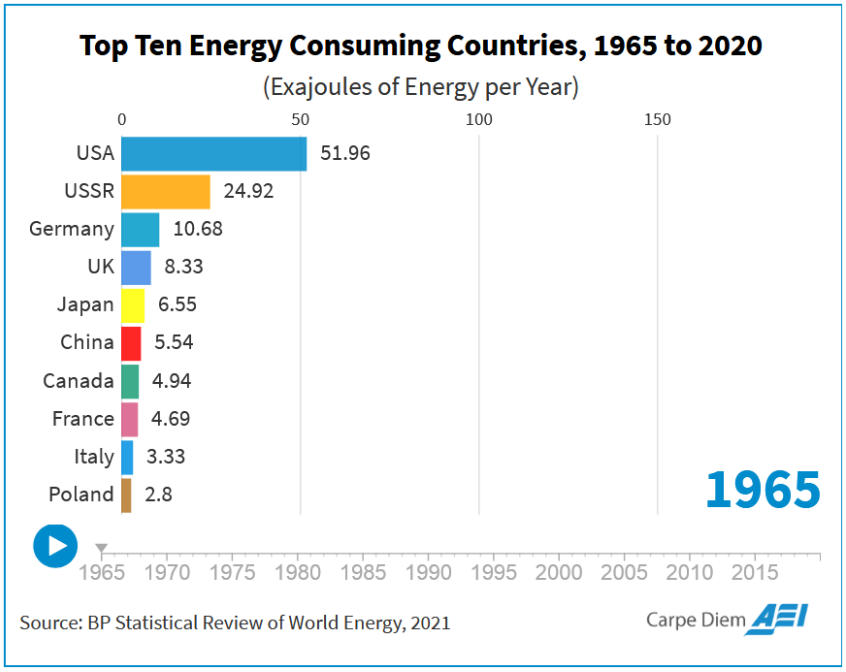
4. Natural gas consumption fell by 81 billion cubic meters (bcm), or 2.3%. Nevertheless, the share of gas in primary energy continued to rise, reaching a record high of 24.7%.

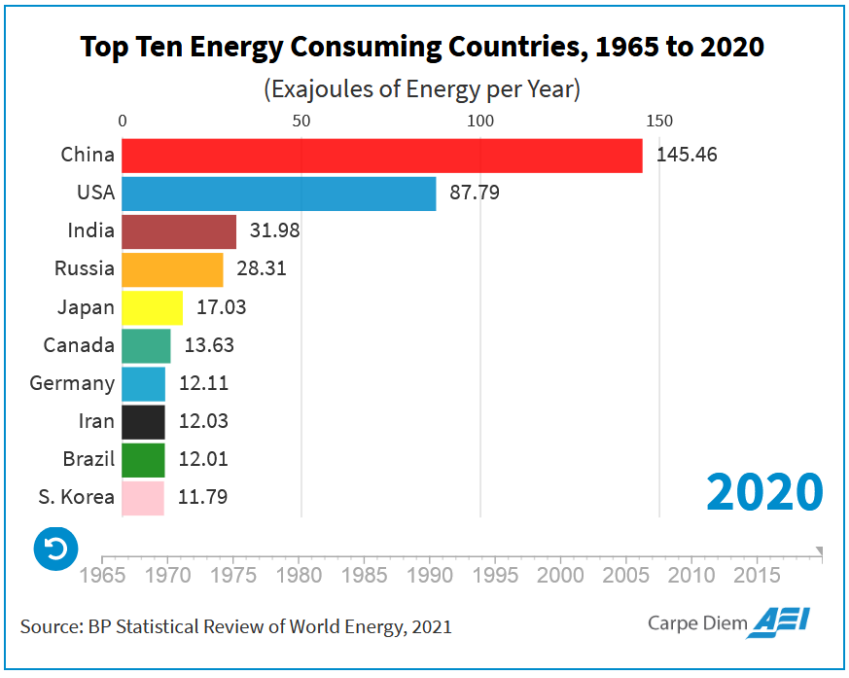
5. Coal consumption fell by 6.2 exajoules (EJ), or 4.2%, led by declines in the US (-2.1 EJ) and India (-1.1 EJ), with OECD coal consumption falling to its lowest level in our data series back to 1965.

11. https://www.aei.org/carpe-diem/some-chart-and-commentary-based-on-bps-annual-report-on-world-energy-statistics/

6. Renewable energy (including biofuels but excluding hydro) rose by 9.7%, slower than the 10-year average (13.4% p.a.) but the increment in energy terms (2.9 EJ) was similar to increases seen in 2017, 2018, and 2019.

Here is a chart that was produced with data from the BP report. Note that the chart was created by *Carpe Diem*, which is a blog written by Mark J. Perry of the AMERICAN ENTERPRISE INSTITUTE (AEI). AEI has been accused of being a climate change denier. It has denied the charge. It doesn't matter. The data in the chart is factual. Here are two clips, the first from 1965 and the second from 2020. Click on the URL to the right to see the change year-by-year.





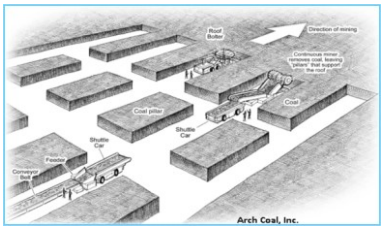
As you see, in 1965, the U.S. consumed twice as much energy as the country in second place, the Soviet Union, which consumed twice as much as the country in third place, Germany. China was in sixth place, just after Japan. By 2020, China consumed 70% more than the U.S. and more than the combined total of the eight others in the top-ten list. France, Italy, the UK and Poland were not even among the top ten in 2020.

Flooded coal mines could heat homes

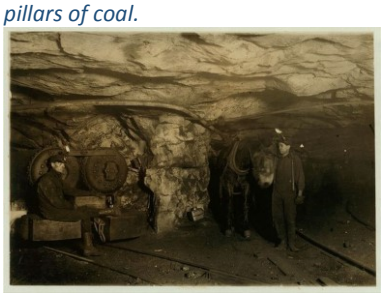
The street in Scranton, PA where my father lived for most of his life and where I spent the first fourteen years of mine was built over fourteen seams of anthracite coal that was extracted using the room-and-pillar tunnel mining method. The theory is that enough coal is left in one seam as pillars to support the ground above, and there is enough distance vertically between the rooms where the coal is removed to support the equipment needed to mine and haul out the coal. Tunnel mining is more practical than surface or strip mining when the coal seams are deeper than one hundred feet.

There are many challenges to mining coal, but the major one for tunnel mining is keeping the mines clear of water. Mine flooding was constant due to both groundwater and seepage of runoff. In order to reach the coal, the water had to be pumped out. In 1712, Thomas Newcomen invented the first steam engine to remove water from mines in a quicker and more effective manner. Government reports in the U.S. showed how much of an impact flooding had on the cost of mining. In 1920 it was estimated that for each ton of coal mined, eight tons of water had to be pumped out. By 1950, it was 27 tons of water per each ton of coal. With the increasing competition from oil and gas, the cost of pumping out the mines to extract the coal far outweighed the price of the coal being mined. That is the principal reason coal mines were abandoned. By the early 1950s, anywhere from one third to two thirds of the mines were abandoned. From 1950 to 1955, the number employed in Northeastern Pennsylvania's coal region's mines fell nearly in half, from 75,231 to 37,397.

