SEMINAR
REPORT

OIML S 5

Edition 2009 (E)

Stakes and priorities of legal metrology for trade

Mombasa, Kenya
26 October 2009

OIML S 5 Edition 2009 (E)

ORGANISATION INTERNATIONALE
DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION
OF LEGAL METROLOGY

Seminar:
Stakes and priorities of legal metrology for trade

An OIML Seminar was held in Mombasa, Kenya, on Monday 26 October 2009 in conjunction with the 44th CIML Meeting. Presentations were given by Jean-François Magaña, John Birch, Håkan Källgren, and Peter Mason. A question and answer session followed – the full proceedings are given below.

Introduction

Alan Johnston welcomed delegates and hoped that Members would enjoy the Seminar and that they would feel free to ask questions. He promised to speak slowly in English for the sake of his French speaking and other colleagues, and asked Mr. Magaña to begin the Seminar.

Mr. Magaña said that he would be giving a presentation about the situation of the OIML in the world economy. Unfortunately, prevailing economic circumstances had made it difficult for the expected number of representatives of manufacturers and industry to attend, but issues of trade would nevertheless be introduced and discussed.

Jean-François Magaña

In the days when he had been a CIML Member, Mr. Magaña continued, he had not realized the extent to which the OIML was represented throughout the world compared to some other international organizations. In fact, however, OIML Members should be proud of their Organization.

The United Nations had 192 Member States, the WTO 153, ISO 162, and the OIML only had 57. Sometimes the OIML might feel like a “small child” among the “big boys” but in fact the OIML was both large and representative. Member States represented some 4.8 billion inhabitants, or about 73 % of the world population; Corresponding Members represented one billion, or 15 % thus together they represented 88 % of the world’s population.

The OIML addressed trade issues; looking in terms of gross national product, Member States represented 90 % of the total world global domestic product, plus 6 % for Corresponding Members, making a total of 96 %. Member States also represented 82 % of the world’s trade, plus 12 % for Corresponding Members, adding up to 94 %. So in fact, OIML Members represented almost all of the world’s economy, which made them a big organization so there was no need for modesty in comparison with other organizations.

OIML Recommendations now covered 112 categories of instruments (some Recommendations, such as R 117, covered several categories). There were also Documents and Guides, all of which addressed a wide range of issues affecting the economy – trade, health, safety and the environment. There were 65 Technical Committees; he would return later to the implications for States of participating in these. The Certificate System was working well, with more than 2000 Certificates having been granted to 465 manufacturers from 38 countries.

Following the 43rd CIML Meeting, an inquiry had been launched into the implementation of OIML Recommendations. An inquiry of this kind had been conducted in the past every 4 years for the Conference, but now took the different form of an online database on which information could be gathered in real time from OIML Members.

There was information on national regulations which could be consulted by manufacturers needing to know whether OIML regulations gave national compliance for them. But the information also allowed the OIML to reflect upon its own priorities as to what should be addressed. There were not yet enough answers – only 24 out of 57 Member States had sent in their replies, also Corresponding Members might not have noticed that they also were able to participate. Already, however, the 24 answers so far received represented 64 % of the gross domestic product of Member States. Mr. Magaña had therefore tried to examine some provisional elements of response, which he had found quite interesting:

- Sorting the categories by the number of countries which regulated them, he had found without great surprise, that the list was headed by fuel dispensers, electricity meters, and non-automatic weighing instruments, all of which were regulated by more than 90 % of countries. Measuring systems on road tankers were also regulated by all the countries which had answered, meaning that some attention should perhaps be given to this category. Next came gas meters, water meters and taxi meters. However, in the next category, he had been quite surprised to discover that automatic catchweighers were not at the top for automatic weighing instruments and automatic rail-weighbridges were regulated in most countries, as well as continuous totalizing automatic weighing instruments – belt weighers. This conclusion would have to be taken into account in consideration of priorities, the Certificate system, etc. Most of these instruments, with the exception of electricity meters, and perhaps LPG road dispensers, were already within the Certificate System. So far, very few certificates had been issued in the categories of automatic rail-weighbridges and belt weighers although they were regulated in many countries; it would be necessary to examine whether these Certificates presented some problems for users.
- Preliminary analysis also suggested that, sorting countries by their population, exhaust gas analyzers were regulated by the biggest countries, and the same applied to labeling of prepackages, which did not quite enter the 90 % category but was not far behind. In these large population countries, road tankers were very often regulated, which had not been obvious from previous analysis of data. These were however perhaps not appropriate for the Certificate System, since they were not often sold abroad, but it was a category of interest to many countries. This analysis according to GDP would be useful in pointing OIML in the directions they should cover by Recommendations. Good progress was being made on electricity meters, which should answer the needs in that aspect.
- Mr. Magaña had then asked himself the question “do we correctly meet the needs of countries which regulate these instruments?” The survey had asked first whether the instruments were regulated in their country and then to what extent OIML Recommendations were accepted. Analysis of the answers had given interesting results. First he had made a list of the categories in which OIML Recommendations were most accepted. There was a large acceptance for non-automatic weighing instruments (17 countries out of 23), fuel dispensers (16 out of 24), road and rail tankers, weights, capacity serving measures, LPG road dispensers, measuring systems on road tankers (13 out of 23 countries fully accepted OIML requirements). Later the Seminar would discuss how to address those Recommendations which

should be improved. Members could also see systems for unloading ships’ tanks and rail and road tankers. Clearly, ships’ tanks addressed international trade but road tankers were for domestic use.

- There were categories which a number of countries did not accept. These included electricity meters. Here the Recommendation was from 1976, so this was hardly surprising. A revision was in progress and no doubt would lead to a good level of acceptance. The current gas meter provisions were out of date and would soon be replaced, but 8 countries did not accept the OIML requirement for sound level meters. This would have to be looked at, as there were important implications for the environment. Mr. Magaña had also been surprised to discover that there was a high level of rejection for R 44 *Alcoholometers and alcohol hydrometers and thermometers for alcometry* which had been rejected by 7 countries. Yet wine producers he had met used these Recommendations. There was a need to address this problem to reach other countries’ requirements.
- Gas vulume meters, strangely, were among the top ten categories for acceptance for OIML Recommendations and also among the top ten for rejection. The TC or SC would look at this issue – indeed, all TCs should look at the results of the survey to know to what extent Recommendations were accepted, and approach the objectors to try to solve the problems involved. Recommendations had to be approved by 80 % of countries, so on the face of it, it might be expected that they would be adopted by at least that proportion. Yet implementation did not always follow a positive vote in the CIML.
- Mr. Magaña had then drawn up a list of countries which had requirements additional to those of the OIML. These were more difficult to interpret, but taxi meters topped the list. Although this was a recent Recommendation, 8 countries had additional requirements. The technology was simple but tariff requirements from one country to another were complex. Additional requirements for electricity meters were hardly surprising, and for belt weighers, as previously mentioned, the OIML requirements were not sufficient in 6 countries. In more specialized areas, such as systems for the refueling of aircraft, additional requirements were not surprising, but the Recommendations for water meters were recent and in the MAA, so he had expected general acceptance here, but 5 countries had additional requirements. TCs should look at this. There were also additional requirements for automatic gravimetric filling instruments and for some measuring systems for liquids other than water.
- Mr. Magaña concluded from these results, first and foremost that it was necessary to have answers from more than the present 24 countries. Members and Corresponding Members would be reminded of this. Some countries might still be looking at the old versions of Recommendations and not have analyzed the new ones.
- The second conclusion was that there was a strong need in many countries for the regulation of utilities, including the measurement of oil for delivery; a static measurement for oil tankers and LPG; and some automatic weighing instruments, such as rail-weighbridges and belt weighers. These should be considered in looking at priorities.
- For gas meters there could be a surprising situation, where the same category was well accepted by some and rejected by others. 13 countries still accepted the Recommendation and 6 did not; TCs must pay attention to this, but in some cases it

was just that states were not prepared to give easy consensus – Members did not know what their colleagues’ experience was.

- More progress was needed in mutual confidence, trust and communication. This was something that was generally slow to enter the culture of Member States. It was necessary to start from the position that the technologies and instrumentation being dealt with were distributed throughout the world. All colleagues faced the same instruments and had the same competence. This was not always easy to admit; and they had the same objectives. The objective of all colleagues was to have reliable measurements, fair trade and protection of the consumer. Colleagues he met had the same objective as himself – the consumer, fair trade and the avoidance of fraud. One rule in Europe, which could be an objective in the OIML, was that what was legally considered acceptable in one country should be accepted, not mandatorily, but at least duly considered in others. If a country had evaluated an instrument it should be considered that they had probably done a good job. These ways of thinking had to be disseminated in the OIML.
- Following this inquiry, Mr. Magaña concluded that a couple of actions had to be taken. First, the survey needed to be completed by more countries; but also publications should be reviewed in the light of this inquiry, and then the TCs should analyze the reasons for non-acceptance of certain categories in certain countries, analyze which were the additional national requirements (easily ascertained from countries) and then revise the relevant publication where necessary, in order to achieve its wider acceptance and reduce additional requirements and non-acceptance. Publications should then where possible be included in the Certificate System if this was not already the case. There was a lot of work to be done and the active participation of Member States would be needed.
- Mr. Magaña had worked out the minimum participation to be expected from Member States. Prior to attending the CIML Meeting he considered that each State needed to spend 3 weeks studying the documentation. Members would tell him whether this was a reasonable requirement. For the technical activities of TCs, he considered that when a draft was circulated, key members of the TCs would need about 10 days (2 weeks) of work to look at the draft, to consult stakeholders in their countries, and to send their comments. For the Secretariat to consider the comments and make the next draft would require about 30 days. He would be interested to hear Members’ comments on these figures. If these were added together, and if there were about 16 drafts per year, the conclusion was that the total activity needed from Member States amounted to 4 400 working days, or an average of 76 days for each Member State.
- OIML resources included the work of the BIML and the work and resources expected from Member States. This represented the budget of the Bureau, which was 1.8 million euros, or 30,000 euros per Member State. Looking at the BIML budget divided by the population of Member States, the OIML cost about 0.37 euros per thousand inhabitants in Member States. Member State contributions were sometimes regarded as “high”, but if one considered what they actually represented, this translated to less than half a euro per thousand inhabitants. This could be used as an argument when asking for finance. It was 0.05 euros per million of the gross domestic product, so not a big amount for the economic benefit to be expected from legal metrology. Mr. Magaña had calculated these figures to give an idea of the costs of international legal metrology. The costs of national legal metrology were another matter which perhaps should be discussed on some future occasion.

