




# Implementing the New SI

Breaking the Invisible Chain

18 November 2022

A large, colorful graphic on the right side of the slide. It consists of numerous concentric, overlapping circular bands in a rainbow spectrum of colors (red, orange, yellow, green, blue, purple, magenta). The bands are slightly offset from each other, creating a sense of depth and movement. In the center of these bands, the text "Working together to promote and advance the global comparability of measurements" is written in white, sans-serif font.

Working together to  
promote and advance  
the global comparability  
of measurements





## am·pere

That constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed one metre apart in vacuum, would produce between these conductors a force equal to  $2 \times 10^{-7}$  newtons per metre of length.

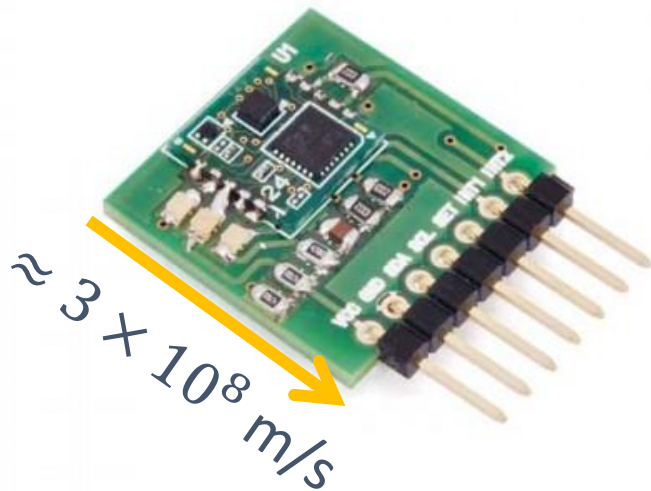
## THE DEFINING CONSTANTS OF THE INTERNATIONAL SYSTEM OF UNITS

Defining constant	Symbol	Numerical value	Unit
hyperfine transition frequency of Cs	$\Delta\nu_{\text{Cs}}$	9 192 631 770	Hz
speed of light in vacuum	$c$	299 792 458	$\text{m s}^{-1}$
Planck constant*	$h$	$6.626\,070\,15 \times 10^{-34}$	$\text{J Hz}^{-1}$
elementary charge*	$e$	$1.602\,176\,634 \times 10^{-19}$	C
Boltzmann constant*	$k$	$1.380\,649 \times 10^{-23}$	$\text{J K}^{-1}$
Avogadro constant*	$N_{\text{A}}$	$6.022\,140\,76 \times 10^{23}$	$\text{mol}^{-1}$
luminous efficacy	$K_{\text{cd}}$	683	$\text{lm W}^{-1}$

