

Some thoughts on our progress in defining and advancing nanoinformatics

Nano WG discussion

November 1, 2018

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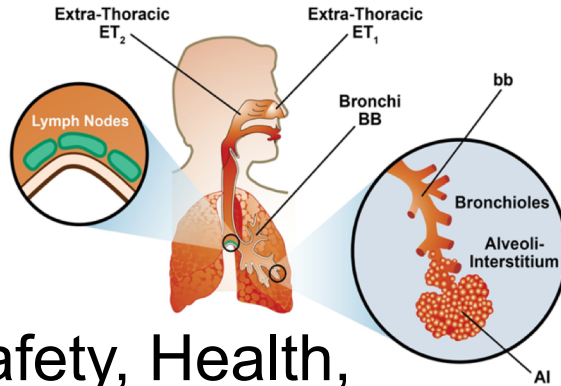
(Jan 1, 2019)

The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of his organization.

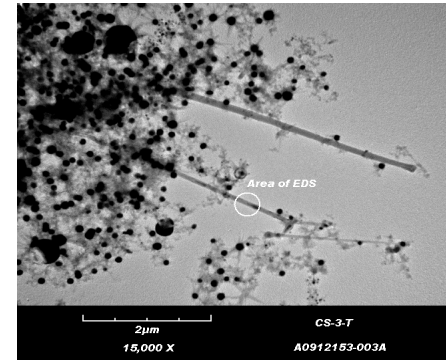
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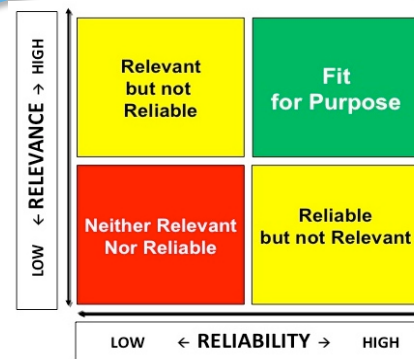
Our Goal is to foster Robust Decisions to Reduce Risk and Maximize Societal Benefit



Safety, Health,
Well-being, and
Productivity



Emerging
Technology



Risk Management

An Informatics Approach - Our 'nano' Working Definition

- The **science and practice** of **setting relevant objectives** and determining **which information is relevant** to protecting worker safety, health, well-being, and productivity,
- 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 finally **conveying experience to the broader community, contributing to generalized knowledge, and updating standards and training.**

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

and Hoover et al. 2015

Some Interdisciplinary Citations that shared our Nanoinformatics Message

- Maiello, M.L. and M.D. Hoover (editors), *Radioactive Air Sampling Methods*, CRC Press, Boca Raton, FL, 2010.
- de la Iglesia, D., S. Harper, M.D. Hoover, F. Klaessig, P. Lippell, B. Maddux, J. Morse, A. Nel, K. Rajan, R. Reznik-Zellen, M.T. Tuominen. *Nanoinformatics 2020 Roadmap*, 2011. <http://eprints.internano.org/607/>.
- Hoover, M.D., L.J. Cash, S.M. Mathews, I.L. Feitshans, J. Iskander, and S.L. Harper: 'Toxic' and 'Nontoxic': Confirming Critical Terminology Concepts and Context for Clear Communication, in *Encyclopedia of Toxicology*, 3rd edition (P. Wexler, ed), Elsevier, Oxford, Vol. 4, pp. 610–616, 2014.
- Hoover, M.D., D.S. Myers, L.J. Cash, R.A. Guilmette, W.G. Kreyling, G. Oberdörster, R. Smith, J.R. Cassata, B.B. Boecker, and M.P. Grissom. Application of an informatics-based decision-making framework and process to the assessment of radiation safety in nanotechnology, *Health Phys J.*, 108(2): 179-194, 2015.
- Hoover, M.D., D.S. Myers, L.J. Cash, R.A. Guilmette, W.G. Kreyling, G. Oberdörster, R. Smith, and M.P. Grissom: *Radiation Safety Aspects of Nanotechnology*. NCRP Report No. 176, National Council on Radiation Protection and Measurements, Bethesda, MD, 2017.

Shared Message Citations (continued)