Mr. Magaña then asked for questions from the floor.

Mr. Kochsiek wished to mention another problem. Mr. Magaña had said that concerning non-automatic weighing instruments there was an acceptance of 100 %. But on the other hand there was a problem with developing countries. He knew that there was production of more than 5 000 000 mechanical scales per year but there is no OIML Recommendation. Formerly there had been R 3 and R 28, but currently R 76 dealt mainly with electronic scales.

Mr. Magaña said that he had discussed this problem informally with some Member States. In the first place, R 76 was applicable to mechanical weighing instruments – why not? The other point was that in a number of countries purely mechanical instruments were not submitted to type approval. They were regulated but in a lighter way.

Mrs. Lagauterie spoke as a member of the co-secretariat in charge of R 76; she confirmed that mechanical instruments were still covered by this Recommendation; and when R 76 was drawn up in the mid-eighties, R 3, R 28 and R 74 were all merged into it. This one Recommendation therefore covered all instruments and the relevant paragraphs from the old Recommendations were still there in full. So it could be used for mechanical instruments. It also foresaw that simple instruments did not need type approval but could be regulated according to the OIML Recommendation. This was common practice in many countries, though perhaps not in the countries to which Professor Kochsiek was referring.

Mr. Magaña added that some countries had not found it very easy to take in which parts of R 76 were applicable to mechanical instruments, so some regions, and especially SADCMEL had issued a specific document for the application of R 76 to mechanical instruments.

Mr. Dunmill commented that, as Mr. Kochsiek had pointed out, this was a problem which was becoming more and more current as the Recommendations were applying to more and more sophisticated kinds of instruments. Although, as Mrs. Lagauterie had said, the Recommendations continued to cover mechanical instruments, it was becoming difficult for those who only used mechanical instruments to extract the necessary information that applied just to them. So in his view this was something which should be dealt with in the future, whether by producing a cut down version of some of the Recommendations just to apply to mechanical instruments, or by guides on how to apply these Recommendations to mechanical instruments. There was also the case of a few Recommendations which it had been suggested to withdraw completely because they were no longer used, but which had later been discovered to be in quite wide use in developing countries. This had been the case with the Recommendation on hexagonal weights, which had been excluded from R 111 (which covers all classes of weights) because it was felt that hexagonal weights were no longer appropriate, were not used, etc. But the BIML had been told that in a number of developing countries they were not only used but also manufactured, so that Recommendation had been retained; it would be used in some countries but not in others. So they would have to continue to be quite careful about not withdrawing Recommendations which could still be used, particularly in developing countries. It should not be made too difficult for those who only wanted to apply a Recommendation to mechanical instruments to obtain the information they needed from that Recommendation. So he thought this question would be looked at in more detail in the future.

Mr. Magaña considered that it was not necessary to change anything in R 76 for mechanical weighing instruments, but some guides for the application of this to mechanical instruments might be useful, providing that these did not deviate from the Recommendation. Thought must be given to the production of simplified guides for specific applications of some Recommendations.

Mr. Magaña showed on the screen the list of countries which did not accept the OIML requirements on non-automatic weighing instruments and the list of those which did. These lists would be made available to the regional bodies. He said that this demonstrated that some of the questions in the survey were not clear enough and would have to be improved.

Mrs. Lagauterie, this time speaking on behalf of France, said that this was one of her comments concerning Mr. Magaña’s presentation: she had found it very interesting, and of course Members were looking forward to the full results of the inquiry, but she would like to mention a few matters before discussion on the Recommendations began. First, she would like to see an analysis of the results of the inquiry: when a country said they did not accept a Recommendation, was this not because they had not understood the question? Was it perhaps not clear whether they were talking about accepting the product or accepting the Recommendation? For example, for European countries, all the answers for all the instruments covered by the Measuring Instruments Directive should be the same. The table of correspondence made it clear that there were two basic points in which they had additional requirements because they were in the Measuring Instruments Directive. The first was about software, and they hoped that this would be solved by the new Document on software (D 31) published by the OIML, and the second was about documentation; and the rest was because some OIML Recommendations were rather old; this should disappear.

Mrs. Lagauterie’s second comment was about the analysis of the inquiry, especially because Mr. Magaña had several times mentioned automatic rail-weighbridges. This had drawn her attention to the fact that it was also possible to discriminate between the categories and the number of instruments they covered in the field. For example, taking the case of France, automatic weighbridges were indeed regulated, but effectively only one instrument of that kind was in use for transactions in France. There were also regulations for automatic catchweighers. There were hundreds of these instruments and they were used for millions of prepackages every day. So the weight of the regulation was not the same. This should also be part of the analysis.

Mr. Magaña agreed with Mrs. Lagauterie, saying that this was one issue on which the questions should be made clearer. He was sure that, especially in the EU, if there were differences in the answers it was because the question had not been interpreted in the same way.

Mr. Mason agreed that there was something wrong with the interpretation of the results if the UK was shown as adopting a position different from that of other EU countries. Their position was the same and ought to be the same. But the conclusion he drew from this was that interpreting these results was very difficult but it was also very important. He thought that the OIML should be congratulated on the work they had already done on this. Basing policy on findings of this nature was very important, but it also had to be recognized that it was very difficult. The solution of putting the results on the web site or making them available so that the results and conclusions could be tested, and answers adjusted in the light of this, was a very important way forward. For him, the solution lay in this testing of the answers rather than in concentrating on getting the questions right.

Mr. Magaña agreed. What he had shown were just a few preliminary elements for reflection. This could by no means be taken as the conclusion of the inquiry, but he had tried to sort the answers and come up with some statistics, on the basis of which thought had to be given to looking case by case at the situation of the categories.

Mr. Seiler found the analysis very interesting, but it also contained a risk that answers had come from OIML Members, mainly from industrialized countries; the question arose as to whether responding to these answers met overall needs. It was necessary to differentiate

between developing countries, countries which were developing their legal metrology system, on the one hand, and advanced countries on the other. He would therefore appreciate rather more elaboration of the statistical analysis, taking into account the different state of the economies; this would produce a different picture of the need, and it would be seen that needs differed quite widely, because although technology could spread all over the world, it was not applied in the same manner in all countries. All the questions that had been raised were very important to the OIML when it needed to attract developing countries to the Organization, so that they could also benefit.

Mr. Magaña agreed, saying that now that all the results were in the form of a database, they could be cross referenced with the database of the economy of the countries, to show results for countries according to gross national income per capita. In this way he could draw statistics on developing countries in the survey. The results he had given so far were just the first figures, not taking account of the level of the economy.

Mrs. Van Spronssen supported what Mr. Seiler had said, but she herself was approaching the matter from the different point of view of the manufacturers; Mr. Magaña had said that after analyzing all the answers, Recommendations would be reviewed to achieve a better acceptance. But it also had to be taken into account that not all the extra requirements which countries were adding were necessary for reaching the correct measurement. So taking everything in would be adding an unnecessary burden. So, as Mr. Seiler had said, there was a need to look at what was really necessary and how a balance could be kept between achieving more acceptance of the Recommendations and putting extra burdens on the manufacturer.

Mr. Magaña agreed. All this was a starting point for reflection and it would be necessary to go deeper in the analysis for most categories.

Mr. Issaev felt that as a result of Mr. Magaña’s analysis it was clear that much work must be done in the TCs and SCs. The analysis was a good support in the struggle against technical barriers to trade, which was very important given that the OIML was a supporter of the WTO, which should be informed of the help being given by the OIML in this. Finally, it was interesting to know what was meant by “the needs of Member States for metrological activities”. The results of the inquiry gave an average, but distinctions must be made, and more support given to those countries that were putting in a lot of work in the TCs.

Mr. Magaña agreed. He added that there were plans in a couple of Regional Organizations to hold inquiries as to which instruments were regulated and which not; these inquiries could answer a lot of the current questions. At the moment the inquiries could be answered by Member States and Corresponding Members, but they could also be opened to other countries, which would simply receive a login for the inquiry. He also offered help to other Regional Organizations which might like to use the same inquiry.

Mr. Magaña showed Members the inquiry database. By selecting a category of instruments it was possible to see lists of the countries which had or had not accepted the Recommendations, which had additional requirements, or, alternatively, all the answers of a particular country. It was intended to put these results on the web site, though this would involve a considerable amount of work, as the web site used a different computer language from the local database.

Mr. O’Brien commented that the day’s Seminar was on legal metrology for trade, and it seemed to him that trade in prepackaged goods was fundamental to that area. He had been interested in the statistics shown, but also he was particularly interested in the net content of prepackages. Of the 24 countries which had responded, roughly 30 % did not accept the Recommendation for that particular category. He saw this as fundamental to international

trade. He understood that a number of Documents were currently being reviewed in TC 6 and he would be interested to see whether the situation could be rectified within the TC.

