

METROLOGY CAREERS:

Drew Liming



Drew Liming is an economist in the Office of Occupational Statistics and Employment Projections, BLS. He is available at (202) 691-5262 or at liming.drew@bls.gov.

What kind of career rewards precision and accuracy? One in metrology—the science of measurement. By evaluating and calibrating the technology in our everyday lives, metrologists keep our world running smoothly.

Metrology is used in the design and production of almost everything we encounter daily, from the cell phones in our pockets to the walls of our homes.

JOBS FOR GOOD MEASURE



But it isn't always easy to classify the workers who apply metrology in their jobs. Metrology workers are employed in a variety of industries and have different job duties. For example, both scientists conducting research in a laboratory and technicians supervising production on a factory floor might rely on knowledge of metrology. And because metrologists come from diverse educational backgrounds, many learn their skills on the job.

This article introduces metrology as a career field. The first section defines the different types of metrology. The next section

describes five industries in which metrologists are employed and some of the work they perform in each. The third section discusses skills and training metrologists often have, along with some of the ways they typically advance in their careers. Sources of additional information are provided at the end.

TYPES OF METROLOGY

In the United States, metrology standards are determined by the National Institute of Standards and Technology.

There are three different types of metrology: scientific, legal, and industrial. Scientific

metrology focuses on developing new systems of measurement and standardizing existing ones. Legal metrology is concerned with regulating measurements and measuring instruments related to public policy issues, such as preserving public safety and health. Industrial metrology applies the principles of measurement science to manufacturing.

Workers in scientific and legal metrology are usually employed by government agencies. But most metrology workers have jobs in industrial metrology, where they test new products for private companies as well as for government. For example, an industrial metrologist working in the automobile industry may design an evaluation for a car's crash detection system. And another industrial metrologist, employed in government, might verify that the system works correctly.



Classifying metrology jobs is difficult because of these workers' varied skills, educational levels, and positions. There are also some occupations in which metrology skills are only part of the job: An electronics engineer designing microchips, for example, might occasionally perform metrology tasks but has many other duties as well.

And metrology workers may have different titles, depending on their industry and employer. Other job titles might include calibration engineers, calibration technicians, quality engineers, quality technicians, process control technicians, and safety engineers.

METROLOGY AT WORK

Because metrology work is often interspersed with other job duties and occupational titles, the U.S. Bureau of Labor Statistics (BLS)

does not collect employment or wage data specifically on metrologists. Metrology, however, is critical to the success of many different industries. Metrologists help to develop technology by designing or performing tests to determine a product's effectiveness. They also calibrate existing devices, such as fuel gauges or radio antennas, to keep them in working order.

There are many industries that employ metrologists. In the following industries, descriptions of metrology work provide a glimpse of the broad range of projects that rely on the science of measurement.

Aerospace. Complex machinery like airplanes requires metrology workers to consider both function and safety. Metrologists in aerospace supervise the manufacture of planes and are responsible for testing their components, including turbines and landing gear. Calibration technicians also regularly check the assembly process to

ensure that the machinery is functioning correctly.

Metrologists' contributions to the aerospace industry extend beyond structural assembly. For example, the instruments in a cockpit, such as the navigation system and altimeter, are subject to metrologists' review and calibration. Metrology also helps to ensure the safety of passengers inside the plane. Fabric in the plane's cabin is designed to be fire resistant, and metrologists set standards for measuring flammability and help test and develop new flame-retardant products.

Communications. Without metrology, dependable and secure digital networks couldn't exist. In computer network security, for example, metrologists thwart hackers by developing new programs to measure network activity and flag suspicious actions.

Cell phone production also benefits from metrology work. Metrologists help test the phones' numerous components, recording under what circumstances the phones can function.

Construction. Metrology aids the construction industry in a number of ways. Metrology tools developed for building managers help them determine the cost-effectiveness of worksite decisions. By researching new methods to automate the construction process, metrologists help reduce labor costs. And the production of cheaper, more resistant building materials relies on measurement science.

