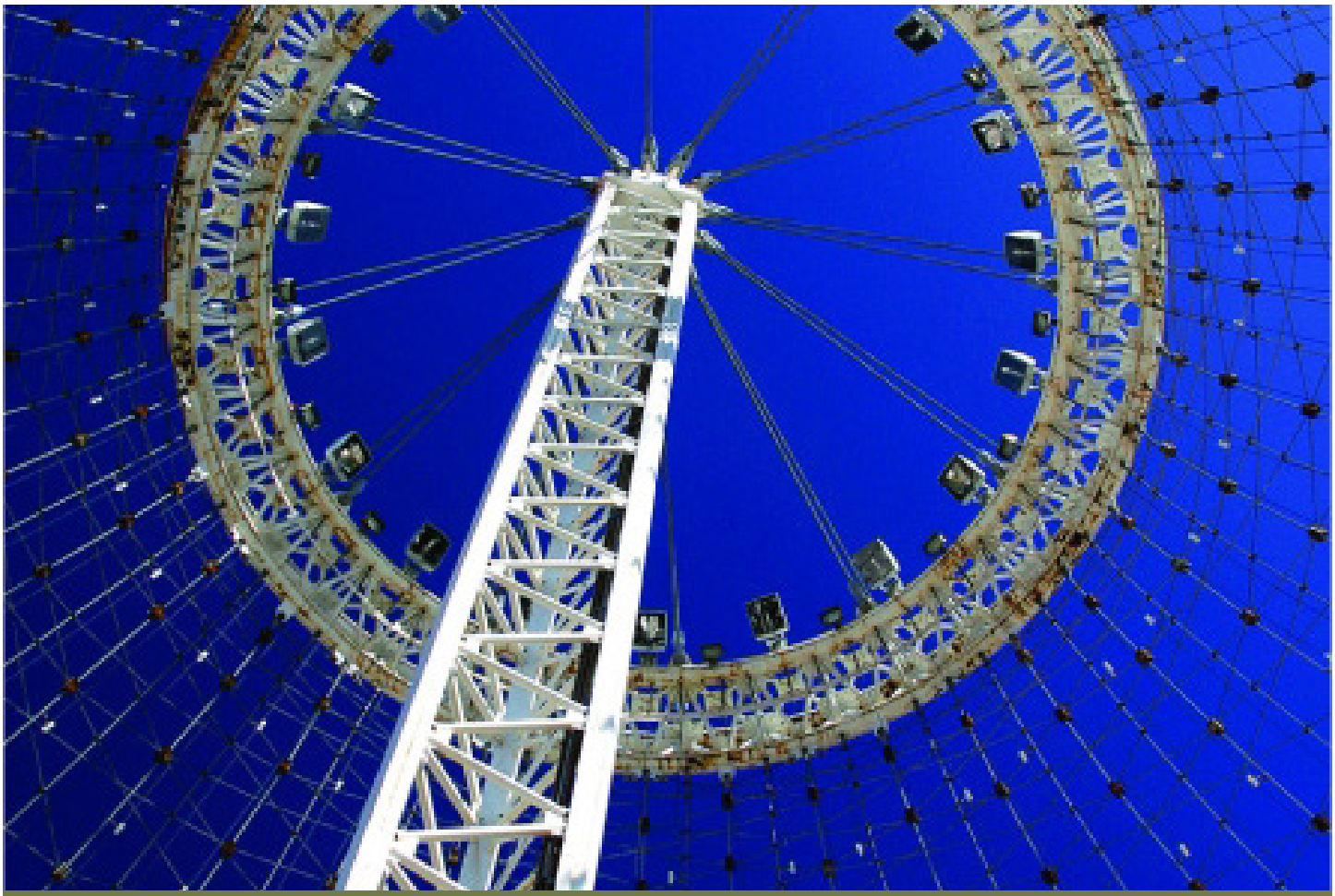
HEALTH PHYSICS SOCIETY

PRELIMINARY PROGRAM



61st Annual Meeting

Spokane Convention Center
Spokane, Washington
17-21 July 2016


DRIVE RESEARCH
THAT SUPPORTS OUR
NATION'S DEFENDERS.
NICHOLS
Lead the way in research, health education and disease prevention on the U.S. Army or Army Reserve health care team. Conduct groundbreaking research while working in some of our military's most advanced research facilities with the best scientific minds. You'll be an important member of a team that's focused on what matters most. If you choose to serve in the Army Reserve, you may qualify for a loan repayment program and special pay, all while you continue to work in your community and serve when needed.
Visit the Army Medical Recruiting Booths #415/417 to talk with an Army medical Soldier about career opportunities or go to healthcare.goarmy.com/fe54
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61st Annual Meeting

Health Physics Society

Spokane Convention Center • Spokane, Washington • 17-21 July 2016

Key Dates

1 June
Current Events/Works-In-Progress Deadline

8 June
HPS Annual Meeting Preregistration Deadline

17 June
Hotel Block Registration Deadline

14-15 July
PDS Course

16 July
AAHP Courses

17-21 July
Professional Enrichment Program
HPS 61st Annual Meeting

18 July
American Board of Health Physics
Written Exam

Registration Hours and Location

Spokane Convention Center, Hall A/B

Saturday, 16 July
2:00 pm - 5:00 pm

Sunday, 17 July
7:00 am - 5:00 pm

Monday, 18 July
8:00 am - 4:00 pm

Tuesday, 19 July
8:00 am - 4:00 pm

Wednesday, 20 July
8:00 am - 4:00 pm

Thursday, 21 July
8:00 am - 11:00 am

Table of Contents

Saturday
Saturday AAHP Courses will take place in the Davenport Grand Hotel

Sunday-Thursday
PEPs, CELs, and Sessions will be at the Spokane Convention Center

Student Worker Orientation

Mandatory Meeting
for Student Travel Grant Awardees

Saturday 16 July, 5:45 PM-6:45 PM

Current Events/ Works-In-Progress

The submission form for the Current Events/Works-in-Progress poster session is on the Health Physics Society Website at www.hps.org under the Spokane Annual Meeting section. The deadline for submissions is Wednesday, 1 June 2016. All presentations will take place as posters on Monday, 18 July, between 1:00-3:00 pm. Individuals will be notified of acceptance of their poster submissions by mid-June.

For questions regarding poster submissions, contact **HPSProgram@burkinc.com**, or Lori Strong at the HPS Secretariat at **LStrong@burkinc.com**.

Note For CHPs

The American Academy of Health Physics has approved the following meeting-related activities for continuing education credits for CHPs:

- Meeting attendance is granted 1 CEC per contact hour, excluding meals and business meetings;
- AAHP 8-hour courses are granted 16 CECs each;
- HPS 2-hour PEP courses are granted 4 CECs each;
- HPS 1-hour CELs are granted 2 CECs each.

Officers

Nancy Kirner, President
Robert Cherry, President-elect
Eric Goldin, Secretary
Kathleen L. Shingleton, Treasurer
Michael Lewandowski, Treasurer-elect
Barbara Hamrick, Past President
Brett J. Burk, Executive Director

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James Bogard
Elizabeth L. Gillenwalters
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Ken Krieger
Elaine Marshall
Debra McBaugh Scroggs
Cheryl L. Olson
Sandy Perle
David R. Simpson

2016 Exhibitors

(as of 2 May 2016)

AAHP/ABHP
AIHA
Ameriphysics, LLC
Army Medical Recruiting
Bayer Healthcare
Berkeley Nucleonics Corp
Best Dosimetry Services (formerly Best Medical)
Bionomics
Canberra
Chase Environmental Group, Inc.
CRCPD
Dade Moeller
Eckert & Ziegler
ENVINET GmbH
F&J Specialty Products
FLIR
Fuji Electric Co., Ltd
G/O Corporation
Gamma Products
GEL Engineering
General Nucleonics
H3D, Inc
Health Physics Instruments
Hi-Q Environmental Products Co.
Hitachi Ltd
Hopewell Designs
HPS Journal
HPS Web Ops/Newsletter
Illinois Inst of Tech
J.L. Shepherd
K & S Associates
LabLogic Systems, Inc
Landauer
LND, Inc.
Ludlum Measurements
Mazur Instruments
Mirion Technologies
NATS, Incorporated
NRRPT
NSSI/Recovery Services
ORTEC
Perkin Elmer
Philotechnics, Ltd.
Quest Environmental and Safety Products
Radiation Detection Company
Radiation Safety & Control Services Inc (RSCS)
Radiation Solutions, Inc
Saphymo GmbH
SE International
Spectrum Techniques
Technical Associates/Overhoff Technology
ThermoFisher
Thomas Gray & Associates
Ultra Electronics - Lab Impex Systems
Unfors RaySafe, Inc and Fluke Biomedical
Washington State University/ USTUR
X-Z Lab

IMPORTANT EVENTS

3rd Annual Quiz Bowl

You and your friends can test your knowledge against other HPS members (members are encouraged to group with students and young professionals). Join us Sunday 17 July, 4:00-5:30 pm, at the Davenport Grand Hotel.

Welcome Reception

Please plan on stopping in at the Davenport Grand Hotel, Grand Ballroom, Sunday 17 July, from 6:00-7:30 pm. There will be an opportunity to meet friends to start your evening in Spokane. Cash bar and light snacks will be available.

Exhibits

Free Lunch! Free Lunch! – 12:00 pm, Monday, 18 July and Tuesday, 19 July. All registered attendees are invited to attend a complimentary lunch in the Exhibit Hall.

Breaks Monday Afternoon-Wednesday Morning – Featuring morning continental breakfasts and afternoon refreshments such as fruit, ice cream, and cookies. Be sure to stop by and visit with the exhibitors while enjoying your refreshments!

AAHP Exam

Monday, 18 July Davenport Grand Hotel, Grand A
Part 1 - 8:00-11:00 am; **Part 2** - 12:30-6:30 pm

HPS Works in Progress Submittal

Click **HERE** to submit.

Register HERE for the PDS

Sessions and Course Locations

AAHP Courses on Saturday are at the Davenport Grand Hotel; Sunday PEPs are in the Davenport Grand Hotel; PEPs, CELs, and all sessions Monday through Thursday will take place at the Spokane Convention Center.

AAHP Awards Luncheon

Spokane Convention Center
Tuesday, 19 July • Noon-2:00 pm

HPS Awards Banquet

Spend an enjoyable evening with members of the Health Physics Society. This event will be held on Tuesday, 19 July, in the Davenport Grand Hotel, and is an excellent opportunity to show your support for the award recipients as well as the Society. The awards will be presented after the dinner and the event will last from 7:00-9:00 pm. Included in Member, Non-Member, Emeritus, Past President, and Student Registrations.

HPS Business Meeting

Spokane Convention Center, Conference Theater
Wednesday, 20 July, 5:30-6:30 pm

Professional Development School

Join us for the PDS, 14-15 July 2016.
See page 11 for more information.

Again this YEAR!

PEP Courses will have presentations posted online for those who have signed up for them prior to the meeting. There will be no hard copy handouts.
See page 36 for course information

Things to Remember!

All speakers are required to check in at the Speaker Ready Room in the Convention Center at least one session prior to their assigned session.

Preregistration Policy: Unless payment accompanies your form, you will NOT be considered preregistered.

All posters up Monday–Wednesday in Exhibit Hall

Poster Session featured Monday, 1:00-3:00 pm No other sessions at that time

PEP Refund Policy
See page 36

61st Annual Meeting

Health Physics Society

Spokane Convention Center • Spokane, Washington • 17-21 July 2016

WELCOME

The Columbia Chapter of the Health Physics Society is thrilled to welcome you to the City of Spokane, Washington, for the 61st HPS Annual Meeting. It's been 11 years since the HPS celebrated its 50th Anniversary meeting here, and the city and environs are as beautiful as ever. We hope you will make plans to attend this meeting and enjoy the great Pacific Northwest.

WEATHER & LOCAL AREA

Spokane has an average July temperature of 83 degrees F (28.3°C) and may drop to the mid 50s (13°C) at night, with relatively low humidity and little rain. Facilities are air-conditioned. The Davenport Grand hotel is connected to the Spokane Convention Center by a Skywalk.

Spokane takes great pride in its slogan, "Near Nature, Near Perfect," and offers urban advantages with a suburban flavor. Within a short walking distance downtown you'll find an abundance of restaurants, shops, entertainment, and cultural opportunities. Take the time to explore the many facets of Riverfront Park by walking the paths, enjoying the scenic views of the Upper and Lower Spokane Falls, and discovering the many sculptures throughout the park. Plan some vacation time and enjoy the many outdoor recreational opportunities within an hour of downtown Spokane. If you haven't visited our Official Website for ideas, please do so at **www.visitspokane.com/hps2016**.

TO/FROM AIRPORT, GETTING AROUND DOWNTOWN

The Davenport Grand and Doubletree Hotels are about a 15 minute drive from the Spokane airport. A kiosk near the baggage claim area provides phone contacts for various services. Taxi fare runs about $25. The Davenport Grand Hotel shuttle costs $25. The Doubletree Hotel shuttle is complimentary.

ACCOMMODATIONS

Headquarter Hotel: The Davenport Grand Hotel

333 W. Spokane Falls Blvd, Spokane, WA 99201, Direct Phone (509) 458-3300

HPS Rate: $126 per night. The Davenport Grand Hotel is connected to the Convention Center by Skybridge.

The Doubletree Spokane

322 N. Spokane Falls Court, Spokane, WA 99201, Direct Phone (509) 455-9600

HPS Rate: $129 per night. The Doubletree Spokane is connected to the Convention Center by Skybridge.

TOURS & EVENTS

Monday, 18 July

Private Cruise on Scenic Lake Coeur d'Alene

1:00 pm–5:00 pm — Preregistration: $50/Onsite: $55

Leaves from the DoubleTree Hotel Lobby

Travel to Idaho where you'll board the cruise boat for a two hour private cruise on Lake Coeur d'Alene. National Geographic reports this as one of the most beautiful lakes in the world, see why! The cruise is narrated and there is seating both inside on the main floor and in the open air up top. Along the way, pass by the famous floating green at the Coeur d'Alene Resort Golf Course. After the cruise, there is free time to browse in the shops, walk the world's longest floating boardwalk or grab a drink in one of the many cafés. Tour price includes bus transportation, guide and two hour private cruise on the lake. Snacks, beer, wine and cocktails are available for purchase.

Historic Walking Tour of Downtown Spokane and Wine Tasting

1:30 pm–4:30 pm — Preregistration: $25/Onsite: $30

Leaves from the Convention Center Front Entrance

This leisurely walk of about 2 miles will inform you about the Native Americans, early fur traders and pioneers who settled along the Spokane River. See the former Expo' 74 site, now Riverfront Park and view the Spokane Falls. As you walk through downtown, your guide will tell you about architects and point out ornate details on the buildings they created after the Great Fire of 1889. Learn about what these buildings were originally built for and some interesting and colorful stories about Spokane in the late 1800s. Along the way, we will stop for a wine tasting at the Nectar Tasting Room which features five wineries from around Washington State.

Spokane Indians Baseball Game

5:30 pm — Preregistration: $20/Onsite: $25 (includes ticket and shuttle)

Leaves from the Davenport Grand Hotel Lobby

Take us out to the ball game. The Spokane Indians, a minor league member of the Class A Short Season Northwest League and a farm team for the Texas Rangers, will play the Vancouver Canadians at Avista Field, a short taxi ride or hotel shuttle from downtown. Game time is 6:30 pm. Meet at 5:30 in the Grand Hotel lobby for the hotel shuttle or arrange your own transportation.

Open Mike Night

Evening — Free

Details are still being worked out on this fun event. Stop back for details.

Tuesday, 19 July

5K Fun Run/Walk

6:30 am–8:30 am — Preregistration: $25/Onsite: $30

Leaves from the breezeway between the Convention Center and the INB Performing Arts Center

Our course begins on the river side of the Spokane Convention Center, between the Convention Center and the INB Performing Arts Center, a two minute walk from the Davenport Grand Hotel lobby. We will follow the Centennial Trail east, across the Spokane River, through the Gonzaga University campus, to Mission Park and back. Fun awards presented after the run.

Hiawatha Trail Bike Tour

8:30 am–4:00 pm — Preregistration: $175 adult/$152 youth (minimum age – 4)
Onsite: $180 adult/$157 youth (minimum age – 4)

Leaves from Spokane Convention Center Main Entrance

On the Idaho/Montana border, the Old Milwaukee Railroad has been transformed into one of the most breathtaking bike rides in the world. This is rugged country with big mountains, and to keep the grade, railroad engineers designed a series of tunnels and high trestle bridges that remain today as remarkable engineering feats. On this 15-mile ride you'll pedal through ten tunnels including the 1.6 mile-long Taft Tunnel. You'll cross over seven canyon-spanning trestles with panoramic views of the Bitterroot and St. Joe Mountains. Our full day trip includes transportation to/from Spokane, lunch at the end of the ride, and bike/helmet/light rental. Be sure to bring: sunscreen and sunglasses, athletic shoes, personal water bottle, camera (optional) and activewear appropriate for biking. Dress in layers depending on the weather.

Historic Spokane's "Age of Elegance" Bus Tour

1:30 pm–4:30 pm — Preregistration: $25/Onsite: $30

Leaves from the Convention Center Front Entrance

Enjoy a bus tour of the rich history, historic homes and attractions of Spokane. Learn about the Native Americans that first discovered this area and where the city began as we travel along the Spokane River, view the Spokane Falls and the grounds of the former Expo '74 site, now Riverfront Park. See the Looff Carousel built in 1909, named one of the "Top Ten Carousels in the US" by the National Carousel Association. Then, ascend up "The Hill" with views of the city and stunning mansions. Tour inside the majestic Saint John's Cathedral, said to be one of the most beautiful cathedrals in the Pacific Northwest. Marvel at the stained glass windows, wood carvings and design. Discover Manito Park while strolling through the formal French Renaissance gardens, Perennial Gardens, Rose Gardens, authentic Japanese Gardens, and flower-filled Conservatory. Trip Advisor's Travelers Choice Awards rated Manito Park "One of the Top 25 Parks in the US." See the historic area of Browne's Addition where many of the old mansions, built in the late 1800s, have been restored to their original splendor. Stop at Bing Crosby's childhood home to see the largest public collection of Crosby's memorabilia in the Country.

Star Party

9:00 pm–10:30 pm — No Fee

Meet on Skybridge that connects to the North side of the Spokane Convention Center

Things are looking up! That is, the Accelerator Section is going to host a free star party at the meeting for your enjoyment. It will be a modest affair that will be held within easy walking distance from the Spokane Convention Center and the Davenport Grand Hotel, and will follow immediately after the Awards Banquet on Tuesday night, July 19, 2016, from 9 PM to 10:30 PM. The location will be on the small pedestrian bridge that connects to the north side of the Spokane Convention Center. Please plan to stop by and enjoy the wonders of the nighttime sky with us. After all, stars are particle accelerators, too!

Wednesday, 20 July

Relish Spokane™ Food Walking Tour

2:00 pm–5:00 pm **Preregistration: $39/Onsite: $45**

Leaves from the Spokane Convention Center Main Entrance

Between tantalizing your taste buds with the delicious food of Spokane, you will be engulfed by the quaint, historical vibe of the city. Our walking food tour makes 6 stops over about 1.5 to 2 miles. As you stroll the city, you will be satisfied with several savory tastings from local bakeries, bistros, and other local unique shops. The visits range from French delights to saucy bites that will provide enough of the local ethnic eateries to get you acquainted to the real Spokane, WA! And all of this is accompanied with fun facts about the town's culture, people, architecture and history. Our small group tours allow for a more intimate experience, leaving your appetite and hunger to learn about our small-big city satiated! Not recommended for people with special food needs or allergies.

Spokane Pub Crawl

6:30 pm till ???? **Pre-registration: $20/Onsite: $25**

Leaves from the Front entrance to the Davenport Grand

An HPS annual meeting tradition! Not only is Washington State the home to some fabulous Northwest microbrews, Washington Wine Country is famous for its "perfectly balanced" wines! Whether you prefer a pint glass or a wine glass, it's all available within easy walking distance in downtown Spokane. Destinations that are a bit farther will also be identified for those who want to stretch their legs. Crawlers will leave from the front of the Davenport Grand Hotel. Includes a commemorative t-shirt; variety of colors available with pre-registration.

Available Shirt size:
- Small
- Medium
- Large
- XL
- 2XL
- 3XL
- 4XL

Available Shirt Color:
- Neon Green
- Black
- Gray
- Cardinal
- Aquatic Blue

(see registration form to choose)

SAVE THE DATE

HPS 50th Midyear Meeting
22-25 January 2017, Bethesda, Maryland

HPS 62nd Annual Meeting
9-13 July 2017, Raleigh, North Carolina

Night Out, O'Doherty's Irish Grille and Pub, plus an Evening of Songs and Stories of the Pacific Northwest

6:30 pm–9:30 pm — Preregistration: $40/Onsite: $45

This fun Night Out will take place at O'Doherty's Irish Grille and Pub, a short walk across the street and parking lot from the Davenport Grande.

Enjoy a delicious meal followed by Songs and Stories of the Pacific Northwest. Your meal will include your choice of Tullamore Dew Whiskey Steak (cooked medium), Donegal Salmon (baked with lemon butter) or Corned Beef and Cabbage, with a Caesar salad, Shepherd's bread, and garlic mashed potatoes as accompaniments and a no-host cash bar. Following the meal we will be treated to Songs and Stories of the Pacific Northwest by noted Northwest folk entertainer Hank Cramer. Hank is in high demand for folk festivals, concerts, and cultural presentations, and hails from Winthrop, Washington (home to our President Nancy Kirner, who highly recommends him). He even has some ties to our profession as a former emergency planner. Check out his website at **hankcramer.com**, but for a more engrossing taste of what he will be doing, don't miss a YouTube video at **www.youtube.com/watch?v=oigaOkSBhH0**. You won't want to miss this unique night out.

Thursday, 21 July

Hanford B-Reactor Tour

7:30 am–6:00 pm — Preregistration: $50/Onsite: $55

Meet at Bus. Leaves from the Spokane Convention Center Main Entrance.

Visit the Hanford B-Reactor, the world's first production nuclear reactor, which created plutonium for the Manhattan Project. It is now part of the Manhattan Project National Park. This tour will depart from the Convention Center by bus for a three-hour ride to Hanford. A delicious box lunch will be provided from the Shrub Steppe Smokehouse (your choice of pulled pork sandwich, Caesar salad with brisket of beef, or vegetarian Caesar salad, with a potato salad side and drink). The tour will have over two hours at the B-Reactor, allowing ample time to explore this historic facility at your leisure. We will return to Spokane at approximately 6 pm.

Meal Preference:
Pulled Pork Sandwich, Caesar Salad w/ Brisket of Beef, Caesar salad (no meat)

Friday, 22 July

LIGO (Hanford) Tour

8:00 am–6:00 pm — Preregistration: $50/Onsite: $55

The Laser Interferometer Gravitational-wave Observatory (LIGO) made history in February 2016 with the announcement that it had measured gravitational waves, confirming their existence for the first time. The LIGO at Hanford is one of two such observatories in the world. Our tour of this scientific wonder will involve a three-hour bus ride to LIGO, located on the Hanford Site, followed by a two-hour tour covering the mile-long arms of the observatory and the control room. A delicious box lunch will be provided from the Shrub Steppe Smokehouse (your choice of pulled pork sandwich, Caesar salad with brisket of beef, or vegetarian Caesar salad, with a potato salad side and drink).

Meal Preference:
Pulled Pork Sandwich, Caesar Salad w/ Brisket of Beef, Caesar salad (no meat)

COMPANION PROGRAM

Information for Registered Companions

Companion Registration cost is $110 and includes the Welcome Reception, Monday-Thursday breakfast buffet at the Doubletree Hotel, and lunch and breaks in the Exhibition hall. There will not be a separate Hospitality Room, however the Local Arrangements Committee staff in Convention Center Room 102B will be happy to answer your questions or assist in finding the answer.

