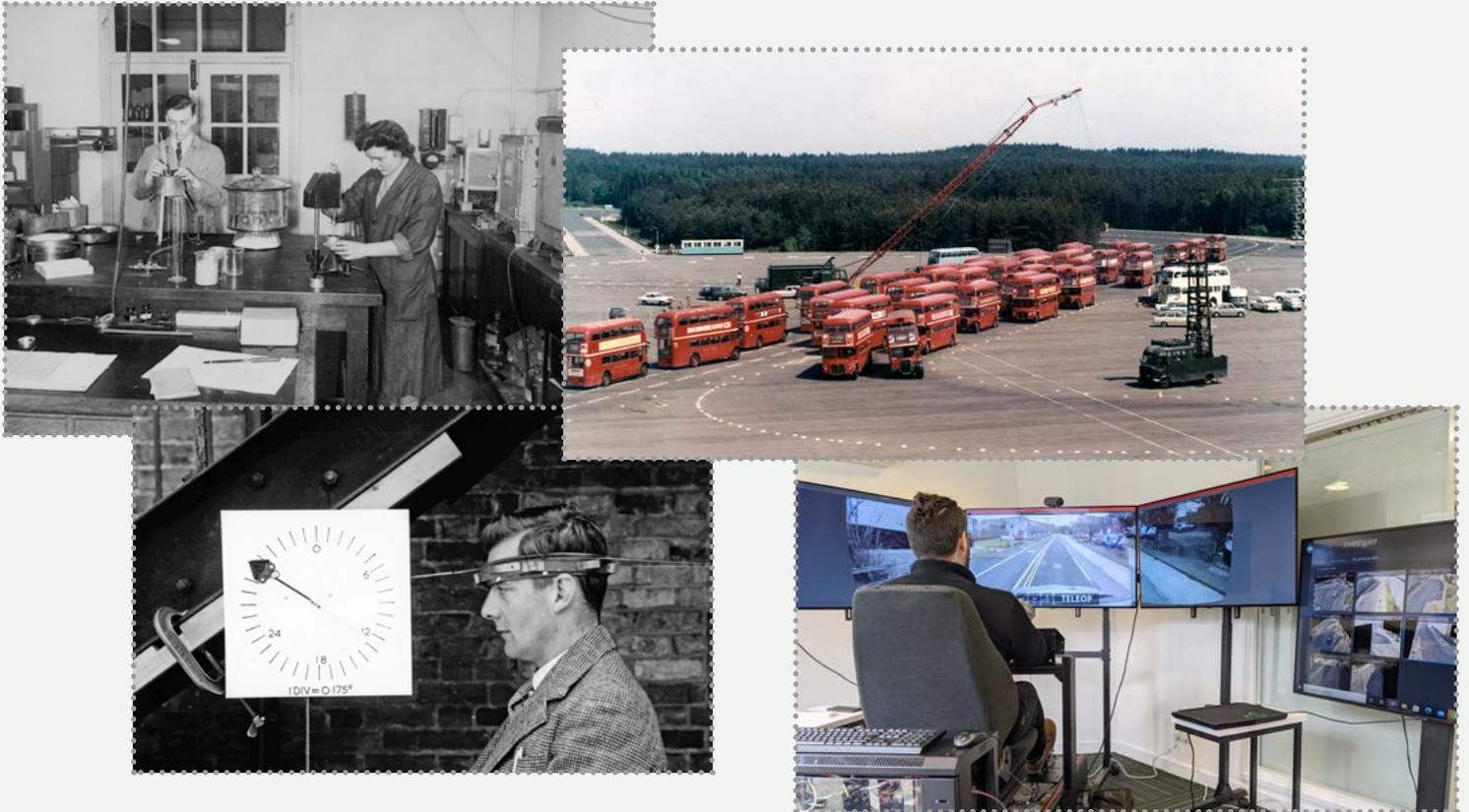


The golden threads through nine decades of transport research

By Penny White



December 2023 is a big birthday for TRL.

The organisation has been in existence for 90 years. It has had four changes of name and been put under the oversight of three different government agencies prior to privatisation in 1996; it peaked in size at nearly 1700 enthusiastic civil servants in the 80s, and has delivered transformative projects in every Commonwealth country.