When the mines were abandoned, most of the seams filled with water, forming subterranean pools. Above the ground water level, the seams that were not flooded became the object of robber miners, who took the pillars and replaced them with timber. These timber supports eventually rotted and caused the ceilings in the tunnels to collapse, creating chain reactions up to the surface and resulting in surface subsidence. That's what happened



The rooms are the spaces between the pillars of coal.



The actual dimension of the pillars was much smaller than the ideal shown in the top diagram. They were more like columns.

When the pillars as well as coal in the roof were removed by coal robbers after the mines were abandoned, timber pillars were placed in for support. These supports were never intended to be permanent. Their purpose was to keep the roof from falling on the robbers while they worked.

to our street and many others in places where coal was tunnel mined, but those large pools of water are still left down there, and that's what this article is about. Its inspiration was an article in BBC Future.[12]

In Great Britain, one quarter of all homes have been built over abandoned coal mines, according to the UK Coal Authority. Nine out of ten of Britain's largest urban centers are above areas of former coal mining activity. The water that has filled these mines after they were abandoned is naturally warmed. A fellow by the name of Adam Black, who had a day job keeping a bottling company's buildings heated and cooled, also had an interest in renewable energy. He figured it was worth a try to see if the four seams of flooded coal mines under one of the company's large wine storage warehouses could be used. He called in a few geothermal experts from Iceland, a place that has plenty of experience with geothermal heating, and they found that the water was a 15C (59F). With supplemental warmth from an electric heat pump, the mine water provided a perfect source of energy for keeping the warehouse at the right temperature.

Based on this successful pilot project, the UK Coal Authority is now looking into the feasibility of around seventy mine water heating projects in the country's coal mining regions. Mine water heating would generate only 25% of carbon emissions compared to natural gas, which supplies 70% of Britain's heat and do it for 10% less cost, estimates the Coal Authority.

The UK is neither alone nor first in using mine water as an energy source. Today, across the North Sea in the south east part of The Netherlands that was once the country's coal mining center, a full-scale mine water heating and cooling project has been implemented for residences and businesses. It is run by Mijnwater BV.[13] There are similar success stories in Nova Scotia, Canada and the Asturias region of northern Spain. Undoubtedly, there are more.

12. https://www.bbc.com/future/article/20210706-how-flooded-coal-mines-could-heat-homes

13. Mijnwater BV, the scheme's operator, has connected 500 houses and commercial facilities, serving over 250,000 square meters (2.7 million square feet) of building space to the town's district heating network. The system distributes locally generated heat to a nearby community, in a similar way to the one planned at Seaham, reducing the area's carbon emissions from heating by almost two-thirds. Mijnwater is working to further decarbonize its operation, with plans for solar and wind resources to power the electrical heat pumps that supplement the mine water's temperature.

Taking Back Control of the Vehicle from the Robot

If robots are so smart, why aren't they making us?
Editor, THE DISPATCHER

Fail-safe response must be designed in

Humans and computers both have their strong points. Humans work well when uncertainty is at its highest, applying their knowledge and expertise to solving complex problems. Computers excel when uncertainty is at its lowest with rules-based operation and well-defined skills. Driving a vehicle involves both routine skills and snap judgments. For driverless cars to work safely, they must be designed to seamlessly transfer control back and forth between computers and humans.

FROM THE FIRST time you ease yourself into the driver's seat to start the lessons that will lead to your driver's license, you are told to keep your hands on the wheel and your eyes on the road. You are also told to keep the car at a controllable speed and be prepared to bring it to a stop at all times. My father, who was my driving teacher, taught me how to handle the car on icy roads: *"Pump the brake. Steer into the direction of a slide. Don't panic."* What I learned about driving on ice went out the window when I bought my first car with ABS, a 1988 Saab 9000.[14]

"What's ABS?" I asked the dealer when he had finished telling me how to turn on the radio and adjust the air conditioning. He wasn't exactly sure, but we found the page in the owner's manual that explained how it worked. There were plenty of icy winter roads in Massachusetts around that time. I kept pumping the brakes and steering into slides when I was around other cars, but when I was on my own I tried out the "Press down hard on the brakes and keep the car moving straight ahead" method described in the owner's manual. In 1994, after my wife and I had moved to Sweden, another place with plenty of icy winter roads, it was time for me to start my driver's test process. It began with a few hours on an ice driving course. The cars we drove had a switch which turned on and off ABS, so we got to show our stuff with both. The young Swedish kids who had been trained in school did fine, but the other immigrants, mostly from places where there are no icy winter roads, spent the majority of their time sideswiping the hay bales along the track when ABS was

14. Anti-lock Braking System (ABS) is a safety anti-skid braking system used on cars, motorcycles, trucks and buses. ABS operates by preventing the wheels from locking up during braking, thereby maintaining tractive contact with the road surface and allowing the driver to maintain more control over the vehicle.

Symbol for ABS

turned off, and couldn't seem to get the hang of steering and braking at the same time with ABS on.

For many, ABS was their second experience with driver assistance systems. Cruise control was first. Ralph Teetor, a mechanical engineer and inventor, who also happened to be blind, invented cruise control in 1948. The story he tells is that he tired of his driver regulating his driving speed according to whether he was talking or listening. Once set by the driver, cruise control keeps a constant speed until the accelerator or brake pedal is pushed. Some of us use cruise control to keep from getting a ticket in areas where we know there are speed traps or speed cameras. Others, like Mr. Teetor, use it to experience a more comfortable ride.[15]

15. In 1945, after ten years of tinkering, Ralph Teetor received his first patent on a speed control device. He was president of the automotive parts manufacturer THE PERFECT CIRCLE CO. Early names for his invention included "Controlmatic", "Touchomatic", "Pressomatic" and "Speedostat", with "Speedostat" becoming the trademark name. The common name became "Cruise Control". THE PERFECT CIRCLE device wasn't used commercially until CHRYSLER introduced it in 1958.

Lane keeping and blind spot detection systems are more recent developments. I experienced both while working with VOLVO CARS on the introduction of *Volvo On Call* in markets around the globe. A *Volvo XC60* introduced me to the first VOLVO lane keeping system while I was driving on narrow, two-lane, winding roads in Poland. I turned it on just to see how it worked. With beeps and seat vibrations, the system told me that I had touched the center or road edge line. I felt like I was a laboratory mouse being given electric shocks for entering the wrong path in a maze. I turned it off after several minutes.

Let me give you just a little more help along the way

Adaptive Cruise Control (also known as Dynamic, Active or Autonomous CC, as well as by OEM-specific names such as Distance Pilot, Distronic, Distance Assist and many more) was a step up from basic cruise control.[16] Adaptive Cruise Control (ACC) allows the driver to set a speed and a distance to a car in front. Instead of just keeping a constant speed, ACC adjusts the vehicle's throttle to keep a constant distance behind the car in front using sensors. If the car in front slows down, the vehicle slows down to maintain the set distance until you put the vehicle into a passing lane. Once in the passing lane, the vehicle disconnects the distance variable and automatically speeds up to the set speed to pass the car. Neither basic cruise control nor adaptive cruise control involve any road data or associated attributes.