Sunday 17 July

Welcome Reception
6:00-7:30 pm, Grand Ballroom, Davenport Grand Hotel
Come see old friends and make new ones! Enjoy hors d'oeuvres with a cash bar, 6:00-7:30 pm.

Monday, 18 July - Thursday, 21 July

Companion Breakfast
6:30-10:30 am, Shutter's Café, the DoubleTree Hotel

Companion Registration includes Monday – Thursday breakfast buffet at Shutter's Café in the Doubletree Hotel, 6:00 to 10:30 a.m. A delicious buffet awaits you including made-to-order omelets, scrambled eggs, breakfast meats (sausage and bacon), French toast, pancakes, hot oatmeal, assorted pastries, fresh fruits, juice, coffee, and tea.

Registered companions are welcome to come to the lunch and breaks in the Exhibition Hall.

Monday, 18 July

Welcome to Spokane Companion Orientation
Spokane Representative – 9:00-10:30 am
Shades Conference Room, the DoubleTree Hotel

The city orientation takes place Monday, 18 July from 9:00 to 10:30 a.m. at the Shades Conference Room in the Doubletree Hotel. The room is just across from Shutter's Café. A representative from Visit Spokane will be on hand to describe some of the many opportunities, provide maps, and answer questions.

Be sure to consider the tour options on pages 5–8 for the HPS sponsored events.

Sign up early for Social Events!

If social events do not meet minimums by the deadline of 8 June, there is a chance that they will be canceled. Don't get to the meeting and find that the tour or social event you kept meaning to sign up for was cancelled due to lack of reservations.

Meeting Refund Policy

Request for refunds will be honored if received in writing by 8 June. All refunds will be issued AFTER the meeting and will be subject to a 20% processing fee.

NO REFUNDS WILL BE ISSUED AT THE MEETING. Refunds will not be issued to no-shows.

Spokane PDS: "Decontamination and Decommissioning—Case Studies"

Plans are well underway for a two-day professional development school (PDS) in Spokane, Washington, on Thursday–Friday, 14–15 July 2016, just before the 2016 Health Physics Society (HPS)Annual Meeting. PDS Committee Chair Ray Johnson, CHP, and Academic Dean Alan Fellman, CHP, PhD, have put together an impressive agenda and list of national and international speakers on the theme **"Decontamination and Decommissioning—Case Studies."** Speakers and topics include:

- Introduction to Decommissioning *(Alan Fellman, Dade Moeller)*
- Health, Safety, and Environmental Planning *(Tom Hansen, Ameriphysics)*
- Historical Site Assessment and Data Quality Objectives *(Tony Mason, PermaFix Environmental Services)*
- Site Remediation Criteria With Case Study Examples *(Steven Brown, SHB, Inc.)*
- Characterization and Early Site Assessment *(Tom Hansen, Ameriphysics)*
- Remediation and Radiological Controls *(Dustin Miller, Chase Environmental Group)*
- Waste Management *(Wayne Glines, Dade Moeller)*
- Case Study—Chernobyl *(Oleg Nasvit, Institute for Strategic Studies, Department of Energy and Technogenic Safety and Security)*
- Cost Estimating and Project Management *(Art Palmer, Energy Solutions)*
- Instruments and Analyses *(Ray Johnson, Radiation Counseling Institute)*
- Surveys of Material and Equipment *(Alex Boerner, Oak Ridge Associated Universities [ORAU])*
- Case Study—Fukushima *(Tatsuo Torii, Director of Research Planning Department, Japan Atomic Energy Agency)*
- Final Status Surveys *(Tom Hansen, Ameriphysics)*
- Lessons Learned *(Tim Vitkus, ORAU)*
- Changes/Implications—Revised MARSSIM 2016 *(Tim Vitkus, ORAU)*
- Case Study *(Dustin Miller, Chase Environmental Group)*

Tuition for the PDS is $695. Details and a full agenda are available on the HPS website PDS page.

Photo courtesy of Gene Carbaugh

Riverfront Park is home to many sculptures celebrating Spokane culture; this one celebrates the annual Bloomsday Run in which over 30,000 runners participate.

Spokane Meeting—Come and Stay, Come and Play!

Gene Carbaugh, CHP, Spokane Local Arrangements Committee Co-chair

While the Program Committee has been putting together a powerhouse technical program, the Local Arrangements Committee has been putting together the "extracurricular" activities for attendees and companions.

The Open Mike Night is again being planned by our vendors for Monday at a nearby venue, so come and demonstrate your musical talents, be they vocal or instrumental. Or catch a Spokane Indians baseball game.

Bright and early Tuesday morning, plan on enjoying a 5K Fun Run/Walk through central Spokane, including portions of Riverfront Park. A Spokane girls' track team is laying out the route and will be helping with the run administration—a great way to increase our Society's visibility to locals!

Wednesday evening will see the ever-popular Pub Crawl. The Night Out social event of the meeting will also be Wednesday night and will feature a folk music concert, "Songs and Stories of the Pacific Northwest," by Northwest folk entertainer, musician, and historian Hank Cramer.

Committee Meetings

Meetings take place at the Spokane Convention Center (CC), Davenport (D), or Doubletree (DT)

Friday 15 July 2016

ABHP Board Meeting
8:30am – 5:00pm — Meeting Room 6 (D)

Saturday 16 July 2016

ABHP Part II Panel
8:00am – 5:00pm — Meeting Room 1 (D)

Finance Comm
8:30am – Noon — Redwood Boardroom (D)

NRRPT
8:30am – 4:30pm — Meeting Room 3 (D)

Registration
2:00pm – 5:00pm — Exhibit Hall AB (CC)

HP Journal Editorial Board
3:00pm – 5:00pm — Meeting Room 2 (D)

Student Orientation
5:45pm – 6:45pm — Meeting Room 10 (D)

Sunday 17 July 2016

Registration
7:30am – 5:00pm — Exhibit Hall A (CC)

ABMP Written Exam
8:00am – 1:00pm — Meeting Room 11 (D)

ABHP Part II Panel
8:00am – 5:00pm — Meeting Room 1 (D)

Speaker Ready Room
8:00am – Noon — 102CD (CC)

HPS Board of Directors
8:00am – 5:00pm — Birch Ballroom (D)

NRRPT
8:30am – 4:30pm — Meeting Room 3 (D)

AAHP Executive Committee
8:30am – 5:00pm — Meeting Room 2 (D)

Quiz Bowl
4:00pm – 5:30pm — Meeting Room 12 (D)

Accelerator Section Awards Meeting
4:30pm – 6:30pm — 206A (CC)

Welcome Reception
6:00pm – 8:00pm — Grand A (D)

Monday 18 July 2016

Elda Anderson Breakfast
6:45am – 8:00am — 202A (CC)

Idaho State Univ. Alumni Breakfast
7:00am – 9:00am — Meeting Room 12 (D)

ICC Welcome Breakfast for Int'l Attendees
7:30am – 8:00am — Meeting Room 1 (D)

Registration
7:30am – 5:00pm — Exhibit Hall A (CC)

ABHP Exam - Part I
8:00am – 11:00am — Grand A (D)

Plenary Session
8:00am – Noon — 100AB (CC)

Speaker Ready Room
8:00am – 5:00pm — 102CD (CC)

NRRPT
8:30am – 4:30pm — Meeting Room 3 (D)

Companion Orientation
9:00am – 10:00am — (DT)

Medical HPS Board Meeting
Noon – 2:00pm 201C (CC)

Ask the Editors Meeting
Noon – 3:00pm 201B (CC)

Exhibits Open
Noon – 5:00pm Exhibit Hall AB (CC)

Exhibitor Lunch
12:15pm – 1:30pm Exhibit Hall AB (CC)

ABHP Exam - Part II
12:30pm – 6:30pm Grand A (D)

Nominating Committee
1:00pm – 2:00pm 101 (CC)

Decommissioning Section Executive Comm.
1:00pm – 3:00pm 102A (CC)

Poster Session
1:00pm – 3:00pm Exhibit Hall AB (CC)

Chapter Council Meeting
1:30pm – 2:30pm 100C (CC)

History Committee
2:00pm – 4:00pm Redwood Boardroom (D)

Thermo Fisher Users Group
2:00pm – 6:00pm 202B (CC)

PDS Committee
2:30pm – 3:30pm 101 (CC)

Section Council Meeting
2:30pm – 3:30pm 205 (CC)

Membership Committee
3:00pm – 5:00pm 201C (CC)

Student/Mentor Reception
5:30pm – 6:30pm Meeting Room 1 (D)

Purdue Alumni Reception
5:30pm – 7:00pm Meeting Room 12 (D)

Open Mic Night
8:30pm – ???

Tuesday 19 July 2016

Landauer Breakfast
7:00am – 8:30am 202A (CC)

Registration
7:30am – 5:00pm Exhibit Hall A (CC)

Exhibitor Breakfast
8:00am – 9:00am 202BC (CC)

HPS Journal/ORS Meeting
8:00am – 9:30am 201B (CC)

ANSI N13.61
8:3 am – Noon Meeting room 3 (D)

NRRPT
8:30am – 4:30pm Meeting Room 3 (D)

N13.11 Working Group
9:00am – 1:00pm 101 (CC)

President Meeting with Committee Chairs
9:00am – 5:00pm 201C (CC)

Exhibits Open
9:30am – 5:00pm Exhibit Hall AB (CC)

International Collaborations Committee
Noon – 2:00pm 102A (CC)

International Collaboration Comm
Noon – 2:00pm 201B (CC)

AEC/Program Directors Meeting
Noon – 2:00pm Terrace Room West (D)

AAHP Lunch
Noon – 2:30pm 202ABC (CC)

Student Support Committee
1:30pm – 2:30pm Meeting Room 3 (D)

ANSI N13.32
2:00pm – 5:00pm 101 (CC)

ANSI N13.8 – Radiation Protection in Uranium Mines meeting
2:15pm – 4:00pm 205 (CC)

ANSI N42.33
2:15pm – 4:15pm 201B (CC)

NRCP Meeting
2:15pm – 6:00pm Meeting Room 8 (D)

AAHP Nominating Committee
3:00pm – 4:00pm 102A (CC)

HPS/AAHP/AAPM/Med Section
5:45pm – 6:45pm 201B (CC)

CSU Alumni Reception
6:00pm – 7:00pm Grand Foyer (D)

Awards Dinner Reception
6:30pm – 7:00pm Grand Foyer (D)

Instrumentation Committee
7:00pm – 9:00pm Meeting Room 3 (D)

Awards Banquet
7:00pm – 10:00pm Grand AB (D)

Wednesday 20 July 2016

Registration
7:30am – 5:00pm Exhibit Hall A (CC)

HPS Journal/ORS Meeting
8:00am – 9:30am 201B (CC)

NSI 42.17A/C working group
8:00am – 11:00am 202B (CC)

ANSI N13 Revision
9:00am – 5:00pm Skybridge Boardroom (D)

Exhibits Open
9:30am – 5:00pm Exhibit Hall AB (CC)

Leadership Meeting
11:00am – Noon 201C (CC)

Science Support Comm
Noon – 2:00pm 201B (CC)

AEC/Student Branch Society Support Committee
Noon – 2:00pm Terrace Room West (D)

Standards Committee
12:30pm – 2:30pm 101 (CC)

Continuing Education Committee
1:00pm – 2:00pm 202A (CC)
1:00pm – 3:00pm 202B (CC)

Web Operations Meeting
1:00pm – 5:00pm 102A (CC)

President Mtg with Section Presidents
1:00pm – 5:00pm 201C (CC)

Academic Education Committee
2:00pm – 4:00pm Terrace Room West (D)

AIRRS Business Meeting
2:30pm – 3:30pm 205 (CC)

Membership Committee
3:00pm – 4:00pm 201B (CC)

Thursday 21 July 2016

Local Arrangements Committee
7:30am – 9:30am Room 102B (cc)

Registration
7:30am – 5:00pm Exhibit Hall A (CC)

HPS Finance & Executive Committees
8:00am – 10:00am Redwood Boardroom (D)

ANSI N13 Revision
9:00am – 5:00pm Skybridge Boardroom (D)

HPS BOD
11:45am – 2:15pm Maple Ballroom (D)

Friday 22 July 2016

ISO WG14
9:00am – 5:00pm Skybridge Boardroom (D)

Saturday 23 July 2016

ISO WG14
9:00am – 5:00pm Skybridge Boardroom (D)

Preliminary Scientific Program

Presenter's name is asterisked (*) if other than first author.

MONDAY

7:00 AM

CEL-1 Strategies for Keeping Your Radiation Safety Program on Course in a Sea of Constant Change
Emery, R.
University of Texas School of Public Health

CEL-2 Five Tools for Effective Responses to Workers, the Public, and the Media
Johnson, R.
Radiation Safety Counseling Institute

CEL-3 Current Uses of Radiopharmaceuticals in Nuclear Medicine Therapy
Stabin, M.
Vanderbilt University

8:15 AM – Noon Room 100 AB

MAM-A: Plenary Session: The Wild and Wonderful World (Universe) of Health Physics
Chair: Nancy Kirner

8:15 AM **INTRODUCTION**
Nancy Kirner, HPS President

8:25 AM **MAM-A.1**
Regulatory Cooperation and Radiation Protection in Europe
Magnusson, S.M. (G. William Morgan Lecturer)
Icelandic Radiation Safety Authority

9:00 AM **MAM-A.2**
Update from the Joint Commission
Browne, A. (Robert S. Landauer Lecturer)
The Joint Commission

10:00AM **BREAK**

10:30 AM **MAM-A.4**
Clearance of Materials from Accelerator Facilities
Rokni, S.
SLAC

10:50 AM **MAM-A.5**
Lessons Learned and Unlearned from the Social, Regulatory, and Political Aspects of Health Physics
Toohey, R.
M.H. Chew & Assoc.

11:15 AM **MAM-A.6**
The Wild and Wonderful World of Health Physics: Homeland Security Section
Lanza, J
Florida Department of Health

11:45 AM **MAM-A.7**
Space the Final Frontier – Research Relevant to Mars
Boice, J.
NCRP, Vanderbilt University

Noon – 1:00 PM Exhibit Hall

Complimentary Lunch in Exhibit Hall

1:00 PM – 3:00 PM Exhibit Hall

P: Poster Session

Environmental Monitoring

P.1 Radiation Safety Experience with Actinium-225 in an Academic Research Environment
Gibbons, W., Weaver, A.
University of South Florida

P.2 MARSSIM Support Features in Visual Sample Plan (VSP)
Newburn, L., Wilson, J., Fortin, D., Newburn, L.
Pacific Northwest National Laboratory

P.3 Multi-attribute Shielding Analysis Methodology Selection for Shielding Design of Varying Complexity
Woolfolk, S.
Bechtel/NS&E

P.4 A Comparison of National and International Paradigms for the Protection of Non-Human Biota
Ruedig, E., Gillis, J.
Los Alamos National Laboratory

P.5 Radiocesium Dynamics in Irrigation Ponds in the Proximity of Fukushima Dai-ichi Nuclear Generating Station
*Byrnes, I., Johnson, T.**
Colorado State University, Fort Collins

P.6 Vertical Distribution of Radiocesium in Soils and Sediment Deposits on the Contaminated Areas After the Fukushima Daiichi Nuclear Power Plant Accident
*Carradine, M., Johnson, T.**
Self-Employed, Colorado State University

P.7 Cesium and Plutonium Partitioning in Mammalian (Boar, macaque)
Anderson, D., Hinton, T., Johnson, T.
Colorado State University, University of Fukashima

P.8 Anthropogenic Radioistopic Distribution in Sediments
Gibson, K., Carroll, J., Adzanu, S., Ankrah, M., Han, F.
Alcorn State University, St. Catherine College, Jackson State University

P.9 Radium in Soils Collected in the Vicinity of Coal Ashpond
Harris, E., Giddings, A., Billa, J., Kanganti, S., Adzanu, S., Ankrah, M., Han, F.
Alcorn State University, St. Catherine College, Jackson State University

P.10 Evaluation of Naturally Occuring Radioactive Materials in Sediments Collected from Lower Reaches of Mississippi River
Nandi, S., Gella, U., Billa, J., Adzanu, S., Han, F., Ankrah, M.
Alcorn State University, Jackson State University, St. Catherine College

P.11 Radiation Transfer Factor in Selected Farm Products Produced around a Nuclear Plant
Burrell, C., Bailey, J., Billa, J., Ankrah, M., Han, F., Adzanu, S.
Alcorn State University, St. Catherine College, Jackson State University

P.12 Survival and Growth of Chironomus Dilutes and Hyalella Azteca in Sediment Containing Legacy 239,240Pu Downstream of Los Alamos National Laboratory
Fresquez, P., Hansen, L., Gaukler, S., McNaughton, M.
Los Alamos National Laboratory

P.13 Radiological Assessment of Organic Manures
Queen, K., Tepeh, J., Billa, J., Adzanu, S., Ankrah, M., Han, F.
Alcorn State University, St. Catherine College, Jackson State University

P.14 Gamma Spectroscopy Measurements of Soil from the Vicinity of a Mineral Sand Processing Plant in the Eastern Coast of Sri Lanka
Warnakulasuriya, T., Weerakkody, T., Williams, S., Wickremasinghe, R., Waduge, V., Ediriweera, D., Siriwardena, N.
University of Kelaniya, Sri Lanka, Atomic Energy Board, Sri Lanka

P.14.5 Concentration Ratios of 137Cs for Hydrobionts of the Techa River
Sharagin, P., Shishkina, E., Popova, I., Osipov, D., Pryakhin, E.
Urals Research Center for Radiation Medicine, Chelyabinsk

P.15 Reconstructed Mass Model Investigation of the Particulate Matter Load of the Ambient Air of a Tropical Location in Southwestern Nigeria
Akinlade, G., Olise, F., Owoade, O., Olaniyi, H., Hopke, P.
Obafemi Awolowo University, Nigeria, Clarkson University

External Dosimetry

P.16 Practical Lessons for a Dosimetry Progarm
Baca, M., Hopponnen, C.
Mirion Technologies, Inc.

Instrumentation

P.17 Minimum Detection Limits of Lead in Bone Phantoms Using a Dedicated Microbeam XRF System
Gherase, M., Freire-Gama, A.
California State University, Fresno

P.18 Obtaining the Neutron Dose Equivalent through Energy Identification of the Emitting Source's Shavano Series of Dose Meters
Scott, P., Hoshor, C., Oakes, T., Myers, E., Rogers, B., Currie, J., Young, S., Crow, J., Miller, W., Bellinger, S., Sobering, T.J., Frank, R.G., Shultis, J.K., McGregor, D.S., Hicks, D.I., Caruso, A.N.
University of Missouri - Kansas City, U2D Incorporated, University of Missouri - Columbia, Kansas State University

P.19 Theoretical Performance Analysis of a Novel Hemispherical Tissue Equivalent Proportional Counter for Neutron Monitoring and Dosimetry
Broughton, D., Orchard, G., Waker, A.
University of Ontario Institute of Technology

P.20 Impact of Sample Preparation on Radioactivity Measurement
Mensah, C., Billa, J., Adzanu, S., Atkins, M., Green, B.
Alcorn State University

P.21 Calculation of Self Attenuation Factors for Unidentified Materials by Using Numerical Simulation Method in Î³-Ray Spectrometry Routine Work without Collimator

Badawi, M., Thabet, A., Elsafi, M., Gouda, M., El-Khatib, A., Abbas, M.
Alexandria University, Egypt, Pharos University in Alexandria, Egypt

Internal Dosimetry

P.22 Using a Graphical User Interface When Running Multiple Monte Carlo Simulations

Graham, H., Waller, E.
University of Ontario Institute of Technology

P.23 Assessment of Dose and the Occupational Suitability in Case of Single Emergency Ingestion Intake of 137Cs

Korneva, E., Gantsovsky, P., Granovskaya, E., Kasymova, O., Kretov, A., Kukhta, B., Podvarko, I., Tsovyanov, A., Yatsenko, V.
State Research Center – Burnasyan Federal Medical Biophysical Center of Federal Medical Biological Agency

P.24 Estimation of Dietary Intake of Strontium-90 in Six Regions in Japan after the Fukushima Daiichi Nuclear Power Plant Accident

Nabeshi, H., Tsutsumi, T., Uekusa, Y., Hachisuka, A., Matsuda, R., Akiyama, H., Teshima, R.
NIHS

Medical Health Physics

P.25 Compact DD Generator based in Vivo Neutron Activation Analysis (IVNAA) System to Determine Sodium and Calcium Concentrations in Human Bone

Coyne, M., Liu, Y., Zhang , X., Nie, L.
Purdue University

P.26 Radiation Safety Aspects of MIBG Patient Treatments

Harvey, B.
MD Anderson Cancer Center

Radiation Effects

P.27 Voxel Phantom Model of Beehive for Determining the Acceptable Dose Levels of Bees and Bee Larvae

Junwei, J.
Oregon State University

P.28 The Radiation Carcinogenesis Paradox

Raabe, O.
University of California, Davis

P.29 Graphical User Interface for Simplified Transport Calculations

Schwarz, R.
Visual Editor Consultants

P.30 Database of Mayak Workers' Families and Their First-, Second- and Third-Generation Offspring: Establishment Principles and Potential Application

Azizova , T., Zhuntova , G., Rusinova , G., Korneva , D.
Southern Urals Biophysics Institute

P.31 Zooplankton of the Radioactively Contaminated Lake Karachay

Osipova, O., Osipov, D., Pryakhin, E.
Urals Research Center for Radiation Medicine, Chelyabinsk, Russia

P.32 Characteristics of Zoobenthos in the Reservoir-17

Peretykin, A., Deryabina, L., Pryakhin, E.
Urals Research Center for Radiation Medicine, Chelyabinsk, Russia, Chelyabinsk State University, Russia

Radiation Bioassay

P.33 Quantifying Biomarkers in Wildlife Exposed to Low Doses of Environmental Radiation

Halim, N., Bailey, S., Johnson, T., Hinton, T.
Colorado State University, Fukushima University

P.34 Electron Spin Resonance of Plutonium and Cesium in Mammalian Wildlife near Fukushima Daiichi Nuclear Power Plant

Heard, J., Hinton, T., Johnson, T.
Colorado State University, Fukushima University

Risk Assessment

P.35 Radiation Dose Estimation of Sand Samples Collected from Selected Public Beaches in Texas

Brempong, O., Oloko, O., Tsorxe, I., Billa, J., Han, F., Ankrah, M., Adzanu, S.
Alcorn State University, Texas A and M, College Station, Jackson State University, St. Catherine College

P.36 Radiological Implication of Locally Produced Construction Materials

Dimpah, J., Norwood, A., Billa, J., Adzanu, S.
Alcorn State University

P.37 HDF5 as a Good Way to Store Large and Complex Scientific Data

Yurkin, A.
Soutern Urals Biophysics Institute, Russia

Works-In-Progress

P.38 Dynamic Modeling of Cesium in an Eutrophic Lake through Deterministic and Stochastic Methods
Miller, V., Jeong, H., Johnson, T., Pinder, J.
Colorado State University

P.39 NRC's Implementation of Its Jurisdiction over the Remediation of Military Radium
Chang, R.
USNRC, Jackson, T, USNRC*

P.40 Alpha Air Sample Counting Efficiency Versus Dust Loading: Evaluation of a Large Data Set
Hogue, M., Slack, T., Smiley, J., Owensby, B., Gause-Lott, S.
SRNS

P.41 The Uptake and Translocation of Tc, I, Cs, Np and U into Andropogon Virginicus
Montgomery, D., Edayilam, N., Tharayil, N., Martinez, N., Powell, B.
Clemson University

P.42 Survival Guidelines for Journalists Reporting on Significant Radiation Incidents
MacKenzie, C.
University of California, Berkeley

