

Fountain Pens from the Printer

BY REINHARD KARGL

Dutch industrial designer Rein van der Mast uses pioneering technology to create wondrous fountain pen designs.



Pjotr by Rein van der Mast Meteor 3D-printed titanium fountain pens in Merlot Red, Royal Blue, and Pure with 3D-printed titanium nib.

The fountain pens called “Pjotr by Rein van der Mast” are among the world’s most extraordinary and rare writing instruments. Designed and printed by Rein van der Mast, a Dutch expert in industrial design engineering and additive manufacturing, they are the result of pioneering experience and painstaking development: wondrously unusual fountain pen designs that would have been impossible to turn into real objects only a few years ago.

For centuries, consumer goods were produced with “subtractive” manufacturing—techniques in which extraneous material is removed. Examples include turning, milling, eroding, grinding and lapping the workpiece into the desired shape. But this approach is limited; all tools require space. So, designs manufactured this way cannot have any areas or cavities—nooks and crannies, so to speak—in which the required carving tools cannot fit. But this is changing.

Today, experts say we are at the cusp of a new industrial revolution: additive manufacturing (AM), in which objects are built by adding material as required as opposed to removing what isn’t wanted. This is done by adding patterns consisting of tiny specks of material one microscopically-thin layer at a time. When repeated, this builds up a three-dimensional

object from a digital blueprint. Essentially, the principle is not entirely dissimilar to an office laser printer, except that it is much more complex and works in three dimensions.

Early 3D printers were limited to easily moldable thermoplastic materials, but now high-tech 3D printers routinely print objects from metal. This includes metals that are difficult to work with by conventional means, such as super-hard, light, and rust-free titanium. And that’s precisely where Van der Mast is engaging his considerable know-how.

As a child, Van der Mast, living close to Rotterdam, the Netherlands, was taken to art museums across Europe. With a love of art inspired by his mother and an aspiration for engineering influenced by his father, Van der Mast found himself at the University of Delft in the early 1990s, where he immersed himself in subjects such as mechanical engineering, fiber reinforced plastics, and manufacturing technologies. From a magazine about the (then) brand new field of 3D printing—at the time still primitive and mostly used to make rough product prototypes—Van der Mast soon realized the technology’s potential. After working for various companies, he launched SOLide, his own design and consulting firm, in 1998. Since then, he has been involved in high tech startups,



Above, left to right—engineer/artist Rein van der Mast; manufacturing technician Wesley van der Heijden preparing the titanium printer; rack of over 120 titanium nibs and pen parts. Right—Meteor in Royal Blue with included nylon 3D-printed pen stand. Below, left to right—Meteor in British Racing Green and Merlot Red.

international research projects, and various industrial applications. He also is the research leader on metal printing at Fontys University of Applied Sciences at Eindhoven, the Netherlands.

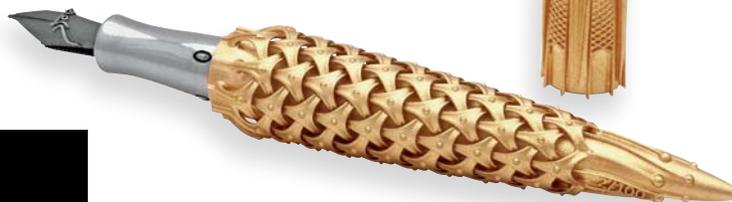
Around 2010, he embarked on a project of personal interest. “[As a fountain pen user] dreaming of creating precious objects with the latest technologies, the fountain pen would be my subject for merging art and technology,” he explains.

In 2013, he succeeded in printing the world’s first such pen in titanium. The design was inspired by his army service in the Dutch Cavalry, which forms honor guards for the Dutch royal family, the opening of Parliament, and other state occasions. The Theme Cavalry pen alludes to the legendary warrior Saint George, the patron saint of cavalry, and to the 11th century legend in which Saint George is said to have saved a princess from being sacrificed to a dragon. As if that wasn’t enough heroism, by some accounts George unselfishly declined to accept the grateful king’s offer of treasure, leaving it all to the poor instead. (Read more about Theme Cavalry in *PW* Volume 26, No. 3, “Have It Your Way,” by Laura Chandler).





Clockwise, from top—Spica Virginis in titanium, including nib, with 3D-printed lattice presentation box; Spica Virginis with gold barrel, silver section, and titanium nib; gold Spica Virginis with 3D-printed 18 karat gold nib.



