

The Australian

Metrologist

The official journal of the Metrology Society of Australia

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Metrologist

The official journal of the Metrology Society of Australia

The Australian Metrologist is the journal of the Metrology Society of Australia, an association representing the interests of metrologists of all disciplines throughout Australia.

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Fellow	\$45 Annual Subscription
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WALTER GIARDINI

The Australian Metrologist (TAM) is settling into its stride with many articles in this issue contributed and sourced right across our editorial team. We are planning to have an open forum at this year's MSA conference in Victoria, to hear MSA members' views on what is wanted, what is good, what can be better. Advertisements for equipment, technology and personnel; communication of pressing issues where metrology has a bearing, from numerical techniques to quality of medical and environmental measurements to training and educational support for metrology. Print, web and electronic media, fast and slow technologies, having a voice and being informed. When everything is possible, what we actually choose to do is critical.

Please think about how *TAM* and our website can best meet your needs, the needs of the MSA and the broader needs of Australian metrology and come to the conference and the forum and tell us

your views. If you really cannot come along, then send an email to the *TAM* editor, but let us know.

Following the forum, the editorial team, (including any new members who would like to be part of the team) will meet more formally to decide how we will manage and continue to deliver a *TAM* which can support the society, its activities and its agenda into the future. We look forward to seeing everyone at the conference.

A handwritten signature in black ink, appearing to read 'Walter Giardini'. The signature is stylized with a large 'W' and a long, sweeping underline.

Electronic submission of manuscripts to the journal

The Australian Metrologist welcomes authors to submit all articles, whether a letter to the editor, conference report or an original article to be peer reviewed, via our web-based Manuscript Management System.

Steps to submission and publication

- Go to either the publisher's website, www.cambridgemedica.com.au, or to *The Australian Metrologist (TAM)* section of the MSA website.
- Click on Manuscript System.
- Create an account when using the system for the first time. Enter your personal and professional details; please complete all fields. These will be retained for future enquiries and submissions.
- Login.

Author guidelines are available on both the MSA and Cambridge Publishing's websites.

Submitting an article

Step 1. Choose *The Australian Metrologist*, type the name of the article, choose the category of article and, if applicable, type in the abstract.

Step 2. Add co-author details (all fields) if applicable.

Step 3. Upload files. Please ensure your document contains the required information and is formatted according to the author guidelines. **PLEASE NOTE THAT AUTHOR DETAILS SHOULD ONLY BE ON A SEPARATE TITLE PAGE IF SUBMITTING AN ORIGINAL ARTICLE.**

Step 4. Add any comments for the editor.

Step 5. Review your information then click submit.

Once submitted, the manuscript is reviewed by the editor and, if applicable, sent for peer review.

Peer review

Peer reviewers will be asked to review manuscripts using the online Manuscript Management System.

Letters to the editor



Chartered Metrologist

I write further to the issue of Chartered Metrologist raised in the May 2011 issue of *TAM* by Daniel Burke, and also commented on by Len Kerwood in his letter to the Editor. I feel I can add something to the debate as I hold Chartered Mechanical Engineer status with the Institution of Mechanical Engineers here in the UK (I have been living and working here since mid-2007). Like Len, I am also a founding member of the MSA. I too started my life as an apprentice and I am also a past Metrology Award Winner.

The model operated by the engineering profession here in the UK is slightly more complicated, by the addition of a national registration body called the Engineering Council UK (ECUK; <http://www.engc.org.uk/>). The ECUK then licences 36 (at present) professional bodies to administer registration on their behalf. In other words the ECUK "owns" the standard, while the professional engineering institutions (PEIs), are responsible for ensuring their members meet the standard for registration. One needs to be a member of a PEI in order to be ECUK registered. (The Institution of Mechanical Engineers is one of the largest bodies with approximately 80,000 members.) The ECUK operates registration at three levels, Engineering Technician, Incorporated Engineer and Chartered Engineer. The framework for determining competence is defined in the "regulations for registration" and the "UK spec" (links below). In short there are three basic requirements: academic

achievement, training, and initial and continued professional development. A professional review interview is utilised to review the total competency of a candidate. This is the final stage prior to registration. It is possible to progress from Engineering Technician through to Chartered Engineer (I myself have made this journey). Additional training or the writing of a technical report from the workplace can overcome any lack of academic qualification. There are quite stringent requirements on this report in that it must meet the required academic level, format and word-count as agreed by a cross-section panel of your peers.

I am not saying any one model should bind us as metrologists, but I do think it would be helpful to create a competency standard similar to that shown in the UK spec (or something similar elsewhere) based on a published metrology body of knowledge formatted in a similar way.

URL references (also available from the MSA website):

<http://www.engc.org.uk/ecukdocuments/internet/document%20library/Regulations%20for%20Registration.pdf>

<http://www.engc.org.uk/ecukdocuments/internet/document%20library/UK-SPEC.pdf>

Dennis Sexton

In response to Ron Cook's article on truncating instruments

In *TAM* May 2011 Ron makes some interesting suggestions regarding the uncertainty statements that may be appropriate for truncating instruments. Asymmetric uncertainties, as recommended by Ron, are one way to deal with the problem. A possible disadvantage is that such asymmetric uncertainties are not easily handled when there is further analysis to be performed 'downstream', so to speak. For example, suppose that a truncating digital voltmeter measures the current through a diode. To do this, a resistor is connected in series with the diode and the voltmeter measures the voltage across the resistor. The resistance of the resistor has an uncertainty, so that the uncertainty of the voltmeter and the uncertainty of the resistance both propagate into the uncertainty of the current. If the voltmeter uncertainty is asymmetric, the standard formula for the propagation of uncertainties is not immediately applicable, because we need to insert into the formula an estimate of the squared standard uncertainty $u^2(V)$ of the voltage V .

Truncation is, after all, a less accurate operation than rounding. This is mathematically true – never mind statistics for the moment! So the measured value +1.7 when rounded to 2 is a more accurate result than if truncated to 1. Suppose a whole lot of positive values

are obtained and then truncated. Half the time the truncated values will coincide with the rounded values and half the time they will be 1 unit smaller. So on the average – now we have statistics! – the truncated values will be biased in the negative direction by 0.5 unit. It seems to me to be very tempting to increase all positive truncated values by 0.5 of a unit, and to do this initially before commencing any statistical analysis. (Didn't Oscar Wilde say that the best way to get rid of a temptation is to yield to it?) Truncated negative values (assuming that, for example, -1.7 is truncated to -1) would similarly initially be reduced (made more negative) by 0.5 of a unit. The GUM (paragraph 3.2.4) recommends correcting for any systematic effects at the outset and surely the bias of 0.5 due to truncation is such an effect. A Monte Carlo simulation that I have carried out does indicate that the mean of a large set of positive numbers is about +0.5 of a unit higher than the mean of the same numbers when truncated, whereas the standard deviation is very little affected (less than one percent).

So all this amounts to a defence of Ron's second method. I am not sure why, in Ron's words, most laboratories would not feel comfortable with this approach. It is surely simpler than dealing with asymmetric uncertainties.

Bob Frenkel
National Measurement Institute



President's column



DANIEL BURKE

Preparations for this year's conference are well under way as you will see in the following pages of this issue of *The Australian Metrologist*. I am constantly impressed and thankful for the excellent calibre of our national team and of the conference organising committee. One of the main functions of our Society is this biennial conference and it's a joy to see how well the whole team is working to make this one another success. I look forward to seeing as many of you there as possible.