P.43 Assessing the Use of Photon Fluence Calculations for Simple and Reasonable Dose Estimations in an Industrial Radiation Accident in Nanjing, China
Steiner, J., Donahue, W., DiTusa, R., Wang, W., Yu, N., Jia, G.
Louisiana State University, Institute of Radiation Protection - Nanjing

P.44 Direct Surface Contamination Measurement of Low Energy Beta and Electron Capture Isotopes
Iwatschenko-Borho, .M, Loew, R.
Thermo Fisher Scientific Messtechnik GmbH

P.45 Methodology for Calculating External Dose Coefficients for Multiple Exposure Geometries for Improvised Nuclear Device Radionuclides
Chamber, S., Wang, C., LePoire, D., Yu, C., Favret, D.
Argonne National Laboratory, US Department of Energy

P.46 Modeling Submerged Contamination Source in RESRAD-OFFSITE
Gnanapragasam, E., Yu, C., Favret, D.*

P.47 Reassessment of Empirical Resuspension Factors Following Radionuclide Release
Marshall, S., Medich, D., Potter, C.
Worcester Polytechnic Institute, Sandia National Laboratories

1:00 PM — Room 100 C

MPM-A: Special Session: Updating NCRP's General Recommendations

Co-Chairs: Ken Kase, John Boice

1:00 PM — MPM-A.1
Principles and Ethics of the System of Protection
Cool, D., Boyd, M.
Electric Power Research Institute, US EPA

1:30 PM — MPM-A.2
The Next NCRP Recommendations for Radiation Protection in the U.S.: An Overview
Kase, K.
NCRP

2:00 PM — MPM-A.3
Appropriate Use of Effective Dose in Radiation Protection and Risk Assessment
Fisher, D., Fahey, F.
Dade Moeller Health Group, Children's Hospital Boston

2:30 PM — MPM-A.4
Engaging Stakeholders & Communicating the System of Protection
Irwin, W., Ansari, A., Hyer, R., Till, J.
Vermont Dept of Health, Centers for Disease Control, Center for Risk Communication, Risk Communication Corporation

3:00 PM — BREAK

3:30 PM — MPM-A.5
Protection of the Environment
Higley, K.
Oregon State University

4:00 PM — MPM-A.6
Tissue Reactions Following Radiation Exposure
Woloschak, G.
Northwestern University

4:30 PM — Panel Discussion

3:00 PM Room 111 A

MPM-B: Special Session: HPS Wants Your Vision for Future Meetings

Chair: Elizabeth Brackett

Round Table Discussion on the Future of HPS Meetings
Brackett, E., Braun, J., Kirkham, T., Lewandowski, M., Mahathy, J., McFee, M., Wilson IV, C.
MJW Companies, Mayo Clinic, RTI, International, 3M, ORAU, Louisiana State University

3:15 PM Room 111 B

MPM-C1: Radiobiology/Biological Response

Chair: Grady Calhoun

3:15 PM **MPM-C1.1**
A Review of the Effect of Dose and Dose Rate on Various Aspects of Plant Life
Gladfelder, G., Higley, K.
Oregon State University

3:30 PM **MPM-C1.3**
Dose Rate Effect on Double-Stranded DNA Damage and Repair in Mammalian Cells Exposed to Low-LET IR.
Ozerov, I., Tsvetkova, A., Grekhova, A., Pustovalova, M., Osipov, A.
State Research Center – Burnasyan Federal Medical Biophysical Center of Federal Medical Biological Agency (SRC-FMBC), Moscow, Russia

3:45 PM **MPM-C1.4**
Candidate Biomarkers of Radiation Response in Plasma of Metastatic Melanoma Patients
Sproull, M., Tandle, A., Kramp, T., Shankavaram, U., Rosenberg, S., Citrin, D., Camphausen, K.
National Institutes of Health/National Cancer Institute

4:00 PM Room 111 B

MPM-C2: Radiation Effects

Co-Chairs: Otto Raabe, Lavon Rutherford

4:00 PM **MPM-C2.1**
The 2016 Annual Conference of the Canadian Radiation Protection Association
Shonka, J.
Shonka Research Associates

4:15 PM **MPM-C2.2**
Concerning Ionizing Radiation-Induced Cancer from Internally-Deposited Radionuclides
Raabe, O.
University of California, Davis

4:30 PM **MPM-C2.3**
Integrated Spatial and Temporal Stochastic Model for Radiation Biology: Design and Application
Liu, R., Higley, K.
Oregon State University

4:45 PM **MPM-C2.4**
Clinical Features of Subacute Radiation Syndrome
*Krasnyuk, V., Ustyugova, A.**
Burnasyan FMBC of FMBA of Russia, Moscow, Russia

3:00 PM Room 111 C

MPM-D: ACADEMIC

Co-Chairs: Kim Kearfott, Charles Wilson

3:00 PM **MPM-D.1**
Seventeen Seventy and Eighteen Seventy Seven: Numbers and Intercultural Radiation Risk Communication
Kearfott, K., LaGarry, H.
University of Michigan, Oglala Lakota College

3:15 PM **MPM-D.2**
Radiation in Pop Culture
Wilson, C., DiGregorio, T., Wang, W.
Center for Energy Studies, Louisiana State University, Texas A&M Nuclear Engineering Department

3:30 PM **MPM-D.3**
LNT and ALARA: An Invitation to Frivolous Litigation
Fellman, A.
Dade Moeller

3:45 PM **MPM-D.4**
My Biggest Mistakes and My Greatest Lessons
Ford, M.
Ford ES&H Solutions, LLC

4:00 PM **MPM-D.5**
Mobile Radiation Detection Security Sweeps as Teaching Tool
Marianno, C., Falkner, J., Jacob-Hood, T., Trevino, J., Dromgoole, L., Shah, M., Boyd, M., Emory, G., Murchison, D.*
Texas A&M University

4:15 PM **MPM-D.6**
Risk Assessment and Radiation Safety Climate in a University Setting
Root, C., Sinclair, R., Povod, K., Martinez, N.
Clemson University

4:30 PM **MPM-D.7**
Radiation Shielding in the Future
Waite, D.
Retired

3:00 PM Conference Theatre

MPM-E: Decommissioning & Decontamination

Chair: TBD

3:00 PM **MPM-E.1**
How Clean is Clean? The Psychology of Decontamination
Johnson, R.
Radiation Safety Counseling Institute

3:15 PM **MPM-E.2**
Radiation Protection at U.S. Department of Energy Clean-up Sites
Anderson, A.
U.S. Department of Energy

3:30 PM **MPM-E.3**
Rad Decon App - A Decision Support Tool for Selecting Radiation Decontamination Technologies Following a Large-Scale Radiological/Nuclear Incident
Cardarelli II, J., Carney, D.
US EPA, CSS Dynamac

3:45 PM **MPM-E.4**
Decommissioning an Oil and Gas Waste Water Treatment Facility with Known Impacts from Naturally Occurring Radioactive Material
Weddermann, C., Lopez, A.
Amec Foster Wheeler

4:00 PM **MPM-E.5**
The University of Rochester and Challenges to the Environment from Historical Research
Mis, F.
University of Rochester

4:15 PM **MPM-E.6**
Oak Ridge Gaseous Diffusion Plant Deactivation and Demolition - A Summary of Lessons Learned
Long, M.
URS|CH2M

4:30 PM **Decommissioning Section Business Meeting**

3:00 PM Room 207

MPM-F: Instrumentation

Chair: Alex Boerner

3:00 PM **MPM-F.1**
Advancements in Radon Detection and Spectrometry Using Tensioned Metastable Fluid Detectors
Boyle, N., Archambault, B., Taleyarkhan, R.
Purdue University, Sagamore Adams Labs LLC

3:15 PM **MPM-F.2**
Penetrating Heavy Charged Particle Dose Measurements Are Invariant with Angle of Incidence
Bahadori, A., Kroupa, M.
Kansas State University, Lockheed Martin

3:30 PM **MPM-F.3**
Electret Ion Chamber System for Survey Measurements of Pulsed Radiography X-Ray Unit
Paulus, L., Brown, R., Gomez, J., Walter, J., Zubiate, X.
Sandia National Laboratories

3:45 PM **MPM-F.4**
Response Characterization of 11 cm x 42.5 cm x 5.5 cm NaI(Tl) Detectors
Sulieman, N., Seow, C., Cao, S., Frank, S., Boria, A., Calma, J., Kuznetsov, D., Lynch, R., Liu, K., Kearfott, K.
University of Michigan

4:00 PM **MPM-F.5**
Characterization of Dose Rate Discrepancies Between Energy Compensated Geiger Mueller Tubes and Pressurized Ionization Chambers Due to Cosmic Radiation
Gift, M., Rademacher, S.
Colorado State University, United States Air Force

4:15 PM **MPM-F.6**
Low Pressure Proportional Counter Responses in Accelerator-Based High Altitude Neutron Fields

Orchard, G., Waker, A.
University of Ontario Institute of Technology

4:30 PM **MPM-F.7**
Do You Trust Your Radiation Measurements?
Johnson, R.
Radiation Safety Counseling Institute

3:00 PM Room 205

MPM-G: Power Reactors/Waste Management

Chair: Barbara Fisher

3:00 PM **MPM-G.1**
Case Studies of Spent Nuclear Fuel Pool Leaks
Fisher, B.
Illinois Institute of Technology

3:15 PM **MPM-G.2**
Activated Corrosion Source Term Characterization and Their Dose Assessment During the Outage of China's NPPs
Liu, L., Cao, Q., Wang, C., Xu, H., Wang, K., Li, Z.
China Institute for Radiation Protection, CNNC – Nuclear Power Operations Management Co., JiangSu Nuclear Power Co.

3:30 PM **MPM-G.3**
Radiological Conditions Generated by a Defective Fuel Rod
Hanni, J.
Duke Energy

3:45 PM **MPM-G.4**
Managing Noble Gas Release During Reactor Vessel Head Removal After Operating with a Defective Fuel Rod
Hanni, J.
Duke Energy

4:00 PM **MPM-G.5**
Braidwood Groundwater Tritium: Assessing Abnormal Plant Discharges from Leaking Plant Structures
Lake, I.
ChemStaff/Illinois Institute of Technology

4:15 PM **MPM-G.6**
Discussions on Radiation Protection Design under Accident Condition of China Pressurized Water Reactor Power Plant
Wang, X., Mi, A., Mao, Y.
China Nuclear Power Engineering Co.,Ltd, Beijing

TUESDAY

7:00 AM

CEL-4 NORM/TENORM: History + Science + Common Sense = ???
Kennedy, Jr., W.
Dade Moeller & Associates

CEL-5 Herbert M. Parker (1910-1984): Laying the Foundations of Medical and Health Physics
Kathren, R.
Washington State University at Tri-cities, Richland

CEL-6 Channeling Richard Feynman: How Lessons from the Great 20th Century Physicist Can Inform and Inspire Great Health Physics in the 21st Century
Hoover, M.
National Institute for Occupational Safety and Health

8:30 AM Room 100 C

TAM-A: Special Session: USTUR: Five Decade Follow-up of Plutonium and Uranium Workers

Chair: Patricia R. Worthington

8:30 AM **TAM-A.1**
KEYNOTE
The USTUR: Where We Have Been and Where We Are Going
Kathren, R.
Washington State University at Tri-cities

9:15 AM **TAM-A.2**
KEYNOTE
The Atomic Man: Case Study of the Largest Recorded 241Am Deposition in a Human
Carbaugh, E.
Dade Moeller

10:00 AM **BREAK**

9:30 AM Exhibit Hall

PID: Poster Session: Industry Day

PID.1 Performance Assessment Modeling for NORM/TENORM Disposal
Kennedy, Jr., W.
Dade Moeller

PID.2 Measurement of RN-222 Alpha Decay from Barite Pipe Scale
Thompson, D.
Sulas Radiation Safety Consultants, LLC

PID.3 Survey and Disposition of NORM-Containing Refractory Brick
Ikenberry, T.
Dade Moeller

PID.4 Radium Gamma-Ray Signatures through Pipe-Walls
McNeil, W.
Kansas State University

PID.5 The US Abandoned Uranium Mines Project
Manglass, L., Townsend, A., Liles, D.
Arcadis

PID.6 The Top 10 Things Oil Producers Need to Know About Technologically Enhanced Naturally Occurring Radioactive Material
Rhea, G.
SECURE Energy Services

10:30 AM Room 100 C

TAM-A1: Technical Session I: USTUR Internal Research

Co-Chairs: Carol Iddins, Dunstana Melo

10:30 AM **TAM-A1.1**
Estimation of Actinide Skeletal Content from a Single Bone Analysis
Tolmachev, S., Kathren, R.
USTUR, Washington State University

10:45 AM **TAM-A1.2**
Updating ICRP 70 Skeleton Weight vs. Body Height Equation
Avtandilashvili, M., Tolmachev, S.
USTUR, Washington State University

11:00 AM **TAM-A1.3**
USTUR Case 0785: Modeling Pu Decorporation Following Complex Exposure
Dumit, S., Avtandilashvili, M., Breustedt, B., Tolmachev, S.
USTUR, Washington State University, Karlsruhe Institute of Technology

11:15 AM **TAM-A1.4**
Digital Autoradiography of Am-241 Spatial Distribution within Trabecular Bone Regions
Tabatadze, G., Miller, B., Tolmachev, S.
USTUR, Washington State University, Pacific Northwest National Laboratory, University of Arizona

11:30 AM **TAM-A1.5**
Reanalysis of Radiation and Mesothelioma in the U.S. Transuranium and Uranium Registries
Zhou, J., McComish, S., Tolmachev, S.
U.S. Department of Energy, USTUR, Washington State University

8:15 AM Room 111 A

TAM-B: Special Session: Sealed Source D&D

Chair: John Hageman

8:15 AM **TAM-B.1**
Realistic Adaptive Interactive Learning System (RAILS): Achieving Search and Secure Program Sustainability through E-Learning
Uhrig, K., Winso, J., Taplin, T., Kahn, R., McRee, B., Miller, R.
MELE Associates/DOE-NNSA, Spectral Labs Incorporated, DOE-NNSA, ANL, PNNL-DOE, SNL

8:30 AM **TAM-B.2**
Recommendations for Improving the Management and Disposition of Disused Sources
Robertson, G., Lovinger, T.
Disused Sources Working Group/Low-Level Radioactive Waste Forum

8:45 AM **TAM-B.3**
Update on Current Activities of the Off-site Source Recovery Program and Coping with the Extended WIPP Closure
Feldman, A., Manzanares, L., Drypolcher, K.
Los Alamos National Laboratory

9:00 AM **TAM-B.4**
National Nuclear Security Administration and the Off-Site Source Recovery Project Domestic Recovery Lessons Learned
Rasmussen, R.
Los Alamos National Laboratory

9:15 AM **TAM-B.5**
Summary of the IAEA Report on Decommissioning of Irradiators and Management of Associated Radioactive Sources
Hageman, J., Benitez-Navarro, J.
SW Research Inst, IAEA

9:30 AM **BREAK IN EXHIBIT HALL**

10:00 AM **TAM-B.6**
Utilization of the International Isotopes Inc. Mobile Hot Cell to Support the Recovery and Disposition of Disused Sources
Miller, J.
International Isotopes Inc.

10:15 AM **TAM-B.7**
IAEA Assisted Source Consolidation of Cat 3-5 Nuclear Gauges
Tompkins, A., Benitez-Navarro, J.
IAEA

10:30 AM **TAM-B.8**
Transportation Challenges for Shipping Sealed Radioactive Sources
Zarling, J., Stewart, W., Taplin, T.
Idaho National Laboratory, Los Alamos National Laboratory, National Nuclear Security Administration

10:45 AM **TAM-B.9**
Disposal of High Activity Sealed Sources Under the Revised Concentration Averaging Branch Technical Position
Stewart, W., Martin, D.
Los Alamos National Laboratory, Energetics Inc.

11:00 AM **TAM-B.10**
The Source Collection and Threat Reduction Program: A Summary of Experience with the Commercial Disposal of Sealed Radioactive Sources
Meyer, C., McBurney, R., Rogers, A.
Conference of Radiation Control Program Directors

11:15 AM **TAM-B.11**
Options of Disposal of Sealed Sources at WCS Disposal Facilities
Kirk, S.
Waste Control Specialists LLC

11:30 AM **TAM-B.12**
Sealed Source Disposal
Rogers, V.
EnergySolutions

11:45 AM **TAM-B.13**
Update on IAEA Report on Management of Disused Depleted Uranium (DU) Used for Radiation Shielding
Hageman, J., Benitez-Navarro, J.
SW Research Inst, IAEA

8:30 AM Room 111 B

TAM-C: Special Session: Environmental Radon

Chair: Matthew Barnett

8:30 AM **TAM-C.1**
Environmental Radiation Dosimetry for the Techa River Population
Napier, B., Degteva, M.
PNNL, Urals Research Center for Radiation Medicine

9:00 AM **TAM-C.2**
Monitoring and Displaying Radon Measurements in Washington
Brennan, M., Echeverria, T.
Washington Office of Radiation Protection, Washington Department of Health

9:15 AM **TAM-C.3**
A Comparison of $11CO_2$ And 85Kr as Calibration Gases for a Beta-Detecting Stack Monitor for Pet Manufacturing Facilities
Krueger, D., Moroney, W., Plastini, F., Parkin, J.
Siemens Molecular Imaging, Ultra Electronics Nuclear Control systems

9:30 AM **TAM-C.4**
Evaluation of an Upward Trend in Background Counts from a Stack Continuous Air Monitor
*Barnett, J., Rishel, J.**
PNNL

9:45 AM **BREAK IN EXHIBIT HALL**

10:15 AM **TAM-C.5**
The WIPP Radiological Release Effluent Correlations
Hayes, R.
North Carolina State University

10:30 AM **TAM-C.6**
Open Sites with Radiocesium Contaminated Soil: Evaluating Dose Rates and Remediation Strategies
Malins, A., Kurikami, H., Nakama, S., Machida, M., Kitamura, A.
Japan Atomic Energy Agency

11:00 AM **TAM-C.7**
Darlington Newbuild Environmental Assessment – An Overview
Chambers, D.
Arcadis

11:30 AM **Environmental Radon Business Meeting**

9:30 AM Room 111 C

TAM-D: Special Session: Accelerator

Chair: Elaine Marshall

9:30 AM **TAM-D.1**
High Power Beam Dump Hydrogen Detection Technology
May, R., Fanning, H., Gonzales, R.
Jefferson Lab

9:45 AM **TAM-D.2**
Shielding Analysis for a New High Power Electron Accelerator at the Idaho State University Idaho Accelerator Center
Kadiri, A., Harris, J.
Idaho State, Purdue University

10:00 AM **TAM-D.3**
Development of a Laser-Induced Ionizing Radiation Dose Yield Model at SLAC for High-Intensity Short-Pulse Laser Facilities
Liang, T., Bauer, J., Liu, J., Rokni, S.
SLAC National Accelerator Laboratory, Georgia Institute of Technology

10:45 AM **TAM-D.4**
Design of Radiation Safety Systems for LCLS-II Accelerator at SLAC
Rokni, S., Blaha, J., Liu, J., Mao, S., Nicolas, L., Santana, M., Xiao, S.
SLAC National Accelerator Laboratory

11:00 AM **TAM-D.5**
Activation and Shielding Analyses for China ADS Research Facility
Luo, P.
Institute of Modern Physics, CAS

11:15 AM **TAM-D.6**
Decommissioning and Repurposing of LLNL's B865 Legacy Accelerator Facility
Castro, M.
Institute of Modern Physics, CAS

11:45 AM **Accelerator Section Business Meeting**

8:30 AM — Conference Theatre

TAM-E: Special Session: AAHP – Nuclear Weapons – Present and Past Hazards, Part I

Co-chairs: Robert Miltenberger, Charles "Gus" Potter

8:30 AM **TAM-E.1**
Nuclear Weapon Basics
Walker, S.
Sandia National Laboratories

9:15 AM **TAM-E.2**
Prompt Effects from Nuclear Detonation
Potter, C.
Sandia National Laboratories

10:30 AM **TAM-E.3**
Fallout from a Nuclear Detonation, Delayed Effects and Shelter Opportunities
Buddemier, B.
LLNL

11:15 AM **TAM-E.4**
Health Impacts from Nuclear Weapon Effects in Modern Urban Environments
Stricklin, D., Wentz, J., Millage, K., Dant, T., Kramer, K., Blake, P.
ARA, DTRA

8:00 AM — Exhibit Hall B

TAM-F: Interactive Session: Industry Day

Chair: Bill Kennedy

10:00 AM — Room 205

TAM-G: NORM/TENORM Industry Day

Co-Chairs: Tracy Ikenberry, Alan Fellman

10:00 AM **TAM-G.1**
Uranium Mining and NORM, a North American Perspective
Brown, S., Chambers, D.
SHB Inc, Arcadis Canada

10:20 AM **TAM-G.2**
NORM Safety for Oilfield Workers
Johnson, R.
Radiation Safety Counseling Institute

Again this Year!

Tuesday, 10:00-11:30 am

Workshop: Publishing in *Health Physics* and *Operational Radiation Safety*

Speakers: Mike Ryan, Deanna Baker, Craig Little, MaryGene Ryan

A workshop geared towards first-time authors who are interested in publishing but are uncertain of the process. There will be a tutorial as well as presentations from both editors in chief. This workshop will answer many questions regarding the flow of a manuscript from submission to publication. This is also a good refresher for authors who have already published with HPJ or ORS but would like to have a better understanding of the process.

HPS Awards Banquet

Spend an enjoyable evening with members of the Health Physics Society. This event will be held on Tuesday, 19 July, in the Davenport Grand Hotel, and is an excellent opportunity to show your support for the award recipients as well as the Society. The awards will be presented after the dinner and the event will last from 7:00-9:00 pm. Included in Member, Non-Member, Emeritus, Past President, and Student Registrations.

10:40 AM **TAM-G.3**
NORM Radiation Protection for Alum Production and Storage
Ikenberry, T., Arana, J.
Dade Moeller

11:00 AM **BREAK IN EXHIBIT HALL**

11:20 AM **TAM-G.4**
Technologically Enhanced Naturally Occurring Radioactive Material Waste Streams in the Oil and Gas Sector
Rhea, G.
SECURE Energy Services

11:40 AM **TAM-G.5**
Baseline Surveys, Environmental Monitoring and Assessment for TENORM Facilities.
Egidi, P.
USEPA

2:30 PM Room 100 C

TPM-A: Technical Session II: USTUR Collaborative Research

Co-chairs: Isaf Al-Nabulsi, Ray Guilmette

2:30 PM **TPM-A.1**
Red Marrow Dosimetry for Former Radium Workers
Toohey, R., Goans, R., Iddins, C., Dainiak, N., McComish, S., Tolmachev, S.
M.H. Chew & Assoc., MJW Corp., ORISE, USTUR

2:45 PM **TPM-A.2**
The Pseudo Pelger-Huet Cell as a Retrospective Dosimeter: Analysis of a Radium Dial Painter Cohort
Goans, R., Toohey, R., Iddins, C., Daniak, N., McComish, S., Tolmachev, S.
MJW Corporation, M.H. Chew and Associates, ORISE, USTUR

3:00 PM **TPM-A.3**
EURADOS Intercomparison on Measurements of Am-241 in 3 Skull Phantoms
Lopez, M., Nogueira, P., Vrba, T.
Ciemat, Spain, Hmgu, Germany, Ctu-Prague, Czech Rep.

