

# How a Princeton University research lab handles vibration control in optical microscopy



## INDUSTRY

Biological Research



## TECHNOLOGY

Optical Microscopy



## AFFILIATION

Princeton University

## SITUATION

Assistant Professor Tian-Ming Fu's research in Princeton University's Department of Electrical and Computer Engineering involves light-sheet, adaptive optics, and multi-photon microscopy. His focus is on advancing the field of optical microscopy for biological and biomedical research. Achieving high-resolution imaging of biological samples, including single molecules, subcellular organelles, and other microscopic structures, is critical to understanding their functions and interactions in living organisms.

"I build optical microscopes," said Tian-Ming. "Because these microscopes have such a high resolution, I must build the microscope on top of an optical table to eliminate vibrations. If you want to look at something at a hundred or even tens-of-nanometer resolution, any vibration will quickly destroy your resolution. So, I need to make sure I have a super stable table. There is no way to make a building so stable that you don't need an optical table."

Due to his work in a previous lab, Tian-Ming knew that TMC's tables were well-suited for his need to minimize the effects of vibration on imaging.

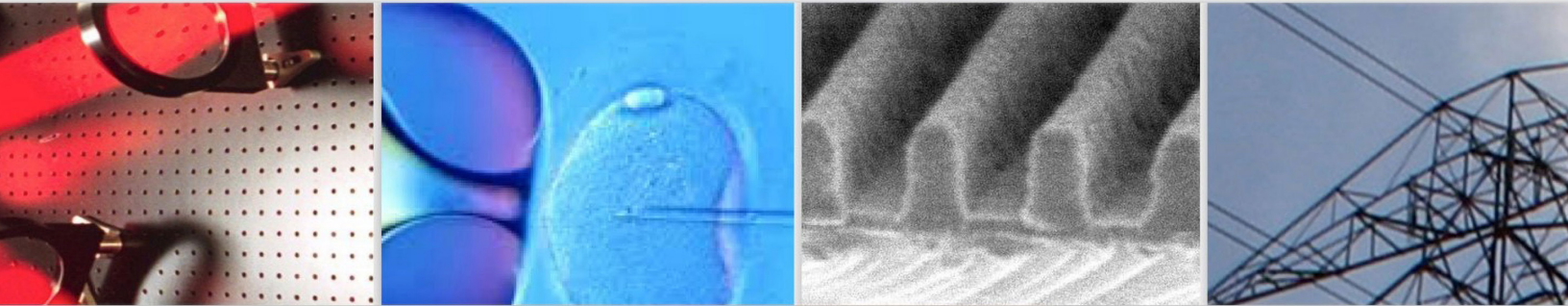


**"TMC tables are very good at providing excellent vibration insulation. If you are working on optical microscope development, a TMC table is something you should consider."**

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### TIAN-MING FU

Assistant Professor, Department of Electrical and Computer Engineering  
PRINCETON UNIVERSITY



## SOLUTION

TMC designs and manufactures advanced building floor vibration isolation systems for nanotechnology. With passive products ranging from simple, CleanBench<sup>™</sup> laboratory tables to optical table systems of virtually any size and shape, TMC also leads the industry with sophisticated, active, inertial vibration cancellation systems featuring piezoelectric actuators and digital controllers.

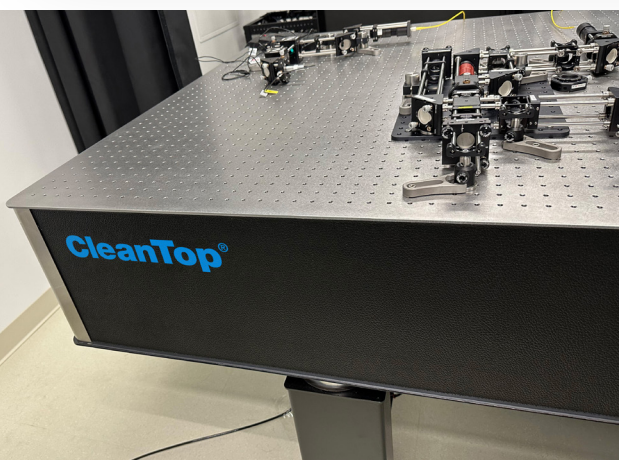
Tian-Ming ordered two CleanTop<sup>™</sup> optical tables that were four feet long, eight feet wide, and twelve inches thick. The TMC tables surpass the National Institute of Health's guidelines for vibration levels and offer superior performance, as well as a number of practical features that make them suitable for use in biological research environments. Such features include retractable casters for easy repositioning within the lab, a proprietary nylon cup structure that prevents water or other liquids from entering and damaging the table, and ample space under the table for storing essential equipment.

"The space under the table is very useful," said Tian-Ming. "For example, when I build a microscope, I need cameras, and those cameras need to be cooled down to reduce the noise. To do that, I need chillers to recycle cooling water, and I store those chillers under the table."

## BENEFITS

While Tian-Ming's lab has only recently started using the TMC optical tables, preliminary observations and experiences indicate promising results for high-resolution optical microscopy experiments. For example, the tables provide a stable environment for conducting experiments, ensuring that image resolution is not compromised. Such stability allows Tian-Ming to focus on improving the optical microscopes' capabilities without worrying about external factors that could negatively affect his work.

Furthermore, the retractable casters and ample under-table storage have contributed to an organized and adaptable lab environment, enabling Tian-Ming to easily reposition and store equipment as needed. This has led to an overall increase in lab efficiency, so Tian-Ming can focus on his experiments with fewer distractions and disruptions.



Shown is one of the CleanBench<sup>™</sup> laboratory tables Tian-Ming Fu uses for his research.