One of the topics that is emerging again is how we as a professional society are evolving. With the reduced activity in the Australian manufacturing industry, the need for traditional metrologists who calibrate physical processes has also reduced. However, advanced economies will always need those who know about calibration and standards. At this conference you will hear more about metrology in the medical sector from both Martin Turner and myself and I'm sure there are many other new areas of our society where metrology will be needed.

To respond to these and other changes in the last decade since the society was formed it may be necessary to adapt our structure to the new realities. We already have revamped our website and can now pay our annual subscription and update personal details online (thanks to Randall Anderson and Liam Shanahan at the Australian Pressure Laboratory Pty Ltd). You will hear about a proposed New Zealand branch of the MSA and about a proposal for a Chartered Metrologist. Both of these issues may need a change in our constitution and this can really only be achieved at the AGM.

Change is a certainty, how we respond is up to you.

See you at the conference in Geelong.

"Although this seems a paradox, all exact science is dominated by the idea of approximation. When a man tells you that he knows the exact truth about anything, you are safe in inferring that he is an inexact man."

– Bertrand Russell

New system for 2011 subscriptions and database

This year we are developing a new system allowing members to update their own contact information on the MSA website. It will also be possible to subscribe to MSA publications as well as joining MSA interest groups. We are hopeful the changes will improve the integrity of the membership database and improve our communication systems.

Through this system invoices for annual subscriptions will be payable online using a Paypal account or credit card. It will still be possible to use less preferred payment methods. Members without email addresses, or incorrect email addresses, will receive an invoice by mail. Efficiency in our administration system is important when collecting a relatively small payment and members are encouraged to use the web payment system and email communication if possible.

As the system is implemented in the next few weeks you may expect to receive an email indicating that you have been added to the online database and asking you to choose a password for access. Another email will be sent indicating the subscription invoice is ready for payment.

The Australian Metrologist – a chance to reflect

The Metrology Society of Australia and its official magazine *The Australian Metrologist (TAM)* are now around 16 years old. The first *TAM* was published in February 1994. We are now up to its 47th issue, so coming up soon will be its special 50th anniversary edition.

The MSA is continuing to evolve and change in concert with everything else in our world. We are looking at the idea of Chartered Metrologists, we have a new website, we have a new online accessible database and registration system and there is a lively dialogue around Australia about the metrological aspects of global warming and medical instrumentation.

TAM too is changing, with a more team-based structure to its editorial functions and a commercial publishing house (Cambridge Publishing), who have brought a new level of professionalism from the online and interactive article submission and review process to layout, scheduling, advertising, marketing and some good advice.

It is time to reflect and to consolidate a strong and sustainable editorial team and structure which will reflect and express both the leadership and the membership of the society through its communications. The associated *e-News*, the society's occasional fast-communication and the opportunity to develop a web-based

version of *TAM* are potential future further developments, but the focus will always be on content from around the country, to bring the society's members together, to inform and to express our views and public dialogue.

We are planning to run a workshop at the MSA conference to talk about and plan the further development of *TAM*. The workshop will be run in two parts. The first will be an open meeting to which all members are invited to attend. The current editorial team need to hear your ideas and feedback on our ideas and we always need committed and active members of the editorial team, not only to help, but more importantly to broaden and have a turnover of views, skills and contributions. The second part will be a face-to-face meeting of the editorial committee, taking the opportunity to come together at the conference.

Details of time and location of the meetings at the conference will be notified when the programme is finalised, but please keep this meeting in mind.

TAM Editorial Team

Walter Giardini, Jeff Tapping, Paul Pokorny, Geoff Barnier, Jane Warne, Rob Crawford, Neville Owen.

NATA appoints Jennifer Evans as new CEO

Dr Barry Inglis, Chair of the National Association of Testing Authorities (NATA) recently announced the appointment of Ms Jennifer Evans as its new Chief Executive Officer (CEO).

Dr Inglis said that Ms Evans, who has served as NATA's General Manager, Accreditation Services since 2006, has had an extensive career at NATA. He said:



After an exhaustive recruitment process we concluded we are fortunate to have a person with Jennifer's breadth and depth of experience to fill this important position. She has demonstrated strong leadership abilities while directing NATA's many complex operational activities.

After earning her BAppSc from RMIT University, Ms Evans worked as a Medical Laboratory Scientist before joining NATA in 1987 as a Scientific Officer in the new Medical Testing programme. In 1992 she was awarded an MBA from RMIT University. She has held several senior management positions in NATA including Manager, Forensic Science, Manager, Medical Imaging and Manager, Corporate Governance.

Ms Evans said:

I consider myself fortunate to have played a part in bringing NATA to its present pre-eminent position in the scientific community. I share the commitment of all my colleagues on NATA's executive team to continue improving our service delivery to members and to maintaining our position of leadership in the global accreditation system.

Ms Evans is only the fifth person to head the 64-year-old organisation since its founding in 1947 and the first woman to be its CEO.

An interview with Dr Barry Inglis

The first Australian to become President of the International Committee for Weights and Measures (CIPM). Interview by MSA member Dr Angela Samuel.



BARRY INGLIS

On 15 October 2010, Barry Inglis – the inaugural Chief Executive of the National Measurement Institute, Australia (NMIA) – became the 15th President of the International Committee for Weights and Measures (Comité International des Poids et Mesures; the CIPM). Barry was elected to the position in October 2009 and is only the second person from outside Europe and the UK to be elected to this position in the 136-year history of the CIPM, and the first Australian. This position is the most prestigious in international metrology. The CIPM is the peak international body in metrology, made up of 18 experts elected on the basis of their personal contributions to global metrology.

The CIPM was established at the time of the creation of the Convention du Metre (Metre Convention) in 1875 and past CIPM members include a number of Nobel Laureates such as Louis de Broglie, Pieter Zeeman and AA Michelson. One of the CIPM's roles is to administer the International Bureau of Weights and Measures (Bureau International des Poids et Mesures; the BIPM), the laboratory that coordinates global scientific metrology activities as well as realising, maintaining and disseminating a number of primary measurement standards. The CIPM's Consultative Committees are the peak expert international committees in each area of metrology that provide specialist advice to the CIPM. In turn, the CIPM advises the General Conference of Weights and Measures (Conférence Générale des Poids et Mesures; the CGPM), an assembly of government representatives from the member states of the Metre Convention that meets at a four-yearly conference in Paris to set future directions for the work programme of BIPM and the international measurement system. Up until his election as President, Barry was one of two Vice-Presidents to the CIPM, being elected to this position in 2002 after his election to the Committee in 2000. In 2003 he was appointed President of the CIPM Consultative Committee for Electricity and Magnetism. He succeeds Professor Ernst Göbel as CIPM President. Professor Göbel is President of the German national metrology institute (NMI), the Physikalisch-Technische Bundesanstalt (PTB).

Barry became Chief Executive of NMIA when it came into being on 1 July 2004 with the amalgamation of the then-National Measurement Laboratory, CSIRO (of which he was Director), the National Standards Commission and the Australian Government Analytical Laboratories (AGAL). Barry's vision was a key factor in bringing together Australia's peak measurement bodies into the one institute to provide a coherent and coordinated approach to metrology for Australia. In recognition of his contributions to Australia's measurement system, Barry was awarded the Australian Public Service Medal in 2007.

