

New ★ ★ ★ mobility



If you want to be involved in shaping the future of mobility, you need to be at the epicenter of new ideas. So what's happening in California's creative technology hub? A virtual tour of Silicon Valley.

📍 – Fremont, USA



16,000

The number of active start-ups in Silicon Valley in 2017.
That compares with 2,400 in the same year in Berlin.



5 MILLION

Sales of electric vehicles in California are
expected to reach 5 million units by 2030.



1951

The foundations of Silicon Valley as we know
it now were laid in 1951 when Stanford Industrial
Park was built near Stanford University.

Today, Silicon Valley is the embodiment of progress, driven by corporations such as Apple, Google, and Facebook. The high-tech metropolis to the south of San Francisco is one of the most exciting and fastest-booming locations in the world. While Silicon Valley is best known as a global IT hub, in recent years it has attracted more and more firms whose goal is to develop cutting-edge technological solutions not only for computers but also in the field of mobility. That includes autonomous driving sensors, apps that respond to new trends in mobility, and advanced cartographic software. It's not an exaggeration to say that the whole concept of mobility is being reinvented in Silicon Valley. As a leading technology firm and innovator, ElringKlinger has had a base here since 2017 and is actively involved in shaping the future.

If you fly to Silicon Valley from Europe, you get a wonderful view as the aircraft turns south over San Francisco Bay. Look to the right on the horizon, and you'll see Palo Alto opposite Fremont, where ElringKlinger is based. At the head of the bay lies San José. Together, these three cities trace out the magic triangle known all over the world as Silicon Valley.

While you're landing, you can think about how you are going to cover the 32 miles from San Francisco airport to

ElringKlinger's plant in Fremont. By train? There is no train service from the airport. By bus? The bus to Fremont runs from downtown. By taxi? You'd have to spend ages waiting. Why not call a ride-sharing firm? It's quick and very straightforward. Just open the app, enter your destination, and the system will provide you with the plate number for your ride-share driver. In fact, given that the market share of electric vehicles is higher in California than anywhere else in the USA, it's quite possible that you won't even hear the sporty mid-range car with your designated license plate as it pulls up silently alongside you. While you exchange a few words with the driver, your eyes are wandering over the sporty bodywork and the interior. What appears at first sight to be a tablet in the central console turns out to be an integrated multi-function touchpad monitor – the vehicle's brain center – which does the job of the old dashboard instrument panel.

Let's call the driver Jeff. Jeff asks you to confirm your destination: ElringKlinger Silicon Valley in Fremont. After a few miles he says: "As long as the system doesn't report a hold-up, we'll turn left here and take San Mateo Bridge over the bay. Before we get to the bridge, we'll drive through Foster City, which is now home to some innovative pharmaceutical and IT companies." The automotive industry has also moved in and left its mark on the city, he adds. Jeff asks if you have heard of robotaxis: "They are being developed here by a new manufacturer, and it won't

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The number of autonomous driving levels. At levels 0 to 2, the vehicle and its environment are controlled by the driver. At levels 3 to 5, the vehicle itself has partial or full control.

be long before they go into series production." As far as Jeff is concerned, that is the future of mobility – the next step up from ride-sharing. Using the app, you will be able to order a ride as before, but the vehicle that turns up and takes you to your destination will be equipped with an autonomous driving system. You might even find yourself sharing the ride with other passengers heading in more or less the same direction. "So it'll work like a minibus?" you reply. "That's right," says Jeff. "Only, there won't be a driver, it won't run on a scheduled bus route, and you'll be able to book a ride using your smartphone. Basically, robotaxis bring together the worlds of personal mobility and public transport."



That gets you thinking. Driving without a driver? It's a crazy idea – but an exciting one! Everybody talks about autonomous driving, but up to now it's been no more than a concept. In the near future, however, that theory will become a reality. The first licenses have already been issued, and, in California, the first autonomous vehicles are already on the roads. Rather than sitting at the steering wheel yourself and having to concentrate on your driving, you will be able to chat with other passengers, work, surf the web on your smartphone, or just relax. All those stressful situations that lead to traffic jams and wrong turns will be a thing of the past.

What impact will that have? For one, people will be calmer. There will be no need for all those multi-story car parks in the city, so there will be more space for green areas and new homes. With everything controlled super-efficiently by computers, there will be fewer hold-ups. For commuters, the journey home won't take as long.

All this is no longer science fiction but science fact! However, the new driving systems being developed rely crucially on our ability to process huge volumes of data and control autonomous road traffic. In turn, that demands computer power on an enormous scale. New vehicles are already connected to the Internet and supply all the data they generate to the manufacturer, transforming its role from that of a traditional car maker to one of comprehensive data manager. Besides monitoring your vehicle's current status, the system will evaluate the data it receives on your movements and offer you customized solutions to match your individual mobility needs. Obviously, big data management firms such as Google have been interested in cars for years.

While you are still reflecting on all these changes, Jeff announces that you have arrived in Palo Alto. The city is home to Stanford University, which has provided the spark for a host of business start-ups. It was the construction of Stanford Industrial Park here in 1951 that laid the foundation for Silicon Valley. You might say that Palo Alto and its neighbors Mountain View and Sunnyvale are the birthplace of what we now refer to as Industry 4.0. Companies such as Hewlett-Packard and Google are based here. Intel and AMD are in nearby Santa Clara, and Apple is just a bit further south in Cupertino.

As Jeff turns off Highway 101 in Sunnyvale and picks up Highway 237, he says: "Look over there. That's an Amazon R&D lab. All the established car makers have also set up technology centers in this area – the Americans as well as the Germans and Japanese." The future of mobility is being forged right here.



