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“How we Formed Our Profession – the Psychology of Radiation Safety” It’s All About Fears

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Where would our profession be if people were not afraid of radiation? Fears have made our profession what it is today. The primary motivation for developments in technology and regulations has been fears of radiation. Fears are the basis of antinuclear sentiments and aversion to nuclear power, nuclear wastes, and especially nuclear bombs. Fears of radiation have moved our profession to very conservative practices in the name of radiation safety. And yet, psychologists know that fear is a good thing as a natural response of our brains for our protection. We have survived as a species by knowing when to be afraid and when to react for safety. Psychologists define fear as an emotional response to a specific stimulus, such as pain or immediate threat of danger. Since radiation does not produce any sensation in our bodies, then our fears of radiation have to be based on imagination. Thus, fear of radiation is not a true fear based on something happening right now, but a manufactured fear based in images of terrible consequences. Our imaginations drive worries and anxieties.

The primary delivery vehicle for radiation fears is the news media. As the wealthiest nation in the world, we also have the luxury of being afraid of virtually everything. Although, it’s hard not to worry when fear is sprayed at us like tear gas from our TV 24/7. The media thrives on telling us of calamities and dangers everywhere in the world, and seems to especially like stories of “deadly radiation.” In fact those words have been used to portray radiation for so long (at least 60 years) that now subconsciously people automatically react to the word “radiation” with aversion. Unfortunately, much of what the media reports is based on radiation mythology (common beliefs which are not technically true). For example, most public concerns are fueled by misconceptions of the LNT model.

Regulators are also driven by fears (what if they are not seen as responsive to scared constituents, what if they do not provide for adequate safety regulations, what if people are harmed from their negligence, etc.?). Health physicists may be driven by fears as well, such as fear of criticism for not doing their jobs well, irresponsibility, carelessness, or neglect. Thus our profession is built around fears. Even the words which describe our work “radiation safety” imply that there is something to be afraid of, something to be avoided, something for which caution is needed, or something which threatens us.



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- BS Civil Engineering (1961) University of Vermont
- MS Sanitary Engineering (1963) Massachusetts Institute of Technology (MIT)
- Prof. Sanitary Engineer Degree (1963) MIT and Harvard University
- PhD Studies, Radio and Nuclear Chemistry (1966–1972), Rensselaer Polytechnic Inst.
- Greater Washington Institute for Transactional Analysis - Counseling (1977–1980)
- American Board of Health Physics Certification (1983–present)
- Johns Hopkins Fellow, Organizational Systems (1984–1985)
- Past President and Fellow of the Health Physics Society (2000)
- President-elect Designate, American Academy of Health Physics (2011)
- Commissioned Stephen Minister – Counselor, United Methodist Church (2003–pres)

Experience

- 2010 – pres. Director, Radiation Safety Counseling Institute. Workshops, training, and counseling for individuals, companies, universities, or government agencies with concerns or questions about radiation safety. Specialist in helping people understand radiation, risk communication, worker counseling, psychology of radiation safety, and dealing with fears of radiation and nuclear terrorism for homeland security.
- 2007 – pres. VP, Training Programs, Dade Moeller & Associates, training and consulting in radiation safety.
- 1984 - 2007 Director, Radiation Safety Academy. Providing x-ray and radiation safety training, audits, and consulting to industry (nuclear gauges and x-ray), universities, research facilities, and professional organizations
- 1988 - 2006 Manager and Contractor to National Institutes of Health (NIH) for radiation safety audits of 3,500 research laboratories and 2,500 instrument calibrations a year, along with environmental monitoring, hot lab and analytic lab operations, and accelerators and x-ray inspections.
- 1990 - 2005 President of Key Technology, Inc. a manufacturer and primary laboratory for radon analysis with over 1,500,000 measurements since 1985. Primary instructor at Rutgers University 1990-1998 for radon, radon measurements, radiation risks, radiation instruments, and radon risk communication courses.
- 1986 - 1988 Laboratory Director, RSO, Inc. Directed analytical programs and Quality Assurance for samples from NIH, Aberdeen Proving Ground, radiopharmaceutical companies, and the nuclear industry.
- 1970 - 1985 Chief, Radiation Surveillance Branch, EPA, Office of Radiation Programs. Directed studies of radiological quality of US, coordinated 7 Federal agencies for nuclear fallout events, QA officer 8 years. Head of US delegations to I.A.E.A and N.E.A. on radioactive waste disposal. ANSI N-13, (1975-1985). Retired PHS Commissioned Officer (0-6) in 1985 with 29 years of service.
- 1963 - 1970 U.S.P.H.S. Directed development of radiation monitoring techniques at DOE National Labs, nuclear plants, and shipyards in the US and Chalk River Nuclear Laboratory in Canada.