Barry also chaired the Asia-Pacific Metrology Programme (APMP) from 1994 to 1999, during which period he steered APMP into being a significant global player, providing a strong and effective

voice for the Asia-Pacific region in international metrology matters. Through his leadership of APMP, Barry was instrumental in raising awareness of the need for a transparent mechanism by which NMIs could demonstrate their competence. This provided impetus for the establishment of the CIPM Mutual Recognition Arrangement (MRA) in 1999 to recognise the measurement standards and calibration and measurement capabilities of NMIs and other signatory expert institutes.

Barry was a founding member and Vice-President of the Metrology Society of Australia. He is also the current Chairman of the Board of the National Association of Testing Authorities, Australia (NATA).

Interview with Barry Inglis

AS: Barry, firstly, warm congratulations on your recent appointment! A brilliant personal achievement and a great boost for Australian metrology! Speaking of which, in your view, what benefits does the international metrology system provide metrologists and the broader engineering, science and technology community in Australia?



ANGELA SAMUEL

BI: The international measurement system (SI) provides the basis for metrology that underpins international trade, commerce, health and the environment. It benefits metrologists by providing a focus and a framework for their work. Without this there would be a need for constant bilateral debate and discussion over acceptable standards to use for measurement traceability in testing, trade and commerce. For engineering, science and technology, it provides the basis for validation and international acceptance of test results, compliance and the advancement of science and technology.

AS: What do you see as the significant issues in the current international metrology setting and what is the CIPM's role in addressing these?

BI: There are many significant international metrology issues that need to be addressed and the CIPM/BIPM certainly cannot address these issues alone. Issues include: the scientific challenges of ensuring the integrity of the SI system; the development of the next generation of measurement standards; assistance to developing economies to help develop their metrological capabilities to meet the needs of their economies and particularly their export industries; the big picture issues of climate change and the "carbon economy", metrology in chemistry and health; and metrology and standards to support emerging technologies such as nano and bio structures. The CIPM's role is to draw attention to these issues, prioritise the work programme of the

BIPM in order to address them where possible and to collaborate with other intergovernmental bodies, international organisations and NMIs, to seek to facilitate and coordinate activities where possible. Examples of where the CIPM and BIPM have been active in addressing some of the big picture issues are the recent MOU with the World Meteorological Organization (WMO), workshops on Nanometrology and physiological quantities, and the BIPM–WMO Workshop on Climate Change.

AS: And emerging issues in that context? What are the future global trends and how is the international scientific metrology community and the CIPM responding to these?

BI: Many of the issues are here and now and will continue to emerge. I think particularly of the climate change and the carbon economy issues, traceability to stable reference standards for metrology in chemistry and health. I believe many people in the scientific community are aware of these issues but they are big issues embracing the international community and in many cases involving multinational organisations with large commercial interests. The issues require commitment and considerable resources to address. The scientific metrology community and the CIPM, through the BIPM, are working hard to create an awareness in the stakeholder community of the problems and risks of not having sound metrology to provide the confidence needed to take decisions.

AS: What are the key challenges in this brave new world for metrology?

BI: I see a number of key challenges such as: the revision of the definitions of units in terms of fundamental constants to ensure long-term stability; metrology in chemistry traceability to SI for biological activity, for example, moving away from arbitrary “international Units”; increased accuracy for absorbed dose for radiotherapeutic treatment of cancer; metrology in “climate change” and the “carbon economy”; metrology in nano-structures, and by this I do not just mean dimensional metrology associated with nano-particles I mean all aspects of metrology associated with nano-structures. In particular, thermal effects and breakdown mechanisms associated with electromagnetic, optical and acoustic stimulation that might be used to communicate with nano-structures.

AS: What are your thoughts on how Australian metrology and the broader standards and conformance infrastructure should engage in this evolving global environment?

BI: As a member of the international community, Australia must participate in the global economy for trade and commerce. However, the size of the Australian economy is such that it requires us to punch above our weight to ensure that Australia has an influence on the global stage and to ensure that its interests are protected. Australia has an outstanding record in the area of standards and conformance thanks to the high reputation enjoyed by our key technical infrastructure bodies: NMI, Standards Australia, NATA and JAS-ANZ. It is critical that this reputation be maintained. To achieve this it is important that we continue to invest resource into the activities of these bodies, that Australia is adequately represented at international meetings and that the technical infrastructure bodies work together and provide mutual support wherever possible. It is also important that Australia takes advantage of the key asset it has in the infrastructure bodies in connection with trade, trade agreements and in the attraction of capital investment.

AS: And what is your vision for the future of metrology, at the national, regional and global level? What inter-relationships do you think are emerging and how do you see the future of the Metre Convention and similar international institutions?

BI: I believe the Metre Convention is more important now than it has been at any time in its history. Indeed if it did not exist some other form of treaty or international agreement would have to be developed to underpin trade and the other key issues referred to earlier. However, the Convention needs to be sufficiently flexible to adapt and respond to the needs of the stakeholder community, and this also applies to regional metrology organisations and the NMIs. I believe that the system set up under the Metre Convention is adapting, and this is evidenced, for example, by the recognition of the importance of the Regional Metrology Organisations by the CIPM and reflected in the resolutions passed by the CGPM on the MRA and the creation of the new category of membership in the form of Associates to the CGPM. It would have been impossible for the BIPM to undertake the tasks required by the CIPM MRA without the RMOs. However, this is a dynamic situation and I believe that the role and activities of the BIPM, regional metrology organisations and NMIs need to be reviewed regularly to ensure that they are serving the needs and aspirations of their stakeholder communities

As an intergovernmental organisation, the CIPM/BIPM is uniquely positioned to engage with other intergovernmental and international bodies on behalf of its member states and it is doing this with contacts, MOUs and collaboration with bodies such as OIML, ILAC, ISO, IEC, WHO, WMO, UNIDO, ITU, IAEA and it continues to strive to enhance and develop these relationships

Collaboration with and between regional metrology organisations is particularly important. Effective international metrology and support for the metrology infrastructure of developing economies require strong regional participation to address the different needs of regions throughout the world.

AS: Finally, Barry, if you could achieve five things during your term as President of the CIPM, what would they be?

BI: In responding to a question like this it would be very easy to list a whole range of things that realistically could not be achieved in any reasonable time frame. With this in mind, five things that I would like to see achieved during my term are: (i) Redefinition of Units in terms of fundamental constants; (ii) financial viability for BIPM; (iii) a review of the activities of the BIPM to ensure that its role and activities are relevant to the 21st century; (iv) closer cooperation with regional bodies; (v) closer cooperation and collaboration with NMIs – examples of international collaboration lie in the international calculable-capacitor project and in the international Avogadro project. Standards research is long-term and very expensive and I would like to see more international collaboration of this nature. I believe the CIPM/BIPM have a key role to play in the future to achieve greater collaboration in standards research.

AS: Barry, you have made and continue to make outstanding contributions to the Australian, Asia-Pacific and international metrology community. Thank you for your time today, I'm sure the readers of *The Australian Metrologist* will appreciate this opportunity to hear from their most “visible” member – and, as I suspected at the time, wishing you a “Happy Retirement” back in 2007 was slightly premature!

All the very best from the MSA membership for the challenging tasks ahead!!

Communication



JEFF TAPPING

Daniel Burke, in his President's column in the May 2011 issue, raised the problems we often have in conveying the purpose of our work to others. This question of communication has occupied my mind for some time and I would like to share some of my thoughts with you.

If we are to communicate properly with another person, we need to understand their culture. If the other person is from another country this will be obvious to us, but we can overlook the differences in subcultures in our own society. We then do not see that subcultures have different languages, particularly by sometimes putting different meanings to the same word. It is helpful in our communications that we understand this and also see that we ourselves have split personalities: we are both metrologist and layperson. We need to have some understanding of how we and our clients think about things.

