Final Program

American Radiation Safety Conference and Exposition

(Health Physics Society's 47th Annual Meeting)

June 16-20, 2002
Tampa Convention Center
Tampa, Florida

Headquarters Hotel:
Tampa Marriott Hotel
Telephone: 813-221-4900
Fax: 813-204-6349

Convention Center:
Telephone: 813-276-6905

Overflow Hotel:
Wyndham Harbour Island Hotel
Telephone: 813-229-5000

Future Annual Meetings

48th	7/20-24, 2003	San Diego, CA
49th	7/11-15, 2004	Washington, DC

Future Midyear Topical Meeting

36th	1/19-22, 2003	San Antonio, TX

HPS Secretariat
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Thank you to the following Sponsor:
Canberra Industries, Inc.

Registration Hours

Registration will take place at the Tampa Marriott and Tampa Convention Center. See Below.

Registration at the Tampa Marriott:
Saturday, June 15 .... 2:00 - 5:00 pm
Sunday, June 16 .... 7:00 am - 7:00 pm

Registration at the Tampa Convention Center:
Monday, June 17 .... 8:00 am - 4:00 pm
Tuesday, June 18 .... 8:00 am - 4:00 pm
Wednesday, June 19 .... 8:00 am - 4:00 pm
Thursday, June 20 .... 8:00 am - Noon

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Kathleen M. Hintenlang, LAC Co-Chair

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Pete Bailey, ABHP Proctor, PEP Asst. Proctor & Floorwalker
Brian Birky, Technical Tour & PEP Asst. Proctor
Paul Burress, Floorwalker
John Campbell, PEP Asst. Proctor
Walter Cofer, PEP Asst. Proctor & Floorwalker
Gregg Cohn, Floorwalker
Ray Diehlman, Floorwalker
Jerry Eakins, PEP Asst. Proctor, Floorwalker & Technical Tour
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Warren Keene, Floorwalker
Bob Knecht, Floorwalker
Dennis Mitchell, Floorwalker
Kathy Nall, Hospitality Suite Coordinator
Wesley Nall, LAC Room Coordinator
Kevin Nelson, Social & Technical Tour, PEP Asst. Proctor & Floorwalker
Chuck Ness, Floorwalker & Golf Tour Coordinator
Rod Nickell, PEP Coordinator & 5K Run Coordinator
Cathy Perham, PEP Asst. Proctor
Vijay Raghaven, Floorwalker
Allison Rapa, PEP Asst. Proctor
Melodie Rivenbark, Special Projects
Chuck Roessler, PEP Asst. Proctor
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Randy Scott, 5K Run Coordinator, Floorwalker & Raffle
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George Snyder, Student, AV Coordinator
Kathy Thomas, PEP Asst. Proctor, Floorwalker & Hospitality Suite
Jason Timm, Student & AV
Julie Timm, Hospitality Suite
Laura Vladimiros, Floorwalker
Adam Weaver, PEP Asst. Proctor & ABHP Proctor
Golda Winston, PEP Asst. Proctor

Important Events!

Welcome Reception

The Welcome Reception will be held Sunday, June 16 from 6–7:30 pm at the Tampa Marriott, Grand Ballroom E/F.

Exhibits

Free Lunch! Free Lunch! – Noon, Monday, June 17. All registered attendees are invited to attend a complimentary lunch in the exhibit hall in the Convention Center immediately following the Plenary Session.

Breaks Monday Afternoon-Wednesday Afternoon – Featuring morning Continental Breakfasts and afternoon refreshments such as ice cream and cookies. Be sure to stop by and visit with the exhibitors while enjoying your refreshments! A raffle takes place during every break, so don't miss your chance at winning a prize ranging from a Palm Pilot to textbooks!

Sessions

Saturday – AAHP Courses will be held in the Tampa Marriott.

Sunday – PEP Sessions will be held in the Tampa Marriott.

Monday - Thursday - PEP Sessions will be held in the Tampa Convention Center.

Monday – Plenary Session will be held in the Tampa Convention Center Ballroom A/B.

Monday –Thursday – All Technical Sessions and PEPs will be held in the Tampa Convention Center.

Different this Year!