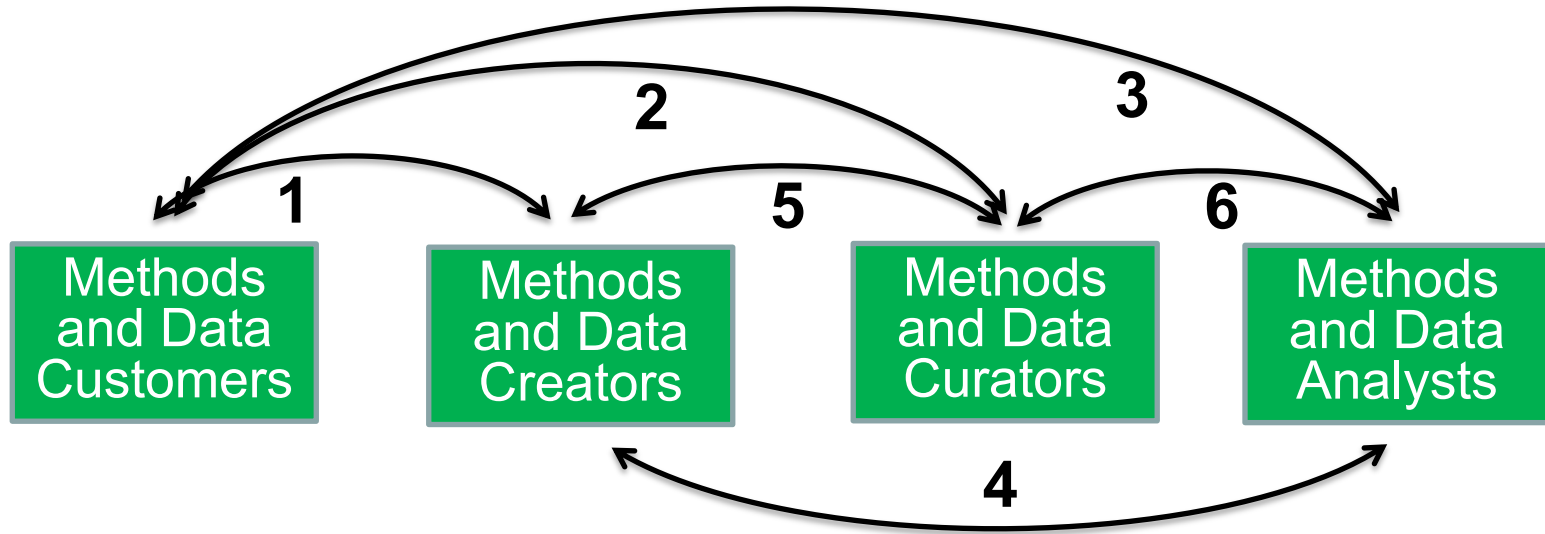
- Woodall, G.M. et al.: **Interpreting Mobile and Handheld Air Quality Sensor Readings in Relation to Air Quality Standards and Health Effect Reference Values: Challenges and Promising Tools**, *Atmosphere*, 8(10):182, 2017.
- Hoover, M.D. and L.J. Cash: **Plutonium Aerosol Informatics: Update on Understanding, Communicating, and Managing Radiation Safety in Plutonium Science**, *Health Phys. J.* 115(1): S99-S100, 2018.
- Hoover, M.D. and L.J. Cash: **Plutonium Aerosol Informatics: Update on Understanding, Communicating, and Managing Radiation Safety in Plutonium Science**, In *Proc. Plutonium Futures: The Science 2018*, American Nuclear Society, La Grange Park, IL, in press.
- Hoover, M.D., L.J. Cash, I.L. Feitshans, C.O. Hendren, and S.L. Harper. **A Nanoinformatics Approach to Safety, Health, Well-being, and Productivity**, Chapter 5, in *Nanotechnology Environmental Health and Safety: Risks, Regulation, and Management*, 3rd edition, M.S. Hull and D.M. Bowman, eds, Elsevier, Oxford, 2018.
- Hoover, M.D. and L.J. Cash. **Plutonium Aerosol Characterization and Safety Issues**, in *The Plutonium Handbook*, 2nd edition, D.L. Clark, D.A. Geeson, and R.J. Hanrahan, Jr., eds, American Nuclear Society Press, La Grange Park, IL, in press.

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.

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

Thoughts on getting the right things done right

- If money is being spent to reduce an already minuscule risk, while larger risks are going unaddressed, **that is not only foolish; it is in effect an unsafe act.**

Kaplan, Stan (1991) Risk Assessment and Risk Management – Basic Concepts and Terminology. In Risk Management: Expanding Horizons in Nuclear Power and Other Industries. R.A. Knief, V.B. Briant, R.B. Lee, R.L. Long, and J.A. Mahn, eds., Hemisphere Publishing, New York.

- The ***method*** is not the message; [the message] is in the ***managerial frame of mind determined*** to make ***robust decisions***.

Zebroski, E.L. (1991) Lessons Learned from Man-Made Catastrophes. In Risk Management: Expanding Horizons in Nuclear Power and Other Industries. R.A. Knief, V.B. Briant, R.B. Lee, R.L. Long, and J.A. Mahn, eds., Hemisphere Publishing, New York.

Two Theorems on Communication

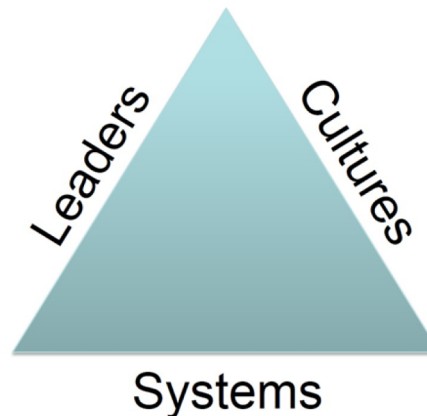
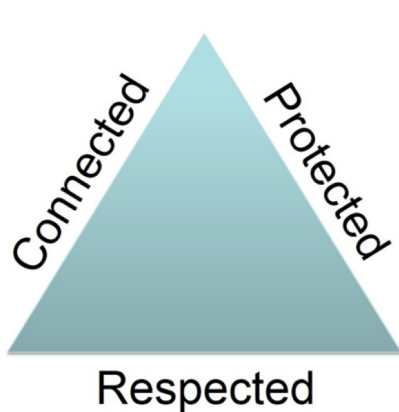
Theorem 1: *50% of the problems in the world result from people using the same words with different meanings.*

Theorem 2: *The other 50% come from people using different words with the same meaning.*

Kaplan, Stan (1991) Risk Assessment and Risk Management – Basic Concepts and Terminology. In Risk Management: Expanding Horizons in Nuclear Power and Other Industries. R.A. Knief, V.B. Briant, R.B. Lee, R.L. Long, and J.A. Mahn, eds., Hemisphere Publishing, New York.