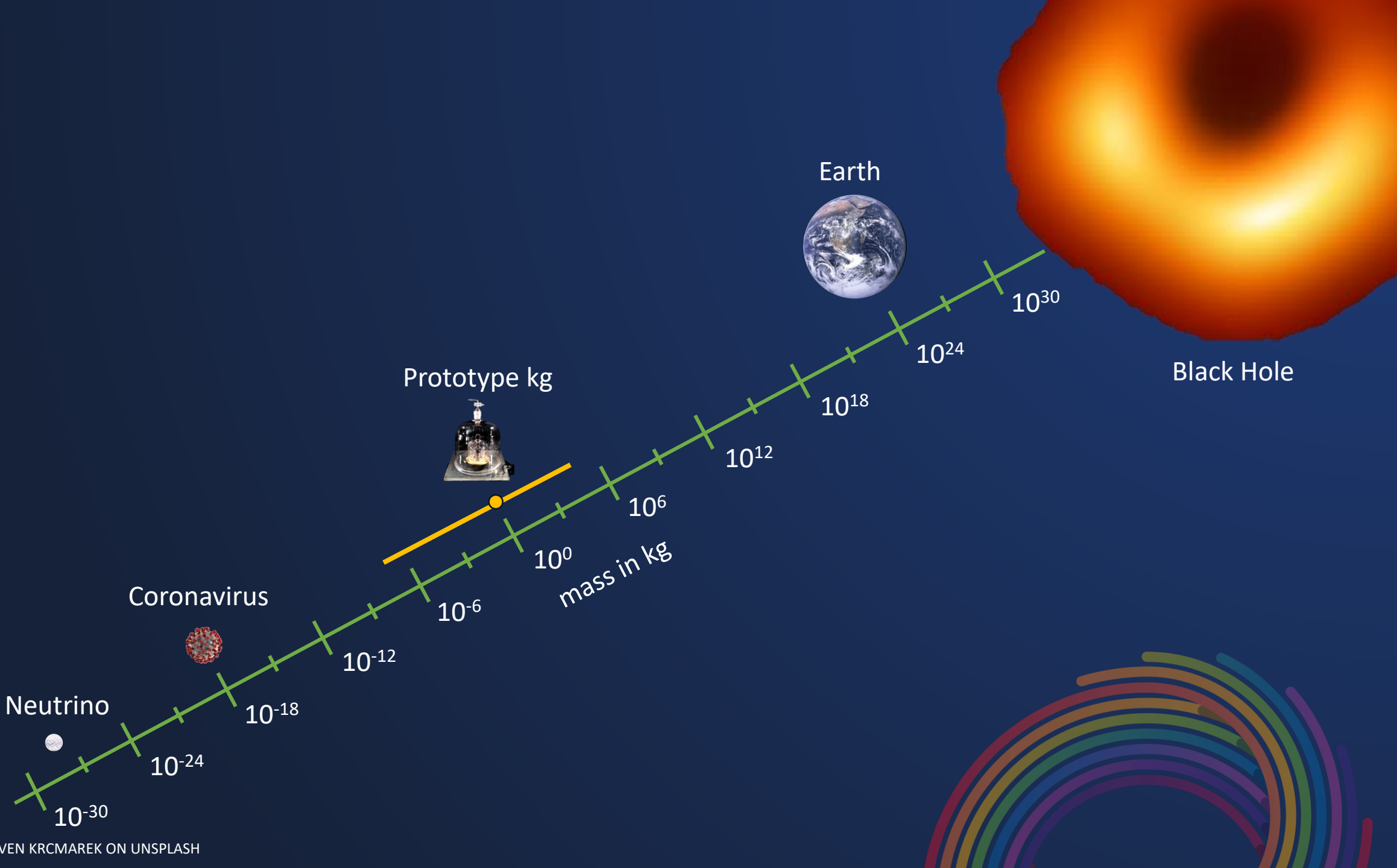
\*These numbers are from the CODATA 2017 special adjustment. They were calculated from data available before the 1<sup>st</sup> of July 2017.