Mr. Magaña said that this was a question of which countries did or did not accept the OIML Recommendations on the content of prepackages. But any answer had to be provisional, because the relevant Recommendation R 87 was being revised to require both the average value and the minimum value to be on the package. This would solve some issues, though others remained outstanding. This was the domain in OIML work which addressed the most important part of trade, both national and international.

Mr. Carstens felt that the CIML Member who filled in the survey was often not personally involved in prepackaging and might be giving inadequate answers. There might be a need to approach the correct regulator or department for input before completing the survey.

Mr. Magaña repeated that the survey produced only yes and no answers. When the survey was complete, these answers would be examined more carefully, and discussions held with the TCs and countries concerned, to discover their implications.

John Birch

Taking the floor, Mr. Birch thanked members for the opportunity to speak to them. He had already talked on a number of occasions about the economic and social benefits of metrology and he would again be talking about some aspects of that with regard to trade facilitation. He would also be going further into the role of metrology in public policy issues, a subject which he believed was becoming increasingly important and which he thought the OIML needed to take account of in their programs. So he would talk about the development of metrology systems and their role in facilitating trade, and the integrity of measurements in regulation and public policy.

Metrology had been around for some 5 000 years. Metrology systems were developed by most governments to ensure consistency of measurement. This was the hallmark of metrology. From the late 19th century, in response to globalization which was occurring, steps were taken to establish a global metrology system. The 1875 Treaty of the Metre was signed during that period of globalization and it provided for consistency of national standards. In 1955 the Legal Metrology Treaty was signed for measuring instruments, to ensure that they were used consistently throughout the world. Together with well defined physical quantities and legal units of measurement and accreditation, these formed the main components of the metrology system currently being worked with.

There had been a massive increase in measurements in the 20th century in industry, commerce and government regulation, many of which had not been subject to metrological control. In 1980, Dr. Hunter had published a very interesting paper in *Science* magazine, in which he said that the quantity of scientific measurements then required by measurement-intensive laws was increasing, with the result that the quality of many scientific measurements was suspect. This was a call for more of the measurements to be incorporated into the metrological control systems.

Mr. Birch considered it most appropriate that the OIML had organized a seminar in Mombasa on the present occasion to discuss trade facilitation, because this was an important issue, particularly for developing countries, and, of course, since 2001, the WTO Doha Development Round had sought to rebalance trade rules in favor of developing countries by cutting tariffs and farm subsidies. The OECD had estimated that net gains of 100 billion dollars from full tariff liberalization could be achieved.

Regarding the Doha Round, many developing countries had not been prepared to support the proposals which were being brought forward, primarily because they were seen as comprehensive and required a country either to open up all its markets or not open up at all, and the problem for many developing countries was that, while particular sectors of the economy might be competitive internationally, large sectors of the economy were not, and to open up prematurely would result in many of those sectors being wiped out. In 2008 a report of the Growth Commission had looked at how countries grow and had found that few developing countries had achieved sustained growth and that growth was actually country specific. So it was not possible to have a “one fits all” system for developing countries, it was necessary to bring in requirements which were country specific. Market access in fact could be detrimental if introduced before the development of strong domestic markets. Market access was interesting: one of the countries which had achieved market access was Mexico, with the North American Free Trade Agreement. Before that Free Trade Agreement, Mexico had been growing at 3 % per year; since the Free Trade Agreement it had been growing at 1 % per year.

Since the 1980s, economic liberalism had emphasized market based reforms with de-regulation, privatization of government services at the expense of environmental sustainability and reduction in trust and social capital. The global financial crisis was causing a re-evaluation of market based policies. Metrology had been affected by these market policies, with privatization and deletion of some functions. Metrology systems were facilitatory rather than regulatory, and they facilitated markets by providing trust and confidence in measuring and significantly reducing transaction costs.

The point Mr. Birch wished to make at the current Meeting was as follows: he was sometimes accused of trying to take OIML Members outside their technical comfort zone, into an area they should not really be dealing with in terms of economics. But he did not think they could afford to be outside this area. Economic policies were affecting metrology and the operation of metrology. Metrology was a very practical activity, and not a scientific activity, and if account was not taken of the economic and social impacts and benefits, then he did not think it was possible to end up with good metrology requirements. He was reminded of the quote by Professor Joan Robertson, the most prominent woman economist of the 20th century, who had said: “The reason economics is studied is to avoid being deceived by economists”.

Kenneth Arrow, another Nobel Laureate in Economics had talked about trust in 1972, Mr. Birch told Members, and he had said: “Virtually every commercial transaction has within itself an element of trust; certainly any transaction conducted over a period of time”. Much of the economic backwardness in the world could be explained by this lack of mutual confidence. Mutual confidence was a great lubricant of trade, both domestically and internationally; without that lubricant, it was not possible to get the benefits of the trading process.

The global trade metrology system, to which Mr. Magaña had referred in his earlier presentation, comprised the OIML Recommendations, OIML Certificate System for Measuring Instruments and the MAA. The MAA facilitated trade of 30 billion dollars in measuring instruments (this was a figure Mr. Birch had quoted in an earlier paper he had given in Cape Town; the references could be found there). The MAA also enhanced the integrity of national systems, which was of particular importance to developing countries. Under the MAA developing countries would now have access to instruments which they could be more confident would meet the OIML Recommendations. In his experience, there had been too many examples of measuring equipment being dumped in developing countries which was sub-standard and resulted in very poor measurements. As had been commented several years previously, when the USA had done an analysis of the benefits of measurement

they had come up with the fact that measurements provided a benefit of 4 % of GDP every year. The comment had been made then, “If good measurement creates such value, imagine what bad measurements must do to the economy”. It was a fact that bad measurements did great damage. The important thing for developing countries was to avoid any dumping. A compliance system within the MAA would be very important, and Mr. Birch hoped that that could be considered by the OIML.

Developing countries did need access to global markets, but they needed to be able to be able to take it on their terms. Some countries could do very well. One example was the success story of Fiji Water. This was the largest selling bottled water in the US. It was able to sell large quantities because it had the image of being a South Pacific country, coming from a pristine environment, the water must be good, so people bought Fiji Water. However, Fiji had also been a major exporter of textiles and clothing, but once it lost its preferential treatment that industry had been wiped out completely. So, as he had pointed out earlier, getting access to markets could have positive and negative sides. For many developing countries, exports of minerals, energy and bulk commodities were often developed by multinationals, and significant benefits were transferred overseas. Transfer pricing was a fact of life for many developing countries, and they did not always get the benefits they should. However, there were increased opportunities to add value to exports. This had come up in some of the earlier discussions. The global trade in processed food and beverages was increasing twice as fast as the trade in primary commodities. In 2002 it had been estimated that there were 900 billion US dollars in the processed food trade, 75 % of the global agri-food trade. And, in many ways, many people had not caught up with this fact. Processed and prepackaged food was now the big export and the big market, both domestically and internationally, rather than the bulk commodities. Developing countries could benefit from the trade in the high value per cent of the agri-food exports.

It was interesting to be in Kenya at the current time, Mr. Birch continued. The traditional export for Kenya had been tea. In 2009 it had been displaced as their major export by fresh flowers. Fresh flowers were not measured, so this fact did not support Mr. Birch’s argument in that respect, but it did support the general argument that the opportunities were in high value products, rather than the bulk commodity traditional products that developing countries had previously been so involved in. Thus, as the point had been made earlier, it was prepackages rather than weighing which constituted the big measurements in international and domestic trade.

The trouble for developing countries was that to comply with the various requirements around the world was a major impediment to development, and overcoming that diversity of requirements was a major issue. And this is where Mr. Birch believed that the OIML solutions, both for trade in measuring instruments and for prepackaged goods, were far more flexible than the WTO solutions. The future OIML system on prepackaged goods, which he had long promoted, would reduce model testing, speed up entry of goods across borders, provide a level playing field, reduce compliance costs, enhance consumer protection and reduce fraud. Such an agenda could not be surpassed. This was what developing countries needed, and, with the OIML, they could pick those areas where they had comparative advantage and get access to markets in those particular areas without necessarily exposing other less developed areas of their economies to unfair competition.

Regarding the legal, as opposed to trade, aspects, OIML Recommendations provided essential metrology elements for a wide range of regulatory measurements. Many government agencies were reluctant to introduce metrology principles into their legislation. Take-up of OIML Recommendations had been discussed earlier. The difficulty was, of course, that most of the Organizations which attended OIML meetings were responsible for weights and measures.

Many did not have responsibility for prepacked goods and very few had responsibility for other legal metrology areas. These came under various other government departments, which were reluctant to allow another department to interfere in the way they had been doing things for years. This was the organizational impediment in government. There were ways around this. For example, in Australia they had had difficulties in the use of breathalyzers and radar speed devices, and the police had raised quite a few objections to the OIML Recommendations when they were proposed. A committee had been set up, particularly to consider the objections to breathalyzers. But, because of problems with litigation, the one thing they wanted was to have the same sort of situation with their breathalyzers that the weights and measures people had with their working standards: that they were certified as giving true measurements and so there was no argument in court about whether the inspectors’ measurement was correct. They had asked for similar certification on breathalyzers. The definitions in the act had therefore been changed to include not only standards of measurement in the traceability definition, but legal measuring instruments. The police had consequently agreed to adopt the OIML Recommendations and metrological control systems had been set up on the basis that these would receive certification under the Act which they could take in the courts, and overcome the litigation which had been occurring.

