



Where Innovation Happens

How Google ATAP
Uses 3D Printing to
Design Brand-New
Tech Experiences



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Bryan Allen

**Technical Program Manager
and ATAP Lab Lead**

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At Google's Advanced Technology and Projects (ATAP) group, problem-solving is key.

"Our team is really looking for solutions. We're always searching and exploring new technologies but in the end the most important thing is application driven innovation," explains Bryan Allen, Technical Program Manager and ATAP Lab Lead. The team specializes in 3D printing and advanced fabrication, so they work with many different additive manufacturing technologies, including PolyJet Technology™ from Stratasys.

A hardware R&D lab at Google, ATAP combines

diverse teams of engineers, scientists and designers to develop technologies that enrich everyday interactions with the physical world. A successful ATAP project begins with a novel technical insight, and ends when a product incorporating new technology reaches customers' hands.

The process necessarily involves research, prototyping, product design, engineering, business development, manufacturing and close partnerships with academic and commercial collaborators from across Google and beyond.





Jacquard by Google

Led by Ivan Poupyrev, the Jacquard team is working to create innovative products across a wide range of applications, exploring how technology can be more accessible, helpful, and ultimately human.

Jacquard by Google is a wearable platform designed to bring the digital world into everyday experiences – without disrupting the user's lifestyle. The platform includes an app and a physical tag that can be incorporated into a number of soft goods, allowing for interactive

digital experiences without needing to physically hold a device. The Jacquard Tag itself looks unassuming, but that's entirely purposeful.

"Our designs are meant to disappear. They're meant to fit seamlessly into our aesthetic surroundings," says Allen.

That's why the physical Jacquard component is a small, sleek tag that can be modified to fit into almost any product, from a backpack to a shoe. These are products that aren't typically associated with digital experiences.

Jacquard by Google

One Jacquard application incorporated the tag into the sleeve of a denim jacket. A set of motions, like swiping or tapping the sleeve, allows the user to perform actions such as pausing music, taking a photo or answering a phone call.

The ATAP team follows the philosophy that a marriage of hard and soft goods shouldn't be disruptive. For the team, the moments of success in developing the Jacquard platform came when the tag merged seamlessly with the garments aesthetic.

"The idea of ambient computing means that the 'compute' is integrated into the world around us – it's in the things we use every day and sits idly by until we ask for it, and is then able to help us," Allen explains.





Bringing Flexibility to Product Development

The team faced a complex task: gracefully merging a hard goods and soft goods product pipeline. This challenging project required a versatile array of manufacturing techniques and technologies, both traditional and additive. PolyJet Technology provided the flexibility the ATAP team needed.

The versatility of PolyJet allows designers to jump in at any stage of the design process and create the prototypes they need, from single-color concept models to functional multi-material prototypes. Parts printed with literally flexible materials allow for further part realism. PolyJet printers like the J8 Series combine excellent resolution with a wide range of material offerings and workflow capabilities. These printers are also Pantone Validated™, offering thousands of unique shades and the capability to simulate surface textures from woodgrain to leather.

Allen explains that PolyJet printers provide a good balance between speed, material performance and functional fidelity – the last of which is a crucial step in the ATAP product development process.

“We’re talking about things that didn’t exist before,” he says. The team needs to be able to closely replicate the multimaterial assembly of the final product, and that process needs to happen fast. Typically, getting a multimaterial prototype would take weeks, but with PolyJet, the ATAP team can hit print at the end of the day and have a high-fidelity model in engineers’ hands the next morning.

Stratasys has made that process even easier with the recent announcement of support for KeyShot 10 rendering software and 3MF file format capability. By saving designs to 3MF, KeyShot produces files ready for printing, with accurate colors and displacement maps to three-dimensionally simulate textures. The Google ATAP team was a key beta customer.

“A lot of designers are using KeyShot. The closer the end part coming off the printer looks to the KeyShot rendering and the easier it is to go from the designer’s vision to the final print, the better,” Allen says.

The result is that designers get more questions answered faster. In other words, says Allen, you’re “de-risking” the process. “You’re buying design time to explore and optimize your solutions and get critical needs done so you can move into the next stages.”

Having that extra time is critical for groups like ATAP, which is focused on creating truly novel products that enhance tech experiences. The team looks to develop products that can be integrated in multiple areas, with the versatility to help users in a range of different environments and experiences. That, explains Allen, is why Jacquard is so exciting.