16. In 1991, MITSUBISHI MOTORS installed a LIDAR system in its *Debonair* model, but it was just a rudimentary warning system and did not regulate speed. Four years later MITSUBISHI became the first OEM to offer an Adaptive Cruise Control (ACC) system after equipping its 1995 *Diamante* sedan with a Preview Distance Control system, which introduced LIDAR in the front bumper and a miniature camera mounted in the rear-view mirror. It was able to sense when the distance to the vehicle ahead was closing and would automatically ease off the accelerator or make the transmission downshift to slow the car. Its limitation, however, was that it could not operate the brakes, so when the speed difference with the vehicle in front was too great, it had to resort to alerting the driver with audible and visual warnings.

My first experience with ACC was this year when I had a loaner Toyota Corolla Hybrid over a weekend. We drove to Stockholm, first on a two-lane undivided road with lots of speed cameras, and then on a motorway. I was sold on it after that one drive. It did all the work I normally had to do, removing those slightly irritating

moments when you approach a car from behind that is moving more slowly than your set speed and when you cannot move into a passing lane because of the left lane cruisers.

Climbing the ladder to fully driverless

Early driver assistance systems fully engaged the driver. With basic cruise control, which is still the standard offering on most series production vehicles (SPVs), the driver needs to stay alert so that he does not slam into the rear of a vehicle ahead that is moving at a slower speed. Adaptive cruise control provides an added degree of freedom, but the driver is still responsible for engaging, steering and disengaging the system—and applying the brakes when necessary. Automatic Lane Keeping Systems (ALKS) are a combination of ACC and a hands-off version of lane keeping. I wrote about ALK systems in the April 2021 issue of *THE DISPATCHER* and the UNECE Regulation, UN R157, which establishes a set of uniform requirements that can be used for type approving or the equivalent

As I wrote in the April issue, "to be certified as an ALKS, the system, once activated, must perform the driving task instead of the driver. That means it should manage all situations, including failures, and it must not endanger the safety of the vehicle occupants or any road users. Above all, it must comply with all traffic rules. It is the manufacturer's responsibility to take measures to guard against 'reasonably foreseeable misuse' by the driver and tampering of the the system. Most importantly, it must be possible for the driver to take back control of the vehicle **at any time**."[17] TESLA would claim that its Autopilot system is an ALKS, but it would not be certified as such because it does not apply most of the requirements.[18]

Predictive Cruise Control (PCC) ratchets things up a notch. While there is no one-size-fits-all definition of PCC, the main difference with ALKS is that PCC is intended to extend perception beyond the immediate visible environment. Predictive Cruise Control uses a combination of geographic data, positioning algorithms, multiple sensors and specialized software. The vehicle 'knows' where it is and is 'aware' of what is coming up within an established and selectable distance, called the *Electronic Horizon*. At a minimum, the exact geometry of the road, highway interchanges, intersection and roundabout locations are included in the *Electronic Horizon* to prevent accidents from occurring due to a mismatch between the speed of the vehicle and the road geometry. More complex PCC applications require more data, such as the location of traffic

17. https://unece.org/DAM/trans/doc/2019/wp29/ECE-TRANS-WP29-2019-34-rev.1e.pdf

18. UN R157 states in its definition that ALKS "can be activated under certain conditions on roads where pedestrians and cyclists are prohibited and which, by design, are equipped with a physical separation that divides the traffic moving in opposite directions and prevent traffic from cutting across the path of the vehicle." The Regulation also specifies 60 kph as the operational speed limit.

lights and stop signs, posted speed limits and other rules of the road. These data are all included in the *Electronic Horizon* that is used by the vehicle's control systems to regulate the speed of the vehicle.

At present, UN R157 is the only set of guidelines that could be used to regulate driverless vehicles on public roads. It is gradually being incorporated into the laws of the roads in those countries that have adopted the type approval process, of which the U.S. is not one. Those tests that are being performed in Chandler, AZ and in other places by Waymo and other companies where there is no one behind the wheel of the vehicle are being conducted with the acceptance of the local or state authorities. They are exceptions to the laws that are on the books. TESLA is getting around the rules by claiming that its system cannot be used in a hands-off manner, even though it promotes such use and aggressively defends the performance of its Autopilot system even when using it in a hands-off manner results in accidents and deaths. These companies with the help of the state and local authorities break the rules that were established by the United Nations as the *UNECE Convention on Road Traffic done at Vienna on 8 November 1968*. The rules have been applied in most countries. Of most interest is Article 8 of the *Convention*, which states that "every moving vehicle or combination of vehicles shall have a driver, every driver shall possess the necessary physical and mental ability and be in a fit physical and mental condition to drive, shall possess the knowledge and skill necessary for driving the vehicle, and shall at all times be able to control his vehicle."[19]

19. https://unece.org/fileadmin/DAM/trans/conventn/crt1968e.pdf

So, on the one hand, we have international regulations that state there must be a driver in control; on the other hand, we have companies that are developing vehicles that can be driven without a driver, and their vehicles are doing so with both the explicit and tacit approval of the same authorities that have accepted the international rules of the road regulations. Finally, we have the UNECE attempting to create a standard set of requirements that can be applied for the most rudimentary form of driverless vehicles, but which specify in its first regulation for ALKS that a human must be able to take back control of the vehicle when necessary.

It is the moment when the driver must take back control of the vehicle that is the main problem for moving to fully driverless vehicles. Aren't there other areas of transport where these issues

have already been addressed, where there are computers controlling the ship or plane or train or missile? As it turns out, there are.

The Musketeer didn't invent autopilot either

Land-based vehicles have arrived late to the driverless vehicle party. The airplane 'autopilot' system was invented in 1912 by Lawrence Sperry, an American, who was the son of inventor Elmer Sperry, founder of SPERRY CORPORATION. Lawrence connected the gyroscopic heading indicator, which was invented by his father and was the basis of SPERRY CORP., to hydraulically-operated elevators and a rudder on a small bi-plane. This allowed the plane to be flown straight and level on a compass course without the pilot's engagement. ***Sperry named his invention 'autopilot'***. It later became known popularly as 'George', as in "We'll let George fly for a while." Improvements were added to the basic design over the years. Radio-navigation aids allowed planes to be flown at night and in bad weather. The first transatlantic flight with autopilot, including takeoff and landing, was made in 1947 with a U.S. Air Force C-53.

Autopilot in today's complex aircraft control roll, pitch and yaw and divide the flight into taxi, takeoff, climb, cruise, descent, approach and landing phases. The critical phases are taxi, takeoff and landing, and for these, control of the plane is in the hands of one of the two pilots in the cockpit while the other handles communications. Installation of autopilot in planes with more than twenty seats is generally mandatory to meet international aviation regulations. Turning it on is a must above 28,000 feet because of the *Reduced Vertical Separation Minimum Rule*, the rule that allows planes to fly with just 1,000 feet of separation above that height.