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Waymo, a subsidiary of Google's parent company Alphabet, is busy developing fully autonomous driving systems. According to unconfirmed reports, Apple has set up a project called "Titan" to work on its self-driving iCar. Many other car makers will undoubtedly want to break into the market. From where you are standing here in the nerve center of US technology development, that's an inescapable conclusion. Every one of them is looking for a solution that will define the future of mobility. To achieve that goal, they need to attract the best people. Competition for the smartest brains, the most productive workers, and the best ideas is intense.

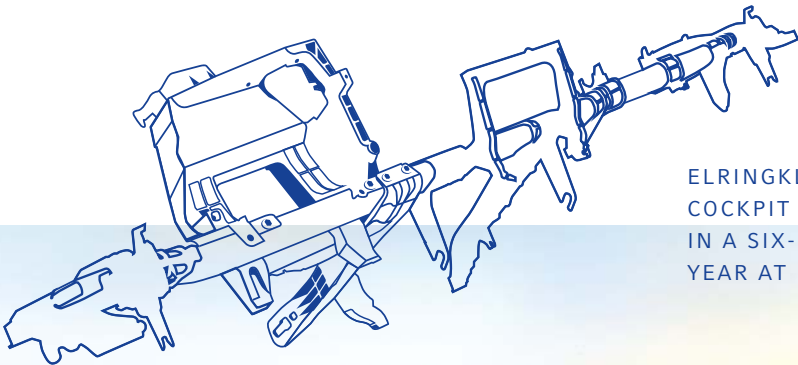
Jeff's enthusiasm for all things Silicon Valley is unmistakable. He tells you he has already worked for various start-ups and loves their flat hierarchies. The dress code is jeans and a T-shirt, but that's just for show, he explains. The real secret to their success is flexibility and agility in just about everything they do. You have to think flexibly to start with. If you are part of a flexible team, you have to work fast to overcome new challenges all the time – during the development phase, for example, or in marketing and production scheduling. You share ideas non-stop – over lunch in the trendy café, over a game of pool in the

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The number of companies in California granted a test license for autonomous vehicles with a driver. Only one is allowed to operate without a driver.

corporate social area later in the afternoon, or while you're playing basketball on the sports ground in the evening. The table football and lounge sofas are designed to create an atmosphere in which radical new concepts of mobility can emerge and evolve.

So what will the future look like? If robotaxis can break into the market in the cities, car ownership will be less and less important as a means of transport. As for the drive system, it makes sense to run battery-powered vehicles for trips of just a few miles in large urban areas. Given the short distances involved, the vehicle can simply be recharged at various service points. However, that means the power grid will have to be capable of meeting increased demand for electrical energy.



ELRINGKLINGER CAN PRODUCE COCKPIT CROSS-CAR BEAMS IN A SIX-FIGURE NUMBER EVERY YEAR AT ITS PLANT IN FREMONT.



Our Fremont plant is roughly in the center of the picture. ElringKlinger moved in and began operating in 2017, although the company already had a sales office at the site.

A different picture is likely to emerge outside the cities. People travel longer distances, so the vehicle's range is much more important. That's where fuel cells come in. This solution is completely CO₂ neutral as long as the energy used to separate the hydrogen comes from the sun or the wind. What's more, compared with battery-powered vehicles, it doesn't depend on supplies of relatively scarce materials. The materials needed to make bipolar plates and membranes can be sourced without difficulty. Unlike batteries, there is no need for an entirely new decentralized charging infrastructure. You just need to retrofit hydrogen tanks to the existing network of fuel stations. The technology has one other major advantage. In common with petrol and diesel but unlike electricity, hydrogen can be stored relatively easily. Once the energy has been generated, it can be used whenever it's needed. That makes hydrogen the successor to petrol, while the exhaust gases from today's combustion engines will be replaced by – water!

While you are pondering all these thoughts, Jeff announces that you have arrived in Fremont. He drives right up to ElringKlinger's production site on Encyclopedia Circle. Using an innovative technique, the company makes lightweight structural components here for a model of the next generation of automobiles. This product saves weight, improves the vehicle dynamics, and allows manufacturers to integrate numerous functions at minimal cost. It also enhances passive safety and creates new design options. With the help of ElringKlinger's technology, developers can now give full rein to their creativity in their efforts to design the ultimate "feel-good oasis on wheels."

Jeff says goodbye and heads off. The service will be charged automatically to your credit card. You have now completed your virtual journey through the epicenter of the future mobility revolution. But as you open the door to ElringKlinger's Fremont plant, you can see right away that this new world will soon become a reality. Very soon, in fact. And ElringKlinger is part of it.

M EGATRENDS of future mobility



EFFICIENT DRIVE SYSTEMS

Faced with scarce resources and limits on emissions, we need new vehicle drive systems that can deliver efficient and CO₂-neutral mobility. This is where ElringKlinger's future path lies. We identified this trend early on and responded with a Group-wide focus on battery technology, fuel cell systems, and complete electric drive units.

AUTONOMOUS DRIVING

Cutting-edge software and powerful sensors will take over from human drivers. On-board computer systems are getting better all the time, and vehicles will be capable of learning. Over time, human error as the cause of road accidents will be a thing of the past. We could even see a rapid decline in the number of road accident casualties.

CONNECTIVITY

In order to reduce congestion, all vehicles will be connected to the Internet and form part of a huge network. This will make it possible for road traffic to be managed by computers.

SHARED MOBILITY

Programs are being developed for people with similar mobility needs to ensure that we move around as efficiently as possible. In towns and cities, computer-based ride-sharing services will be an integral part of the public transport landscape.