President's Address
National Conference on Weights and Measures
Salt Lake City, Utah
July 12, 2007

Dr. Belinda Collins
NIST, Technology Services Director

Dr. Belinda Collins addressed the National Conference on Weights and Measures Annual Meeting attendees in Salt Lake City, Utah, on July 12, 2007. Dr. Collins presented the National Institute of Standards and Technology (NIST) mission to promote U.S. innovation and industrial competitiveness by advancing measurement sciences, standards, and technology in ways that enhance economic security and improve the quality of life.

The presentation gave an overview of NIST and its pivotal role in the U.S. economy, covering key points such as the American Competitiveness Initiative, details of planned research, the U.S. measurement system, and NIST's partnership with the National Conference on Weights and Measures (NCWM) in standards development and the newest area of enabling a hydrogen economy. The slides presented here cover some of the broad areas of research and contributions made by NIST and give an idea of the impact the agency has in domestic and worldwide arenas.

This presentation ended on a note of cooperation for a continued successful collaboration between NIST Weights and Measures and the NCWM.

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NIST and the Future: Supporting Innovation and Competitiveness

NCWM Annual Meeting

Belinda L. Collins, Ph.D.
Director, Technology Services, NIST

July 10, 2007

NIST
National Institute of Standards and Technology
Technology Administration
U.S. Department of Commerce

Outline

- NIST – Overview
- American Competitiveness Initiative
  - Details of planned research
- The U.S. Measurement System
- Partnering with NCWM
  - Standards Development
  - Enabling the Hydrogen Economy