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Human Analogs to Enable What's Next

So far, in addition to the denim jacket, the ATAP team has used the Jacquard platform to introduce a wearable gaming athletic shoe and a smart backpack, with more to come.

Meanwhile, the team continues to use 3D printing in new ways. ATAP is even beginning to use Stratasys' Digital Anatomy™ technology to improve functional material performance. The

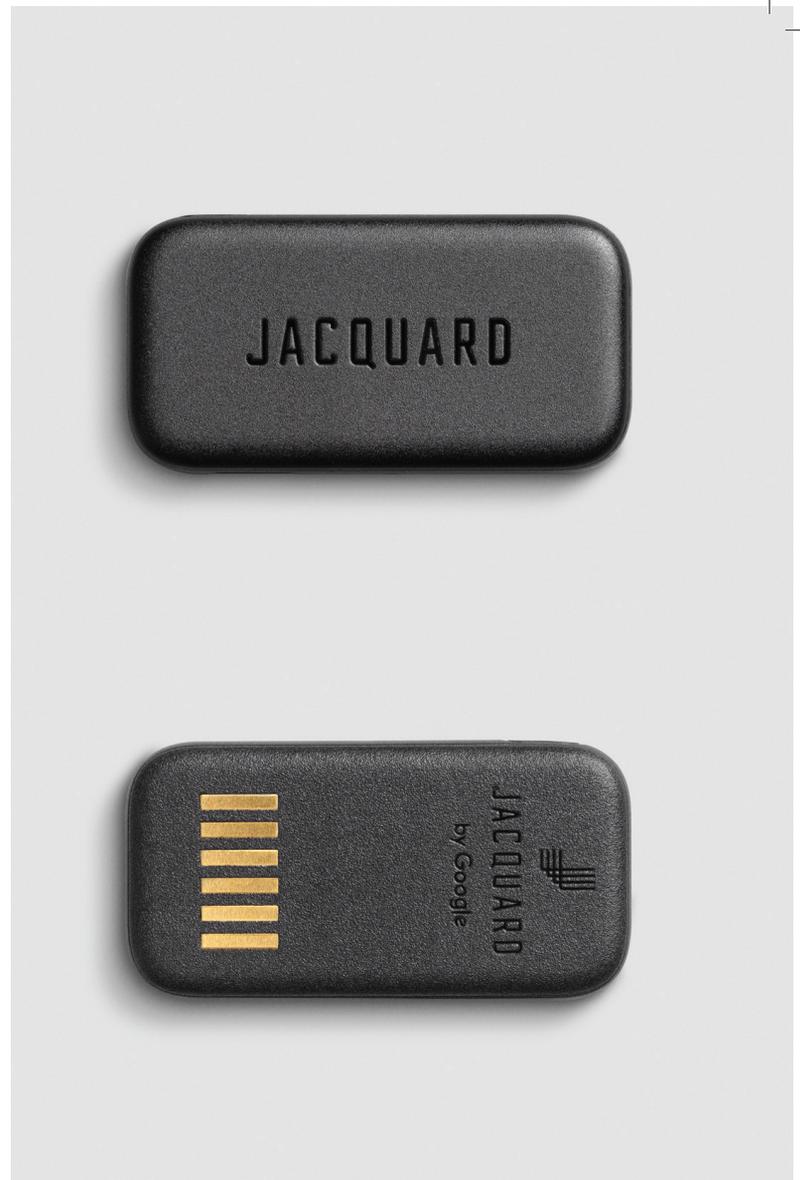
PolyJet-based Digital Anatomy Printer replicates the appearance, texture and responsiveness of human anatomy, including tissue, bone and muscle. Designed to improve surgical preparedness and training and help test new medical devices, it's found a home with Google ATAP Lab team as well. After all, they're designing devices that need to wear well on the human body.

Human Analoggs to Enable What's Next

"The closer replication of human body materials opens up entirely new avenues of exploration," Allen says.

Clearly, PolyJet is helping bring these novel experiences to life. Allen says as 3D printing continues to evolve and improve, the final printed parts will even more closely match designer intent and real-world materials.

"Printers are really catching up to how designers think about design and materials," Allen explains. "The future is coming a lot faster than we thought it would, and at Google ATAP we're building the capabilities for us to be able to predict what's possible."





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