Tuesday Evening Awards Reception and Banquet at the
Tampa Waterside Marriott 7:00 - 10:00 pm
Grand Ballroom

Science Workshop

The Science Teachers Workshop Committee will be hosting a special session **Sunday, June 16th from 12:30-2:30 in Room #3 at the Tampa Marriott**. This session will feature interactive demonstrations and a preview of the most current teaching modules on Compact Disk. Participants will also be available to offer assistance and guidance for developing and maintaining a Science Teacher Workshop program in your chapter.

Things to Remember!

All posters up Monday–Wednesday in Exhibit Hall

Poster Session featured Monday, 1:30-3:00 pm – No other sessions at that time

Computer projection available for one designated technical session each day.

AAHP Awards Luncheon

The AAHP is sponsoring an Awards Luncheon on **Tuesday, June 18, from Noon-1:30 pm, in Convention Center Rooms 10-12**. You may purchase tickets on site at the Registration Desk.

Tuesday Evening Awards Reception & Banquet

A reception will take place from 7-7:30 pm followed by dinner and brief award presentations. All attendees are strongly encouraged to stay and show support for the award recipients. This event will take place in the **Tampa Marriott on Tuesday, June 18 from 7:00 - 10:00 pm, in the Grand Ballroom.** The following awards are to be presented:

Robley D. Evans Commemorative Medal
Kenneth W. Skrable

Distinguished Scientific Achievement Award
Raymond A. Guilmette

Elda E. Anderson Award
Richard R. Brey

Founders Award
Kenneth L. Mossman
Charles E. Roessler

Outstanding Science Teacher Award
Bobette Doerrie
Paul S. Lombardi

Fellow Award
Joseph L. Alvarez
David E. Bernhardt
W. Emmett Bolch
John R. Cameron
J. Donald Cossairt
Morgan Cox
Brian Dodd
Paul W. Frame

(Fellow Award cont.)
Janet A. Johnson
William E. Kennedy, Jr.
Judson L. Kenoyer
James E. Martin
Reza Moridi
C. Papastefanou
Jack F. Patterson
Jean M. St. Germain
James E. Tarpinian
John C. Taschner
John E. Till

The following menu has been selected for the **Awards Banquet:**

<u>Bibb Salad</u>
Baby Bibb Lettuce
with Shaved Fennel
Chilled Asparagus
Fresh Pecorino Romano Cheese
Lemon Basil Vinaigrette

<u>Sea Bass and Filet Mignon</u>
Grilled Center Cut Filet
with Vintage Port Reduction
Broiled Sea Bass
Topped with Sun-Dried Relish and Parmesan
Pommes William

<u>Chocolate Dome Dessert</u>
Chocolate Sponge Disks Soaked with Dark Cream of Cocoa
Topped with a Bittersweet Chocolate Cream and Covered with Ganach
Garnished with Raspberry Coulis and Fresh Berries

G. William Morgan Trust Fund

When G. William Morgan died in 1984, he bequeathed a substantial fund to the Health Physics Society. The will requires that the fund's interest be used to have internationally known experts present papers at the Society's meetings. Michael C. O'Riordan of the United Kingdom's National Radiation Protection Board was the first international expert to be supported by the Society through the Morgan Fund. O'Riordan's presentation "Radon in Albion" was part of the Indoor Radon Session at the 1989 Albuquerque meeting.

G. William Morgan was a Charter member of the Society and during the Society's early years a very active member. Bill began his health physics career at Oak Ridge National Laboratory as part of the Manhattan Project. He later joined the Atomic Energy Commission and was instrumental in the development of the initial regulations that became part of 10 CFR Part 20. He was a great champion of education and helped establish the AEC Health Physics Fellowship Program. Bill later became very successful in the real estate business, but always retained his interest in the health physics profession. The Society's Presidents Emeritus Committee has responsibility for the selection of the international experts who will be supported by the G. William Morgan Trust Fund.