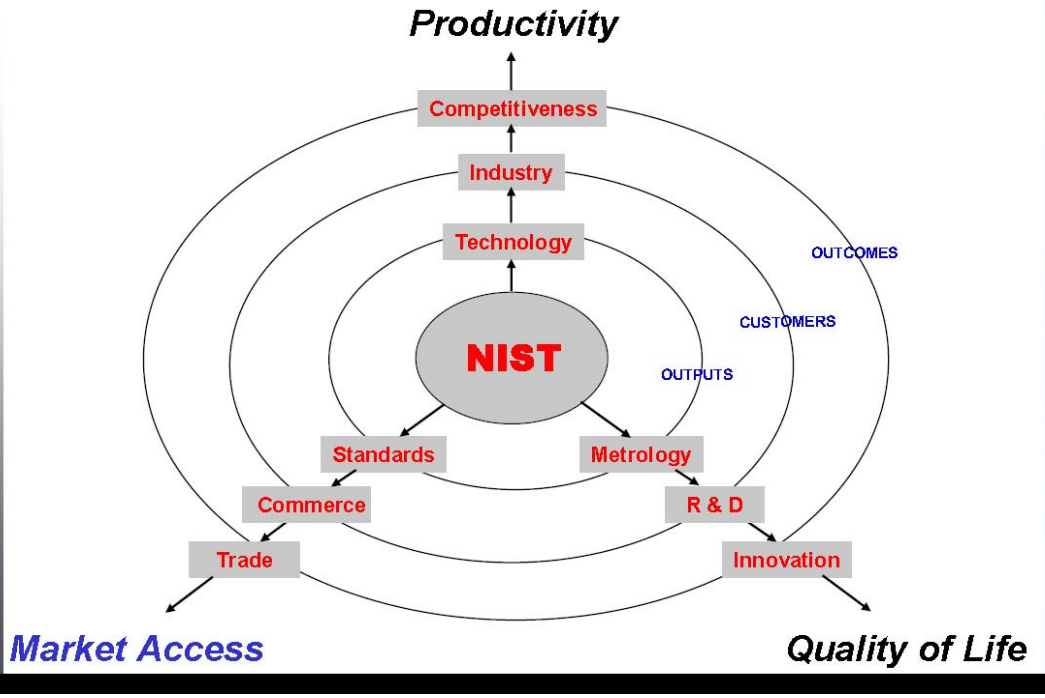
NIST Mission

To promote U.S. innovation and industrial competitiveness by advancing

measurement science,
standards, and
technology

in ways that enhance economic security and improve our quality of life

NIST's Pivotal Role in U.S. Economy

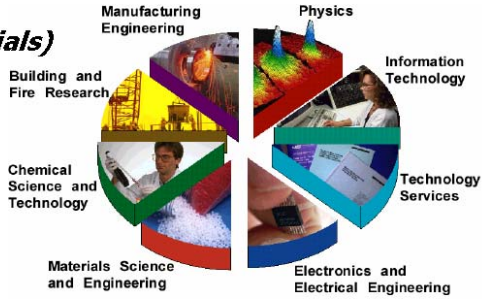


NIST at a Glance - 2006

2,448 Full time employees

Gaithersburg, Maryland
Boulder, Colorado
Charleston, South Carolina

3 Nobel Laureates (Physics)
1 National Medal of Science (Materials)
1 MacArthur Fellowship
14 National Academy Members



1,800 guest researchers
850 users of facilities

NIST Laboratories
Advanced Technology Program
Manufacturing Extension Partnership
Baldrige National Quality Program

American Competitiveness Initiative … announced in 2006 State of the Union Address

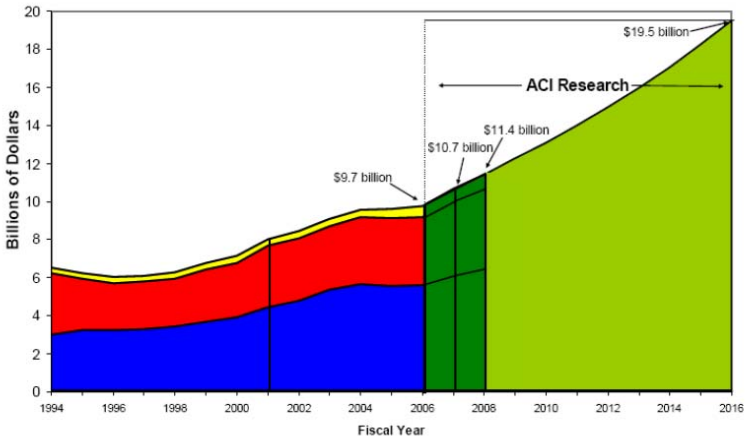
$50B to be invested over the next 10 years in:

- NIST core (laboratory and infrastructure)
- National Science Foundation
- DOE Office of Science

The role of government is not to create wealth. The role of our government is to create an environment in which the entrepreneur can flourish, in which minds can expand, in which technologies can reach new frontiers.

American Competitiveness Initiative (ACI)

- Proposed in FY 2007 and continued in FY 2008 budget request
- Doubles, over 10 years, investment in:
  - NIST core (laboratory and infrastructure)
  - National Science Foundation
  - DOE Office of Science

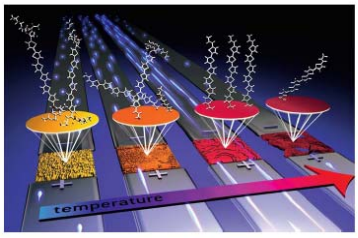


American Competitiveness Initiative

New NIST Programs for FY07

Rapidly developing technologies

- **Nanotechnology from Discovery to Manufacture**
- **Quantum Information Science**
- **Enabling the Hydrogen Economy**
- **Innovations in Measurement Science**
- **Cyber Security**



Critical national assets

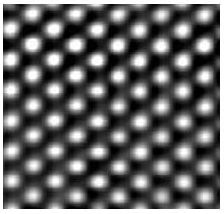
NIST Center for Neutron Research
Synchrotron Measurement

Immediate measurement needs

Innovation through Supply Chain Integration
Structural Safety
International Standards and Innovation
Bioimaging, Biometrics

Center for Nanoscale Science and Technology (CNST)

- New multidisciplinary center aimed at converting nanotechnology discoveries to products
- Mission: develop the necessary measurement science and instrumentation to meet emerging needs
- Establish the materials and process characterization to enable scaled-up, reliable, cost effective manufacturing of nanoscale materials, structures, devices, and systems
- Partner with industry, academia, and government to turn the potential of nanotechnology into reality



NIST Center for Neutron Research

Preservation of pharmaceuticals

National resource for neutron- based measurements

- "See" structure at the nanoscale
- Uniquely sensitive to hydrogen
- Probe magnetic structure
- Non-destructive probe