How to Get *the Right Things Done Right*

- **Make it easier for everyone to get the right things done right for the health of individuals, organizations, and society**
- **by helping to build and sustain connected, protected, and respected communities**
- **of leaders, cultures, and systems that have all the tools, training, and experience needed**
- **to anticipate and recognize hazards, evaluate exposures, and control and confirm protection from risks to safety, health, well-being, and productivity**
- ***in all the places we live, learn, work, and play.***

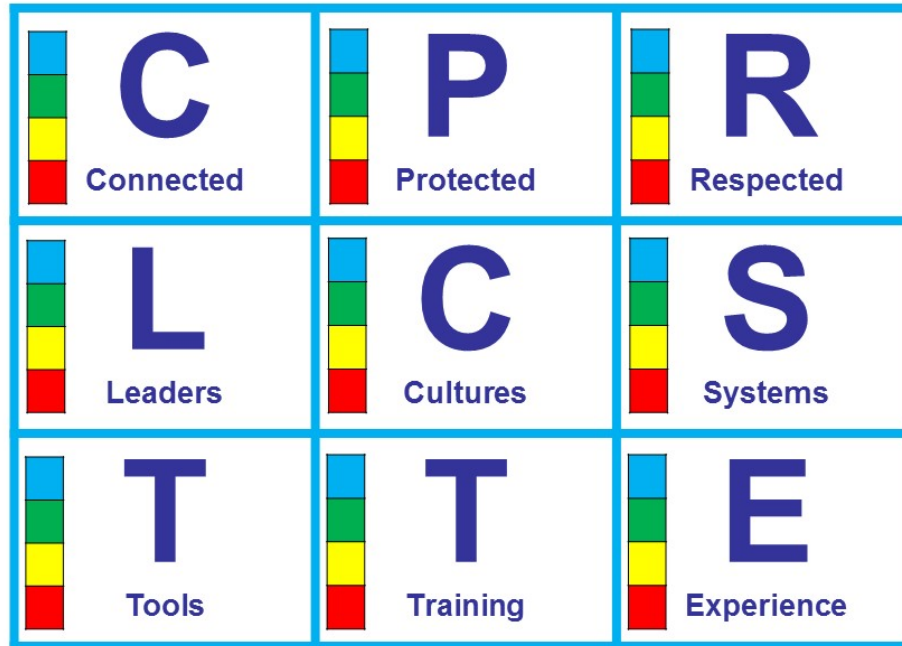


They must be built and sustained.

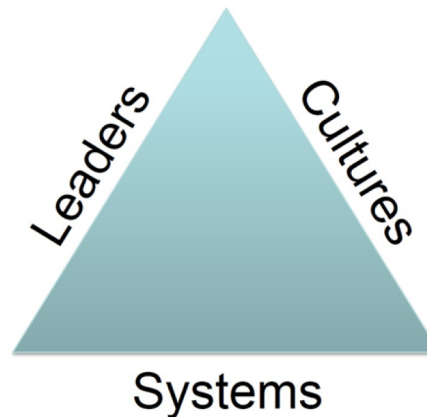
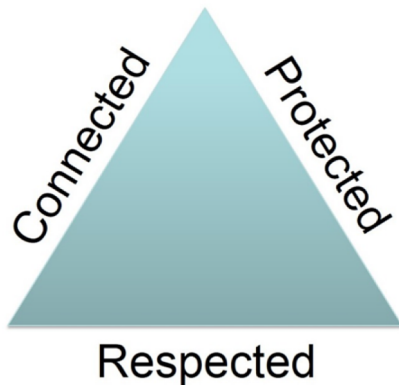
A Right Things Done Right *report card*:

Understanding, communicating, and managing risks to safety, health, well-being, and productivity

What's impressive?
What's improving?



What's detracting?
What's destroying?



They must be built and sustained.

How can we make it easier for everyone to get the right things done right?

How should we tailor our outreach and engagement?

- Conferences
- Publications
- Work groups
- Interdisciplinary collaborations (like nano OESH and nanomedicine)
- Wikipedia opportunities
-

An additional opportunity for us

WIKIJOURNALS



WikiJournal User Group

Open access • Publication charge free • Public peer review

[Ethics statement](#)

[Future](#)

[About](#)

[Journals](#) ▼

[Resources](#) ▼

The WikiJournal User Group publish a set of open-access, peer-reviewed academic journals with no publishing costs to authors. Its goal is to provide free, quality-assured knowledge. Secondly, it aims to bridge the Academia-Wikipedia gap by enabling expert contributions in the traditional academic publishing format to improve Wikipedia content.

WikiJournal of Medicine

Medicine and biomedicine (Flagship)

WikiJournal of Humanities

Business, law, social sciences and history

WikiJournal of Science

Science, engineering, technology and mathematics

WikiJournal Preprints

Content under peer review or still being drafted

Discussion forums

Discussion of the projects is encouraged. The forum for the publishing group is [here](#), and each journal has its own additional discussion page.

The journal group is also currently applying to be a [Wikimedia Foundation Sister Project](#). This would give greater control over the workings and formatting of the site, as well as a dedicated domain name.

How might we get involved more?

- Become familiarized with the Wiki Journals and consider publishing
- Consider encouraging our colleagues to take training or contributing to Wikipedia
- Consider disseminating this effort among our partners and in particular those in Universities to try to the platform from the Wiki Education Foundation <https://wikiedu.org/>
- Join the WikiProject on occupational safety and health and post a request
[https://en.wikipedia.org/wiki/Wikipedia:WikiProject Occupational Safety and Health](https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Occupational_Safety_and_Health)
- Contact the NIOSH resident wikipedian John Sadowski (jsadowski@cdc.gov) for more information.
- Consider promoting an editing workshop (Edit-a-thon). NIOSH staff have been involved in promoting events or contributing edits and they can share their experiences



NIOSH Science Blog

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Search for:

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Expanding and Improving Occupational Safety and Health Content in Wikipedia. It Matters.

