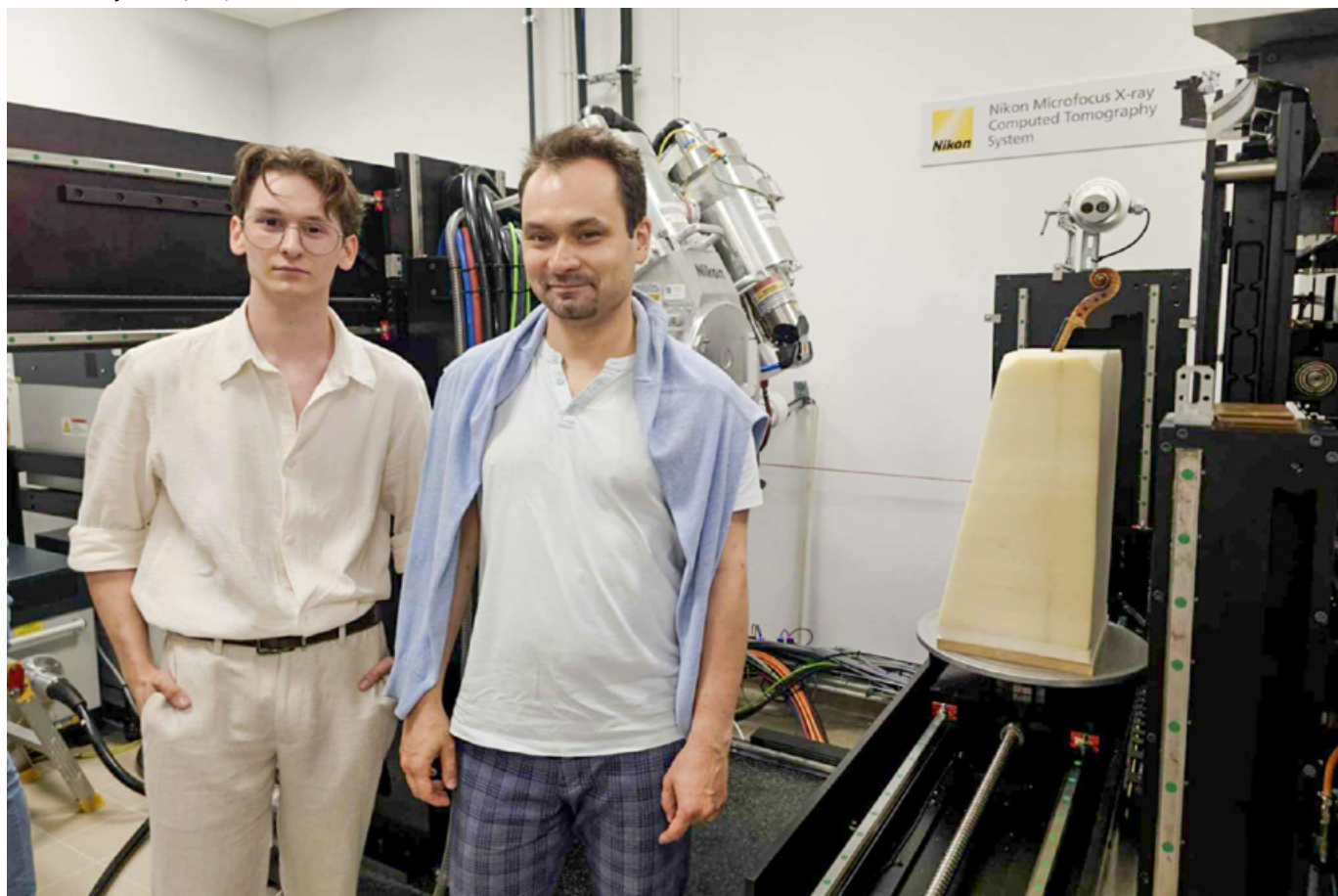


Mateusz Majkowski, left, and Janusz Wawrowski



COURTESY OF MATEUSZ MAJKOWSKI

A DIALOGUE BETWEEN CENTURIES

The 'Polonia' Strad violin is getting a high-tech twin

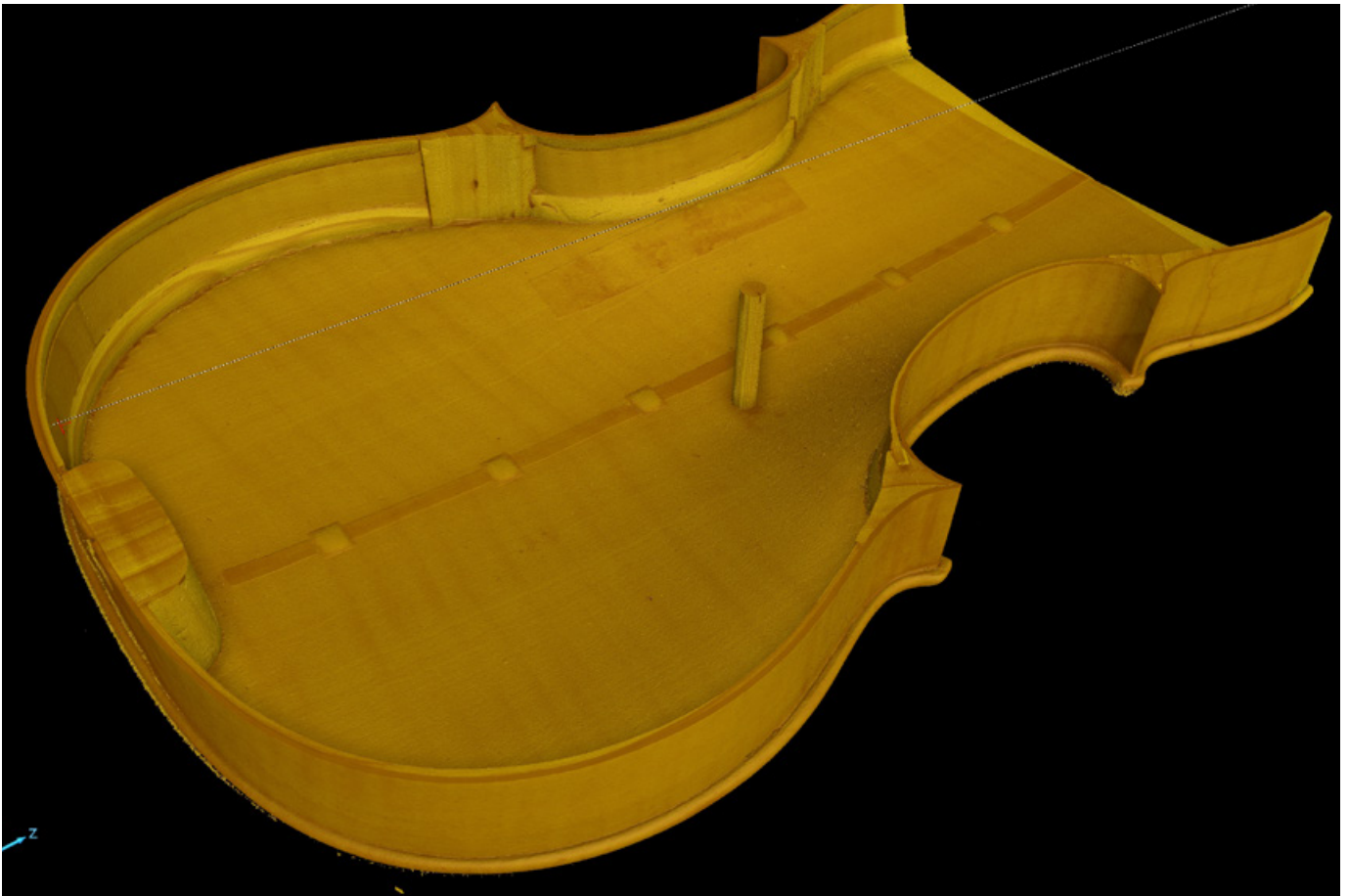
By Emily Wright

We begin today's tale in 1685. The Great Turkish War raged between the Ottomans and a motley coalition of Vatican-backed armies. In February, George Frideric Handel was born. Later that year, Alice Molland became the last person in England sentenced to hang for witchcraft. And just outside of Milan, a man put the final touches on his latest creation: a honey-colored violin that would one day be named "Polonia," a nod to its distinction as the only Stradivari instrument in Poland. Over time, borders would be drawn and redrawn, belligerent empires rising and falling in the characteristic cadence of the second millennium of recorded history. Baroque tastes gave way to the Classical set of aesthetics. The Polonia, unlike some of its brethren lost to time and war, would endure.

Now, an interesting project is afoot in Poland. Violinist-luthier Mateusz Majkowski is poised to add his contribution to Stradivari lore using a combination of time-honored

techniques and cutting-edge technology. It began after a chance encounter at a technology fair with Dr. Wojciech Depczyński, director of the Laboratory of Computed Tomography and Radiography at Kielce University of Technology. The lab houses one of two Nikon M2 LES (Large Envelope System) scanners in the world, so powerful that it lives in a radiation-shielded concrete bunker with doors roughly as thick as a Mahler 3 study score. Its purpose: to take micron-precise images of anything, from high-carbon manganese steel to cherries (as it turns out, pitting techniques have a huge effect on the fruit).