Magnetic data storage

Chemistry of cement

Petrochemicals

Fuel cells
H_2 storage materials

Enabling the Hydrogen Economy

Hydrogen Fuels Benefits

- Reduced dependence on foreign energy sources
- Lower environmental impact

NIST Brings:

- More than 50 years of technical expertise in fuels
- Congressional mandates for weights and measures, pipeline safety

NIST will:

- Improve efficiency, durability, manufacture of hydrogen fuel cells
- Develop standards for pipeline safety and reliability
- Develop standards, calibrations for equitable trade of hydrogen

International Standards and Innovation

Standards-related barriers to trade constrain innovation, entrench inferior technologies, raise transaction costs, and hinder interoperability

NIST works to open markets for American workers and exporters

NIST will:

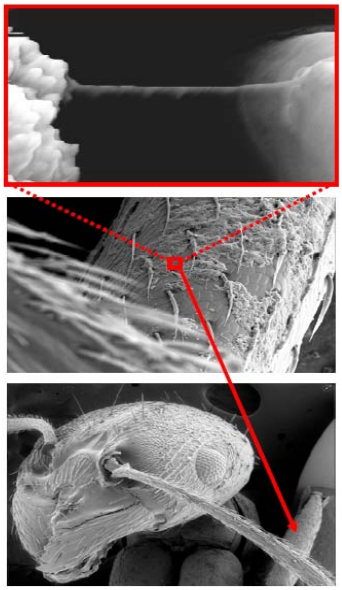
- Provide technical leadership to ensure standards are not a barrier to U.S. exports
- Provide information and effective U.S. coordination with international standards organizations

NIST FY 2008 Budget Request
(In millions of dollars)

	FY 2006 Enacted	FY 2007 JR Cont'g Res.	FY 2008 Request
STRS (w/o directed grants)	$382.9	$432.8	$500.5
CRF (w/o directed grants)	48.2	58.7	93.9
NIST Core Total:	$431.1	$491.5	$594.4
NIST Core Increase = +$102.9 (21%)			
ITS	$183.6 (MEP+ATP)	$183.6 (MEP+ATP)	$46.3 (MEP)
Directed Grants	$137.3	N/A	N/A
Total NIST	$752.0	$675.1	$640.7

Enabling Nanotechnology from Discovery to Manufacture

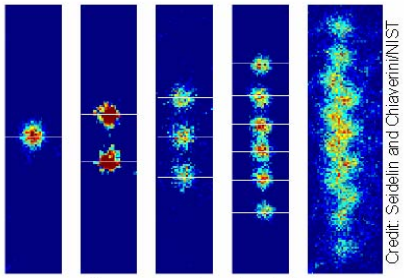
- Manufacturing with nanoscale components expected to be a dominant factor in the 21st century economy
- Exploiting nanoscale behaviors and properties requires new tools and methods
  - NIST is the NNI lead agency on "*Nanoscale measurement science, instrument calibration, standard reference materials, and nanoscale physical and chemical properties standard reference data.*"
- Initiative continues the creation of the Center for Nanoscale Science and Technology (CNST)
  - Partner with industry, universities, and other agencies to bridge the gap between science and production
  - Over 300 new researchers from industry and academia
- Expands research to support industry through nanoscale measurement science and standards
  - Develop new atomic-scale measurement capabilities
  - Support standards for environment, health, and safety



Carbon nanotube on the hair of an ant's leg

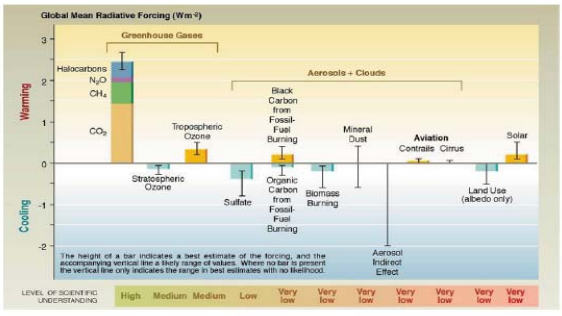
Quantum Science: Infrastructure for 21st Century Innovation