Instrument-aided landings are defined in a set of categories by the *INTERNATIONAL CIVIL AVIATION ORGANIZATION* (ICAO). The categories are dependent upon the required visibility level and the degree to which the landing can be conducted automatically without input by the pilot. There are three levels of flight control systems in the landing phase. In a fail-passive flight control system, in the event of failure (and when there is no significant out-of-trim condition or deviation of flight path or attitude, but the landing is not completed automatically) the pilot assumes control of the plane after failure. In a fail-operational flight control systems, in the event of failure below 'alert height', the approach and landing can completed automatically, without pilot intervention.

GIVE ME CONTROL, COMPUTER!

SECOND BY SECOND *the image of the missiles on the screen grew larger. They had swung round now on to a direct homing course so that all that could be seen of them was the warheads, head-on.*

"Computer, what evasive action can we take?" shouted Zaphod.

"Er, none, I'm afraid, guys," said the computer. "There seems to be something jamming my guidance systems," explained the computer brightly." Impact minus forty-five seconds. Please call me Eddie if it will help you to relax."

"Right!" said Zaphod. "Er…we've got to get manual control of this ship."

"Can you fly her? Asked Ford pleasantly.

"No, can you?"

"No."

"Trillian, can you?"

"No."

"Fine," said Zaphod, relaxing. "We'll do it together."

"I can't either," said Arthur, who felt it was time he began to assert himself.

"I'd guess that," said Zaphod. "Okay, computer, I want full manual control now."

"You got it," said the computer. "Good luck, guys. Impact minus thirty seconds."

The ship suddenly dropped out of the sky like stone.

"Impact minus twenty seconds, guys," said the computer.

""Then turn the bloody engines back on!" bawled Zaphod.

"Oh, sure thing, guys," said the computer. With a subtle roar the engines cut back in, the ship smoothly flattened out of its dive and headed back toward the missiles again.

The computer started to sing.

"When you walk through the storm…" it whined nasally, "hold your head up high…"

The two missiles loomed massively on the screens as they thundered toward the ship.

"And don't be afraid of the dark!"

That's when they reached for the Improbability Drive.

The Hitchhiker's Guide to the Galaxy

Autopilots on ships don't replace human operators

The *J.A. Moffet*, a STANDARD OIL tanker, became the first ship to use autopilot in 1920. It was a simple course holding system. Today's systems learn the characteristics of the vessel in order to minimize rudder movement which reduces drag on the vessel, increases speed and lowers fuel consumption. The steering systems include two independent electrical and/or hydraulic systems that work in concert in the event of a major failure. If they both fail, there is a third back-up called the Trick Wheel. This is located close to the rudder and is used to bypass steering from the helm.

Autopilot systems on ships are not mandatory, according to the *International Convention for the Safety of Life at Sea* (*SOLAS*).[20] When they are used, humans must always be ready to take control. There are autonomous steering systems for uncrewed ships that are being developed, but even these vessels must be constantly monitored and sometimes controlled on demand by land-based crews of professional who are ready to take over in case of need. According to a group developing autonomous ship piloting systems, VTT Finland, maritime accidents related to automated navigation with autopilots have often been the result of human operators not intereacting closely enough with their smart technogies on board.[21]

When you're not supposed to touch the controls

There are vehicles that are designed for being controlled and driven completely by a computer. Mary "Missy" Cummings, Ph.D. knows quite a bit about them. She is a former U.S. Naval officer and military pilot from 1988 to 1999, and was one of the Navy's first female fighter pilots. Today, she is a Professor in the DUKE UNIVERSITY *Pratt School of Engineering*, the *Duke Institute of Brain Sciences*, and is the director of the *Humans and Autonomy Laboratory and Duke Robotics*. Her research includes human-unmanned vehicle interaction, human-autonomous system collaboration, human-systems engineering, public policy implications of unmanned vehicles, and the ethical and social impact of technology.

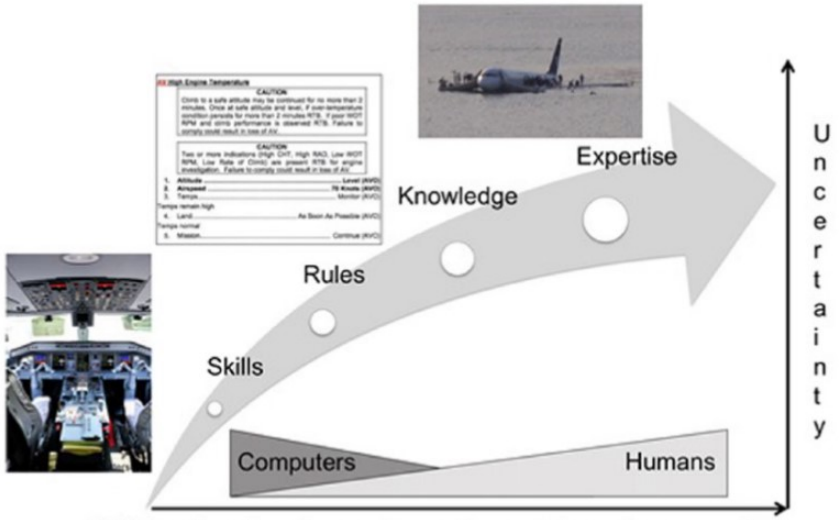
Dr. Cummings's experience in the military heavily influenced her research interests. Once she realized how frequently pilot error was causing fatal accidents among her colleagues, she began asking questions: "Why are people crashing? Isn't there something we can do about it?" That curiosity propelled her to focus on automation. In a video presentation she gave one year

20. SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards.
The current version of SOLAS is the 1974 version, known as SOLAS 1974, which came into force on 25 May 1980. As of November 2018, SOLAS 1974 had 164 contracting states, which flag about 99% of merchant ships around the world in terms of gross tonnage.
SOLAS in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships.

21. https://www.vttresearch.com/en/news-and-ideas/horizon-looks-bright-autonomous-ships

ago, she said that during the three years she was flying off aircraft carriers, one person per month was killed in crashes which were the result of pilot-induced error on the sophisticated fly-by-wire planes.[22] Before a plane was cleared for takeoff on the carrier's catapult, the pilot had to put his or her hands in the air to show that those hands were not touching any of the controls.

"We are nowhere near to having computer systems that can drive a car," said Dr. Cummings during a congressional hearing one year ago. She used the SRKE diagram below to illustrate her thesis that as uncertainty increases, the knowledge and expertise humans have is superior to computers, while in situations where special skills are needed and rules are clearly defined, computers do a better job.[23] The failure of the Boeing 737 Max Maneuvering Characteristics Augmentation System (MCAS) served as an example of why automated driving systems fail.



