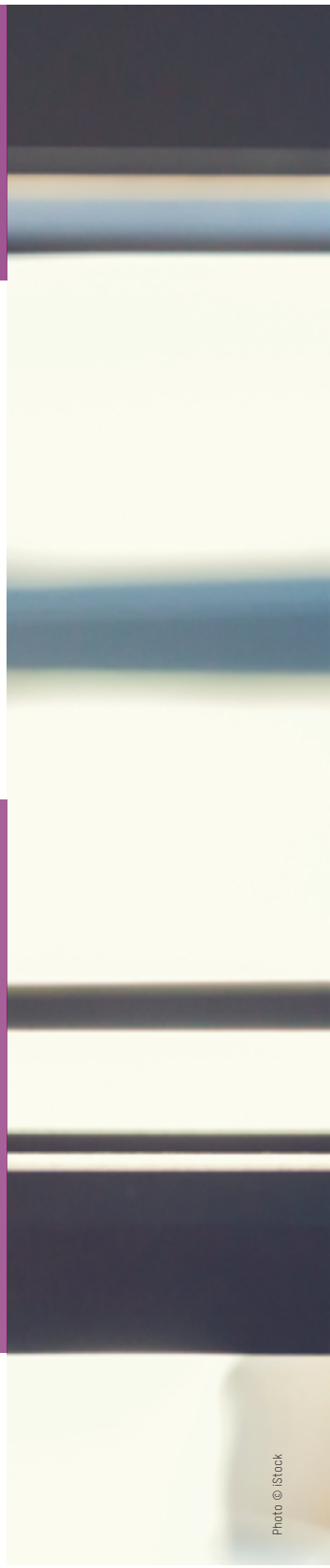
Will the disruption live up to the hype?

Rainer Gebhardt, Head of the Additive Manufacturing Workgroup, VDMA

Until recently, 3D printing was primarily at home in the maker community, where tech-savvy DIY enthusiasts were among the first to build simple devices able to produce three-dimensional objects by laying down successive layers of material. The potential for this technology to reshape manufacturing on a larger scale has sent shock waves of hype throughout the industry.

automotion sat down to discuss this topic with Rainer Gebhardt, who heads the additive manufacturing workgroup at Germany's VDMA engineering association.



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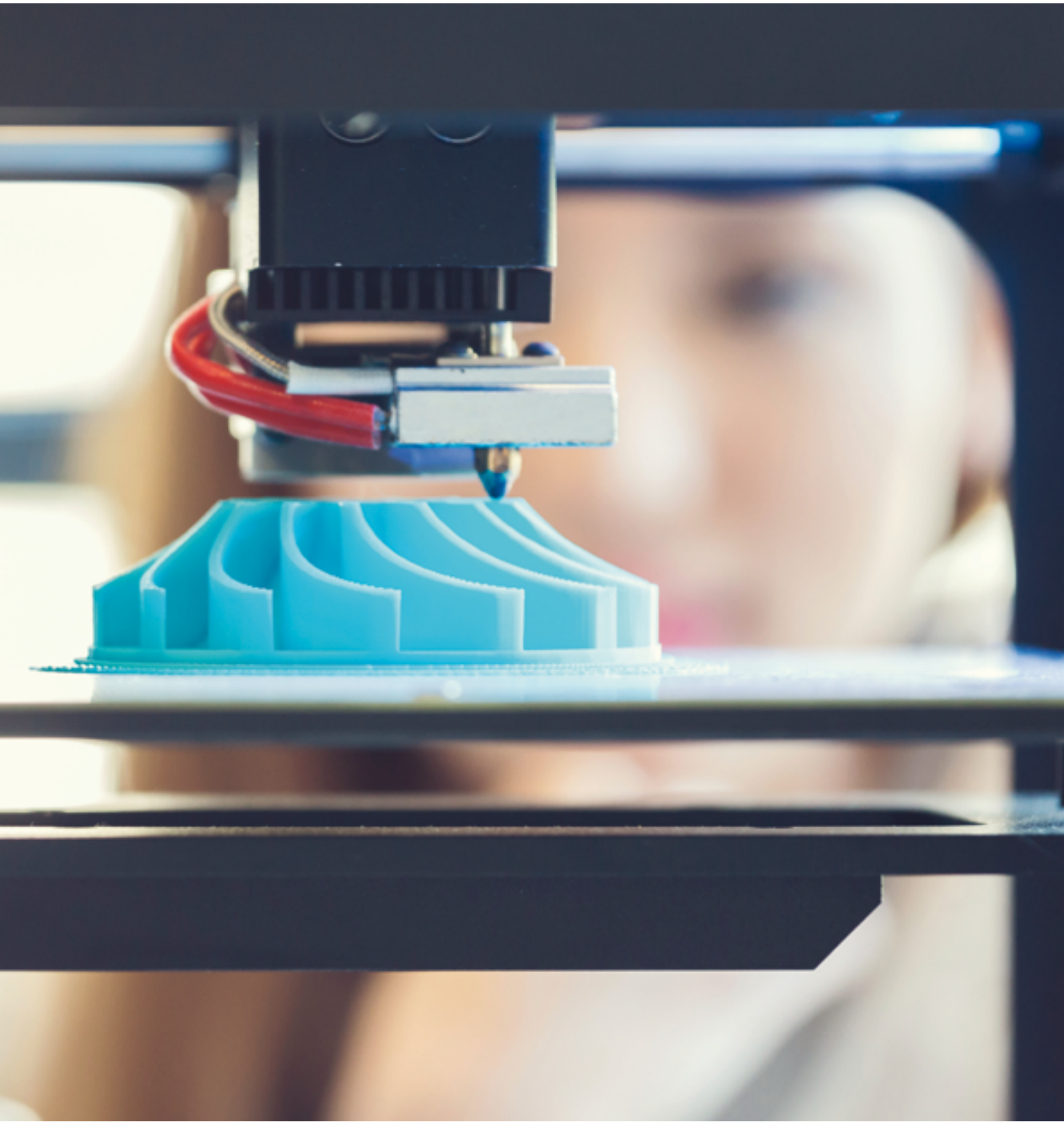