Posted on July 23, 2018 by Max Lum, Thais C. Morata, James Hare, and John P. Sadowski



NIOSH is one of the first US federal agencies to collaborate with the Wikimedia organizations and it is doing so by actively contributing data and the latest research to help improve the health of the population. NIOSH's effort involves examining mechanisms to help make sure that the occupational safety and health information that reaches Wikipedia's millions of readers is complete, up-to-date, and free of errors.

The January 2017 NIOSH eNews *article* [Reaching Our Audience Where They Are: Our Work with Wikipedia](#) describes the motivation behind NIOSH's efforts to expand and improve occupational safety and health content in Wikipedia. Wikipedia

<https://blogs.cdc.gov/niosh-science-blog/2018/07/23/osh-wikipedia/>



WIKIPEDIA
The Free Encyclopedia

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Wikipedia:WikiProject Occupational Safety and Health

From Wikipedia, the free encyclopedia

A WikiProject dedicated to improving Wikipedia content on occupational safety and health.

https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Occupational_Safety_and_Health



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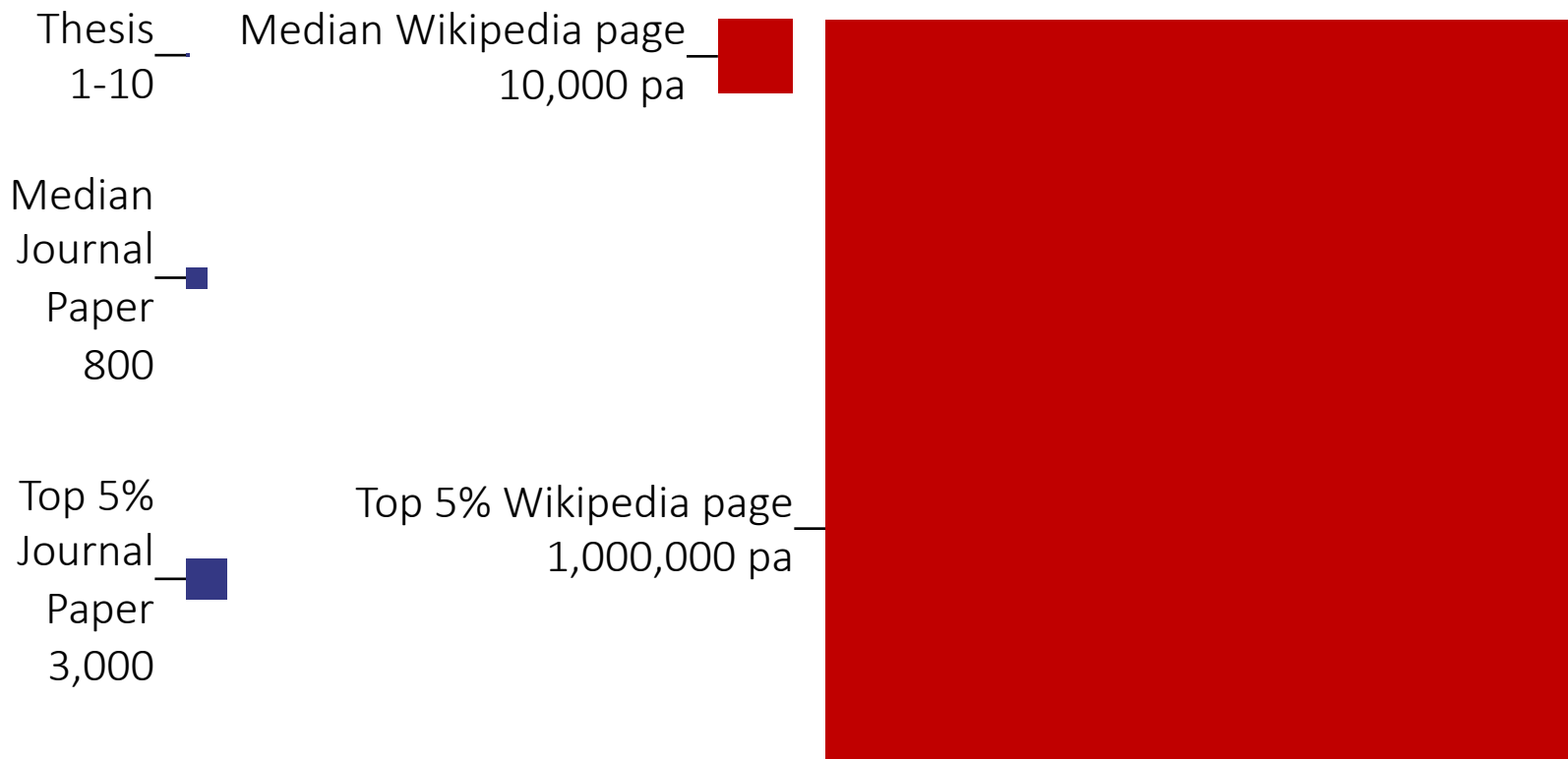
[Resources](#)



[Showcase](#)



WHO READS WIKIPEDIA?



