

The All-Party Parliamentary Group for Engineering

19 November 2024

Driverless Vehicles

Discussion over lunch in the House of Lords

Chair – Professor the Lord Mair CBE

Speakers:

- Professor Paul Newman CBE FREng, Professor of Information Engineering at the University of Oxford
 - Professor Sarah Sharples FREng, Chief Scientific Adviser for the Department for Transport
 - Elias Nassif, Engineering Manager, Oxa
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Lord Mair began the meeting by thanking everyone for attending and introduced the distinguished speakers, who each then gave a short speech. Following this, the audience asked questions.

Professor Sarah Sharples

Professor Sarah Sharples is Chief Scientific Adviser for the Department for Transport. She is a Professor of Human Factors in the Faculty of Engineering at the University of Nottingham and from 2018 to 2021 was Pro-Vice-Chancellor for Equality, Diversity and Inclusion and People. She has led research in transport, manufacturing and healthcare, and currently leads the Engineering and Physical Sciences Research Council (EPSRC) Connected Everything Network Plus. Sarah founded and is co-director of the EPSRC Horizon Centre for Doctoral Training (CDT) and has led research programmes examining implementation of new technologies in rail, highways and aviation. She was President of the Chartered Institute of Ergonomics and Human Factors from 2015 to 2016. In her role as DfT Chief Scientific Adviser, Sarah provides science and engineering advice to ministers and senior officials. She also heads Science and Engineering Profession (HoSEP) at Department for Transport and is responsible for the DfT Science Plan.

Professor Sharples explained how driverless vehicles shift responsibility from human drivers to new entities, such as ‘users in charge’ and ‘authorised self-driving entities’. She added that whilst driverless vehicles promise benefits like safer roads, improved rural transport access, and automated charging, they also introduce challenges, including ethical decision-making in critical scenarios. Professor Sharples emphasised the need for collaboration among scientists, engineers, policymakers, and the public to maximise the positive potential of driverless vehicles.

Professor Paul Newman

Professor Paul Newman leads the Oxford Robotics Institute, which enjoys a world leading reputation in mobile autonomy developing machines and robots which map, navigate through and understand their environments. The group has a particular focus on transport, including robot autonomy, navigation, mapping, scene understanding and perception. Flagship projects include RobotCar UK and a complete autonomy system on small “pods” for urban use. He is co-founder of the spin-out company Oxbotica which develops autonomy software systems for autonomous vehicles in a wide variety of deployments. Paul was also elected fellow of the Royal Academy of Engineering and the IEEE with a citation for outstanding contributions to robot navigation.

Professor Paul Newman shared his journey and passion for advancing autonomous technology, recounting how his passion for machines began during his PhD studies in Australia in the 1990s. He continued that he has dedicated his career to making machines navigate and operate autonomously. Professor Newman highlighted the complexity of predicting human-like decisions, ensuring safety in unpredictable 'open world' environments, and addressing the ethical dilemmas of AI. He urged young engineers to tackle these challenges in the future.

Elias Nassif

Elias Nassif is an accomplished engineer with expertise in autonomous systems, artificial intelligence, and transportation technologies. Currently at Oxa, he develops real-time analytics and virtual validation methods to ensure safe and compliant deployment of autonomous driving systems. His work bridges engineering, risk assessment, insurance, and customer needs. Previously, Elias led AI services at Capita, where he expanded the AI team and generated over £2 million in annual revenue. His earlier roles include designing smart city solutions and connected vehicle roadmaps for the UK Department for Transport, contributing to Europe's largest autonomous vehicle trial at DG Cities, and coordinating airport readiness projects with Egis.

Elias shared insights into his role overseeing the safety and performance of self-driving vehicles. He explained how Oxa employs advanced simulators to test vehicles in virtual environments, enabling millions of miles of testing in different scenarios. Elias explained that once vehicles are operational, his team monitors for early warning signs of potential issues, such as delayed braking, and investigate incidents to refine decision-making systems. He likened his work to being a "psychiatrist for robots," focusing on understanding and explaining the behaviour of complex systems to ensure reliability and public trust.