Uncertainties have a larger-than-normal risk of misunderstanding because of the curious way we all handle probabilities in everyday life. For example, if a probability is high enough we take it as certain, if it is low enough we take it as zero. An example might help in understanding this. Each time we drive our car on the roads we know there is a risk that we could be involved in a serious accident, but we accept that risk and then act as if it did not exist. If we did not do this we could become agoraphobic or consumed with anxiety. If we instead decided to take a bus or train, we act as if its arrival on time is certain, even though there is a chance that it will be late or cancelled. Such a nonlinear response is a necessary survival habit, but in some circumstances it can cause us some trouble.

Another curious characteristic has occurred in the discussion on the likely outcome of pouring huge quantities of carbon dioxide into the atmosphere. Even some of our federal politicians, people whose decisions can profoundly affect our wellbeing, have argued that because there is some possibility that the predictions of catastrophic warming may be incorrect or inaccurate, we should reject the prediction entirely. We have a tendency to reject a proposition we don't like on the most flimsy evidence. And yet there are many situations in which we implicitly carry out quite rational uncertainty estimates in everyday life.

Suppose you are driving along a country road on the way to a farm you have not visited before. You stop at a service station and ask how far it is to the farm and you are told that it is "about 11 km". So how do you interpret this measurement? In your mind you would make a judgement of how well your informant is probably able to estimate distances, you would take note of the word "about", and you would note that the estimate was an odd number rather than being rounded to 10 km. You then might say to yourself that it is probably between 9 km and 13 km. But suppose you were less sure of the evidence and asked if your interpretation was correct. You might be told that your uncertainty estimate was about right, or you might be told that

the informant often goes out to pick up stranded vehicles and charges by the kilometre for this so in fact the distance is correct to around half a kilometre. So what can we make of this story?

Firstly, it shows that far from being a new concept to us, uncertainties are part of our everyday life and we make them implicitly all the time. Sometimes the evidence comes from measurements but mostly not, and we invariably combine components of probability subjectively. In metrology we use statistical methods and (mostly) objective results, but the purpose is the same: to get some idea of how reliable a piece of information is.

Secondly, my story demonstrates clearly that the result of a measurement is not a single value but a range in which the actual answer is expected to be. In our everyday life we usually give a single value, what is called in statistics the most probable value, and we implicitly make an estimate or assumption of what the probable range is. The fact that we usually make our uncertainty estimates implicitly is why we are normally not aware that we are actually doing statistics in the back of our minds.

Thirdly, it shows the effect of differing amounts and reliability of information used to determine an uncertainty. You would have to admit that your estimate of ± 2 km would be a bit suspect if based on a small amount of doubtful information, but the informant's estimate of ± 0.5 km would be very reliable because it comes from a substantial amount of good data. This is exactly analogous to what we do in finding degrees of freedom for an uncertainty.

So all of this shows that although many people may find the processes of statistics a bit of a mystery, they are in fact just mathematical forms of what we do in a less formal way in daily life. The big difference between what we do with statistics and the fuzzy estimates we make in civilian life is that the fuzzy results are adequate and appropriate for their circumstance but the cases we deal with concern dollars, wellbeing, even life and death. Here are some examples that your audience will be able to relate to.

The first comes from a discussion a couple of years ago on the ABC Radio *National Health Report*. The topic was officially about blood pressure and bone density monitoring, but the real crux of the discussion was measurement uncertainty. The programme contained an interview with Professor Les Irwig from the Screening and Test Evaluation Program in the School of Public Health at the University of Sydney. Professor Irwig revealed how variability in test results can result in unnecessary retesting and inappropriate drug treatment (both withholding and application incorrectly). Uncertainty comes not only from the measurement process itself but also from variability in the patient. One interesting example is termed "white-coat hypertension", where blood pressure in a client rises from nervousness in the clinical environment. Home blood pressure monitoring has been suggested to overcome this effect, but I have had personal experience demonstrating that even then the results must be treated with care. I have a home blood

pressure meter and have found that even with pre-test relaxation exercises the measurements vary significantly if repeated over a 10-minute period.

If you are interested in the *National Health Report* discussion you are able to download a transcript. The programme was broadcast on 20 July 2009. There was much more interesting stuff in the programme than I have discussed here and I think you will enjoy it.

Another medical anecdote

In the December 2006 issue of *NATA News*, Professor Graham White wrote a letter in which he addressed objections raised by The Australian Society of Microbiologists to having to estimate uncertainties for diagnostic microbiology measurements. The reasons given for the objections were:

- Microbiology specimen quality can be highly variable and this variability would most likely dwarf that due to methodology.
- Attaching measurement uncertainty to patient results has no clinical value.
- For colony counts, "It is rarely important to get this figure accurate to the nth degree".

In his letter, Professor White answered the immediate objections, but the request arises from a more general problem that I think needs to be faced. There seems to be an attitude in the minds of some measurement takers that uncertainty calculation is an irksome imposition placed on laboratories for some bureaucratic purpose, a task in addition to the real job of making the measurement. We metrologists need to be armed with some arguments to

demonstrate to sceptics why they have a responsibility to estimate and provide uncertainties. A personal experience of mine illustrates the point.

A couple of year ago I had a cholesterol check done as part of my GP's regular review. The result came back marginally high, so we were discussing whether to begin drug treatment to lower it. I asked my GP what the uncertainty of the test was and he had little idea. I would liked to have been able to ask the test laboratory what right they had to withhold that vital part of the test they had been paid to supply. If they had tried to tell me that it was because it had no clinical value they would have received a very sharp reply from me. They are paid to supply a measurement, not a clinical judgement. And so it is with any measurement result. It is up to the recipient to judge how the result is to be used and it is the responsibility of the laboratory to supply (or make otherwise available), as much information about the result as is necessary for anyone to understand what the result means. In this case I considered the probable uncertainty of the test, probable variability of my cholesterol, the probability of side effects from medication, the variability of risk from one individual to another, and the cost and inconvenience, and decided (while having no hard figures for any of these quantities), to decline the medication. The task of making the decision would have been made easier for both my GP and me if the microbiologists had supplied full details on the reliability of their results.

The objection from microbiologists about lack of clinical value is probably better put as "There is no call". And this because there is a vicious cycle: uncertainties are not presented because there is no call, there is no call because the significance is not understood, there is no understanding because uncertainties are not given. It is up to us to see that this cycle is broken.

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In our profession it is very important that there is no misunderstanding by our customers of the meaning of the information we give them. Sometimes this might concern a simple matter like the applicability of our numbers. Sometimes it might be the meaning of an expression. Recently I was told by a tradesman on a Monday that he would call around “next Wednesday”, which I took to mean in two days time, but to him meant the Wednesday of the next week. In another instance I asked my son to cut a notch into a length of wood. I had visualised a V-cut but to him a notch was a rectangular shape. In these cases the result was a minor inconvenience, but in the case of technical terms in uncertainty specification, proper understanding of definition and meaning is vital.

I have deliberately used the two words “definition” and “meaning”, because a person can read about the mathematical process by which uncertainties are estimated, but not understand fully their actual significance in the application of calibration results. It is in the meaning of terms and expressions that most misunderstandings arise. If you do not know the definition of something you are very likely to be aware of this, but if you apply one meaning to a term or expression and I apply another, we have the seeds of a serious misunderstanding.

