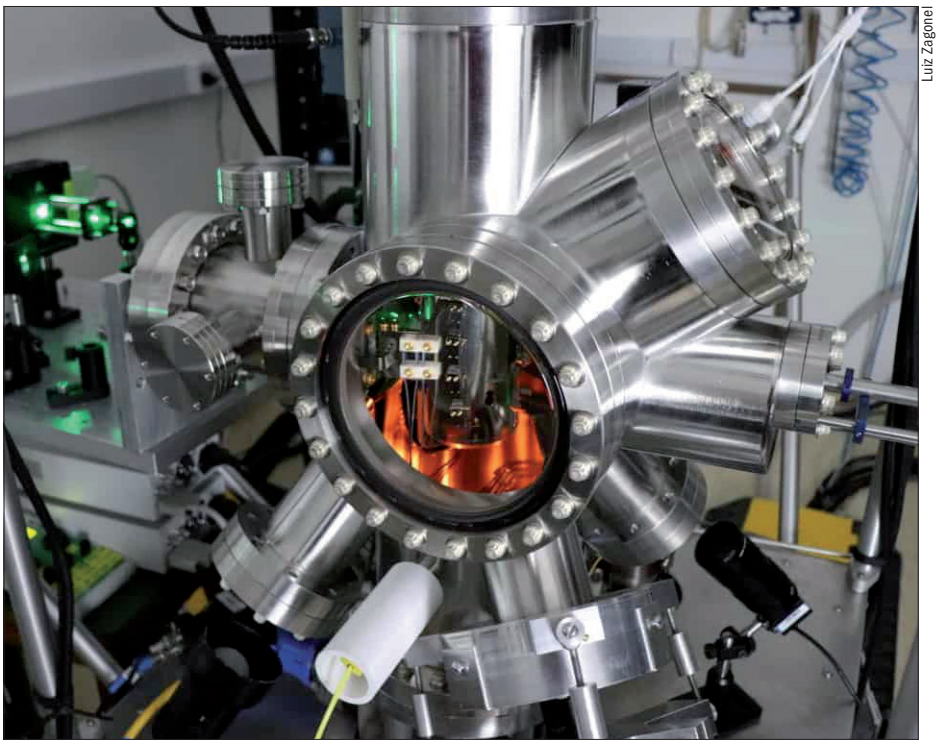
RHK Technology plays the 'long game' in scanning probe microscope systems

Customer-centric product innovation is helping US manufacturer RHK Technology to prosper at the cutting edge of surface science



Luiz Zagonel

Listening to the customer RHK Technology's latest commercial SPM, the PanScan Freedom Lumin-SLT, is the result of a collaborative R&D effort with Luiz Zagonel and colleagues in the department of applied physics at UNICAMP, Brazil.

Customer service, collaborative innovation, continuous improvement: these are the organizational reference points, writ large, for the scientists and engineers of RHK Technology, a Michigan-based technology company specializing in the design and manufacture of advanced scanning probe microscope (SPM) systems and associated instrumentation, controllers and accessories.

Founded in 1981 by Adam Kollin (who remains the company's president today), RHK supports a growing – and increasingly global – customer base of university scientists and government laboratories. At the last count, RHK had shipped more than 300 SPM systems and over 1200 SPM controllers to a diverse community of end-users conducting fundamental and applied research in nanoscale surface science and technology.

The secret of RHK's commercial success – and longevity – is the vendor's granular understanding of its research customers' evolving requirements. Think collaborative product development and innovation. "We've always maintained a symbiotic relationship with our customers," explains Kollin. "In this way, we learn directly from end-users about the new SPM features and capabilities they need to advance their research. Ultimately, those insights make our products better and more useful to a wider range of scientific customers."

Difficult, not impossible

Clearly, that emphasis on listening to (and responding to) the needs of research scientists goes hand-in-hand with organizational adaptability – and agility. In its formative years, RHK focused exclusively on the controllers for SPMs, serving customers who were building their own microscope platforms. Over time, however, the company moved up the value chain towards a more vertically integrated business model and now offers a broad portfolio of ambient, ultrahigh-vacuum (UHV) and cryogenic SPM systems.

"As part of our growth and development strategy," notes Kollin, "we tried to focus on niche markets that were not well served and, as such, we became the 'go-to' company when a researcher wanted an SPM product with unique capabilities that were not available elsewhere."

A case in point: RHK was the first company to develop a cryogen-free SPM – an innovation that opens up ultralow-temperature regimes to researchers whose budgets may already be stretched and so unable to meet the cost of a liquid-helium cryostat. "We were advised by numerous SPM users that the vibration of a closed-cycle cryogenic cooling system would always be too high," says Kollin.