Relative strengths of computer vs. human information processing

First, the designers allocate roles (human driver versus computer) inappropriately. In the case of MCAS, Boeing gave the computer decision-making authority that required more knowledge and expertise than the computer could possibly have. Second, there was insufficient testing to ensure that the system failed safely. By naming the plane 737, which is an existing plane, Boeing signalled that it was simply modifying the plane. Dr. Cummings said that the 737 Max is a completely new plane, and Boeing was simply trying to save money. This is the third reason for failure, a perceived financial imperative. MCAS was rushed to market. Fourth is a lack of regulatory oversight. There should have been a point when the design flaws in MCAS were discovered before the fatal crashes occurred. Boeing managed to avoid oversight, and the authorities

22. https://www.youtube.com/watch?v=TqGv8PfZ7MQ

23. https://hal.pratt.duke.edu/sites/hal.pratt.duke.edu/files/members/Informing%20Autonomous%20System%20Design%20Through%20the%20Lens%20of%20Skill-%2C%20Rule-%2C%20and%20Knowledge-Based%20Behaviors.pdf

failed to exert their authority. Finally, excessive hubris ("We don't make mistakes.") and market hype overwhelm those who attempt to urge caution.

TESLA's crashes with its inappropriately named 'autopilot' served as another example in Dr. Cummings' presentation. All five criteria were met, particularly hubris. The real problem with TESLA, says Dr. Cummings, is its driver monitoring system, which, until the spring of 2021, was not doing the job of driver monitoring at all. TESLA has used torque sensors in the steering wheel to gauge resistance. This crude system could be easily gamed by putting an orange into the steering wheel, simulating hand presence. Due to pressure from regulators and safety experts, the company is finally starting to use the camera above the rear-view mirror in the Model 3 and Model Y to detect driver inattentiveness when Autopilot is engaged. It is still too early to tell how effective this system will be, and it's not yet clear what actions the vehicle takes if distracted drivers do not return to their duties.[24]

24. https://www.theverge.com/2021/5/27/22457430/tesla-in-car-camera-driver-monitoring-system

Computers and humans need to partner, not compete

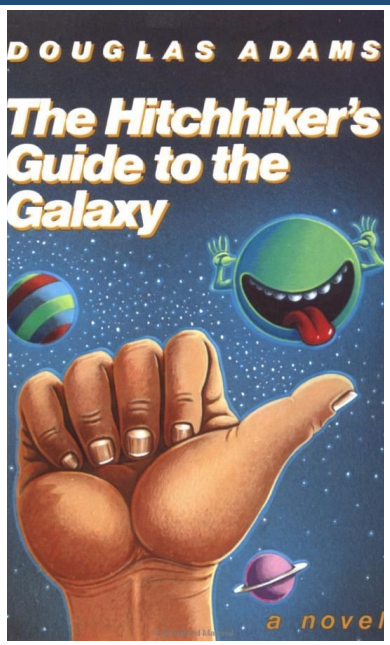
In order to get to completely driverless functionality for those situations where it makes sense to do so, principally to provide mobility to those who cannot drive themselves, cannot afford the transport alternatives that exist for them, or who live in areas where neither public nor private forms of transport are offered for economic or other reasons, we need to develop solutions that work safely everywhere. If there is no qualified back-up driver on board ready to take over when the robot driver reaches its limits, then the back-up driver will have to be remote, and there will have to be staff ready to get to the vehicle to rescue the passengers when the remote function cannot solve the problem.

For series production vehicles in which there is a driver on board and no back-up remote driver, that on-board driver must stay engaged. It should not be possible for the driver to fall asleep or move out of the driver's seat. The driver monitoring system should be designed to disengage the driverless function as soon as non-engagement is detected. As is specified in the UN R157 requirements, the driverless function should refuse to engage if all the preconditions for safe operation are not met.

"George, are you ready to take the controls?"

"Yes, Michael. I'll let you know in plenty of time when I need you."

Musings of a Dispatcher: Evolutionary Domesticity



Choosing a post-pandemic place to live

BYPASSES ARE DEVICES THAT ALLOW SOME PEOPLE TO DASH FROM POINT A TO POINT B VERY FAST WHILE OTHER PEOPLE DASH FROM POINT B TO POINT A VERY FAST. PEOPLE LIVING AT POINT C, BEING A POINT DIRECTLY IN BETWEEN, ARE OFTEN GIVEN TO WONDER WHAT'S SO GREAT ABOUT POINT A THAT SO MANY PEOPLE FROM POINT B ARE SO KEEN TO GET THERE, AND WHAT'S SO GREAT ABOUT POINT B THAT SO MANY PEOPLE FROM POINT A ARE SO KEEN TO GET THERE. THEY OFTEN WISH THAT PEOPLE WOULD JUST ONCE AND FOR ALL WORK OUT WHERE THE HELL THEY WANTED TO BE.

From The Hitchhiker's Guide to the Galaxy *by Douglas Adams, published in 1979 as the first book in a five-book trilogy about the adventures of Arthur Dent.*

The first two books of Douglas Adams' five-book trilogy (sic) did not start out as books. They started out as a 1978 series on BBC RADIO that were also aired on Boston's public radio station, WGBH. At that time, I was living in Cambridge, Massachusetts and was a huge fan of NATIONAL PUBLIC RADIO. I organized my life around listening to *The Hitchhiker's* series and *A Prairie Home Companion* and woke up each morning to *Morning Edition*. That was a period in my life when I did not own a TV, lived alone in an apartment and could organize my non-working time around seemingly trivial things, like listening to the radio and fishing. As it turns out, *The Hitchhiker's* series—which has more to say about transport and mobility than most books actually written on the topics—and, in particular, the quote above, had a seminal influence on my new-found and budding career as a transport specialist, as opposed to my former career as an architect. It explained to me the answer to the question: Why is there traffic congestion? Because all the Point As and Point Bs in the world are in the wrong places.

But why did everyone let themselves end up in the wrong Points A and B? It took me another twenty-nine years to figure that out. That's when I finished my little book, Beating Traffic: Time to Get Unstuck, in 2007. It was definitely not because people had a burning desire to own and drive cars around willy-nilly[25] and create traffic jams. And it was also definitely not because individuals were exhibiting a trait that only followers of Ayn Rand's philosophy of *Objectivism* and economists like Milton Friedman believed

25. Willy-nilly – In a haphazard or spontaneous manner (Merriam-Webster).

people possessed: shockingly selfish, me-first-and-only optimization. Congestion was caused by companies and institutions because of where they put all the As and Bs, and by governments that allowed them the freedom—gave them incentives, even—to put all those As and Bs in the wrong places and then to connect them up with bypasses.

People paid the price. We were told it was in our best interests to move very fast between all Point As and all Point Bs and back again. "Trust us and you shall be rewarded with lower prices," we were told. Businesses knew that putting things like housing developments and shopping centers and regional schools and office campuses on cheap land, which meant by definition far from everything else, and then making all the things we needed (in order to get to and to be where we had to be) in places like China where labor was much cheaper, would make them (particularly the CEOs) and their shareholders very rich. They were right.

That's what my book was about. The book could have been called Evolutionary Location: A sociological view of traffic congestion. But I gave my book its title before I had spent serious time trying to understand *reciprocal altruism*, the foundation of evolution. I learned that people were not shockingly selfish, me-first-and-only optimizers, but we oftentimes exhibit a childlike naiveté when confronted by snakeoil salesmen, particularly those posing as economists, politicians, philosophers, academics and pundits.