Registration Hours

Marriott:

Saturday, June 15 .... 2:00 - 5:00 pm
Sunday, June 16 .... 7:00 am - 7:00 pm

Convention Center:

Monday, June 17 .... 8:00 am - 4:00 pm
Tuesday, June 18 .... 8:00 am - 4:00 pm
Wednesday, June 19 ... 8:00 am - 4:00 pm
Thursday, June 20 .... 8:00 am - Noon

Registration Fees:

Class	Pre-Reg	On-Site
♦HPS Member	$295	$370
♦Non-Member**	$385	$460
❖Student	$ 55	$ 55
●Companion	$ 50	$ 50
Exhibition ONLY	$ 25	$ 25
Exhibitor (2/booth)	No Fee	No Fee
Add'l Awards Lunch	$ 48	$ 48
AAHP Awards New CHP	Free	Free
AAHP Awards (CHP)	$ 10	$ 10
AHHP Awards Guest	$ 15	$ 15
■Member, 1 Day	n/a	$210
■Non-Member 1 Day	n/a	$210
■Student, 1 Day	n/a	$ 30

♦ Includes Sunday Reception, Monday Lunch and Tuesday Awards Dinner

❖ Includes Sunday and Student Receptions, Monday Lunch and Tuesday Awards Dinner

● Includes Sunday Reception, Monday-Wednesday Continental Breakfast and afternoon snacks

■ Includes Sessions and Exhibitions **ONLY**

** Includes Associate Membership for year 2002.

LAC Room

Saturday, Sunday ...... Marriott, Room 4
Monday-Thursday ..... Conv Ctr, Room 1
Telephone: 813-276-6906

Information

Speaker Instructions

You will be allotted a total of 12 minutes unless you have been notified otherwise.

The **Ready Room** (Convention Center, Room 17) will be open Sunday from 3-4:30 pm, Monday from 7-11 am and 1-4 pm, Tuesday from 7-11 am and 1:30-4 pm, Wednesday from 8-11 am and 1:30-4 pm and Thursday from 7:30-11 am. Slides are to be brought to the Ready Room for loading and previewing no later than the time indicated below:

Present. Time	Delivery Deadline
Monday am	3-4:30 pm Sunday
Monday pm	7-11 am Monday
Tuesday am	1-4 pm Monday
Tuesday pm	7-11 am Tuesday
Wednesday am	1:30-4 pm Tuesday
Wednesday pm	8-11 am Wednesday
Thursday am	1:30-4 pm Wednesday

Please meet with your session chairs in the meeting room where your paper will be presented 15 minutes before the beginning of the Session.

Placement Service

Placement Service listings will be posted in the Convention Center, Room 30 A/B, with hours from 8:00 am-5:00 pm, Monday through Wednesday and Thursday from 8:00 am-Noon. Interviews may be conducted in the designated areas of the Placement Room.

Business Meeting

The **HPS Annual Business Meeting** will be convened at 5:45 pm on Wednesday, June 19, in the Convention Center, Room 24/25.

Companion/Hospitality Room

A Hospitality Suite will be available in **Meeting Room 11 on Level Three of the Tampa Marriott Waterside Hotel.** Come meet old friends and relax on the terrace as you learn about the attractions in the Tampa area. Local citizens with literature about the city and environs will be on hand to help attendees plan their do-it-on-your-own family activities described further in the program. On Monday morning from 8:00 to 8:45 am, we invite all registered companions to an official welcome in Room 9/10 from the meeting's tour representative, Florida Destinations & Incentives, who will provide an orientation to Tampa and answer any questions you may have.

Continental breakfast will be available Monday through Wednesday mornings (8-9:30 am) for registered companions, as will afternoon refreshments if attendance dictates. Breakfast and refreshments are available to nonregistered companions **in the hotel restaurant, coffee cart and cafe.**

Hospitality Room
for Registered Companions

Monday Orientation Breakfast
8-8:45 am, Room 9/10

Hours/Days

Marriott Room 11

Monday .... 8:45 am-3 pm
Tuesday .... 8 am-3 pm
Wednesday .... 8 am-3 pm

Activities and Tours

Note: Tickets still available for sale can be purchased at the HPS Registration Desk

Sunday, June 16

Tampa City Tour	11:45 am–3:45 pm

Monday, June 17

Constellation Tech Corp	Cancelled
Tampa City Tour	Cancelled
Marine Eco-Tour	10 am-3 pm

Tuesday, June 18

Golf at Eagles Golf Course	Cancelled
5K Fun Run/Walk	6:30 am-8:30 am
Museum/Shopping	Cancelled
Food Tech Service, Inc	Cancelled

Wednesday, June 19

Golf at TPC Golf Course	9 am–4 pm
Cook like a Chef	Cancelled
P.E.T.N.E.T. Cyclotron	1-3 pm
Ybor City Pub Crawl	7 - 11 pm

Childcare

You can make arrangements for childcare as necessary. The rates per hour depend upon the situation.

