

A Bluffers' Guide to Nano Risk

(Five simple steps to sounding like an expert)

Andrew D. Maynard

Chief Science Advisor, Project on Emerging Nanotechnologies

Woodrow Wilson International Center for Scholars (in partnership with the Pew Charitable Trusts)

Step 1

Identify The Story

There are many nanotechnology stories...

...nanotechnology is a technological revolution, that will lead to increased wealth and improved quality of life...

...nanomaterials are being used in more and more consumer products, from cosmetics to cuddly toys, and milkshakes to mountain bikes...

...there are gaping holes in our understanding of how nanoparticles might impact people's health or the environment...

...no-one is sure what happens when engineered nanostructured materials are released into the environment...

There are many nanotechnology stories...

Nanotechnology is a technological revolution, that will lead to cuddly toys; cosmetics and improved quality of life. There are gaping holes in our understanding of how mountain bikes might impact people's health and the environment. Nanoparticles are being used in more and more milkshakes. No-one is sure what happens to increased wealth from nanostructured materials, when engineered consumer products or nanomaterials are released into the environment.

...that are often told simultaneously!

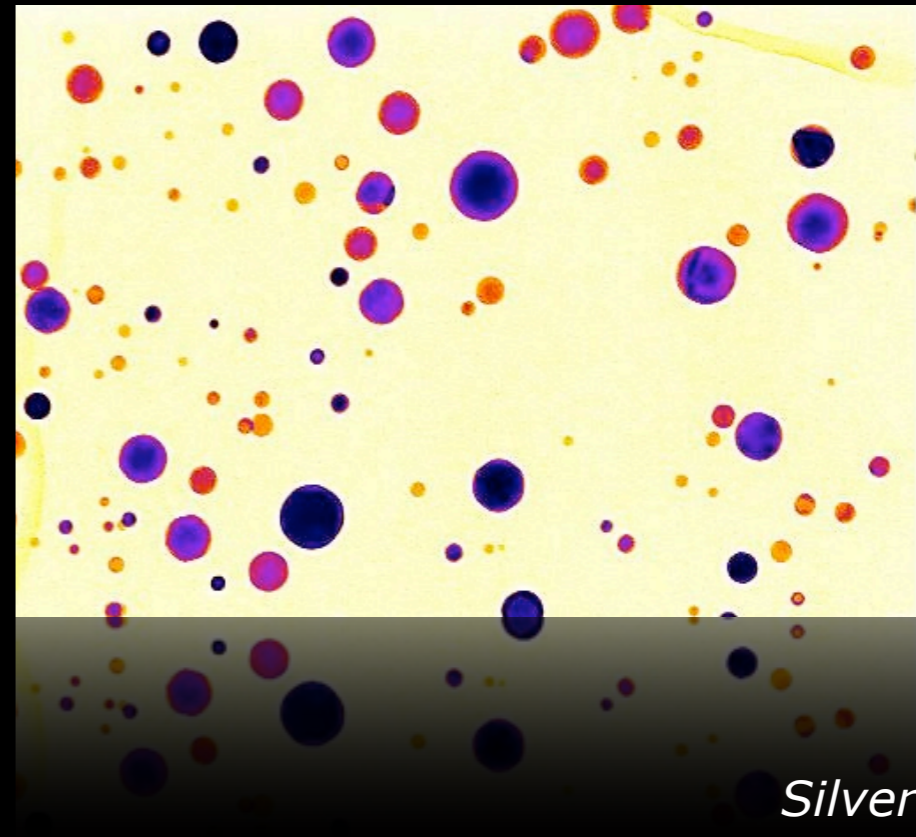
Tip #1:

Be clear about which story is
being told

Step 2

*Determine The Main
Characters*

nano Silver

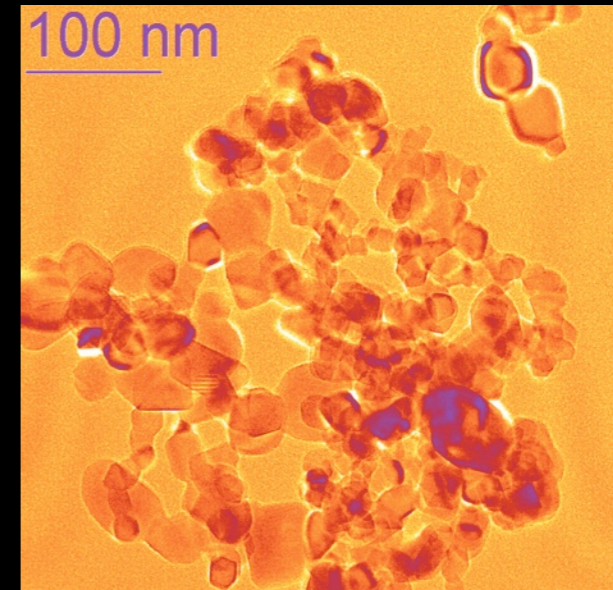


Silver

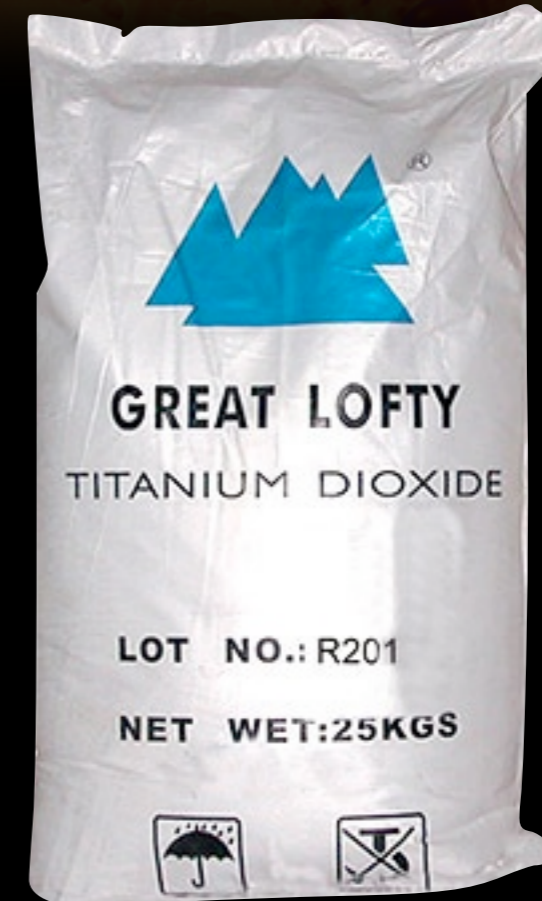




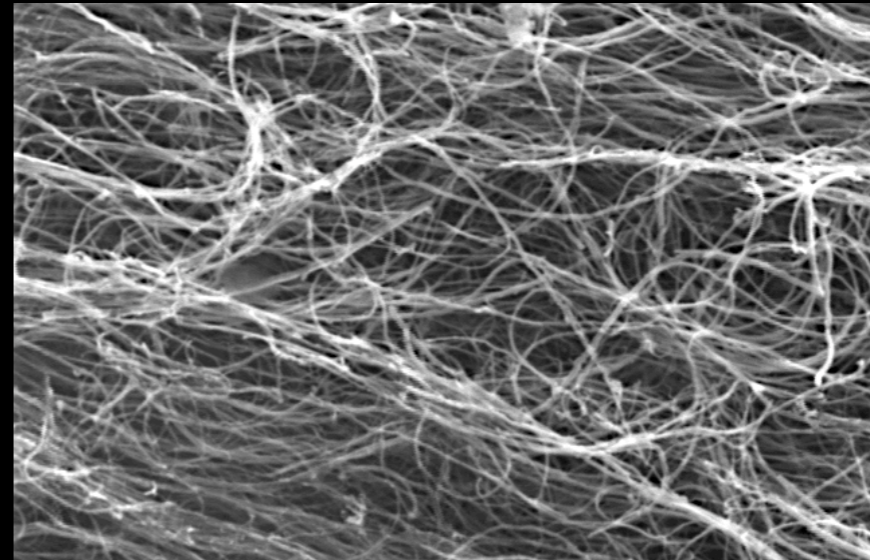
nano Titania



Titania



Multi walled carbon nanotubes



Carbon Black



Tip #2

Identify the material being
used

Step 3

Figure out the Plot

A nano-risk plot:

“Deviant” Behavior

A conventional material is engineered to have a nanoscale structure, and as a consequence begins to behave in unconventional ways

“and they shall beat their swords
into plowshares, and their spears
into pruninghooks”