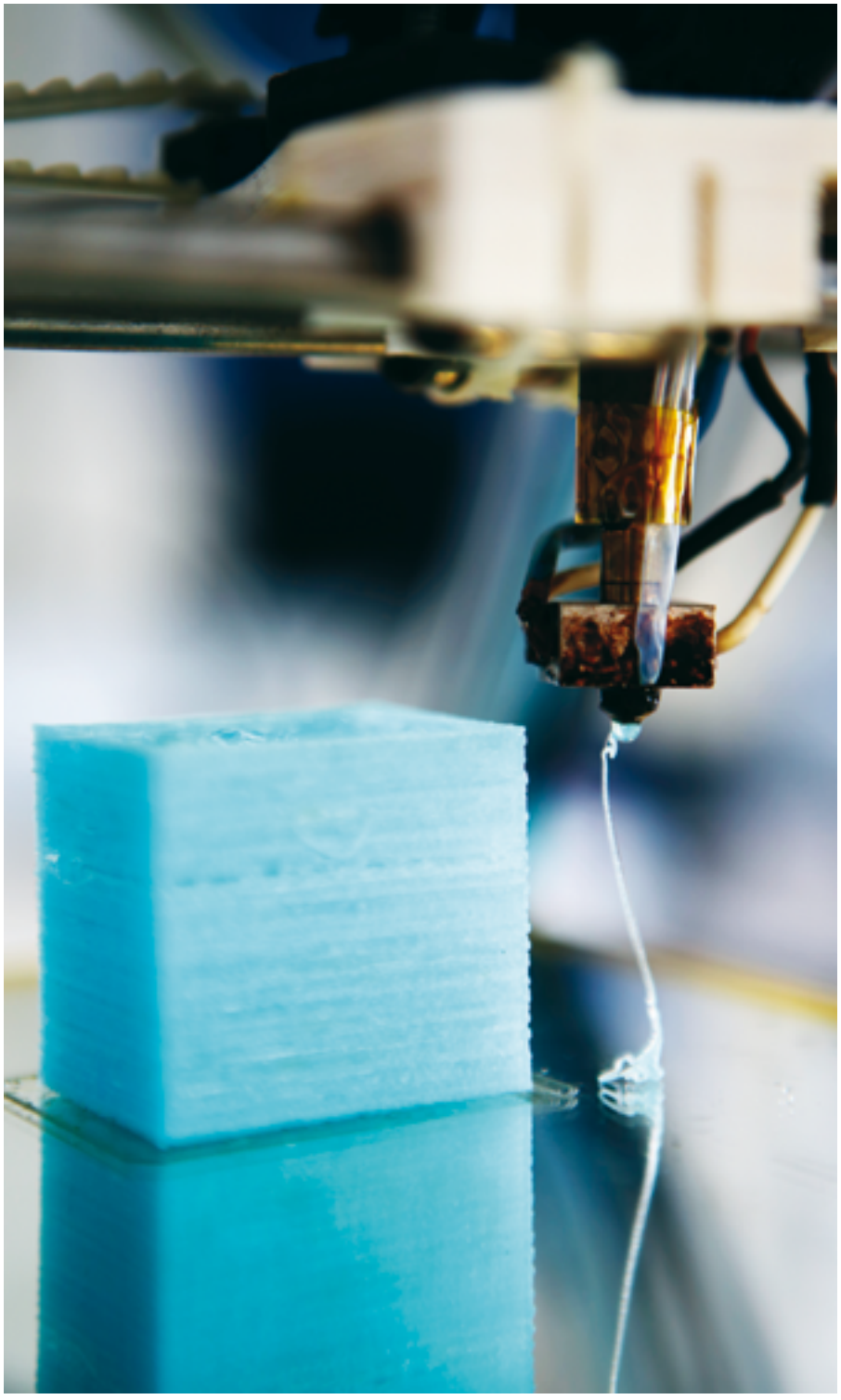

Mr. Gebhardt, how did you come to be involved with the topic of additive manufacturing?
Until three years ago, I was with the printing press manufacturer MAN Roland, where I got to know the printing industry from the perspective of OEMs and users and gathered experience and know-how about the technologies used and the market in general. From there I moved to the trade association for print and paper technology at the VDMA, which gave me the chance to get involved in additive manufacturing. And now I've led the additive manufacturing workgroup since it was created in May of 2014.