Health Physics and Professional Activities

Health Physics Society (HPS) plenary member 1966; President-elect, President, Past President (1998-2001), Fellow (2000), Treasurer (1995-1998); Secretary (1992-1995); Executive Cmte. (1992-2001), Chair, Finance Cmte. (1996-1998); Head of U.S. delegation to IRPA X (2000). RSO Section Founder and Secretary/Treasurer (1997-2000); Co-founder and President, Radon Section (1995-1996). Co-Chair Local Arrangements Cmte. Annual Meeting in DC (1991); Public Info. Cmte. (1985-1988); Summer School Co-Chair (2004); Chair, President's Emeritus, Cmte (2006); Chair, Awards Cmte. (2002); Chair, History Cmte. (2005-Pres.); Continuing Education Cmte. (2005-Pres.). Academic Dean for HPS Professional Development School on Radiation Risk Communication (2010). PEP, CEL and AAHP Instructor; Journal Reviewer; Treasurer, AAHP (2008 – Pres.). AAHP President-Elect Designate (2011). Baltimore-Washington Chapter: President (1990-1991) and Honorary Life Member; Newsletter Editor (1983-2005); Public Info. Chair (1983-1991), Science Teacher Workshop Leader (1995 – Pres.). New England Chapter: Newsletter Editor, Board of Directors, Education Chair (1968-1972). President, American Association of Radon Scientists and Technologists (1995-1998) and Honorary Life Member, Charter Member; Board of Directors; Newsletter Editor (1990-1993). Founder and first President, National Radon Safety Board (NRSB) (1997-1999). Member of Sigma Xi (1966-Pres.); ANS (1983-Pres.), Society for Risk Analysis (1984-Pres.); AIHA, CRPA, CRCPD (1997-Pres.), Studied H.P. communication styles and presented Myers-Briggs seminars to over 3500 H.P.s since 1984. Over 30 professional society awards. Registered Professional Engineer since 1965. Certified Health Physicist since 1983.

Publications

Authored over 500 book chapters, articles, professional papers, training manuals, technical reports, and presentations on radiation safety. Author of monthly column, "Insights in Communication" HPS Newsletter 1984 - 1989 and 1994 -2001.

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How We Formed Our Profession

The Psychology of Radiation Safety (It's All About Fears)

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Where Would We Be – Without Fear ?

- How many of us would be here today if people were not afraid of radiation ?
- Is our profession built on fears ?
- The words “Radiation Safety”
 - Imply risks and a need for caution or safety
- Protection for safety is to avoid what we fear
 - unacceptable consequences of radiation exposure
 - Consequences which we imagine

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Developments for Safety

- Motivated by fears
- Fears are basis for anti-nuclear sentiments, aversion to nuclear power, nuclear wastes, and nuclear bombs
- Fears have resulted in very conservative practices for radiation safety
- Precautionary principle
 - Caution in response to uncertainty

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Fears are Natural and OK

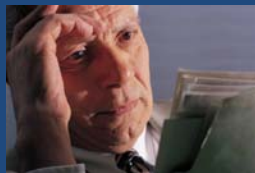
- Fear is a natural response of our minds for our protection
- Our minds are always alert to danger
- We have survived by paying attention to our fears and when to react for safety
- However, all of our thoughts about being harmed
 - May themselves be harming us

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The Gift of Fear

- Fear is a gift for our protection
 - True fear is part of our defense mechanism
- Worries or anxieties are based on our memories or imagination
 - Worry is not a true fear, but a choice
- Many fears are learned
- Does anyone have a true fear of radiation?



