

ERRATUM

To the article “Global Confidence from Identifiability in the SI System” by A. Vollard (*Measurement Techniques*, Vol. 48, No. 7, pp. 629–631, July, 2005).

This article was mistakenly retranslated back to English from a translated Russian version. In the process the name of the author Andrew Wallard was incorrectly rendered as A. Vollard. In addition, some names of international organizations and their acronyms were also misrendered.

Below we republish the article in the original form submitted by the author to the Russian journal.

WORLD METROLOGY DAY: 20 MAY 2005.

“GLOBAL CONFIDENCE THROUGH SI TRACEABILITY”

A. Wallard

On 20 May 1875, 17 States became the founding Members of the Metre Convention. The Convention is the second oldest intergovernmental treaty arrangement and set the scene for what is now 130 years of achievement and success in the establishment of a global infrastructure for precise, accurate and traceable measurement. Today there are 51 Members of the Convention and 17 Associate States and Economies of the General Conference on Weights and Measures. The first members of the Convention and the staff of the Bureau International des Poids et Mesures (BIPM) started with the metre and the kilogram as reference standards. However the work of the Convention now extends to a much greater number of international measurement standards and is making its presence felt in fields as diverse as biological standards and nanotechnologies.

We celebrate the 20th May as a day on which metrologists can be proud of their quiet, largely unseen, but influential achievements. They can look back on a successful past, and look forward to another 130 or more years of service to the scientific, technical, commercial, and social applications of precise, traceable measurements within the International System of units (SI).

This message from the BIPM, which is at the heart of world metrology, is a challenge to, as well as recognition of, the immense contributions of many thousands of metrologists throughout the world. It also aims at drawing the attention of Governments from our Member States and others, as well as international bodies, to the benefits of good metrology and the very large economic benefits which come from their investments. Many studies have shown a clear and very large techno-economic benefit from public investments in metrology. One recent UK study put the return from their £40 million national investment at over £5000 million! Similar figures apply to economies of all sizes and stages of economic development. The benefits of metrology touch us all, wherever we live and whatever we do.

Metrology is the science of measurement, and embraces both experimental and theoretical measurements and determinations at any level of uncertainty in any field of science and technology. The intricate and mostly invisible networks of services, suppliers and communications upon which we are all dependent rely on metrology for their efficient and reliable operation.

The economic success of nations depends upon our ability to manufacture and trade precisely measured and tested products and services. Metrology is central to the manufacturers, suppliers and customers of goods and services. All groups must have confidence in the accuracy and reliability of the measurements made at every level of precision.

A current example of this international standardization of metrology is the construction of the European Airbus A380, parts of which are made in the UK, in Spain, in Germany, in France, and are transported to France for assembly. To achieve this goal, precision position measurements over a 50 metre stretch were needed to the amazing and challenging target of about 50 micrometre. This was laboratory technology until the very recent past, and even now challenges the very best laser trackers. Such international commercial collaboration and product quality would be impossible without accurate validated dimensional measurements between the various national metrology institutes and laboratories of the countries involved.

Apart from areas of engineering, measurement science has profound implications in a number of other areas of science and technology. In the domain of measurements of time, satellite navigation systems and international time coordination make accurate location possible – allowing the worldwide networking of computer systems, and permitting aircraft to land in poor visibility. The new Galileo consortium is working to ensure that “Galileo time” is consistent with the Coordinated Universal Time produced by the BIPM from over 300 atomic clocks in 41 countries.

The maintenance of human health depends critically on the ability to make accurate diagnosis, and deliver precise treatment in which reliable measurement is essential. This also supports an industry worth hundreds of billions of dollars worldwide. For many years we have focussed on radiation dosimetry and radionuclide activity measurements and we continue to improve the uncertainties in the dissemination of the international reference standards for radiotherapy measurements in particular. This is challenging and every small improvement has a direct and beneficial effect on the safety and care of patients who are treated in millions of hospitals in all countries of the world.

We have recently broken new ground working with the International Federation of Clinical Chemistry, the International Laboratory Accreditation Cooperation and the World Health Organisation in the development of an infrastructure of consistent and traceable measurements in laboratory medicine. This will have profound implications for the accurate diagnosis and health monitoring for us all, whether we stay at home but especially as we travel.

The ability to make accurate measurements, traceable to fundamental standards of parameters important in monitoring environmental science is essential in monitoring air quality and changes in the environment such as global warming and climate change. These are areas where we rely on metrology to take sound and reliable decisions which affect us all. We are working with the World Meteorological Organisation and its worldwide Global Atmosphere Watch programme to deliver traceable references for these hugely important issues for our future and the future of our planet

Metrologists working in different areas specialize in different types of measurements. At the highest scientific level, metrologists ensure the consistency of the International System of Units, which built on the early units of the Metric System and which was formally created in 1960. Their work usually involves research into the definitions of the units and ways of realizing them with sufficient accuracy to meet the needs of society and the world of scientific research. Legal metrologists are involved in aspects of metrology in the regulated sector, which directly concern consumers. Both metrologies are essential in ensuring consistent national measurement systems, traceable to international standards; thereby establishing that measurements and tests made in different countries can be regarded as equivalent.

The maintenance of the world's system of units takes many forms, from direct dissemination of units (as in the case of mass and time) to coordination through international comparisons of national measurement standards (as in length, electricity and ionizing radiation). Such comparisons are coordinated by the International Committee for Weights and Measures, the CIPM.

The creation in 1999 of the CIPM Mutual Recognition Arrangement (MRA) marked a major advance in the internationalization of metrology. A means of increasing confidence in the technical abilities of participants from laboratories around the world to make equivalent measurements and enable the provision of calibration certificates that are validated, verified and accepted by all signatories represents a significant contribution to the reduction to technical barriers to trade.

Some people claim that the CIPM MRA is as influential as the Metre Convention itself. Time will tell, but it is clear that metrologists are actively involved in practical research to produce results which bring potentially huge benefits to society at large. One recent estimate is that the impact of the CIPM MRA in reducing technical barriers to trade is worth over \$4 billion.

The reason for the increasing importance of metrology is the turbulence associated with globalization and global trade. For an economy to prosper in the global market place, it must improve the international competitiveness of its manufacturing industry. This requires more than simply the production of better products at lower prices; the potential customer also needs to be convinced of the quality and compliance of the product, which must be proven by reliable test reports and conformity assessments.

To achieve all this, a continuous upgrading of technology and expertise is needed. Typically the accuracy required of national measurement standards doubles every ten years. This demand for increasing precision and uniformity applies not only to national standards but also to the implementation of quality systems based on international standards. For example, the ISO/IEC 17025 quality standards require that all measuring instruments used for production or service are calibrated; where calibration means the comparison of the instrument's measurements with standards or reference materials of known value.

Where are the important areas for metrology for the future? Certainly, there will continue to be a range of challenges from the traditional areas of physics and engineering. However, the greatest and most pressing demand currently is from chemistry and chemistry-based sciences. Here there is an urgent need for precise, traceable measurements. Our long-term aim is to bring these domains into the framework of the CIPM MRA or a similar arrangement, in order to continue our mission of seeking worldwide uniformity in measurement.

The international work of the BIPM demonstrates that the Metre Convention is still a living instrument, responsive to the current needs of globalization. This is a testament to the sagacity of those who met in Paris in May 1875. The adventure of metrology is an enterprise which has been propelling the evolution of the modern world and which continues to excite the imagination and to assist society.

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