Fourteen years later, we have passed through a financial cataclysm in 2010 and are now still held firmly in the jaws of the *COVID-19 Hydra*, who is passing each new variant of the virus from one of its heads to the other. Economists, politicians, journalists, philosophers, academics of all stripes voice opinions about whether we will all forget about what we have been going through for the past eighteen months, whether we will all move out of cities to retreats in the country, or whether we will all adopt a nomadic lifestyle and live in mobile homes so we can quickly move to another place if the place where we are becomes uninhabitable or inhospitiable.[26] Experts speculate on whether everyone will work, shop, educate, recreate, meditate and medicate from their stationary shelter, never leaving it. They all claim to have the answer to the question of life, the universe and everything, just like *Deep Thought*, the super intelligent computer built by the hyper intelligent race of beings in *The Hitchhiker's* series.

Hydra is a many-headed serpent or monster in Greek mythology that was slain by Hercules and each head of which when cut off was replaced by two others.

26. Think *Nomadland*, winner of the 2021 *Academy Award for Best Film*, a kinder and gentler version of the future post-apocalypse *Mad Max* films.

Deep Thought's answer to what is the meaning of life, the universe and everything was '42', which made as much sense as most of what is being discussed today about post-pandemic living and mobility.

Can I get a refund on the last year?

Businesses and governments want it all to go back to the way it was before China exported a pandemic in early 2020, with people living in the wrong places and dashing back and forth between Points A and B on bypasses or high-speed rail or bike/scooter paths or underground or overground hyperloops.[27] But after getting a taste of staying put at Point C, it seems that a lot of people want to continue to stay put, or, better yet, to find a Point D, far removed from the madding crowd.[28] Arthur Dent said he moved out of London because living there made him nervous and irritable. He was looking for and found a quiet place in England's West Country off the beaten track, a Point C, where he could live a simple life, work at the local radio station and head down to the pub in the evenings to converse with his neighbors to get things off his chest, like the news that the local council was going to bulldoze his house at Point C in order to build a bypass between Points A and B. That's precisely what he had done the evening before, gone down to the pub, and he had a hyper hangover to prove it. First thing in the morning, the bulldozers showed up at his house.

When COVID-19 caused businesses, restaurants, stores, factories and schools to close down, everyone who was not furloughed from their jobs was told to work from home.[29] Those who lived in cities like London, Paris and New York, where the likelihood of contracting the virus was highest, either tried to totally isolate themselves from everyone, including the essential workers in the grocery and convenience stores, pharmacies/chemists, hospitals and clinics, and from the police, sanitary workers and firefighters who were all categorized as 'essential' workers. Or, if they could, they moved to somewhere else, like their vacation home in Vermont or their parents' home in Surrey. As the pandemic continued into the summer and autumn, people began to look at permanent moves from big cities to smaller ones, to places where a daily commute to a place of work is not an attractive alternative to life on *Zoom* or *Teams*.

Douglas Adams, who stands heads and shoulders over most philosophers and economists, understood that governments and businesses and most people want simple answers to the most

27. A group of business leaders in the UK has urged ministers to "set the country clearly on the path to recovery" by encouraging people to return to the office. Firms needed to know what the end of COVID-19 restrictions would mean in practice, more than 50 leaders said in a letter to Prime Minister Boris Johnson. The letter was organized by a lobby group called London First. In their letter they said "firms expected city centres to 'buzz again' after 19 July". Working from home should no longer be the default, they said, adding, "Our economic recovery will only succeed if the government commits to reviving our city centres."

28. A major U.S. venture-capital firm, Andreessen Horowitz, asked its 226 portfolio companies to describe work in the future. Two thirds said 'hybrid'. Uber just finished building its new $130 million headquarters in San Francisco. It is reportedly trying to lease out a third of it to other tenants.

29. Google gave each employee globally $1,000 for home-office furniture, offered them virtual fitness videos and cooking lessons, and urged everyone to "take good care of yourselves and one another".

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complex questions, so, to save time, they only ask simple questions. “Why is it that you can’t come into the office five days a week, from nine to five? Wasn’t that in your employment contract?” Hmm, yes, but there’s this pandemic thing, and I’m perfectly happy to work twice as many hours in my trainers behind my ID photo. Arthur asks why the bypass that requires the demolition of his house has to be built. Mr. Prosser, the representative from the local council sent to supervise the demolition of Arthur’s house, responds. “What do you mean why’s it got to be built? It’s a bypass. You’ve got to build bypasses.” Adams, in his books, explains that the answers to difficult questions lie in how the question is framed, who is asking the question and what the biases are of the people who expect to receive the answer. In other words, there are no simple answers to complex questions.

It’s not the first time people in power wanted to continue doing what they had been doing before a major catastrophe put a spanner in their works. For example, when the plague struck Italy in the 17th century, princes of the city states along with the Pope, who ruled over the Papal States, believed that life would return to normal after the plague subsided, that it would be business as usual. That would mean their hold over the land would keep the peasants in positions of subservience, capital would override labor. They were wrong. It was the laborers who held the winning cards, because the plague had killed off so many of them. Land was irrelevant if it could not be farmed, and princes and the Pope were not about to get their hands dirty. Peasants found that they could move to where they were needed most, and were given the rights to live on the land for as long as their family farmed it, and even to keep some of what they farmed for themselves.[30] By the end of the 19th century, steamships and steam trains helped to put an end to even that type of indenture as sons and daughters fled to places where they could exchange their labor for wages. Most sent money home, which was used to free their families as well.

The current pandemic is a manifestation of globalization, as were the plagues. We think of globalization as synonymous with trade, but it is just as much related to exploration and conquest. The Romans, Attila the Hun, the Vikings, the conquistadors and their ilk were globalizers. They brought terror and they brought disease. In the 21st century, viruses like COVID-19 can spread like wildfire globally, almost instantaneously, as a result of unrestrained plane travel by people travelling in and out of virus

30. My maternal grandfather’s ancestors, the Rosati family, in 1620 were given a piece of paper stating that the farmhouse on a property called Masseggio located on the edge of the Town of Sigillo in Umbria could be lived in by the family as long as a Rosati farmed the land. The last Rosati left in 1978. The farmhouse and out buildings remain, unoccupied, and someone else farms the land.

hotspots (e.g. China) on vacation or on business. The greatest number of people are exposed to a virus within large cities like Wuhan, China (at 8.2 million, the 42nd largest city in the world according to 2018 U.N. official estimates) and then they spread it to other large population areas. We can wish there was a simple answer to the question of how to stop pandemics from happening short of ending globalization, short of inventing a vaccine against all pandemics and vaccinating everyone in the world. But while we are wishing and hoping and thinking and praying, people are beginning to make decisions about how they can best protect themselves and their families when it happens again.