The Marriott Waterside Hotel recommends:

Resort Babysitters 1-800-788-6689 or 1-727-865-0061

The Wyndham Harbour Island Hotel does not endorse or assume responsibility for any childcare arrangements; however, prior guests have utilized the following services:

A Choice Nanny	1-727-254-8687
Barbara McClellan	1-727-985-5231
Pat Collings Babysitting Agency	1-727-837-5874
Resort Babysitters	1-800-788-6689 or 1-727-865-0061
Ski	1-727-625-9753

HPS Committee Meetings

Tampa Marriott = (TM)
Convention Center = (CC)

Friday, June 14, 2002

ABHP BOARD MEETING
9:00 am - 5:00 pm Room 10 (TM)

IRPA EXECUTIVE COUNCIL
9:00 am - 6:00 pm Greco Bdrm (TM)

Saturday, June 15, 2002

FINANCE COMMITTEE
8:00 am - Noon Room 11 (TM)

NRRPT
8:30 am - 4:30 pm Room 1 (TM)

ABHP BOARD MEETING
9:00 am - Noon Room 10 (TM)

IRPA EXECUTIVE COUNCIL
9:00 am - 6:00 pm Greco Bdrm (TM)

CONTINUING EDUCATION COMMITTEE
Noon - 6:00 pm Room 7 (TM)

SYMPOSIA COMMITTEE
1:00 - 5:00 pm Room 8 (TM)

AAHP EXECUTIVE COMMITTEE
1:00 - 5:00 pm Room 10 (TM)

HPS EXECUTIVE COMMITTEE
1:00 - 5:00 pm Presidential Suite (TM)

HP JOURNAL MEETING
3:00 - 6:00 pm Room 9 (TM)

Sunday, June 16, 2002

HPS BOARD OF DIRECTORS
8:00 am - 5:00 pm Room 12 (TM)

ABHP ad hoc PART 2 PANEL
8:30 am - 4:30 pm Room 13 (TM)

NRRPT
8:30 am - 4:30 pm Room 11 (TM)

VENUES COMMITTEE
8:30 am - 4:30 pm Room 1 (TM)

AAHP EXECUTIVE COMMITTEE
9:00 am - Noon Room 7 (TM)

SUMMER SCHOOL COMMITTEE
Noon - 3:00 pm Room 2 (TM)

PROGRAM COMMITTEE
1:00 - 3:00 pm Room 17 (CC)

MENTORING PROGRAM
3:00 - 4:00 pm Room 6 (TM)

Monday, June 17, 2002

NRRPT
8:30 am - 4:30 pm Room 1 (TM)

MEMBERSHIP COMMITTEE
Noon - 1:00 pm Room 32 (CC)

HISTORY COMMITTEE
Noon - 2:00 pm Room 31 (CC)

PUBLICATIONS COMMITTEE
Noon - 2:00 pm Room 34 (CC)

HEALTH PHYSICS PROGRAM DIRECTORS ORGANIZATION
Noon - 2:00 pm Room 37/38 (CC)

RESEARCH NEEDS COMMITTEE
Noon - 2:00 pm Room 33 (CC)

NOMINATIONS COMMITTEE
Noon - 3:00 pm Room 36 (CC)

STRATEGIC PLANNING COMMITTEE
Noon - 3:00 pm Room 35 (CC)

PUBLIC EDUCATION COMMITTEE
12:30 - 2:30 pm Room 39 (CC)

CHAPTER COUNCIL MEETING
1:00 - 2:00 pm CC 20/21

INTERNATIONAL RELATIONS COMMITTEE
1:30 - 4:00 pm Greco Bdrm (TM)

SCIENTIFIC & PUBLIC ISSUES COMMITTEE
2:00 - 4:00 pm Room 31 (CC)