Q1. The Lord Hampton

Question: I worked a bit on the Automated Vehicles Bill, and one thing I found disappointing was that the government removed a key provision I felt was crucial. Automated vehicles have the potential to be a game changer for people with disabilities, particularly those who are blind. Initially, the legislation required manufacturers to design vehicles to be accessible to everyone, but unfortunately, that was taken out of the bill. I'd love to hear Sarah's thoughts on this and what the panel has to say.

Professor Sarah Sharples: That's a great question, and you're right that driverless technologies have incredible potential to address accessibility challenges in transport. There are two key aspects to consider: ensuring vehicles are designed to be accessible for all and creating opportunities for those who currently can't drive, such as due to medical conditions or age-related factors, to gain access to mobility. True driverless technologies could open doors for those who otherwise wouldn't own a vehicle, presenting not just a social opportunity but a business one too. However, we're likely to first see adoption in shared environments like buses or in specific, controlled contexts like logistics.

Q2. Kathryn Tyley (ICE)

Question: What physical infrastructure and infrastructure systems are needed to advance the roll out of automated vehicles, and is this something that's limiting automated vehicles, or are we still at the technological stage where it's the sensors etc. that's lacking?

Professor Paul Newman: Should we build infrastructure specifically for these vehicles? Well, one way to look at it is that we've already built quite a lot. But every little improvement helps. For instance, park-and-rides are a great example. They help keep people out of cities while still getting them into cities. These controlled routes are helpful because they're less chaotic. That said, as an engineer, I have to acknowledge the trade-offs. You don't want to rely too heavily on external systems for safety, like traffic lights, being part of the safety system. That introduces complexities, such as needing the lights to be safety-rated and fully integrated with vehicles.

Q3. Samriddhi Sehgal (King's College London)

Question: When I learned to drive in India, I was taught two key principles: always think about what the other person might be thinking and take full responsibility for your own safety. Driving can be very unpredictable, with so much more than just cars on the road. I'm curious how these factors would be accounted for when implementing driverless cars, especially in countries where transportation systems are less structured and adherence to traffic rules isn't as consistent as it is here?

Elias Nassif: We design our vehicles to follow road rules and make certain assumptions about other road users, such as expecting them to adhere to speed limits and traffic regulations. However, we also constantly factor in worst-case scenarios that are reasonable to anticipate, so we can address them in time. Safety is embedded by design in the software, and during virtual testing, we simulate all kinds of adversarial scenarios.

Professor Paul Newman: This is actually something I've had to deal with directly. We were testing a vehicle in a town near Oxford and testing the vehicle's planner. In this instance, someone distracted on their phone walked into the road unexpectedly. To avoid them as safely as possible, the vehicle accelerated to create the most distance and time to avoid the person. Technically, it was the safest thing to do. The whole fleet was grounded, and it raised the dilemma: the system had done the safest possible thing, but it wasn't what people expect. It's a tough balance between logic and human expectations.

Q4. Chi Onwurah (MP for Newcastle Central and West)

Question: When I was young, car ownership was rare, but now many homes have multiple vehicles, changing the social landscape. While we often focus on technological advancements, we don't always consider their social impacts. My question is: what broader social impacts and unforeseen use cases might emerge from advancements in mobility technologies?

Prof. Sarah Sharples: Drawing from my experience in equality, diversity, and inclusion, I've seen how giving up unsustainable privileges can feel uncomfortable, much like the current challenges in transport. Our reliance on hydrocarbon and private vehicle ownership is unsustainable, and achieving societal benefits, like those from autonomous fuels technologies, requires political decisions and collaborative efforts to create realistic alternatives, such as prioritising shared mobility over individual car ownership.

Q5. Dave Doogan (MP for Angus and Perthshire Glens)

Question: I have two questions. First, is there genuine market demand for autonomous vehicles, or is it a solution in search of a problem? Second, in terms of personalisation, could autonomous vehicles be tailored to match individual driving styles, like aggressive or cautious behaviour?

Prof. Paul Newman: The market for autonomy is enormous, and in many ways single-occupancy passenger cars come last. The immediate opportunities lie in areas like airports, buses, and commercial applications, where the demand is clear. On personal driving preferences, I foresee a future where your driving style and insurance are personalised, reflecting how you drive. For example, if you prefer aggressive driving, your insurance would account for that.