Mr. Birch had spoken on road safety at the 1998 Conference. At that time he had been concentrating mainly on the role of road safety and fatalities in developed countries, and the massive drop from 1970 in road fatalities. After that, it had become evident that road safety was a major policy issue for developing countries. The WHO, the World Bank and the International Red Cross had all issued reports on this, the most recent of which was an estimate that by 2030, road deaths could be the 4th leading cause of death in developing countries, with children aged between 5 and 14 the most affected. In fact, in the 5–14 bracket, road deaths would be the major cause of death by 2015 if current trends continued. There had been discussion of this issue at a previous Conference, and Mr. Birch had then given the example of Vietnam, which had been mentioned in an international disasters report. It had had a rather high road toll, and there had been a need to do something about it. The World Bank had started a program on road safety and was supporting a program in Vietnam. A recent World Bank press release estimated that road accidents were costing Vietnam 5 % of their GDP, so there was a great opportunity to do something about it. Mr. Birch wished to speak not only of the economics but also about the policy. With road safety, governments had two policy options. One was the civil engineering option of spending huge amounts of money on road building to try to stop drivers bumping into and killing each other. The second was the social engineering option of trying to change drivers’ behavior. This was highly cost effective, and breathalyzers and radar speed devices could make a major contribution to it. Between these two policies it might be said that there was no question but that governments would choose the social engineering one, and only spend on roads what was necessary for moving traffic as distinct from road safety. But thing were not as simple as that, and anyone getting involved in policy had to recognize that fact. The trouble with road expenditure was that politicians liked to spend money on roads; it was electorally popular – people liked having roads built through their electorates, it created local jobs and politicians went down that path very well. Social engineering was not so popular – people did not like having their behavior changed, they liked to be able to speed and drink, and they objected to losing points and being fined when they did it. So politically it was not an attractive proposition – whilst it was the best policy option, it was not necessarily the best political option. For that reason, it was important that the measurements of legal metrology in those areas had to have complete integrity so that there could be no litigation over those areas, otherwise politicians would just move away from it.

A major problem facing all governments at present was climate change. Climate change was measurement-based as well as being science-based. Metrology was marginally involved in the development of public policy on this issue. In 2008 the Australian Prime Minister, just after the CIML Meeting in Sydney, had launched his carbon pollution reduction scheme. He had been asked whether, if the IPCC changed their temperature estimates, his carbon pollution reduction scheme would also be changed. He replied, “Our job is to respond to what scientists say to us. Scientists come to our meetings and deliver the science. They are in the measurement game. We are required to respond to the data”. On hearing these words, Mr. Birch had thought that metrologists really had to be sure that they were providing the best advice to governments. At the 1999 CGPM, which Mr. Birch had attended, this matter had been discussed, and it had been further discussed in 2007. Barry Inglis had reported on the topic at the Sydney OIML Meeting in 2008. The recommendations which had been passed in 2007 said that all measurements should be fully traceable to the SI units – there was some doubt whether this was the case, and that a Conference to discuss metrology in climate change should be organized.

The main topic when climate change was discussed was probably global temperature change – whether it was going to rise by 4 degrees in the next century, or by 3 degrees or by 2 degrees. And there was a lot of interest in it. That particular measurement was the major interest driving policy development in most countries. Global temperature was of course a strange measurement. It was an aggregation of many thousands of measurements taken all over the world every day and worked out over a year to find the temperature of the earth. There had been concern, however, that some of the measuring instruments used in these measurements were not fit for purpose. Work had been published on that. Mr. Birch had also suggested that, as well as the BIPM being involved with the World Meteorological Organization, that CIML should advise the WMO on measuring instrument requirements for these crucial measurements.

Mr. Birch said that he was about to take Members out into the wilderness. A month previously, in France, the Commission on Measurements had issued its report on measurement of economic performance and social progress. This commission had been set up by French President Mr. Sarkozy, and had been chaired by Joseph Stiglitz, a Nobel Prize Laureate, and co-chaired by Amartya Sen, another Nobel Laureate in Economics.

They had been asked to find out to what extend gross domestic product was a good indicator of economic progress. This was an issue which had been discussed for quite some years. For a long time GDP had been used (the OIML had used GDP to determine its fees), using exchange rates. But many countries had realized that exchange rates did not provide a good comparison of GDP, because they changed the purchasing parity, looking at what the GDP was and what it could buy in each country. But there were still major problems with that. The Commission had been set up before the global financial crisis, but in their recently issued report they had taken account of that crisis. Their report was about measurement rather than about policies. It stated that decisions that were made depended on what was measured and how good those measurements were and how well they were understood. This was something which was frequently said in the OIML, but in this case those saying it were economists. GDP in developed countries was now dominated by services. In many cases, services constituted 70 % of GDP. It was extremely difficult to estimate the output of those services and they were usually done on the basis of inputs. It was also extremely difficult to take account of improvements in quality in the GDP. The goods being produced might be 10 times better than those being produced 5 years previously, but that would not show up in the figures.

Determining the economic value of metrology had also been difficult, and this had probably resulted in under-investment in the activity. It was basically a service activity and many of the

comments made in the Commission's report were somewhat relevant to the OIML. When reading the report, Mr. Birch had been reminded of the Lord Kelvin comment, "When you can measure what you are speaking about and express it in numbers, you know something about it. But when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind". The trouble with that quote was that Mr. Birch was not sure whether the measurements Lord Kelvin was talking about were traceable, and many of the measurements being made in the world did not have much metrology in them. But, just the same, that principle was a good one.

The report went on to state that the reason the global crisis took many by surprise was that the measurement system failed the economist, due to the quantities being measured being ill-defined and often composite. That was a problem sometimes encountered in metrology.

In conclusion, Mr. Birch quoted from Robert Solow who had won the Nobel Prize in 1987 for his theories on growth, who had said, in an article published in *Science Magazine* that same year, "Social sciences have a fuzzy edge and in economics it is possible to keep a bad idea alive for 10 years on sheer ingenuity and enlargement of observations". Eventually, Mr. Birch concluded, the recession catches up with you.

Mr. Birch thanked his listeners and apologized to them for taking them outside their comfort zone in metrology, but he thought it was necessary to look at all aspects of measurement and that OIML Members should brand themselves as the measurement people. They were the people who had been in measurement for thousands of years, they had developed systems to ensure consistency of measurement and many of the people who were new to measurement did not understand what was necessary to ensure good measurements and to provide important information to government.

Mr. Magaña thanked Mr. Birch for his presentation.

Håkan Källgren

Mr. Magaña introduced the next presenter, Mr. Källgren, whom many of those present would know from his involvement in OIML activities, especially in weighing instruments and in European work. Now a consultant, Mr. Källgren would offer a very interesting presentation on what OIML Recommendations could contribute to quality.

Mr. Källgren told delegates that he had been in metrology for some years. He had retired six months previously from the Swedish Technical Research Institute, after 40 years' work, but he found himself unable to leave the OIML and metrology, so he was still continuing with some issues. He was not sure whether the speech he was about to make should be labeled as legal metrology, industrial metrology or some combination of the two. It was certainly not scientific metrology. He would explain how he interpreted the OIML in Sweden and some other countries and how he understood the OIML. He would mention some aspects of OIML Recommendations which he did not like, but he would also give due credit to those many Recommendations which supported industrial work.

Mr. Källgren explained that his background had been that Sweden had not been a developed country in the field of legal metrology. There had been limited metrology legislation in Sweden because the Government had told the people that industrialists understood everything themselves. He did not believe this was true. This gave rise to some thought in industry, because there were some problems. One example was petrol pumps: legislation in Sweden required conformity to OIML Recommendations, with verification once a year. The Government had then carried out an investigation and found that this was not necessary –

two-yearly verification would suffice. The large oil companies wondered why this should be, and discovered that statistics showed that pumps which were used for a long time gave the consumer a little more, and as a result they decided, in many places in Sweden, to do recalibration, or subsequent verification, more often – in Stockholm this could amount to verification 4 times a year. This showed that the Recommendation was a good one. A number of such incidents had demonstrated that the Swedish system was not a good one.

Mr. Källgren said that he had set out to understand the OIML. This was the prime point of the talk Members had heard that morning, and there were other features which benefited the trade in measuring instruments, though perhaps not always facilitating other things based on measurements. Although his own background was in weighing instruments, he had some experience in other areas, and he would generalize a little to say that what was good about the new Recommendations was that they had more performance requirements classification, which simplified discussion with industry. Test procedures were also becoming better and better, especially some of the field tests, which were important for industry, even if this was not strictly within the legal framework but rather in the quality framework. Things like influence factor tests or disturbance tests were very good. There were some examples in Sweden, because legislation was very limited, where load cells, for example, and some balances were tested: some of those which were not approved had performed better as thermometers than as weighing instruments due to a better sensitivity to certain temperatures. This was a very good feature of the Recommendation, as was the EMC test, because there had been some problems with EMC disturbances, especially in laboratories.

Looking at the quality concept, if you wanted to have some uncertainty relations, it was good that there was differentiation of MPE for the initial verification and the in use verification. In use was a very different thing from the initial test, in some areas by a factor not of two but of twenty, depending on the installation circumstances surrounding it and so forth.

In some cases, however, there were too many technical requirements. For use in industrial metrology, some of the details were disturbing, especially when discussion turned to software, this would give rise to some limitations in industrial processes.

Mr. Källgren’s final point was that there were no uncertainty requirements in OIML Recommendations. This was his opinion; others might differ, and the matter might perhaps be discussed. For example, from OIML R 106, some reference records had to be produced, which should be the reference to check the final balance or weighing instrument. It was said that the balance used for this should be three times better than the requirements being looked at. This was correct if that balance was the same one or just beside it, if it could be done immediately, if it had not rained heavily half an hour before the final testing began, and if there was not a journey of 50 km to be made between one balance and the other. This way of explaining uncertainty, according to what Mr. Källgren believed, was not a good one. What should be looked at was the measurement process; what was the uncertainty at the moment when the real final testing was begun, including the time factor and all the disturbances, the modern way of using the GUM in industrial work? This gave headaches when establishing the uncertainty budget. If accreditation was chosen, sometimes the criteria were very strict and demanded that there be a very good uncertainty budget. This example showed how conflict with accreditation bodies could arise.