You live and learn. At any rate, you live[31]

31. Douglas Adams in *The Hitchhiker's Series*, Book #5 Mostly Harmless.

As the virus continues to kill its victims everywhere, governments, businesses and many people are still asking the questions for which they were seeking answers before the pandemic struck. They are not looking at the bigger picture, the virus-impacted one we're in now and will continue to be in well into the future. The question is not how do we get 'back to normal' following the pandemic so that we can focus on reducing global warming. Everyone seemed to be perfectly satisfied that they had the answer to the second part of that question: become a vegetarian, buy a BEV, '42'. Right now, we should not be asking what we can do to get people back to the office to work and back to the stores to shop. Arthur Dent's friend, an alien named Ford Prefect, who was a researcher for the publication The Hitchhiker's Guide to the Galaxy, didn't ask Arthur where he was going to live after his house was levelled. He knew it wouldn't matter. Ford took Arthur to the pub and told him to down three pints of beer quickly because he had to be ready for the trip they were going to be taking in a few minutes on a Vogon spaceship, the same Vogon spaceship that was about to pulverize Earth in order to make way for an intragalactic bypass. "Where are you going to live, Arthur?" was irrelevant. Questions like "Should I become a vegetarian and buy a BEV?" are equally irrelevant today, so verrrry pre-COVID-19. However, "Where should I live?" is not.

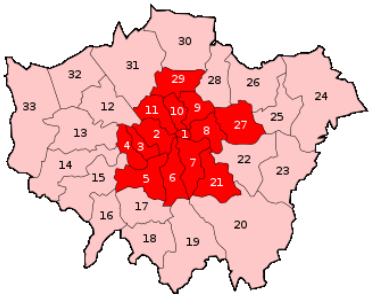
It's time to start paying more attention to where we live where we live

Everyone needs to live somewhere, even if it's in an RV or on a cardboard box at the entrance to London's Pimlico Underground Station. Where we live is in large part the result of where we came from. We've all come from somewhere. After climbing down from the trees, we wandered out of Africa and spread ourselves all

over the Planet. When people leave a place for whatever reason (e.g., war, famine, cost of living, loss of job), they move to where they can find an affordable place to live, oftentimes close to friends and relatives or at least people who come from where they came from, and then try to figure out how to make a living. That was what my maternal grandparents did. They settled in Old Forge, PA. My grandfather tried his hand at being a baker before settling into coal mining. People with academic credentials or special skills often move to where there is work that uses those skills and then figure out where they should live. That was what my paternal grandfather did, who apprenticed in Italy as a shoemaker and settled in Scranton, which was booming at the time. And that's also what I did, eventually ending up in Sweden. Then there are those people who grow up in a town, have family and friends who help them find a place to live when it's time for them to leave home, and they try to find work that matches the skills they have or have acquired. That was what my parents and all of their siblings did. Finally, there are the itinerants, the nomads who never settle down anywhere for very long. Have I covered all the cases?

For the past three hundred years, through wars and famines and pandemics, we have swelled the populations of cities, both old ones and new. We have drained the populations from the farmlands and concentrated our activities into ever-expanding city regions. Today's largest cities are relics of times when it was necessary to gather as many people as possible in close proximity to one another in order to have a labor force for the products that could be built in factories with motors driven and lighting provided by electricity. Trolleys and buses helped to speed up the journey to those factories and all the support services and businesses that grew up around them, and eventually trains made it possible for those who benefitted most from the profits those businesses generated to live in villages outside of the smelly, polluted cities.

While large cities are healthier than they were one hundred fifty years ago, living in them often makes us nervous and irritable. Searching for a parking space after returning from work or on a street cleaning night, having your SUV vandalized by environmental terrorists, tripping over e-scooters, getting recyclables to recycling centers, finding a seat on a rush-hour bus and being sneezed on by the person in the adjoining seat. The fact is, large cities are no longer needed except in those places that are going through their own equivalent of the West's Industrial Revolution. We do



Inner London and Outer London as defined by the Office for National Statistics.

Londinium, also known as Roman London, was the capital of Roman Britain during most of the period of Roman rule. It was originally a settlement established on the current site of the City of London around AD 47–50. It sat at a key crossing point over the River Thames which turned the city into a road nexus and major port, serving as a major commercial centre in Roman Britain until its abandonment during the 5th century. Its population was between 12,000 and 20,000. By 1300 it had grown to 80,000. With the rise in trade, it grew to 225,000 by 1605, and in the mid-1670s, the population of the London was approximately 500,000. In 1760, it was 740,000. It doubled to 1.4 million by 1815, grew three-fold to 3,188,485 by 1860. In 1910, it was well over 7 million.

https://en.wikipedia.org/wiki/Demography_of_London

not need to gather millions of people in close proximity to one another in North America, Europe and other places that have passed through their industrial revolutions. If China were not the factory for the world, it could send most of its cities' residents back to the countryside where there would be less danger of starting and spreading pandemics.

Cogitare incognito; think the unthinkable

Is it time to start thinking the unthinkable and consider dismantling the world's largest cities? Dismantling cities is neither a new nor all that radical an idea. By dismantling I do not mean sectorizing them. This spring, the mayor of Paris suggested that her city be divided up into neighborhoods in which everything is within a fifteen minute walk or cycle ride. This is, of course, how all cities worked before businesses and politicians began to move all the Point As and Point Bs. However, the inevitable result of creating fifteen-minute bubbles (even if you could), sooner or later, will be devolution and secession, the setting up of tolling stations at the borders and threats of tariffs. A real attempt at proper dismantling started while the Second World War still raged, with United Kingdom bureaucrats plotting what was called the 'decanting' of Britain's largest cities. Behind the plan was the idea that large cities were too easy a target for an enemy's artillery, planes and missiles. When the War was over, the process began with the planning and building of a series of New Towns.[32]

Britain's bureaucrats' hearts were in the right place even though their heads and especially the heads of their architects were somewhere else. People moved to the new towns with the help of moving and rent subsidies, but the jobs stayed in the large cities. By the time the jobs began to move to the suburbs, after the UK had built the first parts of its Motorway system, the Conservative government of Maggie Thatcher had decided that building subdivisions was the business of business, not the business of government. Commuting and traffic congestion simply got worse as long as jobs and housing and schools and shopping centers were built as their own, independent Point As and Bs, which they were.

That was then, but 2021 is not 1980, and the preconditions for creating self-contained towns of 35,000, 75,000 or 125,000 are excellent today. Remote working is not only possible, it is preferred, if not every day, many days. It is no longer necessary to give up the benefits of having an interesting and well-paying job in order to enjoy a better quality of life than is available in large cities. Yes, in big cities there are opera houses, football stadiums

32. The new towns in the United Kingdom were planned under the powers of the *New Towns Act 1946* and later acts to relocate populations in poor or bombed-out housing following the Second World War. They were developed in three waves. Later developments included the expanded towns: existing towns which were substantially expanded to accommodate what was called the "overspill" population from densely populated areas of deprivation.
Designated new towns were removed from local authority control and placed under the supervision of a development corporation. These corporations were later disbanded and their assets split between local authorities and, in England, the *Commission for New Towns* (later English Partnerships).

https://aliciapatterson.org/stories/disappointing-new-towns-great-britain

and great restaurants, but one does not go to those places every day unless one doesn't need to work.