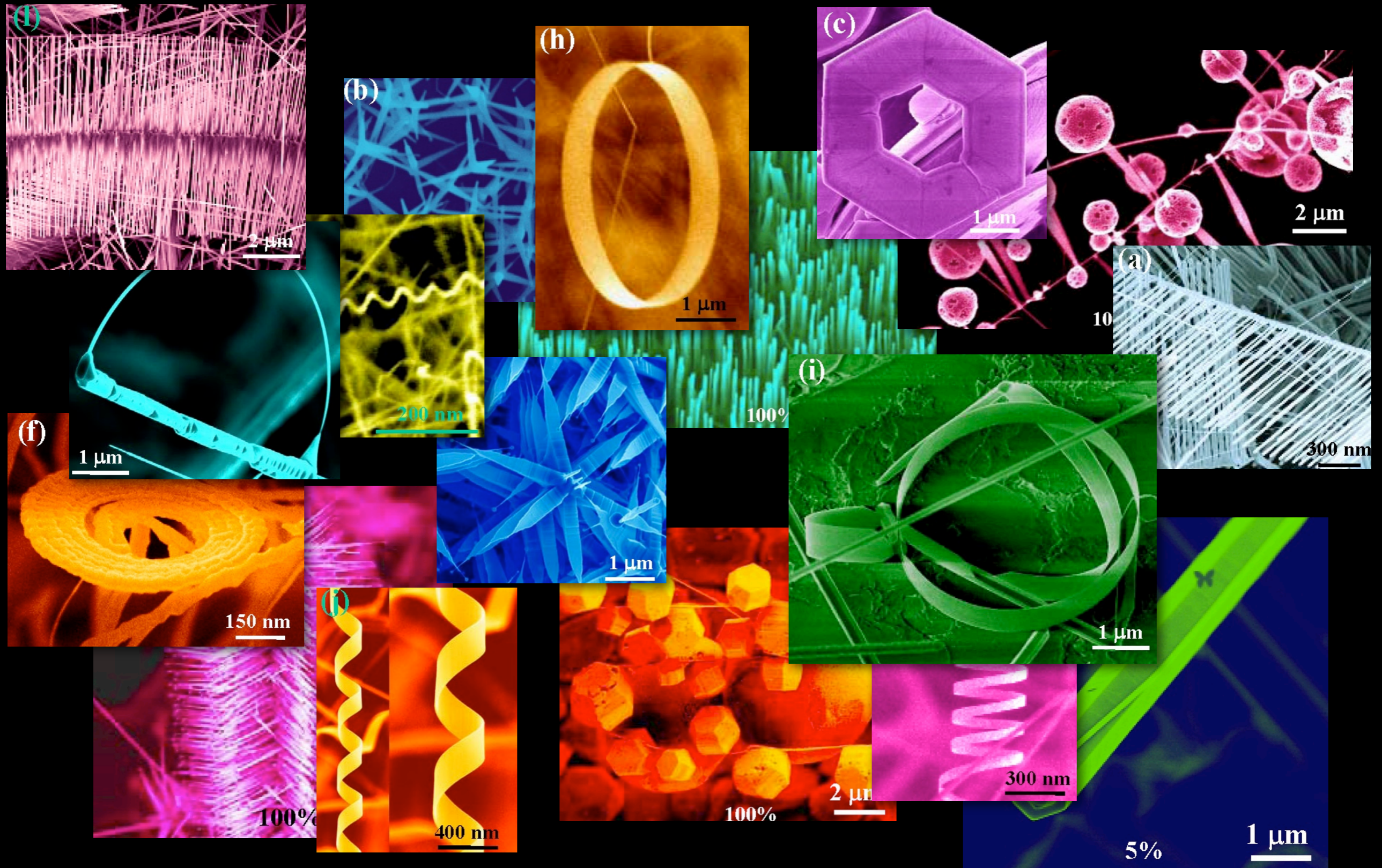
Isaiah 2:4, ~ 8th Century BCE

Similar Chemistry



Different Risks

Similar Chemistry



Nano-ZnO

Images courtesy of Prof. Z.L. Wang, Georgia Tech

Potentially Different Risks

Tip #3:

It's not what you have, but what
you do with it that counts.

Step 4

*Avoid Red Herrings
(misleading plot lines)*

Question

Which are the most dangerous:
Green apples or red apples?



Answer

It's the wrong question!

Question

Are nanotechnologies more dangerous than conventional technologies, or less dangerous?



Answer

It's the wrong question!

Tip #4

Just because something is different,
doesn't necessarily mean it's dangerous

Step 5

Keep a sense of perspective

Question: There is a *possibility* that fish will rain from the sky this afternoon.

What do you do?



- Answer:**
- a) Keep a frying pan handy?
 - b) Weigh up the *probability* of the event occurring before taking action?

Question: There is a *possibility* that titanium dioxide is more hazardous when engineered at the nanoscale.

What do you do?



- Answer:**
- a) Ban all products containing nanoscale titanium dioxide?
 - b) Weigh up the *probability* of products using the material causing harm?

Tip #5

Make decisions based on
probabilities, not *possibilities*

A Cheat Sheet for Nano-Risk Bluffers

(Smart questions to ask nano-experts)

Q: "What aspects of which type of nanomaterial are you talking about?"

Q: "What is known about the non-nano form of the material?"

Q: "How does the nanoscale form of this material deviate from what is expected?"

Q: "Are the health and environmental consequences of this deviation large or small?"

Q: "Are these consequences probable, or merely possible?"



Andrew D. Maynard PhD

Chief Science Advisor

Project on Emerging Nanotechnologies

Woodrow Wilson International Center for Scholars

Tel: +1 202 691 4311

Email: andrew.maynard@wilsoncenter.org

Web: www.nanotechproject.org

Blog: 2020science.org