Let's look at a realistic example in measurement uncertainty. Suppose that shafts are being machined to be 10 mm diameter. If you measure one a number of times you might report that the diameter of this sample is $10.010 \text{ mm} \pm 0.005 \text{ mm}$ where the uncertainty is a 95% confidence interval. This means that there is a 5% chance that the actual diameter is outside the interval. It is important that both you and the customer understand that chance. But you should also understand that the uncertainty itself is uncertain. This is firstly because the interval is computed from a limited sample. You can estimate this uncertainty using degrees of freedom but there is another factor that is less clear. These calculations are based on the assumption that the real measurement population is normally distributed and if you took this at face value you would have to admit that there was a tiny but finite chance that the true diameter was one metre! This is, of course impossible, and points up the fact that the normal distribution assumption is a model that hopefully closely represents reality but is not perfect.

It is worth pointing out at this stage why we use a 95% confidence interval, when it might seem that a one-in-twenty chance of error is a bit bigger than we would like. Our national laboratory used 99% until it changed to conform with international practice some decades ago. The main reason for the smaller interval is that the probability of a normal distribution falls off rapidly after two standard deviations (the approximate location of the 95% limits), so although there is a reasonably large chance that the true value is outside the stated limit, it is very unlikely to be far outside. The choice is based on mathematics rather than practical use and we should not forget this.

One way to deal with the problem of the significance of uncertainty is to look at the probability of being wrong, the penalty for this and the cost of an error. Now this is strictly the responsibility of your client, but human nature dictates that if something goes wrong the customer is likely to look for another person to blame and the target could be you. So what are your options?

- Ignore the potential problems (as is the current practice).
- Issue a disclaimer of responsibility for the application of calibrations.
- Provide an information sheet outlining the possible problems.
- Engage with your customer to discuss these issues.

For me the most interesting of these is the idea of an information sheet. If well constructed with information and references, it would pass responsibility most effectively to the customer. The customer would then have the choice of which of the many options to take up. I am interested to hear what MSA members think of this idea.

And now another parable that could be useful because it will have a familiar feel for managers and business people. You have a laboratory with an air conditioner to control the temperature to a desired value and you have a thermometer in the room to check the temperature. You want to know what uncertainty is applicable to a reading of the thermometer. You have the following points to consider.

- The calibration uncertainty of a thermometer is strictly applicable to the temperature of its sensor, not its surroundings. A judgement should be made of how well the sensor represents air temperature.
- You might assume the reading to be of the air in the vicinity of the sensor at the time of reading, in which case you need to estimate how well the air near the thermometer corresponds to average room temperature.
- There is probably a cycling of the air temperature so do you take a single reading or a series over a cycle, and if a single reading how well might this represent the mean of the cycle? The cycle of an air conditioner is usually not sinusoidal and it may vary with load, so the mean temperature will probably be from a rough estimate.
- The mean of the temperature cycle may vary over the course of a day, from day to night, and the nature of these variations may change with external temperature, with the season and with the amount of traffic through the door.
- You may need the temperature of the equipment in the room and, of course, this may differ slightly from the average air temperature.
- A large piece of equipment (for example a coordinate measuring machine) may have differences in temperature from part to part and you may need to account for this.

The lesson here is that an uncertainty depends on what the reading purports to represent. An uncertainty number alone is not good enough, it should be accompanied by a description of what the uncertainty applies to. You might even need more than one uncertainty, each with its own explanation. The skill of a metrologist involves understanding and dealing with these issues.

I hope that I have shown you that anecdotes and analogies can be useful for conveying the purpose of our work. It is important that the context of the story you use is something that your listener can identify with and that you use a language that will be understood, so you will need different stories for different people. And so you need to prepare in advance a quiver-full of different weapons for each type of target.

**Announcement and Invitation to the
2011 Annual General Meeting
of the
Metrology Society of Australia**



TO BE HELD

Friday 21 October 2011 at 3:30 pm EST

AT THE

Deakin Management Centre*

Deakin University – Waurin Ponds Campus

Pigdons Road, Waurin Ponds, VIC 3217

(GEELONG)

*<http://www.managementcentre.com.au/>

Melways Reference MAP 464 G6

Approximately one hour's drive from Melbourne (and Tullamarine Airport) and 30 minutes from Avalon Airport.

The **Agenda** for the meeting will be as follows

- Apologies
- Minutes of the previous AGM (12 October 2010)
- President's and Treasurer's Reports
- Status/Election of Office bearers
- Developments regarding the New Zealand branch/society membership
- *The Australian Metrologist (TAM)* journal
- Chartered Metrologist initiative
- MSA 2013 conference
- Close of meeting

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Metrology Society of Australia



EXECUTIVE COMMITTEE NOMINATION FORM

Please select the position you wish to stand for:

- ☐ President
- ☐ Vice-President
- ☐ Treasurer
- ☐ Secretary
- ☐ Ordinary committee member

Nominee's name: _____ (print)

Nominated by:

Name (print)	Signature
Date: _____	

Seconded by:

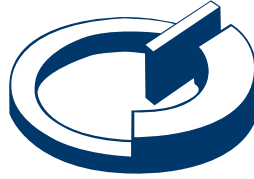
Name (print)	Signature
Date: _____	

By signing this form, you are confirming that you accept your nomination to stand for the above Committee position.

Signature of nominee: _____ **Date:** _____

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Metrology Society of Australia



FORM OF APPOINTMENT OF PROXY

I of
.....(address)

being a member of the Metrology Society of Australia Incorporated

hereby appoint of
.....(address)

being a member of that Incorporated Association, as my proxy to vote for me on my behalf
at the general meeting of the Association (annual general meeting or special general
meeting, as the case may be) to be held on the day
of 20.... and at any adjournment of that meeting.

My proxy is authorised to vote in favour of/against (delete as appropriate) the resolution
(insert details).

Signed.....

The day of 20....



World Metrology Day 2011 prizes

World Metrology Day was held again this year on 20 May to celebrate the signature by representatives of 17 nations of the *Metre Convention* on that day in 1875. The Convention set the framework for global collaboration in the science of measurement and in its industrial, commercial and societal application. The original aim of the Metre Convention – the worldwide uniformity of measurement – remains as important today as it was in 1875.

World Metrology Day has become an established annual event, during which more than 80 states celebrate the impact of measurement on our daily lives, no part of which is untouched by this essential, and largely hidden, aspect of modern society. Previous themes have included topics such as measurements for innovation, and measurements in sport, the environment, medicine and trade. UNESCO and IUPAC have decided to designate 2011 as The International Year of Chemistry (IYC 2011), a worldwide celebration of the achievements of chemistry and its contributions to the wellbeing of humankind.

The World Metrology Day project is currently realised jointly by the BIPM and the OIML together with PTB International Technical Cooperation.

In Australia, celebration of World Metrology Day is marked also by the awarding of two prizes in the field of metrology by the National Measurement Institute (NMI). This year, Senator Kim Carr, Minister for Innovation, announced Dr Philip Nakashima of Monash University as the Barry Inglis Medal winner for his work on determining the true nature and shape of the inter-atomic bonds in aluminium – a question which has defeated scientists for more than 80 years. Senator Carr said: “Not only has Dr Nakashima been able to measure them, he has also mapped their structure”.



The award, for individual excellence in measurement science in Australia, honours Dr Barry Inglis PSM, NMI's first chief executive.

Senator Carr also announced Dr Michael Biercuk of the University of Sydney as the winner of the NMI Prize for excellence in measurement techniques by a scientist under 35. Senator Carr continued:

This award recognises Dr Biercuk's contribution to research in the most sensitive measurement of force to date the yoctonewton. This is an incredibly small force – about a million, million, billion times smaller than the force exerted by a feather lying on a table. And the measurement is a thousand times more sensitive than anything previously possible.

