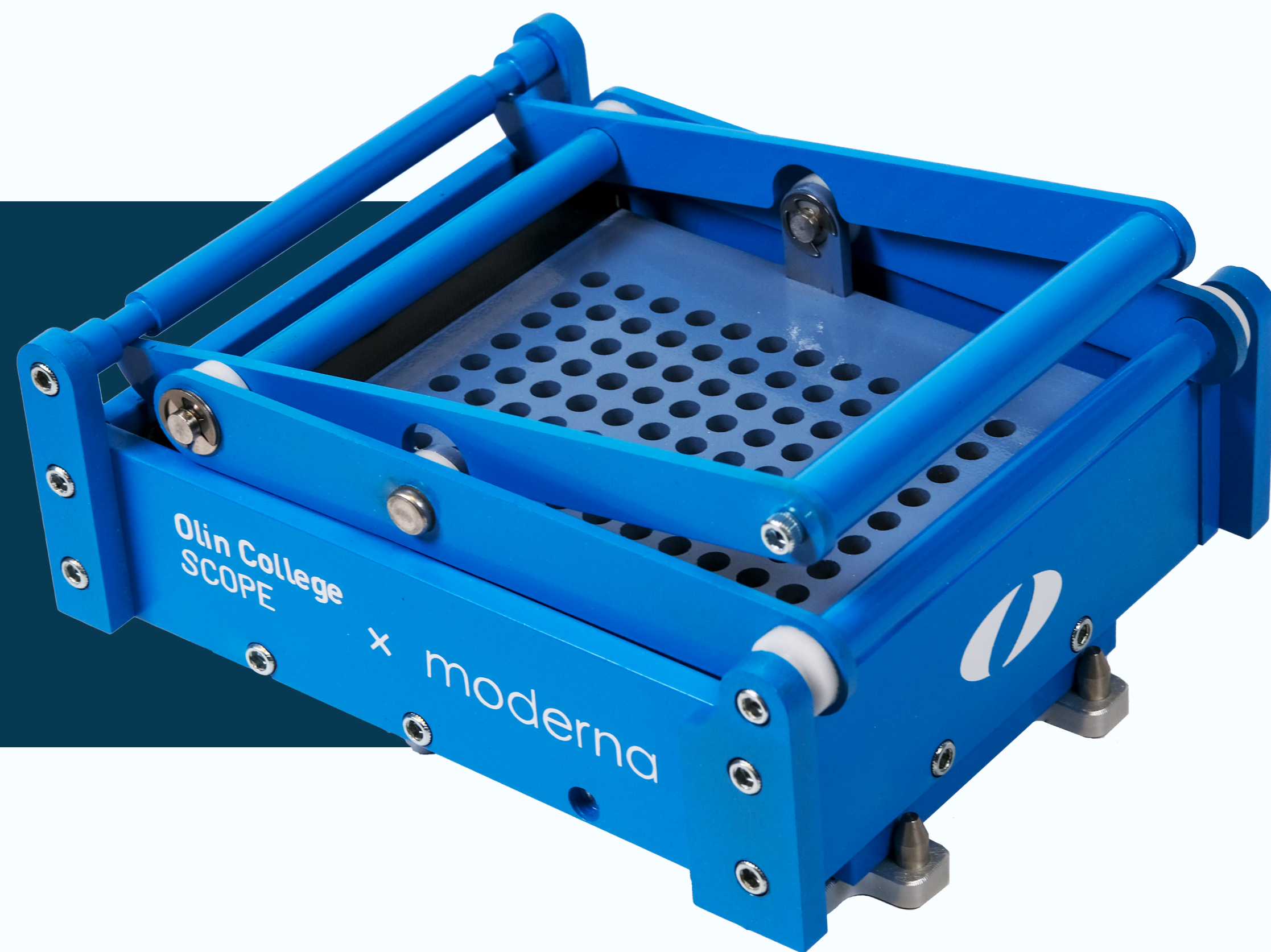


Project Brief

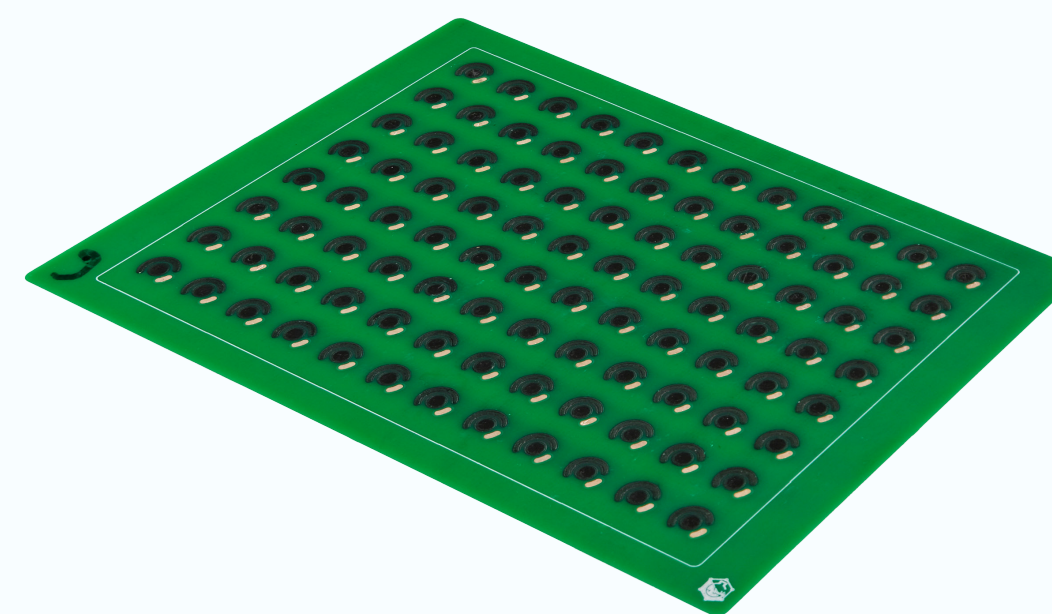
Moderna's mission is to deliver the greatest possible impact to people through mRNA medicines. mRNA molecules are encapsulated in lipid nanoparticles that serve as delivery vehicles, protecting mRNA until it reaches the target cells. The rapid development of new drugs requires thorough chemical and physical characterization of lipid nanoparticle - mRNA formulations. pH measurement is one of the key factors that contributes to these formulations' success.

