Applications of Nanotechnology for Safe and Sustainable Environmental Remediations

Nano-4-Rem

ANSSERs

Opportunities to Harness Nanoinformatics for Impact in Environmental Remediation

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The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

Our Nano-4-Rem Premise

We can ***identify and address*** ***the occupational and non-occupational hazards and opportunities of engineered nanomaterials in environmental remediation*** through a

Knowledge Infrastructure

https://nanohub.org/groups/nano4rem

Grass roots involvement in our community of practice is required!

A key community connection

You are invited to participate in the community-based Nanoinformatics 2020 Roadmap.

A key federal connection

Nano.gov
U.S. National Nanotechnology Initiative

www.nano.gov/NKIPortal

Our Approach

Define *Nanoinformatics: Principles and Practices*

***Who** we are … (Leaders, Cultures, Systems)*

***What** we are trying to accomplish …*

***When** we are taking action …*

***Where** we are involved …*

***Why** we taking specific actions …*

***How** we are defining and meeting our goals …*

This is a work in progress …

A Matrix View of "Who we are" and "What we need"

	Workers	Health and safety practitioners	Managers	Policy makers and regulators	Equipment and facility providers	Materials suppliers	Financiers	Insurers	Legal community	Researchers	Educators	Students	Emergency Responders	Media	Consumers	Society
Literacy and Critical Thinking Skills																
Real Life Examples																
Understanding (not rote application)																
Continuous Improvement Modeling and Sharing																
Assessment																

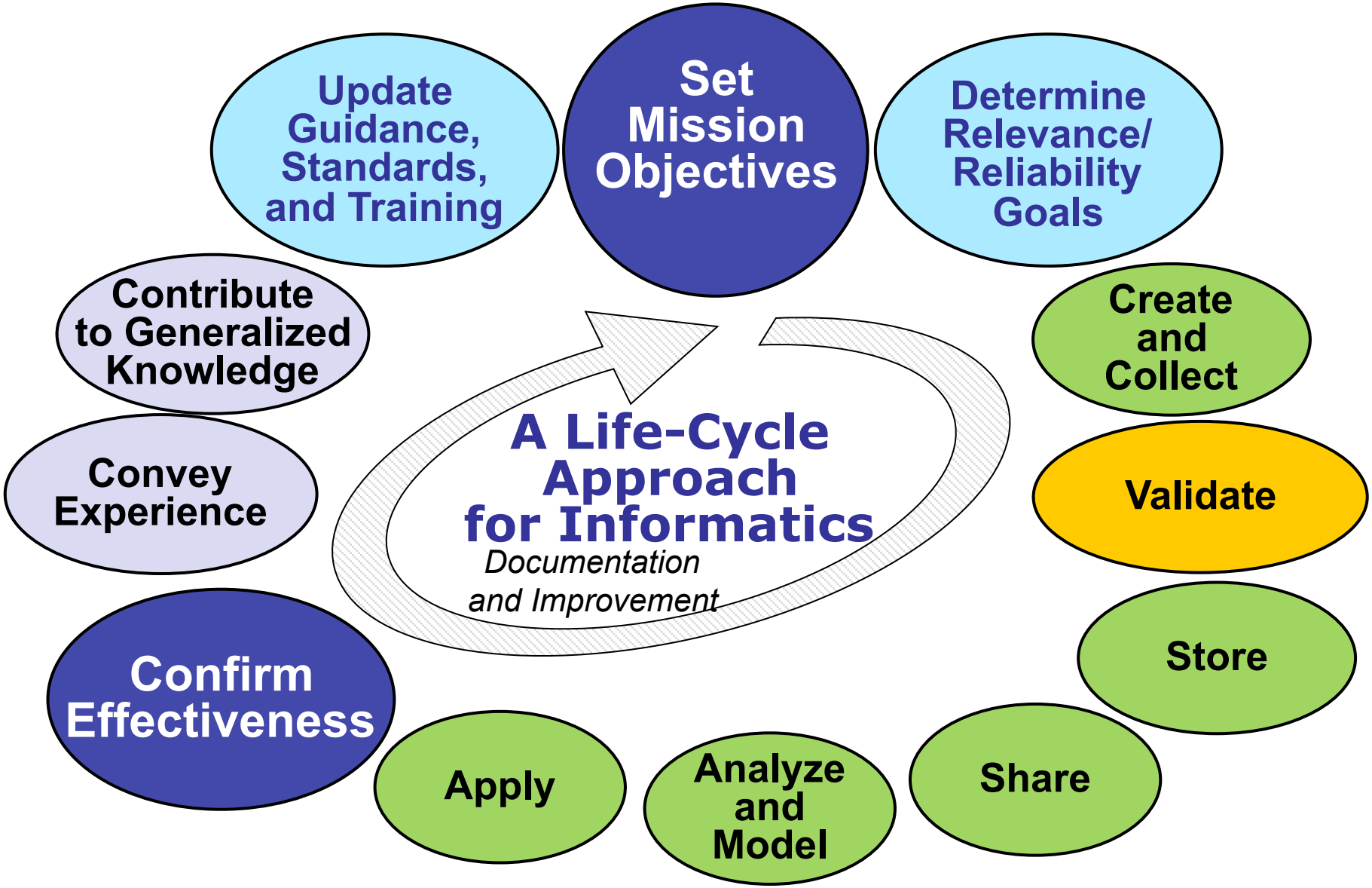
Specific messaging and actions in each element of the matrix must be based on (a) what knowledge and understanding each stakeholder needs and (b) what knowledge and understanding each stakeholder can provide.

