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INSTRUMENTAL TO PERFECTION

The surgical precision with which a Patek Philippe timepiece is made necessitates the use of specialist tools, many of which are customized to the exact specification of the artisans that use them

The atrium of Patek Philippe's headquarters in Plan-les-Ouates is an impressive space, a light-flooded, cathedral-like void that soars from the entrance hall through all the floors of the building to the ceiling. Even after many visits, there is a sense of occasion, as one enters the building, that familiarity is unable to diminish. Sober and understated yet imposing, the towering, benign presence of the *Spiral* balance spring sculpture remains as visible from inside the building as from outside.

After being greeted by the ever-friendly staff behind the blond wood of the reception desk, guests tend to be taken through the plate glass doors to the right to enter the elevators that will carry them to the floors above, so it would be easy to ignore the panes of glass visible to the left. It is impossible to see the work that goes on behind them, as each pane is frosted and decorated with the outlines of components. But, however modest these windows may be, the work that they obscure is arguably the heart, or if not the heart then certainly one of the vital organs, of the complex organism that is Patek Philippe.

Much is said about the marvels made by the top watchmakers at Patek Philippe: the bell-like clarity of the minute repeater; the predictive magic of the perpetual calendar; or the astrological pageant of the Sky Moon Tourbillon. Most recently the horological world was rapt at the *tour de force* that is the Grandmaster Chime, and the price fetched by the fabled "Graves" supercomplication when it sold at auction made headlines around the world. But none of the aforementioned feats would have been possible were it not for what happens behind those windows. For it is here that the tools that fashion the marvels that grace our wrists are made.

Granted, it takes great skill and talent to wield them, but without the burins, the poising tools, the serried ranks of Lilliputian screwdrivers, the unique multi-bladed cutting tools, the little wooden wands (each covered in abrasive paper of minutely differing fineness), the measuring tools and the hundreds of other implements used every day in the manufacture, there would be no watches.

Modern watchmaking is engrossing: culturally it is a traditional activity and many of the tools have changed little over centuries, but today it borrows technology and processes from other branches of science and manufacturing. As well as a place of tradition, a modern watchmaking factory is a crucible of industry and innovation. Alongside the fine saws, the files, and the dwarf hammers, there are machines with the strength to slice through a bar of steel as if it were a silken thread, that simultaneously have the capacity to handle tiny components with a surgeon's delicacy and work within the tolerances of a micron.

To remain relevant in the modern world, a watch company has to innovate and invest constantly in research and development, tools, and machinery.

A typical watchmaker's worktable (previous pages). The average watchmaker at Patek Philippe has a minimum of one hundred different tools on his or her desk or in drawers. Grinding machines are used for making and finessing the functional parts of many of

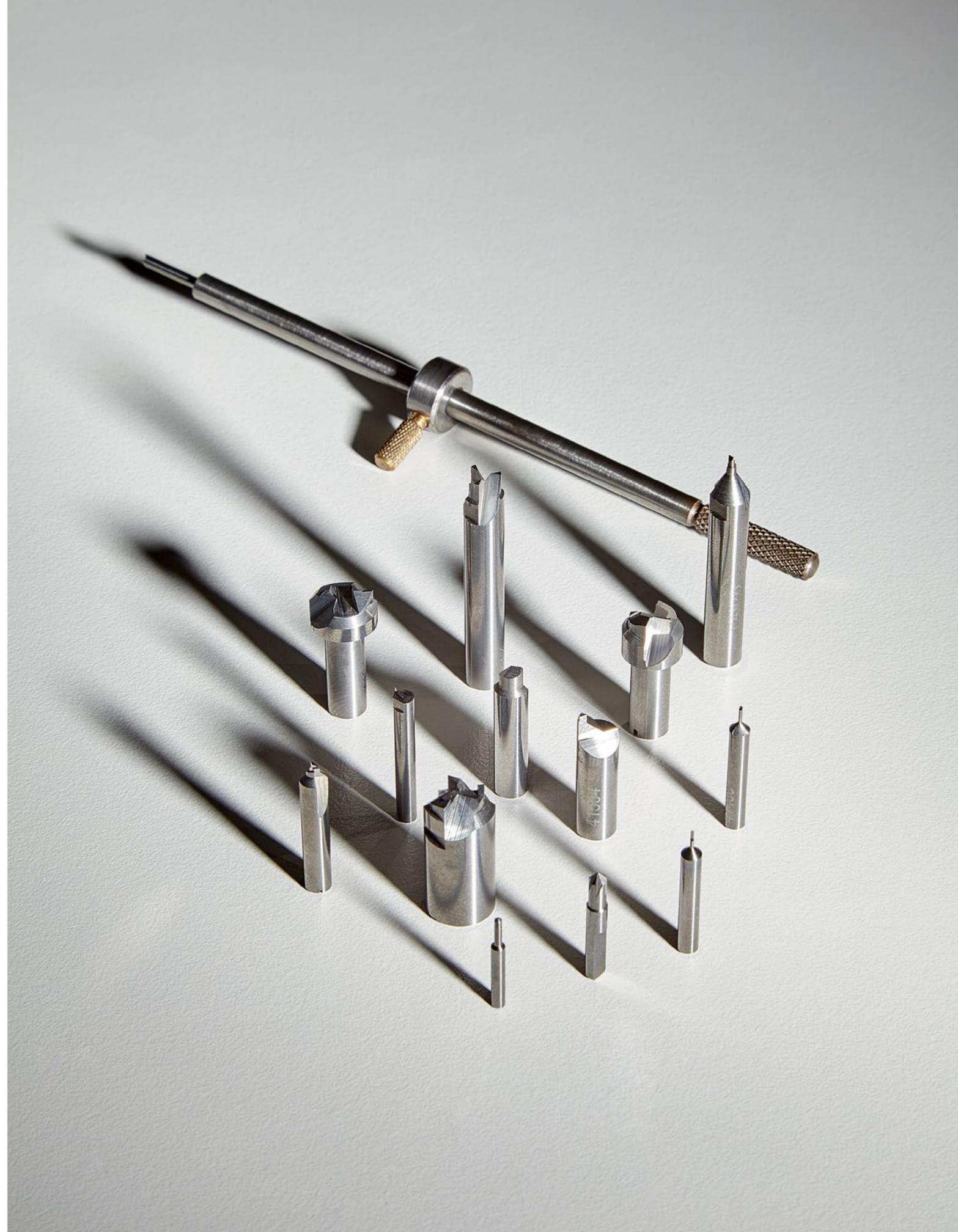
these essential horological implements. The one shown here (above, right) is working on a drill, but it can be used to make other tools such as round or complex-shaped milling-cutters and turning tools, as well as sharpening milling-cutters and other cutting tools (page 17)