- The laws of physics are fundamentally different in the quantum world of atoms, electrons, and light particles. This enables revolutionary potential for:
  - Measurement capabilities otherwise impossible "classically"
  - "Unbreakable" codes (i.e. to protect financial transactions)
  - Powerful computers capable of solving problems impractical to solve today
- NIST is a recognized world leader in the field
- This initiative will
  - Accelerate the economic potential for exploiting the unique properties of the quantum world
  - Advance research on quantum information
  - Develop fundamentally new and unique measurement tools and methods
  - Further leverage the partnership with the Joint Quantum Institute (NIST, Univ. of MD, and NSA)



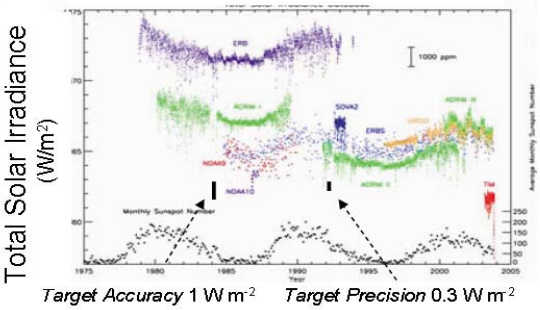
Magnesium ions loaded into NIST's new planar ion trap.

Measurements and Standards for the Climate Change Science Program



- Critical measurement uncertainties in solar output and effects of aerosols limit Nation's ability to model global climate change
- Initiative addresses 2 critical gaps identified in Interagency Strategic Plan
  - Resolves discrepancies in satellite-based measurements of solar intensity
  - Provides quantitative understanding of effects of atmospheric aerosols on sunlight

Total Solar Irradiance Database



Target Accuracy 1 W m^{-2} *Target Precision* 0.3 W m^{-2}

- Results will help modelers to create an accurate picture of Earth's climate through calibrations traceable to international standards
  - Standardized instrument calibration for satellites for accurate international inter-comparisons and lower uncertainties
  - New measurement methods for aerosols
  - Database of aerosol properties

Disaster-Resilient Structures and Communities

- Risk to lives, property, and major disruption of commerce increases as communities encroach on hurricane-prone coasts and fire-prone wildland-urban interface regions
- Single major event (e.g., hurricane) can cost $80B-$200B
- Need to assess community and regional scale risks
- This initiative will develop predictive tools that enable:
  - Local officials to evaluate and mitigate risks via land-use planning and practices;
  - Development of risk-based hazard maps at the community-scale; and
  - Development of risk-consistent and cost-effective mitigation solutions incorporated into next-generation building codes and standards.

NOAA Fire Weather 8 km — New link — 1 km NIST Fire Behavior (WFDS)


Regional


Community


Residence


Components

Predict fire behavior for communities based on fuel maps, local topography, cultural features, and micro wind patterns for real-time firefighting as well as improved building codes and community planning.

National Earthquake Hazards Reduction Program (NEHRP)

- Earthquakes strike without warning – and a single major event can cost $100B - $200B
- 75 million Americans and $8.6 trillion worth of structures in the U.S. in moderate to high-risk areas
- NIST tasked with conducting research to bridge the gap from construction theory to practice and to promote its adoption
- This initiative will enhance the safety of:
  - <u>New structures</u> by establishing and promoting performance-based standards for entire building designs and by accelerating the adoption of basic research into the model building codes, standards, and practices
  - <u>Existing structures</u> through research on actual building performance in earthquakes; developing structural performance models and tools; and establishing cost-effective retrofit techniques for existing buildings


1994 Northridge Earthquake, Los Angeles (NIST)

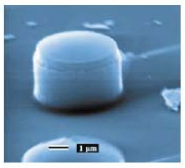
NIST Center for Neutron Research (NCNR) Expansion and Reliability Improvements

- Neutron-based measurements are critical for 21st century innovation – for example:
  - Design of new medications by determining protein structure & function
  - Development of practical alternative energy sources, including Hydrogen
  - Determining the structure of materials and devices at the nanometer scale
  - Discover advanced new materials for technologies beyond semiconductors
- Due to tremendous scientific value – demand for access by industry and academia far exceeds capacity
- NCNR serves more customers than all other U.S. neutron facilities combined – and this initiative will:
  - Further increase capacity by 30% to serve 500 additional researchers each year
  - Add additional cold source and new guide hall
    - New cold source is 2x brighter; Guide system is up to 4x more efficient
  - Provide new generation of world-class instruments
    - Critical new instruments either not available in U.S. or 100x improvement

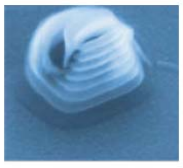
Boulder Laboratories: Building 1 Extension

- Modern measurement science requires extremely advanced capabilities such as manipulating objects at the atomic scale
- The 1950s infrastructure in Boulder is insufficient to meet the Nation's needs for increasingly accurate measurements
  - High speed/high frequency measurements required for advanced electronics, defense, and homeland security;
  - Measurements and tests at the single atom level;
  - Measure forces below 1 billionth of a penny's weight: forces between cells, nanoscale systems, etc;
  - Measure time to 1 second in 30 billion years enabling new science and vastly improved navigation/positioning systems
- Create a 21st-century measurement capability for the Nation
  - Construct a high-performance laboratory extension to existing Building 1 with stringent control of temperature, vibration, humidity, and air cleanliness.
  - Deliver higher performance laboratory space sooner and at lower cost than previous plans

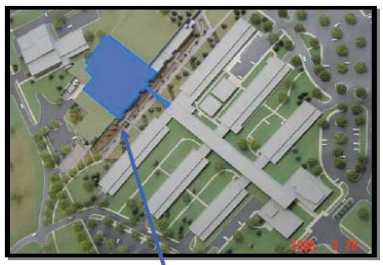
Nanofabrication Capabilities



Adequate Control: Working Device



Poor Control: Non-working device



Budget Summary

- The proposed FY 2008 budget is an excellent budget
  - Enhances NIST's ability for world-class research on measurement problems that impact our Nation's economic security and quality of life;
  - Provides the facility capabilities necessary to carry out our mission well into the future; and
  - Shows continued strong support for our Nation's science and technology
- Keeps NIST on the path to support the American Competitiveness Initiative

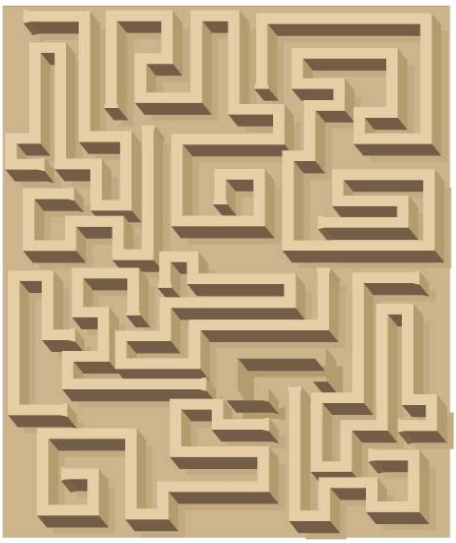
Measuring Up To the Nation's Innovation Challenge
The U.S. Measurement System

A Matter of Competitiveness: Addressing Measurement Barriers to Accelerate Innovation

"America's economic strength and global leadership depend in large measure on our nation's ability to generate and harness the latest in scientific and technological developments and to apply these developments to real world applications."
--President's American Competitiveness Initiative

Measurements are fundamental to the nation's capacity to innovate

What is the U.S. Measurement System?



What is the U.S. Measurement System?

The National Measurement System, which includes the national measurement institute (NIST, in the United States), calibration laboratories, accreditation services, weights and measures regulations, and other elements, is situated within—and operates in support of—the broader USMS.

The U.S. Measurement System (USMS) is a complex set of entities that develop, supply, use, or ensure the validity of measurements. It is a broad and autonomous system which encompasses:

- **Measurement research and development**
- **Measurement technology suppliers and users – in both the public and private sectors**

The USMS relies on, but also contributes to, the scientific research enterprise

A Sense of Urgency, An Economic Imperative

Assessing the U.S. Measurement System

- **Why?** Ensure that capabilities required by science and industry to accelerate innovation are available, under development, or planned
  - Identify measurement infrastructure needs
  - Identify system gaps and weaknesses
  - Engage stakeholders in search for solutions
- **What's the Risk?** Without an advanced measurement system, U.S. risks serious declines in competitiveness and quality of life
  - Other nations view measurement capabilities as source of potential advantage

The USMS Assessment

NIST Conducted a Fact-Based Assessment . . .

- Reviewed 164 Industry Technology Roadmaps
- Conducted 15 NIST-Industry Workshops
- Interviewed Industry Representatives
- Solicited Input from Businesses and Trade Associations
- Hundreds of Participants from Industry, Universities, and Government

. . . Obtained 723 Measurement Needs in 11 Industry Sectors and Technology Areas

- Representative Sample of Barriers to Innovation

Measurement Needs Cross Both Sectors, Technologies

Needs Across 11 Sector/Technology Areas for…

- Increased Accuracy, Resolution
- Fundamentally New Measurement Methods
  - Some Existing Capabilities Pressed to Their Limits
  - Advances in Science & Technology, Changes in Society Require Novel Responses
- Affordable, Accurate Sensors for Real-Time Process Monitoring and Control
- Standards and Metrics for Evaluating System-Level Performance
- Practical, Cost-Effective Methods to Demonstrate Regulatory Compliance

The USMS - NIST and the Future

NIST will continue to provide measurement solutions through cutting edge research, calibrations, standard reference materials, standard reference data, laboratory accreditation, and technology transfer

NIST will continue to provide leadership for the USMS

- Collect new Measurement Needs
- Work with external stakeholders to identify needs
- Collaborate with solution providers, internal and external, to NIST to develop solutions needed for priority Measurement Needs
- Regularly report on state of USMS

Historically Close Relationship Between NIST and NCWM

NCWM

- **Formed in 1905, shortly after creation of NBS (1901)**
- **NIST/WMD staff are members of NCWM**
- **Maturing into a productive partnership**

NIST and NCWM share the common objective of enhancing the uniformity and strength of the U.S. weights and measures infrastructure

To evaluate and monitor the weights and measures infrastructure, NCWM and NIST partner in developing measures such as inspector certification, lab and field proficiency and marketplace surveys

NIST – Partnership and Support for NCWM

NCWM mission: To advance a healthy business and consumer climate through fair and equitable weights and measures standards

NIST support focuses on:

- Standards development
- Training of personnel
- Laboratory support

NIST and NCWM – Long History of Collaboration

Specific Examples of recent or current collaborative efforts:

- Marketplace Survey last year – plan on continuing support for additional surveys
- Professional Development Committee (PDC) and Certification of Inspectors – long term joint goal
- Mutual Acceptance Arrangement – joint efforts led to signing last year
- Standards development and improvement (ongoing)
- Potential adoption of common device definitions for use in national surveys – next step will be data collection and analysis

New NIST Activities in Legal Metrology Support for the Hydrogen Economy

NIST received funding through the American Competitiveness Initiative to support the U.S. transition to a hydrogen economy

The Weights and Measures Division received a small portion of this funding to develop hydrogen standards for weights and measures

- Prior funding dedicated to H_2 =10% of one FTE
- Current funding = 1 FTE + funding for Nat'l Working Group

Over the past year WMD has developed a draft Hydrogen Gas Meters Code and distributed copies to interested parties (weights and measures officials, equipment manufacturers, hydrogen SDOs working in related areas of the hydrogen infrastructure, etc.)

Regular updates to the S&T Committee have taken place to keep them apprised of code and standards work

NIST Hydrogen Initiative

Draft long range plan through 2011 for WMD to support the development of an H_2 infrastructure

- The long range plan encompasses key components such as:
  (1) Establishing a Work Group
  (2) Developing standards to address gaseous, liquid, and other blends of hydrogen,
  (3) Developing Method of Sale Regulations, sampling and test procedures, and test equipment, and,
  (4) Participating in the development of related international standards

NIST Hydrogen Initiative and NCWM, Cont'd

An important component will be to partner with the NCWM at every opportunity in the development of the hydrogen code and for subsequent field trials of test procedures and to coordinate educational and other training events

- WMD will continue to brief the S&T Committee and the NCWM Board of Directors as time becomes available on their agendas
- Juana Williams of WMD is at this meeting and wants to get your ideas!

The first draft of the Hydrogen Gas Meters Code is currently posted at www.fuelcellstandards.com

Conclusions

NIST looks forward to working with NCWM and its members as we face the new challenges in measurements and standards contained in the American Competitiveness Initiative, including the standards and training needed to support the Hydrogen Economy

NIST also looks to NCWM as a solution provider for many of the measurement needs identified in the USMS

- Would welcome opportunity to discuss specific opportunities and ideas

NIST values its long-standing partnership with NCWM!

New Chairman's Address
92nd National Conference on Weights and Measures
Salt Lake City, Utah
July 12, 2007

Judy Cardin
Wisconsin Department of Agriculture & Consumer Protection

Good morning, everyone, and thank you all for being here. I am honored to accept the responsibilities of Chair and the trust you have placed in me to lead the National Conference. What a great organization this is! As difficult as some of our work was this week, we'll leave here friends, ready to continue the work of the Conference.

Thanks to the standing committees for the long hours and fortitude you displayed this week. With your continuing involvement and determination, we'll handle the challenges before us as we always do—seeking balance to provide equity and making the correct technical decisions.

My theme this year is "Seeking Balance." All issues and proposals we consider require us to seek balance. We determine the best science and measurement available, at a cost the market and consumers can bear. Temperature compensation is a tremendous challenge and opportunity that will require a focus on seeking balance during the next year and beyond. Together we will find that balance.

My other goals for the year include:

1. continuing to build our partnerships with NIST and Canada, and our work on OIML agreements;
2. involving and supporting our standing committees and the membership in continued improvement of standards development;
3. improving the efficiency and cost effectiveness of NCWM;
4. improving and communicating the value of NCWM; and
5. retaining and increasing membership.

Please let me know what is important to you. Feel free to call, email, or tap me on the shoulder when you see me. I want to hear from you, and I'll need your help to improve and grow the Conference.

At this time I would like to make the following appointments:

To the Board of Directors, to fill the vacancy caused by Jack Kane's advancement to Chair-elect: Tim Tyson, Kansas.

To the NTEP Committee: Don Onwiler, Nebraska, as Chair.

To the Laws and Regulations Committee: John Gaccione, Westchester County, New York.

To the Specifications and Tolerances Committee: Rick Fogal, Pennsylvania

To the Professional Development Committee (PDC): Ken Deitzler, Pennsylvania

In addition, I am announcing some corrections and changes to the term expirations of the members of the PDC.

Agatha Shields' term expiration was listed incorrectly in Publication 16. Agatha's term will expire in 2008. Ken Deitzler will serve until 2009; Ross Anderson, 2010; John Sullivan, 2011; and Stacy Carlsen, 2012.

Nominating Committee:
Don Onwiler, Chair, Nebraska
Thomas Geiler, Massachusetts
Ross Andersen, New York
Steven Malone, Nebraska
Dennis Ehrhart, Arizona
Maxwell Gray, Florida
Jim Truex, Ohio

Chaplain:
F. Michael Belue, Belue Associates

Parliamentarian:
Lou Straub, Fairbanks Scales, Inc.

Credentials Committee:
David Pfahler, South Dakota

Presiding Officers:
Jerry Butler, North Carolina
Kurt Floren, Los Angeles, California
Tim Chesser, Arkansas
Mike Sikula, New York

Sergeants-at-Arms will be Vermont officials.

Thank you again for your trust. I also appreciate the support and friendship so many of you have offered. I'll do my best to fulfill your expectations and leave NCWM an even stronger organization at the end of my term.

NCWM 2007 Annual Meeting Honor Award Recipients

Full Name	Organization	State	No. of Years
Stacy Carlsen	Marin County Weights & Measures	CA	10
Kurt Floren	Los Angeles County Weights & Measures	CA	10
Joe Gomez	New Mexico Department of Agriculture	NM	10
Bob Murnane	Seraphin Test Measure/Pemberton	NJ	10
Bill Ripka	Thermo Electron	MN	10
Lawrence Stump	Indiana Weights & Measures	IN	10
Norman Brucker	Precision Measurement Standards, Inc.	MN	15
Tina Butcher	NIST, Weights & Measures Division	MD	15
Michael Keilty	Endress & Hauser Flowtec AG	IN	15
Don Onwiler	Nebraska Division of Weights & Measures	NE	15
Robert Reynolds	Downstream Alternatives Inc.	IN	15
Will Wotthlie	Maryland Department of Agriculture	MD	15
Carol Fulmer	South Carolina Department of Agriculture	SC	20
Louis Straub	Fairbanks Scales Inc.	NC	20
F. Michael Belue	Belue Associates	AL	30

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