ARTICLE QUALITY: EXTERNAL REVIEW

- Quality comparable to encyclopedia Britannica even back in 2005
- Accuracy varies by topic, but broad trends:
 - Inconsistent coverage
 - Missing / out of date information
 - Missing illustration
 - Difficult readability
- Accuracy has immediate, real-world impact
 - Internet medical data influences the healthcare decisions of >50% of readers
 - Many articles are read a million times per year
- Yet it has been consistently difficult to engage academics, experts and health professionals

The New York Times

MEDIA

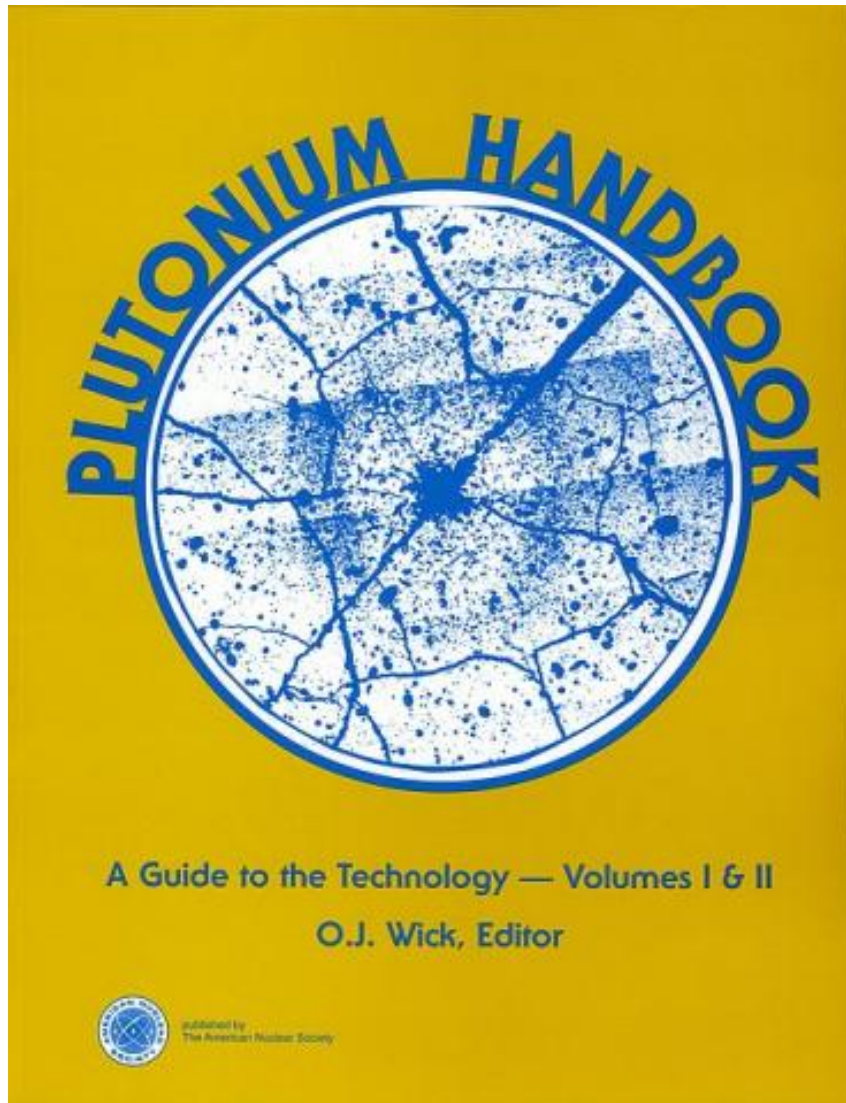
Wikipedia Emerges as Trusted Internet Source for Ebola Information

By NOAM COHEN OCT. 26, 2014

Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

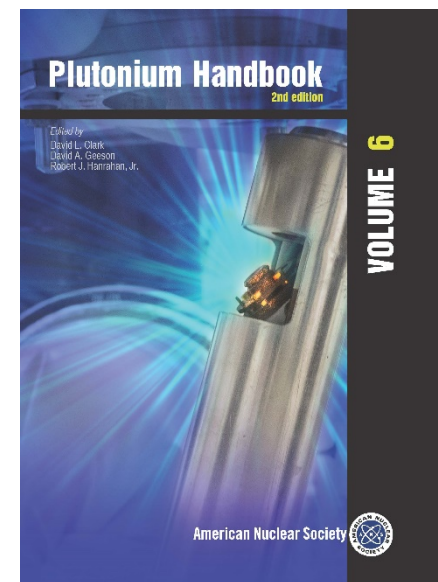
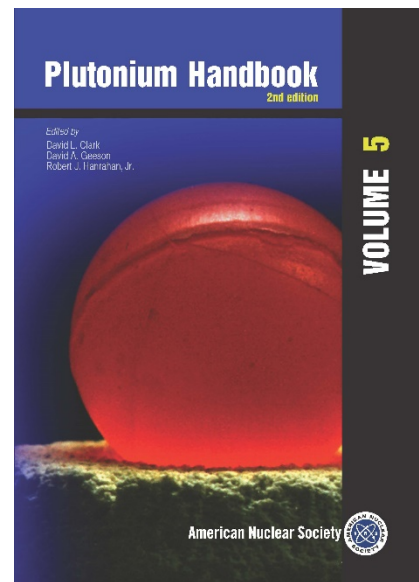
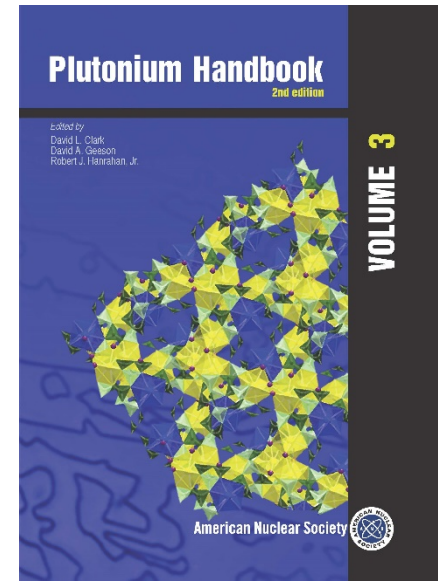
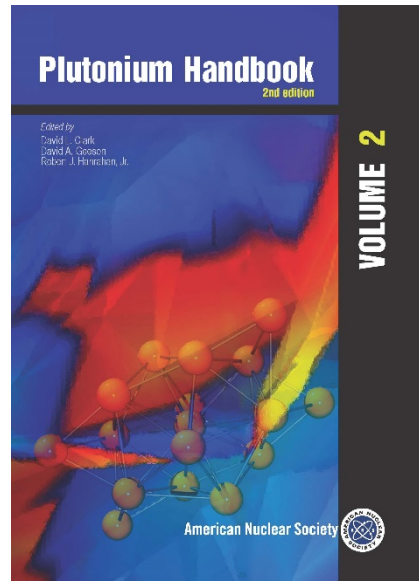
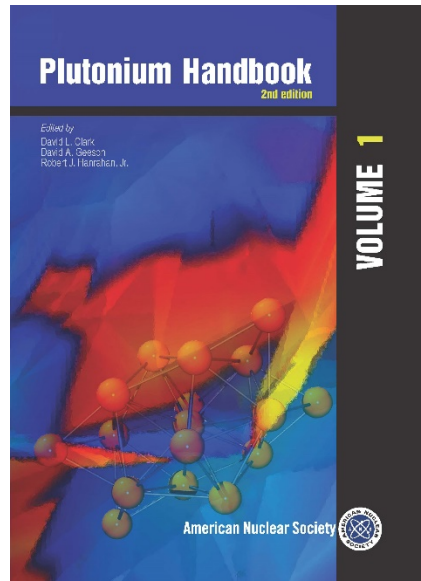