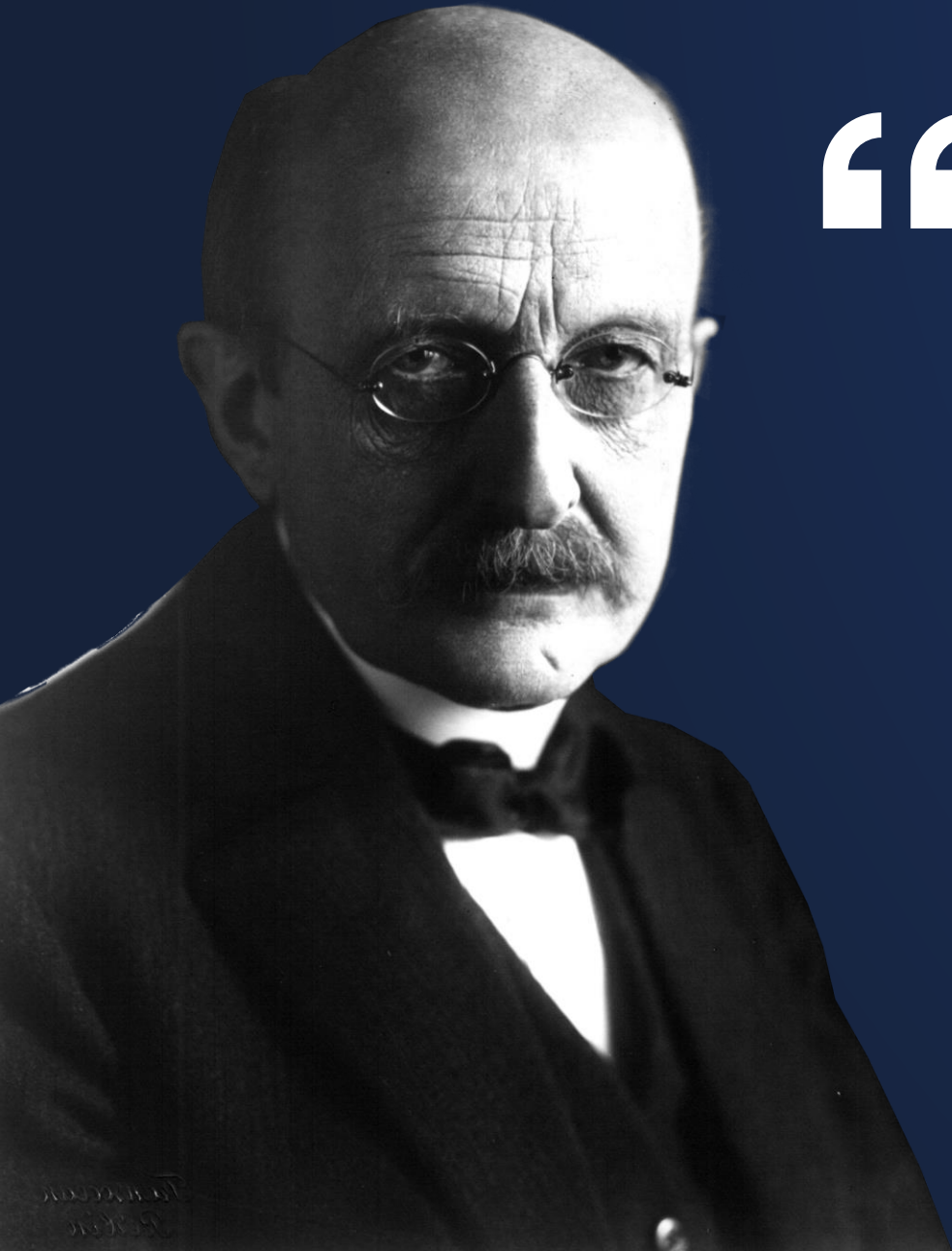


$\approx 3 \times 10^8$  m/s



CREDITS: NASA; NEVEN KRUMAREK ON UNSPLASH





“

...it is possible to set up units...which are independent of special bodies or substances, necessarily retaining their meaning for all times and for all civilizations, including extraterrestrial and non-human ones...

”