This first pen design, made in small numbers, was followed by the stunningly intricate Spica Virginis. For the first time in the world, even the nib of the pen was printed from titanium. And Van der Mast has added more items to his newly formed Pjotr by Rein van der Mast pen company: “Since November 2017 I offer my pens, including their nibs, in titanium, 24-karat gold plating, or additively-manufactured 18-karat solid yellow or white gold.”

In November 2018, the Meteor line was introduced. Very different from the previous designs, its style is reminiscent of Streamlined Moderne. Grip section, barrel, cap, and clip are all printed from solid titanium and stainless steel. There are five different finishes: Pure, Pure+ (with a polished shaft), and polished and colored versions in Merlot Red, Royal Blue, and British Racing Green.

The nibs in particular are a manufacturing wonder. The whole unit—the slit, the logo, the embossed edges that create a more stable ink supply to the tip when the nib is pressed to paper asymmetrically—all this is printed as one piece of titanium, which unlike soft and easily workable metals like gold, is very hard and brittle. Because the nib is first shaped virtually in the computer, and because the printer can turn every imaginable shape into a real object, 3D printing promises new ways to customize nibs for individual buyers.

“I can optimize how the nib responds to the forces put on it by its user,” says Van der Mast, such as “very hard on one side, a lot of flex on the other, and also with specific flexure effects.” His patent-pending 3D-printing process incorporates functional elements such as the slit’s design.

When electronic instruments became available, wild predictions claimed that musicians would soon be unemployed because all sounds could be produced by computers. Today we know that this hasn’t been the case at all. In fact, synthesizers, sequencers, and audio software ended up creating whole new musical genres and sounds.

Likewise, 3D printing isn’t about to replace conventional manufacturing. Van der Mast says, “It’s a complementary manufacturing technology, allowing new designs to be made. New concepts will enter the market.”

The speed of this change depends mostly on the relationship between producers and consumers.

But the process of 3D printing certainly isn’t simple. Before it even begins, the entire intricate design must be made with digital design and rendering tools, taking into account various technical issues inherent to the printing process. This creates a virtual pen in the computer. The various printing techniques have colorful names such as *vat photopolymerisation*, *material jetting*, *binder jetting*, *material extrusion*, *powder bed fusion*, *sheet lamination*, and *directed energy deposition*. If your head isn’t spinning yet: Van der Mast’s titanium pens start out as microscopic metal spheres, which are fused together by laser beams in an inert gas environment.



This page—Theme Calvary fountain pen honors the legend of St. George and the Dutch Cavalry in its symbolism, including a dragon clip and a sleeping princess on the barrel. Below—3Dimensions TypeONE fountain pen with pen stand.

The printing process itself can take days, and when the solid pieces finally emerge from the insanely expensive printing machine, a great deal of hand polishing and fitting is necessary. (Here is where Van der Mast's current goal lies: trying to integrate parts—such as the nib, feed, and barrel—in order to reduce the number of parts).

It should be clear by now why Van der Mast's pens are costly. Starting from the top: the elaborate and intricate Spica Virginis can be had for just under \$3,000. This includes a 3D-printed lattice pen box, which like the pen, cannot be made by conventional means. Only 100 Spica Virginis pens will be made, and the number of each is printed as part of the design.

The Meteor models are available in the \$500 to \$1,000 range with a total run of 200 fountain pens. Nibs are available in fine, medium, and broad. All Pjotr-branded pens use either international cartridges or converters and are available only from one dealership and showroom: La Couronne du Comte in Tilburg, the Netherlands. Van der Mast is looking for further distributorship globally.

Looking to spend less than \$500, but still want to own one of the world's first printed pens? Dennis van de Graaf, owner of La Couronne du Comte, and Van der Mast have created the 3Dimensions partnership. They are offering the TypeONE model, which they call an "affordable 3D-printed fountain pen that is equipped with the world's first 3D-printed titanium nib." Unlike the other models, this pen's barrel is not printed from metal but either from black plastic or a gray hue that is created using a plastic filled with very small aluminum particles.

Throughout the ages, artists and craftsmen have sought to make use of the latest tools and techniques to create new and exciting work pieces, objects no one has made before. Rein van der Mast is doing just that, making him an outstanding pioneer not only in industrial design, but also in fountain pens. Visit pjotrpens.com and 3d-pens.nl. Visit Dutch pen shop La Couronne du Comte at lacouronneducomte.nl. Van der Mast's design firm is found at solide-tct.nl. Read more of Reinhard Kargl's work at reinhardkargl.com.