The TRL archives are vast. And a joy to peruse. They trace the scientific endeavours of a committed team of individuals, recording also the societal changes in the workplace of each decade.

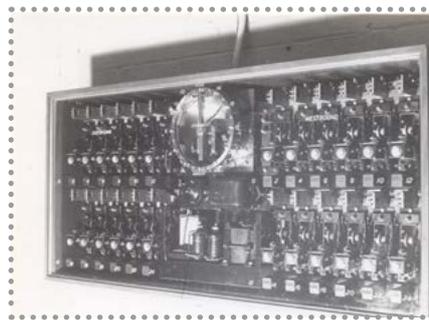
There is however, a disconnect between the events that make history, the prescient pure and applied research being done at the Lab, and the impact that it has had. This is best illustrated

by taking a peek at each decade and exploring some of the lesser known work of our industrious colleagues. Be ready for a sense of déjà-vu, as all work seems to have been based on earlier work, theory being replaced by physical trials and then by digital modelling. There are golden threads connecting themes through the years, and some whacky diversions.

It all starts in the 1930s

The Highway Code went on sale for the first time in 1931 for one penny, when there were already more than one million vehicles on the road in the UK. The Road Research Laboratory was already up and running as a unit within the Dept for Industrial & Scientific Research. It became its own department, separately funded in 1933. Its primary objectives were to make building and maintaining the roads cheaper and more efficient, reduce casualties from crashes, and prepare for future transport needs as yet unknown (i.e. carte blanche to research anything they fancied). In that first decade, when Cats-Eyes were patented (1935), and speedometers and safety

glass for windscreens became compulsory in new cars, the Lab engineers focussed primarily on road building techniques (both asphalt and concrete), improving the skid-resistance of road surfaces, and how to count the traffic (an absolutely fundamental need for just about everything

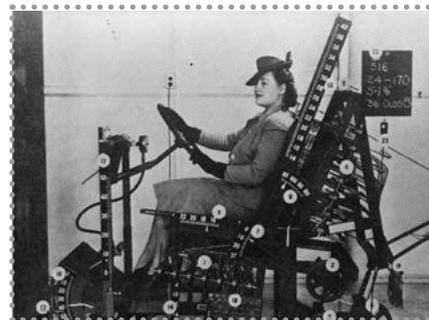


The oldest image in the archive is of an automatic traffic counting machine

to do with roads). The structure of roads, and the assessment of their condition, has been an enduring research activity, which TRL continues to lead today. In fact, what we learned from road building in the tropics post-war is now very much of interest to countries in the northern hemisphere seeking resilience against the ravages of climate change on their transport networks.

The war years

The second decade encompassed the extraordinary research undertaken as part of the war effort. Knowing how to build roads, bridges and dams, it makes sense that the Ministry of War asked the Lab how best to destroy them...which led to Barnes Wallis developing his bouncing bomb at the Lab prior to the Dambusters raid 16th May 1943. The same knowledge was deployed in designing air raid shelters, and developing rapid construction techniques to rebuild damaged runways (techniques still used by countries prone to earthquakes). Among many inventions at this time, the other one worthy of a mention is a form of plastic armour to protect critical structures (the US Navy calculated it saved over \$44 million as a substitute for steel). Research into new materials



for road infrastructure is another of those eternal threads at the Lab... the innovative applications of straw bales and tyres, or recycled plastics in road surfaces spring to mind from recent years.

For civilians in the war years, cars were made safer thanks to studies into the utility of driver assistance devices such as rear view mirrors (using appraisal methods recognisable in modern standards for Intelligent Speed Assistance and Drowsy Driver Awareness

systems). Zebra stripes were painted on roads for the first time to mark safe crossing places, a design which we tend to take for granted, yet it dramatically reduces collisions with pedestrians attempting to cross the road. Recent trials into [side-road zebra crossings](#) illustrate how the concept of pedestrian priority, much emulated around the world, has remained a stalwart pillar of systems thinking in road safety.



50s favourites

The third decade of transport research took place against the backdrop of the first manned space flight (1961) and the global obsession with the race to the moon. It was a golden decade at the Lab with some iconic research providing the evidence behind landmark policy changes, such as the priority rule at roundabouts



(fiercely contested legislation to make drivers give way to traffic merging from the right), the first standard for the manufacture of motorcycle helmets, the original Design Manual for Roads & Bridges, and the first commercial

use of Transyt to co-ordinate traffic lights in Glasgow. In the Lab, the team messed about with heated roads (yes, really), coin operated parking meters (the end of free parking), and the infamous converted Citroen DS19 which drove itself around the test track at Crowthorne ([see film on YouTube](#)). The DS19, I'm pleased to say, is preserved at the Transport Museum.