3D printing and additive manufacturing are hot topics these days. Can you explain these terms briefly for the non-experts among us?
The term additive manufacturing, or AM for short, is basically the opposite of the subtractive methods we're used to, where material is removed through machining processes like turning, milling, grinding and EDM. Instead, material is built up – or printed – layer-by-layer to create a three-dimensional object. This is where the term 3D printing comes from.

What does your additive manufacturing workgroup do?
We observe additive manufacturing along the entire process chain – that is, from the perspective of the equipment builder, the user and the powder supplier. It's important to us that our focus spans all the different methods, including lamination and hybrid techniques for metals and plastics. As a workgroup, we also offer a network for the exchange of know-how throughout the machine manufacturing industry. We also have committees dedicated to current topics such as production quality or process automation.

There is a lot of excitement surrounding 3D printing. What stage in the hype cycle would you say additive manufacturing is in?
The impressive growth rate of over 25% makes it clear that there's some substance

behind all the talk. There are numerous companies offering industrial 3D printing solutions that are already being used commercially for tasks such as prototyping, tooling and mold-making as well as to fabricate replacement parts. Other applications are exploring new geometries that will offer advantages such as weight reduction and improved stiffness. And there are many other applications that haven't yet reached maturity.

There are so many different additive manufacturing techniques. Can you give us a quick overview of which ones are already available?
The best method to use will vary depending on what materials you're working with and what the parts will be used for. The first technology on the scene was stereolithography. Over the years, this has given rise to other techniques for metals and plastics. For metals, you have selective laser melting and electron beam melting. For plastics, there are techniques like thermal 3D printing. It's also possible to use liquid resin, which is then printed using stereolithography and digital light processing. Other popular methods are lamination, polyjet and hybrid systems.

What areas of use are there for parts produced on 3D printers?
OEMs are already using 3D printing to create prototypes without the costly and time-consuming process of first creating the necessary tools. The same applies to replacement parts, which a 3D printer can produce remotely, on demand in small quantities – eliminating the need to maintain a central inventory for years. Another use is to make targeted repairs to very complex components that would otherwise require extensive hardfacing, milling or grinding. Additive manufacturing allows the production of new structures and designs that would be impossible to create with conventional machining. You can make components that are extremely precise, lightweight, stable and integrated, like those used in machine tooling. And these are only a few of the many possibilities.

Where there's light, there are bound to be shadows. What are the challenges people face when implementing 3D printing?
Not everything that is technically feasible makes good economic sense. In addition to the high material costs and the time needed for printing itself, the components also need to be designed in a way that is conducive to 3D printing. The design process must be creative; 3D printing should not be considered a simple substitute for conventional manufacturing. Only then will the technology live up to its full potential.

Additive manufacturing does already have some commercially successful applications. Can you briefly summarize the advantages it offers?
The advantages come when you're producing parts in small quantities or parts that are too complex for conventional methods – or that would otherwise involve high up-front tooling costs. OEMs can use service providers to have parts produced quickly, close-by their customers and without the complications of a lengthy supply chain.

Are there any areas that are definitely not suited to additive manufacturing?
Additive manufacturing won't likely offer the economies of scale you get with conventional manufacturing any time in the near future – so you won't yet see it being used for mass production.

As automation specialists, it's in our nature to focus on how processes and equipment can be optimized. Where do you see the obstacles, technical or otherwise, preventing 3D printing technology from more widespread use?
Additive manufacturing is not yet on par with the long-established conventional methods of production. There is also still some potential for optimizing the automation of the 3D printing process. Aerospace and other industries place particularly high demands on the quality of produced parts. We also have to think about how to encourage creative new designs, while at the same time protecting them as intellectual property.

What does the future hold for this technology? Are there other challenges besides the technical ones you've mentioned?
Like with the topic of Industry 4.0, there are both technical and sociopolitical aspects. Consider the design and development process. Engineers need to get more creative if they're going to take concepts that are otherwise hard to imagine and implement them in a CAD system for 3D printing. We can expect some breakthroughs when it comes to commercializing new ideas, because a 3D printer lowers the cost barrier for producing prototypes.

Do you think we'll start seeing conventional manufacturing processes supplanted by additive ones?
I think the idea of straight-up substitution is wishful thinking. In reality, it seems like additive manufacturing will be more of a complementary technology. Still, there will surely be areas where individualization and lightweight construction are in high demand, and where the shift from subtractive to additive manufacturing will happen relatively quickly.

When it comes to the industrialization of additive manufacturing, we're still at the very beginning. Which industries will be the first to demonstrate the benefits of additive manufacturing in mass production?
We're seeing the highest growth rates in the aerospace and automotive industries, but tool manufacturers are also very involved. Another active industry is medical technology, where they're working on custom prosthetics, hearing aids and dental prostheses that really highlight the social value, flexibility and benefits of 3D printing.

Very exciting – thanks for your time! ←

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