In search of a project to complete his bachelor's thesis in violin making from the I.J. Paderewski Academy of Music in Poznań, Majkowski came up with the idea to take images of the Polonia, one of only a handful of Strads remaining that has not had some kind of advanced scan performed. From there, he would set about



COURTESY OF MATEUSZ MAJKOWSKI

creating his own version, as opposed to a replica, from his own template based on data gleaned from the M2 scans. With the concept rapidly taking shape, Majkowski contacted the current custodian of the Polonia, Janusz Wawrowski, who enthusiastically agreed to lend his support. With Wawrowski on board, the project will further culminate at a later date in a performance, with a program designed to showcase the original instrument alongside its modern counterpart.

Up Close with the Polonia

Computed tomography (CT) was chosen because it allows for a non-invasive and extremely accurate view of the internal structure of the instrument, which is impossible to achieve with other methods. CT uses X-rays that pass through the material and record density variations inside the wood, enabling the curious to see the internal architecture, plate thick-

ness, glue joints, tool marks, and even hidden cracks—all without opening or damaging the instrument.

The initial test scans were performed on a violin Majkowski had previously built, strings and all. The metal made the images noisy, so the decision was made to scan the Polonia with all metal components removed. Another challenge was coming up with a stable, secure support to hold the instrument completely still as it rotated during the scanning process. A precisely shaped foam cradle was created, matching each contour of the violin, which kept it stable without applying pressure or risking any damage.

During the scan, the violin is positioned on a precision-controlled rotating stage between the X-ray source and a high-resolution detector (a device inside all CT scanners that registers photons). As the instrument slowly rotates, thousands of two-dimensional radiographic projections

are captured from different angles. These images are then processed through a reconstruction algorithm, which mathematically combines the data into a three-dimensional volumetric model. The team applied a novel method to ensure further fidelity to the original: The instrument was scanned three separate times, in sections, and later merged into a single 3D volume with a staggering micrometer (one thousandth of a millimeter) precision.

The Build

Majkowski's father is a carpenter and an engineer, and his influence is evident in the design of this project. In regard to his approach, the younger Majkowski says, "I hold great respect for traditional handcraft and the value it represents, but the engineering mindset instilled in me pushes me to look for new solutions that allow certain stages to be completed with greater accuracy than the precision of the human hand

Janusz Wawrowski with the Polonia Strad



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alone can offer.” When the goal is a literal twin of a famous instrument, many luthiers attempt to replicate everything about its construction, soup to nuts, including the method. Majkowski is taking a different path: The templates and forms were cut using a waterjet or CNC (computer numerical control) machine that automates the use of tools to maintain maximum precision and minimize potential human error in manual preparation. From there, forms and templates were created to build a new instrument modeled on the style and geometry of the Polonia as it was in 1685, free from the changes that occur over time and use. To ensure the highest standards of methodology and artistry, distinguished scholar professor Honorata Stalmierska is overseeing the entire process of documentation.

The focus of this project has primarily been on faithfully recording the particulars of the construction of the original.

Assembly will begin shortly—all materials have been selected and are prepped for glue-up. Majkowski plans to have his own example finished “in the white” (luthier speak for *without varnish*) in the early spring of 2026. Once the documentation is finalized and the glue is dry, the project will likely evolve to include acoustic analysis and varnish studies, the latter a topic of heated debate and ongoing experimentation, especially when it comes to old Cremonese examples.

Looking Ahead

Majkowski is equally interested in the preservation of historic instruments, specifically the details frequently lost or obscured using the most common current techniques like impressions and plaster casts. These processes take a fragile object, subject it to all kinds of pressure and contact with foreign substances, to then create *another* fragile object that often cannot be

reused. It’s not just imperfect, it’s detrimental to the original. With an understanding of the value of a tangible, robust reference for the maker who would recreate it, he turned his mind to other ways the Nikon M2 might contribute to violin conservation. After months of research and testing, Majkowski was able to create highly repeatable, hyper-accurate 3D resin prints of violin scrolls with no risk of cracking or chipping. Using a high-resolution 3D printer, even the smallest tool marks on the scroll surface become visible, allowing the original luthier’s gestures to come to life for a patient observer.

Returning to the eventual performance, I am struck by the poetry of Majkowski’s intention. With two versions of an iconic violin, perhaps comparison is unavoidable, but he is committed to the opportunity it provides, “. . . not as a competition, but as a dialogue between centuries—between the master’s voice and the echo it inspired.” ■