MAX PLANCK  
1899

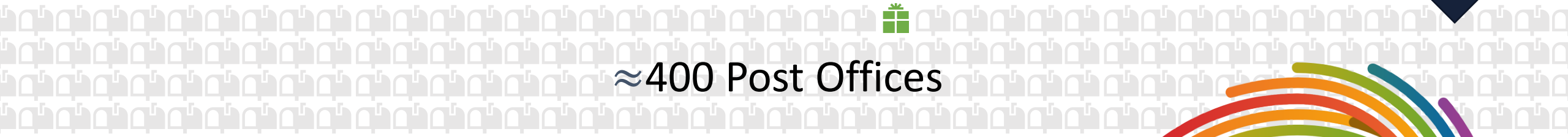




≈ 60 National Metrology Institutes



50 State Labs



≈ 400 Post Offices





## Tabletop Kibble Balance





Josephson Voltage Standard



Quantum Hall Resistor



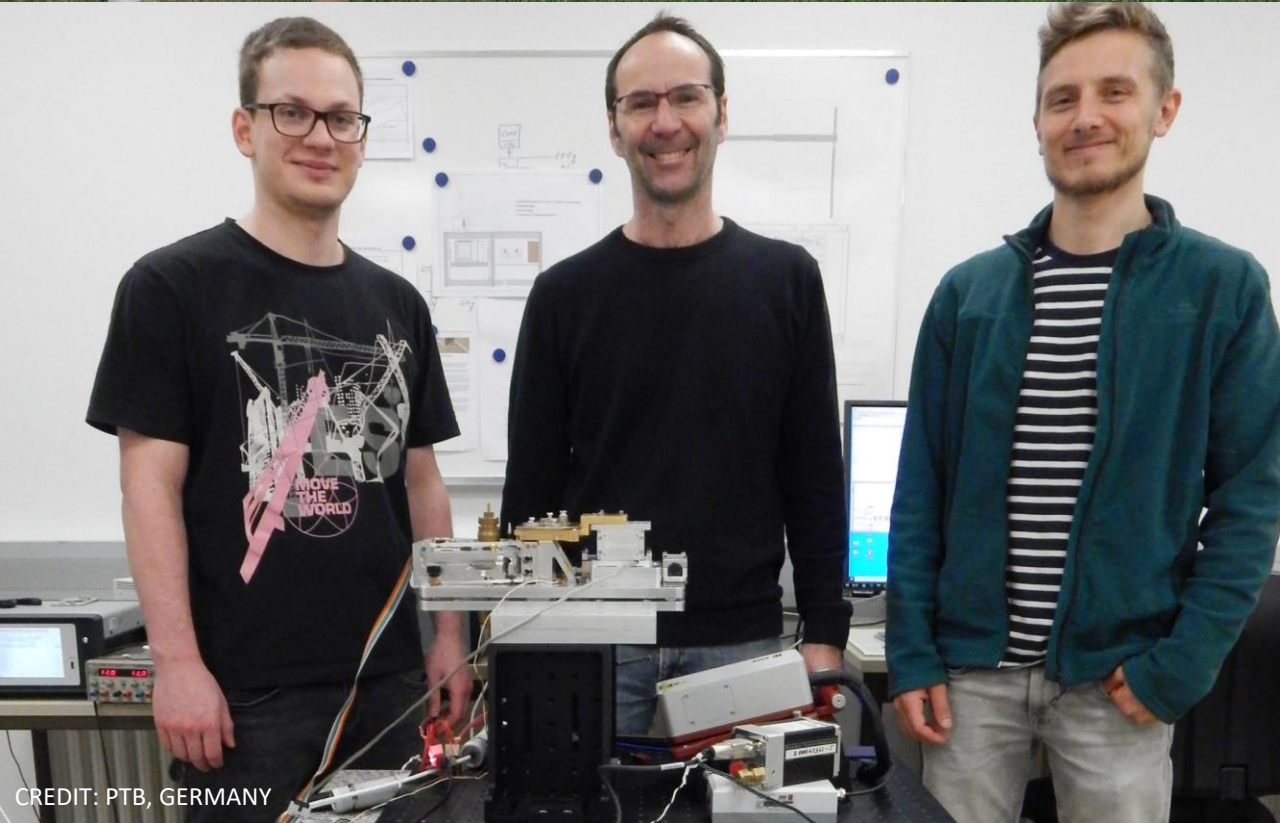
CREDIT: NPL, UNITED KINGDOM



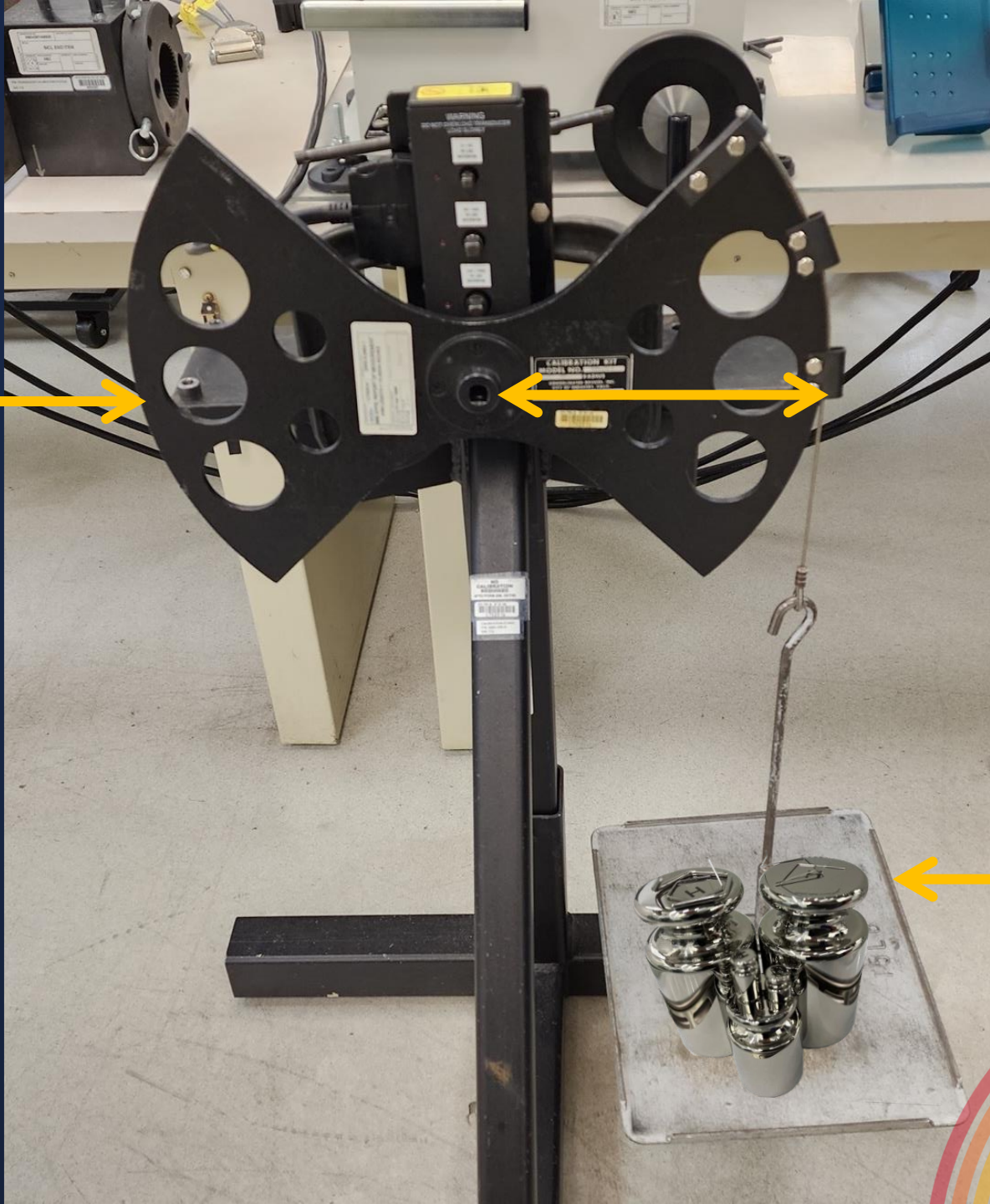