The contrast between the universe of hundreds of components painstakingly arranged within a space of a few cubic millimeters – the size of a coin – and the giant machines at the service of this tiny world of mechanical interaction is one of the striking aspects of visiting a modern watch factory.

The investment, in terms of multiple-axis milling machines alone, is striking. Walking through just one of the workshops on the Patek campus and seeing the giant wheels feeding the machines with spools of movement components, each mounted like a frame in a roll of film in a belt that resembles a tank track, it is hard not to be impressed. Especially when told that there are several dozen such machines operating in this hall alone, and that each one of them costs in the region of US\$380,000. The mention of monetary value may be vulgar, but it helps to give a sense of the commitment that comes with being a true "manufacturer," and with it the knowledge that with the exponential development of technology, the life cycle associated with these machines is growing shorter and shorter.

However, what is truly remarkable is that this sort of machine is also used to make the tooling – tooling that is fitted into these machines. Presented with such a concept, the human mind embarks upon an unending journey



of chicken and egg. Rather like a triptych of mirrors so angled to present the viewer with a seemingly infinite vista of repetition, one rapidly enters a spiral of the tools that make the tools that make the tools...

And it is the mastery of the skills needed to make those tools, however recondite their function, that must be considered one of the marks of a true manufacture. The trouble is, of course, that the tools are simply taken for granted. My own conversion came last summer when I was visiting the manufacturing site at Plan-les-Ouates.

I had visited the building on many occasions but this time I wandered into a room that I had not entered before. It looked much like any other workshop manufacturing precision components, with that special sense of ordered and efficient industry that comes when each man and woman is performing their task with skillful hand and practiced eye, each like a component themselves in an ordered mechanism. Idly I wandered over to one of the workbenches where a set of technical drawings was being studied. There, laid out on the table, were the familiar views of a small component: cross sections, views from above, the scrupulous annotation of figures denoting measurements in microns.

I must confess that I lack the mind to master each component inside a watch (especially when seeing it in a two-dimensional technical drawing), so I asked which caliber these components were destined for. There was a slightly awkward silence and a few wry grins. I asked what was so amusing. “These are not watch components,” I was told. “These are the drawings of milling tools with special profiles.” It was then my turn to smile, a little in embarrassment but more in wonder, as the realization dawned that just the same care that goes into the conception and design of each bridge and pinion, barrel and pivot is also extended to the tools that shape them from the dumb metal.



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An uncased movement waits for the skilled hands of a horologist (below), while a band of bridge components (right, top) are readied for machining. The band allows for perfect stability during the numerous machining processes such as milling, drilling, and tapping.

Polishing is a vital part of the watch-finishing process and boxwood is considered especially suitable due to its hardness. Shown here is a machine in the process of making a grinding wheel from boxwood designed to create Geneva stripes (right, center), and further boxwood wheels (right, below)