3:15 AM **BREAK**

3:45 PM **TPM-A.4**
The Importance of Plutonium Binding in Human Lungs
Birchall, A., Puncher, M., Tolmachev, S.
Global Dosimetry Ltd. , UK., Public Health England, UK, USTUR, Washington State University

4:00 PM **TPM-A.5**
USTUR Case 0846: Modeling Americium Biokinetics after Intensive Decorporation Therapy
Breustedt, B., Avtandilashvili, M., McComish, S., Tolmachev, S.
KIT, Karlsruhe Institute of Technolgoy, USTUR, Washington State University

4:15 PM **Roundtable Discussion with USTUR Former Directors**

4:45 PM **Roundtable Open Discussion**

2:30 PM Room 111 A

TPM-B: Special Session: Future Challenges

Co-Chairs: Jeff Chapman, Nolan Hertel

2:30 PM **TPM-B.1**
Future Challenges for Undergraduate Health Physics Programs
Jokisch, D.
Francis Marion University, Oak Ridge National Laboratory

2:50 PM **TPM-B.2**
Future Challenges for Graduate Health Physics Programs
Higley, K.
Oregon State University

3:10 PM **TPM-B.3**
Future Challenges in Computational Radiation Dosimetry - How Precise Do We Need to Get?
Hiller, M., Dewji, S.
Oak Ridge National Laboratory

3:50 PM **TPM-B.5**
Challenges for Next Generation Health Physicists in the Public Health Arena – An Epidemic of Academic Proportion
Finklea, L.
Centers for Disease Control and Prevention

4:10 PM **TPM-B.6**
Future Challenges in Operational Health Physics at National Laboratories
Bliss, J.
LANL

4:50 PM **TPM-B.7**
Future Challenges in University Radiation Protection
Samuels, C., Tabor, C.
Georgia Institute of Technology

2:30 PM Room 111 B

TPM-C: Special Session: NESHAPS/RADAIR

Chair: Matthew Bennett

2:30 PM **TPM-C.1**
U.S. Department of Energy NESHAPS Subpart H Report
*Ostrowski, C., Snyder, S.**
U.S. DOE, PNNL

2:45 PM **TPM-C.2**
U.S. Environmental Protection Agency Update on 40 CFR 61, Subpart H Radioactive Air Emissions
*Rosnick, R., Egidi, P.**
EPA-HQ

3:00 PM **TPM-C.3**
Update on Standards, Guides and Directives for Monitoring Radioactive Air Emissions
Glissmeyer, J., Blunt, B.
PNL

3:15 PM **TPM-C.4**
Does CAP-88 Underestimate the Gamma Dose from an Overhead Plume?
McNaughton, M., Gillis, J., Ruedig, E., Whicker, J., Fuehne, D.*
Los Alamos National Laboratory

3:30 PM **TPM-C.5**
Dose Comparisons for a Site-Specific Reference Person Using the Age-Dependent Dose Factors in CAP88 PC Version 4
Jannik, G., Moore, K., Dixon, K., Stone, D., Newton, J.
Savannah River National Laboratory, Augusta University

3:45 PM **BREAK IN EXHIBIT HALL**

4:15 PM **TPM-C.6**
Deposition Calculator Revision
Blunt, B.
Blunt Consulting LLC

4:30 PM **TPM-C.7**
Oak Ridge Reservation Environmental Protection RadNeshaps Source and Dose Databases and Rad Inventory Web Database
Scofield, P., Smith, L.
Oak Ridge National Laboratory

4:45 PM **TPM-C.8**
Modeling Considerations for Ingestion Pathway Dose Calculations Using CAP88
Stuenkel, D.
Trinity Engineering Associates

5:00 PM **TPM-C.9**
Modification in Applying Appendix D of 40 CFR Part 61 to Heated Radionuclide Solid Materials with High Melting and Boiling Points
Smith, L.
Oak Ridge National Laboratory

2:30 PM Room 111 C

TPM-D: Special Session: AIRRS

Chair: Kendall Berry

4:30 PM **Business Meeting**

2:30 PM Conference Theatre

TPM-E: Special Session: AAHP – Nuclear Weapons – Present and Past Hazards, Part 2

Co-Chairs: Robert Miltenberger, Charles "Gus" Potter

2:30 PM **TPM-E.1**
Fallout: You Can Take It to the Bank
Brooks, A., Church , B.
Washington State University, BWC Enterprises Inc

3:15 PM **TPM-E.2**
Internal and External Dosimetry of the Early Nuclear Weapons Workers
Brackett, E., Smith, M.
MJW Corporation, Dade Moeller

4:00 AM **BREAK IN EXHIBIT HALL**

4:15 PM **TPM-E.3**
Nuclear Weapons Worker Compensation Energy Employees Occupational Illness Compensation Program Act
Kotsch, J.
U.S. Department of Labor

4:30PM **Business Meeting**

2:30 PM Exhibit Hall B

TPM-F: Interactive Session: Industry Day
Chair: Bill Kennedy

WEDNESDAY

7:00 AM

CEL-7 Twelve Barriers to Effective Radiation Risk Communication
Johnson, R.
Radiation Safety Counseling Institute

CEL-8 Overview of Federal Resources Available for Response to a Radiological/Nuclear Accident or Incident
Groves, K.
FHPS

8:30 AM Room 100 C

WAM-A: Special Session: Homeland Security
Co-Chairs: John Lanza, Doug Draper

8:30 AM **WAM-A.1**
Federal Agency Response to Radiological Accidents/ Incidents
Groves, K.
FHPS

9:00 AM **WAM-A.2**
The National Alliance for Radiation Readiness (NARR): Activities Update Since Fukushima
Lanza, J.
Florida Dept. of Health

9:30 AM **WAM-A.3**
DOE Overview of Actions Resulting from the Fukushima Accident
Blumenthal, D.
DOE/NNSA

11:00 AM **WAM-A.5**
Enhancing Response Capabilities for Radiological Emergencies Post Fukushima 'The States' Perspective
Mulligan, P., Irwin, B.
Conference of Radiation Control Program Directors

11:30 AM **WAM-A.6**
EPA PAG Revisions Considering Fukushima
Decair, S.
USEPA, ORIA

8:30 AM Room 111 A

WAM-B: External Dosimetry
Co-Chairs: Tim Taulbee, Alexander Brandl

8:30 AM **WAM-B.1**
Dosimeter Archeology
Kirr, M., Passmore, C., Koperski, B., Moscatel, M., Zhang, R.
Landauer, Inc

8:45 AM **WAM-B.2**
Improvements in Radiation Monitoring Trending
Passmore, C., Kirr, M., Murthy, S., Harbison, L.
Landauer, Inc

9:00 AM **WAM-B.3**
Back to Basics: the Optically Stimulated Luminescence (OSL) External Dosimetry Program at PNNL
Jones, R., Pierson, R.
Columbia Chapter, Richland

9:15 AM **WAM-B.4**
Design of an Affordable Modular Optically Stimulated Luminescence Dosimetry System for the Investigation of New Dosimetric Materials
Frank, S., Kearfott, K.
University of Michigan

9:30 AM **BREAK IN EXHIBIT HALL**

10:00 AM **WAM-B.5**
Design of an Affordable and Efficient Optically Stimulated Luminescent (OSL) Annealer
Abraham, S., Frank, S., Rucinski, B., Dawson, A., Liu, K., Kuznetsov, D., Kearfott, K.
University of Michigan

10:15 AM **WAM-B.6**
Performance Evolution of TLD-700H/600H Dosimetry System at Extended Issue Periods
Romanyukha, A., Morgan, B., Grypp, M., Williams, A.
Naval Dosimetry Center

10:30 AM **WAM-B.7**
Preliminary Investigation of the Fading Properties of Several Optically Stimulated Luminescent Materials
*West, W., Kearfott, K., Seow, C.**
West Physics, University of Michigan

10:45 AM **WAM-B.8**
Biokinetics of Strontium-90 in Male Nonhuman Primates
Krage, E., Poudel, D., Swanson, J., Guilmette, R., Brey, R.
Idaho State University, Lovlace Respiratory Research Institute

11:00 AM **WAM-B.9**
Dosimetry for Low Dose Rate Neutron Exposures in Mice
Phillips, P., Borak, T., Weil, M.
Colorado State University

11:15 AM **WAM-B.10**
Evaluation of Photon and Neutron Dose Response of Al2O3:C Optically Stimulated Luminescence Dosimeters for Nuclear Accident Dosimetry Applications
Rathbone, B.
Pacific Northwest National Laboratory

11:30 AM **WAM-B.11**
Selective Shielding of Astronauts for Solar Particle Events During Deep Space Missions
Milstein, O., Waterman, G., Zlatsin, Y., Nix, T., Murow, D., Gaza, R., Lytle, B., Hussein, H.
StemRad, Ltd, Lockheed Martin Space Systems Company

11:45 AM **WAM-B.12**
Body-Size Dependent Exponential Regression Coefficients for Dose Coefficients for Adult Males Exposed to External Photon Fields
Chang, L., Lee, C.
National Cancer Institute

8:30 AM — Room 111 B

WAM-C: Special Session: Patient Release Following I-131 Therapy
Chair: Tom Mohaupt

8:30 AM **WAM-C.1**
Medical Protocols for I-131 Administration
Sigg, D.
Nuclear Medicine Specialist

9:00 AM **WAM-C.2**
I-131 Patient Dosimetry
Stabin, M.
Vanderbilt University

9:30 AM **WAM-C.3**
Doses to Members of the Public from I-131 Patient Release
Dewji, S
Oak Ridge National Laboratory

10:00 AM **Break**

10:30 AM **WAM-C.4**
NCRP 155, Patient Releasability and Post-Release Precautions
Zanzonico, P.
Memorial Sloan-Kettering Cancer Center

11:00 AM **WAM-C.5**
IAEA Publications on Patient Release After Radionuclide Administration
Gilley, D.
International Atomic Energy Agency

11:30 AM **WAM-C.6**
I-131 Therapy Releases: The RSO Perspective
Kroger, L.
UC Davis Medical Center

8:30 AM — Room 111 C

WAM-D: Special Session: Supporting Decisionmaking with Non-Technical Language
Chair: Ted Lazo

8:30 AM **D.1**
Informing Decision Making in Non-Technical Language
Lazo, E.
OECD Nuclear Energy Agency

8:30 AM — Conference Theatre

WAM-E: Special Session: McCluskey Room
Chair: Wayne Glines

8:30 AM **WAM-E.1**
Explosion in Waste Treatment Box at Hanford's Plutonium Finishing Plant Americium Recovery Process Results in Extreme Contamination of Facility and Long Term Lay Up.
Glines, W., Bladow, T., Harder, B.
Dade Moeller & Associates, CH2M Plateau Remediation Company

9:00 AM **WAM-E.2**
Investigating, Evaluating and Preparing for Radiological Hazards for Waste Treatment Box in Situ Size Reduction, Based Upon Similar Activities Performed on Less Hazardous Waste Treatment Boxes.
Glines, W., Bladow, T., Harder, B.*
Dade Moeller & Associates, CH2M Plateau Remediation Company

9:30 AM **WAM-E.3**
Specialized Equipment and Training in Preparation for 242-Z Demolition and Destruction
*Glines, W., Bladow, T., Harder, B.**
Dade Moeller & Associates, CH2M Plateau Remediation Company

10:00 AM **BREAK IN EXHIBIT HALL**

10:30 AM **WAM-E.4**
In-Situ Size Reduction of Unprepared and Highly Contaminated Waste Treatment Boxes by Mechanical Cutting.
Glines, W., Bladow, T., Harder, B.*
Dade Moeller & Associates, CH2M Plateau Remediation Company

11:00 AM **WAM-E.5**
Dose Management and ALARA Techniques Used for Mitigation and Final Dose Evaluation
*Glines, W., Bladow, T., Harder, B.**
Dade Moeller & Associates, CH2M Plateau Remediation Company

11:30 AM **WAM-E.6**
Panel Discussion on Decontamination and Decommissioning of "McCluskey Room"
Glines, W., Bladow, T., Harder, B., Carbaugh, E.
Dade Moeller & Associates, CH2M Plateau Remediation Company

Do you have a job opportunity?
Are you looking for an HP to fill a position?

Email your job description and HPS will post it at the meeting. Send a pdf or Word document to Jennifer Rosenberg at **JRosenberg@BurkInc.com**.

8:30 AM — Room 205

WAM-F: Special Session: Nanotechnology
Chair: Mark Hoover

8:30 AM **WAM-F.1**
Nanotechnology and Radiation Protection
Hoover, M., Marceau-Day, M., Cash, L., Davis, J., Ficklen, C., Holiday, S.
National Institute for Occupational Safety and Health, Scientist Emerita, Los Alamos National Laboratory, Oak Ridge Associated Universities, Ficklen and Associates, Nuclear Regulatory Commission

9:00 AM **WAM-F.2**
Nanomaterials: A Health Physicist's Role in Determining the Risks
Davis, J., Nichols, G.
Oak Ridge Associated Universities

9:20 AM **WAM-F.3**
Nanomaterials: Size Really Does Matter
Davis, J., Nichols, G.
ORAU

9:40 AM **WAM-F.4**
How Nanotechnology will Impinge on the Practice of Health Physics - Examples from Accelerator-Related Research and Development
Day, L.
LSU

10:00 AM **Open Discussion**

10:30 AM **Business Meeting**

2:30 PM — Room 100 C

WPM-A: Special Session: Homeland Security
Co-Chairs: John Lanza, Doug Draper

2:30 PM **WPM-A.1**
'WARP: Where are the Radiation Professionals?'
Toohey, R.
M. H. Chew & Associates

3:00 PM **WPM-A.2**
Rad Responder
Crawford, S.
DHS/FEMA

3:30 PM **WPM-A.3**

The Thule Greenland Nuclear Weapons Accident

Taschner, J., Groves, K.
Retired, FHPS

4:00 PM **Business Meeting**

2:30 PM Room 111 A

WPM-B1: Internal Dosimetry

Chair: Alexander Brandl

2:30 PM **WPM-B1.1**

Discover a Million Ways to Fill a Bottle: How PNNL Knows Who Gets to Try

Jones, R., Pierson, R.
Columbia Chapter, Richland

2:45 PM **WPM-B1.2**

Body-Size Dependent Exponential Regression Coefficients for Dose Coefficients for Adult Males Exposed to External Photon Fields

Chang, L., Lee, C.
National Cancer Institute

3:00 PM **WPM-B1.3**

Biokinetics of Plutonium in Adult Nonhuman Primates

Poudel, D., Guilmette, R., Krage, E., Brey, R.
Idaho State University, Lovelace Respiratory Research Institute, Ray Guilmette and Associates, LLC

3:15 PM **WPM-B1.4**

Development and Application of Voxelized Dosimetric Models for Biota: Characterization of the Uncertainty in the International Commission on Radiological Protection's Wildlife Dosimetry System

Caffrey, E., Johansen, M., Higley, K.
Oregon State University, Australian Nuclear Science and Technology Organization

3:30 PM **WPM-B1.5**

Dosimetric Monitoring of a Case of Actinide Intake through Damaged Skin

*Ephimov, A., Sokolova, A., Ishunina, M.**
Southern Urals Biophysics Institute

3:45 PM **BREAK IN EXHIBIT HALL**

4:00 PM Room 111 A

WPM-B2: Dose Reconstruction

Co-Chairs: Eric Miller, Tim Kirkham

4:00 PM **WPM-B2.1**

A Monte Carlo Methodology for Individualized Reconstruction of Mean Organ Doses of Patients treated for Hodgkin's Lymphoma: Progress Towards Correlating Dose with Late Toxicities

Petroccia, H., Mendenhall, N., Bolch, W.
University of Florida, Gainesville, University of Florida Health Proton Therapy Institute, Jacksonville

4:15 PM **WPM-B2.2**

Rapid Acute Radiation Dose Assessment Using MCNP6

Owens, A., Bertelli, L., Sugarman, S., Johnson, T.
Colorado State University, Los Alamos National Lab, REAC/TS

4:30 PM **WPM-B2.3**

Voxel Phantom Model of the Pine Tree

Condon , C., Higley , K.
Oregon State University

4:45 PM **WPM-B2.4**

Organ Doses from Diagnostic Medical Radiography-Trends Over Eight Decades (1930 to 2010)

Melo, D., Simon, S., Miller, D., Chang, L., Moroz, B., Linet, M.*
Lovelace Respiratory Research Institute, National Cancer Institute, FDA

5:00 PM **WPM-B2.5**

Thermoluminescence Characteristics of Household Salts for Retrospective Dosimetry in Radiological Events

Datz, H., Horowitz, Y., Druzhyna, S., Oster, L., Orion , I.*
Soreq Nuclear Research Center, Ben Gurion University of the Negev, Sami Shamoon College of Engineering

2:30 PM Room 111 B

WPM-C: Environmental 1

Co-Chairs: Michael Witmer, Paul Ward

2:30 PM **WPM-C.1**

Lead-210 and Polonium-210 Levels in the Atmosphere in China

Wu, Q., Pan, Z., Cao, Z., Huang, R., Ren, X., Li, P.
Tsinghua University, China, CNCC, China, Zhejiang Province Envrionmental Radiation Montioring Center, China, China Institute for Radiation Protection

2:45 PM **WPM-C.2**
Visualizing High Order Daughters' Activities Using Wolfram Mathematica
Wilson, C., Hamideh, A., Wang, W.
Louisiana State University

3:00 PM **WPM-C.3**
Quantification of the Spatial Distribution of Radionuclides in a Field Lysimeter with a Collimated High-Resolution Gamma-Ray Spectrometer
Erdmann, B., DeVol, T., Powell, B.
Clemson University

3:15 PM **BREAK**

3:45 PM **WPM-C.4**
Radon Transport through a Landfill Leachate Collection System
Morris, R., Ulsh, B.
M. H. Chew & Associates, Inc

4:00 PM **WPM-C.5**
TENORM at Abandoned Uranium Mine Sites in the Southwestern United States
Manglass, L., Liles, D., Townsend, A., Manglass, L.
Arcadis

4:15 PM **WPM-C.6**
Measuring Isotopic Ratios of Uranium and Thorium on the Pine Ridge Reservation
Cano, J., Sandoval, D.
Oglala Lakota College

4:30 PM **WPM-C.7**
Computational Techniques for Quantifying the Non-Linear Dynamics of Indoor Radon Concentrations
Khan, N., Loun, W., Rafique, M., Khan, S.
University of Azad Jammu & Kashmir, Muzaffarabad

2:15 PM Room 111 C

WPM-D: Special Session: Radiation Protection History & Culture

Co-Chairs: Elizabeth Gillenwalters, Nicole Martinez

2:15 PM **Introduction**
N. Martinez
Clemson University

2:30 PM **WPM-D.1**
Women in Radiation Science: a History
Martinez, N., Gillenwalters, E.
Clemson University, Ameriphysics

2:45 PM **WPM-D.2**
Elda Emma Anderson: Who Was He?
Kearfott, K.
University of Michigan

3:00 PM **WPM-D.3**
A Pictorial History of the Health Physics Society
Willison, J.
AECOM

3:15 PM **WPM-D.4**
Reality Health Physics in the Early 1960's: Three Personal Vignettes
Zimbrick, J.
Purdue University and Colorado State University

3:30 PM **BREAK**

4:15 PM **WPM-D.6**
Importance of Diversity Demographics in Radiation Protection
Gillenwalters, E., Martinez, N.
Ameriphysics, Clemson University

4:30 PM **WPM-D.7**
Aspire, Think and Do: the Training of Today's Health Physics Students
Wang, C.
University of Pittsburgh

4:45 PM **Panel Discussion**

2:15 PM Conference Theater

WPM-E: Special Session: Power Reactor Health Physics & NRRPT

Chair: Tom Voss

2:15 PM **WPM-E.1**

Update on Potential Regulatory Changes Impacting the Commercial Nuclear Power industry

Hiatt, J.
NEI

2:30 PM **WPM-E.2**

Powernet - Useful Tool or Not?

Sewell, L.
PG&E Diablo Canyon

2:45 PM **WPM-E.3**

Personnel Contamination Events (PCEs) – Why We Do What We Do and Where the Industry is Headed with Accountability and Tracking!

Benfield, E.
NRRPT

3:00 PM **WPM-E.4**

Applications of the H3D Cadmium Zinc Telluride Gamma Camera in Commercial Nuclear Power

Wirth, M.
Palo Verde Nuclear Generating Station

3:15 PM **BREAK**

3:45 PM **WPM-E.5**

Realistic Computer Based Training for Optimized Radiation Learning Retention

Rolando, J., Winso, J., Uhrig, K.
Spectral Labs, Mele Associates

THURSDAY

7:00 AM

CEL-9 Communicating Radiation Safety Information to the Public, the Media, and Other Non-Health Physicists
Karam, P.
NYPD Counterterrorism

CEL-10 Radiation Dosimetry as Part of an Integrated Radiation Protection Program
Potter, C.
S. H. Goke, Sandia National Laboratories

8:30 AM Room 100 C

THAM-A: Medical Health Physics, 1

Co-Chairs: Mike Stabin, Linda Kroger

8:30 AM THAM-A.1
Assessing the Impact of Phantom Alignment in Monte Carlo Simulations on Organ Doses in Reconstructed Cardiac Fluoroscopic Procedures
Marshall, E., Borrego , D., Fudge, J., Bolch, W.
University of Florida, Gainesville, UF Health, Gainesville

8:45 AM THAM-A.2
Using the HP Volunteer Program for a Research Project Sponsored by the Medical Section of HPS
Leinwander, P.
University of California, Davis

9:00 AM THAM-A.3
Release Criteria Methodology and Patient Instructions for I-131 Therapy
Kroger, L.
University of California Davis Health System

9:15 AM THAM-A.4
Hybrid Computational Canine Phantom Series to Support Preclinical Dosimetry and Biokinetic Modeling for Therapeutic Radiopharmaceuticals
Sands, M., Milner, R., Bolch, W.
University of Florida

9:30 AM THAM-A.5
A Dosimetric and Computational Speed Comparison Between the Voxelized UF Refernece Phantom and Converted Polygonal Phantom
Brown, J., Bolch, W., Sands, M., Borrego, D.
University of Florida

9:45 AM THAM-A.6
Health Physics Concerns Regarding the Use of Cesium-131 Sealed Sources for Non-Prostate Manual Brachytherapy
Hann, P., Keklak, J.
Thomas Jefferson University Hospital

10:00 AM BREAK

10:30 AM THAM-A.7
Survey of Policies and Practices for the Inspection of Lead Aprons at Medical Facilities
Olson, A., Simpson, D., King, S.
Bloomsburg University, Penn State Hershey Medical Center

10:45 AM THAM-A.8
Development of a Low Dose Lung Cancer Screening CT Protocol
Gamble, G., DeRosa, R., Bottorff, M., Cooney, B., Farah, R., LaVoy, T.
V.A. Medical Center Syracuse, New York, S.U.N.Y. Upstate Medical University Syracuse, New York

11:00 AM THAM-A.9
Patient Dose Comparison for Intraoperative Imaging Devices Used in Orthopedic Lumbar Spinal Surgery
Moore, B., Womack, K., Nguyen, G., Foster, N., Blizzard, D., Richardson, W., Yoshizumi, T.
Duke University, U.S. Nuclear Regulatory Commission, Duke University Medical Center, Hospital for Joint Diseases at NYU Langone Medical Cente

11:15 AM THAM-A.10
Anatomically Predictive Extension of Computational Human Phantoms for Retrospective Epidemiological Studies of Second Cancer in Radiotherapy Patients
Kuzmin, G., Jung, J., Pelletier, C., Lee, C., Lee, C.
National Cancer Institute, East Carolina University, University of Michigan

11:30 AM **THAM-A.11**
Current Radiation Safety Guidance for Death of Patients Treated with Sealed Or Unsealed Radioactive Therapy Sources - Part I
Steiner, J.
Louisiana State University

11:45 AM **THAM-A.12**
Current Radiation Safety Guidance for Death of Patients Treated with Sealed Or Unsealed Radioactive Therapy Sources - Part II
Meng, B.
Duke University

Noon **Medical Section Business Meeting**

8:30 AM — Room 111 A

THAM-B: Environmental, 2

Co-Chairs: Michael Witmer, Paul Ward

8:30 AM **THAM-B.1**
Preliminary Identification of Lineaments (Potential Contaminant Pathways) through Satellite Imagery of Northwestern Fall River and Southwestern Custer Counties, South Dakota
Vasek, P., LaGarry, H.
Oglala Lakota College

8:45 AM **THAM-B.2**
Determination of Uranium Minerals and Radionuclide Concentrations of Selected Sites on the Pine Ridge Reservation and Vicinity, South Dakota and Nebraska
Vasek, P., LaGarry, H., Sanovia, J.
Oglala Lakota College

9:00 AM **THAM-B.3**
Predicting Seismic Events with Unattached Radon Decay Products
Harley, N., Chittaporn, P., Fisenne, I.
NYU School of Medicine, USDOE Retired

9:15 AM **THAM-B.4**
Spatial Interpolators: the Risks and Rewards of Several Approaches and Algorithms
Ruedig, E., Whicker, J.
Los Alamos National Laboratory

9:30 AM **THAM-B.5**
Investigation of Indoor Radon Levels in Bloomsburg University Campus Buildings
Dubil, C., Cuff, S., Stacy, A., Dendler, J., Simpson, D., Fallahian, N.
Bloomsburg U.