The Historic 1st Edition of the Plutonium is nearly 50



- It has been nearly fifty years since the 1980 publication of the original Plutonium Handbook.
- It contained 966 pages of authoritative information on plutonium research.

The 2nd Edition of the Plutonium Handbook is in press



2nd Edition of the Plutonium Handbook Topics

- The discovery of plutonium,
- Properties of plutonium isotopes,
- Chemistry and properties of plutonium metal and alloys,
- Plutonium aging,
- Thermodynamic trends of plutonium,
- Plutonium in nuclear fuels,
- Waste forms,
- Heat sources,
- Packaging, storing, and transportation of plutonium,
- Nuclear security and safeguards, and
- **Techniques for working safely with plutonium.**

Our chapter 37 on plutonium aerosols is in Volume 5

Fifty years after publication of the original Plutonium Handbook, this timely and authoritative second edition provides unparalleled coverage of plutonium research. With authorship from twelve countries, this scholarly collaboration brings together an international community of researchers from academia, national laboratories, and research institutions.

VOLUME 5

Volume 5 describes the applications of plutonium materials in nuclear fuels, wasteforms, and space power generation and the considerations of safety and security in plutonium research.



Glowing red sphere of a 100-watt ^{238}Pu heat source used in radioisotope thermoelectric generators employed in the Voyager space missions (photo: Los Alamos National Laboratory).

Astronaut Alan L. Bean removing the Apollo Lunar Surface Experiments Package from the Lunar Module (photo: Alan L. Bean, NASA).



Clark
Geeson
Hanrahan, Jr.

5

Plutonium Handbook

2nd edition

Edited by
David L. Clark
David A. Geeson
Robert J. Hanrahan, Jr.

Plutonium Handbook
2nd edition

VOLUME 5



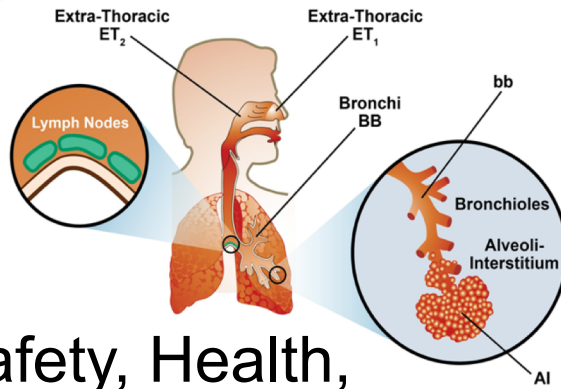
American Nuclear Society



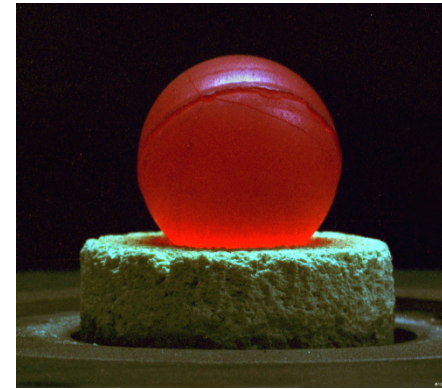
Chapter 37: Plutonium Aerosol Characterization and Safety Issues

1. Introduction
2. Key Concepts for **Understanding** Plutonium Aerosol **Properties and Behaviors**
3. **Sampling and Characterization Methods** for Plutonium Aerosols
4. A Comprehensive Approach to **Selection and Use of** Sampling and Characterization **Methods**
5. An Organized Framework and Process for **Decision-making**
6. Conclusions
7. Acknowledgments
8. References