Mr. Källgren presented several different cases where a start had been made from a poor level but at the end it could be seen that OIML Recommendations were very good:

- If some weighing was done in the crane while loading a truck, this was not within Swedish legislation, but the truck scale which was used when trucks had been moved a little should be verified, of course. It was important for industry to be able to

perform a correct measurement so that the truck was not found to be either overloaded or under-loaded once it had traveled 10 km. Mr. Källgren had been told in a meeting of about 15 people, consisting of researchers, users, and producers, where he was the only metrologist, that they expected not more than 2 %. But 2 % could give rise to a large fine if it was on the wrong side. If it was on the other side, it had been calculated in Sweden that every truck owner could lose about 10 000 USD per year through this uncertainty. He had not personally checked this calculation. So they were seeking more accurate results. Mr. Källgren had told them that this was impossible. A test had been done to see who was correct, Mr. Källgren or the other 15 people. They had gone to a site and used some weights with known traceability, uncertainty, etc. The companies knew that the group was coming and had carefully prepared the balances so that they would give a good result. They had done it in the morning, and when they had come after lunch to check it, they had found differences up to 15 %. Mr. Källgren had spotted at once that the problem was due to the speed of moving the things. From the first loading to putting it on the truck was 5–6 seconds, very fast, so that gravity and acceleration had caused the problem. 2 % was impossible. This had set off a series of developments from different producers, and about three years later there had been an improvement in Sweden, so that now at least one company, probably two at the moment of speaking, had been able to go to 1 000 scale intervals for R 51. This was because SP, where Mr. Källgren had worked at that time, had begun to do some strict calibrations or verifications, following the OIML rules. The secret, of course, had been to measure the acceleration in three directions and perform the calculations on fast computers, rather than the sensor itself. In this case it had not been in the legislation but there had been a lot of support here from the OIML Recommendation.

- The second example was where a recipe was made for production; this could be of anything, fertilizers for example; a lot of different ingredients were weighed, added and mixed and then a big bag was filled – typically 1 T. In this case the relevant Recommendations were R 107, R 50 and R 49. Some of the industries doing this had previously just put the different ingredients together; without realizing the good criteria that were to be found in the Recommendations. Now they were getting more stable results. Previously, it had been necessary to go to a chemical laboratory to make some analysis, which might have taken two or three days to get the results. If it was done with stable instruments, however, the laboratory tests only confirmed results which were invariably correct. This was another example of industrial metrology achieved with help from the Recommendations.
- A special case was the mines in the northern part of Sweden. Here much discussion had arisen from the fact that the results were not correct. A train of ore had weighed in one case 3345 T and in another, having been loaded by a belt weigher and moved to the bridge in the harbor and there had been a difference of 56 T. Of course there had been arguments between the two parties. The metrologists had looked at it and pointed out that there was an uncertainty on one side of 1.5 % and on the other of 1 %, which meant that with a 95 % confidence level such a difference was possible; the miners then thought that the metrologists had solved all the problems, but the temperature difference during one year at that site was not very often 30 °C but 25 °C was common. Temperatures of –40 °C occasionally happened. So if these things were not stable, temperature compensation which was good enough according to the rules in the Recommendations would still give rise to problems. One belt weigher, though not heated, was inside; the other was outside. The miners had been advised to use R 50 Class I and now they had certified instruments, load cells and everything and the risk

had been minimized, though the situation was still not perfect. So the mine owners had begun to think about all their production, some 23 million tons per year, with 160 belt scales as well as numerous other scales. Only one Norwegian harbor was regulated, with a very good instrument and annual verification as well as intermediate checks. Half a per cent error in this case represented some 8 million USD. They had also begun to discuss all the others and were saying that in principle, requirements for weighing instruments should follow available OIML Recommendations. They were not yet completely fulfilling these but felt much more confident, and had got rid of some old equipment which was not reliable. This was another example where some but not all of the problems could have been dealt with through legislation. Recent Swedish legislation meant that new balances had to meet legal metrology requirements.

Mr. Källgren pointed out that Members could now see what he had meant earlier when he spoke of industrial as well as legal metrology. He always urged the people he spoke to, to buy approved indicators, load cells and everything connected with weighing instruments, so that they would not have problems in the future. Even if it was inside industry and far away from legislation, this should be done. Not everybody was in agreement with him, because of the price implications, but he told them they must have something which was very insensitive to mobile telephones and to temperature variations. There were some signs of a move in this direction. If the legal metrology principle was followed, buyers should go for initial verification and for subsequent verification. People asked whether verification or calibration was the better. He supposed that most of those present were on one side or the other on this issue. But there could be another way, depending on what type of instrument was in question. For heavy weighing instruments used in very rough industry, Mr. Källgren always recommended people to go for at least initial verification so that all the problems could be seen. There could be a lot of eccentricity, test repeatability and other questions that are not always addressed by calibration. If the initial installation was good, perhaps calibration might be used subsequently. For stability and other aspects, the number of tests could be reduced. Practitioners should look at the curve and see whether the span was changing. This was not fulfilling either what legal metrology wanted or what accreditation bodies asked for but it seemed to him to be worthy of examination by the metrology community.

Some minor aspects were that trust had been very good since work had begun some years previously on comparability. He wondered about the OIML MAA and certification; he had not seen good comparability for testing in the last ten years, though he had seen many for calibration. He wondered whether the OIML should organize this, or whether some other body should be responsible.

From OIML cooperation with ILAC, the most important thing he had seen was the comment in the OIML report that lead assessors should understand what OIML Recommendations were. Some of them had not heard about them – they just talked about calibration and some other standards. There should be close cooperation between the two bodies on this issue.

Concerning cooperation with ISO, ISO/IEC 17025 was in common use but ISO/IEC 17020 was less used as yet, though it was coming in, at least in Europe. Cooperation between the BIPM, ISO, ILAC and the OIML was essential but it must occur in reality and in industry, not merely on paper. Legal metrology and industrial metrology had much to learn from such realistic joint discussions.

Mr. Magaña thanked Mr. Källgren, and invited Mr. Mason to speak.

Peter Mason

Mr. Mason said that since hearing the two earlier speakers he had been busily rewriting his remarks. There was much common ground and complex interaction when it came to the question of what the OIML was doing. The talk he had originally prepared did not address either stakes or priorities. Since he seemed at the moment to spend much of his life discussing strategies and priorities, he was sure there was much to contribute to debate.

Earlier in the morning, Mr. Mason had felt that two themes were developing out of what Mr. Magaña and Mr. Birch were saying and what he himself was planning to say. These themes were cooperation and skills, to both of which he would shortly return. But he now felt that a more fundamental question was beginning to be addressed, namely, where exactly did legal metrology fit into the bigger picture?

Mr. Mason had originally thought he would be talking about the relation between scientific metrology and legal metrology; but on the other hand there was the fact that the current session was entitled “metrology in trade”. He raised the question of the extent to which what was under discussion was indeed metrology in trade, or metrology for other purposes, for example environmental protection or safety. There was a very complex landscape, and the question was where the OIML fitted within it.

Returning to the remarks he had prepared, Mr. Mason pointed out that two very important changes had taken place in the current year to the office which he headed. Firstly, in April, his office, which had previously been called the National Weights and Measures Laboratory, had been asked to take over responsibility for funding scientific metrology in the UK. They were therefore now responsible for the funding and policy of both the National Physical Laboratory and their other national measurement institutes. The effect of this was to increase the number of people within his agency by about 30 % and increased his budget 12-fold.

The second change was in the name and organization of their parent department, placing him now in the Ministry responsible for Business, Innovation and Skills. He believed that among the subjects under discussion were matters relevant to all of these areas. It was very valuable at the moment to be within a department which was such a significant part of the UK Government.

For Mr. Mason, the first of the above changes had been the more important, and he had had to spend much of his time thinking about the relationship between his old responsibilities for legal metrology and his new responsibilities for scientific metrology. Indeed, until the time of speaking he had thought that these were the only things he had to worry about. However, Mr. Källgren had now caused him to wonder what industrial metrology was and how it fitted into what he had originally thought were just two different cultures.

As many of those present would know, Mr. Mason’s background did not lie in either legal or scientific metrology, though for much of his working life he would have called himself a regulator and therefore he spent much of his time thinking about the policy questions raised by Mr. Birch. When he had first come to the area, like many people, he had tried to understand the world of metrologists, and had found himself concentrating on what then seemed to him to be the two halves of their world. Those differences were both substantial and significant. To generalize, scientific metrology attracted scientists, whereas, in his experience legal metrologists more often than not had an engineering background. The levels of accuracy sought in scientific metrology were often of a different order from those required for legal metrology. Where there was interaction with business, it was often in quite different sectors: scientific metrology was of particular significance to advanced manufacturing and process control, while the businesses that legal metrology dealt with were on the whole

manufacturers of measuring instruments and equipment used for trade, or the traders and producers who used them. The key outputs of the two disciplines were also very different: scientific metrology produced academic papers and reports, as opposed to regulations, approvals and enforcement decisions in the world of legal metrology. The skills involved in the work of the two areas were themselves very different. And, finally, the politics of the two worlds were very different: the investment needed for leading edge scientific legal metrology work meant that the political questions were mainly about money, and to a lesser extent about how to promote innovation. With legal metrology, the political questions were about trade, free movement of goods, the burden of regulations and, to an extent, how to avoid stifling innovation.