The Olin SCOPE team was tasked with designing a device to perform 96 pH measurements within 15 minutes. This first-in-class technology is an order of magnitude faster than current methods and will greatly expedite the characterization of new formulations.



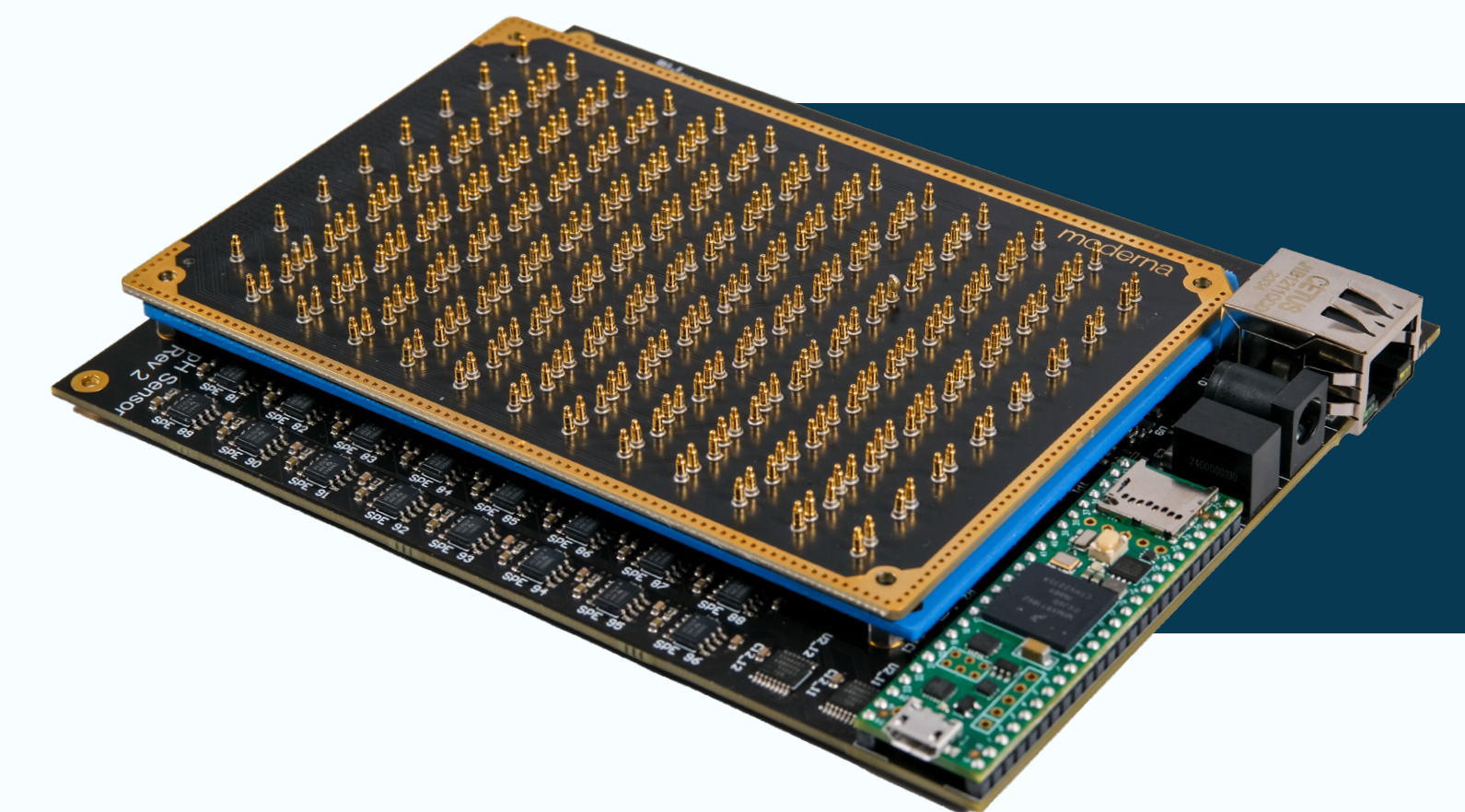
Electrode

The screen printed electrode card has a hydrogen ion specific coating on the front and electrical contacts on the back. It is the first 96 channel pH sensitive electrode to be produced.