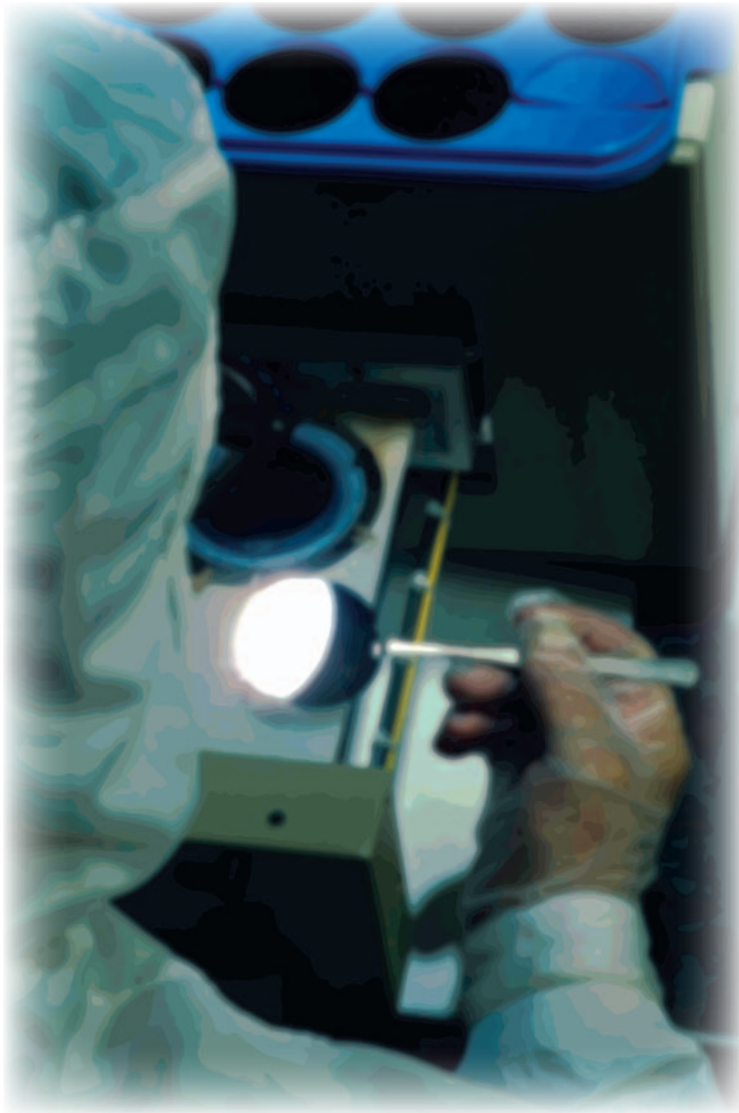
Metrologists also are involved in building design and may study structural durability. To help guide construction standards, metrology workers develop tests to evaluate a structure's resistance to daily stress from both people and the environment. For example, metrologists create trials to measure a home's resistance to earthquakes and fires.



Energy. All energy companies rely on the work of metrologists. Every building has a meter that displays its energy consumption, and calibration technicians ensure that these meters provide accurate readings. Consumption measurements are the underpinning of the energy industry; without them, energy companies wouldn't be able to charge customers by use.

In a power plant, calibration technicians are also needed to continually verify its many gauges and measurements. The potential consequences of a power plant failure range from loss of electricity to nuclear meltdown.

Metrologists are also involved in "green" energy. They help develop wind turbines and solar panels by testing energy output and construction methods. And metrology is critical for measuring the power consumption of new energy-efficient household appliances.



Healthcare. For many patients, the proper functioning of medical devices is a matter of life and death. And metrologists are required to calibrate and certify medical devices, such as external pacemakers and fetal monitors. By fine tuning machinery, metrology workers ensure the accuracy of medical tests to allow for the best possible diagnoses.

SKILLS, TRAINING, AND ADVANCEMENT

Workers in metrology often follow indirect career paths to their jobs. There are, however, some skills and training common to workers in metrology occupations. And experience may lead to increased responsibilities in other metrology work.

Skills. Highly skilled metrologists—those developing new tests and product designs in laboratories—must be proficient in mathematics, the sciences, and engineering. They must also have excellent communication skills, because they often work on teams with other researchers and scientists.

Metrologists at the technician level need mechanical aptitude. Technicians also must be able to maintain high levels of concentration while making slight, precise adjustments to equipment.

Training. Unlike other sciences, metrology has a relatively low profile with few formal education programs. There are several degree programs for metrologists at the associate-degree level. Some 4-year universities offer metrology specializations in their engineering departments.

Many metrologists who have a bachelor's or higher degree study a science or engineering discipline other than metrology. Some research metrologists, for example, might have a physics or mechanical engineering degree. Others have a degree specific to the industry in which they are employed; for example, metrologists working in the aerospace industry might have a degree in aerospace engineering.

Metrologists at the technician level usually don't need a degree. Most have a high school diploma and receive on-the-job training. The U.S. military also offers many training programs in the study of metrology.

Advancement. Assuming more responsibility in jobs related to metrology, like jobs in many fields, often depends on gaining experience. Technicians may advance to more sophisticated metrology jobs with experience and instruction, including through formal or informal mentorships. For example, a quality control technician working on a factory floor might be coached to consider more complex design issues.

Mid-level metrologists might work as technicians or scientists, but either worker may find advancement to other metrology-related jobs. Because of their expertise, the

most experienced usually work as managers or supervisors of other metrologists.

FOR MORE INFORMATION

To learn more about careers in metrology, refer to the BLS *Occupational Outlook Handbook*. As mentioned previously, BLS does not collect employment and wage data specifically on metrologists. However, data are available for some other occupations that may include performance of metrology tasks, such as inspectors, testers, sorters, samplers, and weighers (see www.bls.gov/oco/ocos220.htm) and engineering technicians (see www.bls.gov/oco/ocos112.htm).

The *Handbook* is available in many public libraries. Online, visit www.bls.gov/ooh.

Some associations that might provide more information on metrology work and education include the following:

National Institute of Standards and
Technology
100 Bureau Dr.
Gaithersburg, MD 20899
(301) 975-6478
inquiries@nist.gov
www.nist.gov

American Society for Quality
600 N. Plankinton Ave.
Milwaukee, WI 53203
Toll free: 1 (800) 248-1946
help@asq.org
www.asq.org

NCSL International
2995 Wilderness Pl., Suite 107
Boulder, CO 80301
(303) 440-3339
info@ncsli.org
www.ncsli.org

Cal Lab Magazine
PO Box 871270
Vancouver, WA 98687
(360) 433-2522
office@callabmag.com
www.callabmag.com

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