As a result of this, Mr. Mason had initially been surprised at just how quickly the idea of bringing scientific metrology and legal metrology together had taken hold in the UK. Many others had been surprised when it had been decided that the UK legal metrology organization, NWML, had been chosen to bring the two areas together. The initial motivation had been, Members would not be surprised to learn, administrative savings and efficiency improvements – i.e. doing more for less. Mr. Mason had felt that the decision was a vote of confidence in the way NWML had been developing, but he did not believe that much thought had been given at the time to whether there were any significant advantages beyond bringing scientific and legal metrology colleagues together. Indeed, there had probably been an assumption that the two cultures had lived happily side by side for many years and could continue to live side by side, but not really mixing, within the same organization. In practice, however, things had not turned out that way. The Agencies Board, or senior directors, had mostly been recruited to a legal metrology organization, but they had been quick to recognize the importance of delivering for the UK a measurement infrastructure which was among the best in the world for both areas. There had been a steady flow of staff from legal metrology sections to those taking over the running of their scientific metrology programs. In part this had been because, following the privatizations of the 1990s, there were probably more government officials in legal metrology than supervising scientific metrology. Those present would be aware that most scientific metrology was carried out within commercially run laboratories. However, it also showed that when the jobs were advertised, the skills that had been developed within the legal metrology world had proved to be very good preparation for supervising scientific metrology programs. Those skills consisted:

- firstly, in developing the concept of infrastructure. Infrastructure was a very important word at the moment in the way that policy was developing within the UK. Anyone with a background in regulation would recognize that the reasoning for the State to provide a legal framework of weights and measures was the inefficiency which would result if customers were left to make their own arrangements. This meant, in his opinion, that, in a time when public finances were under pressure throughout the world, they were in a better position to make the intellectual and economic case for government investment. Indeed, the intellectual case for this had been eloquently made by Mr. Birch that morning;
- secondly, the work of a legal metrologist necessarily involved regular interaction with businesses, usually those at the sharp end of product development. It was not possible to practice legal metrology in an ivory tower. Mr. Birch had also described it as a practical activity. Certainly, colleagues in scientific metrology also recognized the need to develop their work in a way to meet the needs of businesses, in particular, no doubt, those who would see themselves as practitioners of industrial metrology. However, he believed that legal metrologists were better placed to help them to reach out more towards business;

- thirdly, at least within the UK, the way in which legal metrology had developed had required its practitioners to develop much higher financial management skills; the need to operate fee based cost recovery systems meant that they had developed high levels of financial management. The challenges of competition and the strategies of diversification to make the most of their assets had meant that they had had to get better at marketing. These skills were very valuable as scientific metrology increasingly faced the same challenges. It also put them in a strong position to follow up the financial arguments which Mr. Magaña had been putting forward earlier;
- fourthly was skills. Mr. Mason felt that any metrological system could only be as good as the people who operated it. They were well placed when it came to the cutting edge of measurement science, the work done in the large measurement institutes. But if metrology was to maximize the contribution it made to economic progress, it was necessary to have skilled people using measurement wherever it occurred in the economy. That meant when they were manufacturing goods; when they were trading them; or when they were enforcing a legal framework. The place of skills in the national strategy for metrology was still a matter for debate in the UK, but the one thing that was recognized was that it was very important;
- a fifth and final area of common interest, perhaps more important than all the others, was the importance of international collaboration. Accurate and reliable measurement was expensive. Achieving greater levels of accuracy was even more expensive but international collaboration offered a way of reducing these costs. Equally, the process of checking for legal compliance was expensive, the cost being borne sometimes by the State, sometimes by business, but in either case excessive duplication was wasteful. The OIML itself was a clear demonstration of how all could benefit by working more closely together. Both scientific metrology and legal metrology had long histories of working in successful international cooperation, but Mr. Mason believed that there was still more that Members could learn from each other by studying the techniques of international collaboration developed in those two worlds. And, indeed, he felt it was necessary to look further than merely to the scientific and legal metrology organizations. Mr. Källgren had referred to the importance of ISO, ILAC, and the IAF; he would return later to this point.

In the light of all this, Mr. Mason suggested, the British experiment which had seemed so odd six months previously, was perhaps not so odd after all. In fact, in recent discussions with colleagues, he had found that many had been thinking in similar ways.

So what did this mean for the strategies and priorities to be adopted, the issue which was the subject of the present seminar? First, when thinking outside the community, there might be value in thinking a little more about the terms being used. Legal metrology was not a concept which was well understood outside its own community. Initially he had thought the expression “metrology for trade”, or even perhaps “measurement for trade” sounded more relevant; however, those present knew that there were elements of legal metrology which went beyond this: regulation for environmental protection, for instance.

The second issue, in Mr. Mason’s opinion, was that more attention must be paid to the aspects of legal metrology which indeed went beyond measurement for trade; for example, the road safety issues raised by Mr. Birch. Indeed, if he had had time to prepare a slide, this would have taken the form of a classic matrix where it was possible to think in terms of the division between on the one side classic scientific metrology and legal metrology and on the other side between measurement for trade and measurement for other purposes.

Mr. Mason's third conclusion was that in order to make a big impact it was necessary to reach outside and beyond the legal metrology community. Again, he had been struck by Mr. Magaña's observation about the lack of mutual confidence being at the heart of metrology work. That mutual confidence could only be achieved by successfully reaching out beyond the community.

Fourthly, in so doing, it seemed to him essential to express what they did in terms of the economic benefits. The thinking set out earlier in the day by Mr. Birch was crucial to this; but this was the language which had to be adopted if an impact was to be made outside the metrology community.

Finally, it was essential to think out carefully what they meant by measurement. The quotation from Lord Kelvin, referred to by Mr. Birch, was on a large poster on the wall of his building, so he walked past it regularly. But one of the things that had struck him at an early stage was that it was only true if it was recognized that measurement was more than just physical quantity. Kelvin's remarks were true only if it was recognized that sometimes measurements were expressed in currency; sometimes by counting; and sometimes by subjective judgments – indices, baskets of indicators. So if metrologists were going to be the measurement people, they had to recognize that measurement in different fields meant those different things.

In conclusion, to the question "What is the role for the OIML in all of this?" Mr. Mason pointed out that this was an extensive and complex landscape. To return to his earlier remarks, he believed that legal metrologists or people with a legal metrology background had an enormous contribution to make, and one of the questions they had to address was where the OIML fitted in that bigger picture. This would be the subject of the discussion to come.

Questions and discussion

Mr. Johnston opened the floor to questions.

Mr. Issaev said that Mr. Mason had referred to the influence of legal metrology over scientific metrology; but, he said, it was quite possible to speak of the reverse process – the influence of scientific metrology upon legal metrology. His question was whether it was necessary to express this idea in the OIML Document D 1.

Mr. Mason said that he would have made more or less the same speech to an audience of scientific metrologists. He did not know the way forward. He did not have enough familiarity with OIML Documents to know whether developing them was the right way forward, or whether there was a better way of seeking common ground. What he had seen so far, however, was a need to do something more than had been done in the past, because there was, to his mind, too much of a division between the scientific metrology community and the legal metrology community.

Mrs. Van Spronssen said that what legal metrology could teach scientific metrology was mainly management skills, and these skills could equally be acquired from outside the metrology community. Mrs. Van Spronssen could understand why Mr. Mason was saying what he did, but she believed that the metrology infrastructure should include also ISO, accreditation, scientific metrology, legal metrology and the whole combination should demonstrate the importance of measurement and how to do it. Within this larger structure, the OIML should look at where it fitted in best and what it should do. This area was worthy of discussion.

Mr. Mason said he could only agree, but his other colleagues might have more to say on the subject.

Mr. Magaña said that in his experience, in France, when budgets were allocated to scientific metrology, two kinds of people were involved: those in the National Institutes, who were researchers, and people from the Treasury. These two kinds of people were incapable of understanding each other and it was virtually impossible for them to talk together. Legal metrology people could perhaps play the role of interpreters between the two, facilitating discussion between personnel from finance and from research.

Mr. Birch referred to relationships between ISO and legal metrology. He had referred in his talk to the importance of physical quantity, which was an important part of the metrological control system. Whilst all the other elements of the metrological system were fairly well defined, physical quantity was only covered by a fairly simple ISO Standard, which did not say a great deal. The economists had been concerned that they got their quantities wrong, but at some stage we may also get it wrong, so we cannot be too pure about it. One which had been around for a long time was the measurement of petroleum, which was energy, yet was sold by volume. There had been long discussion as to whether compensation should be given for the effects of temperature, whether it should be sold by mass, and other matters. So physical quantity was an underdeveloped area of metrology, and needed to be looked at and discussed with ISO with regard to their documentation on the subject.

Mr. Faber commented that after Mr. Birch’s excellent speech promoting legal metrology, he had had the thought that there were so many possibilities of convincing politicians that they were important and needed money and that metrology was essential. He feared budget cuts in the years to come because of the economic and financial situation in many countries. One of their problems in convincing the world of the importance of metrology was the continued use of the word metrology, which was understood by very few politicians, who, in any case, once they did understand the word, thought that it was a technical matter and not interesting. Metrology was not an end in itself but a means to the goal of credible measurement. Every country should have a single institute, not for metrology but for credible measurement. This was what politicians and consumers understood. They read a number and a unit and all they wanted to know was whether it could be trusted. Metrology was just a technique for achieving this. All the aspects of the matter came under this one heading. What was needed was an organization for credibility in measurement. Mr. Källgren had said that legal metrology and scientific metrology were not enough, there was a need to look to industrial metrology, quality control, measuring methods and so on. Looked at from the political angle of credibility in measurement, all these aspects were in this one single sentence. What he would like to promote, though it was unlikely to be achieved within 10 to 20 years, was national organizations for credibility in measurement and, instead of the BIPM and the OIML, a world organization for credibility in measurement. In this way everything would come together, there would be an end to time consuming conversations about what exactly the different cultures were, and so on. Even within his own institute there were differences and sometimes battles between people within the same organization, who did not realize that they were working towards one goal. They believed they had different goals, but these goals were technical and not political. Politically, all of them were working towards the same goal. His remarks related to the presentations of all three speakers, and he invited comments on his ideas.