9:45 AM **BREAK**

10:15 AM **THAM-B.6**
Modeling of Cesium Movement through a Terrestrial-Aquatic Forest Ecosystem near Fukushima
Townsend, A., Ruedig, E., Gomi, T., Sakai, M., Johnson, T.
Colorado State University, Los Alamos National Laboratory, Tokyo University of Agriculture and Technology

10:30 AM **THAM-B.7**
Indoor Temporal Variations in Background Gamma Ray Spectrum Determined with an 11 cm x 40 cm x 5.5 cm NaI(Tl) Detector
Cao, S., Frank, S., Lynch, R., Rucinski, B., Sulieman, N., Kuznetsov, D., Liu, K., Kearfott, K.
University of Michigan

10:45 AM **THAM-B.8**
Uranium in Phosphate Cycle in Saudi Arabia
Khater, A., Ebaid, Y.
King Saud University

11:00 AM **THAM-B.9**
Public Health Effects of Uranium Legacy Sites in Central Asia
Shandala, N., Seregin, V., Filonova, A., Tukov, A., Kiselev, S., Titov, A., Pozhidaev, A., Abasova, G., Hojyion, M.*
State Research Center – Burnasyan Federal Medical Biophysical Center, Moscow, Russia, Federal Center for Nuclear and Radiation Safety, Moscow, Russia, Ministry of Emergency Situation, Bishkek, Kyrgyzstan, State Unitary Enterprise – Tajik Rare Metals – Chkalovsk, Tajikistan

11:15 AM **THAM-B.10**
Estimation of Lifetime Cancer Risk from Indoor Radon in Akoko Region of Southwest Nigeria
Ajayi, I.
Crawford University, Igbesa, Ogun State, Nigeria.

11:30 AM **THAM-B.11**
Estimation of Fatality Risk from Indoor Exposure to Radon in Some Homes in Akoko Region of Ondo State, Southwestern, Nigeria.
Asere, A., Ajayi, I.
Adekunle Ajasin University, Akungba Akoko, Nigeria

11:45 AM **THAM-B.12**
Radiological Air Sampling During Wildfires in Central Idaho
Ritter, P.
State of Idaho

8:30 AM Room 111 B

THAM-C: Emergency Response I
Co-Chairs: Lorne Erhardt, Stuart Hinnefeld

8:30 AM **THAM-C.1**
Radioactive Deposition Measurements from a Radiological Dispersal Device
Erhardt, L., Lebel, L., Korpach, E., Berg, R., Inrig, E., Watson, I., Liu, C., Quayle, D.
Defence Research and Development Canada, Institut de radioprotection et de sûreté nucléaire, Health Canada, Radiation Protection Bureau

8:45 AM **THAM-C.2**
Preliminary Dose Assessment for Emergency Response Exercise at Disaster City Using Unsealed Radioactive Contamination
Dromgoole, L., Marianno, C., Poston, J.
Texas A&M University

9:00 AM **THAM-C.3**
Relative Hazard of Cutaneous Radiation Injury and Acute Radiation Syndrome during Urban Evacuation following Nuclear Terrorism
Adams, T., Yeddanapudi, N., Clay, M., Asher, J., Appler, J., Casagrande, R.
Gryphon Scientific, LLC, BARDA ADS

9:15 AM **THAM-C.4**
Gamma Dose from an Overhead Plume
McNaughton, M., Gillis, J., Ruedig, E., Whicker, J., Fuehne, D.*
Los Alamos National Laboratory

9:30 AM **THAM-C.5**
Learning from Fukushima: Analysis of Ongoing Recovery Efforts as Reported in Japanese Media
Vidoloff , K., Finklea, L., Donovan, J., Salame-Alfie, A., Ansari, A.
U.S. Centers for Disease Control and Prevention

9:45 AM **THAM-C.6**
Bone Marrow Shielding as an Approach to Protect Explosive Ordinance Disposal Personnel
Waterman, G., Nix, T., Zlatsin, Y., Milstein, O.
StemRad, Ltd

10:00 AM **BREAK**

10:30 AM **THAM-C.7**
The Importance of Effective Communication Between Health Physicists and Healthcare Providers
Sugarman, S., Dainiak, N.
REAC/TS

10:45 AM **THAM-C.8**
How to Make Your Radiation Risk Communications Believable
Johnson, R.
Radiation Safety Counseling Institute

11:00 AM **THAM-C.9**
Community Reception Center Modeling a Tool to Assist Resource Management for Emergency Planners
Finklea, L., Caspary, K., Salame-Alfie, A., Ansari, A.
Centers for Disease Control and Prevention, Oak Ridge Associated Universities

8:30 AM Conference Theater

THAM-D: Movies

2:30 PM Room 111 C

THPM-A1: Medical Health Physics, 2
Co-Chairs: Mike Stabin, Linda Kroger

2:30 PM **THPM-A1.1**
An Estimate of Dose from Cervical Spine Radiographic Exposures in Pediatric Patients Using a Monte Carlo Simulation
Gearhart, A., Carver, D., Parikh, A., Marta Hernanz-Schulman, M., Pruthi, S., Stabin, M.
Vanderbilt University

2:45 PM **THPM-A1.2**
Health Physics; Applying Hard Statistics to a Soft Science
Leuenberger, R.
Louis Stokes Cleveland VA Medical Center

3:00 PM **THPM-A1.3**
Nuclear Regulatory Commission Revised Licensing Guidance for Radioactive Seed Localization
Sheetz, M.
University of Pittsburgh

3:15 PM **THPM-A1.4**
Monte Carlo Based Internal Dosimetry Assessment of Cancer Bearing Canine Patients Treated with Cu-64-ATSM
Bell, J., Mann, K., Kraft, S., Brandl , A.
Colorado State University

3:30 PM **THPM-A1.5**
Response Comparison between a Geiger Muller Tube and Ion Chamber Detectors with Commonly Used Radiopharmaceuticals
Barnes, J., de la Guardia, M., Granger, M.
Cook Children's Medical Center

3:45 PM **THPM-A1.6**
Participation in the NATO HFM 222 2015 Exercise: Diagnosing Acute Radiation Syndrome and Medical Management Based on Clinical Signs and Symptoms
Dant, J., Stricklin, D., Reeves, G.
Applied Research Associates, Inc.

4:00 PM **BREAK**

4:15 PM — Room 111 C

THPM-A2: Regulatory Licensing
Co-Chairs: Tim Kirkham, Mark Roberts

4:15 PM **THPM-A2.1**
An Evaluation of the Security of Radioactive Source Regulations (10 CFR 37)
Dodd, B., Cervera, M.
BDConsulting, USNRC

4:30 PM **THPM-A2.2**
Over 100 mSv from Neutrons During a Day of Air Travel
Bramlitt, E., Shonka, J.
Retired

4:45 PM **THPM-A2.3**
Distribution of License-Exempt Products Containing Radioactive Material During 2014 and 2015
Reber, E.
USNRC

5:00 PM **THPM-A2.4**
Recommendations for Improving the Management and Disposition of Disused Sources
Robertson, G., Lovinger, T.
Disused Sources Working Group, Low-Level Radioactive Waste Forum

5:15 PM **THPM-A2.5**
Background Checks for Information Technology Employees
Harvey, R., Harvey, R.
Roswell Park Cancer Institute, University of Buffalo

2:30 PM — Room 111 A

THPM-B: Sources and Irradiation
Chair: Marcia Maria Campos-Torres

2:30 PM **THPM-B.1**
Development of a Database to Track and Authorize Use of Radioactive Sealed Sources at SLAC
Campos Torres, M.
SLAC

2:45 PM **THPM-B.2**
Calibration of an Irradiation Facility
Marcinko, R., Johnson, T.
Colorado State University

3:00 PM **THPM-B.3**
Development of a High Dose Rate Research Irradiator Design
Shannon, M., Mickum, G., Hope, Z.
Hopewell Designs, Inc.

3:15 PM **BREAK**

3:30 PM **THPM-B.4**
Radioactive Sources Used for Neutron Dosimetry Standards - Historical Overview and the Role of Cf-252
Murphy, M., Thompson, A.
Battelle-PNNL, National Institute of Standards & Technology

3:45 PM **THPM-B.5**
Beyond Californium-252 a Neutron Generator Alternative for Dosimetry and Instrument Calibration in the U.S.
Mozhayev, A., Piper, R., Thompson, A.*
Pacific Northwest National Laboratory, National Institute of Standards and Technology

4:00 PM **THPM-B.6**
Investigation of Workplace-like Neutron Calibration Fields via a Deuterium-Tritium (DT) Neutron Generator
Mozhayev, A., Piper, R., Rathbone, B.
Pacific Northwest National Laboratory, Richland, WA

4:15 PM **THPM-B.7**
Cs-137 Dosimeter Irradiation Facilities: Calibration Frequency, Precision, and Accuracy
Boria, A., Rucinski, B., Dawson, A., Seow, C., Abraham, S., Miklos, J., Kearfott, K.
University of Michigan

2:30 PM Room 111 B

THPM-C1: Emergency Response II
Co-Chairs: Lorne Erhardt, Kim Kearfort

2:30 PM **THPM-C1.1**
Calculation of Scaled Dose Rate Conversion Factors for Search and Rescue Dogs
Trevino, J., Marianno, C., Poston , J., Ford, J.
Texas A&M University

2:45 PM **THPM-C1.2**
Mitigation of Cs-137 Contaminated Waters from Further Environmental Spread
Ng, G., Higley, K.
Oregon State University

3:00 PM **THPM-C1.3**
Generic Dose Assessment for an Incidental Radiological Contamination of a Reservoir-Based Urban Water Supply
Guerrido, L., Cao, S., Leak, C., Seow, C., Pachek, E., Son, W., Kearfott, K.
University of Michigan

3:15 PM **BREAK**

3:45 PM Room 111 B

THPM-C2: Homeland Security
Chair: Roland Benke

3:45 PM **THPM-C2.1**
Collection, Management, Analysis and Dissemination of Environmental Radiation Monitoring Data for a Public Outreach Project
Lynch, R., Frank, S., Jacobs, M., Rucinski, B., Kearfott, K.
University of Michigan

4:00 PM **THPM-C2.3**
Development of Bayesian Statistical Algorithms for Radiation Detection at the Decision Threshold
Brogan, J., Brandl, A.
Colorado State University

4:15 PM **THPM-C2.4**
Source in a Box: Website for Estimating Threats Posed by Radioactive Material in Sealed Containers
Benke, R.
Atom Consulting

AAHP Courses

Davenport Grand • 16 July 2016

AAHP 1

The Role of a Radiological Operations Support Specialist (ROSS)

William Irwin

During radiological and nuclear emergencies, routine decisions and operations for state and local response agencies become increasingly complex. These actions require on-scene radiation specialists to provide expertise and address key issues in safeguarding the public and responders. Some jurisdictions have some of these specialists; others do not. In the worst emergencies, likely all jurisdictions will not have enough. Through the creation of a new National Incident Management System (NIMS)-Typed position, the Radiological Operations Support Specialist (ROSS), the Departments of Homeland Security (DHS) and Energy (DOE) want to train, equip, and certify radiation experts to integrate with the incident command system during a radiological response. When activated, the ROSS will directly support the incident commander, agency decision makers, and elected officials during a radiological emergency.

This training consists of both instruction and group activities to help develop skills that will be needed in a radiological emergency by the ROSS. It is an introductory course including components of a larger training curriculum currently being developed for ROSS certification.

The training begins with an introduction to the ROSS program's origin, purpose, and current status. Next, instructors describe key references and documents that the ROSS will need to leverage to accomplish their mission in support of emergency managers and incident commanders. Some of these references include the Planning Guidance for Response to a Nuclear Detonation, the National Response Framework's Nuclear/Radiological Incident Annex, EPA PAG Manual, and ROSS Resource Guide. By fostering a fundamental understanding of these references, the training shows students how to identify key federal resources, best use these specialized assets during a response, and understand how public protection recommendations are generated.

In addition to references and documents, the course introduces students to key tools, such as RadResponder, HotSpot, and CMWeb, that the ROSS can use in a radiological emergency to collect and disseminate radiological data. Using drills and exercises, instructors reinforce how the ROSS will use these tools to support the emergency response on the ground, focusing on key skills, knowledge, and abilities of radiation professionals, such as:

- FRMAC and other data product interpretation and briefing
- Integration of health physics into the Incident Action Planning process
- Monitoring plan development
- Radiological data mapping, information sharing, and public safety decision-making

This training covers the key resources and tools used by the ROSS during an emergency. Those interested in taking this class should be familiar with the incident command system and NIMS (i.e., ICS-100, ICS-200, IS-700, IS-800) and have a good foundation of health physics / radiation protection and emergency preparedness training and experience.

Please sign up early; class size is limited to 40.

AAHP2

Lessons in Communication from HPS's Ask the Experts

Linnea Wahl

Communicating about radiation and its risks is arguably one of the hardest things a radiation protection professional does. How can we communicate difficult information successfully? *Research* tells us that when we talk to people who are concerned or upset, they want reassurance that we care about them, they have difficulty understanding and remembering what we tell them, they focus on what they hear first, and they focus on the negative news over the positive. *Experience* tells us all this and more.

Experts who support the Health Physics Society's (HPS's) Ask the Experts feature have that experience after answering nearly 12,000 questions from colleagues, regulators, curious folks, angry folks, and frightened folks. Our Ask the Experts experience has taught us lessons such as when to stop with the details already, which words will get the discussion off in the right direction,

and when a speedy response is better than a technically perfect response. We have also learned that it is preferable to use plain language (as opposed to tech talk) and capture the big picture instead of dwelling on the minutiae. People want an uncomplicated answer that they can readily understand.

In this course, we will share the lessons we've learned, illustrated by examples drawn from Ask the Experts questions and answers. These are lessons that all radiation protection professionals can apply to their daily communication challenges.

AAHP3

How Randomness Affects Understanding of Radiation Risk Assessments and Decisions for Radiation Safety

Ray Johnson, MS, PSE, PE, DAAHP, FHPS, CHP
Director, Radiation Safety Counseling Institute

Randomness and Measurement Uncertainties - For a health physicist, radiation risk assessments begin ideally with measurements to characterize the source of radiation. While we depend on radiation instruments to tell us about radiation, how often do we evaluate the uncertainties of measurements? Misunderstandings abound when it comes to interpretation of measurements. Most people want absolute values for measurements and do not want to know about uncertainties and seldom ask questions such as, "Was the best instrument used, was it calibrated and working properly, was it used properly, was the measurement taken in the right place, etc.?" Interpretations of measurements may also have as much to do with attitudes and perceptions of risks as they do about technology. Also, measurements are only part of the information needed for risk assessments.

Randomness and Risk Assessments – While health physicists usually understand that radiation is of main concern for stochastic effects (future random chance of cancer), most of the world does not understand randomness or probabilities. Most people just want to know if they will be "safe or not safe." They do not want to hear about radiation risk estimates as probabilities. When confronted with a risk probability, they are inclined to substitute an easier question, such as, "How do I feel about getting cancer?" They can easily answer this question without any technical knowledge or understanding of statistics.

Randomness and Uncertainty in Safety Decisions – Research has shown that when chance or randomness is involved, people's thought processes for safety decisions are often seriously flawed. How many people understand the principles that govern chance, the development of ideas on uncertainty, and how these processes play out in decisions for radiation safety? The normal processes for safety decisions can lead to mistaken judgments and technically inappropriate reactions for radiation safety (consider reactions following Fukushima).

Is Telling the Truth the Answer to Communicating Risk Assessments? - While we may all agree that HPs have an ethical responsibility to tell the truth about radiation risk assessments, the big question is, "What is the truth?" If we tell people the scientific truth about radiation will that allay their fears or lead to a better understanding? Can our best technical information overcome the common automatic belief in "Deadly Radiation" and other radiation myths perpetuated subconsciously throughout the population? Most importantly, how does anyone actually determine the truth? Is seeing or hearing the basis for believing?

Possible Answers - Perhaps the best way to help people make appropriate decisions for radiation safety is to guide them in the steps for making the risk assessment themselves. People have more confidence in decisions they make for themselves rather than depending only on experts to tell them the answers. While experts may believe they know the answers to risks assessments, their answers may not consider all of the nuances of safety decisions typically used by non-technical people. Several tools will be presented for effective risk communication.

Professional Enrichment Program (PEP)

Sunday 17 July through Thursday 21 July

ONCE AGAIN

The Professional Enrichment Program (PEP) handouts for the Annual Meeting will not be available in hard copy. For those who preregister, you will be provided with an access code for downloading the handouts approximately two weeks prior to the meeting. For those who register for courses on-site, you will be provided the code when you register.

Please note, not all instructors provide downloadable information.

The Professional Enrichment Program (PEP) provides a continuing education opportunity for those attending the Health Physics Society Annual Meeting. The two hours allotted each course ensure that the subjects can be discussed in greater depth than is possible in the shorter programs offered elsewhere in the meeting.

On Sunday, 17 July, a series of 24 courses will be offered between 8:00 am - 4:00 pm.

In addition to the above-mentioned sessions for Sunday, five PEP lectures are scheduled on Monday-Thursday, and four on Thursday afternoons from 12:15 - 2:15 pm. Registration for each two-hour course is $90 and is limited to 60 attendees on a first-come, first-served basis. Those whose registrations are received before the preregistration deadline will be sent confirmation of their PEP course registration.

Students with a current ID card will be admitted free of charge to any sessions which still have space available after the waiting list has been admitted. Student admission will be on a first-come, first-served basis and will only begin 15 minutes after the start of the session to allow for completion of ticket processing.

Please Note!!

Please be on time for your sessions. The lecturer will begin promptly at the scheduled time. Please allow time for check-in. The HPS reserves the right to schedule a substitute speaker or cancel a session in case the scheduled speaker is unavailable.

Attendees not present at the starting time of the session cannot be guaranteed a space, as empty spaces will be filled from the wait list at that time. Spaces left after the wait list has been admitted may be filled with students. If your duties at the meeting cause you to be late for your lecture (e.g., chairing a session), contact the PEP registration desk so that your name can be placed on the waiver list and your space held.

Refund Policy

Requests for PEP refunds will be honored if received in writing by 8 June. All refunds will be issued AFTER the meeting. Exceptions will be handled on a case-by-case basis.

Sunday 8:00 AM – 10:00 AM

1-A EH&S "Boot Camp" for Radiation Safety Professionals, Part 1

Emery, R., Gutierrez, J.
The University of Texas School of Public Health

It is currently quite rare for organizations to maintain stand-alone radiation safety programs. Resource constraints and workplace complexities have served as a catalyst for the creation of comprehensive environmental health & safety (EH&S) or risk management (RM) programs, which include, among other health and safety aspects, radiation safety programs. But many of these consolidations were not inclusive of staff training to instill an understanding of the areas now aligned with the radiation safety function. This situation is unfortunate because when armed with a basic understanding of the other safety programs, the radiation safety staff can provide improved customer service and address many simple issues before they become major problems. This unique Professional Enrichment Program (PEP) series is designed to address this shortcoming by providing an overview of a number of key aspects of EH&S and RM programs from the perspective of practicing radiation safety professionals who now are involved in a broader set of health and safety issues. The PEP series will consist of three 2 hour segments:

Part 1 will address "The Basics of Risk Management & Insurance" and "The Basics of Fire & Life Safety". The risk management & insurance portion of the session will address the issues of retrained risks (those which are not covered by insurance) and transferred risks (those covered by a financial vehicle), and how these aspects impact EH&S and RM operations. Included in the fire & life safety segment will be a discussion on the basic elements of the life safety code and the fire detection and suppression systems. The requirements for means of egress will also be discussed

Each PEP segment is designed so that participants can take any session individually, although the maximum educational benefit will be derived from the participation in all three sessions. The particular topics included in the PEP series have been consistently identified as extraordinarily useful to participants in the highly successful week-long "University of Texas EH&S Academy". Ample time will be allotted for questions answers and discussion, and each segment will be supplemented with key reference information.

1-B Integrating the Radiation Protection Program into the OSHA Injury and Illness Program: A Primer for Business Managers

Larson, S.
Tufts University

The primary sources of guidance and advice for business mangers on the management of radiation protection programs are documents authored by the U.S. Nuclear Regulatory Commission (US NRC) and the National Council on Radiation Protection (NCRP). However, most business organizations using ionizing radiation producing machines or radioactive materials engage in other activities that present additional occupational safety and health hazards. Some of these hazards are regulated by the Occupational Safety and Health Administration (or state OSHA programs). In 2016, OSHA revised the Safety and Health Management Program guidelines originally published in 1989. It's significant that OSHA refers to this document as describing a management system. In October 2016, the International Standards Organization (ISO) is planning to publish ISO45001 Occupational Health and Safety Management Systems. These two documents reference another document, ANSI Z10 Occupational Safety and Health Management Systems 2005, 2012). In a business organization, programs consist of many plans and systems consist of many interdependent programs. In summary, any business intending to establish a positive safety culture must embrace safety as a core objective at the same level as profitability, productivity, quality and environmental compliance and sustainability. In this course, the participants will learn the history, current use and future of safety plans, safety programs and safety management systems and why it's unlikely that a safety culture can be sustained in a business organization without adopting a safety management system.

1-C Randomness and Interpretation of Radiation Measurements

R. Johnson
Radiation Safety Counseling Institute

For a health physicist, radiation risk assessments begin ideally with measurements to characterize the source of radiation. While we depend on radiation instruments to tell us about radiation, how often do we evaluate the quality or uncertainties of measurements? Misunderstandings abound when it comes to interpretation of measurements. Most people want absolute values for measurements and do not want to know about uncertainties and seldom ask

questions such as, "Was the best instrument used, was it calibrated and working properly, was it used properly, was the measurement taken in the right place, etc.? There are over 20 factors that can affect the quality of measurements that may not be considered when interpreting measurements. Two key factors, in particular, govern measurement interpretations: 1) measurements have no meaning until interpreted and 2) measurements only have meaning in terms of how they are interpreted. Thus, recorded or reported radiation measurements have no inherent meaning by themselves, they are just numbers Interpretations of measurements may also have as much to do with attitudes and perceptions of risks as they do about technology. For example, a worker at an industrial facility observed the RSO taking readings with a Geiger counter and saw the meter go off scale. That was enough information for this worker to start an uproar that eventually involved several hundred other workers, the union, and management. Another worker at a food production facility heard a GM meter in use for surveying the installation of a new x-ray machine for product quality control. He raised concerns and when the company manager heard there was radiation in his facility, he told the x-ray company to remove their machine. This resulted in the loss of a $4 million sale for 20 x-ray machines. Radiation safety specialists have the advantage for interpreting radiation measurements based on knowledge of comparative readings from background and other sources. Most people without this specialized knowledge do not know that we live in a sea of radiation which surrounds us all the time. Furthermore, a screaming Geiger counter may sound alarming, but radiation risks depend on many other factors, such as the type of radiation, the proximity of people, and the duration of exposures. A Geiger counter reading or other measurements of radiaton are only part of the information which specialists would use for assessing potential risks. Unfortunately, all radiation measurements have many potential sources for errors which people may not know about and may therefore assume the measurements represent the real world. For interpreting radiation measurements, how much do we rely on technical understanding and how much on our interpretation as an emotional reaction regarding safety?