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What is Fear ?

- Psychologists define fear as a response to a specific stimulus
 - Such as pain or imminent danger
- Since radiation produces no sensation
 - Not a true fear based on imminent danger
 - Radiation fears are based on imagination
 - Manufactured fear based on images of consequences
- Many radiation fears are also based on mythology
 - Something believed which is not technically true
 - Based on false premises and misunderstanding


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How We Formed Our Profession - The Psychology of Radiation Safety

Fears and Imagination

- All fears are based on imagination
- Fears summon powerful predictive forces
- Fear is about what might happen next
 - Not what is happening now
- Example – fear of heights
- If we tell that person, “You do not need to be afraid,” will that help them?
- Radiation fears are based on imagination of unacceptable consequences
 - Cancer and death



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Basis of Radiation Fears

- When did radiation become fearsome?
 - 1945 – Hiroshima / Nagasaki
 - 1979 – Three Mile Island
 - 1986 – Chernobyl
 - 2011 – Japan, Fukushima Daiichi Reactors
- Is there a good basis for radiation fears?
- Is radiation deadly? What is the evidence?
- How many people in the US have died from radiation exposures? Where? When?
- How much radiation does it take to cause effects? Death?



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Fear May Be the Greatest Danger


- Fear, anxiety, stress, and worry kill through
 - high blood pressure
 - addictions, drugs
 - heart disease
 - weight loss or gain
 - depression, insomnia
 - suicides, abortions
 - post traumatic stress disorder



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Common Views Behind Radiation Fears


- Fearful images of consequences, such as cancer and death
- Dread and expectations of catastrophic consequences
- No way to know if you have been exposed
- If you know, it may be too late
- You do not know what will happen, but you know it will be bad
- Possible effects on children and future generations
- Possible long-term harm to property and property values
- You have no control and there is no escape



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Sources of Radiation Fears

- Perceptions of radiation risks
 - Related to images of unacceptable consequences
- Lack of information
 - Forces people to rely on
 - What they already know or believe about radiation
 - Use of imagination
 - Worst case images of disaster



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Fear of Radiation

- Psychological effects may be equally, if not more, damaging than physical health effects
- Fear is created by the unconscious mind as a protective mechanism
- Result of linking radiation with emotional trauma
 - Real life injuries – not likely
 - Portrayed by news, movies, TV shows
- Powerful negative association, unconscious mind says this is very dangerous and to avoid radiation, I will attach terrible feelings to radiation, to assure that I will be safe
- A radiophobia is born

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Radiation Phobia

Fears arise from the question,

“What if..?”

- What if I am exposed to radiation?
- What if I get contaminated?
- What if my children are exposed?
- What if my property gets contaminated?

Basis of phobias (fears / images) ?

Ask “What’s so bad about that ?”



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Dread of Radiation

- You cannot see it, smell it, or feel it
 - We rely on our five senses to warn us of danger
 - No one has ever had a direct experience of radiation
 - Like touching a hot pan or a live electric wire
- Many feel defenseless against radiation
- Many may conclude,
“If radiation is there, it is bad for you!!!”
 - Therefore, for many people no radiation is acceptable

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Two Word Risk Assessments

- Media avoids complex risk assessments with only 2 words
 - “Deadly Radiation”
 - Is there any other kind?
 - Is all radiation deadly?
 - Does the type or amount matter?
- Media has created and perpetuates a mindset against radiation
- Now part of everyone’s subconscious alert to danger
- Putting these two words together
 - Assumes - Cause and Effect



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Role of Fear in Our Lives

- Fear can be a constructive emotion. When we worry about a risk, we pay more attention to it. Fear keeps us alive and thriving.
- In 1933 Roosevelt said, “....the only thing we have to fear is fear itself, nameless, unreasoning, unjustified terror which paralyzes needed efforts to convert retreat into advance.”
- However, unreasoning fear may cause us to make increasingly foolish choices in daily decisions about risks.