Barry Inglis Medal

Dr Philip Nakashima's work solves the mystery about how electrons 'glue' aluminium atoms together. His research builds upon previous work done by the Monash Centre for Electron Microscopy, the



Department of Materials Engineering and the ARC Centre of Excellence for Design in Light Metals (ARC CoE DLM).

“Aluminium is one of the focal light metals being studied at the ARC CoE DLM, and it is an important metal both chemically and commercially”, Dr Nakashima said.

Armed with powerful electron microscopes and his new techniques, Dr Nakashima was able to discover how electrons between the atoms in aluminium 'glue' the element together. Dr Nakashima explained:

In a practical sense it meant that for the first time we were able to measure very precisely and accurately, how, and by how much, aluminium atoms deviate from being perfect spheres. Believe it or not, these tiny deviations in atomic shape strongly influence all properties of materials, except radioactivity. For theorists, electronic structure is the basis of theoretical and computer models that aim to predict the behaviour of materials, including man-made alloys.

Dr Nakashima's breakthrough comes as industries, such as alloy production for aviation and aerospace, are looking to refine production techniques based on knowledge obtained at the atomic level. Dr Nakashima continued:

The research may lead to a deeper understanding of the driving forces that can be controlled in the alloy production process, not just for aviation and aerospace, but every industry that uses alloys.

NMI Prize for excellence in measurement techniques by a scientist under 35

Research into the most sensitive measurement of force yet recorded has earned Dr Michael Biercuk, from the School of Physics, the NMI Prize for excellence in measurement techniques by a scientist under 35 years of age.

In collaboration with the Ion Storage Group at the US National Institute of Standards and Technology, Dr Biercuk demonstrated it is possible to use trapped atomic ions as extremely sensitive detectors of applied forces and electromagnetic fields. In so doing, the researchers were able to measure forces with extraordinary sensitivity – down to the yoctonewton (yN) level.

The discovery provides an opportunity to address new challenges in materials science, nanotechnology and industrial sensing. For example, forces at the yoctoscale correspond to the weight of tiny nanoparticles consisting of just a few dozen atoms, or the effects

of tiny electric fields on charges in nanoscale materials.

Dr Biercuk said:

By characterising the detector's sensitivity, a term with technical importance, rather than just the minimum force we could detect, we touched on an important area for industrial applications – the speed with which a measurement can be performed. Even if it isn't necessary to measure force at such a tiny level as the yoctoscale, our technique could simply be used to speed up the detection of larger forces. Compared to previous record-setting techniques, our measurement scheme would allow measurement of the same force about one million times faster.

This ability to measure tiny forces at a dramatically enhanced measurement speed is a key demonstration that may spark new interest in ion-based sensors for applications such as the characterisation of nanomaterials and standoff detection for the mining and defence industries.

To detect the force, Dr Biercuk and colleagues used a device consisting of about 60 beryllium ions confined in a Penning Trap, which stores charged particles using electric and magnetic fields. Any movement caused by an applied force was measured with a laser. The resulting measurement of forces with sensitivity at the level of 390 yoctonewtons with just one second of measurement eclipsed the previous record by three orders of magnitude.

Dr Biercuk said:

I am extremely grateful and humbled that this work was deemed significant enough to warrant this distinction, and I'm very pleased that the exciting new field of quantum science is having impacts on a variety of disciplines, including measurement science. I'm looking forward to new capabilities in measurement science emerging from collaborations abroad and with my colleagues in the School of Physics and the Centre for Engineered Quantum Systems.

MSA conference preview



MARTIN TURNER

Amongst papers to be presented at this year's MSA conference will be MSA member Dr Martin Turner's (co-written with colleague Dr Johan van Schalkwyk) titled "Inadequate quality control of physical measurements in clinical medicine is an unrecognised cause of harm". Martin is well known to MSA members, has presented papers on this contentious issue at previous conferences, and is a strong advocate for paying more attention to this badly neglected critical area of metrology. He says that metrological quality control of physical measurements in medicine in Australia lags well behind the quality control of other measurements that are important to society. There is a clear, unmet need in Australia

and other countries to link physical medical measurements to the international traceability framework to lift quality to the standards that pertain to medical laboratory measurements and other measurements such as those in science, industry and trade. If it is indeed true that we can rely more confidently on how much petrol we put into our car at the service station than such common medical measurements as blood pressure and respiratory parameters, then we most certainly hope that Martin's calls to action will be heard in the right quarters.

Walter Giardini

***The Australian Metrologist welcomes
contributions to the letters page, comments,
opinions, questions and so on.***

MSA Award

The Metrology Society of Australia Award recognises achievement and excellence in Australian metrology and the contribution metrologists make to the Australian community. The MSA Award is presented biennially at the MSA conference dinner which in 2011 will take place in Victoria on 19–21 October.

The work nominated must be substantially produced in Australia and is for work completed, or that has gained scientific or industrial recognition, in the past five years and which has contributed to the Australian economy. The work must fall into one or more of the categories of basic research, development or application to industry.

This year there are two nominees for the MSA Award: Mr Don Zhao of Ecotech Pty Ltd and Mr Bob Frenkel of the NMI. The award recipient will be chosen by the MSA National Committee and will be announced at the 2011 conference.

Mr Don Zhao



Mr Don Zhao is a calibration engineer for Ecotech Pty Ltd. Prior to this position he was a research and calibration engineer for the Primary Metrology Center of the China Aerospace Group. Don holds a Bachelor of Engineering from the NWN University of China and a Master of Engineering Management from the University of Melbourne.

While working for the China Aerospace Group for five years, Don delivered a number of influential national primary metrology instrument research and development projects, which included a static expansion pressure calibration system, a constant pressure gas flow calibration system, a constant volume gas flow calibration system and an aerospace vacuum measurement system. He has published more than 10 academic papers in these areas

Since moving to Australia in 2005, Don has been working for metrology- and NATA-accredited calibration laboratories and he has extensive experience in the calibration of metrology instruments in a wide range of areas, such as: pressure, tension, load cell, voltage, current, gas flow, RH, temperature, solar radiation and ozone. Don's passion for metrology is infectious and he combines his substantial knowledge and experience of measuring techniques with a meticulous attention to detail and strict adherence to standards and accreditation requirements.

In 2010, Don led a team to successfully relocate the CSIRO wind tunnel to Ecotech Pty Ltd, and re-established this NATA-accredited service into the industry. Since this wind tunnel has been commercially running in Ecotech Pty Ltd, Don has performed a great deal of study and research to improve its performance in a short space of time. Based on different types of hot wire anemometer operating principles, he standardised different types of hot wire anemometer temperature and barometric

pressure calibration correction methods. He performed principle and experimental study on wind tunnel blockage correction and solved sonic anemometer intermittent output issues. Currently, Don is investigating the upgrading of the wind tunnel facilities and test methods to fulfil the wind energy industry requirements and to ensure it can continue to serve more industries.