A Working Definition of Nanoinformatics

- The ***science and practice*** of determining ***which information is relevant*** to meeting objectives of the nanoscale science and engineering community,
- and then developing and implementing effective mechanisms
- to *collect, validate, store, share, analyze, model, and apply the information, and then to confirm achievement of the intended outcome* from use of that information,
- and then *conveying experience to the broader community, contributing to generalized knowledge, and updating standards and training*.

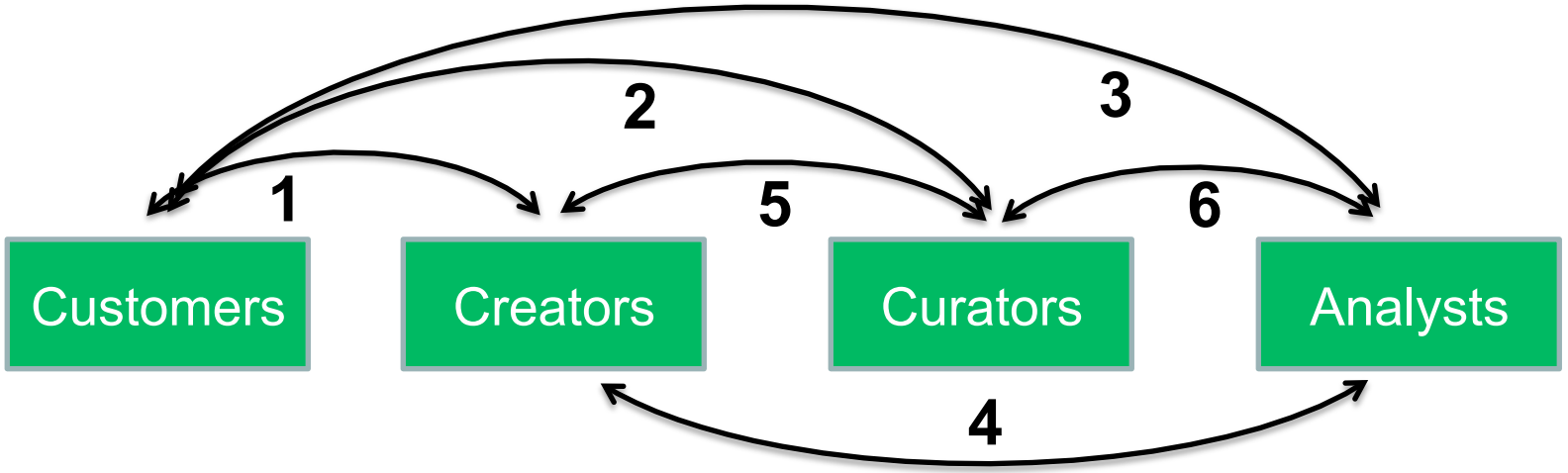
Adapted from http://www.internano.org/nanoinformatics/

