Radiation Safety Institute of Canada
Institut de radioprotection du Canada

Hazard, Danger, Risk, and Fear:

Effective Communication Through Examination of Misconceptions

Guest: Dr. R. Neil Alexander, Ph.D., Bucephalus Consulting

May 12, 2025

Good Science in Plain Language®

Land Acknowledgement

Webinar Functionality

Audio and video

- During the presentation, from the presenters only
- Captions: More>Language and speech>Turn on live captions

Use the Chat feature to talk to discuss with everyone

Use Q&A feature to ask questions for Q&A portion

Posted on webinar page

- Video, answers to questions, copy of the slides

Follow up email will be sent

- Topics covered, time of attendance

In This Session

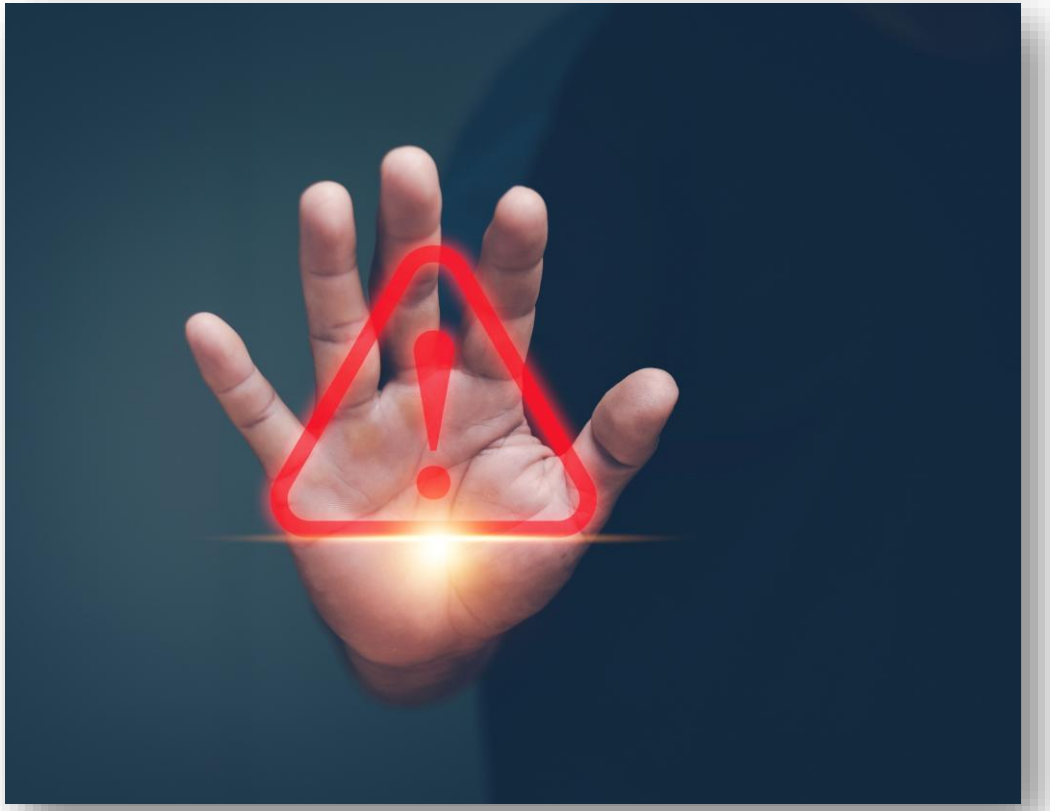
Canadian Nuclear Society

Hazard, Danger, Risk, & Fear

- Definitions
- Industry Examples
- Facts and Fear
- What is safety
- Some Misconceptions
- Blowing Away the Fog

Movement break

- Charlmane Wong
- Ji Hong Tai Chi and Qi Gong Richmond Hill



Hazard, Danger, Risk and Fear

Neil Alexander

Head of
Communications

Effective Communication through Examination of Misconceptions

Who are we?

An independent learned society of individuals who have an interest in the use of nuclear technology in Canada and the use of Canadian nuclear technology around the world.

The Canadian Nuclear Society (CNS) promotes the exchange of information on all aspects of nuclear science and technology and its applications. This includes nuclear power generation, fuel production, uranium mining and refining, management of radioactive wastes and used fuel.