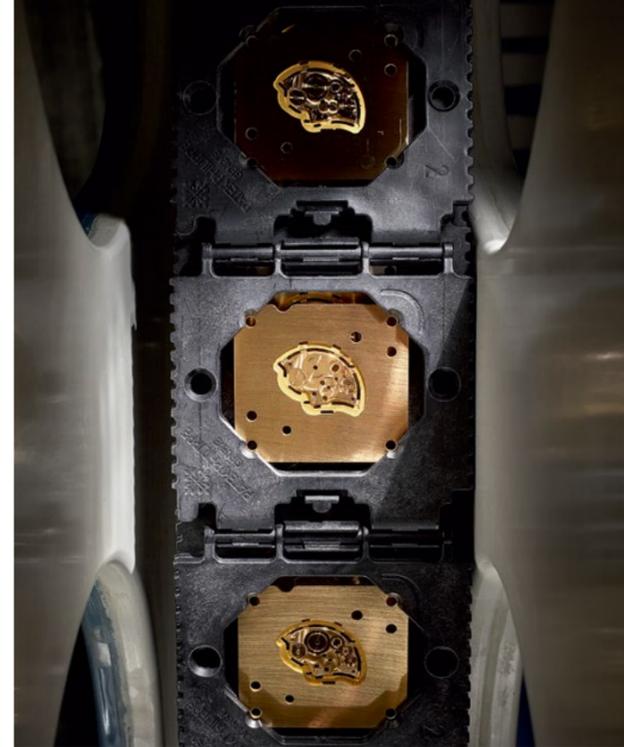
On reflection it seems obvious: a precision component requires precision tooling. And, of course, almost every component is the “child” of a set, often many sets, of tools – some working behind glass within multiple-axis milling machines moving at speeds so high that they and the piece upon which they work need to be cooled by a constant stream of lubricant; others in the hands of artisans and applied sparingly with a calm and meditative precision.

I felt slightly less foolish about taking the tools for granted a little later in the year when I visited the grand complication ateliers and restoration workshops. In a totally unscientific poll I asked watchmakers in different workshops how many tools they had on their desks and in their drawers. The responses were encouragingly vague and varied: “well over a hundred,” “a good two hundred,” “around three hundred”...

My guess is that if one were to count every single implement neatly arranged in racks, stands, and carousels at each bench, and empty all the drawers (each watchmaker has around 30 drawers, big and small, at his bench), the tool count would quickly top four hundred. Each drawer contains trays ranged with pliers, pipettes, brushes, tweezers, balance screw holders, files, countersinks, and much more besides. And then the nameless tools. It is here that the spectrum becomes almost bewildering: tools without names, with functions at which the uninformed could only guess.

In many ways the tools of the watchmaker’s trade are rather like the parts of the movement of, say, the Grandmaster Chime – some components will move thousands of times an hour, while others may remain stationary for months or years on end. So it is with a watchmaker’s tools. There are those in near constant use and those that may sit in their allotted space on a shelf in a cupboard for a decade or more, until they are required once again to make a part needed for the restoration of a long discontinued reference.

The same sort of thinking that characterizes watchmakers is also part of the culture of watchmaking tools. Just as, historically, Patek Philippe and other famous makers used to receive *ébauches*



(movement blanks) from the workshops in the Vallée de Joux, so the potences (the hand-operated stamps that proliferate in the workshops) are described as arriving at Patek “ébauchée,” where they are then equipped with manufacture-made bits and tools that are appropriate for the tasks they will perform.

Moreover, in a family firm such as Patek Philippe, the long-term thinking that watchmaking imposes upon the strategic planning of the enterprise is also evident in the tools. For instance, during the 1970s, veteran Patek Philippe employee Daniel Jaquet recalls that a part of the Swiss Cantonal hospital was being demolished and that a fine park of boxwood trees would be lost once redevelopment of the site commenced. Boxwood is particularly significant to watchmakers in Geneva because, thanks to its density and hardness, it’s the perfect material with which to decorate a movement and is used in the creation of the characteristic stripes of Côtes de Genève, as well as for various other jobs elsewhere in the manufacture. Jaquet oversaw the purchase of all the boxwood trees, which were then felled and the wood stored in sand-filled caskets and left to season for a decade (it must be dried slowly so as not to crack and splinter).

Around 40 years later, those same boughs are still in use, and to see Jaquet holding a piece of bark-covered tree trunk is like seeing a pair of old friends meeting after many years. In time, this piece of rough wood will be transformed into special polishing tools, which are cut and turned in the workshops behind the frosted glass to the rear of the reception desk.

In those same workshops there is a room that is sealed off from the rest of the open-plan workspace. It has a strange slightly shuttered air. I turn to Jaquet and ask what this room is. He informs me that it is the “dust room.” He finds my enthusiastic reaction rather perplexing. “Don’t you see how amazing that is?” I say incredulously. “Patek Philippe makes its own dust?” So profound has been my own journey to the heart of toolmaking at Patek Philippe that I believe that, dissatisfied with the industry standard abrasive materials, the company has decided to take matters into its own hands and manufacture its own diamond dust.

Daniel Jaquet is a kindly man, and he looks at me with the sort of face that one might compose if informing a child of the non-existence of Santa Claus. Softening the blow as much as he can he says that “Yes, indeed, dust is made here. But it is merely a by-product from certain toolmaking processes that generate enough dust for it to make sense for them to be carried out in a separate room, so as not to contaminate other manufacturing procedures.”

Nevertheless, I would like to think that if there ever did come a time when conventional diamond dust just wasn’t up to the job, Patek Philippe would not hesitate in grinding its own diamonds to the required fineness.♦

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