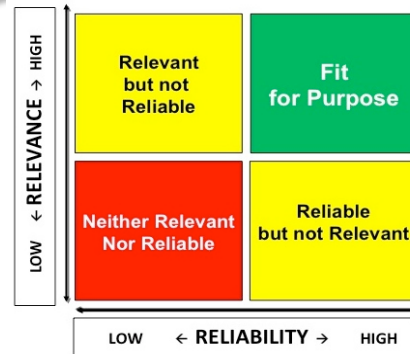
Convergence to meet our objectives



Safety, Health,
Well-being, and
Productivity



Plutonium Science

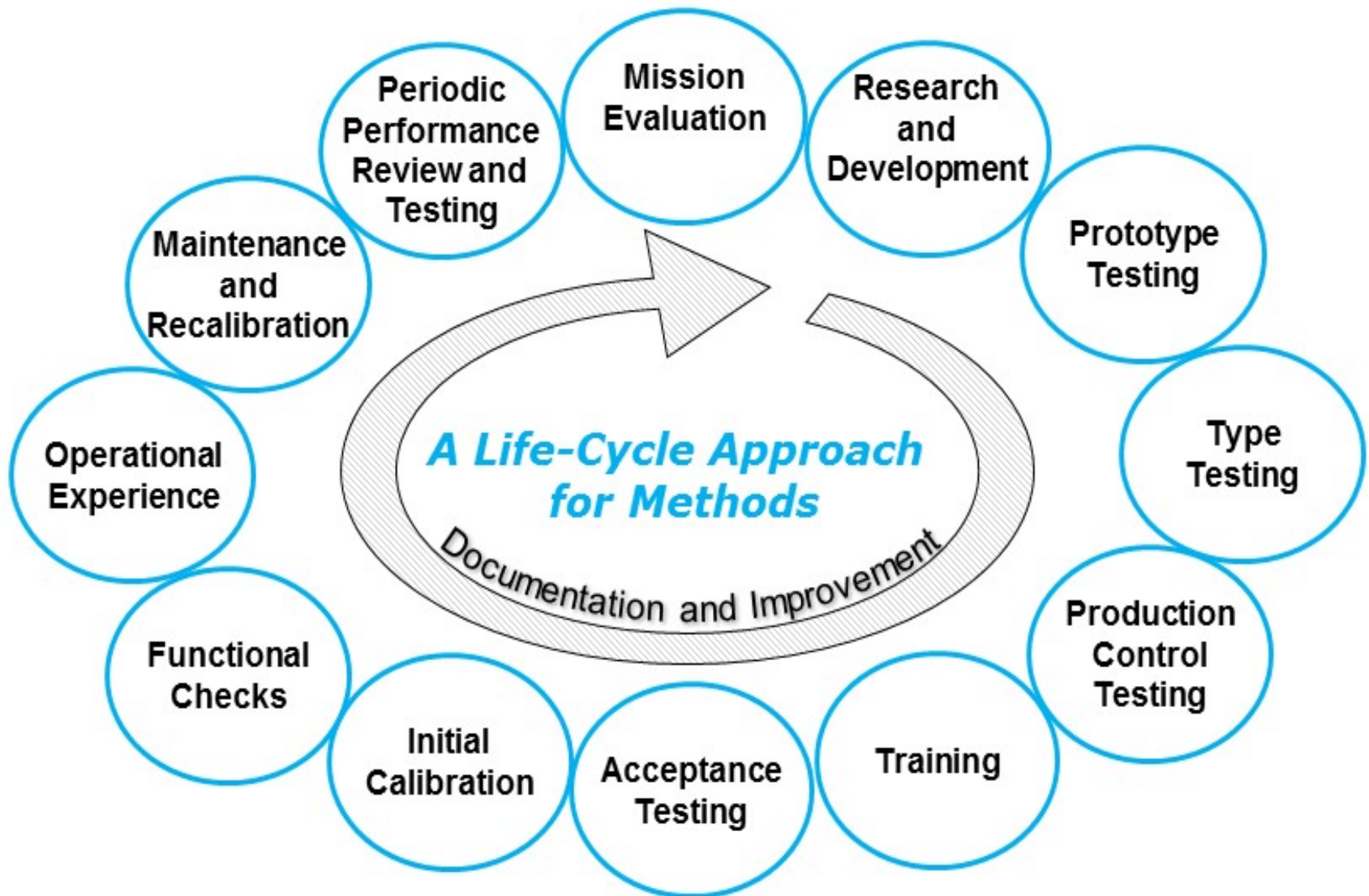


Risk Management

Graded Approach to Sampling

Level 0	Level 1	Level 2	Level 3
Prioritization of Sampling Needs	Initial Screening and Detection	Comprehensive Characterization and Assessment	Routine Monitoring and Control
<ul style="list-style-type: none"> • Process knowledge <ul style="list-style-type: none"> - Work flows - Anticipated or recognized hazards and potentials for exposure 	<ul style="list-style-type: none"> • Process knowledge • Gross mass or activity counting • Optical particle counting • Condensation particle counting • Microscopy 	<ul style="list-style-type: none"> • Composition <ul style="list-style-type: none"> - Elemental and chemical • Particle size <ul style="list-style-type: none"> - Physical, aerodynamic, thermodynamic, electrical mobility • Concentration <ul style="list-style-type: none"> - Peak, mean, variability • Biophysical factors <ul style="list-style-type: none"> - Shape, surface area, solubility • Other factors relevant to the assessment 	<ul style="list-style-type: none"> • A necessary and sufficient subset of Level 1 and Level 2 methods for the material and situation of interest

Lifecycle Approach to Methods



The IH Decision-making Framework and Process



Constant communication, continuous improvement

Risk Assessment

exposure-informed Hazard Assessment

Identify and define dose-response relationships and "Hazard Criteria"