Divisions

- Nuclear Science and Engineering
- Fuel Technologies
- Materials Chemistry and Fitness for Purpose
- Nuclear Operations and Maintenance
- Environment, Waste Management & Decommissioning
- Generation IV and Small Reactors Technology
- Science and Technologies of Radioisotopes
- Fusion Energy and Accelerator Science and Technology
- Disruptive, Innovative and Emerging Technology
- Space Nuclear Applications Division

Mandate

The primary mandate is to promote the transfer of nuclear science and engineering technical knowledge amongst CNS members and the CANDU nuclear industry at large.

The secondary mandate is the training of young scientists and engineers in the fundamentals of our craft to ensure our knowledge base is maintained and advanced.

Activities

- Branch events
- Conferences
- Courses (industry)
- Courses (public)
- Media communications
- Occasional news updates
- Correcting misinformation in the media

Hazard, Danger, Risk and Fear

Hazard: Something that has the potential to cause harm.

Danger: Something that has the potential to do harm and has a credible mechanism by which that harm could occur.

Risk: A complex conflation of the likelihood something might cause harm and the magnitude of the harm it might cause.

Fear: An unpleasant often strong emotion caused by anticipation or awareness of danger (may be real or imagined).

Used Nuclear Fuel?

Hazard: Large amount of penetrating radiation.

Very very hazardous.

Danger: Radiation is very predictable and easy to shield.

Used fuel is mostly solid so easy to contain.

Not very dangerous at all.

Risk: Potentially high consequence but almost no possibility of it being realized.

Little risk.

Fear: Unknown not understood…..anti nukes conflate danger and hazard.

Fear is high.

X-Rays?

Hazard: Significant amount of penetrating radiation.

Very hazardous.

Danger: Radiation is very predictable and easy to shield.

X-rays can be turned off.

A little bit dangerous

Risk: Accessible and so some harm is possible.

Some risk.

Fear: Known and understood.

Not a lot of fear at all.

Nuclear Reactors?

Hazard: Significant quantities of radioactive material.

Very hazardous.

Danger: Meltdown and loss of containment.

Very dangerous.

Risk: Very high consequence.

Very low probability.

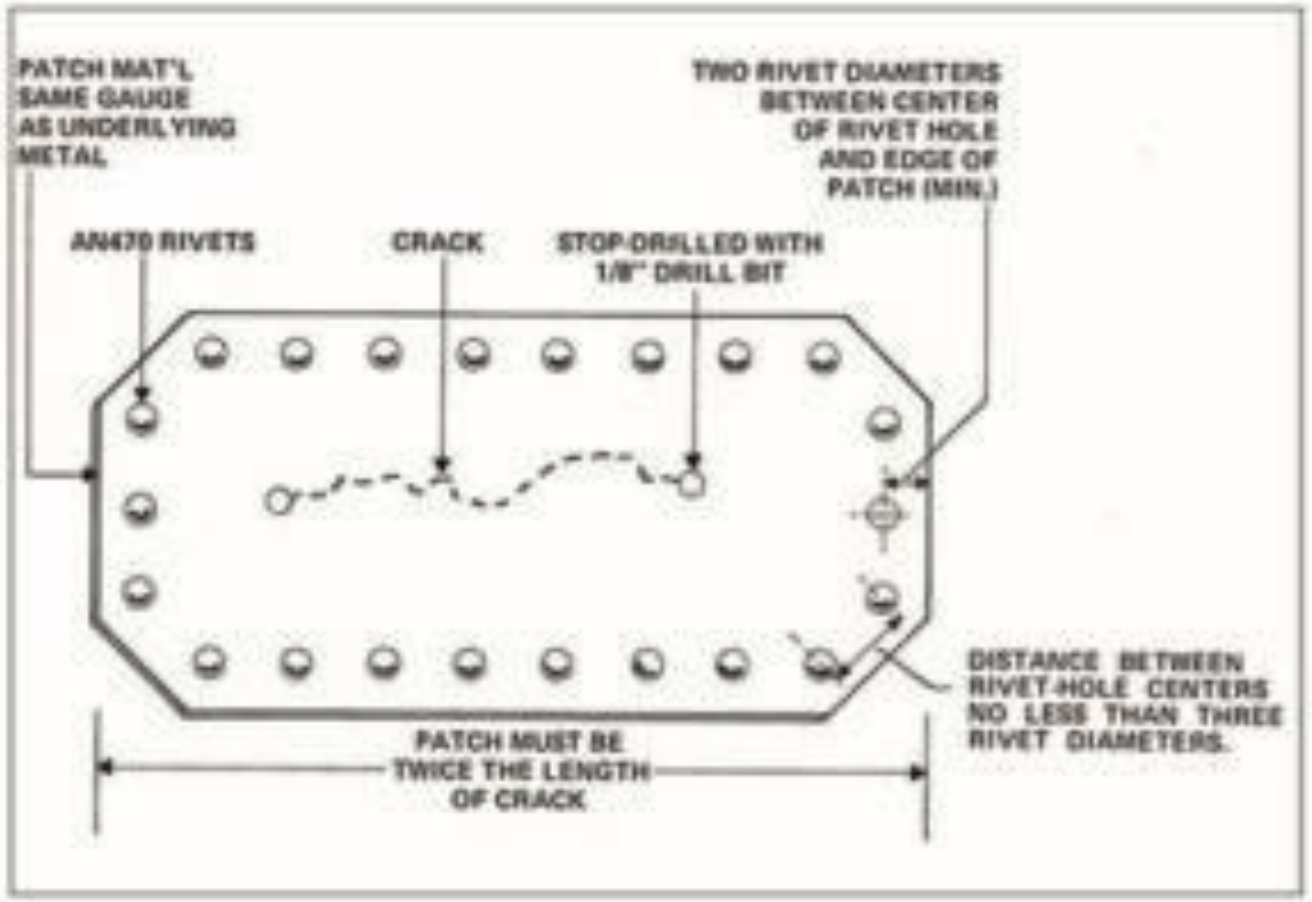
????????