There are many other benefits to reducing the size of cities. We will no longer need to have public debates and referenda on whether to raise taxes to build light rail or underground systems, for instance. Because people will not have to live in high rise towers, they will be able to take responsibility for their own electricity production, grow their own fruits and vegetables. Local schools and local stores would mean lower emissions since children and shoppers will not have to travel long distances to get to them. All the Point As and Point Bs can be turned into Point Cs.

I am simplifying. I know that. I am trying to sow a seed, not plant a forest. The U.S. is going to spend trillions of dollars on infrastructure projects as part of its 'Build Back Better' initiative. Those projects are based on ideas people have on what should be done, like using public money to build BEV charging stations and to provide subsidies for BEV buyers. I'm adding one idea, to reduce the size of the largest cities, to direct efforts to encourage people to move out of larger cities to smaller ones, and to provide incentives to build new, energy-efficient small-to-medium-sized towns. I will continue to develop and promote this idea.

Don't panic!

This is the number one piece of advice in *The Hitchhiker's Guide to the Galaxy* to its users. No matter how bad the situation looks, stay calm. Easy for Douglas Adams to say. He's probably with Ford Prefect on a small planet somewhere in the vicinity of Betelgeuse. Well, he's left us his books, and if we look hard enough, the answer can surely be found in one of them, the five in his *The Hitchhiker*'s series and his others, like this one from The Long Dark Tea-Time of the Soul: ***"I may not have gone where I intended to go, but I think I have ended up where I needed to be."***

We are going to have to maintain a calm state of mind, and try to remove all causes of nervousness and irritation so we can concentrate on getting through what we need to get through in the coming years.

Decanting Cities in the Republic of Ireland

Ireland wants 20% of its 300,000 public employees to be working remotely by the end of 2021, and it is offering financial support to encourage them to relocate outside of the country's cities. More than 400 remote working hubs will be created so that those staff who wish to may work closer to home.

The history of every major Galactic Civilization tends to pass through three distinct and recognizable phases, those of Survival, Inquiry and Sophistication, otherwise known as the How, Why and Where phases. For instance, the first phase is characterized by the

question How can we eat? *the second by the question* Why do we eat? *and the third by the question* Where shall we have lunch?

A passage in the HITCHHIKER'S GUIDE TO THE GALAXY

We thought we were already at the *Sophistication* phase, but we are back at *Inquiry*. We have come far enough as a civilization to at least appreciate how most things work and how we can put them to use for our benefit. It's the 'why' we are still having trouble with. Why do we live where we live? And when we understand that, where shall we live now? Global warming is a problem, but it is not our most immediate and urgent problem. It is not the biggest one we have at this very moment. We haven't gotten to the bridge yet that we will have to cross, and if we don't solve the bigger immediate problems we are not going to get there.

Wars in the Middle East amongst people holding different views on the same religion cause the dispersal of people holding fundamentally different beliefs to people in the western societies to where they flee, and this in turn causes cultural clashes, terrorist incidents and political backlashes in the form of surges in nationalistic parties.[33] Wars in Africa to control minerals that we need to build electric cars and mobile phones, and extreme corruption in the handling of aid provided by western countries and loans provided by China, combine to create dislocation of vast numbers of people, excruciating poverty and boatloads of immigrants arriving on Europe's shores. Pressure on social services, and pressure to provide housing, schooling, health care and jobs makes life difficult for both the receiving countries and those that need to be helped. Crime in South and Central America to control drug production and distribution, and poverty and hopelessness resulting from the absence of functional governments to provide for basic services and safety, have convinced hordes of residents of these countries to become refugees and to try to enter the United States. China's threats to invade Taiwan, its breaking of the promise of democracy to Hong Kong and its aggressive actions in the seas surrounding it destabilize the entire region. On top of this, fear of pandemics in the U.S. and Europe causes everyone to be nervous and irritable.

If we didn't think it could get worse, our inability to generate enough electricity to power our electronic devices as well as keeping the air conditioners and lights working, our inability to mine enough minerals to produce new technology, the unreliable weather making it difficult to depend on solar and wind power,

33. "In the past 15 years, Sweden has had Europe's highest rate of death by shooting, according to a recent report by the country's National Council for Crime Prevention. Most of the victims are men between 20 and 29. Sweden's homicide by shooting is two-and-a-half times the European average. Such violence is invariably fueled by illegal drugs and ill-feeling between jobless, marginalalised young men and the police. Recent immigrants, many from the Horn of Africa, have failed to integrate. The Syrian migrant crisis of 2015 has led to more ghettoization. Shooting has become a common way for gangs to settle their differences."

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the ease with which criminal computer hackers can insert themselves into our computer systems and demand ransoms of extraordinary amounts of money, and governments everywhere that seem to have forgotten their purpose, which is to ensure that their citizens are safe, makes it much worse. Shall we stop production of all electric vehicles until batteries can be built with materials that do not cause wars and poverty? Perhaps. I think we should. Shall we stop immigration? We would first need to stop the reasons it exists, and we are not going to do that until we start concentrating on it rather than all the issues we believe we have to solve first. Should we stop the import of all products from countries that burn coal to produce the products or the materials that go into making them? I have advocated that, even though I know it is probably not practical until we can produce those products where we don't burn coal or simply stop buying them.

Before we can stop global warming, we need to have global cooperation on the more immediate issues. We don't get this with school strikes and ICE vehicle bans and climate zones and the selling of emissions credits. We get it by making global cooperation irresistible.

I am perfectly willing to allow, as Douglas Adams has suggested, that Earth is an experiment. Perhaps it's not the one described by him in The Hitchhiker's Guide *series, a computer built by Deep Thought to determine the question for which 42 is the answer, a computer which is disintegrated after 10 million years of processing, just before its calculations are complete. More likely, the experiment is being conducted by hyper intelligent beings in a psychology class at* CRUXWAN UNIVERSITY *on the Planet Magrathea, whose inhabitants specialize in designing and bringing to life planets tailored to the special tastes of hyper wealthy galactic citizens. When the experiment is over, if there are any of us left, we will receive our $5 reward for participating and return to our own classes. Hopefully, the hyper intelligent students will have learned something useful from the experience that they can apply when they create real planets. For example, they might learn that one is better than many: one sex, one race, one eye color, one hair color, one tone of voice, one height, one weight, one religion, one level of intelligence, one wage, even one car model—simply one of everything—might save a lot of time, effort, money, pain and mental anguish. Everyone runs a 12-second 100 meters; everyone clears 1.5 meters in the high jump; everyone can eat no more or no less than six hot dogs during the* Nathan's 4th of July Hot Dog Eating Contest. *All of us could then get on with more important things than making comparisons to people around us and feeling envious, jealous, suspicious, superior, inferior, nervous or irritable. If everyone had more, rather than less in common from the start, we might never have gotten ourselves into a dangerous climate change mess in the first place. This might sound pretty boring, but where is the rule written that says life has to be fun?*

About Michael L. Sena

Michael Sena, through his writing, speaking and client work, attempts to bring clarity to an often opaque world of highly automated and connected vehicles. 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.

Michael L. Sena

Editor

SUNDBYVÄGEN 38

SE-64551 STRÄNGNÄS

SWEDEN

PHONE: +46 733 961 341

E-MAIL: ml.sena@mlscab.se

www.michaellsena.com