1-D Status of (1) ANSI N42 RPI Standards and (2) International Electrotechnical Commission (IEC)

Technical Committee 45 and Subcommittee Nuclear Standards
M. Cox
Co-chair RPI and HSI standards

This summary covers the current status of American National Standards Institute (ANSI) N42 standards for health physics instrumentation in two sections:

(1)This section includes the discussion of some seventeen ANSI N42 standards for Radiation Protection Instrumentation (RPI) in effect, being revised or being combined, including those for performance & testing requirements for portable radiation detectors, in ANSI N42.17A for normal environmental conditions and in ANSI N42.17C for extreme environmental conditions, being combined; and now published ANSI N42.323A/B, for calibration of portable instruments over the entire range of concern, i.e., in the normal range and for near background measurements; performance criteria for alarming personnel monitors in ANSI N42.20; airborne radioactivity monitors in ANSI N42.30 for tritium, ANSI N42.17B for workplace airborne monitoring, ANSI N42.18 for airborne and liquid effluent on-site monitoring, and ANSI N323C for test and calibration of airborne radioactive monitoring; instrument communication protocols in ANSI N42.36; in-plant plutonium monitoring in ANSI N317; reactor emergency monitoring in ANSI N320; quartz and carbon fiber personnel dosimeters in ANSI N322; installed radiation detectors in ANSI N323D; ANSI N42.26 for personnel warning devices; radon progeny monitoring in ANSI N42.50; and radon gas monitoring in ANSI N42.51.

The new ANSI N42.54 standard is combining the salient materials for airborne radioactivity monitoring from ANSI N42.17B, ANSI N42.18, ANSI 323C and ANSI N42.30, with a comprehensive title of "Instrumentation and systems for monitoring airborne radioactivity".

This section includes the discussion of twenty ANSI N42 standards recently developed, being developed, or being revised and updated for Homeland Security

Instrumentation (HSI), including those for performance criteria for personal radiation detectors in ANSI N42.32 in revision; portable radiation detectors in ANSI N42.33 in revision soon; portable detection and identification of radionuclides in ANSI N42.34; all types of portal radiation monitors in ANSI N42.35; for training requirements for homeland security personnel in ANSI N42.37 in revision;

spectroscopy-based portal monitors in ANSI N42.38 in revision; performance criteria for neutron detectors in ANSI N42.39, needing attention; neutron detectors for detection of contraband in ANSI N42.40, not addressed; active interrogation systems in ANSI N42.41; data formatting in ANSI N42.42, revised and updated; mobile portal monitors in ANSI N42.43; checkpoint calibration of image-screening systems in ANSI N42.44; criteria for evaluating x-ray computer tomography security screening in ANSI N42.45; performance of imaging x-ray and gamma ray systems for cargo and vehicles in ANSI N42.46; measuring the imaging performance of x-ray and gamma ray systems for security screening of humans in ANSI N42.47; spectroscopic personal detectors in ANSI N42.48; personal emergency radiation detectors (PERDs) in ANSI N42.49A for alarming radiation detectors and in ANSI N42.49B for non-alarming radiation detectors; backpack-based radiation detection systems used for Homeland Security in ANSI N42.53; and portable contamination detectors for emergency response in ANSI N42.58.

(2)This presentation of international standards covers the efforts of 16 working groups & project teams addressing important issues such as 1) the instrumentation & control (I&C), & electrical power for nuclear facilities; 2) radiation detection & protection for workplace personnel, the public & the environment, & from airborne & waterborne effluents; and 3) safeguarding special nuclear materials at all locations.

Those efforts are from working groups and project teams in IEC Technical Committee 45, and from Subcommittees SC 45A and SC 45B. The overall work is distributed among over more than 250 experts as volunteers from some twenty countries of the world.

The SC 45B standards include those from Working Group (WG) B-5 responsible for radioactive aerosol measurements and environmental monitoring; WG B-8 for electronic personnel and portable detectors, plus passive radiation dosimeters; WG B-9 is responsible for installed radiation monitoring systems at all nuclear facilities including power reactors; WG B-10 continuously handles all of the issues of radon and radon progeny monitoring; WG B-15 is responsible for controlling the illicit trafficking of all types of radioactive materials, using a variety of detectors; WG B-16 develops standards for radioactive contamination monitors & meters; and WG B-17 covers security inspection systems using active interrogation with radiation.

The SC 45A standards include those from WG A-2 for sensor & measurement technology; WG A-3 uses the application of digital processing to safety in nuclear power plants; WG A-5 responds to special processing measurements & radiation monitoring; WG A-7 addresses the reliability of electrical equipment in reactor safety systems; WG A-8 covers the design of control rooms; WG A-9 is termed instrument systems; WG A-10 is upgrading & modernizing I&C systems; and WG A-11 addresses all electrical systems.

1-E Radiation Protection at Accelerator Facilities

M. Quinn
Fermilab

The Radiation Protection at Accelerator Facilities class will present an overview of the composition of accelerator radiation fields for electron, proton, and ion accelerators at all energies. Ionizing radiation produced by high-intensity laser sources will also be discussed. General methods of designing radiation shielding at accelerators will be presented, with special attention being devoted to low-energy neutron phenomena that are found at nearly all accelerators. The production of induced radioactivity in both accelerator components and environmental media will be covered, along with a discussion of radiation detection instrumentation commonly used at accelerator facilities.

1-F Air Monitoring in Nuclear Facilities - Part 1

J.T. Voss
Los Alamos National Laboratory

A. Basic Fundamentals of Air Sampling and Air Monitoring

Basic fundamentals of air sampling and monitoring includes basic calculations, interferences, and limitations of air sampling and monitoring systems.

The following exercises are presented

- Calculate concentration using count rate, counting efficiency, and sample volume
- Concentration conversion factors (such as pCi/L to uCi/mL or Bq/M3)
- Calculate DAC (Derived Air Concentration) and DAC-h
- Calculate the DAC level on a filter from the number of DPM on the sample filter and the sample time and the sampling rate
- Calculate the number of DAC-h on a filter from the number of DPM on the filter and the air sampling rate
- Calculate the DPM on a filter to reach an 8 DAC-h accumulation

- Calculate the mrem/h and mrem from inhaling airborne radioactivity

The following discussion of the interferences encountered in air sampling and air monitoring for airborne radioactive materials is presented.

- Radon and Thoron interference in aerosol and gas sampling
- Uranium-238 decay chain
- Thorium-232 decay chain
- Comparison of typical radon/thorn progeny concentrations compared to desired concentration limits for transuranic airborne activity

B. Air Sampling and Air Monitoring Regulatory Requirements

An overview of the requirements the following is presented.

- 10 CFR 20 (Standards for Protection Against Radiation)
- 10 CFR 20 Subpart D (Radiation Dose Limits for Individua10 CFR 20 (Standards for Protection Against Radiation)
- Nureg 1400 (Air Sampling in the Workplace)
- 10 CFR 835 (Occupational Radiation Protection)
- 29 CFR 1910 (Occupational Safety and Health Standards)
- 40 CFR 50 (National Primary and Secondary Ambient Air Quality Standards)
- 40 CFR 50 Appendix B (Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere)
- 40 CFR 61 (Radiological National Emission Standards for Hazardous Air Pollutants)
- ANSI N13.1-1999 R2011 (Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities)

1-G Heat Stress for Health Physicists, Part 1 of 2

G. Ceffalo
Bechtel

Heat, or thermal stress, is a work hazard related on a worker being exposed to low temperatures and wind chill; or high temperatures, radiant heat and humidity. These thermal factors can stress a worker, reducing their effectiveness, and requiring controls, typically in the form of heat management or time limitations. From a HP perspective, accommodating heat stress controls can either adversely affect radiological controls, or harmonize with a set of controls and optimize worker safety.

Part 1 of this two-PEP series is intended to aid an HP understand the concepts, measurements and terms associated with heat stress. While heat stress is typically the specialty of Industrial Hygienists, part 1 of this PEP set should enable a HP to be an active participant in hazards evaluation and control processes that include thermal stress. The PEP will demonstrate the fundamentals of measuring and quantifying the contributors to heat stress, and understanding the effect of different contributors to heat stress. Evaluating controls and mitigation will be discussed in part 2 of 2.

1-H Laser Safety for Health Physicists

B. Edwards
Vanderbilt University

This course provides an overview of laser physics, biological effects, hazards, and control measures, as well as a concise distillation of the requirements in the ANSI Z136.1-2014 Standard for the Safe Use of Lasers. Non-beam hazards, emerging issues, and accident histories with lessons learned will also be covered. Course attendees will learn practical laser safety principles to assist in developing and conducting laser safety training, performing safety evaluations, and effectively managing an institutional laser safety program. While some knowledge of laser hazards will be helpful, both experienced and novice health physicists with laser safety responsibilities will benefit from this course. Attendees may find it helpful to bring their own copy of ANSI Z136.1-2014.

Sunday 10:30 AM – 12:30 PM

2-A EH&S "Boot Camp" for Radiation Safety Professionals, Part 2

R. Emery, J. Gutierrez
The University of Texas School of Public Health

See description for PEP 1-A. Part 2 will examine "Security 101 for Radiation Safety Professionals" and "The Basics of Biological & Chemical Safety". The first part of this session will focus on security as it is applied in the institutional settings. Various strategies employed to improve security controls will be presented. The second part of the session will address the classification of infectious agents and the various assigned biosafety levels. Aspects of chemical exposures, exposure limits, monitoring and control strategies will also be discussed

Each PEP segment is designed so that participants can take any session individually, although the maximum educational benefit will be derived from the participation in all three sessions. The particular topics included in the PEP series have been consistently identified as extraordinarily useful to participants in the highly successful week-long "University of Texas EH&S Academy". Ample time will be allotted for questions answers and discussion, and each segment will be supplemented with key reference information.

2-B Update to U.S. DOT Regulations

S. Austin
Plexus Scientific

The harmonization of domestic and international standards for hazardous materials transportation enhances safety by creating a uniform framework for compliance. Harmonization also facilitates international trade by minimizing the costs and other burdens of complying with multiple or inconsistent safety requirements and avoiding hindrances to international shipments. Harmonization has become increasingly important as the volume of hazardous materials transported in international commerce grows. The U.S. Department of Transportation (DOT) amended the Hazardous Materials Regulations to incorporate changes adopted in the 2009 Edition of the IAEA Safety Standards publication titled "Regulations for the Safe Transport of Radioactive Material, 2009 Edition."

These changes to DOT regulations affect the packaging and transportation of radioactive material. The changes impact marking of packages, reporting of total activity in a package, placarding of certain shipments of LSA-I and SCO-I materials, several key definitions, shipping paper retention requirements, surveys, labeling, and assessment of radiation hazards from packages or conveyance that have been suspected to leak radioactive material. Organizations that are offering packages of radioactive material for transport or transporting these materials need to be aware of these changes and incorporate them into their existing shipping program.

2-C Why Our Natural Intuitive Processes Fail for Radiation Risk Assessments

R. Johnson
Radiation Safety Counseling Institute

We often employ intuitive processes when we make assessments and choices in uncertain situations, such as dealing with radiation risks. The normal processes for safety decisions by a caveman confronted with a saber-toothed tiger do not do very well in today's world and may lead to decisions that are incongruous or even harmful. Studies have shown that the parts of our brain involved in decisions for risk assessments are closely connected to the seat of our emotions. The amygdala, which is linked to our emotional state, especially fear, is activated when we make decisions couched in uncertainty. Mechanisms by which people analyze situations involving chance are a complex product of evolutionary factors, brain structure, personal experience, knowledge, and emotion. Making wise assessments and choices in the face of uncertainty is a rare skill. We often start with a naive realism, namely the belief that things are what they seem. However, when viewed more broadly, we may realize that things are not what they seem, but something quite different. This is illustrated by the story of the wise men and the elephant. By necessity we employ certain strategies to reduce the complexity of risk assessments and our intuition about probabilities plays a role in that process.

Our subconscious mind is designed to jump intuitively to conclusions often with very little evidence. It is not designed to know the size of the jumps. Our confidence in our intuition is a function of the coherence of the story we construct. The quality or quantity of the evidence does not count for much because a very good story can be constructed based on very poor evidence. How many people automatically conclude that radiation is bad with very little (and likely very poor) evidence? Kahneman says, "Considering how little we know, the confidence in our intuitive beliefs is preposterous – and also is essential." We have to believe in something. Swimming against the tide of human intuition for safety decisions can be exceedingly difficult. Confidence in our intuition is not usually based on a logical analysis of the probability that our judgment is correct. Confidence in our intuition is a feeling based on the coherence of information from which we construct a story and the ease of processing that information. While it is not common to admit uncertainty, expressions of high confidence mean we have constructed a coherent story, not necessarily that the story is true. For example, many people are very confident about their intuition regarding radiation risks even though their beliefs are based on mythology (beliefs not technically true).

2-D Search and Secure and RAILS

K. Uhrig, R. Kahn
MELE Associates

In today's volatile world, it is imperative that radioactive sources are protected or securely disposed. The Office of Radiological Security (ORS) works hard to secure radioactive sources both domestically and internationally by protecting, reducing, and removing radioactive sources. ORS's Search and Secure (S&S) Program works directly with foreign governments to assist in establishing effective and sustainable programs to improve radiological security by providing training and equipment for the search, location, identification, recovery, transportation, and secure storage of sealed radiological sources that have fallen out of regulatory control (i.e., orphan sources). These training courses are conducted in partner countries where participants are taught key S&S concepts and practical skills on how to plan, organize and conduct searches. To sustain these capabilities, training participants are given access to RAILS, the Realistic Adaptive Interactive Learning System. RAILS allows users to refresh their training and train new individuals in a virtual hands-on interactive environment, where they can practice using radiation detection equipment to locate orphan sources. This PEP will discuss the importance of the S&S mission, key search concepts, and discuss key radiation detection equipment. It will also demonstrate RAILS and its use for sustaining training. Participants will be provided a RAILS account and may bring a mobile device or laptop to access it. Devices will also be available at the PEP for testing RAILS.

2-E Integration of Health Physics into the Medical Management of Radiation Incident Victims

S. L. Sugarman,
REAC/TS

In the event of a radiation incident it is essential that the radiation dose a patient may, or may not, have received is rapidly assessed so that proper medical treatment can be planned. The initial information needs to be easily obtained and able to provide a realistic potential of dose magnitude. Various techniques can be employed to help gather the necessary information needed. Evaluation of nasal swabs and wound counts can help with ascertaining the potential for significant intakes of radioactive materials, and mathematical dose estimations can help with determining the potential magnitude of external doses. Externally contaminated areas must be assessed so that treatment and decontamination priorities can be determined. As time goes on and more information, such as bioassay or biological dosimetry data, is received the health physicist will be called upon to interpret that data and communicate its meaning to the healthcare staff. Support duties can also include assistance with communicating with the patient, other medical staff, or external entities such as regulators and the media. Coupled with a good event history and other data, health physicists and physicians can develop a strategy for providing proper medical care to individuals who may have been involved in a radiological event. It is, therefore, essential that health physicists are able to seamlessly integrate themselves into the patient care environment and effectively communicate their findings to a wide variety of people. This PEP will describe methodologies to rapidly assess radiation doses and use real case reviews to reinforce the teaching points.

2-F Air Monitoring in Nuclear Facilities – Part 2

J.T. Voss
Los Alamos National Laboratory

A. Methods of Extracting Representative Samples from Stacks, Ducts, the Environment, and Work Areas

Deposition 2001a software developed at Texas A&M University is demonstrated. Sampling rakes and shrouded probes for stacks and ducts are discussed as well as methods of measuring air flow rates through stacks and ducts. Isokinetic sampling limitations are discussed. The guidance in ANSI N13.1-1999 R2011 (Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities) is more fully explored using Depo 2001a.

B. Equipment used for Air Sampling and Air Monitoring

- Types of air pumps are discussed and their operational characteristics are explained.
- Types of vacuum and pressure lines are discussed and operational characteristics are explained.
- Types of sample nozzles are discussed and their operational characteristics are explained.
- Types of sample flow controllers are discussed and their operational characteristics are explained.
- Types of sample flow measurement systems are discussed and their operational characteristics are explained.
- Power versus air sampling rate for various types of air sampler pumps is discussed.
- Types of filter media are compared and the suggested applications for each are discussed.
- Typical operation, maintenance, and calibration procedures are presented.

2-G Heat Stress for Health Physicists, Part 2 of 2

G. Ceffalo
Bechtel

Heat, or thermal stress, is a work hazard related on a worker being exposed to low temperatures and wind chill; or high temperatures, radiant heat and humidity. These thermal factors can stress a worker, reducing their effectiveness, and requiring controls, typically in the form of heat management or time limitations. From a HP perspective, accommodating heat stress controls can either adversely affect radiological controls, or harmonize with a set of controls and optimize worker safety.

Part 2 of this two-part PEP will provide information on techniques and equipment available to help manage heat stress. If an HP can be part of the design of the hazard control set, more effective controls can be selected, optimizing worker safety, comfort and radiological consequences. The controls will include PPE selection, respiratory protection, cooling devices for both the worker and the areas; and discussion of time management.

2-H Performing ANSI Z136-based Laser Hazard Calculations

B. Edwards
Vanderbilt University

This course provides a step-by-step guide to performing laser hazard calculations based on the principles and methodology in the ANSI Z136.1-2014 Standard for the Safe Use of Lasers. Attendees will gain an understanding of how to complete these calculations for continuous wave, pulsed, and repetitively pulsed laser systems. While some knowledge of laser hazards will be helpful, both experienced and novice health physicists with laser safety responsibilities will benefit from this course. However anyone not already familiar with the fundamentals of radiometry and the arcane conventions of the Z136 series of standards for the safe use of lasers would benefit from attending the Laser Safety for Health Physicists PEP so they'll have some familiarity with the concepts under discussion. Attendees will also find bringing their own copy of ANSI Z136.1-2014 a useful reference.

Sunday 2:00 PM – 4:00 PM

3-A EH&S "Boot Camp" for Radiation Safety Professionals, Part 3

R. Emery, J. Gutierrez
The University of Texas School of Public Health

See description for PEP 1-A. Part 3 will focus on "Measuring and Displaying Radiation Protection Program Metrics That Matter to Management". Radiation protection programs typically accumulate data and documentation so that regulatory officials can assess compliance with established regulations. The implicit logic associated with this activity is that compliance equates to safety. But in this era of constricted resources, mere regulatory compliance is no longer sufficient to justify all necessary programmatic resources. Radiation protection programs are now expected to readily demonstrate how they add tangible value to the core missions of an organization. The demonstration of this value is expected to be in the form of some sort of performance metrics, but this is an area in which many radiation safety professionals have not been trained. The issue is further compounded by the need to display the metrics in manners that are succinct and compelling, yet another area where formal training is often lacking. This session will first describe a variety of possible radiation protection program performance measures and metrics, and then will focus on the display of the information in ways that clearly convey the intended message. Actual before and after data display "make-overs" will be presented, and ample time will be provided for questions, answers, and discussion.

Each PEP segment is designed so that participants can take any session individually, although the maximum educational benefit will be derived from the participation in all three sessions. The particular topics included in the PEP series have been consistently identified as extraordinarily useful to participants in the highly successful week-long "University of Texas EH&S Academy". Ample time will be allotted for questions answers and discussion, and each segment will be supplemented with key reference information.

3-B So Now You're the RSO: Elements of an Effective Radiation Safety Program

T. L. Morgan
Columbia University

Designation as a Radiation Safety Officer brings with it unique opportunities and challenges. The author will offer insights on how to manage a radiation safety program from his 20+ years' experience as a RSO at medical, university, and industrial facilities. Regardless of the type of facility, number of radiation workers, or scope, an effective radiation safety program must be driven from the top down. Senior management must embrace the goals of the program. The RSO must have the trust of senior management as well as a good working relationship with line managers and workers. These relationships are built on the integrity, knowledge, experience, and accessibility of the RSO. This talk will focus on the role of the RSO in achieving and maintaining an effective program.

3-C Errors in Randomness and Understanding of Stochastic Risk Assessments

R. Johnson
Radiation Safety Counseling Institute

While health physicists usually understand that radiation is of main concern for stochastic effects (future random chance of cancer), most of the world does not understand stochastic effects, randomness, or probabilities. Most people just want to know if they will be "Safe or Not Safe." They do not want to hear about radiation risk estimates as probabilities. When confronted with a risk probability, they are inclined to substitute an easier question, such as, "How do I feel about getting cancer?" They can easily answer this question without any technical knowledge or understanding of randomness or probabilities. Research has shown that when chance or randomness is involved, people's thought processes for safety decisions are often seriously flawed. Not many people understand the principles that govern chance and how these processes play out in decisions for radiation safety. The normal processes for safety decisions can lead to mistaken judgments and technically inappropriate reactions for radiation safety (consider reactions following Fukushima Dai-ichi). Health physicists have long been puzzled and often frustrated about how people can make instant decisions regarding radiation with little or no actual data. Studies in psychology show that our ability to make instant decisions for safety is a part of how our brains are wired for our protection. We are programmed to fear first and think second. We have survived by this innate ability to foresee dangers and take protective actions accordingly. Instant prediction of danger is not something we do consciously by evaluation of facts or circumstances. This is done by our subconscious mind which functions as a superfast computer processing all incoming signals by associations with images and experiences in our memories. Thus we are programmed for instant response without any conscious thought. While this instinct for safety is important for our survival, it is also prone to substantial errors for some dangers, such as radiation. There are at least 15 or more ways that our subconscious is prone to errors relative to the actual circumstances. My studies are showing that even professionals with technical understanding are also prone to errors. This can be demonstrated by the question, "Are your sources of radiation safe?" An instant answer to this question can only come from the subconscious because a conscious evaluation of data takes time to process. Also, when asked, "How do you know?" the answers invariably come down to beliefs in what we have heard or read about radiation safety. Out subconscious mind is prone to running ahead of the facts to draw coherent conclusions from a few scraps of evidence. Subconscious impressions then become the basis for instant decisions and long term beliefs about radiation.

3-D Overview of NRC Regulations in 10 CFR Part 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Materials

R. C. Ragland, Jr.
Nuclear Regulatory Commission, Region I Office

The presentation will provide an overview of the NRC Regulations in 10 CFR Part 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Materials." Special emphasis will be placed on new requirements for the development of an access authorization program and procedures, a security plan, implementing security procedures, coordination with local law enforcement, development and implementation of a security training program, development of an audit program, response to the identification of suspicious activity, and lessons-learned/experience gained from NRC Implementation. The target audience includes individuals who are responsible for developing, maintaining, or overseeing a 10 CFR Part 37 security program.

3-E Excel: Tips and Tricks for the Health Physicist

J.Guido, A. Wilding

Course will focus on the use of spreadsheet programs in the performance of health physics related calculations and activities. Main focus will be the use microsoft excel but additional insight into the use of non-spreadsheet alternatives (such as R / R Studio) will be explored. Areas to be covered will include advanced spreadsheet functions such as pivot tables and data consolidation techniques as well as the extension of excel capabilities using visual basic and other add-in applications

3-F Air Monitoring in Nuclear Facilities – Part 3

J.T. Voss
Los Alamos National Laboratory

A. Hands-on use of Air Sampling and Air Monitoring Equipment Including Analysis Methods and Algorithms

- Calibration equipment is provided to demonstrate how the air samplers and monitors are calibrated
- Various air sample filters are used in the hands-on demonstration
- Air sample filters are counted and airborne concentrations are calculated
- Various sample analysis methods and algorithms are demonstrated

Air sampling pumps demonstrated are rotary vane, centrifugal, diaphragm, and ejectors. Air sample flow controllers such as throttling valves, mass flow controllers, critical flow orifices, and pinch valves are demonstrated. Air sampling rate meters such as dP gauges, mass flow meters, and rotameters are demonstrated.

