The NRRPT NEWS

OFFICIAL NEWSLETTER of the *National Registry of Radiation Protection Technologists*

September 2017 **Incorporated April 12, 1976**

Chairman's Message

Who will be the leaders of tomorrow?

Greetings fellow RRPTs !

Congratulations to the 15 successful candidates from the February 2017 exam – welcome to the Registry! This brings our total to an impressive 5490 successful registrants since inception. Best wishes to the candidates from the August exam that are anxiously awaiting word of their results and good luck to the candidates preparing for the upcoming Canadian exam in October.

As always, Todd and DeeDee have put together a great edition of the newsletter. There is an informative piece on risk perception from Dannie Green and some interesting history from Pete Darnell. Please check out these highlights and review the material from our sponsors.

This past July, we held the 88th meeting of the Board of Directors and the Exam Panel in Raleigh, North Carolina in conjunction with the Health Physics Society Meeting. It was an excellent meeting with progress in several areas, most importantly the work towards implementing the new exam blueprint.

Who will be the leaders of tomorrow?

As your Board of Directors we have a responsibility to the Registry, and to you its members, to provide effective leadership. I believe there are three key areas where we need to focus – the strategic direction of the Registry, management of the financial resources and management of the human resources. Human resources for us consists primarily of ensuring that we have the talent and capability on our volunteer Board and Exam Panel to sustain and grow the Registry. We are in fantastic shape in this regard at the moment – but the fact is that in a decade or so, most of the current Board and Panel members will be retired.

Recently, DeeDee and I spent some time looking at the make-up of the Registry. We don't keep demographic information on Registrants like date of birth – so it is difficult to directly assess the age profile. However, year of registration is likely to be correlated with age. Here is a look at our current set of active practitioners

Inside This Issue

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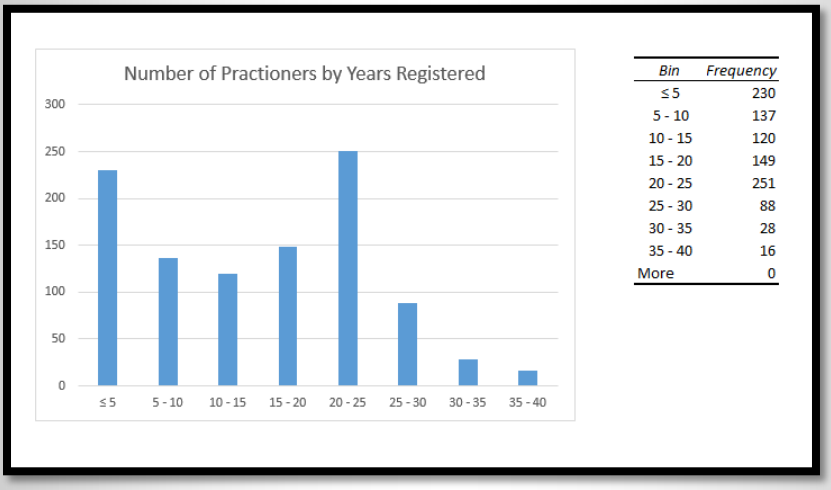
by year of Registration. A couple of things stand out for me. First – great news – we have a lot of new Registrants, and it would appear that the rate of adding new Registrants is growing. Second – this doesn't look much like the age (or year of Registration) distribution of the Board and Panel. We need to get the set of new Registrants engaged in the business of the Registry to carry us into the next 40 years.



Bin	*Frequency*
≤ 5	230
5 - 10	137
10 - 15	120
15 - 20	149
20 - 25	251
25 - 30	88
30 - 35	28
35 - 40	16
More	0

How can new folks get involved?

I was delighted to see four new additions to the Exam Panel all of whom are likely to be in the workforce long after I and others on the Board have retired. Welcome Jon Biela, Nic Christiansen, Justin Fox and Ryan Murdock! If you can be available for at least one of the two meetings each year – with or without sponsorship from your employer – and you are willing to contribute to the Exam Panel, we want you! Work on the Exam Panel is rewarding and a great way to stay sharp and it may lead to participation on the Board after some time. As I said in the previous Chairman's message – it is work hard – play hard – work hard some more. You will become part of a great group of motivated, warm and committed people.

Exam Panel membership is a big commitment and is not practical for everyone. Other ways to get engaged in the Registry would include writing newsletter articles, promoting Registration with your colleagues and encouraging the "next generation" to take on the challenge of becoming an RRPT. Run study groups for them. Talk up the benefits of Registration with your employer. Help us find new sponsors and make sure that our current sponsors hear from you that their sponsorship is important and appreciated.


Some of our leaders of yesterday


Some of our leaders of today


Who will be our leaders of tomorrow?

In upcoming newsletters, I'll provide an overview of where we are on the other two areas – strategic direction and financial resources.

Enjoy the end of the summer all the best for a safe and happy Autumn.

Dave Tucker

NRRPT, Chairman of the Board

Risk Perception

By Dannie Green

In the practice of radiation protection, the radiation protection professional is responsible for communicating information to employees and the public about the nature, degree, and the technical aspects associated with the hazard. This form of communication is referred to as risk communication. Risk communication serves to inform the participants, influence behavior, solicit positive involvement in ALARA programs, and address any concerns and perceptions.

Risk communication is a two-way process. In order for risk communication to be successful, it is important for the radiation protection professional to know the participants' concerns as well as understanding and perceptions of the radiation hazard. Most often, general employees and the public perceive the risk associated with anything radioactive to be far greater than the radiation protection professional's perception. Because of this inflated concern, we often find that a disproportional amount of resources are channeled to low risk and/or exposure situations in order to address those unsubstantiated fears. To avoid the unnecessary diversion of resources to low risk situations, it is necessary for the radiation protection personnel to address those fears and misconceptions. Risk communication is used to reconcile the difference in risk perception between the radiation protection professional and the general public/employee.