Mr Bob Frenkel



Uncertainty is the link between metrology and statistics and for over 30 years this link has been under formal scrutiny by international metrological organisations. In the early 1990s, the Guide to the Expression of Uncertainty in Measurement (GUM) took shape, and, after several revisions, has now become the foundational document for

metrologists. To an increasing extent awareness of this document is spreading well beyond the national measurement institutes to scientists and engineers who do not regard themselves principally as metrologists. There are books, articles and training courses that introduce the GUM to academics, students and to the general scientific and engineering community

The GUM makes heavy use of theoretical statistics in its recommendations, which not all scientists, engineers and metrologists necessarily have a strong background in. This led in March 2001 to the formation of an Uncertainty Panel at the National Measurement Institute, of which Bob Frenkel was a member, together with Robin Bentley and Ron Cook. That involvement led Bob to write a monograph to describe the statistical background to the GUM. Bob is also currently co-writing a paper on the GUM addressed specifically to clinical biochemists.

There is now a third edition of *Monograph 2*, which covers basic concepts such as probability, mean, standard deviation and variance, degrees of freedom, correlation, ordinary least-squares fitting, the propagation of uncertainties, Type A and B uncertainties, the Gaussian and other distributions and the central limit theorem. There are further chapters on the analysis of variance (ANOVA), the Welch-Satterthwaite formula (which also has an electric analogue), frequentist and Bayesian statistics, and a chapter 'Beyond the GUM' where more complicated issues are discussed, such as total least squares, multiple regression, autocorrelation and Monte Carlo simulation.

Bob's monographs, in which he has tried as far as possible to go from first principles and to appeal to the common sense and intuition that often underpin statistical reasoning and the consequent mathematical analysis have helped build a strong foundational understanding of uncertainty amongst Australian metrologists.

Humour corner

The imperial ruler

(or: every inch a king – every foot a ruler)

Amongst the multitude of modern tool users there are obviously many who – coming from parts of the world where people toil at the complexities of the metric measuring system – are not aware of the simplicity, the stark beauty nor the crystal-clear efficiency of the imperial measuring method.

We propose spreading the message of British measurement by bringing you the derivation of some of the more commonly used units of length.

The base measurement of length is the yard. This unit was very sensibly defined as the distance between the fingertips and the nose of a king looking straight ahead with his arms outstretched. It is believed that a platinum-iridium replica of the King is now used, as after a long and useful life of holding his arms outstretched and looking straight ahead, the original king suffered some distortion in the embalming process.

Now obviously the yard is too big to use in measuring all things. For example, the maximum permissible extension of a recalcitrant serf on the rack was only a small part of a yard if he was to retain his service and work ability. So the unit was divided up into 36 sub-units called inches. Thirty-six was chosen as the king was just 36 days from being 44 years old at the time. Had he acted a day earlier, the intrinsic tidiness of the whole system would have been jeopardised.

Unfortunately the inch proved impractical for some purposes. The royal throne maker would have been extended by several parts of a yard if he had worked only to

this tolerance in his craft. So the inch was further divided into 64 parts. Sixty-four was chosen because this was, in fact, one year before the age at which the king was to be superannuated, and because he liked this number better than 93 anyway.

Historians differ on this point and some say that 64 was chosen because this made $1/64^{\text{th}}$ of an inch around $1/2304^{\text{th}}$ of the distance between the king's nose and his fingertips – 2304 being the number of weekly tournaments held under the king's Standard (he had celebrated his 44th birthday only 57 days previously).

However, in applications like filing a small amount of gold from the edge of sovereigns before making payment on the national debt, $1/2304^{\text{th}}$ of a yard proved to be too gross a unit, and so the inch was divided into one thousand parts. This introduction of one thousand into the system detracts from the romance of British measurement, but fortunately it is now used only by artisans in the metal trade. Gentlemen and men of commerce shun this unit with its decimal overtones and talk properly in sixty-fourths.

There still existed a need for a unit in between the inch and the yard for measuring such things as the correct drop of a well-constructed gallows and so the foot was devised. This unit was called the foot to confuse industrial spies from European gallows manufacturing concerns, who of course thought it was the length of the king's foot – which was actually only 10 and $93/64^{\text{th}}$ inches. As a result, European gallows made to those pirated specifications never really worked well, many criminals escaped because they dropped only $679/768^{\text{th}}$ of the proper distance.

Now there are many measurements to be made, even in a small kingdom. The proper width of a moat, for example, was much more than a yard and so the rod was created. This is $5\frac{1}{2}$ yards because that was exactly the king's size in crowns. Fortunately the king did not take $5\frac{3}{4}$ crowns because the rod would not have equalled 198 inches, nor $16\frac{1}{2}$ feet, nor for that matter 12,672 sixty-fourths.

Many people think that the most important unit of length in the whole British system, the chain was made exactly one cricket pitch long because the king was a promising off-spin bowler. They are wrong – this was purely coincidental. Twenty-two yards was chosen as the length of a chain because that was the maximum range at which the king ever felled a vassal with a pewter between August and December. And so once again, we see providence and Britannia in collusion. A larger vassal, a heavier pewter, and a chain may not have equalled 352 nails 792 inches, nor even 50,688 sixty-fourths.

There were still other lengths measurements to be made: the distance attained by a deserting serf pursued by dogs: the ground put between the king's army in retreat and the enemy between matins and vespers: the perimeter of the estates seized by the king from barons not contributing sufficiently to the king's comfort. All these things needed a much larger unit – consequently the mile.

The king, a quick-witted man despite his small size in crowns, decreed that the mile should be $3\frac{9}{16}$ times the range of the most powerful crossbow in the castle when fired into a force 3 headwind. Fortuitously, this distance was found to be 4,055,040 sixty-fourths, or 63.360 inches, or 28,160 nails, or 15,840 hands, or 8,000 links or 5,280 feet, or 1,760 yards, or 320 rods, or 80 chains, or if you prefer, even 8 furlongs – which of course all turned out to be exactly 1.408 ells. (English ells of course. The Flemish had 1,760 ells to a mile and hence undershot, while the French had 1173.33 of their ells to a mile, and after many years of overshooting, invented the metric system to maintain the status quo vis-à-vis perfidious Albion.)

Table of everyday equivalents of length measurements

1 mile = 1408 ells	1 chain = 352 nails
1 furlong = 1980 hands	1 rope = 6 and $\frac{2}{3}$ yards
1 skein = 545 and $\frac{5}{11}$ links	1 rod = 16 and $\frac{1}{2}$ feet
1 league = 2640 fathoms	1 cable = 8640 inches

Author unknown. Courtesy of Minimax Tools.



A Climate for Better Measurement – MSA Conference Update

Preparations are well in-hand now for the Metrology Society of Australia biennial conference, which is being held this year at the Deakin Management Centre in Geelong starting on Wednesday evening 19 October with a welcome barbecue. This centre boasts modern facilities in a pleasant environment, which the MSA will completely take over for the duration of the 2½ day conference activities. A large open foyer will allow our sponsors to demonstrate their latest offerings while delegates can find a quiet corner to catch up with interstate colleagues. The centre offers a number of ample-sized presentation rooms and small meeting rooms and includes on-site accommodation in the centre.

The two presentation days are Thursday and Friday and are full with the latest developments in metrology in fields covering mechanical, medical, environmental, electrical, legal and uncertainty developments and issues. The conference features three simultaneous presentation streams to cover these diverse measurement areas so everyone will find something of interest during the conference.

Our keynote presentations include:

- Dr Bruce Forgan, Superintendent Data Quality and Improvement (STQI), Bureau of Meteorology presenting the latest developments in climate measurement and recent discussions between the BIPM and the World Meteorological Organisation.
- Dr Rod White, Head of Temperature Standards, Measurement Standards Laboratory of NZ presenting a philosophical look at why we measure.

We have industry leaders and international guests talking on the latest developments in the SI scale, nanometrology and nano pollution.

We have also secured some of the best people in industry to host our forums.

