A drive into the future

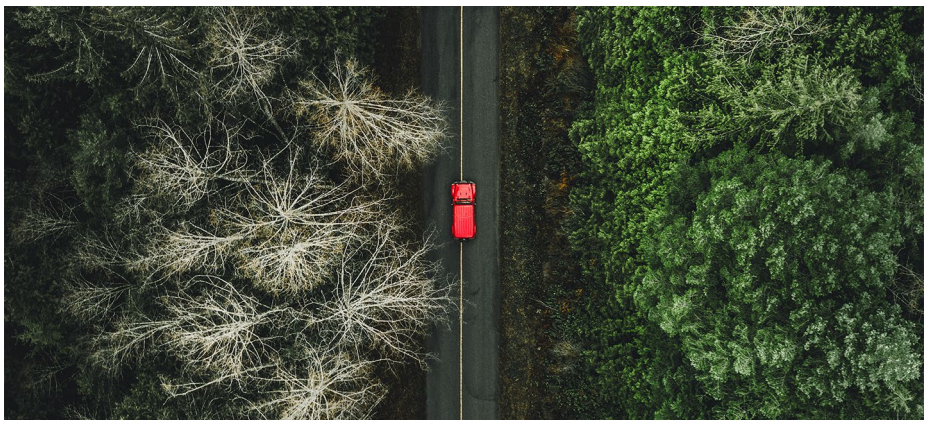
The future of transport is the theme of our 2022 technology of the year.

In 2019, we chose edge computing as our technology of the year and in 2020 we chose the fifth generation of wireless communications technology (5G). An annual feature of the January issue, and reflecting the thoughts of the editorial team, our technology of the year aims to highlight an area that has achieved a key breakthrough or reached an important moment of development. In 2021, with the world in the grip of the coronavirus pandemic, we took a different approach and highlighted the impact of the pandemic on digital technology.

This year, with the world still in the grip of the coronavirus pandemic, circumstances have dictated our thinking again. The pandemic has, for many of us, created an opportunity to rethink travel and transportation; to reflect on the necessity of any trip and any air travel it might require; and to consider our carbon footprints and how they can — or must — be reduced. In recent months, the urgency of such actions has been exposed once again by the 26th UN Climate Change Conference of the Parties (COP26), which was held in Glasgow in November 2021. For our 2022 technology of the year, we therefore explore the future of transport.

Road transport is the dominant source of carbon dioxide emissions from transportation and accounts for around 15% of all carbon dioxide emissions globally. Transitioning to a more sustainable road transport system is an imperative. Behavioural changes — from travelling less to switching to more sustainable modes of transport such as bikes or trains — will be important in achieving this. But technology has a central role to play and this is where we focus our attention, with a series of Comment articles exploring key challenges in the future of road transport.

Various low-carbon technologies for road transport are already commercially available, including battery electric vehicles and plug-in hybrid vehicles (which combine a battery and electric motor with a fuel tank and a combustion engine), as well as fuel cell electric vehicles that are powered by hydrogen. But as Patrick Plötz at the Fraunhofer Institute for Systems and Innovation Research in Germany argues in the first of our Comment articles, technical and economic developments in battery technology mean that hydrogen technology is unlikely to play a major role in the future of road transport. Hydrogen will, he suggests, have a role in applications such as aviation and shipping. With road transport though, the focus now should be on battery electric vehicles in both passenger and freight transport.



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Building electric vehicles is resource intensive — and a lot of vehicles are going to be required. Currently, there are around 10 million electric cars on the road. According to the International Energy Agency, the global stock of electric vehicles needs to increase to 145 million by 2030 in order to meet existing government policies. And to meet the climate goals of the Paris Agreement, 230 million vehicles will be required by 2030. It is unclear whether the necessary resources will be available to meet these numbers. As Jessika Richter of Lund University explains in a further Comment article, in order to avoid creating resource issues while trying to achieve the necessary climate goals, a circular economy approach to electric vehicles is critical.

Driving wider adoption of electric vehicles will also be key, and cities will be central to this process, a point highlighted by the Comment article from Oliver Heidrich and colleagues at Newcastle University, the Faraday Institution, the International Energy Agency in Paris and Urban Foresight Ltd. A range of situational and contextual factors influence electrical vehicle uptake in cities, and a variety of mechanisms, including policies and incentives, will be needed to deliver the necessary change.

The successful development of electric vehicles — and electric mobility more broadly — is dependent on power electronics. As Sheldon Williamson of Ontario Tech University explores in another Comment article, the field faces a number of challenges in the coming years, particularly in relation to controlling electric energy storage systems and improving charging infrastructures. This infrastructure includes the development of wireless charging, a technology that could have implications for the costs (lower) and uptake (higher) of electric vehicles, as well as the creation of autonomous electric vehicles.

On the topic of autonomous vehicles, predictions about the potential benefits of this technology abound — from safer roads to reduced emissions. But as Matthew Dean and Kara Kockelman at the University of Texas at Austin argue in their Comment article, fundamental policy changes are needed in order to help cities and states realize the benefits of these vehicles. Left alone, we are likely to just see a repeat of the issues that afflict transportation systems today. Like many of the challenges that surround the transition to more sustainable transport, action is required now. ❐

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