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Why Do We Fear ?

- Why do we shrug off great risks and why have we become a culture of fear ?
- Part of the answer is self interest.
Fear sells. Fear makes money.
Fear is a fantastic marketing tool.
- We cannot turn on the news or open a paper without seeing fear at work.
- Activists and NGOs know that their influence with the media is to tell the scariest stories possible.
- Media also know that competition in the marketplace is related to promoting fears

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Dealing with Nuclear Fears

- Experts are wrong to think they can ease fears by simply “getting the facts out.”
- While facts are evaluated rationally , fears come from our subconscious gut feelings, not logical analysis
- Our gut tell us that even though radiation injuries are very unlikely to occur, that is not a an adequate justification for ignoring the risk of possible effects.
- Judgments are commonly made on basis of anecdotes and speculation

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Basis of Radiation Fears

- Inability to see, feel, smell, or detect by our senses
 - Also true for many chemical toxins, mercury, PCBs, dioxin, asbestos
- Word association of nuclear weapons and nuclear energy
 - Radiation was actually cause of few deaths from bombs
- Causes cancer

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Stories Promote Fears

- We are good with stories and bad with numbers.
- The fact that 3,000 died on 9/11 does not carry the same feeling as watching the buildings collapse
- A touching story is more memorable than the best analysis. However, anecdotes are not data, and don't prove anything

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Worry

- We worry about what has a low probability of happening
 - If probability is high, we take action
- Worrying about radiation is a distraction from what is happening in favor of what you imagine might happen
 - Imagination can conjure powerful possibilities



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Results of Worry

- I've experienced a great many terrible things in my life, a few of which have actually happened.



Will Rogers

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How Nuclear Fears Perpetuate

- Confirmation bias – Once we have formed a view, we embrace information that supports that view while ignoring, rejecting, or harshly scrutinizing information that casts doubt on it. Once a belief is established, our brains will seek to confirm it.
- Seeking to confirm our beliefs seems natural, while it seems strange to look for evidence that contradicts our beliefs.
- Groups tend to hold more extreme beliefs than individuals. Confirmation bias further strengthens those beliefs, until everyone is convinced of mortal danger.
- Media reports what “everyone knows” radiation is deadly.

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We Are All Afraid of Something

- What are we afraid of ?
 - What we worry about – loss of family, home
 - Failure – loss of employment, loss of trust, or loss of credibility
 - Embarrassment – appearing stupid
 - Change - which may leave us out
 - Losing too much - money, status, security
 - Getting hurt – feelings or physical
 - Loss of relationships – loss of friends or loved ones
 - What we do not understand - how much do people generally understand about radiation ?

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Fear in Our Future

- Wins elections, expands budgets, sells news media,
- Fear is an excellent way to promote the interests of groups to boost memberships, and donations, and enhance political clout.
- We encounter these messages of fear daily.
- The opportunities for finding a fear, promoting it, and leveraging it to increase sales are only limited by imagination.

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Marketing of Fear

- If people believe they can be protected by a pill (KI) they will buy out all stocks.
- Fear of death is a great promoter.
- Drug companies like to show how we have lost control of our lives and can regain control with a medication
- There is money to be made by marketing fear. “Unreasonable fear” is bad for society, but great for marketers.