Mr. Källgren commented that this was a very clever statement. He found that legal and scientific metrology worked very well together, with producers of instruments also, but not with users. Putting everything together should help with this situation and with international trade.

Mr. Mason agreed almost entirely with this statement. He had succeeded in getting his own organization rechristened the National Measurement Office. He had an advantage here, since he certainly had a metrological office and he was quite sure he would not get agreement to calling it the metrology office. But he agreed that the use of the word metrology was unhelpful. The definition of the word in English was that it was a science – the science of measurement. This gave a rather odd view of what scientific metrology was – the scientific element of the science of measurement. Anything was helpful that used language comprehensible to everybody, including users; it had to be remembered that there were more users than producers and that politicians were more likely to listen to them.

Mr. Birch concurred that metrology was a difficult expression. But it was no more difficult than meteorology, and everyone knew what that stood for. Metrologists had done a poor job of explaining what their term meant. In terms of talking to politicians, the important thing was to talk from the politician's perspective and not from one's own. What politicians were interested in was policy – that was their business, and that was why Mr. Birch's presentation had dealt with the role of metrology in policy development. Politicians were content to leave technical details to others; what they wanted to know was how it impinged on their responsibility for policy. It did impinge in some key areas, including climate change. To talk to politicians, who were representatives of the general community, it was necessary to talk about issues which were meaningful to them, such as road safety and climate change. Metrologists tended to see these issues from a technical point of view, and it was important to get the technical side right. They talked best as authorities on the technical side, but if they limited their discussions to the purely technical, they would not get through either to politicians or to the community.

Mr. Magaña remembered an example which had occurred when he had been in the French Ministry, during the general assembly of the Board of the Institute of Metrology. When requests for budgets were being prepared, he had been told "we have one of the best atomic clocks in the world, we have an uncertainty in the order of 10^{-15} and we need to improve it, but we need money for this". Mr. Magaña told them that it would be impossible to explain to the Minister of Finance what uncertainty was, and that this was not a reason for asking for a higher budget. Legal metrologists could help others to formulate their objectives in a way which others would understand.

Mr. Leitner wished to comment on the definition of the word "metrology", which had changed. It was no longer only the science of measurement but, according to the 3rd edition of the *International Vocabulary*, it meant both the science of metrology and its application. This was a very important change, which gave links between scientific and legal metrology. Scientists in metrology had to keep its applications in mind. Regulators and legislation defined more and more measurement limits, be it in food safety, in bioscience, in drug prevention, in anti-doping programs, and so on. There were limits for measurements, and what were needed was of course reliable measurement standards for this legislation. There should be interaction between scientific metrology and legal metrology concerning these requirements of legislation.

Mr. Ehrlich thanked Mr. Leitner for bringing forward the new definition of metrology, which he himself had also been about to do. He added that he did not like the term scientific metrology because of the problem mentioned by Mr. Mason, that the word science was used twice. To him, metrology was the science of measurement, meaning the study of how to measure something. To his mind, legal metrology was the practice and the process of applying regulation and enforcement to metrology. He would like to see a simple definition of legal metrology in the VIML, like the above or perhaps slightly altered, which made it clear that legal metrology took metrology a step further and was the application of the study of how

to measure things in the context of regulation and enforcement. He felt that this might make it easier for politicians, the dispensers of money and the decision makers to understand a little better what legal metrology was, and might give a context to the science of measurement. Addressing Mr. Mason’s comment that people had been surprised at the combined metrology operation in the UK being run by the legal metrology side, Mr. Ehrlich said that legal metrology had good answers to the question of which of the many things that could be measured were the ones that should be measured, funded and studied. There were also measurement needs in industrial metrology. For scientific metrology, when the argument could be made that moving the decimal point could lead to better technologies, the case for this was good. This was how he proposed that things should be structured.

Mr. Issaev said that in his country they tried not to divide metrology into its different parts, legal metrology, scientific metrology, applied metrology or industrial metrology. Instead they spoke of uniformity of measurement results. This was a general concept related to all metrology questions, be they legal, scientific, applied or industrial. They therefore had no problems with the infrastructure: in the same Institute they had all the parts of metrology – applied, legal, scientific – it did not matter. He believed there were similar arrangements in Japan and in Australia; the general idea was to arrange some combination of all activities related with metrology and measurement. His question was, therefore, to the second speaker: what did he think about the possibility of setting up communities similar to CECIP, related to weighing in trade, some sort of combination of assessment of conformity, technical regulations, normative standards and uniformity of measurements, all together – a simple, or perhaps not very simple, example for measurement systems all over the world?

Mr. Källgren said that this was interesting but that for the moment CECIP was only for producers of weighing instruments and not for their users. It would be more promising if users could also be brought in.

Mr. Issaev said that CECIP was in some measure responsible for legal metrology, for example, so it was possible to push forward some new ideas to be discussed with them.

Mr. Kållgren agreed that this might be attempted but it would be necessary to push them harder so that they were not exclusively looking at production of weighing instruments. But some movements within CECIP gave grounds for hope.

Mrs. Lagauterie wished to comment on Mr. Källgren’s presentation, especially the slide that showed an intermediate solution where there was an approved instrument and then calibration. She wished to remind Members that in legal metrology what was looked for was appropriate accuracy of measurement in some fields and also reliability of these measurements. Different procedures were used at the level of design, then in production and then in use. In use, of course, the instrument was tested with simple methods and this was sufficient because of all the steps that had gone before. What was hidden behind all this was the principle of conformity to type. The aim of all the different procedures was to ensure that the instrument was still valid, by using the principle of conformity to type and then a simple test in the field relying on what had been done before. When it came to the intermediate solution, with its reference to “approved instrument”, without the declaration of conformity by the manufacturer, and then afterwards just calibration, she believed that the difficult part was hidden. This was because it was not clear who would take responsibility for the principle of conformity of the instrument. Later, in use, it was still possible to refer to the validity of the approval and still to be sure that the instrument was valid for purpose and offered the required reliability. Often manufacturers offered what they said was the same product and it was cheaper when it was just for industry than when it was for legal purposes, and they said this was just because they had to pay for the checking. And then when somebody wanted to

change the field of application of the instrument, and take the instrument that he had bought cheaply to the field of legal metrology where it was supposed to be a little more expensive, and this user asked the manufacturer to confirm the declaration of conformity to approved type, the manufacturer said this was not possible, because in fact, there were small differences which accounted for the lower price. Conformity to type was very important if there was a desire to rely on the OIML system which allowed for light testing in the field, because of what had gone before.

Mr. Källgren said that he had of course expected this discussion, but by looking at the middle of his slide Members could see that he had talked about conformity assessment in principle, because he stated that type approval and initial verification were necessary. After that step it was possible to go further with some calibrations. The conformity process was fulfilled. After that, if it was inside a production, it might be better to follow the stability diagrams and things like that instead of just checking that it was within class one or class two or something of the sort.

Mrs. Vukovič, speaking as representative of WELMEC, said that in Europe there was currently much discussion and they were also drafting a new strategy document for WELMEC, in the framework of which one of the key issues was their relationship with EUROMET, the European association of NMIs for the scientific side of metrology. The key question was what sort of cooperation there should be between these two key European metrology organizations. Nothing much had been done in this field in the past, so they were now trying to set up some cooperation. There was also an MoU on cooperation, going from very basic things such as joint representation at certain organizations (e.g. EA, European Accreditation) and some sharing of information. This paper could be developed further, possibly to the stage of common working groups, or possibly the inclusion of representatives of the one in the working groups of the other. Up to the present, everything was still only at the discussion stage, but in her view they had a very strong partner in the European Commission, and if they were able to cooperate it would make them stronger within it. This was another feature of the goal of cooperation. At the moment they were organizing a joint seminar which would take place in Brussels in March 2010, for neighboring countries. WELMEC had also been invited to participate in a EUROMET Focus Group on metrological infrastructures. So this was another example of trying to bring two organizations together.

Mr. Lindløv liked the idea of a global organization on reliable measurements. However, this was probably a vision for some years in the future. Mr. Mason’s final question had been where the OIML’s role lay. The OIML was still an organization for legal metrology and he thought the OIML should look more into the whole process of legal metrology, not from the perspective of harmonizing everything, but to facilitate better for the different Member States which would like to go into the question of asking what requirements they would have for measurements and why society needed them. Regulations should be based on the answers to this. They should be asking what help there was in discovering how to make these regulations. The next step was that they needed some measuring instruments to produce measurements. As he understood it, that was where the OIML was at the present moment, a sort of standardization body for measuring instruments. Next would come the rest of the process, which was the installation and use of the measurements and their supervision, or the requirements that were set for this. There was a whole set of activities, and perhaps the OIML should look more into this process and not concentrate so much on measuring instruments, which were just tools to produce measurements.