A Sensible, Sustainable Life Cycle



Each step must be tailored to our mission.

Informatics Roles and Responsibilities

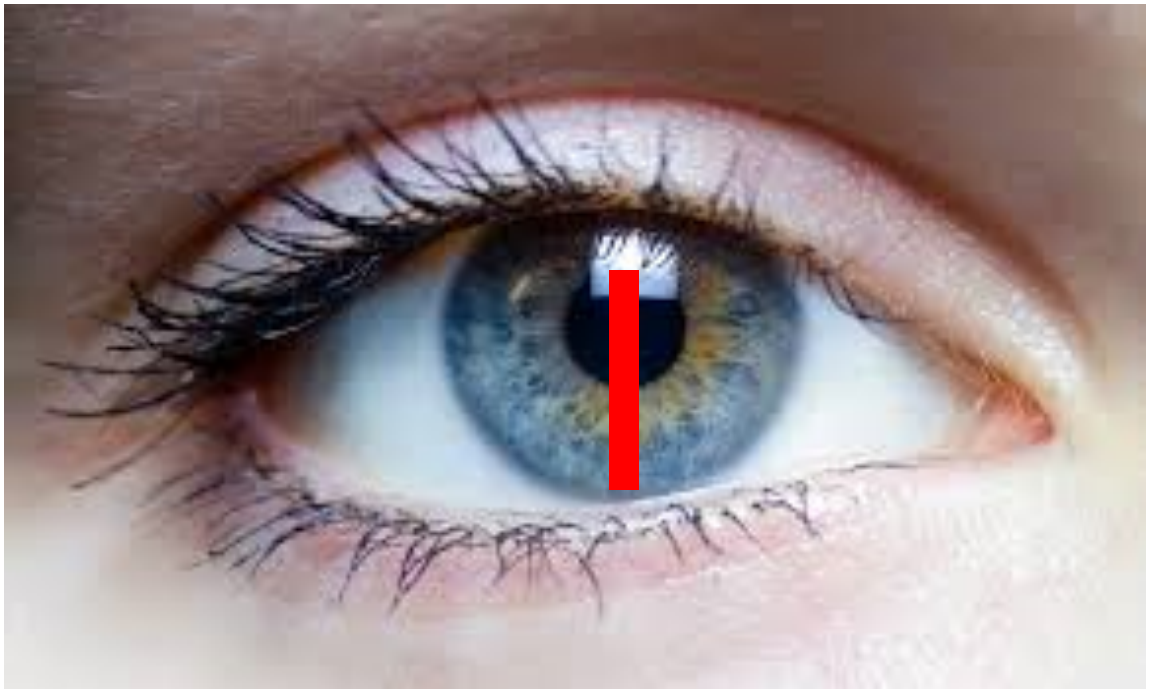


	Set Mission Objectives	Determine Relevance	Collect	Validate	Store	Share	Analyze and Model	Apply	Confirm Effectiveness	Convey Experience	Generalize	Update Guidance
Customers	X	X						X	X	X	X	X
Creators		X	X	X					X			X
Curators		X		X	X	X			X			X
Analysts		X		X			X		X		X	X

Communication and understanding are essential at all steps.

INFORMATICS 4 IMPACT

A critical point of view



*The "**I** "s are in the eye of the beholder.*

One size does not fit all...