Serious 60s

Just when everyone else was having a party, things got serious in the late 60s. Allan Breed in the USA patented the air bag, while Nils Bohlin, a Swedish engineer at Volvo, invented the 3-point seat belt and Volvo generously declined to patent it. At the Lab there was intense study into the effects of drink driving, and many experiments relating to seat-belts lead to the design of crash test dummies. Ethics in research was taken seriously as a new capability, and the skill set of the Lab personnel trained in ethical research has remained in constant demand. There are reports from this era that remain the original

sources underpinning academic and applied research all over the world. SCRIM took to the roads (and is still doing duty in 2023). And PhDs were written by TRL staff about traffic noise and the potential of electric vans.

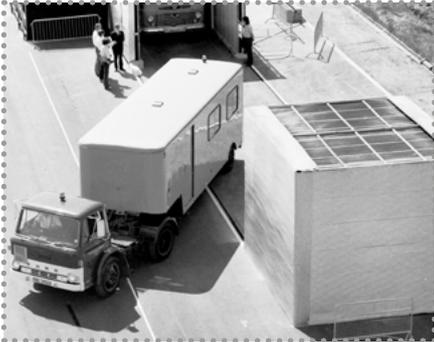


Fun times in the 70s

By the late 70s, TRL was a sizeable organisation of engineers and scientists and the breadth of research is quite astonishing. We have the Lab team to thank for speed bumps and mini roundabouts, and the terrifying motorway contraflow – all methods of keeping the traffic flowing smoothly. They built a



traffic control and they built a full size car simulator for the first time to create an immersive driving experience for trial participants. Much fun was also had testing the very earliest satnavs, and a team installed radar on the front of a car to detect obstacles in front and brake if the driver didn't. While Lab technicians used satellite images to locate and assess the condition of roads in Africa (which is a technique TRL has [refined to great effect](#) in the past couple of years), Tufty the Squirrel was at large and the Green Cross Code (1978) was learned at school.



model of the proposed Channel Tunnel to assess the safety of vehicle loading operations (the Lab's scathing conclusion sent the designers back to reconsider their plans). They invented SCOOT (Split Cycle Offset Optimisation Technique) for real time adaptive

The Thatcher years

Into the 80s and the Lab was running major programmes overseas, sharing best practice and customising its road building [manuals](#) for local conditions. These were the Thatcher Years. Along with discussions about privatisation of the Lab came the first forays into commercial work. This is



the decade of new product evaluations (like the Sinclair C5), and the creation of the Isofix standard for child restraint systems. Much of the work centred around safety improvements to vehicles to benefit vulnerable road users, and exploration of new modes of transport (Docklands Light Railway 1987). We also have to thank the Lab for the breathalyser test.

Foundational 90s

Staying true to its original mission, the 90s sees TRL as a key enabler of the [NCAP](#) programme (first proposed to the DfT in 1994) which has been a fantastic force for improving vehicle safety standards around the world. The HARRIS road condition inspection vehicle was commissioned in 1991, and the first variable speed signs lit up on the UK motorways (TRL are still working hard to perfect this system and prepare it for an automated vehicle parc). In 1994 the Channel Tunnel finally opened, and in 2000 the Toyota Prius went on sale.



A new century

The first decade of the new century was certainly busy, but by now there is a smaller team of approx. 300 staff, and less work is published. Whilst passengers in London enjoyed the novelty of the Oystercard (2003), back at the Lab they were working on the Traffic Speed Deflectometer to measure road condition without holding up the traffic, a new



hazard perception test as part of the driving test (which has done wonders at reducing the appalling waste of young drivers lives),



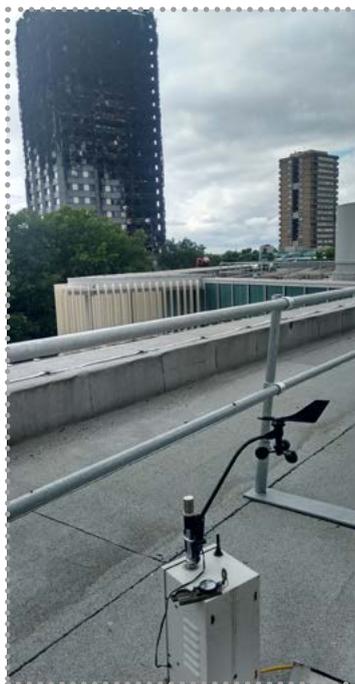
and doing seminal research on the impairment of using a mobile phone while driving (a study that was discussed at length by the Transport Select Committee only last year when considering whether to make the use of hands-free devices illegal).