CREDIT: NMISA, SOUTH AFRICA



CREDIT: MSL, NEW ZEALAND



CREDIT: PTB, GERMANY

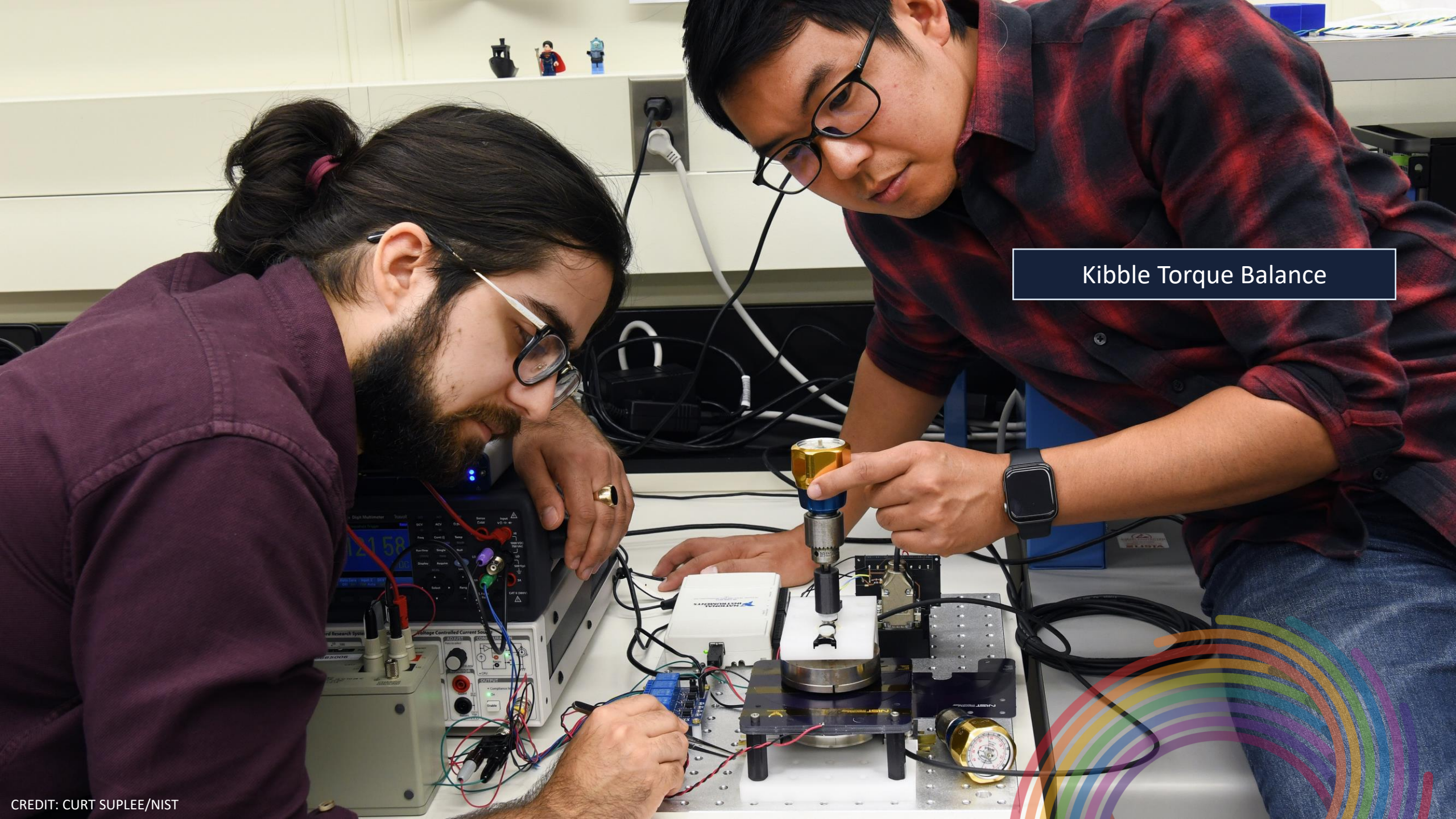


“Stick”

One foot

One pound  
of “stones”



