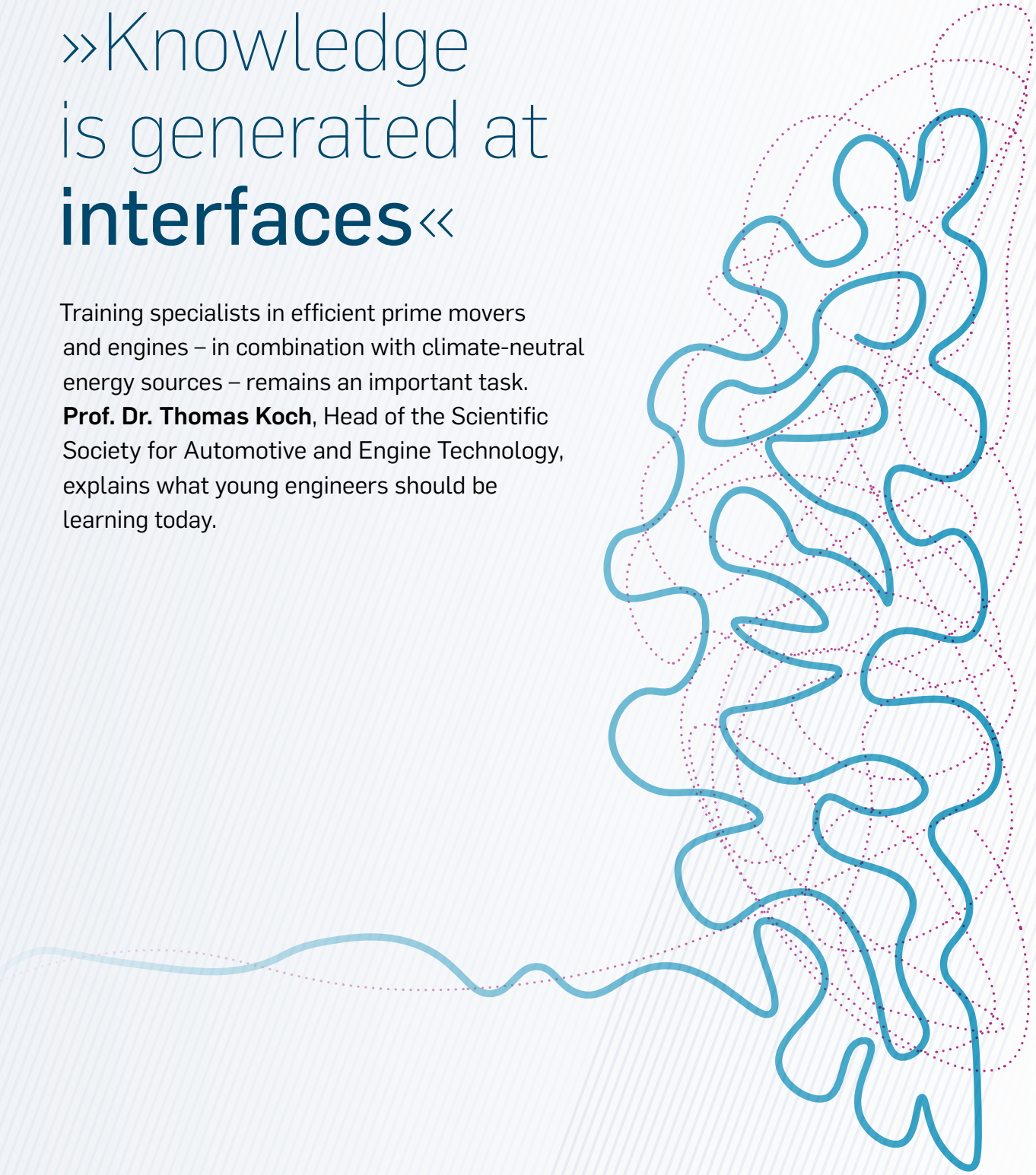
»Knowledge is generated at **interfaces**«

Training specialists in efficient prime movers and engines – in combination with climate-neutral energy sources – remains an important task. **Prof. Dr. Thomas Koch**, Head of the Scientific Society for Automotive and Engine Technology, explains what young engineers should be learning today.



Professor Koch, why should a young person choose to study mechanical engineering with a focus on combustion engines?
Engines power countless machines, from hand-held chainsaws to agricultural machinery and ships. In many applications, there is no chance of the combustion engine being replaced in the coming decades. And even in the automotive sector, combustion engines still have a future in many regions of the world and possibly also in Europe.

Young people usually want to make the world a better place. Can they do that with a scientific education as specialists in motor vehicle and engine technology?
Whether it's electric powertrains, fuel cells or combustion engines, much remains to be done; for example, when it comes to raw materials, costs or the sustainability balance. At the same time, we have to make sure that we can produce the solutions in this country so that we can also generate prosperity here.

Please be a bit more specific – what will be the most exciting tasks for research and development in the future?
First, the new tasks are the same as they were 30 years ago: improving efficiency and thus reducing energy demand remains an important engineering task. The same applies with regard to further increasing the durability and with it the sustainability of machines. Added to this is the new task of operating with carbon-neutral fuels. The conventional piston engine is also usually part of a hybrid powertrain, which raises new control engineering questions.

How much knowledge is there already out there regarding the interaction between piston engines and renewable fuels?
The biggest challenge is that we have to dovetail the development of energy sources and energy converters better than we have managed to in the past. After all, the investment costs for fuel production plants are very high. We have to achieve an overall optimum, which is not possible if we only consider the engine or the hybrid powertrain individually. At present, no one can say whether a holistic optimum will ultimately be found in the use of hydrogen, methanol or another hydrocarbon.

At the same time, methodological development seems to be taking a big leap forward.
In the last 15 years, the focus has been on optimisation in n-dimensional space, i. e. the search for the optimum with simultaneous variation of injection timing, exhaust gas recirculation rate, boost pressure or Adblue dosing, for which the design of experiments has been continuously developed further. But it still takes us far too long to get from an initial application solution to a drivable prototype. That is why new methods, such as artificial intelligence processes, are playing an increasingly important role in engine development.

How is teaching changing as a result of the increasing electrification of combustion engine powertrains?
We have to incorporate everything, but also need the courage to hand over, at the right time, to neighbouring institutes which are working on batteries or fuel cells, for example. But teaching also needs to dovetail better. For example, I will present a lecture on hybrid powertrains together with a head of the Electrotechnical Institute at my university. Close collaboration is important because knowledge is generated at interfaces.

PROF. DR. SC. TECHN. THOMAS KOCH
has headed the Institute for Internal Combustion Engines at the Karlsruhe Institute of Technology (KIT) since 2013. Before his appointment, the mechanical engineer with a doctorate from ETH Zurich worked in engine development at Daimler AG for ten years. His numerous voluntary activities include involvement in the Scientific Society for Automotive and Engine Technology (WKM).

Photo: KIT

What role does Industrial Collective Research play in this?
Even if the application process has become somewhat cumbersome and bureaucratic, I consider Industrial Collective Research, as organised by FVV, to be extremely valuable. In the past, it has significantly strengthened the competitiveness of German companies – especially in the SME sector – as well as environmental protection. One example is research into exhaust gas purification. I see no reason why such a successful instrument should be less profitable in the future – especially as working in FVV projects prepares young engineers well for their work in the industry later on.

What are the current job prospects for young engineers?
The pandemic initially cut quite a swathe through the personnel market, but our graduates are now experiencing increased demand again – including from the automotive industry.

Thank you very much for the interview, Professor Koch! //