

### 13 THE EXPANDING SCOPE OF LEGAL METROLOGY AND THE CHANGING ROLE OF THE STATE IN A GLOBALIZATION WORLD

**John Birch, CIML Honorary Member, Australia**

I will be talking primarily about the relationship between the State and metrology and I will be using the State in a generic sense of a theocratic state, an empire or a democratic government and I will be using metrology in a very broad sense of both legal metrology and trade metrology, but making a distinction between metrology and people making measurements.

Metrology developed when civilization developed and it developed in response to the need of the State for information which was provided by metrology. That information was needed by the State to assist it to organize, plan, defend and tax. The role of metrology was to make this information consistent.

State means bureaucracy and it was bureaucrats in China or in Mesopotamia who wanted the information in order to be able to carry out their tasks. Another aspect of that was that the State involvement to require measurements to be made consistently was that the measurements had to be derived from standards, royal standards, theocratic standards and this concept of traceability is the continuing thread through the history of metrology.

Another aspect was that State involvement provided a trust in measurements and this is why they could then be used in transactions in the community, this involvement constituting an element which could reduce disputations and facilitate market and commerce. In addition, the great virtue of measurements, because of their objective nature, is their mobility. They can be moved and accepted. They only move as far as they are trusted and that trust is determined by the reach of the State.

Another important aspect of the relationship between the State and metrology is that strong states have strong metrology systems, weak states have weak metrology systems. A typical example is given by the French Revolution and the establishment of the metric system: it took one thousand years, from 789 (Charlemagne) through 1789, to reform the French measurement system. This reflects the difficulties that measurement is very much determined by the political and that has some relevance to what is happening to the State in our today society.

Eric Hobsbawm noted that *'the most lasting and universal benefit of the French Revolution was the metric system.... For it is well known that such small changes usually require socio-political earthquakes to bring them about'*.

Another point to be noted was at the establishment of the United States, when George Washington, in his first address to the Congress, identified what he thought to be the six priority areas, one of them being the establishment of a national weights and measures system, which became effective in 1797 at the time of John Adam, through a national weights and measures law which was a survey act about the collection of excises on goods imported in the United States, which highlights that important factor that, for most states, the main source of income was in fact taxes on imports and trade, not

income tax. With the establishment of income tax in the 19<sup>th</sup> century, excises on imports and trade reduced in importance, which partly explains the reduction of metrology to governments compared with the first 5000 years.

We also need to look at some changes that occurred in the late 19<sup>th</sup> century.

Such changes occurred because of globalization. If you measure globalization in terms of percentage of international trade compared with total growth national product of the world, you will realize that globalization was greater in 1930 than it is in 2000. The Treaty of the Meter was a reflection of the need to support that globalization which was occurring, driven by the industrial revolution and increased transportation. This Treaty was between the legal metrology authorities but one of its outcome was that, when at the turn of the century, the modern states began establishing national measurement institutes, these institutes were in many cases separated from the legal metrology authorities. We had therefore a bipolar structure of metrology which we are still trying to come to terms in our particular societies.

The expanding scope of metrology was driven by changes in agriculture, industry, demography, transportation and technology. There were also changes from direct sale of products to consumer to a multiplicity of transactions through production, wholesaling, processing and retail trade. Quality measurements were also introduced and became more and more important, as shown by the commerce of grain, initially sold by volume, then by mass, and for which now humidity and protein contents are taken into consideration. The establishment of water, gas, electricity and telephone utilities further expanded the scope of trade measurement, as did the provision of a wide range of services charged on the basis of measurements such as taximeters, parking meters, postal services, etc.

But the biggest structure problem we are facing is the use by governments of measurement for an increasingly wide range of regulatory measurements, in environmental and resource control, health and safety which have never been properly incorporated into our measurement system.

In 1980, when the OIML held its Conference in Washington D.C., Dr. Mc Coubrey from NBS noted that the institutionalized metrology services did not extend in these new areas to a sufficient degree. I think that the same comment could have been made up at that time about any other national measurement system. The reason of this situation is that trade metrology systems are not adapted to regulatory metrology. In trade metrology, the government acts as a referee between two people involved in a transaction. In regulatory metrology, the government is one of the people. This situation is not covered by weights and measures regulations. However, in many cases, the national systems have relied upon weights and measures regulations to define the legal basis for measurements in the society.

Another major structural difficulty is that very basic and ancient requirements stipulate that all measurements shall be derived from the national standards. This is traceability. But to what extent do we have a traceability definition in our legislative system which meets the requirements of modern society. In many cases the weights and measures systems do have a traceability requirement but it does not extend to cover this wider range of regulatory measurements. In fact we have not got a legislative basis which is appropriate for this expanded scope of legal metrology in the present days.

I would like now to refer to two other aspects of the challenges we are facing. One relates to economics, and the second one to globalization.

Lot of things could be said concerning the changes in economics over the last thirty years. But one thing you can say is that if you deregulate the market, you increase the need for metrology. An example may be found in the deregulation of electricity industry. If you change from a vertical integrated structure to one with separate components for generation, transmission, and retail sale, then the measurements needs of the second system will be far greater.

In terms of globalization, I believe that our ability to globalize will partly be determined upon how long we have nationalized, how will we sort out our national problems so that we can essentially integrate them into a global measurement system. The traceability requirement is still a major problem. But the other fundamental problem in terms of globalization for metrology is that if you have a system of trust based upon traceability and government requirements at a national level, to what extent can that system be transferred internationally where you don't have a international governmental structure that can provide the same degree of trust for the measurement system.

The CIPM is currently developing their MRA and the OIML is developing its own MAA. I believe that they will go some way to meeting the technical and scientific needs of the metrology system but it is the judicial or legislative needs which I think are the major problems. I do not think we are going to get world government and so we have to find the smart ways to do with difficult problems. I believe that we may need to look at providing stronger treaty provisions even in the Convention of legal metrology which will allow the acceptance of calibration results and measurements which are derived from standards outside national systems. The difficulty in doing so is to accept a great deal legal liability. And so I think that there are some major challenges which to me are primarily relating to the fundamentals of legal metrology which is the legislation. So the question is how do we find a legislative basis for metrology which will encompass the expanded scope into a coherent system and how do we provide a legislative basis for metrology which will also meet the demands of a globalized system.

## Discussion

**Comment:** An interesting distinction was made between trade metrology and legal and regulatory metrology. In certain new areas where measurements occur, the word 'metrology' is even unknown and there is no standards, no traceability. Owing to the limited means of NMIs, how is it possible to expand the necessary measurement system? This question is not limited to legal metrology; it applies to metrology as a whole.

**Reaction:** The trust is primarily setting the rules and this is a governmental responsibility. In a sense, all metrology is legal metrology because all

measurements should be derived from a national standard and this provision should appear in the today legislations. Concerning the general problem of traceability, it may be noted that we have, with the SI, an excellent system of units of measurement, but a very poor system of quantities of measurement. And not all physical quantities are traceable.