AAHP PROFESSIONAL DEVELOPMENT COMMITTEE
2:00 - 4:00 pm Room 32 (CC)

LIAISON COMMITTEE/LEADERSHIP FORUM
2:00 - 5:00 pm G. Ballroom A/B (TM)

STUDENT BRANCH OFFICERS
4:00 - 5:00 pm Room 3 (TM)

INTERSOCIETY SHARING RESOURCES WORKSHOP
4:30 - 6:30 pm Room 8 (TM)

Tuesday, June 18, 2002

COMMITTEE CHAIR BREAKFAST
7:30 - 9:00 am Room 9 (TM)

N13.48
8:30 am - Noon Bayshore Bdrm (TM)

NRRPT
8:30 am - 4:30 pm Room 1 (TM)

LABORATORY ACCREDITATION POLICY
9:00 am - Noon Greco Bdrm (TM)

SCIENCE TEACHERS WORKSHOP COMMITTEE
Noon - 1:30 pm Room 31 (CC)

LEGISLATION & REG. COMMITTEE
Noon - 2 pm Room 32 (CC)

LABORATORY ACCREDITATION ASSESSMENT
Noon - 2:30 pm Greco Bdrm (TM)

ANSI N13.32 WORKING GROUP
1:00 - 5:00 pm Room 33 (CC)

AAHP CONTINUING EDUCATION COMMITTEE
1:30 - 2:30 pm Room 35 (CC)

ABET EVALUATORS/AEC ACADEMIC ACCREDITATION SUB-COMMITTEE
2:00 - 4:00 pm Room 34 (CC)

ANSI/HPS N13.1 WORKING GROUP
2:30 - 5:00 pm Room 31 (CC)

Wednesday, June 19, 2002

AFFILIATES COMMITTEE
7:30 - 9:30 am Room 9/10 (TM)

HPS WEB SITE EDITORS
Noon - 3:00 pm Room 31 (CC)

ACADEMIC EDUCATION COMMITTEE
2:00 - 4:00 pm Room 32 (CC)

HOMELAND SECURITY ad hoc COMMITTEE
7:30 - 9:00 pm Room 8 (TM)

Thursday, June 20, 2002

LOCAL ARRANGEMENTS COMMITTEE
7:30 - 9:30 am Room 1 (CC)

HPSSC/N13/N43 MEETING
8:00 am - Noon Room 4 (TM)

HPS BOARD OF DIRECTORS
8:00 am - Noon Room 11 (TM)

ACADEMIC EDUCATION COMMITTEE SPONSORSHIP/ROUNDTABLE DISCUSSION
9:00 - 11:00 am Room 3 (TM)

PROGRAM COMMITTEE
Noon - 3:30 pm Room 10 (TM)

American Radiation Safety Conference and Exposition

Tampa, Florida - June 16-20, 2002 - *Final Scientific Program*

NOTE: If a paper is going to be presented by other than the first author, the presenter's name is underlined.

All Technical Sessions take place in the Tampa Convention Center

Monday

7:15-8:15 AM **Room: 18/19**
CEL-1 Backgrounds, Detection Limits, and Treatment of Uncertainties in Survey Data. *J. Shonka; Shonka Research Associates, Inc.*

7:15-8:15 AM **Room: 20/21**
CEL-2 The Oklo Natural Nuclear Reactor. *A. Karam; University of Rochester*

8:30 am - Noon Room: Ballroom A/B

MAM-A: Plenary Session
Trends in Medical Doses, Technology, and Population Risks

Chair: George Anastas

8:30 AM
Welcome and Introduction of Landauer and Morgan Lecturers. *Local Committee and G. Anastas*

8:45 AM **MAM-A.1**
Radiation Risks, a Review of What We Know from Medical Radiation Studies. *J.D. Boice, Jr.; International Epidemiology Institute* ***(Robert S. Landauer, Sr. Lecture)***

9:30 AM **MAM-A.2**
The Challenge of Radiation Exposure from CT: An Editor's Perspective. *L. Rogers; American Journal of Roentgenology* ***(G. William Morgan Lecture)***