- Occupational Exposure Limits
- Skin Notations, ...
- Hazard Bands



hazard-informed Exposure Assessment

Collect all "relevant and reliable" exposure information for assessment against and refinement of the "Hazard Criteria"

Risk Characterization
for "realistic" combinations of hazards and exposures

Risk Management

- Leadership Commitment
- Hierarchy of Controls
- Confirmation of compliance and protection

Adapted from AIHA 2015

A Strategy for Assessing and Managing Occupational Exposures

A Vision of the Hierarchy of Control to Understand, Communicate, and Manage Risks



Use of the Hierarchy of Control to Understand, Communicate, and Manage Risks

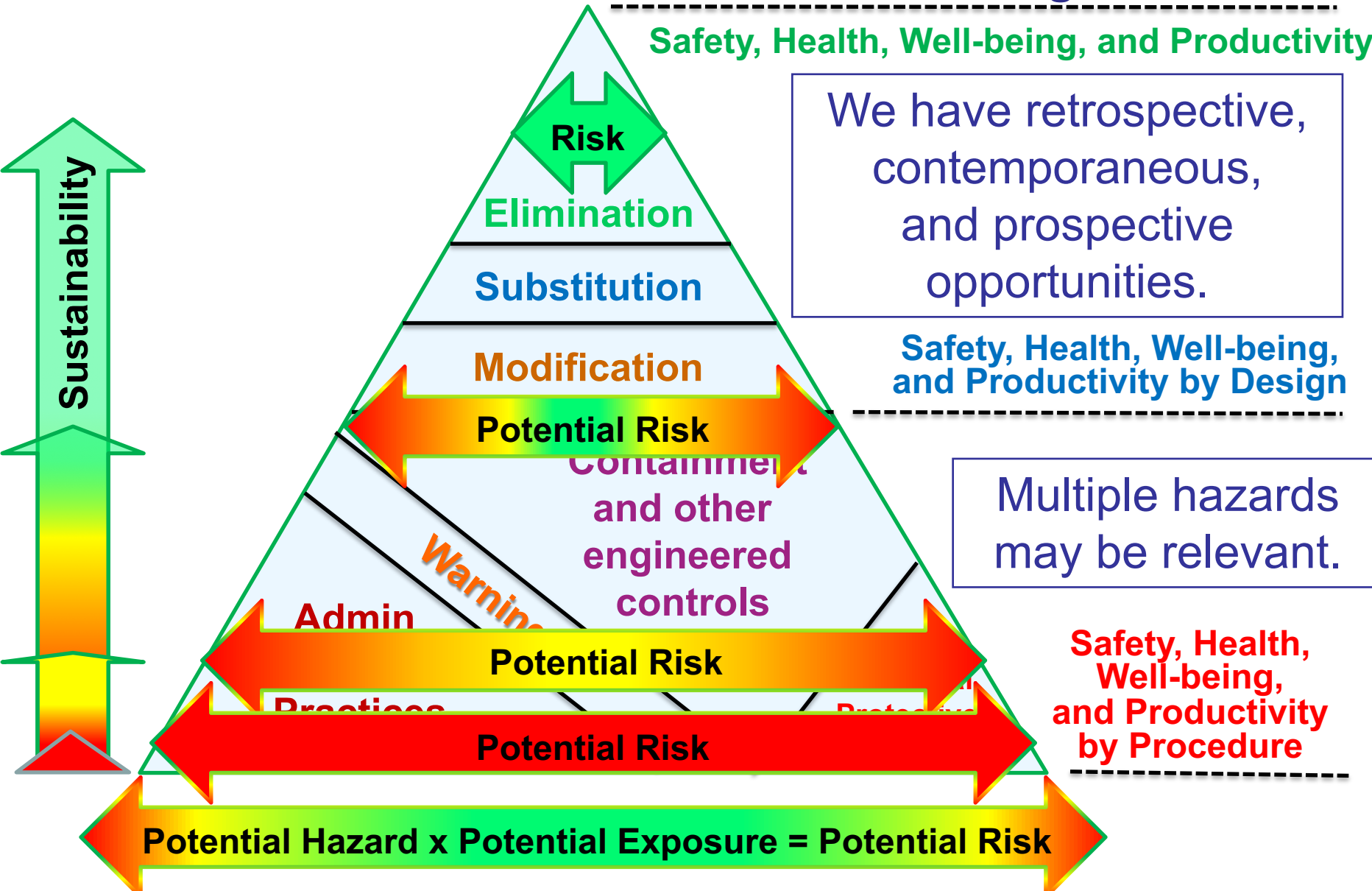
Safety, Health, Well-being, and Productivity

We have retrospective, contemporaneous, and prospective opportunities.

Safety, Health, Well-being, and Productivity by Design

Multiple hazards may be relevant.

Safety, Health, Well-being, and Productivity by Procedure



A Valuable Safety Message

TAKE2  4U
WSST

After the paperwork,
after the pre-job,
before you begin the work,
take 2 minutes for you.



WHAT COULD GO WRONG?

WHAT DIDN'T I THINK OF?

IS ANYTHING MISSING?

DO I HAVE THE RIGHT TOOLS?

DO I HAVE THE REQUIRED TRAINING?

NOW DO THE JOB !

A Complementary Message for Total Safety, Health, and Well-being

TAKE2☀4U

It's more than just safety...

It's your Health.

While using TAKE2☀4U
for safety at work,
also take a few
moments each day to:



- Minimize stress.
- Choose healthy foods.
- Get some exercise.
- Ensure adequate rest.
- Get support when needed.

GO FOR TOTAL WELL-BEING !

Questions and Discussion



Current:

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