INFORMATICS 4 IMPACT

An implementation example

- ***Identify*** mission objectives and information needs
- ***Initiate*** a plan to gather, examine, and evaluate that information
- ***Investigate*** to detect, collect, and inspect the relevant information
- ***Incorporate*** findings and conclusions into everyday practices to beneficially impact workers, consumers, and communities
- ***Improve*** by confirming outcomes and making adjustments as needed

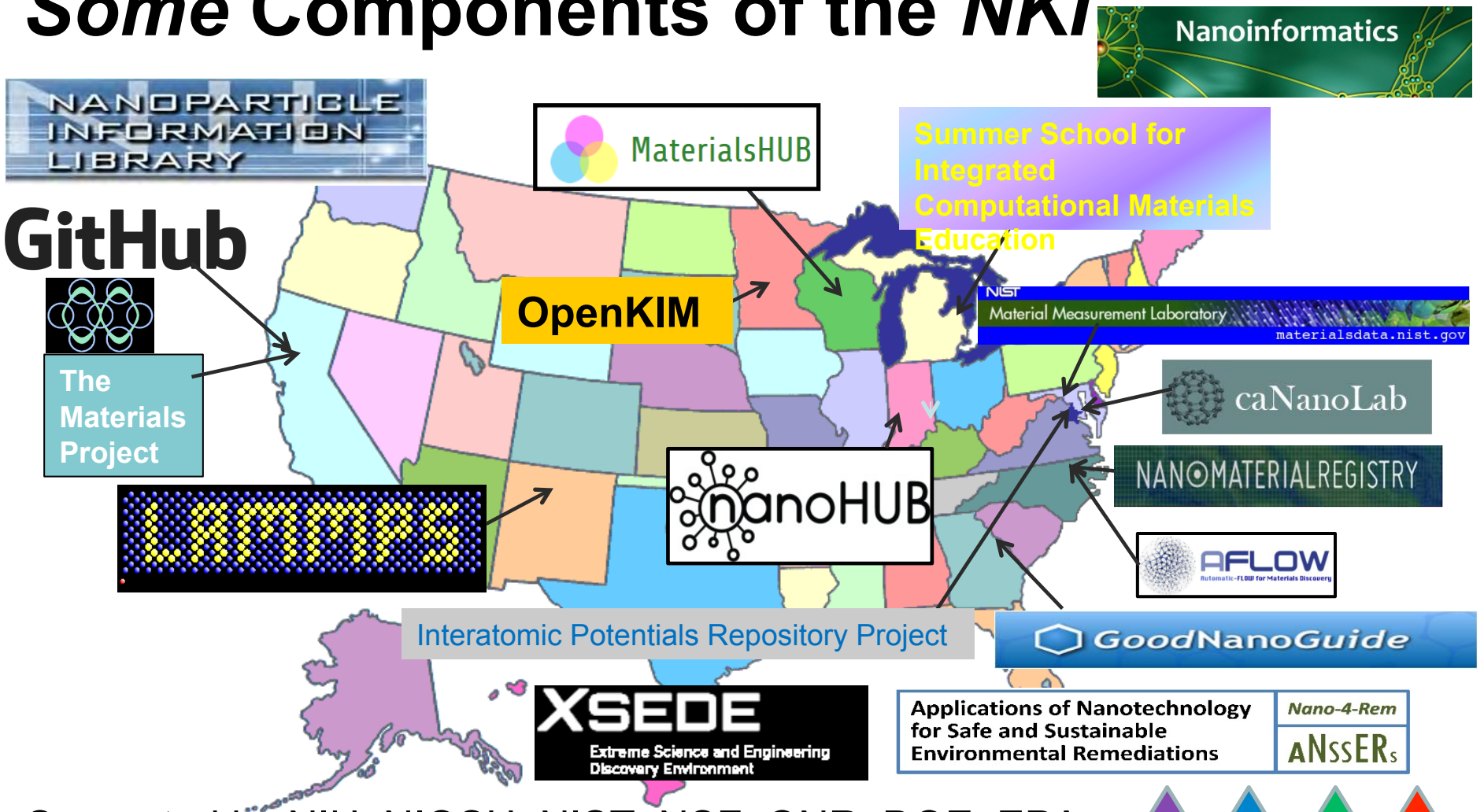
One size does not fit all...