Thanks to the Lab, local roads everywhere sprouted vehicle activated road signs smiling and scowling at drivers. And years of effort was poured into preparing the roads and transport systems in London to welcome the 2012 Olympics; there was a huge programme of street adaptations to make routes through London safe for the millions of extra visitors, as well as the first implementation of [GLOSA](#) to ensure that athletes and VIP visitors got to events on time.

Two quick asides

There are happily not many major "incidents" in the archives. Road collisions have been recorded, analysed and investigated at the Lab since 1934 (and precious data is still captured today in RAIDS). The [Selby train crash](#) investigation (2001) was probably the highest profile tragedy to be deconstructed by the Lab to ensure it never happened again (pre RAIB), and the Lab has campaigned ceaselessly for an equivalent Road Accident Investigation Branch. It was a TRL team who went to the [Grenfell Towers](#) in 2017 to set up air quality monitoring units to reassure the remaining residents it was safe to stay in the neighbourhood, the same technology now being used to measure pollution outside schools from idling traffic.



The archives also contain some frankly bonkers experiments. A personal favourite is the 1965 "Vehicle impact tests on a hedge of *rosa multiflora japonica*" ...the idea being that it was a cheap and environmentally friendly alternative to the central reservation restraint systems on the motorway. [Read it here.](#)



Recent times

The most recent decade 2013 – 2023 has been dominated by themes which are more forward looking, but still anchored in our core mission of creating a better world, by promoting safe, clean and accessible transport. It is much harder to pick out the highlights from this decade because we have yet to evaluate the true impact of much of the work. And many studies are newer points on a continuum, finessing existing

knowledge, or concentrating on the practical application of previous knowledge, developing roadmaps to anticipate the known unknowns. The questions asked are harder, for sure. Transport is a derived demand and there is no research question that exists in a vacuum any more, everything is connected and co-dependent. Our subject matter experts mostly work in cross-discipline teams. If there is one thing the Lab has learned, it's that

it is uniquely equipped to foresee unintended consequences. Every generation of technical leaders ensures that lessons learned are recorded and passed on. This is the root of TRL's exceptional domain knowledge, not just the library of reports but the lived experiences of its staff, many of whom have spent their entire working lives at the Lab.



Back at Crowthorne, in the final days of the test track (star feature of many a BBC News film – check them out in this [collection](#) on YouTube, TRL ran one of the biggest physical trials ever, bringing in over 5000 people to test various proposals for a new cycling infrastructure in London. With an eye to the future, the [GATEway](#) autonomous vehicle trials in 2015 set in motion the road map to self-driving public transport and led to the joint public-private investment project to build the Smart Mobility Living Lab in London – the only real world testbed using the streets of a mega-city to validate new mobility concepts. While all 24km of instrumented roads on the testbed are like an observatory, there is [one roundabout](#) in particular that is the ultimate test for any new technology; if it works here, it will work anywhere.

Top pick for future impact

Many of TRL's projects these past few years have generally been well publicised and my colleagues will complain at whichever ones I highlight, for each has their favourite. If I had to pick just one however, there is an activity – probably unheard of by most readers – which we can be sure will positively affect every road user in the future (and every journey starts with a walk!). It's not glamorous, but it's right in the sweet spot of the Lab's mission and is a really good example of its quiet influence. For over a decade, a small group of passionate people at TRL represented the EU Commission in an enormous [programme](#) to harmonise the global standards for vehicle emissions' type approval. It's a vital step towards clean air for everyone, particularly in the most polluted places on earth. The impact of this kind of technical leadership will probably not be appreciated immediately, but that's ok, we do it for the benefit of future generations. That's why TRL's tag line is "the future of transport".