Mr. Kochsiek wished to mention the same thing. He remembered a seminar seven years previously in St. Jean de Luz, where the question asked had been where they would stand in the year 2020. He was in favor of two of the conclusions reached at that seminar. The first

was that they should move on from the measurement itself to the result of that measurement; citizens or users of instruments were not interested in the instrument itself, but only in making use of its results. The second, mentioned by Mr. Kochsiek in his own lecture on that occasion, was that by 2020 he expected there to be no distinction between scientific, industrial and legal metrology. They should all be under one umbrella; Mr. Kochsiek did not believe that the time had been right for this up to the present, but work should now begin upon it, especially in view of what Mr. Källgren had told them, that the outcome of the measurement depended upon the measuring instrument. Mr. Källgren had shown that the result was more important than the instrument.

Mr. Seiler wished to make one comment and one suggestion. His comment was that he had appreciated all the contributions very much, especially all three very interesting lectures. His suggestion was that, since the current seminar was devoted to metrology for trade, and taking into account that they were in Mombasa, in an African country, and having in mind one remark made by the Minister, when he had told them that 80 % of their trade was performed by micro traders, he believed the opportunity should not be missed to learn about the problems of metrology for trade in Kenya, and in other African countries and other countries, and the problems they had, the progress they were making and their expectations from the OIML for the facilitation of trade and for making metrology really a tool for fostering trade and thereby for increasing the income and welfare of the people. So he hoped they would hear something about these problems and not have a merely academic discussion.

Mr. Issaev wished to ask Mr. Birch a question. The previous year, Russia had adopted a new law on the assurance of measurement uniformity. One of the articles of this stated that it was obligatory within the Russian Federation to use the SI units adopted by the General Conference of Weights and Measures and recommended by the OIML. He felt that not too much was being done concerning the national policy for legal metrology. He wondered how these activities could be strengthened within national policy.

Mr. Birch wished to give a very general answer to the question, which had been worrying him throughout the discussion of legal metrology. He had no real problems with legal metrology because his experience was that if you did not have legal metrology you ended up with lawyers’ metrology, i.e. the courts, rather than metrologists and the drafting of legislation, determining what a good measurement was. So he approved of legal metrology. He talked about it a lot with his son who was a lawyer – he did not like lawyers’ metrology. This brought back in some ways the differences between the areas of scientific and legal metrology. He himself had begun working in temperature standards 56 years previously, in the National Measurement Laboratory, so he had some experience in scientific metrology. Of course, scientific metrologists did not like the idea of legal metrology, they believed that it should be possible to make measurements scientifically and that should be all there was to it. The idea of legislating for it seemed to them to cut across its scientific aspect. But if measurement was to be regulated, science was not good enough; it was necessary to be able to write regulations. It was worth remembering the history of how the OIML had come into existence: after the Treaty of the Metre, when the standards had been sorted out, there had been suggestions that the Treaty of the Metre should extend into the practical measurement area. Scientific metrologists had rejected this idea, they wanted to stay at the highest level of scientific measurements. Throughout the 1920s there had been discussion about what should be done about practical (rather than legal) measurements. Eventually, it had been decided to create a Treaty organization, which, because it was intergovernmental, had to be about what government did. What government did was legislation, and so legal metrology was legislative metrology and not practical metrology. This was how legal metrology had begun. To his mind, the problem with legal metrology was the people in that room, who had done an

extremely bad job in getting over to the community, and even to themselves, what they did. They had to be prepared to explain more clearly to politicians and to the community what they meant by legislative, or regulatory metrology. There were many more practical applications at present than had been the case when it had been weights and measures. One of the interesting things about the Treaty, for him, was that its committee was the International Committee of Weights and Measures. In many ways it could be said that the OIML should be the International Committee for Weights and Measures and the Treaty of the Metre should be something different. However, this was one of those anomalies which did not have to be explained so much to politicians. OIML was about legislation, regulation and ensuring that governments' regulations were consistent around the world. The one thing he had tried to stress in his talk had been that metrology was about consistency. The standards and units employed were arbitrary but eventually those arbitrary measurements had to be consistent between everybody around the world, otherwise they could not be compared, transactions could not be made and discussions could not be held. It was possible to agonize too much about legal metrology; it was badly understood and needed to be better explained, not in metrologists' terms but in terms of the people they were talking to.

Mr. Mason added a further suggestion on how to make more of an impact. It all came down to the word "confidence". To a large extent what metrologists were involved in was providing the measurement tools which allowed for confidence, and in particular confidence in trade. But when it came to having an impact at the policy making level, the most important quality was confidence in terms of the delivery of metrology's message. It was necessary to believe that this could be achieved and that measurement was part of the solution to a wide range of public policy problems, and to present it in those ways. What Mr. Mason had been trying to do was in fairly minor ways a reflection on their recent experience, to show that, even in quite a small organization, that element of confidence would mean that more of an impact could be made.

Mrs. Lagauterie had something to say about legal metrology and trade. One often heard about reliable measurements but nothing was ever heard about the correct use of instruments. She would give a short report on something which had not yet been made public in France. Members might know that for the last 5 or 6 years, all French regional inspectors had been conducting an inquiry about surveillance of instruments in service. In the current year the subject of the inquiry was instruments used for non-constant weight prepackages, both nonautomatic instruments and automatic catchweighers. The approximate result was that less than 10 % of the instruments had proved to be faulty, and of these 10 %, only very few were wrong for metrological reasons; in some cases the reasons were administrative – verification was no longer valid but the measurement was still accurate, so the instrument could in fact be relied on. On the other hand the situation was not satisfactory since the main problem for trade was that although the instrument itself could be relied upon, 50 % of the instruments were not being used correctly, because the tare device was not being used correctly. Looking at correct use of instruments was another large part of metrology. If the instrument was correct but not being used correctly, the goal of ensuring reliable measurement might not be achieved.

Mr. Melhem had one comment and one recommendation. His comment was on how to convince politicians about the importance of metrology; in Jordan, when they had set out to do this, they had set up a very small seminar, to which they had invited politicians. They had not talked about the different types of metrology, traceability, etc. and what they meant. Politicians did not care about such matters. They only cared about one thing – dollar signs were the only thing they could hear and understand. So in the seminar the metrologists had given examples, for example, that a 1 % uncertainty in fuel measurement cost Jordan about

ten million Jordanian Dinars (JOD). Another example was blood pressure measurement – if they did not have people to verify manometers, did the politicians know what the impact of this had been in Jordan just in the last month? The metrologists had confiscated about 300 000 clinical thermometers. They had given the politicians numbers which would affect their children. In this way they had been able to raise questions in the politicians’ minds. At the end of that seminar, the politicians had asked the metrologists what they needed to solve these problems, and the metrologists had told them what was needed to ensure credible measurements, and started to teach them about metrology, and in this way the politicians had become convinced of the value of the metrologists’ work. The thing to do was to teach politicians the impact of metrology before asking them for money. It seemed to him that each year at the CIML Meeting what was talked about was principles, even basic ones, as though they were not convinced of their own value. However, there were practical problems to be solved, such as how to mix different fuels, high quality with low quality. This was not only a Jordanian problem, it was general to the region, with which they would like the OIML to help them. He wondered what possibility there was of the OIML developing the necessary measurement methods to support the economy of developing countries. Creative solutions were needed. Research had shown that there were many solutions, but they were all very costly. Scientific metrology should be giving these answers to legal metrology, not the other way round. They had taken their problem to university scientists, who had in fact solved it creatively. What he now wanted was for thought to be given to the developing countries. They did not care about the manufacturing of instruments, they cared about the results. When they had translated the MID to include it in their regulations, they had omitted the chapter on conformity assessment, which was not of interest to them, because they did not have industry. They cared about the results. To this recommendation he wanted to add just one comment: when Recommendations were developed, either they should be made as simple as possible, or a chapter could be added at the end for developing countries, summarizing which were the most important points for them to implement in their regulations.

Mr. Ehrlich said that Mr. Källgren had correctly pointed out in his presentation that many OIML Recommendations did not cover measurement uncertainty: it was true that, although he would not quite go so far as to say none of them did, this was to be found in very few. As was known, an effort was underway to remedy this, in TC 3/SC 5 to develop a Document to cover that. But, taking that one step further, a measurement result contained both a measurement value and an uncertainty, so if they were going to go in this direction it would be necessary to speak of measurement values and uncertainties. His question was, looking at the comments that were coming back on the CD circulating on measurement uncertainty, the problem was that calculating measurement uncertainty was difficult; he wondered whether Mr. Källgren had any ideas about simplifying the process for the industrial metrology community or the legal metrology community, in a way that would remain rigorous but would not be burdensome.

Mr. Källgren said this might differ in different areas, but in his country, when this was discussed, it was often said that scientific calculations were not necessary – common sense could be used.

Mr. Ehrlich said that this was a sensible approach, but not one which could be quantified and included in an OIML Recommendation. He was interested in any studies that might have been done on the calculation of measurement uncertainties for many routine measurements in a way where it was just not practical to do a very detailed uncertainty analysis but still meet the needs of, for example, ISO/IEC 17025, so that if an auditor came in it was possible to say that an uncertainty analysis had been done. He asked whether any of those present were aware of

any relevant studies that had been done on the matter, and whether Mr. Källgren’s employers had found his common sense approach acceptable.

Mr. Källgren said that this question should be put to his former employers, SP, because they had done a number of those things for industries in Sweden. Some of this material could not be published but could be revealed to close contacts if some sensitive details were removed.

Concluding remarks

Mr. Johnston thanked the panelists for their interesting and diverse presentations and the audience for their interest and attention, and declared the seminar closed. One of the themes had been that metrology was little understood from a political perspective. No matter how it was labeled, a way had to be found of explaining it to politicians. Use could be made of policy, of simplified terms, of video, of many means, and it was up to each Member to determine the best way of achieving this end.