To address the differences in risk perception between general employees, the public, and the radiation protection professional, it is necessary to know the factors that influence and shape employees' and the public's perceptions. Like other health and safety professionals, our perception of the risk associated with a hazard is based on two facts: probability of occurrence, and the resulting consequences of that occurrence. (Risk = Probability x Consequences). As probability and consequences increase, so does the risk. With regard to general employees and the public, risk communication experts have identified several factors influencing the layman's perception of risk. These influences are outside of the technical facts. They include the following considerations:

Voluntary and Control – In general, people perceive the risk associated with a hazard to be lower when participation is voluntary and there is an element of control.

Familiarity with the Hazard – Familiar hazards are considered less risky than exotic hazards. This is why the public will consider the risk associated with driving to be less than the risk associated with exposure to low doses of radiation.

Natural vs. Manmade – Risk associated with manmade hazards are viewed as being more hazardous than natural hazards.

Rare vs. Common – Hazards associated with rare and highly published events such as nuclear accidents are viewed as being riskier than hazards associated with more common events.

Social Consciousness – A hazard will be viewed as more risky when it conflicts with the public's core values. For example, the public is less willing to accept a risk that affects children regardless of how low that risk may be.

Distribution – The public is more willing to accept a hazard when the risk and benefits associated with that hazard are evenly distributed.

Benefits – The public is willing to accept a risk perceived to have clear benefits.

Statistical vs. Catastrophic – Statistical based risks are more acceptable than catastrophic based risk.

Trust in the Source – Risk generated by trusted sources is more acceptable than risk generated by untrusted sources. This gives rise to the generalization that, "With the general public, trust is difficult to gain and easy to lose".

It is important to note that risk communication is more than a simple dissemination of information. Instead, the radiation protection professional must work to understand and address those factors that shape the general employees and public perceptions of the hazard. Risk communication's ultimate end goal is to help the person put the risk into the proper context and to enable each person to make sound decisions based on knowledge and scientific facts rather than react out of fear with regard to their personnel health and safety.

References:

Persensky, J., Browde, S., Peterson, L., Specht, E., and Wright, E. (n.d.). Effective Risk Communication. U.S. Nuclear Regulatory Commission

McColl, S., Hicks, J., Craig, L., and Shortreed, J. (2000). Environmental Health Risk Management A Primer for Canadians. Institute for Risk Research

(1994). Risk Communication Principles and Practices Overview of Issues and Guiding Principles. Centers for Disease Control and Prevention. Retrieved from http://www.atsdr.cdc.gov/risk/riskprimer/vision.html

(2015). Risk Communication Overview: Guidance Documents. U.S. EPA. Retrieved from https://www.epa.gov/risk/risk-communication

Welcome New NRRPT Members

Congratulations to the following individuals who successfully passed the **NRRPT** Examination on February 25, 2017:

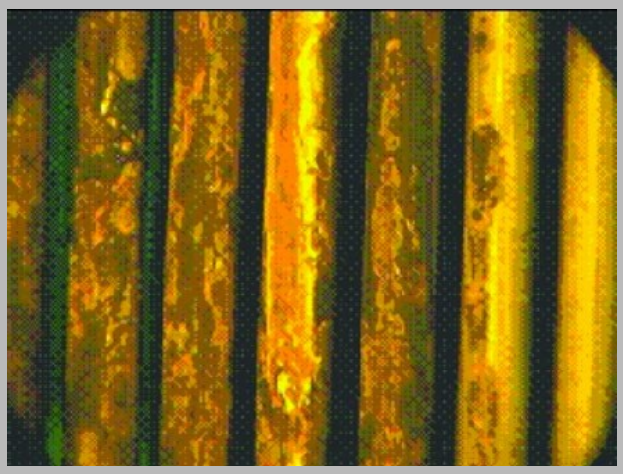
Michael H. Ames
Paul Armani
Ryan T. Crihfield
Jared A. Daw
Nick Dorrell
Scott M. Finch
Timothy Gildea
Darren L. Hagen
Neilan R. Harris
Jarvis K. Jensen
Sarah Juntunen
Sandra R. Kirkpatrick
Jake W. Reynolds
David F. Romaine
Steven M. Slovyan

Crud, what is it good for?

By Peter Darnell

Absolutely nothing…
I said crud, good god, now, what is it good for?
Absolutely, nothing
Say it again, crud, what is it good for?

Well, if you know the song by Edwin Starr, this is a good opening.



University of Michigan Engineering picture of chemical deposits on nuclear fuel

Crud, what is it good for?
Absolutely, nothing
I said crud, good god, now, what is it good for?
Absolutely, nothing
Say it again, crud, what is it good for?
Absolutely, nothing, listen to me!

Chalk River Unidentified Deposits (CRUD)?

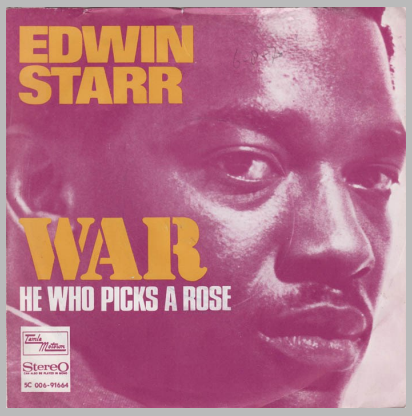
Wrong.

Crud is not an acronym at all. But, you could say it started life that way. In 1959, Commander EE Kintner wrote an article about a test conducted for Admiral Rickover's canoe club (US Navy) in 1953.

The Navy put a sample of the Mark I prototype reactor (think USS Nautilus – the first nuclear submarine) in the research reactor at Chalk River. The sample came back with unidentified deposits made over the months-long test. There you go – the first military use of CRUD. Unfortunately, the good folks at Hanford beat Kintner to the punch by almost a decade.

In 1944, the Hanford Engineering Works described a chemical process that seeped insoluble "crud" and mud out of solutions. The term "crud" became so ubiquitous that by 1947 no one used the quotation marks. In the 1940's crud (/krəd/) was an informal noun that meant "A substance that is disgusting or unpleasant, typically because of its dirtiness." Dogfaces in WW II (US Soldiers) called unknown illnesses the "crud."

Not a bad word to describe contamination.



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References:

US NRC History Blog, 2015, Tom Wellock

The Dictionary of American Slang, Fourth Edition by Barbara Ann Kipfer, PhD. and Robert L. Chapman, Ph.D.

NRRPT Logo Merchandise
Blow Out Sale!

It's time to make room for new merchandise so all the old merchandise is on sale—up to 75% off!
Contact the Executive Secretary soon—the items below will not last long!

***** Order form is on the following page *****

Logo on Merchandise	Description	Price	Size Available
	Sweatshirt—navy w/white logo	$3.00	Med or Lg
	Vest—blue fleece w/white logo	$5.00	Lg
	Vest—brown nylon w/blue logo	$5.00	Sm
	Jacket—tan nylon w/blue logo	$5.00	Sm

Logo on Merchandise	Description	Price	Size Available
	Polo shirt—heather grey w/black logo	$10.00	Med or Lg
	T-shirt—long sleeve light blue w/dark blue logo	$5.00	Sm—3XL

Logo on Merchandise	Description	Price	Size Available
	Polo shirt—maroon w/gold logo	$10.00	Med, Lg or 2XL-4XL
	Polo shirt—navy blue w/gold logo	$10.00	XL
	T-shirt—short sleeve heather gray w/maroon logo	$5.00	Med—4XL
	Ball cap—stone w/black logo	$5.00	

Logo on Merchandise	Description	Price	Size Available
	Polo shirt—white w/navy logo	$10.00	3XL or 4XL
	T-shirt—short sleeve light blue w/white logo	$5.00	XL or 3XL or 4XL

NRRPT Logo Merchandise
Blow Out Sale!

Fax or email form to:
(401) 637-4822
nrrpt@nrrpt.org

Please include your email address so the Executive Secretary can contact you if an item is unavailable

NRRPT Merchandise Order Form

1 Item(s) Description _____
2 Item(s) Description _____
3 Item(s) Description _____
4 Item(s) Description _____

1 Size_____ Qty _____
2 Size_____ Qty _____
3 Size_____ Qty _____
4 Size_____ Qty _____
Hat _____ Qty _____

Check, Money Order, Visa & MasterCard

"Tall" sizes are NOT available

Plus one-time shipping charge of $7.00
(Canadians, please add an additional $5.00 for international shipping)

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SL-1 Accident at the National Reactor Testing Station (NRTS), Idaho on January 3, 1961

by Peter Darnell

The first indication of trouble at the Army SL-1 (Stationary Low Power No. 1) reactor was an automatic alarm received at Atomic Energy Commission (AEC) Fire Stations and Security Headquarters at 9:01 p. m. (MST) January 3, 1961. The NRTS immediately broadcast the alarm over all radio networks. At the same time, the personnel radiation monitor at the Gas Cooled Reactor Experiment gatehouse (about one mile away) alarmed and remained erratic for several minutes.

SL-1 before the accident (Together We Served)

Several conditions could cause this alarm including excessive temperature or a pressure surge in the region above the reactor floor. Upon receipt of the alarm, the Central Facilities AEC Fire Department and AEC Security Forces responded. The Phillips Petroleum Company was the operating contractor for some NRTS facilities. Phillips called in one of the health physicists from the Materials Testing Reactor area.

The fire engines and security forces arrived at SL-1 at approximately 9:10 p.m (they left from the central facilities area about eight miles away). Security patrolmen opened the gates in the site area fence and later the south door of the SL-1 Administration Building. Firefighters equipped with Scott Air Packs and radiation survey meters went through the administration building and the support facilities building in search of the operators and evidence of fire. The initial penetration went as far as the entrance to the reactor building; however, unusually high radiation levels there caused the search party to withdraw pending health physics guidance. They noted no fire, smoke, or personnel in the support facilities or admin building. The searchers did not enter the reactor building.

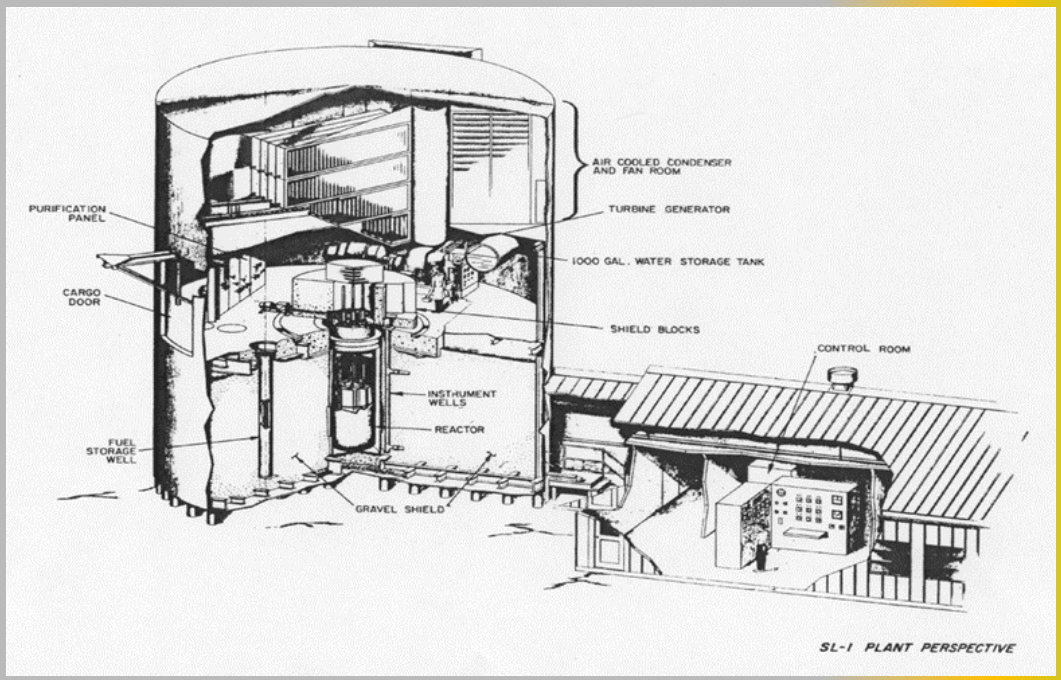
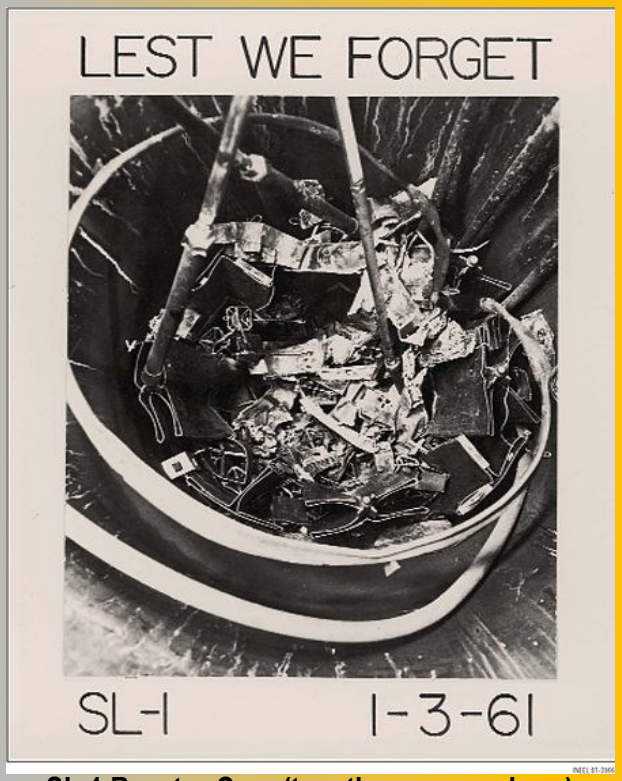


Photo of SL-1 (allthingsnuclear.org)

References: AEC Information Notice No. 61-11
AEC Investigation Board Report, June 1961
American Nuclear Society, SL-1 Accident YouTube video



SL-1 Reactor Core (togetherweserved.org)

At 9:17 p.m., the Phillips health physicist arrived at the SL-1. He and a firefighter, wearing Scott Air Packs, made another trip through the administration and support facilities buildings and as far as the foot of the stairs to the operating floor of the reactor building. They encountered a radiation level of 25 roentgens per hour, which maxed out the survey meter they used. They retreated from the reactor building and thoroughly searched the administration and support facilities buildings looking for the three men believed to be on duty. They saw no one, nor any smoke or fire. During this search, they encountered radiation fields of from 500 mR per hour to 10 R per hour.

By this time, Phillips verified via radio check that none of the SL-1 operators had reported to them and they presumed the operators were in the reactor building.

At 9:35 p. m. two more Phillips health physicists arrived, already in protective clothing. One of them, with two firemen and with a 500 r per hour range survey meter, went up the stairs of the reactor building until a 200 r per hour radiation field was encountered. This group withdrew from the building to plan a course of action based on radiation levels noted. Then, with AEC approval, the other Phillips health physicist and an AEC fireman went to the top of the stairs and took a brief look at the reactor floor. Observed radiation levels of the order of 500 r per hour forced their quick withdrawal. They saw some evidence of damage but no bodies.

By 9:36p.m. key personnel of AEC-Idaho Operations Office, Combustion Engineering Inc. (operating contractor for SL-1), and Phillips Petroleum Company had been notified of the SL-1 accident. Following notification, many personnel who played key roles in the rescue efforts a.t SL-1 had to travel from Idaho Falls to the SL-1 site, a distance of 41 miles. At 10:25 p. m. IDO designation of a Class I Disaster was broadcast over the NRTS radio network.

When four Combustion Engineering personnel, including the SL-1 Plant Health Physicist, arrived, they decided to enter the 500 r per hour field. The four Combustion Engineering men, having verified that the three military men on duty had not left the site, prepared to enter onto the reactor operating floor.

At approximately 10:35 p. m. the Combustion Engineering supervisors for plant operations and health physics, wearing Scott Air Paks and carrying two 500 roentgen scale Jordan Radectors, entered the reactor operating floor for less than two minutes. They saw two men; one moving. They withdrew and returned with two more Combustion Engineering men and an AEC health physicist.

American Nuclear Society (YouTube screen grab)

References: AEC Information Notice No. 61-11
AEC Investigation Board Report, June 1961
American Nuclear Society, SL-1 Accident
YouTube video

Two of the group picked up the man who was alive and put him on a. stretcher at the head of the stairs. The other three of the group observed that the second man was apparently dead. The group got the stretcher down the stairs and out the west door within three minutes of entry, and put the stretcher in a panel truck. After removing him from the site, the rescuers transferred him to an ambulance met the AEC doctor at the junction of Highway 20 and Fillmore Blvd. The doctor pronounced the casualty dead at 11:14 p.m. The ambulance returned the body to the SL-1 site to await a decision on the temporary disposition of the body.

Control Rod Impaled in Ceiling (radiationworks.com)

At about 10:48 p. m. another group, made up of two military and two Phillips personnel, entered the reactor floor briefly to locate the third man. They determined that he was dead and did not attempt to remove him. The recovery group went to the GCRE for preliminary decontamination. Gamma exposures of the five-man group ranged from 23 to 27 roentgens. As the groups were returning from the GCRE, they stopped long enough to permit one military man and one AEC health physicist to go through the support facilities building and close doors to lessen the chance of a fire starting and spreading in the disaster area. The two men did not enter the reactor building on this trip.. When the two men returned to the rest of the group, it proceeded on to the decontamination trailer set up at Fillmore Blvd. and Route No. 20.

Personnel decontamination took place at the NRTS Central Facilities Dispensary and Chemical Processing Plant. Having concluded that the remaining two operators were dead, the AEC health physicist suspended rescue efforts and ordered all personnel back to the roadblock established on Fillmore Blvd. at Highway 20. Between midnight and 3 a.m. on January 4, approximately 30 people arrived at the dispensary for secondary decontamination. The AEC collected preliminary badge readings and urine samples; all personnel released.

Jordan Radetector (YouTube screen grab)

At approximately 6 a.m. on the morning of January 4, a team removed the body from the ambulance for decontamination. Individuals involved in the disrobing and transfer process received a maximum exposure of 770 millirem. Before decontamination radiation levels measured on the body showed approximately 400 R per hour at the head, 100 r per hour at the feet, and from 200-300 R per hour over the remainder. First efforts to decontaminate the body resulted in no significant decrease in the readings.

Between 7 a. m. and 11 p. m. on January 4, the AEC made several entries into the reactor buildings to plan for recovery of the second body from a 750 R per hour area.

References: AEC Information Notice No. 61-11
AEC Investigation Board Report, June 1961
American Nuclear Society, SL-1 Accident YouTube video

A recovery team consisting of six military personnel and two AEC health physicists proceeded from the decontamination check point on Fillmore Blvd. near U. S. Highway 20 to the entrance of the SL-1 compound at about 7: 30 p. m. Four of this group entered the Support Facilities Building through the side entrance into the maintenance workshop area and laid a blanket on the floor of the control room. Their stay time was one minute. A two-man team entered the reactor-operating floor and proceeded directly to the body. One man picked up the victim's legs while the other grasped the body around the shoulders and they moved rapidly out of the high radiation area and down the stairway. They exceeded the one-minute stay time but successfully removed the second victim to the blanket in the control room.

A second two-man team entered the Support Facilities Building, retrieved the body, and carried it out of the SL-1 compound with the blanket. Responders removed the work clothing or coveralls from the body and placed it in an ambulance at 8:08 p.m. The ambulance proceeded with the body to the Chemical Processing Plant for disposition. Another two-man military team proceeded into the Support Facilities Building and on to the reactor-operating floor to gain some more information about the status of the reactor. These efforts on the reactor-operating floor resulted in gamma exposures of from 1 to about 13 rem.

On Thursday evening, January 5, a photographer entered the radioactive reactor compartment to photograph the scene. An accompanying health physicist reported radiation fields greater than 500 R per hour. The photographer's stay time was 30 seconds. By entering the reactor compartment only long enough to trigger his camera and withdrawing to a less radioactive area to change film and make adjustments, the photographer was able to obtain the interior photograph needed. This photograph assisted AEC investigating teams in making plans to recover the third body and in evaluating damage to the reactor operating area. Maximum radiation exposure of these two men was less than two Roentgens.

Core removal with crane (radiationworks.com)

A blown control rod lodged the third victim in the ceiling above the reactor. Because of the high radiation (>500 R per hour) and contamination, the AEC prohibited climbing up to the victim. To remove him, AEC planned to position a large net and attempt to lower the body onto the net. Workers fastened the net to the end of a crane boom. With the net in position, 2 man teams attempted to lower the body onto the net. Their stay times were less than a minute. It took 5 teams to accomplish freeing the body and lowering it onto the net. A sixth team moved the crane. Cessation of recovery occurred at 4:42 a.m. on January 9, 1961. Doses for the recovery teams ranged from 2.5 to 7.5 rem.

SL-1 today (screen grab YouTube video)

References: AEC Information Notice No. 61-11
AEC Investigation Board Report, June 1961
American Nuclear Society, SL-1 Accident YouTube video

Scholarship Donation Opportunities

Ed Lohr, Chairman Awards Committee

The NRRPT has an active scholarship program to promote the field of Health Physics and closely related technical disciplines. The program funds the student scholarships, the Don Marshall Scholarship, and the Memorial Scholarship. Information on these scholarships and applications can be found on the NRRPT webpage under the Forms tab.

Financial support for NRRPT scholarship program is provided by a generous grant from Cabrera, not from member's dues. Over the last three years over $30,000 have been awarded. Because of the NRRPT's active outreach activities, the scholarship fund is anticipated to be depleted in the next couple of years. In order to for the NRRPT to continue to provide scholarships, the scholarship fund needs to be replenished.

In the coming months, the membership renewal form will be modified to add a box to afford members a convenient avenue to contribute to the NRRPT scholarship fund. This is strictly voluntary and provides the opportunity for members to give back to the organization. Also, on the Corporate Sponsor's renewal form, a solicitation for contributions will be added to make it easy for a sponsor to make a donation.

Please consider the NRRPT scholarship fund when your membership is being renewed. Of course you can donate anytime by contacting the NRRPT Executive Secretary at NRRPT.org. Your generosity is appreciated.

RAD MOVIE REVIEWS!

The Man with X-ray Eyes – Yet another mad scientist on the loose. Best intentions turn grave when Dr. Xavier (you know he's mad because his name starts with an "X") develops eye drops that allow humans to see beyond the visible spectrum. He develops x-ray eyes!

Of course it starts off real cool – who wouldn't want to see through people's clothes?

Perverts!

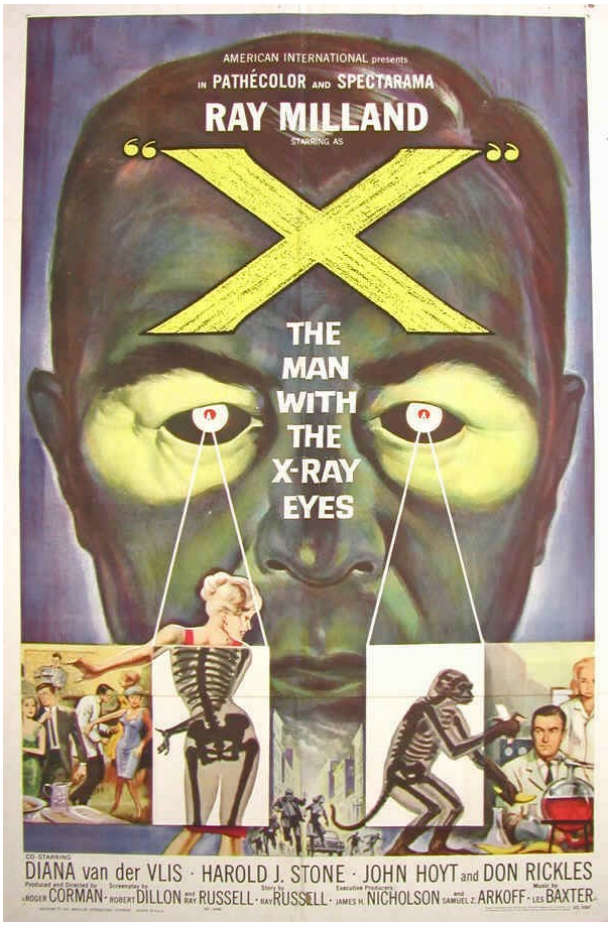
Dr. Xavier saves a girl with a misdiagnosed medical problem but his problems start to grow. Soon his eyesight becomes so perceptive he is unable to control it. He starts seeing things in forms, lights and textures humans can't understand.

Next comes the obligatory killing of a dear friend.

I've actually seen this movie – the ending is kind of neat. Xavier goes to an evangelist in the middle of a desert. The quote:

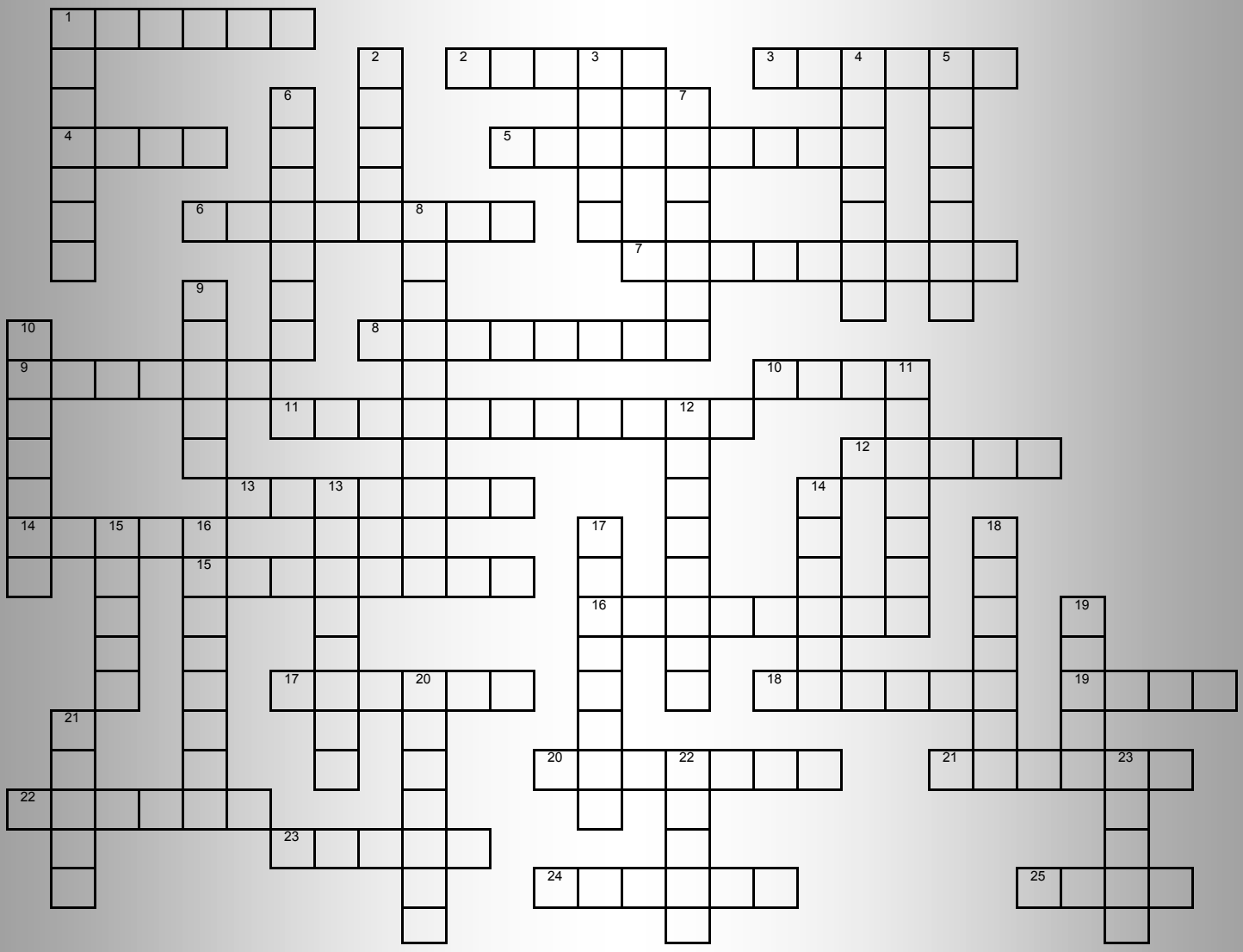
"If thine eye offends thee... pluck it out!"

Watch the move to find out how it ends and get a great load of cheesy special effects.



Pete Darnell, RRPT, CHP, amateur movie critic

Crossword Puzzle



Crossword Puzzle Answers on back page

Across

1	He discovered the neutrino and received half a Nobel Prize for it
2	Robert _____, a Scottish botanist and palaeobotanist whose contributions include one of the earliest detailed descriptions of the cell nucleus and cytoplasmic streaming and the observation of Brownian motion
3	This English physicist and mathematician was the original discoverer of the infinitesimal calculus
4	The Danish physicist who is generally regarded as one of the foremost physicists of the 20th century
5	He gained worldwide acclaim for his groundbreaking work on quantum theory. In his 1924 thesis, he discovered the wave nature of electrons and suggested that all matter have wave properties
6	He was the safety control rod axe man who stood ready with an axe to cut the control rod rope during the start-up of Chicago Pile-1 (CP-1)
7	He was the discoverer of radioactivity, for which he also won the 1903 Nobel Prize in Physics
8	The English physicist who was awarded the 1935 Nobel Prize in Physics for his discovery of the neutron in 1932
9	The French physicist and mathematician who was one of the founders of the science of classical electromagnetism
10	The dentist who first linked the relationship between radium dial painting occupation and health effects
11	He formulated a version of quantum mechanics based on his wave equation
12	He showed how X-rays passing through a crystal collect information that allows the crystal's atomic structure to be deduced
13	He discovered plutonium as well as isotopes of elements with important applications in the diagnosis and treatment of diseases, most notably iodine-131, which is used in the treatment of thyroid disease. He coined the term "nuclear spallation" and element 106 was named for him
14	He developed a Superheated Drop Detector as a possible alternative for neutron dosimetry
15	This Italian mathematician is best known for his hypothesis that equal volumes of different gases contain an equal number of molecules, provided they are at the same temperature and pressure
16	The German mechanical engineer and physicist, who, on 8 November 1895, produced and detected electromagnetic radiation in a wavelength range known as X-rays
17	He coined the term fission to describe the energy released when the uranium nucleus split in two
18	The British chemist and physicist noted for his discovery of the element thallium and for his cathode-ray studies, fundamental in the development of atomic physics
19	He was exclusively awarded the Nobel Prize in Chemistry in 1944 for the discovery and the radiochemical proof of nuclear fission
20	His "effect" demonstrated the particle concept of electromagnetic radiation
21	The German theoretical physicist whose discovery of energy quanta won him the Nobel Prize in Physics in 1918
22	He is credited with making Hormiesis a household word
23	The Russian General who admitted the loss of 84 nuclear suitcase bombs
24	As a secretary of the Manchester Literary and Philosophical Society he presented an important series of papers, entitled "Experimental Essays" on the constitution of mixed gases
25	The English physicist who worked mainly on the effects of radiation on biological systems, inventing the field of radiobiology as he went

Down

1	Swedish physicist mainly known for devising the formula, in 1888, which is used to predict the wavelengths of photons emitted by changes in the energy level of an electron in a hydrogen atom
2	With Abelquist, published a paper on the Use of Smears for Assessing Removable Contamination
3	The SI unit of magnetic flux is named after him
4	The American theoretical physicist who also worked with Neils Bohr to explain the principles of nuclear fission. More notably, he is responsible for the popularization of the term “black hole” and coining terms such as “wormhole” and “quantum foam.”
5	The Danish physicist and chemist who discovered that electric currents create magnetic fields, which was the first connection found between electricity and magnetism
6	He was best known for developing law of the electrostatic force of attraction and repulsion
7	The first person to propose the concept of nuclear fission
8	He discovered the concept of radioactive half-life
9	The first woman to win a Nobel Prize and the only woman to win the award in two different fields (physics and chemistry)
10	He discovered that a varying magnetic field causes electricity to flow in an electric circuit
11	An English-New Zealand physicist who pioneered the non-medical use of radioisotopes in New Zealand, and conducted a series of experiments to determine the role of cobalt in animal metabolism
12	He won the Nobel Prize for Physics in 1921 for his explanation of the photoelectric effect
13	The Swedish physicist and meteorologist who is credited with the invention of the pyranometer, the first device to accurately measure direct and indirect solar radiation
14	The German physicist who conducted the gold foil experiment, which led to Rutherford's new theory for the structure of the atom
15	This Italian-born American scientist directed the first controlled chain reaction involving nuclear fission
16	In 1929, he invented the cyclotron, a device for accelerating nuclear particles to high velocities in order to disintegrate atoms and form new elements
17	The phenomenon, associated with charged atomic particles moving at velocities greater than the speed of light in the local medium, was named after him
18	He presented the paper "Dynamical theory of the electromagnetic field," to the Royal Society of London in 1864 and published the following year. In 1873 he published the book A Treatise on Electricity and Magnetism
19	The American physicist who is generally credited as the father of the neutron bomb
20	The Swedish medical physicist whose major contribution was in the study of the biological effects of ionizing radiation. He played a pioneering role in the measurement of doses of radiation especially in its use in the diagnosis and treatment of cancer
21	The Austrian-born Swiss and American theoretical physicist and one of the pioneers of quantum physics whose discovery involved spin theory, which is the basis of a theory of the structure of matter
22	Mickey Mouse's pet dog or the planet Plutonium was named after
23	One of two Los Alamos scientists who discovered the neutrino but was not awarded the Nobel Prize

NRRPT Night-Out in Raleigh, NC

***** Thank you to our generous NRRPT Night-Out sponsors *****

Pictured below: Robbie Millen (Frham Safety Products), Ken Baugh (B&B Environmental Safety), Eddie Benfield (Duke Energy), and Todd Davidson (Envirachem)

Not Pictured: Bill Peoples (BHI Energy), Bob Wills (GEL), Terry Donohue (Rad Safe), Jay Tarzia (RSCS) and Gregg Johnstone (UniTech)

Thank You

A fun night as always!

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SCE is committed to a safe and timely decommissioning of the San Onofre nuclear plant that protects the environment and our customers' economic interests. SCE established a set of guiding principles focused on safety, stewardship and engagement that will guide the successful decommissioning of SONGS and can make San Onofre a model for the industry.

SONGS is proud of its' continued dedication of registered RRPT members that are represented in various organizations across the station.

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The McMaster Nuclear Reactor (MNR) first became operational in 1959 and was the first university-based research reactor in the British Commonwealth. Originally designed to operate at a maximum power of 1 MW, MNR was upgraded during the 1970s to its current rating of 5 MW with a maximum thermal neutron flux of 1 x 10^{14} neutrons/cm^2s. MNR is classified as a medium flux reactor and it is by far the most powerful research reactor at a Canadian university – the handful of so-called "Slowpoke" reactors at other institutions typically operate at a power of 0.02 MW.

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Detroit Edison operates the Fermi 2 Nuclear Power Plant located in Monroe, MI along the shores of Lake Erie. Fermi is a 1200 MW power plant supplying electricity to the metropolitan Detroit area.

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Incorporated in 1983, Frham Safety Products, Inc. continues its sole purpose of manufacturing and distributing products to the Nuclear Power Utilities, DOE, DOD, Naval facilities as well as several industrial accounts and related users of safety supplies and equipment.

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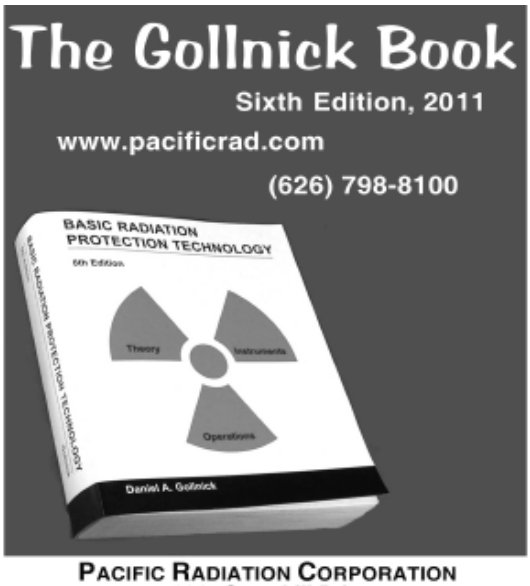

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Scholarship Awards

Ed Lohr, Chairman Awards Committee

The Awards Committee is active year round and in the last six months has been fortunate to be able to award several student scholarships and one Don Marshall Scholarship. Student scholarships are for students who are attending an accredited educational institution in a course of study in Health Physics or a closely related technical discipline. The Don Marshall Scholarship is for registered members who are attending an accredited educational institution in a course of study in Health Physics or a closely related technical discipline.

These awards have been made possible by a very generous grant from Cabrera that is currently funding the NRRPT scholarship program. Each student will receive $500 and the Don Marshall recipient will receive $2000 towards their education expenses. Congratulations to: Arshdeep Bal, Tracy Burke, Tracy Olson, Carly Faulkner, Jonathan Epperson, and Malmoud Rashed for student awards and to George Hoskison for Don Marshall award.

In addition to administering the scholarship program, the Awards Committee also reviews applicants for Associate Membership to the NRRPT. Associate members are students or personnel not fully qualified to sit for the NRRPT Exam but possessing sufficient interest in radiation safety to apply for membership. Since the beginning of the year the following individuals have been granted Associate Membership: Zachary Brown, Tracy Olson, Julianna Sebastiani, Malmoud Rashed, Cindy Sampson, and Jonathan Epperson.

If you or someone you know is pursuing a degree in a radiation safety related field please visit the NRRPT website for information on the NRRPT scholarship opportunities. You can also find information on NRRPT Associate Membership. Just click on the Forms tab on the NRRPT home page.

If you'd like to join the Panel of Examiners please contact one of the following:

Exam Panel Chairman—Dave Wirkus—wirkdl@cableone.net

Executive Secretary—DeeDee McNeill DeGrooth—nrrpt@nrrpt.org

Crossword Puzzle Answers

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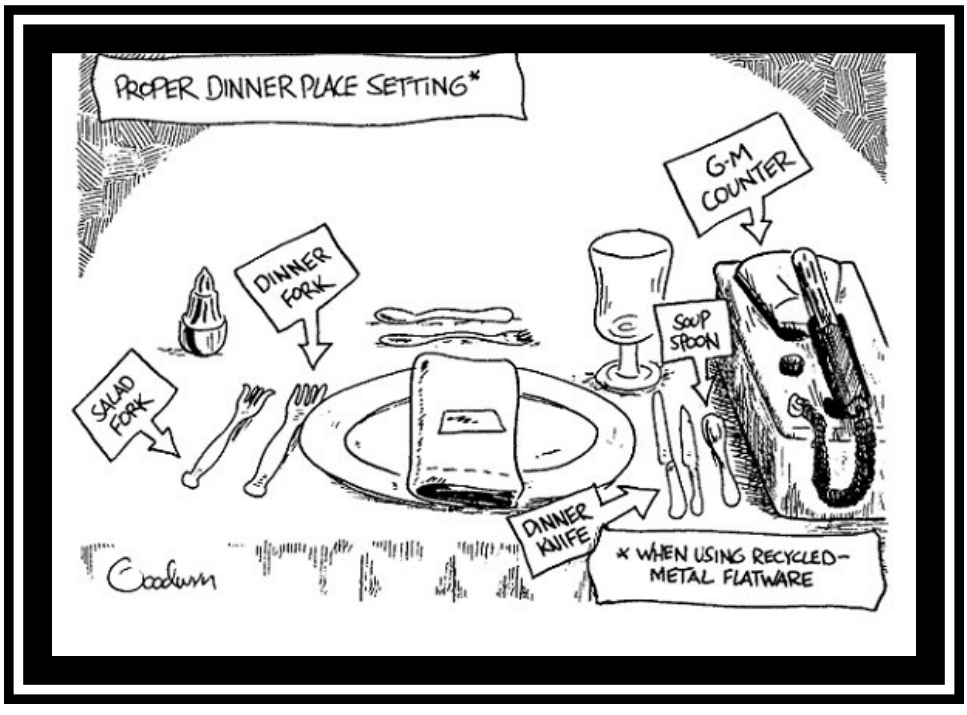

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