B. Detection Levels, Interferences, and Limitations

The uncertainties in reference standards are explored, including standard calibration sources, decay correction for radioactive sources, ingrowth for radioactive sources, reproducible placement of the standard calibration sources in proximity to the detector. The uncertainties in the device to be calibrated are explored. The effects of background count rate, sample count time, and detector efficiency are explored. Interferences in the detection device are explored. All pertinent interferences and uncertainties are explored. Methods of determining the limitations of the measurements are explored.

3-G Archival Systems for Managing and Organizing Radiological Data

B. D. Fisher
Argonne National Laboratory

Archival systems are an efficient tool for managing and organizing radiological data, but not everyone has the time to maintain and check the quality of information stored in the system. This program will discuss guidance for large sets of data and information. It will provide recommendations for designing the framework of an archive system, with a focus on maintaining data quality through evolving standards; techniques for developing metadata and linking data; and how to address incomplete data sets. What interpolation or error statistics should you apply, when you suddenly discover that your data is missing information, and you can neither retrieve nor repeat the data collection? The program will provide scenarios, and conclude with the various ways to present radiological data to stakeholders in addition to confidence building methods for information that results from sets of data.

3-H Non-ionizing Radiation: An Overview of Biological Effects and Exposure Limits

B. Edwards
Vanderbilt University

This course provides a fundamental overview of non-ionizing radiation (NIR) hazards and biological effects. Course attendees will learn the basic terminology and nomenclature, spectral region designations, regulatory framework, and consensus guidance associated with NIR. The course material will begin at the edge of the ionizing part of the electromagnetic (EM) spectrum and walk participants through a tour of the optical, radiofrequency (including microwave), and extremely low frequency (ELF) portions of the EM range, finally ending with static electric and magnetic fields. The existence of a series of exposure limits covering the entire NIR spectrum forms one of the course's basic themes. This continuous line of "safe" exposure levels helps establish the concept that NIR dose response curves are at least well enough understood at all parts of the spectrum to provide a reasonably safe exposure envelope within which we can operate. After completing this course, attendees will be conversant in the major sources and associated hazards in each part of the NIR spectrum, along with the recognized exposure limits and control measures for those sources. Armed with this information, safety professionals can better recognize, evaluate, and communicate the hazards associated with the spectrum of significant NIR sources, and address

workers' concerns in a credible, fact-based, knowledgeable, and professional manner.

While some knowledge of optical, radiofrequency, ELF, and static electromagnetic field characteristics may be helpful, both experienced and novice health physicists with NIR interests or responsibilities will benefit from this course.

Monday 12:15 pm – 2:15 pm

M-1 Neutrons – Discovery and Application

J. Chapman
Oak Ridge National Laboratory

M-2 Radiation Safety's Role in Mitigating the "Insider Threat" Risk

R. Emery
The University of Texas School of Public Health

While organizations maintain many layers of controls to prevent outsiders from gaining unauthorized access to cause loss or harm, persons who have been granted legitimate access can become an "insider threat", and because they are very difficult to detect, cause over $100 billon is losses annually. Although the typical insider targets assets or data, in some cases their actions can also have significant impacts on workplace and environmental health and safety. Because much of an organization's radiation safety program activities are carried out with the workers in their workplace, this represents a unique opportunity to assist in the possible detection of insider threats. This presentation will discuss the threats represented by insiders and will detail their recognized traits so that radiation safety professionals can enhance their situational awareness and report suspicions to the appropriate authorities.

M-3 How Randomness Affects Our Decisions for Radiation Safety

R. Johnson
Radiation Safety Counseling Institute

As health physicists we understand that radiation is a random phenomenon. We also understand that our practice of ALARA is to minimize the future random chance of cancer. Thus, dealing with randomness is a normal part of our practice as specialists in radiation safety. Unfortunately, most of the rest of the world wants to deal only with absolutes and does not want to know about uncertainty or probabilities. Most people want specific answers to questions such as, "Am I safe or not safe?" "Will I be harmed or not harmed?" Most people do not want to hear about risk estimates. When presented with a probability of cancer as a risk of one out of some number of those exposed, they will often conclude that they are the one. Or, not understanding risk probabilities, they may substitute an easier question, such as, "How do I feel about getting cancer?" This is a question they can readily answer without any knowledge of radiation science or statistics. This approach eliminates any concerns for randomness or probabilities. Everyone knows of someone who has had cancer and they are aware of the horrible consequences. The prospects of radiation causing cancer become an overwhelming influence on decisions for radiation safety. Our natural human instincts for safety are not well suited to situations involving randomness or uncertainty. Thus, while people may not be certain about the risks of radiation effects, they are certain that they do not want to become a victim of cancer.

How do people make judgments and decisions when faced with imperfect, incomplete, or uncertain information? Research has shown that when chance is involved, people's thought processes are often seriously flawed. What are the principles that govern chance, the development of ideas about uncertainty, and how those processes play out in decisions for radiation safety? We will look at how we make choices and the processes that lead us to make mistaken judgments and poor decisions when confronted with randomness and uncertainty. When information is lacking, this invites competing interpretations. Unfortunately, misinterpretation of data may have very negative consequences. How often is past performance a good indicator of the future? The human mind is built to identify a definite cause for each situation and it can have a hard time accepting the influence of unrelated or random factors. According to Mlodinow, "Random processes are fundamental in nature and ubiquitous in our everyday lives, yet most people do not understand them or think much about them." This PEP session will explore the role of chance in the world around us and how chance affects our decisions for radiation safety.

M-4 Radiation Safety Instruments for Emergency Responders – What Responders Need and How the Instruments are Used

P. A. Karam
NYPD Counterterrorism

There are currently far more radiation detectors in the hands of emergency responders than there are in the hands of radiation safety professionals, but the health physics community, in general, just isn't familiar with the people who are using these instruments, how the instruments are being used, or what emergency responders need – what does a firefighter need, for example, when responding to a radiological emergency compared to a cop involved in an interdiction mission? Not to mention the fact that information gathered by cops might be used for evidentiary purposes. In this PEP we'll first take a look at the people who are using radiation detection instruments in an emergency response capacity and will then look at their various missions. From there we'll go on to see what characteristics might go into making a good instrument for this category of users and how they can be used effectively.

M-5 Preforming Depositional Studies in Sample Lines with Deposition Calculator, Version 1

B. Blunt
Blunt Consulting LLC

Deposition Calculator is an object oriented software package that is used to estimate losses (deposition) of particulate material in sample lines. This software package was written as a replacement for Deposition 2001A. ANSI N13.1-2011 requires that a sample transport system be designed such that depositional losses of a 10 micron AED particle is less than 50%. The Deposition Calculator can be used to estimate the losses of any size particle, or a particle distribution and thus demonstrate compliance with ANSI N13.1-2011.

This course discusses the uses of Deposition Calculator and will delve into the studies included in the software package as they relate to sample line design and performance. Additional topics will include the mechanisms of depositional losses, bend calculations, flow related decisions made by the software, and methods for modeling a shrouded probe. The course will also discuss the limitations of the software and the models. The student will leave the class with a much better understanding of the subject of depositional losses and how to best use the available software to estimate such losses in sample transport systems.

Deposition Calculator Version 1 will be supplied to each student.

Tuesday 12:15 pm – 2:15 pm

T-1 Nanotechnology and Radiation Safety

Mark D. Hoover
National Institute for Occupational Safety and Health

This course will present an update for health physics professionals on relevant national and international experience and resources in nanotechnology safety, including a graded approach to sampling, characterization, and control of nanoparticles in the workplace. Case studies of good practice as well as experience "when things have gone wrong" will be presented. Nanotechnology and nanoengineered structural materials, metals, coatings, coolants, ceramics, sorbents, and sensors are increasingly being evaluated and applied in radiation-related activities. Anticipating, recognizing, evaluating, controlling, and confirming protection of worker safety, health, well-being, and productivity during these activities is essential.

T-2 Estimating Patient Peak Skin Dose from DICOM Information for Fluoroscopically Guided Interventional Procedures

C. Martel
Philips Healthcare

The current method generally accepted method for assigning peak skin dose to patients during fluoroscopically guided interventional procedures uses the cumulative air kerma displayed at the fluoroscopy console. However, limitations with this approach result in significant underestimates and overestimates of actual peak skin dose. Underestimating peak skin dose can result in missed skin reactions. Overestimating peak skin doses can result in increasing healthcare costs and burdens to patients and staff when patients are asked to return to the clinic for observation. The DICOM file available from fluoroscopic systems that employ Radiation Dose Structured Reporting provides information that can be used to estimate peak skin dose. Examples of calculating peak skin dose estimates using DICOM files will be presented.

T-3 A Contemporary Approach to Managing Low-Level Radioactive and Mixed Waste at an Academic Institution

M. J. Zittle
University of Washington

Management of low-level radioactive and mixed waste at academic institutions is challenging due to the small quantities and wide variety of wastes generated. These organizations are often non-profit or government funded and it is critical to maintain regulatory compliance while minimizing disposal costs, despite the unpredictable and often unreasonable cost of waste disposal.

This course will present waste management strategies for various waste streams and processes including sanitary sewer disposal, decay-in-storage, bench top treatment, minimization techniques and waste processing services, as well as the EPA mixed waste conditional exemptions. This course emphasizes the importance of training generators and utilizing process knowledge, accurate sample analysis, standard operating procedures, and quality assurance to efficiently manage radioactive and mixed waste.

The presenter recently overhauled the course to include an updated broker/processor directory, a variety of new recycling and disposal options, and case studies of waste disposal challenges and successes. Participants with low-level radioactive or mixed waste disposal challenges are encouraged to bring detailed descriptions of their waste for discussion of disposal options.

T-4 Understanding Ionizing Radiation Carcinogenesis

O. G. Raabe
University of California-Davis

A comparative evaluation is described for two types of radiation carcinogenesis.

Ionizing radiation induced cancer from internally deposited radionuclides is analyzed with data from human studies for Ra-226, and from laboratory animal studies for alpha radiation associated with Ra-228, Ra-226, Ra-224, Pu-238, Pu-239, Th-228, Cf-252, Cf-249, and Am-241 and for beta radiation associated with Sr-90, Y-90, Y-91, and Ce-144. Intake routes included ingestion, inhalation, and injection.

Cancer induction risk associated with protracted ionizing radiation exposure is observed to be a rather precise function of lifetime average dose rate to the affected tissues rather than a function of cumulative dose. The lifetime effects are best described by a three-dimensional average dose-rate/time/response relationship that competes with other causes of death during an individual's lifetime. At low average dose rates the time required to induce cancer may exceed the natural lifespan yielding a lifetime virtual threshold for radiation induced cancer.

In sharp contrast the Atomic Bomb Survivor Studies display a somewhat linear relationship of proportionality between increased lifetime solid cancer rates and acute ionizing radiation exposures. Resolving this paradox involves the conclusion that two completely different carcinogenesis mechanisms are associated with these two types of exposures to ionizing radiation.

These are induction of cancer in the case of protracted exposures and promotion of carcinogenic processes in the case of single acute exposures.

T-5 Elements of Credibility for Professional Health Physicists

R. Johnson
Radiation Safety Counseling Institute

As professionals in radiation safety perhaps one of our most cherished attributes is our credibility. But, what is credibility? Is it trustworthiness, honesty, truthfulness, faithfulness, admiration from others, reliability, dependability, integrity, reputation, status, or believability? Our credibility probably has all of these elements and more. Our peers may judge our credibility according to how we are introduced as a speaker. Introductions often include information on our employment, service to the profession, college degrees, publications and awards, etc. The chances are that we have devoted a large part of our career to developing our technical expertise and credentials for credibility. While such efforts may establish credibility with our peers, how credible are we with members of the public, especially those who have concerns for radiation safety or health effects? Will technical or professional credentials suffice for public credibility? Despite many years of education and professional experience, many health physicists are challenged about how to achieve credibility with the general public. Our best efforts to convey the "truth" about radiation safety (as we understand it) have apparently not changed the public's sentiments about radiation. Generally members of the public would seem to be as concerned and afraid of radiation today as they were after the bombs in Japan. If we are telling the "truth" why aren't we believed? One of the elements for public credibility may be how well we can accept the public's dismay and fears about radiation. This can be especially difficult when

their fears do not seem to have a rational technical basis. Perhaps it would be helpful to remind ourselves that, " the public may not care how much we know, until they know how much we care." Do we care? Yes, deeply, but how will others know? We might begin by letting people know that it's OK to be afraid of radiation. While technical expertise is crucial for credibility, so also may be our ability to identify with public fears. Some of the tools for achieving public credibility could include active listening (hearing and reflecting feelings), asking questions (rather than giving answers), providing opportunities for people to answer their own questions, and giving non-defensive responses. These and other options will be explored. This PEP will also look at how people determine truth and judge credibility.

Wednesday 12:15 pm – 2:15 pm

W-1 Internal Dosimetry Developments from 1949 to 2016

D. J. Strom
Dade Moeller & Associates

Standard Man was born as an adult at the 1949 Tri-Partite Conference held at Chalk River, and has evolved through variations of Reference Man into today's 'reference family' and 'reference hermaphrodite." Although much work had been done on ingestion intakes of radium prior to 1949, and considerable attention had been given to intakes of radionuclides during the Manhattan Project, this conference was the formal beginning of the concepts, quantities, and units of the "dosimetry" of "internal emitters," as radionuclides in the body were called in the old days. This PEP class covers some history as well as applications and computations associated with radionuclides in the body (as opposed to on the body or outside of the body). The progress in ICRP Publication 130 (2015), with the additions of the NCRP wound model, the ICRP Human Alimentary Tract Model (HATM), and the revised Human Respiratory Tract Model are presented, as are the new digital phantoms, and the very unscientific decision to average men and women. A brief discussion of the history of radon and thoron decay products is presented, along with the ICRU's latest foray into that field. Medical dosimetry (mird), dose reconstruction for compensation programs like EEOICPA, and dose reconstruction for radiation epidemiology are briefly discussed. The class emphasizes the fact that for assessment of external irradiation we do personnel dosimetry for individuals, but for assessment of internal irradiation we do dosinference (or worse, doswaggery) not on an individual, but on Reference Man. Except perhaps for tritium and the alkali metals like 40K and 137Cs, so-called internal dosimetry does not provide the dose you got and will get, but the dose Reference Hermaphrodite would have gotten had ½(he) + ½(she) inhaled, excreted, or carried a given activity, conditional on the models being correct. Course participants will be directed to numerous resources on internal dosimetry on the Internet.

W-2 Uses and Misuses of Dosimetric Terms in Patient Radiation Protection

C. Borrás
Radiological Physics and Health Services Consultant

According to the Linear Non-Threshold Dose Hypothesis, all radiation doses carry risks. To minimize them, the International Commission on Radiological Protection (ICRP), introduced many years ago the principles of practice justification, protection optimization and dose limitation, and defined the dosimetric terms: equivalent dose, effective dose, committed dose and collective effective dose. Although all these terms are based on mean absorbed dose, they cannot be measured directly; instead they are inferred using operational quantities defined by the International Commission on Radiation Units and Measurements (ICRU). To determine external exposure, ambient dose equivalent, $H^*(10)$, and directional dose equivalent, $H'(0.07, \Omega)$, are used for area monitoring; and personal dose equivalent, Hp(d), is utilized for individual monitoring. Compliance with dose limits can be ascertained with the use of properly-worn dosimeters. To link the protection and operational quantities to physical quantities which characterize the radiation field (such as tissue absorbed dose, air-kerma free-in-air and particle fluence), the ICRU advises the use of computed conversion coefficients. To assess internal exposure, the ICRP recommends the use of activity quantities in combination with dose coefficients based on physiological models and 4-D computations. The unit for all the ICRP and ICRU quantities listed above is the sievert (Sv); doses are assumed to be well below 100 mSv, and thus, only stochastic effects are considered. At doses above about 0.5-1 Sv, where tissue reactions (deterministic effects) may occur, the dosimetric quantity to use is the absorbed dose in the irradiated tissue modified by the radiobiological effectiveness of the radiation for the biological endpoint of concern. The unit is the gray (Gy). Exposures in radiotherapy are clearly expressed in absorbed dose to the irradiated tissue,and exposures in medical imaging should be expressed also in this way. Yet, many publications use the term 'patient

effective dose' instead, ignoring the huge uncertainties incurred when applying population risks to individual patients. Effective dose was meant to be used in planned exposure situations to show regulatory compliance with dose limits and constraints for workers and the public. It is applied to a reference person - the terms wR and wT used in its computation are derived averages over age and gender from large populations - and it was never intended to provide a measure of risk to individuals. That measure can be assessed only by determining organ doses, a task which is not trivial. Current methods of organ dose calculations, like placing external dosimeters such as TLD or OSL on the patient's skin, making measurements in physical phantoms which simulate patients, and performing Monte Carlo radiation transport calculations using mathematical phantoms, not only are time-consuming but also they have large uncertainties. The question is whether we need to assess individual risk in order to optimize patient protection. If the goal is not to assess risk, but to reduce it, dose-related machine parameters can be measured easily and compared against previously-established diagnostic reference levels (DRLs). The ICRU recommends the following determinations: For radiography/fluoroscopy, use incident or entrance air-kerma, and for computed tomography, use CT air-kerma (or dose) index, CT air-kerma (or dose) length-product and more recently, CT size-specific dose estimate.

This course will focus on the definition and determination of quantities and units used for radiation protection in the medical field, and those which are acceptable for patient dosimetry.

W-3 A Forgotten Nuclear Accident — Bravo

C. Sun
U.S. Nuclear Regulatory Commission

This presentation is based on decades of personal experience from managing the Marshall Islands Radiological Safety Program (MIRSP) at Brookhaven National Laboratory (BNL).

It starts with the selection of Bikini Island for the US Pacific Test Ground in the Republic of Marshall Islands (RMI). Later, on March 1, 1954, the Bravo detonated. Since then, Bikini has never been the same -- space and the people. The catastrophic event resulted (1) from unpredicted weapon yields and (2) from the nuclear debris and fallout reached to the east of many inhabited Atolls.

BNL scientists played an important role in the radiological health and medical care of exposed populations funded by the Department of Energy (DOE) for about 40 years. The MIRSP was established for bioassay monitoring and internal dose assessment. The overview will explain the dose assessment methods including whole-body counting, urinalysis and LLNL's environmental and diet/intake studies.

Finally, the presentation summarizes and analyzes the operational activity as lesson learned that could be applied and implemented to modern emergency planning and accident preparedness.

W-4 Setting Up and Operating a Radiation Instrument Calibration Facility for a Major Law Enforcement Agency

P. A. Karam
NYPD Counterterrorism

Over the last decade emergency response agencies have purchased a tremendous number of radiation detectors for use in both interdiction and emergency response capacities. Although the radiation safety community recognizes the value of annual instrument calibrations, the cost of doing so can be prohibitive for those with large numbers of instruments. In addition, the training received by most emergency responders does not include radiation safety or instrument calibration. Yet the benefits of setting up and operating an in-house calibration facility are undeniable. This PEP describes the path taken by one such agency, culminating in establishing and operating an instrument calibration facility for a major city police department. Included in this presentation will be a description of the instruments that are being calibrated, the physical space and equipment used, ALARA considerations, training police officers to calibrate instruments, and developing procedures aimed at meeting all regulatory requirements while allowing for the most efficient use of time and resources. We will also discuss the calibration goals, including the possibility that instruments must be able to meet both regulatory and evidentiary performance standards; and the fact that ANSI standards are not always consistent with these requirements – and in some cases, do not cover some particular instrumentation needs. Finally, we will discuss some of the additional work performed in our calibration laboratory (including testing new instrument designs), and some possible expansions of our role in coming years.

W-5 Overview of Nondestructive Assay Systems

J. Chapman
Oak Ridge National Laboratory

Thursday 12:15 pm – 2:15 pm

Th-1 Developing Radiation Safety Materials for Emergency Responders — Recognizing What They Need to Know and Communicating It Effectively

P. A. Karam
NYPD Counterterrorism

Emergency responders are involved in interdiction missions every day and they must also be prepared to respond to any sort of radiological event – not only the terrorist attacks we all worry about, but even relatively minor events such as vehicular accidents involving radioactive materials. It's only fair to the responders to teach them about the potential risks they might be exposed to, in addition to trying to alleviate whatever fears they might have. At the very least, it's important for responders to understand how to keep themselves safe – and how to recognize when they are in potential danger. Unfortunately, there is only a limited amount of time available for training – this makes it important to get the most utility out of every training session, and also means distilling a huge body of knowledge down to its fundamentals – and finding a way to present it that will stick with the students. In this PEP we will discuss what the responders really need to know and will review some ways to present this information – written and verbally – to help communicate the most important knowledge to the responders. In addition, we will discuss how to augment this basic training for more advanced students.

Th-2 CAP88 PC Version 4 Topics

R. J. Rosnick
U.S. Environmental Protection Agency

This lecture is an introduction to the CAP88 version 4 code, including what it does, how it does it, the models and equations used behind the scenes, how and where to download, install, and run the code, the file types and where the files would be located, etc. Also included (for more advanced users) is how to correctly interpret output reports and error logs, how to modify input files (including population files), and a more detailed explanation of the limitations of the CAP88. This course would be intended for a novice or new user, although more experienced users could also benefit from the background information.

Th-4 Decay Chain Calculations, A Primer

D. Stuenkel
Trinity Engineering Associates

Many problems encountered in health physics require the calculation of the activities of radionuclides in a decay chain or cascade at a later time based on the initial activities and/or production rates of the radionuclides in that decay chain. This PEP session presents a system of differential equations describing the decay and ingrowth of radionuclides in a decay chain along with methods to solve it. It will include discussion of both analytical solutions (i.e., the Bateman equations) and numerical methods for practical problems that involve decay branching, physical or biological removal mechanisms, and external sources. Understanding the system of differential equations describing the decay and ingrowth of radionuclides and some of the methods to solve this system of equations will help the health physicist to select an appropriate solution method when confronted with such a problem.

Th-5 A Million Ways to Fill a Bottle

R. Jones
Pacific Northwest National Laboratory

A well-rounded internal dosimetry program contains several important elements. Within the Department of Energy complex, most of these elements are heavily assessed as well as accredited. One of the least discussed, yet arguably the most critical part of an internal dosimetry program is determining who to sample. As the nuclear workforce ages and legal remedies for illness have been tested, a growing need is developing to provide defendable answers on an individual basis to the question: "why didn't I get a sample." This presentation will cover methods of integrating an internal dosimetry program into radiological work planning in order to determine how people are selected for radiobioassay sampling. Also covered is the evolution of the Pacific Northwest National Laboratory's approach from within the Hanford program to an independent service over the last generation. In addition, the presentation will provide a high-level review of the internal dosimetry program at the Pacific Northwest National Laboratory, as a separate entity from the Hanford site. Be prepared to interact with the speaker and each other.

Continuing Education Lectures (CELs)

Monday 18 July through Thursday 21 July

Monday

CEL-1 Strategies for Keeping Your Radiation Safety Program on Course in a Sea of Constant Change

R. Emery, University of Texas School of Public Health

The University of Texas School of Public Health recently conducted a straw poll of approximately fifty very experienced safety professionals (inclusive of health physicists) and the results were astonishing: 80% had reported to the person they current report to for a period of less than 5 years, and 25% for a period of less than 1 year! These striking results underscore the old adage that "change is constant". But adapting to change is not something that is traditionally addressed in our academic preperation. Interestingly, although change is indeed constant, the underlying data that drives radiation safety programs doesn't change. What does change is the framing of the delivery of this important information to ensure continued program support. This presentation will discuss the dilemma of constant change and provide some tips on the personal management of change and will present options to consider for communicating essential information to the ever-changing environment.