Prof. Sarah Sharples: In a Department for Transport project called 'The Great Self-Driving Exploration', participants tried autonomous vehicles, and my favourite feedback was that they were 'reassuringly boring'. That's exactly what we should aim for.

Q6. Guy Turner (Royal Commission for the Exhibition of 1851)

Question: My question is about cost accessibility. As cars become more advanced with black-box systems, repairs are increasingly expensive. With autonomous cars relying on even more electronics, how can we ensure they remain good value for individuals?

Prof. Sarah Sharples: You are right, new technologies often start out expensive for most people. However, I believe autonomous technologies can improve accessibility by enabling cost-effective public transport in areas where it's currently difficult to provide, such as using automated guided path bus services. For me, driverless technology's real potential lies in improving mass transit before focusing on personal vehicles.

Q7. Max Watson (London Design & Engineering UTC)

Question: My question is about infrastructure. With the introduction of autonomous vehicles, where will they be stored and recharged, especially given the shortage of charging points in the UK? In a congested city like London, how practical is it to store and manage a large number of these vehicles?

Prof. Sarah Sharples: Over 90% of vehicles in the UK are not in use at any given time. The solution is to reduce the overall number of cars and make better use of them. By using technology to ensure vehicles are where they're most needed, we can minimise empty journeys and maximise value for users, ultimately creating a more efficient transport system.

Q8. Hattie Dormer (Headington School)

Question: I wanted to ask, given the high demand and business opportunities for autonomous vehicles, how will the requirement for businesses to share accident and development data impact market competition and the incentive to invest?

Prof Paul Newman: It's frustrating that there's no effective mechanism to share data from vehicles with automation technology, as automation makes vehicles safer. The evidence base is weak because manufacturers are reluctant to share data. Neutral brokers to manage data sharing, and companies that champion openness, are crucial to improving this landscape.

Elias Nassif: Oxa is building an energy monitor, and whenever a safety-critical incident occurs, we aim to report it to regulators acting as neutral brokers. This helps them understand the safety exposure the public faces with these vehicles.

Q9. Ella Ulbrich (King's Maths School)

Question: My question is about control privacy. For example, if I were involved with a bank robbery, would the car try to stop me or report this information? How much ownership would I have over the data being generated?

Prof Paul Newman: It is not the vehicle's job to understand all of life. Its role is simply to get from A to B without hitting anything. Data privacy is a separate issue, for example if someone requests data and we have it, that's another conversation. These vehicles will have cameras collecting vast amounts of data, which could provide valuable forensics and insights.

Q10. Jessie Hill (Headington School)

Question: Will drink-driving limits for people in autonomous vehicles be reconsidered, given people may not be directly responsible for the vehicle's operational decisions?

Prof. Sarah Sharples: There's a distinction between a user in charge scenario, where someone in the vehicle is responsible for safety and a no user in charge scenario, like a robo-taxi, where no such responsibility applies. In a robo-taxi, much like a regular taxi, drink-driving limits wouldn't matter. However, for a user in charge, I see no reason to change the drink-driving rules, as they still have responsibilities similar to a driver.

Q11. Arushi Gupta (King's Maths School)

Question: My question is, if society becomes fully reliant on self-driving vehicles and we lose the ability to drive ourselves, what would happen if the technology were to fail? What would the implications be for society?

Prof. Sarah Sharples: I'd recommend reading a paper called Ironies of Automation by Lisanne Bainbridge, which highlights how automation leads to skill loss. We've already experienced this, like losing navigation or tracking skills over time. My view is that skills evolve as life moves on. In an apocalyptic scenario where we lose automation, we'd need to relearn driving, but I see this as a very distant future. Even with autonomous vehicles, I expect there will still be tasks requiring driving skills, and some will choose to drive for leisure.

Professor the Lord Mair closed discussions by thanking the distinguished speakers and excellent guests, particularly for their wide-ranging questions, and said that the next APPEG meeting would be on 4 February 2025.