- The Co-ordinate Measurement Machine (CMM) forum will feature Dr Greg Hetland from the International Institute of Geometric Dimensioning & Tolerancing to speak on the value of GD&T.
- The Pressure Metrology forum will discuss the results of recently completed proficiency testing in Australia and seek feedback on industry needs.
- We will revisit the always controversial subject of uncertainty convened by Australia's leading uncertainty specialists and trainers: Ron Cook, Walter Giardini and Bob Frenkel, who

will bring us up to date on the current thinking, rules and applications.

- We have secured a speaker from NATA who will highlight the latest changes and how these might affect your laboratory.

Our current signed-up sponsors include Fluke Australia, NMI, NATA, Abstec Calibration, Crystal Engineering and Scientific Devices. These sponsors will be present at the conference venue with staff and equipment ready to answer your questions and demonstrate their latest and best. We have a few additional demonstration tables available for additional sponsors if you wish to take part. Please contact Keith Fordham for more information. We encourage you to spend time with our sponsors as, without their support, this event would not happen.

This year the conference dinner will be held at the Werribee Open Plains Zoo including a twilight zoo tour. Full details on the programme, location, accommodation and registration are available on the MSA website at www.metrology.asn.au. Keep your calendar clear for this significant metrology event.

If you want to hold a meeting with interstate colleagues, please let us know and we'll make sure time and space is available. If you have any questions or comments you can contact any of your conference committee members:

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J.Warne@bom.gov.au

Keith.Fordham@mt.com

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Don't miss out. See you there in October.

Queensland meeting

A general meeting will be held in Brisbane for Queensland members. Visiting members are welcome. Once again, Max Purss has kindly volunteered to be the star attraction and lead a discussion on uncertainties.

Date 27 September 2011
Time 6:00 pm (refreshments) for 6:30 pm start
Venue Dental Depot Unit 6/43 Sandgate Rd
Albion, QLD 4010
Please RSVP to geoff.barnier@deedi.qld.gov.au

Changed practice on NATA signatories

NEVILLE OWEN



A few notes on what changes are being made and how this might impact metrologists.

For those who have not heard, NATA is changing the rules regarding authorising signatories for calibration and testing reports. At present this only affect the field of biological testing. Once the role of a NATA assessment team, the authorisation of a signatory is now moving to permit authorisation of signatories by the laboratory. So if a laboratory loses a staff member and needs to appoint a new signatory then this can be achieved without the need for a NATA audit/signatory interview. But, this does place the onus on the laboratory to assure that the person appointed is adequately qualified and trained, has the necessary experience and understands the laboratory's requirements and NATA rules. This also places a different set of requirements on the laboratory during a NATA audit. It will now be necessary for a laboratory to demonstrate that it is competent at training staff and reviewing staff capabilities to demonstrate a superior level of competence. This may require additional training for supervisors and managers of signatory staff in these laboratories. This also changes the role of the NATA assessment team where the laboratory chooses this option. The sorts of things the laboratory must consider and the audit team must seek demonstrated capability of include:

- a degree in a subject relevant to the testing concerned and a minimum of two years' practical experience
- a diploma or certificate IV in a subject relevant to the testing concerned and a minimum of five years' practical experience
- no tertiary qualifications and a minimum of 10 years' practical experience.

Practical experience must include:

- sound knowledge of the principles of the core competencies related to the testing for which approval has been authorised, which must include participation in proficiency testing and or internal staff assurance programmes
- sound understanding of quality control data, including:
 1. results of method controls run in conjunction with testing
 2. results of quality control checks on consumables
 3. awareness of the status of equipment checks and calibrations
 4. understanding of the requirements for sample acceptance applied to samples under test
 5. understanding of the principles and application of measurement uncertainty
 6. understanding of the NATA requirements for the content and issue of test reports including the use of the NATA endorsement.

So has the life of a laboratory manager become easier or not? There are some new freedoms available but these come with new obligations of proof.

If you'd like more details, please see NATA Policy Circular 35, March 2011. If you'd like to have your say on this issue, please send us your thoughts and we'll publish them in the next *TAM*. This is a big change to the NATA assessment process that may impact all accredited laboratories at some time and may affect some who use NATA-accredited laboratories.



The difference between success and failure could be your measurements.

Your work will be assured of international acceptance when you follow simple but fundamental measurement practices. To be successful your measurements must be:

- **Fit for purpose.** Enough accuracy for the job.
- **Traceable.** Linked to international standards.

Without these two basic attributes your work cannot be validated and will be meaningless.

The Metrology Society of Australia promotes the science and practice of measurement. For more information on how we can be of assistance, visit us at www.metrology.asn.au and download your free 'Measurement Made Simple' brochure or contact us on (02) 9449 0119

Metrology Society
of Australia



Metrology Society of Australia Award

Calling all Australian metrologists! Do you know of good metrology work being done in Australia?? On the factory floor, on the production line, in the analytical lab, along the pipeline ... anywhere. Here is your chance and the metrology industry's chance to recognise work that makes all our lives better. Note that the rules for the award have been changed – we are now including not only work actually done by members of the MSA, but work done by anyone, anywhere in Australia, which deserves to be recognised. So if you can think of a potential worthy recipient, read on below and get your proposal in ...

The Metrology Society of Australia Award recognises achievement and excellence in Australian metrology and the contribution metrologists make to the Australian community. Metrology is the science of measurement. Membership of the MSA includes scientists, engineers and technicians working in government and industry from all fields of measurement in Australia and overseas.

The MSA Award is presented biennially at the MSA conference dinner. In 2011 this will take place in Victoria on 19–21 October.

Nominations are now invited for this award. The work nominated must be substantially produced in Australia, but must be nominated by a member of the MSA. The National Committee of the MSA will decide where necessary the eligibility of the submission and its decision will be final.

The award is for work completed, or that has gained scientific or industrial recognition, in the past five years and which has contributed to the Australian economy. The work must fall into ONE OR MORE of the following categories:

BASIC RESEARCH Original research directed towards the significant improvement of fundamental measurements, the accuracy of derived units or fundamental constants. Solutions to difficult measurement problems, work that has FUNDAMENTAL importance to the development of measurement, the application of new or existing science and mathematics to new measurement applications, including the development of new instruments, techniques or methods for reducing uncertainty.

DEVELOPMENT The development of new instruments, measuring techniques or systems for Australian industry, including the design of prototypes, testing, characterisation and product manufacturing. For example, the development of a new thermometer or an inline automatic inspection system.

APPLICATION TO INDUSTRY The use of new or improved measurement science and technology in Australian industry to increase quality, productivity and competitiveness. For example, the use of new sensors to control production processes or the application of statistics for scheduling recalibration systems.

SELECTION PROCESS The award judges will be a subcommittee of the MSA National Management Committee. The judges will use criteria such as: degree of innovation; significance of the work; potential or real cost savings; stage of development; potential for application in other fields or industries; quality of supporting material and testimonial evidence supplied.

The award judges are bound by confidentiality agreements, ensuring complete confidentiality of submitted material.

Application form opposite.



MSA AWARD APPLICATION FORM

To nominate, please fill in the entry form below and send it to:

The Secretary
Metrology Society of Australia
C/- National Measurement Institute
PO Box 264
Lindfield, NSW 2070

Name of nomination:

Address:

Telephone:

Fax:

Email:

Concise description of work on which the nomination is based:

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Nominated by:

If self-nominated, please provide contact information below:

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Signed:

Printed name (if different from nomination):

Date:

Do you wish the submitted material to remain confidential? Y/N:

