

# Announcement of a NIST Workshop

Co-sponsors:

**NIST** Mathematical & Computational Sciences Division (MCSD)

**NIST** Statistical Engineering Division (SED)

**DOD** Defense Modeling & Simulation Office (DMSO)

( More to be announced. )

1. Title: **V**erification & **V**alidation (**V&V**) of Computer Models for design and performance evaluation of **H**igh-consequence **E**ngineering **S**ystems

**V-1** (Mathematical Software Uncertainty Estimation)

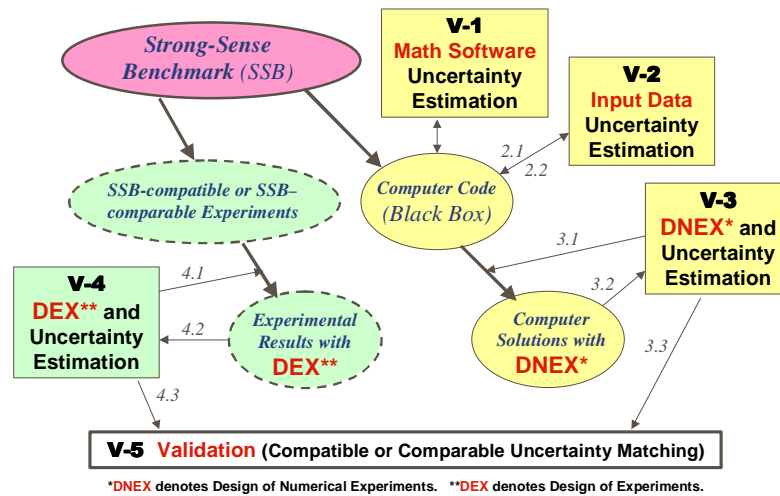
**V-2** (Input Data Uncertainty Estimation),

**V-3** (Design of Numerical Experiments & Uncertainty Estimation)

**V-4** (Design of Physical Experiments & Uncertainty Estimation), and

**V-5** (Validation by Compatible or Comparable Uncertainty Matching)

Fig. 1 A 5-Step Reference Benchmark Approach to V&V (after Fong, 2004)



New Information on Conference Logistics appears on Pages 2 & 7.

2. Dates: Monday, Nov. 8 (full-day), and Tuesday, Nov. 9 (half-day), 2004

3. Place: **National Institute of Standards and Technology (NIST)**  
100 Bureau Drive, Gaithersburg, MD 20899

4. Room: Lecture Room D, Admin. Bldg. (Capacity: 80, theater style)

5. Purpose: To help build confidence and reduce uncertainties in computational models of high-consequence engineering systems, NIST researchers have recently formulated a five-step metrology-based process (see Figs. 1 & 2) for the verification and validation (V&V) of those models. The implementation of this process begins with the collection of a large number of the so-called “strong-sense” benchmarks (SSBs), the choice of which is motivated by applications as well as the availability of theoretical solutions and experimental data.

In this one-and-one-half-day workshop, NIST researchers and invited participants from industry, government, and universities will examine the feasibility of the reference-benchmark-based methodology (see Fig. 1) through a series of invited talks and a group discussion of 25 carefully documented SSBs. A bound volume of 40 papers (estimated to run to about 560 pages) will be edited, printed, and distributed to each pre-registrant two weeks before the workshop.

6. Organizing Committee: **Jeffrey T. Fong**, NIST/MCSD, Chair  
Email: [fong@nist.gov](mailto:fong@nist.gov)  
Tel. (301) 975-8217

**Ronald F. Boisvert**, NIST/MCSD  
**James J. Filliben**, NIST/SED  
**Nell Sedransk**, NIST/SED  
**Simone Youngblood**, DOD/DMSO

7. NIST Conference Program Staff: **Kathy Kilmer** (301) 975-2858  
**Patrice Boulanger** (301) 975-3882  
**Teresa Vicente** (301) 975-3883  
**Angela Ellis** (301) 975-3881

8. NIST Policy on Registration:

*No on-site registration will be accepted for any conference held on NIST campuses and all attendees must be pre-registered. Photo identification must be presented at the main gate to be admitted to the conference. Attendees must wear their conference badge at all times while on the campus.*

9. Conference Listing: [http://www.nist.gov/public\\_affairs/confpage/conflist.htm](http://www.nist.gov/public_affairs/confpage/conflist.htm)
10. On-line Registration: After accessing the above website, click  
(effective Sep. 17, 2004) “On-Line Registration Form”.
11. Registration Fee: **U.S.\$ 125.00** per attendee. (Including two books, two coffee-breaks.)

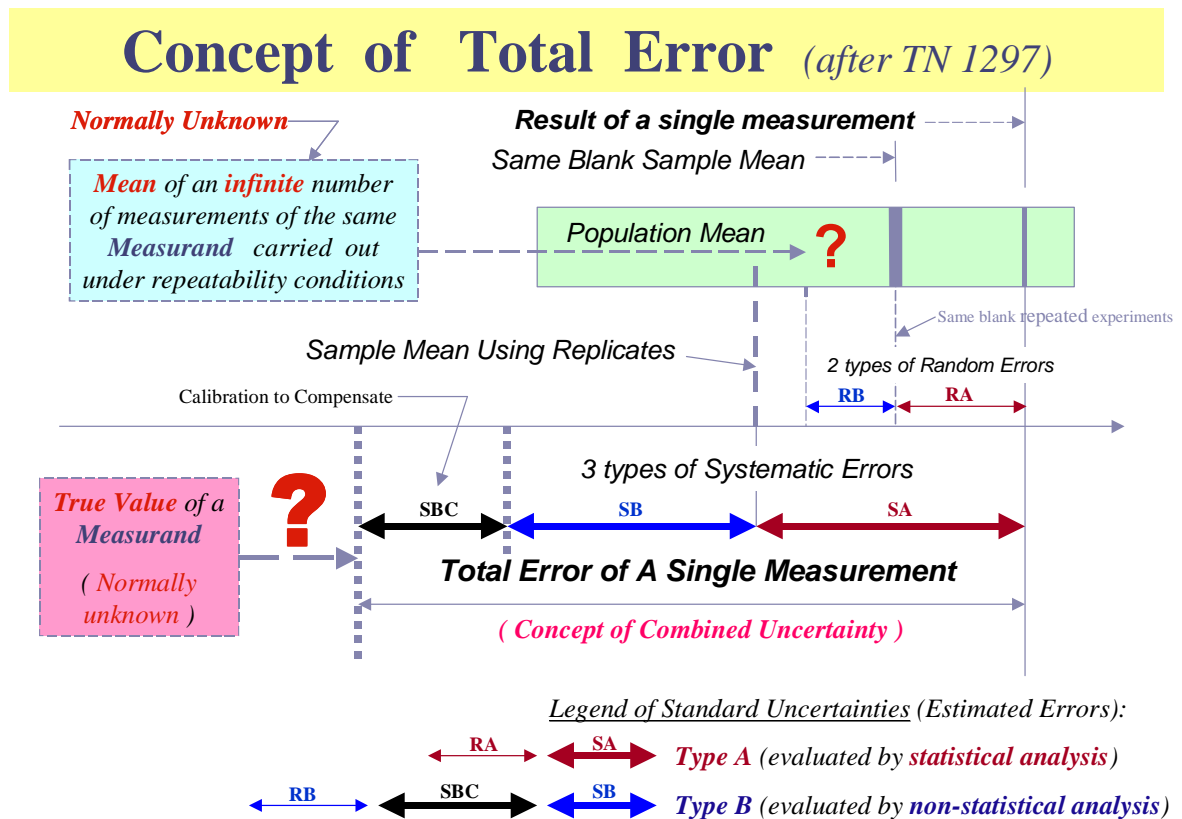


Fig. 2

## 12. Schedule of Events

- June 29, 2004 - Invitations to authors of workshop papers.
- Sep. 17, 2004 - Deadline for submission of 40 invited manuscripts.**
- Oct. 8, 2004 - Deadline of edited volume to **Printer** (200 copies, hard-cover). Preprints of each paper will be mailed to two invited discussers for written comments (due Oct. 29, 2004).
- Oct. 22, 2004 - Mailing of one copy of Workshop Book to each pre-registrant.
- Oct. 29, 2004 - Deadline for submission of 80 invited written discussions.**
- Nov. 3, 2004 - Compilation of unedited discussions in a soft-cover volume.
- Nov. 5, 2004 - Copies of Discussion Book ready for distribution on Nov. 8, 2004.
- Nov. 8, 2004 - Workshop opens at 11 a.m., with an optional Breakfast at NIST (7:30 - 8:30 a.m.), a NIST site tour (9 - 10:30 a.m.), a no-host Lunch in NIST Cafeteria (12:15 - 1:00 p.m.), and an optional Dinner Social sponsored by Stanford Mechanics (6:30-8:30 p.m.).**
- Nov. 9, 2004 - Workshop resumes at 8:30 a.m. and ends at 12:00 noon.**

## 13. Co-Editors of Workshop and Discussion Books:

**Jeffrey T. Fong**, NIST, and  
**Roland deWit**, Potomac, MD

14.	Program:	<b>Monday, Nov. 8, 2004</b> (Lecture Room D, Admin. Bldg., NIST)			
	7:30 - 8:30 a.m.	Breakfast at NIST Cafeteria.	<i>(Optional. No registration required.)</i>		
	9:00 - 10:30 a.m.	Tour of NIST site.	<i>(Optional. Registration required.)</i>		
					(Pages)*
	11:00 - 11:10 a.m.	Welcome Remarks .. ..	<b>Boisvert</b>		
	11:10 - 11:15 a.m.	Workshop Objectives .. ..	<b>Fong</b>		( 6 )*
	11:15 a.m. - 12:15 p.m.	<b>Verification, Validation, and Predictive Capability in Computational Engineering and Physics ..</b>	<b>Oberkampf</b>		( ~30 )*
	12:15 - 1:00 p.m.	Lunch at NIST Cafeteria.	<i>(Optional.)</i>		
	1:00 - 1:30 p.m.	<b>Statistics in Metrology .. ..</b>	<b>Sedransk</b>		( ~20 )*
	1:30 - 2:00 p.m.	<b>A Reference-Benchmark Approach to V&amp;V ..</b>	<b>Fong</b>		( ~30 )*
	2:00 - 2:30 p.m.	<b>Measuring Error in Mathematical Computations ..</b>	<b>Lozier</b>		( ~20 )*
	2:30 - 3:00 p.m.	<b>FEA Code Verification with a Single Pre-Processor..</b>	<b>Rainsberger</b>		( ~20 )*
	3:00 - 3:10 p.m.	Session Break			
	3:10 - 3:40 p.m.	<b>Design of Numerical Experiments (DNEX) ..</b>	<b>Filliben</b>		( ~30 )*
	3:40 - 4:00 p.m.	<b>Bayesian Approach to Combining Results from Multiple Methods ..</b>	<b>Liu</b>		( ~20 )*
	4:00 - 4:15 p.m.	An Example on V-1 (Math Software Verification)...	<b>deWit</b>		(10)*
	4:15 - 4:30 p.m.	An Example on V-2.1 (Input Data-Material Properties) ..	<b>Fields</b>		(10)*
	4:30 - 4:45 p.m.	An Example on V-2.2 (Boundary & Initial Data) ..	<b>Bernstein</b>		(10)*
	4:45 - 5:00 p.m.	An Example on Validation by Uncertainty Matching ..	<b>Fong</b>		( ~20 )*
	6:30 - 8:30 p.m.	Dinner Social. <i>(Sponsored by Stanford Mechanics Alumni Club. Optional. Registration required.)</i>			

**Tuesday, Nov. 9, 2004** (Lecture D, Admin. Bldg., NIST, Gaithersburg, MD)

	7:30 - 8:30 a.m.	Breakfast at NIST Cafeteria.	<i>(Optional. No registration required.)</i>		
	8:30 - 9:00 a.m.	Introduction of a Compilation of 25 Strong-Sense Benchmarks ( see list of SSBs on page 5 )..	<b>Fong</b>		( 250 )*
	9:00 - 9:45 a.m.	<b>Uncertainty and Sensitivity Analysis for Models of Complex Systems .. ..</b>	<b>Helton</b>		( ~20 )*
	9:45 - 10:30 a.m.	<b>A History and Perspective of V&amp;V in ASME &amp; AIAA ..</b>	<b>Freitas</b>		( ~20 )*
	10:45 - 11:30 a.m.	<b>Uncertainty of Computer Model using Decision Theory ..</b>	<b>Wortman</b>		( ~20 )*
	11:30 - 11:55 a.m.	Questions, Answers, and General Discussion	All		
		<i>Front &amp; Back of Workshop Book (index, etc.)</i>	<i>Editors</i>		(24)*
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		Total number of pages in Workshop Book (15 papers + 25 benchmarks)..	..	..	( ~560 )*

\*Estimated Length.

## 15. List of 25 Strong-Sense Benchmarks

<u>I.D. No.</u>	<u>Author(s)</u>	<u>Tentative Title of a Strong-Sense Benchmark</u>
00 (NIST-3)	Fong, Filliben, Fields, Bernstein	Compressive Failure of a Single-Floor Grillage on Fire
01 (NASA-2)	Abramson, Dodge, Green	Inertia Wave Fluid Motions in a Spinning Tank
02 (NSF-6)	Bernstein, Fong, Tang, Brinson	Adiabatic Tensile Creep Test of a Nonlinear Visco-elastic Material.
03 (NSF-3)	Brinson, Fong, Bernstein	Adiabatic Stress Relaxation Test of a Linear Visco-elastic Material.
04 (NRC-1)	<b>Chen</b>	<b><u>Dynamic Penetration Tests on Fractured Rocks</u></b>
05 (NASA-1)	<b>Chocron, Walker</b>	<b><u>CAIB &amp; Return to Flight Damage Test</u></b>
06 (DOE-1)	<b>Colton, Florence</b>	<b><u>Flexible Core Barrel in a Pressurized Steel Vessel</u></b>
07 (NSF-1)	deWit, Fong	Bending of a Cantilever Beam
08 (DOD-3)	Dzwilewski, Sandstrom	Shock Initiation of Explosives in a 1-D Planar Geometry
09 (NIST-2)	Fields, Fong, Tang, Bernstein	Adiabatic Tensile Creep Test of a Visco-plastic Material
10 (NIST-5)	Fong, Tabiei, Koebbe, Filliben	<b><u>Collapse of a 7-Story Box Impacted at 6<sup>th</sup> Floor</u></b>
11 (DOD-2)	<b>Gran, Senseny, Schwer</b>	<b><u>Combined Loading of Reinforced Concrete Columns</u></b>
12 (DOT-3)	Kanninen	Dynamic Crack Propagation in a Pressurized Pipeline
13 (NIST-4)	Koebbe, Fong, Filliben	Collapse of a Two-Floor Steel Grillage on Fire
14 (DOE-2)	<b>Nickell</b>	<b><u>Nuclear Waste Container Impact Resistance Test</u></b>
15 (DOE-3)	<b>Roy, Oberkampf</b>	<b>A Test Case in Compressible Aerodynamics.</b>
16 (DOT-1)	<b>Smith</b>	<b><u>Burst Test of Flawed Gas Cylinders</u></b>
17 (NRC-2)	<b>Steele</b>	<b><u>Local Stresses in Cylinder-Nozzle Intersections</u></b>
18 (NIST-1)	Swindeman, Fong, Bernstein, Fields	Adiabatic Stress Relaxation Test of a Visco-plastic Material
19 (NSF-4)	Tabiei, Fong, Brinson, Bernstein	Adiabatic Tensile Creep Test of a Linear Visco-elastic Material
20 (NSF-2)	Tang, Fong, Fields, Bernstein	Adiabatic Tensile Test of an Elastic-plastic Material
21 (NASA-3)	Thacker	Crushing of a thin stainless steel sphere between two frictionless rigid platens
22 (NSF-5)	Venerus, Fong, Bernstein, Brinson	Adiabatic Relaxation Test of a Nonlinear Visco-elastic Material
23 (DOT-2)	Wierzbicki	A 3-D Fracture Test Specimen under Combined Loadings
24 (DOD-1)	<b>Yatteau, Dzwilewski</b>	<b><u>Transverse Impact of Long Rod on Thin Plate</u></b>

Legend: **Benchmark** underlined in Bold appears in a June 2004 NIST Proposal on V&V to DOD, DOE, DOT, etc.

**Benchmarks color-coded in pairs** denote two different tests for a material with time-dependent mechanical properties (e.g., visco-elastic, visco-plastic, BKZ, etc.)

**Benchmark in green** denotes a test for a material with time-independent properties (e.g., elastic-plastic.)

## NIST Software Technologies and Standards (\*)

NIST works in several areas to create software development and analysis tools, testing technologies, and standards:

- **Software quality.** NIST is developing models, methods, and tools for tracing software processes to variables and resources, helping industry to improve the quality of software development and maintenance. Topics include formal methods, semantic correctness, performance assessment, and benchmarking.
- **Software analysis.** NIST researchers are developing tools for static and dynamic software analysis, focusing on measuring conformance to specifications and diagnosing causes of deviations from specifications. Initial R&D will be conducted on static analysis tools for program slicing, generating testing paths, and on object classes to detect pre- and post-condition violations in Web applets. NIST is developing experimental software designs and standard reference software with known errors for measuring the effectiveness of software development and testing methods.
- **Software assurance.** NIST provides technologies to produce high integrity, affordable software for productive use. NIST will provide guidance to establish fundamental life cycle processes to develop and maintain quality software and advanced development, evaluation, and measurement technologies to address specific assurance problems.
- **Conformance Testing.** NIST is development performance testing scenarios, testing procedures, and test suites to help industry, the user community, and testing laboratories with conformance standards testing. NIST works with other standards organizations to capture and incorporate conformance criteria early in the test cycle.
- **Software standards.** NIST makes technical contributions to standards-making bodies, representing the interests of the Federal user community, and serves as liaison with standards committees. NIST developed and maintains the online retrieval system for Federal Information Processing Standards (FIPS).

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(\*) as described in an April 1999 White-House mandated report by the Subcommittee on Computing, Information, and Communications R&D of the Committee on Technology, National Science and Technology Council, entitled "Information Technology Frontiers for a New Millennium: High Performance Computing and Communications," p. 63.

(<http://www.itrd.gov/pubs/blue00/BlueBook2000.pdf>)

# A Non-Binding Expression of Interest (\*)

in attending the

NIST Workshop on V&V of Computer Models, Nov. 8-9, 2004

Date: \_\_\_\_\_, 2004

To: Dr. Jeffrey T. Fong  
Mathematical & Computational Sciences Division  
National Institute of Standards & Technology  
100 Bureau Drive, M.S. 8910  
Gaithersburg, MD 20899-8910

From: \_\_\_\_\_

Mailing Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Daytime Phone No.: \_\_\_\_\_ Email Address: \_\_\_\_\_

Messages ( Please check where appropriate ) :

- Yes, I am interested in attending the NIST V&V workshop on Nov. 8-9, 2004. I understand I must pre-register using an on-line form and there is a registration fee of \$125.00 per person to cover the cost of two workshop proceedings volumes and two breaks.
- Yes, I am interested in taking a no-cost tour of the NIST site on Nov. 8 between 9 a.m. and 10:30 a.m. The tour will stop at **a descendent of the Newton's apple tree, the World Trade Center damaged steels, and the new \$240M Advanced Measurement Laboratory.**
- Yes, I am interested in attending the optional dinner and social program on Mon., Nov. 8, 2004 between 6:30 p.m. and 8:30 p.m. Please send me a separate registration form with cost information. I understand that I have the option to bring an accompanying guest if I attend.
- Thanks for your invitation. Unfortunately, I am unable to decide whether to attend. Please keep me informed of your future activities.
- I am from out-of-town. Please send me information on hotel & local transportation info.**

(\*) An email response, also non-binding, to [fong@nist.gov](mailto:fong@nist.gov) will be equally appreciated. If you have already sent us the form, you must still pre-register using the "On-Line Registration Form" (see Page 2).