Fear: Uncertainty

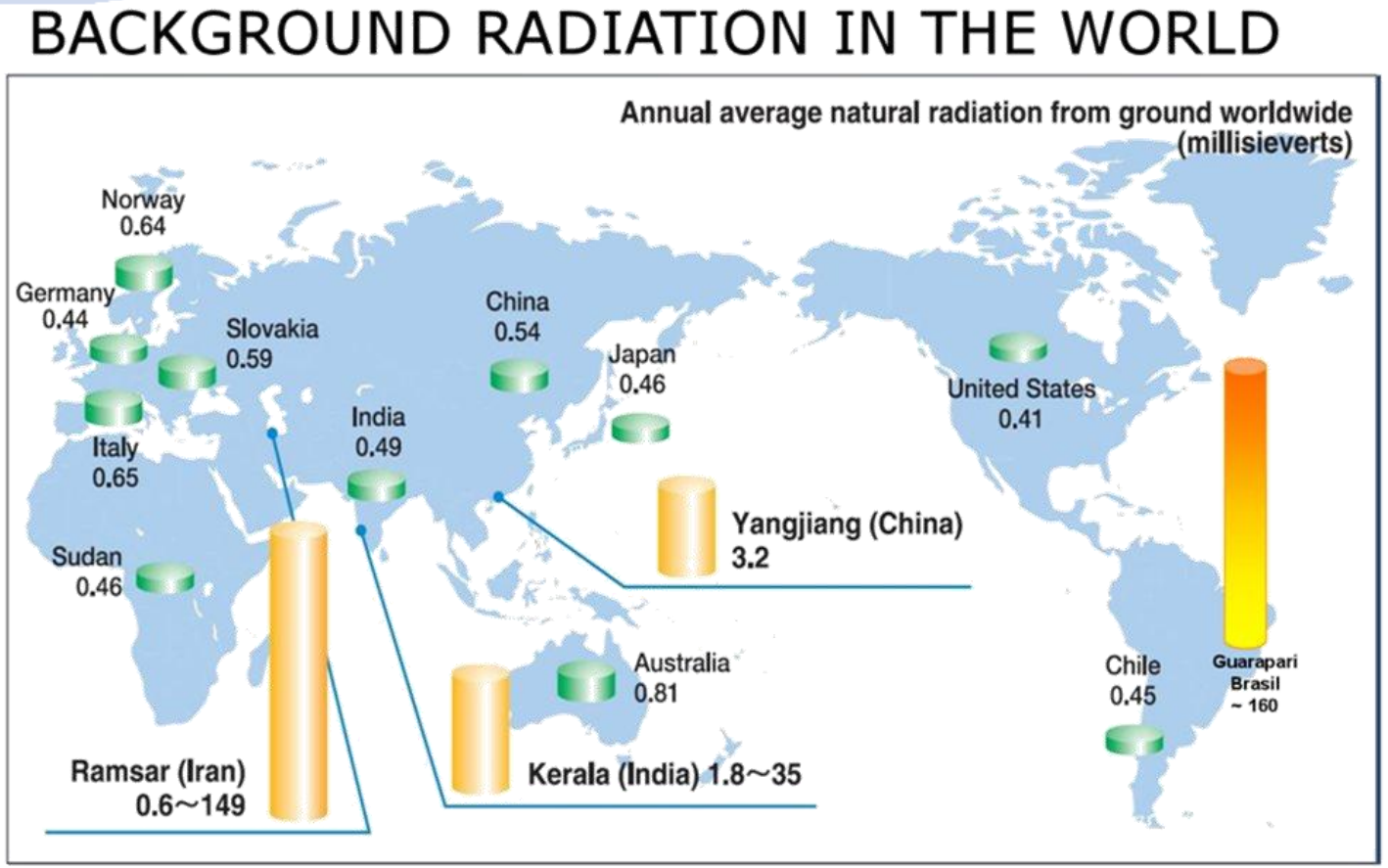
Some fear; some don't.

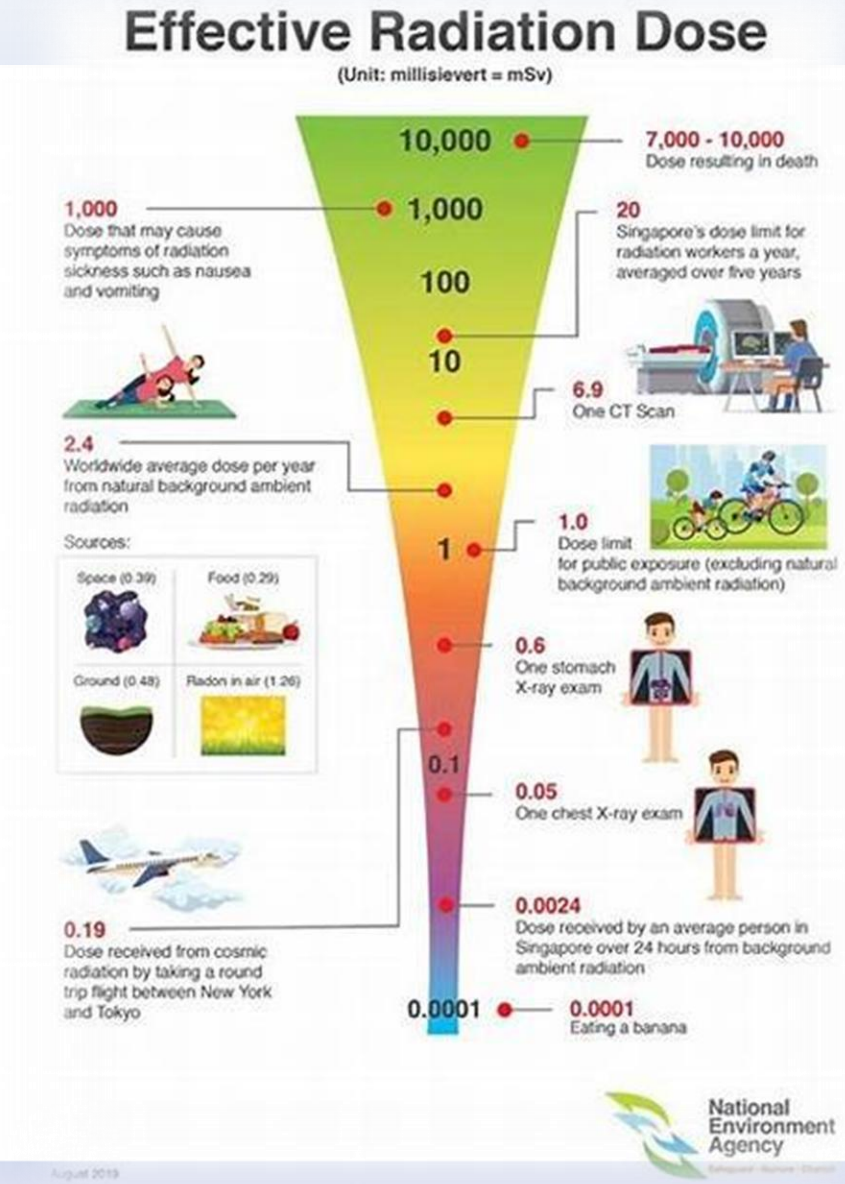
Facts and Fear

Facts and Fear



Some Facts


BACKGROUND RADIATION IN THE WORLD
Annual average natural radiation from ground worldwide (millisieverts)
Norway 0.64
Germany 0.44
Slovakia 0.59
Italy 0.65
China 0.54
India 0.49
Japan 0.46
United States 0.41
Sudan 0.46
Yangjiang (China) 3.2
Australia 0.81
Chile 0.45
Guarapari Brasil ~ 160
Ramsar (Iran) 0.6~149
Kerala (India) 1.8~35


Effective Radiation Dose
(Unit: millisievert = mSv)
10,000
7,000 - 10,000
Dose resulting in death
1,000
1,000
Dose that may cause symptoms of radiation sickness such as nausea and vomiting
20
Singapore's dose limit for radiation workers a year, averaged over five years
100
10
6.9
One CT Scan
2.4
Worldwide average dose per year from natural background ambient radiation
Sources:
Space (0.39)
Food (0.29)
Ground (0.48)
Radon in air (1.26)
1
1.0
Dose limit for public exposure (excluding natural background ambient radiation)
0.6
One stomach X-ray exam
0.1
0.05
One chest X-ray exam
0.19
Dose received from cosmic radiation by taking a round trip flight between New York and Tokyo
0.0024
Dose received by an average person in Singapore over 24 hours from background ambient radiation
0.0001
0.0001
Eating a banana
National Environment Agency

What Does Safe Mean?

Some Misconceptions

Any bit of radiation can kill you!

Some Misconceptions

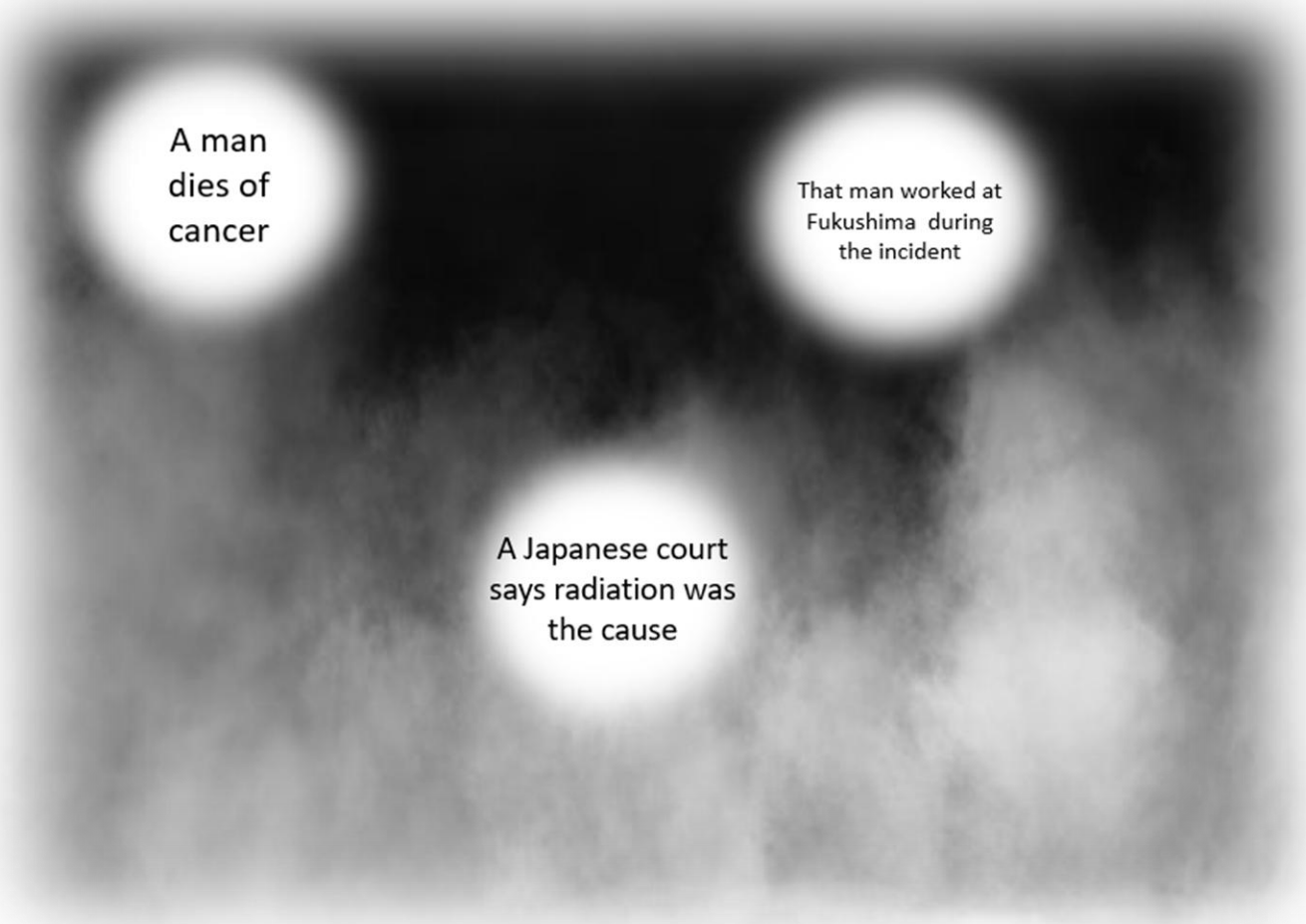
Any bit of radiation can kill you!

- Any bit of anything can kill you, a hug, a piece of bacon and don't get me onto bananas.
- There are more than 5,000 radiation emissions in your body every second.
- And then there is background radiation.
- We are living in a lower radiation environment than in history as the radioactivity is always progressively decaying.

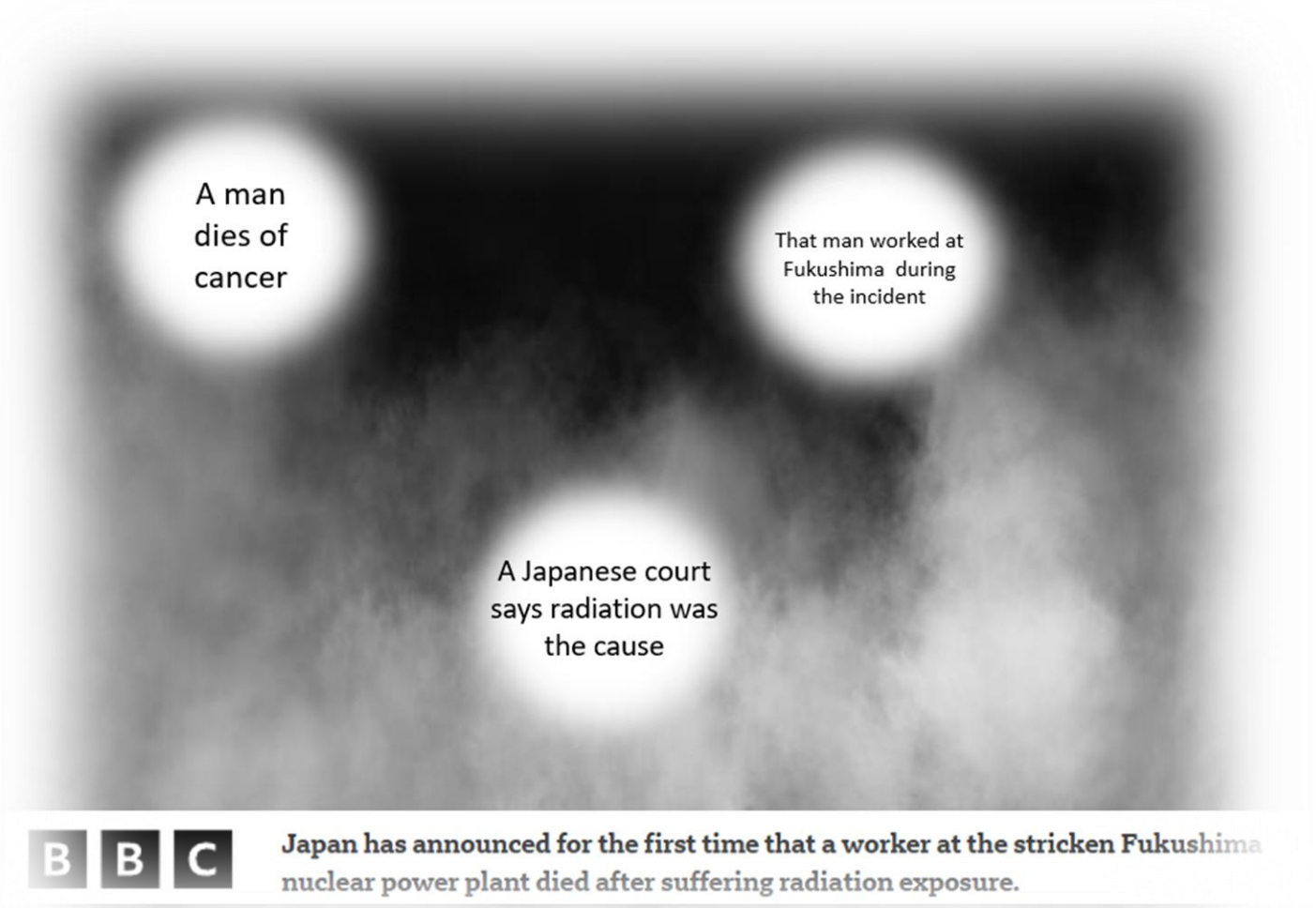
Some Misconceptions

Plutonium; the most toxic material on earth.

Blowing Away the Fog

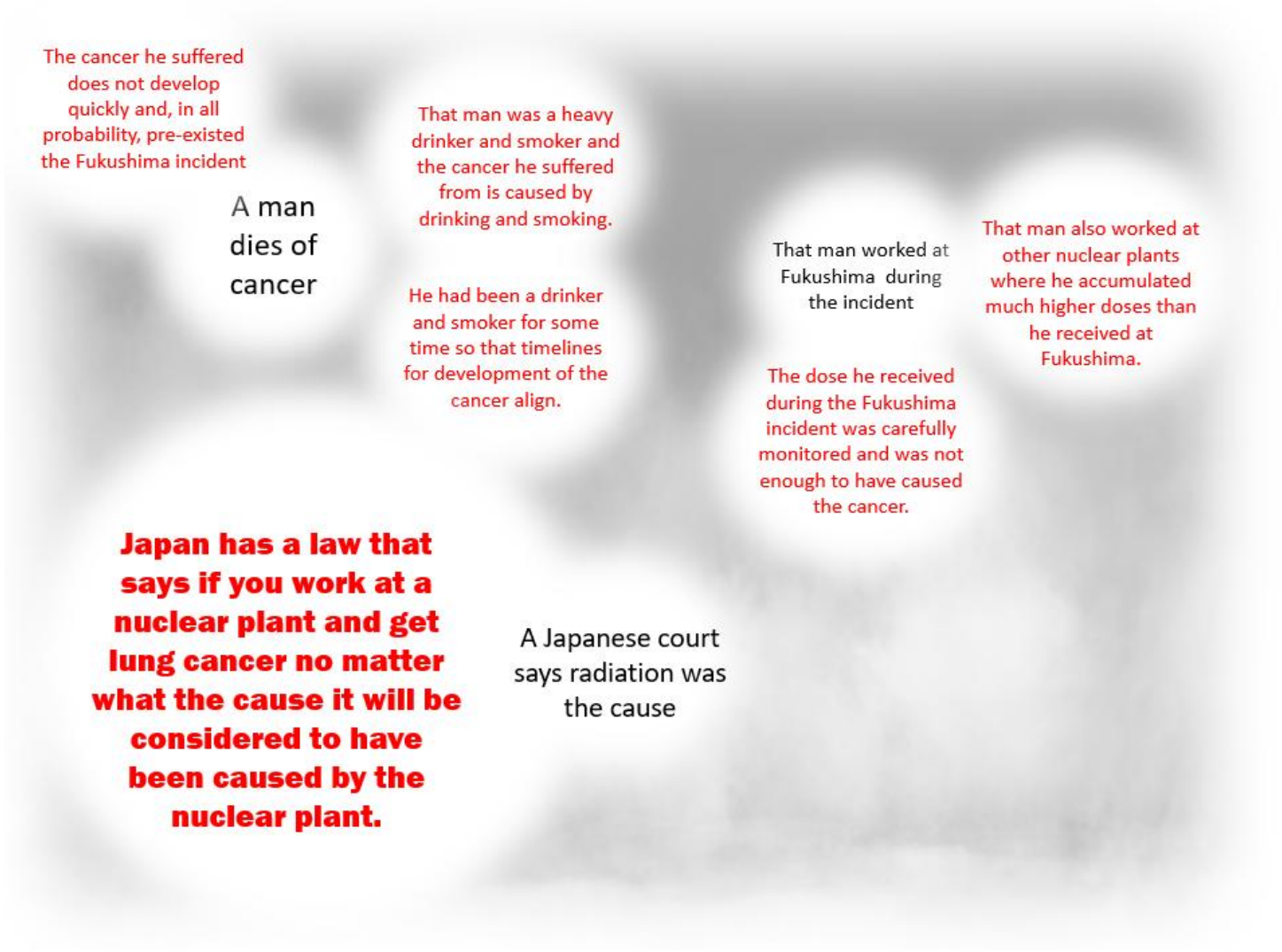


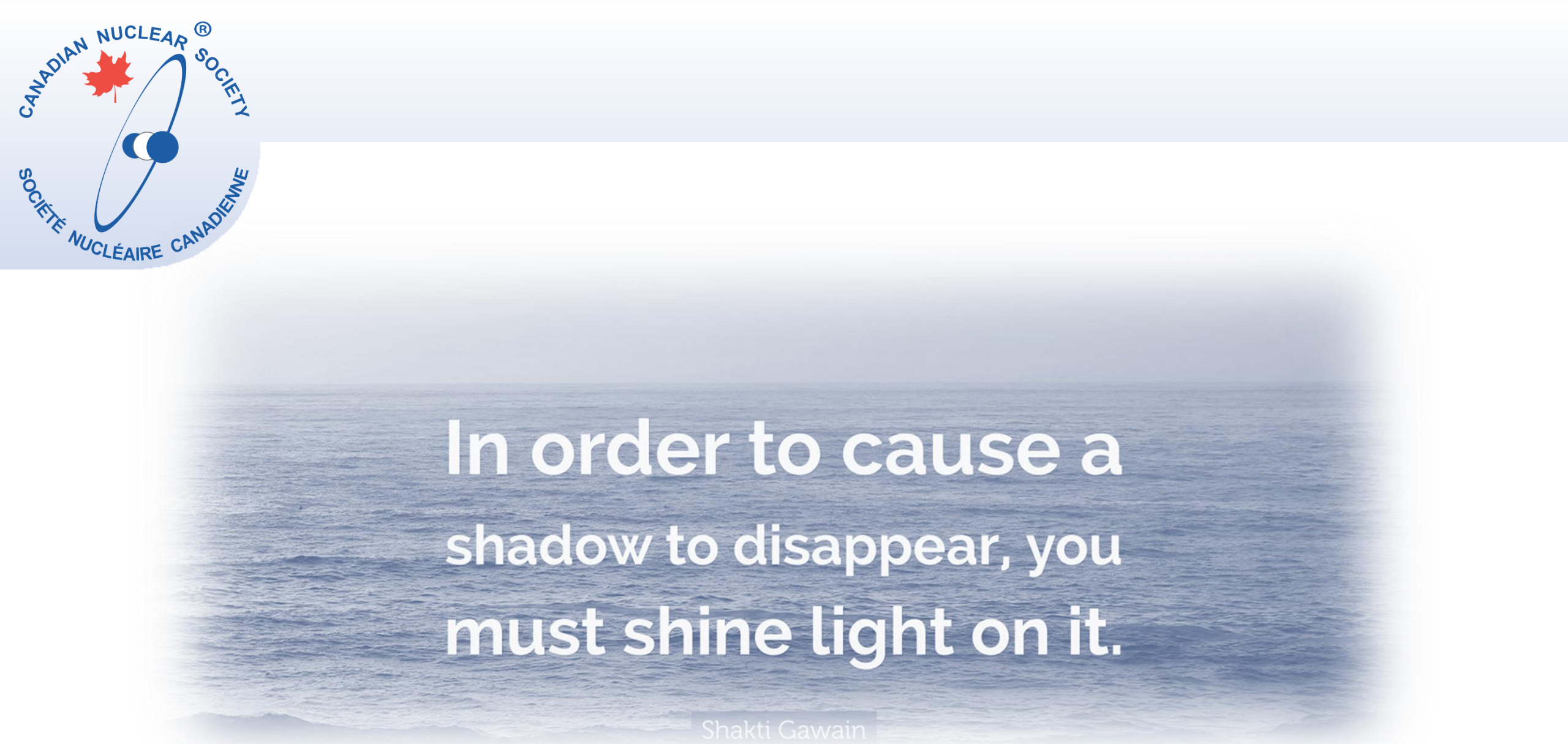
Blowing Away the Fog



Blowing Away the Fog

Blowing Away the Fog




In order to cause a
shadow to disappear, you
must shine light on it.
Shakti Gawain


-Question-

"Good science in plain language"®

Thank you for listening!

www.radiationsafety.ca

1-800-263-5803

info@radiationsafety.ca

Wellness Break

Ji Hong Tai Chi & Qi Gong, Richmond Hill, ON