CEL-2 Five Tools for Effective Responses to Workers, the Public, and the Media

R. Johnson, Radiation Safety Counseling Institute

Most health physicists have had extensive education in the technology of radiation safety and perhaps little in the area of risk communication and dealing with upset people. One of the reasons many of us choose health physics is because we like the technical challenges. And then we discover that from day-to-day people issues may demand more of our time and energy, and that we may not be well prepared for dealing with such issues. To help HPs better deal with people issues, this lecture will present five simple tools to consider when addressing radiation risk concerns of workers, the public, and the media. These include 1) Active Listening, which is a response that reflects the content and feeling of another person's message. In many cases when another person's feelings are really heard, their upset goes away. 2) Asking questions, rather than giving answers. When we give answers, which we are technically trained for, we may discover that others will discount our answers, or that we are actually answering the wrong questions. 3) Providing opportunities for others to answer their own questions. People have a vested interested in their own answers. 4) Staying non-defensive, recognizing defensiveness and deciding to throw back marshmallows when others are throwing rocks. 5) Options on what to say, when you do not know what to say, or what you might think of saying may cause more difficulties. Each of these tools will be presented with examples. Attendees are encouraged to bring at least one scenario to this CEL where one of or more of these communication tools may be applied. Time will be allowed for practicing these tools during this lecture, however, skill in the use of these tools will only come from continued practice.

CEL-3 Current Uses of Radiopharmaceuticals in Nuclear Medicine Therapy

M. Stabin, Vanderbilt University

A variety of radiopharmaceuticals are used in nuclear medicine therapy. The use of radioiodines to treat thyroid diseases and P-32 to treat polycythemia vera [Ferreira et al. 2007] (which is no longer in use) were established decades ago. Development and investigation of new agents is always progressing; an important issue, however, is clinical acceptance of new therapies that are intended to replace existing therapies. Resistance to change can cause difficulties in sustaining new products, as the approval process for new drugs is quite expensive, and poor market performance has caused distribution of some very good agents to be discontinued. Nonetheless, some very effective new agents have been developed recently, and the future of radiopharmaceutical therapy is bright. In this talk, we will overview the existing agents and their application. We will also review how implementation of patient-individualized dosimetry for these therapies is needed to optimize the effectiveness of these agents; at present this is not a common practice.

CEL-4 NORM/TENORM: History + Science + Common Sense = ???

W. E. Kennedy, Jr., Dade Moeller & Associates

Since the early twentieth century, beginning with the search for domestic sources of radium, it has been understood that rock formations contain primordial concentrations of naturally occurring radioactive materials (NORM). NORM includes the radionuclides associated with the uranium or thorium decay chains, and Potassium-40. These sources are all around us to some degree in rocks and soil. They are of primary concern during mineral resource recovery, where human actions modify the NORM concentrations or isotopic distributions, creating technologically enhanced NORM (TENORM). Sources of NORM/TENORM span many human activities, including: using clay for production of bricks or ceramics; mining waste from extracting rare earths or other metals such as aluminum; using heavy casting sands which potentially contain thorium; purifying drinking water, which can concentrate radium or uranium in waste; and recovering oil and gas, which can produce large volumes of TENORM waste. Most recently, there have been news reports and concerns about TENORM waste issues associated with application of newer oil and gas recovery technologies, using horizontal drilling coupled with hydraulic fracturing. The major radiation protection concerns of NORM/ TENORM are protecting workers, members of the public, and the environment similar to any activity involving radioactive materials, with one important difference: there is no Federal guidance for NORM/TENORM waste management – the regulatory authority lies with the States. Individual States are left to cope with emerging NORM/TENORM radiation protection issues on an ad hoc basis with little scientific support. As a result, State guidance and regulations vary greatly. A harmonized approach would be most beneficial. We are currently at the confluence of history, science, and common sense. This continuing education lecture will provide an overview of NORM/TENORM issues, with an eye to developments which may shape, or reshape, future industrial applications.

CEL-5 Herbert M. Parker (1910-1984): Laying the Foundations of Medical and Health Physics

R. L. Kathren, Washington State University at Tri-cities, Richland

This presentation chronicles the life and legacy of Herbert M. Parker and how his contributions have impacted the parallel professions of medical and health physics. In 1938, after six highly productive years in Manchester, England, during which he codeveloped a revolutionary cancer radiotherapy treatment system that bears his name, Parker accepted an invitation to come to Swedish Hospital in Seattle to research supervoltage x-ray therapy for cancer. Four years later, at the urging of Simeon Cantril, he joined Clinton Laboratories at Oak Ridge, serving as head and principal architect of the health physics organization and as the principal architect of the program there. Subsequently he was personally selected by Arthur Holly Compton as the best possible choice to cope with the extraordinary problems associated with plutonium production at Hanford Pu production site to which he transferred in the summer of 1944. Here, Parker developed a highly successful radiation protection program that included included the first DAC, derived for plutonium, and new quantities and units for physical and biological dose that live on today in the form of the gray and sievert. After WWII, he was instrumental in creating and managing the Hanford Laboratories whose contributions to health physics, radiation biology and environmental protection, achieved world reknown. He personally made numerous important contributions across the entire spectrum of health physics, often through the many committees on which he served, including prescient contributions in the areas of radioactive waste management, dosimetry, standards, and environmental protection. His his many honors include the HPS Distinguished Scientific Achievement Award and the AAPM Coolidge Medal and he is the only health physicist to grace the cover of the national magazine Business Week.

CEL-6 Channeling Richard Feynman: How Lessons from the Great 20th Century Physicist Can Inform and Inspire Great Health Physics in the 21st Century

M. D. Hoover, National Institute for Occupational Safety and Health

Whether working on the atomic bomb, exploring and explaining quantum physics, investigating the Challenger disaster, or declaring his prescient vision of a future for nanotechnology ("There's plenty of room at the bottom."), Richard P. Feynman (1918-1988) was an insightful and thoroughly grounded practitioner and thinker. This lecture will revisit some of the many experiences of this great 20th century physicist that can inform and inspire our pursuit of great health physics in the 21st century, especially our need to make decisions in the face of uncertainty.

Individuals planning to attend the lecture are invited to read the entertaining and informative collection of Prof. Feynman's writings The Pleasure of Finding Things Out.

Wednesday

CEL-7 Twelve Barriers to Effective Radiation Risk Communication

R. Johnson, Radiation Safety Counseling Institute

Communication specialists have identified twelve barriers or roadblocks that could interfere with our best efforts to provide helpful information to persons concerned with radiation risks. These roadblocks are called the "dirty dozen" (as defined by Dr. Thomas Gordon) and they represent our typical approaches to communications. Thus, the use of any of these approaches is not about right or wrong, but whether our normal approach opens or closes the door for further dialogue. People with concerns for radiation risks usually want their concerns (feelings) heard and to know their concerns are understood and appreciated. Feelings are an element of every communication, especially involving risks or safety. Technical people, such as specialists in radiation safety, may often miss the feeling dimension of risk communication and focus only on the technical aspects for which they have training and experience. It may seem that other person's concerns for radiation are misguided and our response may be to attempt to straighten out their misunderstandings of radiation. Would you agree that pointing out another person's errors of technical understanding may not be the best way to open a dialogue? This approach is only one of the following dozen that will be described in this lecture, including:

1. Ordering, directing, commanding
2. Warning, threatening, promising
3. Moralizing, preaching, giving shoulds and oughts
4. Advising, giving solutions, suggestions, and answers
5. Teaching, lecturing, giving logical arguments
6. Judging, criticizing, disagreeing
7. Praising or agreeing
8. Name calling, labeling, stereotyping
9. Interpreting, analyzing, diagnosing
10. Reassuring, sympathizing, consoling
11. Probing, questioning, interrogating
12. Withdrawing, distracting, humoring, sarcasm, diverting.

The common factor in each of these twelve approaches is that they all miss the feelings of the other person. We might want to remind ourselves that "People may not care how much you know, until they know how much you care." We will explore how each of these twelve approaches could be barriers that interfere with radiation risk communications.

CEL-8 Overview of Federal Resources Available for Response to a Radiological/Nuclear Accident or Incident

K. Groves, FHPS

This presentation will review those resources that the Federal Government either provides or funds to support local, regional or state entities in the event of a radiological/nuclear accident or incident. Most are provided by the Department of Defense through NORTHCOM, the Department of Energy through the NNSA's Office of Emergency Operations, and the Environmental Protection Agency's Radiological Emergency Response Team. Other Federal Agencies also provide support, including the Department of Health and Human Services through the Centers for Disease Control and Prevention, and the Department of Veterans Affairs. Federal funded State resources include the National Guard's Weapons of Mass Destruction Civil Support Teams in each state and territory. While most emergencies are local and local assets need to be able to respond in the early phase; two of the Federal response teams can respond to assist within hours; they are the DOE's Radiological Assistance Program (RAP) teams and the State's Civil Support Teams (CSTs).

Thursday

CEL-9 Communicating Radiation Safety Information to the Public, the Media, and Other Non-Health Physicists

P. A. Karam, NYPD Counterterrorism

Let's face it – most of the people we meet or communicate with don't understand radiation and are inclined to be frightened of it. And a surprisingly large number of scientists – including health physicists – either try to avoid speaking to the public or to the media or they don't do a good job of communicating what they know in a manner that the public is able (or willing) to absorb. As a result, the radiation-related stories that come out tend to be dominated by people who are either not terribly knowledgeable about radiation or who have an agenda to push. We need to do better. In this PEP, we'll discuss some of the Do's

and Don'ts of communicating radiation information to the public, drawing upon Andrew Karam's experience working with members of the media in over 100 interviews. We'll also discuss some factors to keep in mind when developing graphics for showing the public, whether for use in video interviews or for your own blog or website.

CEL-10
Radiation Dosimetry as Part of an Integrated Radiation Protection Program

C. A. Potter, S. H. Goke, Sandia National Laboratories

Radiation protection programs are designed to provide engineered and administrative controls that prevent workers from receiving unnecessary radiation dose, whether from an external radiation field or from radioactive material that individuals may have taken internally. Radiation dosimetry programs are frequently designed with the objective being to assess and report doses to management and ultimately to regulating bodies. While this one of the important reasons for having a dosimetry program, it does not result in the possibly more important goal of preventing additional exposure following uncontrolled contamination or generation of a radiation field.

A radiation protection program can work more effectively if rather than considering workplace control and dosimetry separate tasks, the design is around defense in depth. In this paradigm, the first line of defense is the understanding of the radiation sources and the worker's procedures, including those invoked following the identification of an anomaly that could cause exposure. The second line of defense would be the periodic radiation survey program that identifies unaddressed contamination and external fields. The third line of defense is the dosimetry program.

An effective dosimetry program is well-integrated into the radiation protection program. Under normal operations it is a quality assessment on the effectiveness of the radiation survey and workplace control processes ensuring that there are not unidentified losses of control. Under abnormal operations where contaminations or exposures have occurred, it helps with recovery by identifying exposures that have occurred or are continuing and evaluating the significance. This CEL will describe experience at Sandia National Laboratories on how program integration is achieved and how feedback is looped into the workplace control process to ensure that unnecessary exposures are minimized.

Notes

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Health Physics Society's 61st Annual Meeting

17-21 July 2016 - Spokane, Washington

CHP? ❑Yes ❑No
NRRPT? ❑Yes ❑No

HPS Member Number: __ __ __ __ __
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Email (for confirmation): _____ **If Registering-Companion Name:** _____

PREREGISTRATION DEADLINE 8 JUNE 2016

REGISTRATION FEES: (Mark Appropriate Box)	**Preregistration Fees**	**On-Site Fees**
PROFESSIONAL DEVELOPMENT SCHOOL REGISTRATION FEE 14-15 July 2016, Spokane, Washington:		
❑ PDS Registration HPS MEMBER (does not include HPS Meeting Reg)	$695.00	$795.00
❑ PDS Registration NON MEMBER (does not include HPS Meeting Reg)	$750.00	$850.00
❑ PDS Full-Time Student Registration (does not include HPS Meeting Reg)	$325.00	$425.00
MEETING REGISTRATION FEES 17-21 July 2016:		
❑ HPS Member *(Sun Reception, Mon and Tues Lunch, Tues Awards Dinner)*	$430.00	$530.00
❑ HPS 2016 Dues Renewal (Full, Associate)	$200.00	$200.00
❑ Non-Member* *(Sun Reception, Mon and Tues Lunch, Tues Awards Dinner)*	$580.00	$680.00
❑ Emeritus Member *(Sun Reception, Mon and Tues Lunch, Tues Awards Dinner)*	$215.00	$265.00
❑ One Day ONLY ❑Mon ❑Tues ❑Wed ❑Thurs	$275.00	$300.00
❑ Student (*Sun Reception, Mon and Tues Lunch, Tues Awards Dinner*)	$ 70.00	$ 70.00
❑ One Day ONLY Student ❑Mon ❑Tues ❑Wed ❑Thurs	$ 40.00	$ 40.00
❑ Companion *(Sun Recep, Mon, Tues Lunch, Breakfast)*	$110.00	$110.00
❑ Emeritus Companion (*Sun Reception, Breakfast*)	$ 55.00	$ 55.00
❑ HPS Member PEP Lecturer *(Sun Recep, Mon, Tues Lunch, Tues Awards Dinner)*	$130.00	$230.00
❑ HPS Member CEL Lecturer *(Sun Recep, Mon, Tues Lunch, Tues Awards Dinner*	$280.00	$380.00
❑ Additional Tues. Awards Dinner Ticket(s) # of Tickets _____	$ 67.00	$ 67.00
❑ AAHP Awards Lunch Ticket(s) (Tues.) CHP	$ 10.00	$ 10.00
❑ AAHP Awards Lunch Ticket(s) (Tues.) Guest	$ 15.00	$ 15.00

*Includes Complimentary Associate Membership for year 2016 - FIRST TIME MEMBERS ONLY

Would you like your name included on the Attendee List? ❑Yes ❑No

Are you a presenter? ❑Yes ❑No If yes, abstract/Title:_____

SOCIAL PROGRAM	**Preregistration Fees**	**On-Site Fees**	**Total $**
❑ Private Cruise, Lake Coeur d'Alene (Mon 7/18, 1-5pm)	# of Tickets____X $50	# of Tickets____X $55	$_____
❑ Historic Walking Tour and Wine Tasting(Mon 7/18, 1:30-4:30pm)	# of Tickets____X $25	# of Tickets____X $30	$_____
❑ Spokane Indians Baseball Game (Mon 7/18, 5:30pm)	# of Tickets____X $20	# of Tickets____X $25	$_____
❑ Annual HPS 5K **RUN/WALK** (Tues 7/19, 6:30-8:30am)	# of Tickets____X $25	# of Tickets____X $30	$_____
Shirt Size: S❑ M❑ L❑ XL❑ XXL❑ XXXL❑ ***(XXL and XXXL are available with Preregistration Only)***			
❑ Hiawatha Trail Bike Tour (Tues 7/19, 8:30am-4pm)	# of Tickets____X $175adult	# of Tickets____X $180	$_____
	# of Tickets____X $152youth	# of Tickets____X $157	$_____
❑ Historic Spokane's "Age of Elegance" Bus Tour (Tues 7/19, 1:30-4:30pm)	# of Tickets____X $25	# of Tickets____X $30	$_____
❑ Relish Spokane™ Food Walking Tour (Wed 7/20, 2-5pm)	# of Tickets____X $39	# of Tickets____X $45	$_____
❑ Pub Crawl (Wed, 7/20, 6:30pm)	# of Tickets____X $20	# of Tickets____X $25	$_____
Pub Crawl - Shirt Size: S❑ M❑ L❑ XL❑ XXL❑ XXXL❑ ***(XXL and XXXL are available with Preregistration Only)***			
Pub Crawl - Shirt Colors: ❑Neon Green ❑Black ❑Gray ❑Cardinal ❑Aquatic Blue			
❑ Night Out: An Evening of Songs/Stories of Pacific NW (Wed, 7/20, 6:30-9:30pm)	# of Tickets____X $40adult	# of Tickets____X $45adult	$_____

TECHNICAL PROGRAM	**Preregistration Fees**	**On-Site Fees**	**Total $**
❑ Hanford B-Reactor Tour (Thurs 7/21, 8am-6pm)	# of Tickets____X $50	# of Tickets____X $55	$_____
❑Pulled Pork ❑Caesar Salad w/Beef Brisket ❑Caesar Salad no meat			
❑ LIGO (Hanford) Tour (Fri 7/22, 8am-6pm)	# of Tickets____X $50	# of Tickets____X $55	$_____
❑Pulled Pork ❑Caesar Salad w/Beef Brisket ❑Caesar Salad no meat			

PAYMENT INFORMATION - ***Government Requisitions are accepted for registration, however Purchase Orders are NOT accepted for PEP, AAHP, Social/Technical Tour Registration. HPS TAX ID # 04-6050367***

Check Payment: Health Physics Society, 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101

Cardholder's Information ❑VISA ❑ MasterCard ❑ American Express

Card Number _____ Exp. Date_____ CV2 _____

Credit Card Billing Address: _____

Cardholder Name: _____ Phone Number _____

Signature: _____ Email Address for receipt _____

Please see AAHP/PEP Registration form and Disabilities information on next page

If FAXing registration form, (703) 790-2672
please do not mail the original.

Registration Section Total	**$** _____
Social Program Total	**$** _____
AAHP/PEP Total (From Other Form)	**$** _____
TOTAL FEES ENCLOSED	**$** _____

Your housing while in Spokane, WA: _____

DISABILITIES: The Annual Meeting is accessible to persons with disabilities. Please specify assistance required and a HPS representative will contact you. _____

AAHP Courses: Saturday, 7/16 - 8:00 AM - 5:00 PM

- ❑ AAHP1 The Role of a Radiological Operations Support Specialist (*Ross*) $275
- ❑ AAHP2 Lessons in Communication From HPS's Ask the Experts *(Wahl)* $275
- ❑ AAHP3 How Randomness Affects Understanding of Rad Risk Assess and Decisions for Radiation Safety *(Johnson)* $275

PROFESSIONAL ENRICHMENT PROGRAM

Special PEP Session: All Day Sunday, 7/17

Sunday, 7/17 8:00-10:00 AM

1-A EH&S "Boot Camp" for Radiation Safety Professionals, Part 1 *(Emery, Gutierrez)*
1-B Integrating the Rad Protection Program into the OSHA Injury and Illness Program... *(Larson)*
1-C Randomness and Interpretation of Radiation Measurements *(Johnson)*
1-D Status of (1) ANSI N42 RPI Standards and (2) International Electrotechnical Commission (IEC) Technical Committee 45 and Subcommittee Nuclear Standards *(Cox)*
1-E Radiation Protection at Accelerator Facilities *(Quinn)*
1-F Air Monitoring in Nuclear Facilities - Part 1 *(Voss)*
1-G Heat Stress for Health Physicists, Part 1 *(Ceffalo)*
1-H Laser Safety for Health Physicists *(Edwards)*

Sunday, 8:00-10:00
___/ ___/ ___ = $90.00
1st 2nd 3rd
Yes, stand by list ❑

Sunday, 7/17 10:30 AM-12:30 PM

2-A EH&S "Boot Camp" for Radiation Safety Professionals, Part 2 *(Emery, Gutierrez)*
2-B Update to U.S. DOT Regulations (*Austin*)
2-C Why Our Natural Intuitive Processes Fail for Radiation Risk Assessments (*Johnson*)
2-D Search and Secure and RAILS (*Uhrig, Kahn*)
2-E Integration of Health Physics into the Medical Management of Radiation Incident Victims (*Sugarman*)
2-F Air Monitoring in Nuclear Facilities – Part 2 *(Voss)*
2-G Heat Stress for Health Physicists, Part 2 of 2 *(Ceffalo)*
2-H Performing ANSI Z136-Based Laser Hazard Calculations *(Edwards)*

Sunday, 10:30-12:30
___/ ___/ ___ = $90.00
1st 2nd 3rd
Yes, stand by list ❑

Sunday, 7/17 2:00-4:00 PM

3-A EH&S "Boot Camp" for Radiation Safety Professionals, Part 3 (*Emery, Gutierrez*)
3-B So now you're the RSO: Elements of an Effective Radiation Safety Program *(Morgan)*
3-C Errors in Randomness and Understanding of Stochastic Risk Assessments (*Johnson*)
3-D Overview of NRC Regulations in 10 CFR Part 37, "Physical Protection of Cat 1 and Cat 2..." (*Ragland, Jr.*)
3-E Excel: Tips and Tricks for the Health Physicist (*Guido, Wilding)*
3-F Air Monitoring in Nuclear Facilities – Part 3 *(Voss)*
3-G Archival Systems for Managing and Organizing Radiological Data *(Fisher)*
3-H Non-ionizing Radiation: An Overview of Biological Effects and Exposure Limits *(Edwards)*

Sunday, 2:00-4:00
___/ ___/ ___ = $90.00
1st 2nd 3rd
Yes, stand by list

Monday, 7/18 12:15-2:15 PM

M-1 Neutrons – Discovery and Application *(Chapman)*
M-2 Radiation Safety's Role in Mitigating the "Insider Threat" Risk *(Emery)*
M-3 How Randomness Affects Our Decisions for Radiation Safety *(Johnson)*
M-4 Radiation Safety Instruments for Emergency Responders – What Responders Need...(*Karam*)
M-5 Performing Depositional Studies in Sample Lines with Deposition Calculator, Version 1 *(Blunt)*

Monday, 12:15-2:15
___/ ___/ ___ = $90.00
1st 2nd 3rd
Yes, stand by list ❑

Tuesday, 7/19 12:15-2:15 PM

T-1 Nanotechnology and Radiation *(Hoover)*
T-2 Estimating Patient Peak Skin Dose from DICOM Information for Fluoroscopically... *(Martel)*
T-3 A Contemporary Approach to Managing Low-Level Radioactive and Mixed Waste... *(Zittle)*
T-4 Understanding Ionizing Radiation Carcinogenesis *(Raabe)*
T-5 Elements of Credibility for Professional Health Physicists*(Johnson)*

Tuesday, 12:15-2:15
___/ ___/ ___ = $90.00
1st 2nd 3rd
Yes, stand by list ❑

Wednesday, 7/20 12:15-2:15 PM

W-1 Internal Dosimetry Developments from 1949 to 2016 *(Strom)*
W-2 Uses and Misuses of Dosimetric Terms in Patient Radiation Protection *(Borrás)*
W-3 A Forgotten Nuclear Accident -- Bravo *(Sun)*
W-4 Setting up and Operating a Radiation Instrument Calibration Facility... *(Karam)*
W-5 Overview of Nondestructive Assay Systems *(Chapman)*

Wednesday, 12:15-2:15
___/ ___/ ___ = $90.00
1st 2nd 3rd
Yes, stand by list ❑

Thursday, 7/21 12:15-2:15 PM

Th-1 Developing Radiation Safety Materials for Emergency Responders... *(Karam)*
Th-2 CAP88 PC Version 4 Topics *(Rosnick)*
Th-4 Decay Chain Calculations, A Primer *(Stuenkel)*
Th-5 A Million Ways to Fill a Bottle (*Jones*)

Thursday, 12:15-2:15
___/ ___/ ___ = $90.00
1st 2nd 3rd
Yes, stand by list ❑

AAHP Total $ _____
PEP Total $ _____
AAHP/PEP Total $ _____
(Transfer these totals to previous page)

❑ ***Please check the box to confirm you have read and understand the Cancellation/Substitution Policies***

Cancellation/Substitution Policy: Substitutions of meeting participants may be made at any time without penalty. All conference and tour cancellations must be in writing and must reach the HPS Office by **8 June** to receive a refund. All refunds will be issued after the meeting minus a **20% processing fee**. Refunds will not be issued to no-shows.