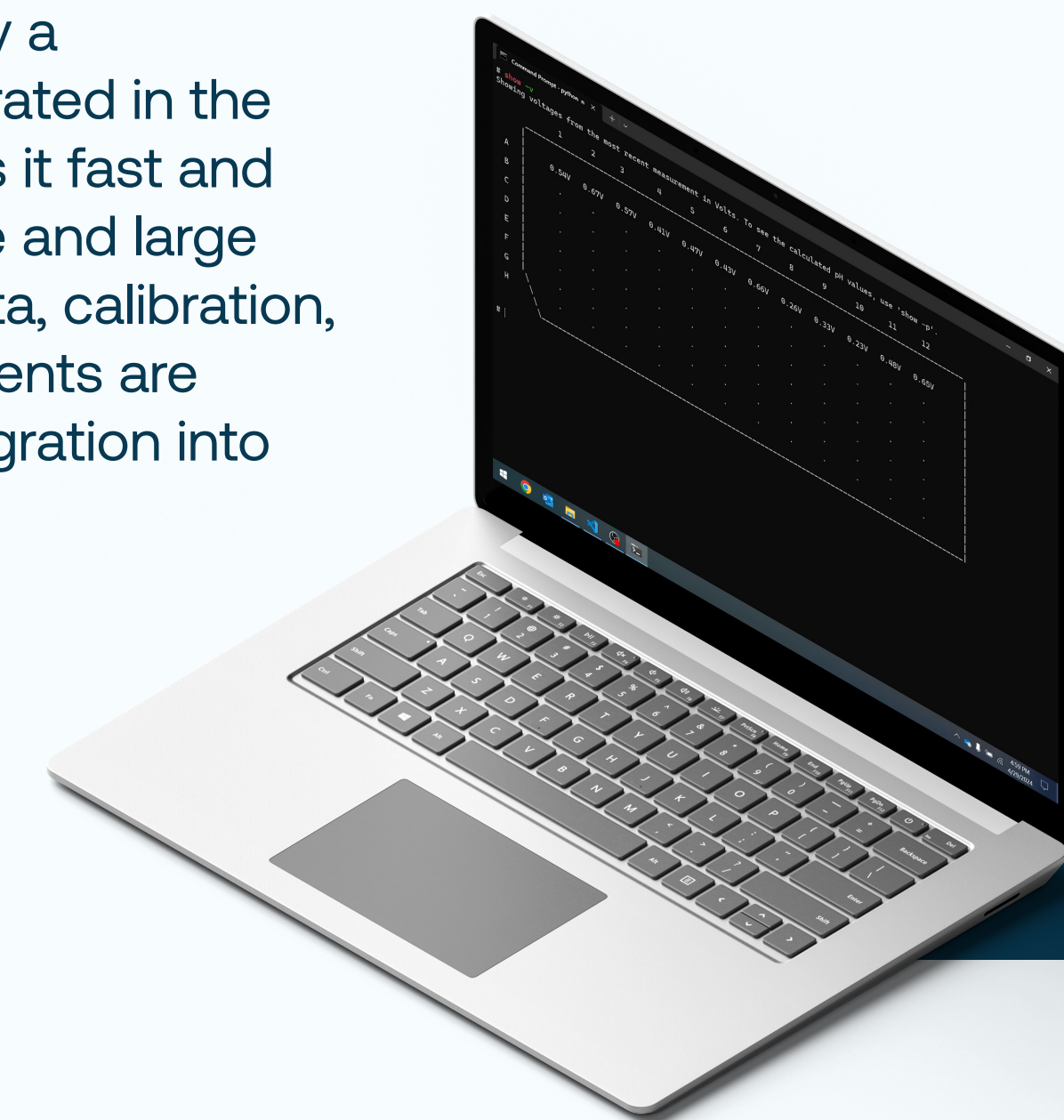
Electrical

The electrical system is broken into two PCBAs. The interface board is a connector between the sensing board and electrode and can be replaced in case a pin is damaged. The sensing board contains 96 separate channels which amplify voltages from the electrode. The signals are then read by a microcontroller which finally sends data to a computer over USB.



Software

The device is controlled by a streamlined interface operated in the command line. This makes it fast and extensible for both lab use and large scale automation. Raw data, calibration, and calculated measurements are saved to CSV files for integration into existing workflows.



Mechanical

The retaining system mounts to a liquid handler bed and can be opened to quickly replace the electrode card. A linkage compresses the electrode card forming a watertight seal at each of 96 wells and ensuring a reliable electrical connection to the sensor board.

Team



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