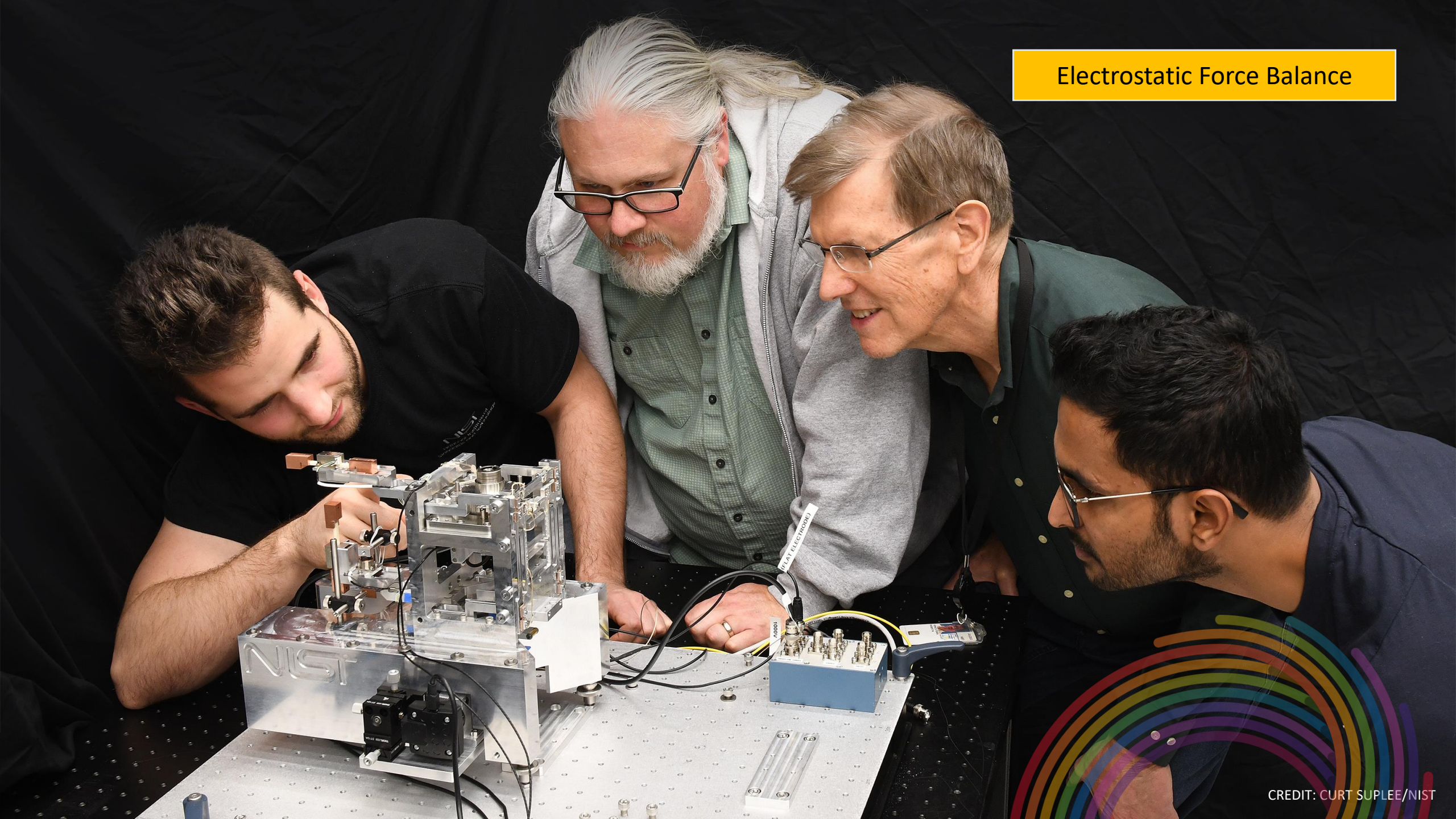


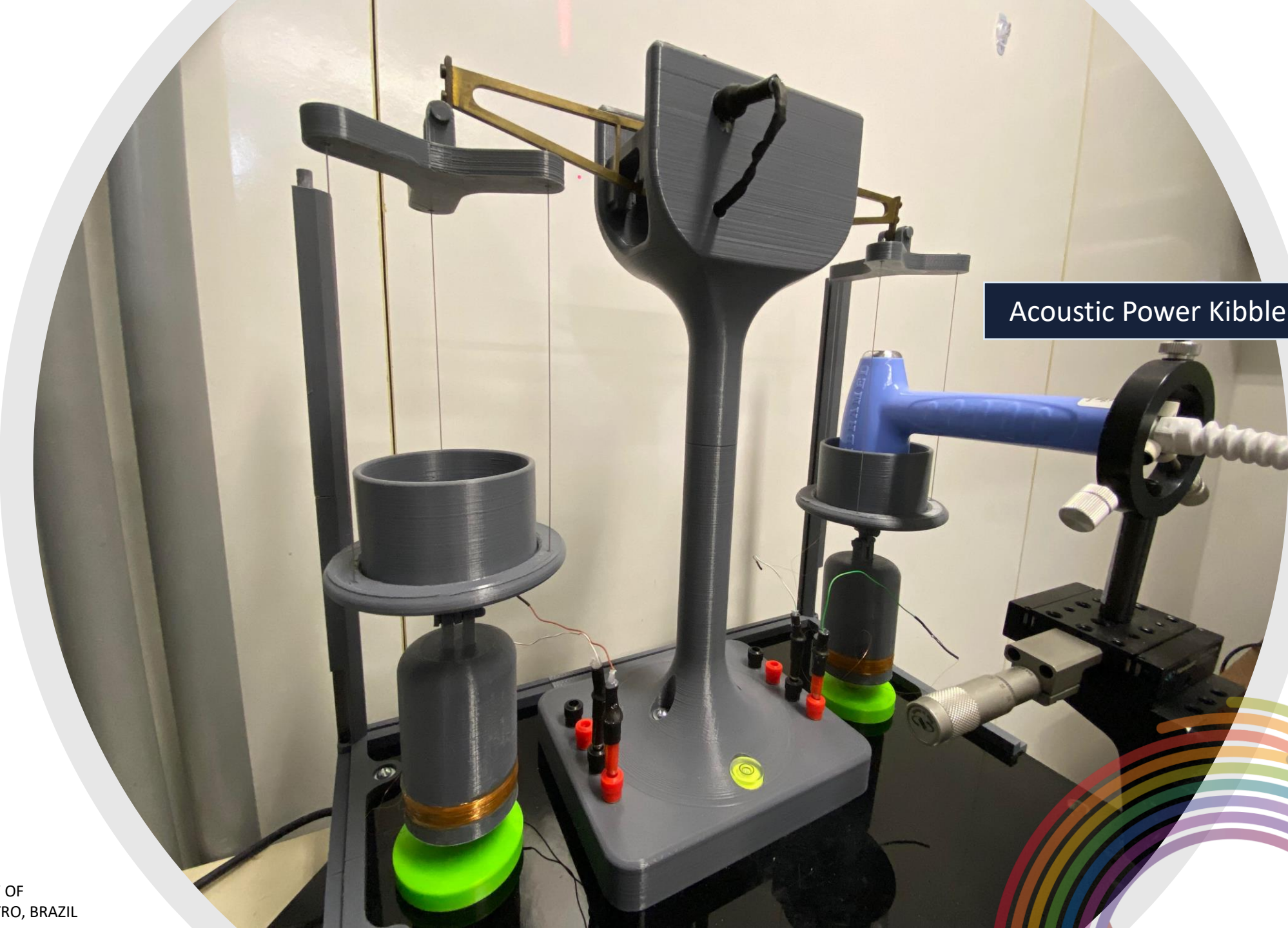
Kibble Torque Balance



Dynamic Torque Balance

## Electrostatic Force Balance

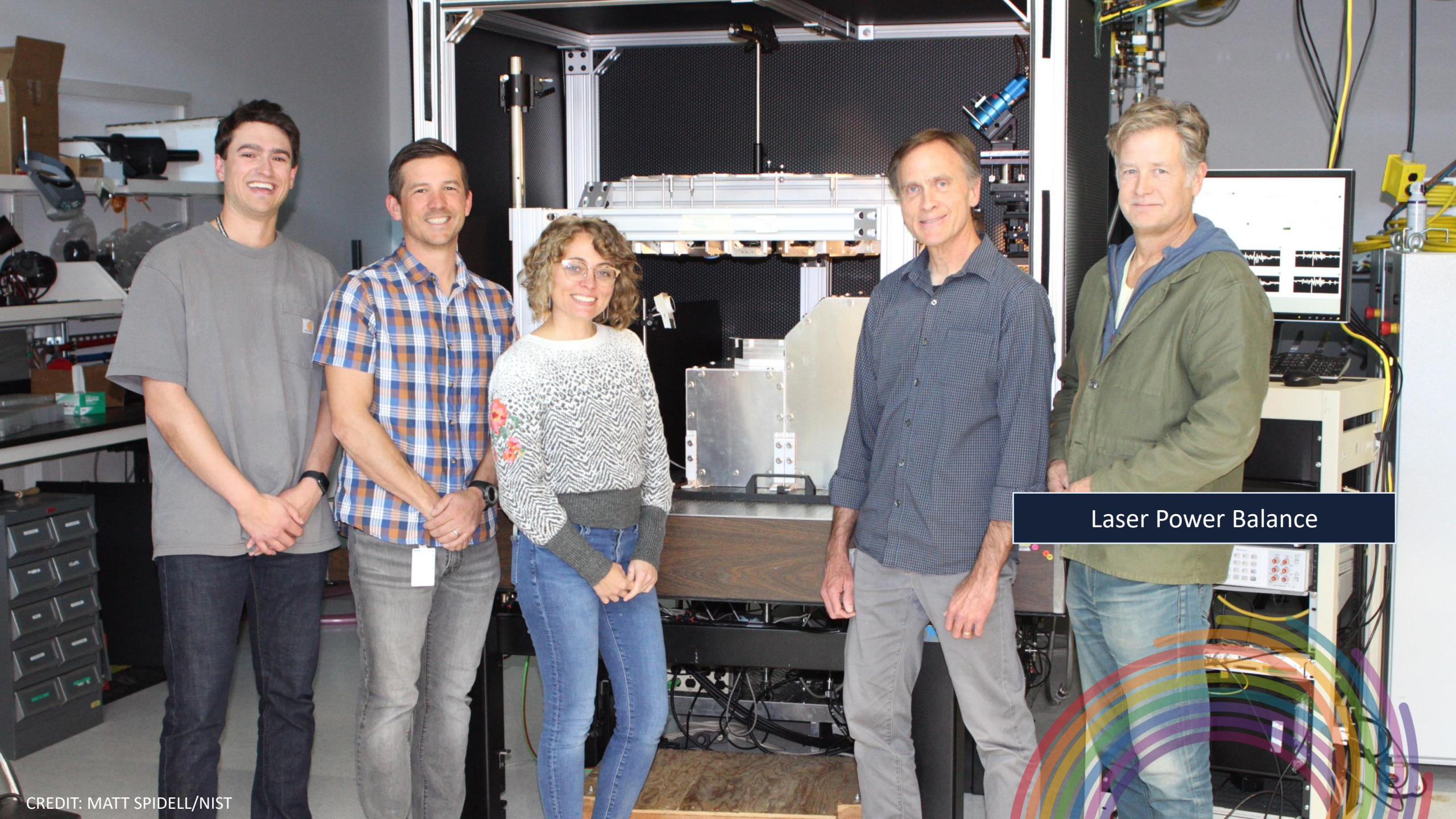




Acoustic Power Kibble Balance







Laser Power Balance





**openflexure**  
microscope



# The Beginning

An open book with a red bookmark is shown in a close-up, shallow depth-of-field shot. The pages are slightly blurred, and the red bookmark is the central focus, pointing towards the center of the book. The text 'The Beginning' is overlaid in a large, black, sans-serif font across the upper middle of the image.