*The "**I** "s are in the eye of the beholder.*

We basically need to Plan, Do, Check, Adjust.

Opportunities to Partner

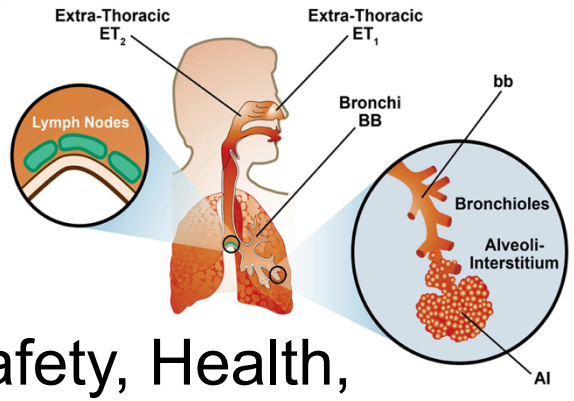
Some Components of the *NKI*



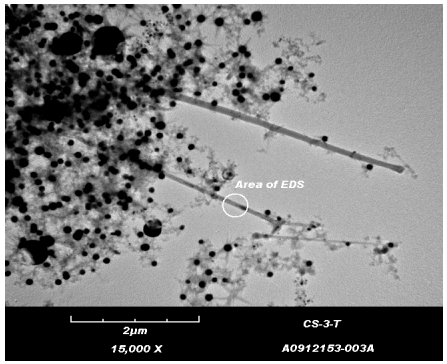
- Supported by NIH, NIOSH, NIST, NSF, ONR, DOE, EPA …

A wide array of nanoinformatics activities are already underway.

A Convergence for Information Sharing



Safety, Health, Well-being, and Productivity



Nanotechnologies

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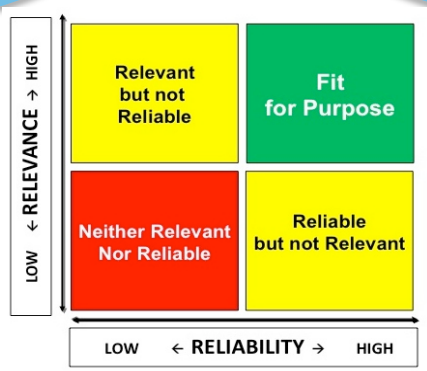

Risk Management

Focus on the Convergence = Focus on Success.

Four Steps for Community Action

to build and sustain **leaders, cultures, and systems** for **safety, health, well-being, and productivity**

Thank you for partnering with Nano-4-Rem for impact.

Questions ?

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Example initiative for Data Readiness Levels

Concept for Expressing Data Maturity

DRL:	Data Readiness Level
0	Invalid data
1	Raw or unscaled data
2	Scaled data
3	Scaled data with defined precision or noise level
4	Scaled data with defined precision and noise levels, but not related to the larger body of scientific knowledge
5	DRL 4 data related to the larger body of scientific knowledge, but with measurement uncertainty too large for data standards
6(X)	Standards-quality data of X % measurement uncertainty

Readiness level is application-dependent.

Data Readiness Levels

Summary of DRLs Versus Data Attributes

Attribute	DRL 0	DRL 1	DRL 2	DRL 3	DRL 4	DRL 5	DRL 6
Units		maybe	yes	yes	yes	yes	yes
Precision and Noise				either	both	both	both
Independent Confirmation				possibly	yes	yes	yes
Related to Larger Body of Scientific Knowledge					no	yes	yes
Measurement Uncertainty					specula-tive	high	low
Example or use	little to none	unscaled sensor data	scaled sensor data	scaled data; noise levels defined	major scientific advances	coarse validation of theory	theory refinement and methods validation

Data attribute details are application-dependent.