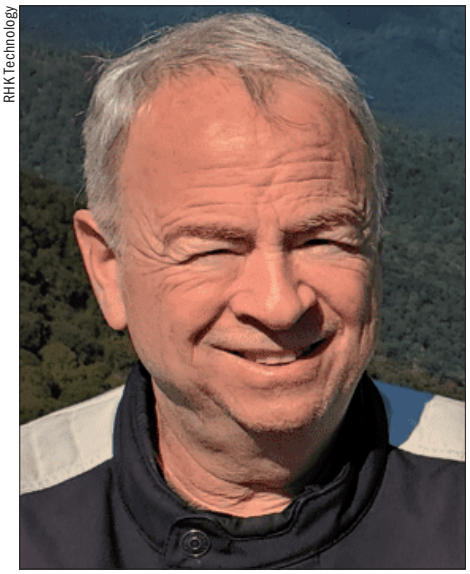
However, RHK's product development team thought otherwise and invested the necessary time and resource to make the technology work. "There are now many groups using our cryogen-free SPMs," adds Kollin. "These are scientists who previously, owing to the complexity and cost, would never have considered an ultralow-temperature option for their microscope."

Improvement by design

Notwithstanding the relentless pursuit of SPM innovation, RHK has faced its fair share of operational challenges along the way – most recently, the supply-chain disruptions resulting from the COVID-19 pandemic. "When COVID hit, virtually all of our customers closed their doors at the same time," notes Kollin. "Every order that was in purchasing ground to a halt – some were even cancelled because of extensive delays to users' research projects."

On the supply side, the delivery time for SPM components and subsystems – the building blocks of RHK's SPM instrument portfolio – also increased dramatically. Advanced semiconductors that had previously been in stock, for example, were suddenly being quoted with a year lead-time (sometimes even longer). "We

RHK Technology



Adam Kollin: "Happy and productive customers are the best source for future sales"

Collaboration, customization, innovation

The PanScan Freedom Lumin-SLT, RHK's latest commercial SPM, is a case study in customer-driven product innovation. The customer in question – Luiz Zagonel, professor of applied physics at UNICAMP in São Paulo, Brazil – was seeking a multimodal SPM with market-leading light-collection efficiency to study the interplay between optical, electronic and morphological surface features in a range of advanced materials, including 2D nanostructures for flexible LEDs and halide perovskites for high-efficiency, long-lifetime photovoltaic cells.

"We envisaged a scientific-grade optical instrument that was not available commercially at the time," explains Zagonel. The way forward, it turns out, was an R&D collaboration with RHK and co-development of its flagship PanScan system into a custom SPM platform with high-performance optical-collection capability (as much as 72% light capture from the sample surface).

The resulting RHK PanScan Freedom Lumin-SLT is nothing if not versatile. The instrument can collect light emitted by the sample upon excitation with the scanning tunnelling microscope (STM) tunnel current, a technique called STM-induced light emission. What's more, when operating the STM in field-emission mode, higher-energy electrons hit the sample surface – an interaction that can trigger light emission from the deep-UV all the way down to near-IR via an effect called cathodoluminescence. The SPM can also be used to inject light into highly localized regions of a sample to enable photoluminescence and Raman spectroscopy studies.

"The PanScan Freedom Lumin-SLT is another example of a customer coming to us in need of a product that did not exist," explains Adam Kollin, president of RHK. Customization and collaboration, however, laid the ground for the latest iteration on the PanScan theme. "To meet the exacting specifications of the UNICAMP team," adds Kollin, "we lengthened the scan head to accommodate a parabolic mirror, while changes to the UHV chamber, inner and outer shields, and shutters were also required."

Significantly, those modifications for UNICAMP are now part of the standard PanScan SPM design, such that any researcher can add the Lumin-SLT optical interface to their systems as their research priorities evolve. "The result of the UNICAMP-RHK collaboration," Zagonel concludes, "is a widely applicable commercial instrument... a novel UHV SPM with atomic-scale resolution and up to 72% light capture."

• **Click here** for full technical data on the PanScan Freedom Lumin-SLT.

used this downtime to restructure," says Kollin, "becoming more streamlined and efficient despite the challenging business environment. As a result, we were able to lower our SPM system prices, even as the component and raw material costs to build them increased."

Having weathered the COVID storm, RHK has redoubled its efforts around continuous improvement of its existing product lines. With this in mind, Kollin still spends a significant chunk of his time meeting face-to-face with customers in their laboratories – a key conduit for RHK's collective requirements-gathering and product development roadmap. "Often, customers don't want to tell you anything negative," he notes, "though I stress that they are doing us a disservice if they just tell us things they think we want to hear. It is important for me to hear first-hand what customers think our products don't offer – where we fall short and where they think we should improve."

It helps, of course, that this continuous improvement mindset is hard-wired across the RHK workforce – from R&D and engineering functions to technical support and business development. Many RHK staff have also been with the company for 20 years or more, so the manufacturer's specialist domain knowledge runs wide and deep. Another differentiator is the RHK ownership model, with the company under the management of the same family since its founding (while several SPM peers have been bought and sold multiple times over the past four decades).

Perseverance, it seems, brings its own rewards – and especially so when reinforcing RHK's core value proposition for excellent customer service. "Customers trust us with their scarce research funds and we feel a strong obligation to provide them with the tools to be successful," concludes Kollin. "It's really just common sense: happy and productive customers are the best source for future sales."

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This article was written by *Physics World* on behalf of RHK Technology. Read more on *physicsworld.com*.