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Hard to Turn off Thoughts of Risks

- Especially when fear is sprayed at us like tear gas from every TV
 - Next up, another nightmare
 - Next up, another tragedy
 - Next up, another terrible thing from someone’s imagination
- Its too hard to be on constant duty
 - Its very stressful to live like this
- We have an opportunity to become less controlled by unwarranted fear



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Role of the Media

- What makes news – novelty, conflict, impact, and human interest.
- The dramatic out sells the slow, routine, and massive toll taken by smoking, alcohol, and obesity.
- Definition of news is “bad news”.
- We do not like to hear bad news, but we want to hear it in case its coming our way.

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Electronic Terrorism

- America against America
 - When our own TV news terrorizes us
- News should tell us:
 - What is happening
 - What has happened
- News should not make up stories about what “might” happen in some awful version of the future



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Electronic Terrorism

- Language, images, and graphics are carefully chosen to make each story seem urgent or significant
- Viewers are left swimming in pictures of FEAR
 - Without a balanced perspective on the situation
- News should focus on what is known
 - Instead news focuses on what is not known
 - Builds on speculation, supposition, rumor, gossip, projection, and conjecture

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TV News

- With fearful images filling our minds
 - Qualifying words: “allegedly, unconfirmed, possibly, could, potentially, conceivably” drop from our consciousness, leaving us with a sense that danger is everywhere around us
- TV news should just begin by saying:
 - We are surprised that you made it through another day
 - Here is what happened to those that didn't

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The Newspeak of Fear

- “Deadly”
 - “Deadly Radiation”
 - Is radiation “deadly” in any amount?
 - Deadly implies that all will die
- In truth, we are extremely resistant to harmful effects of radiation
 - Truth in advertising should say,
“Today a person was exposed to highly survivable radiation”

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Radiation and Cancer

- Reports on radiation raise fears, public concern rises, and reporters respond with more fear stories, and the loop expands.
- Everyone knows radiation causes cancer
- Cancer is a word which is black and frightening, it stirs bleak feelings, reporters experience those feelings and their perceptions are shaped by them.

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We Want to Avoid Cancer

- It's easy to conclude - “better to be safe than sorry.”
- Cancer is a crab-like scavenger reaching its tentacles into the life of the soul as well as the body. It destroys the will as it gnaws away at the flesh.
- We worry about cancer when more than half of all cancers might be prevented by lifestyle changes, such as exercise, weight control, and not smoking.

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Nuclear Fear Motivates Regulators

- Few will blame a regulator for saying a risk is high when it does not come to pass, but if they downplay a risk that later hits the news, they can expect a trial by inquisition.
- Therefore, Japan regulators called for evacuation out to 12 miles
- US regulators said to evacuate to 50 miles

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Fears of Radiation Professionals

- Fear of criticism
 - For not doing their jobs well
 - Irresponsibility
 - Carelessness
 - Neglect
- Profession of radiation safety is built around fears
- The words “Radiation Safety”
 - Implies something to be afraid of
 - Something to be avoided
 - Something for which caution is needed

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Future of Nuclear Energy – Public Sentiments

- Cannot rely on nuclear power
- Cannot guarantee safety
- Need to revise plans for more nuclear
- Worried about children and grandchildren
- Nuclear accidents could take great toll of lives
- Other energy sources are safer - wind, solar

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Fears in Our Future

- After sixty years of bad news about radiation we are fertile soil for fear mongers.
- The “War on Terror” has done well to establish a culture of fear
- Fear obscures reason, intensifies emotions, and makes it easier to mobilize public opinion.
- Americans remain inordinately fearful of unlikely dangers, such as radiation

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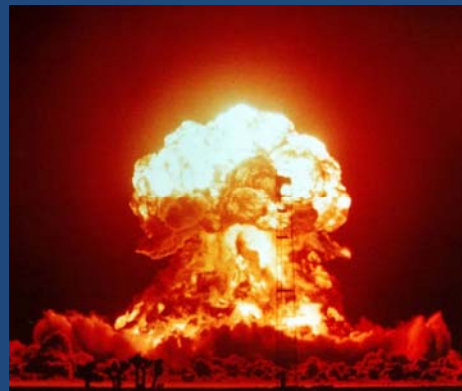
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