10:15 AM **BREAK**

10:45 AM **MAM-A.3**
The Risks of Radiation Exposure During Pregnancy: Controversies Resolved and Yet to be Resolved. *R.L. Brent; Jefferson Medical College, duPont Hospital for Children*

11:30 AM **DISCUSSION**
George Anastas

Noon-1:30 pm Exhibit Hall B

Lunch in Exhibit Hall for all Registrants and Opening of Exhibits

12:15-2:15 pm PEP Program

1:30 - 3:00 pm Room: Exhibit Hall

P: Poster Session

ACCELERATOR

P.1 Development of Dose Coefficients for Radionuclides Produced in Spallation Neutron Sources. *J. Shanahan, Y. Song, P. Patton, M. Rudin; University of Nevada - Las Vegas*

P.2 Health Physics Aspects of the DARHT Facility Beamstop and Shielding Wall. *A. Cucchiara, J. Hoffman, M. Bayless; Los Alamos National Lab*

P.3 Radiation Research Opportunities at the Idaho Accelerator Center. *D.P. Wells, J.F. Harmon, R. Brey; Idaho State University*

P.4 Small, Portable Linear Accelerators as a Waste Management Tool. *J. Kwofie, D. Wells, F. Selim, F. Harmon, J. Jones, S.P. Duttagupta; Idaho State University, Idaho National Engineering and Environmental Laboratory, Boise State University*

Monday

P.5 Study of the I-129 (gamma,n) I-128 Photonuclear Reaction. *G. Kharashvili, R. Brey, D. Wells; Idaho State University*

P.6 A Fricke Dosimetric Technique to Calculate G-Values for Accelerator Produced Photons with Energies between 1-30 MeV. *J. Macklin, R. Brey; Idaho State University*

P.7 Shielding Analysis at Two Radiation Oncology Sites. *N. Gee, R. Brey, M. Davidson; Idaho State University, Champs, LLC*

BIOKINETICS/BIOEFFECTS

P.8 Effects of Low Fluence Rate PDT on Human Gliomas. *R. Rodenbush, S. Madsen; University of Nevada - Las Vegas*

EMERGENCY RESPONSE/PLANNING

P.9 First Responders Need to Know. *T. O'Connell, P. Ares; MA DPH Radiation Control Program, MA Emergency Management Agency*

P.10 Overview of Data Simulator for Radionuclide Releases. *E. Wagner, C. Riland; Bechtel Nevada*

P.11 Potassium Iodide and the National Pharmaceutical Stockpile Program. *R. Whitcomb, Jr.; Centers for Disease Control and Prevention*

ENVIRONMENTAL/DECOMMISSIONING

P.12 Technical Basis for Calculating Radiation Doses for the Building Occupancy Scenario using the Probabilistic RESRAD-BUILD 3.0 Code. *S. Kamboj, B.M. Biwer, C. Yu, S.Y. Chen, T. Mo.; Argonne National Laboratory, US Nuclear Regulatory Commission, Washington, D.C.*

P.13 NRC License Termination Planning at the Former Army Depot that Stored Depleted Uranium Munitions and Other Licensed Commodities. *K. Picel, S. Kamboj, T. Sydelko, J. Cleary, T. Enroth; Argonne National Laboratory, Seneca Army Depot*

P.14 The Practices on Automatic Drain Water Radioactivity Monitoring in the Institute of Nuclear Energy Research. *S.-F. Fang; Institute of Nuclear Energy Research, Taiwan*

P.15 Effects of the Cerro Grande Fire (Smoke and Fallout Ash) on Possible Contaminants in Soils and Crops Downwind of Los Alamos National Laboratory. *P.R. Fresquez, W.R. Velasquez, L. Naranjo; Los Alamos National Laboratory*

P.16 A Simple Non-Destructive Method to Determine Depths of Radiological Contamination. *A.R. Al-Ghamdi, X.G. Xu; Rensselaer Polytechnic Institute*

P.17 Comparison of Thyroid Dose Estimates to Native Americans from Hanford Releases to the Air using Reference versus Tribal-Specific Diets. *E.H. Donnelly, E.B. Farfán, C.W. Miller, W.E. Bolch; Centers for Disease Control and Prevention, Atlanta, University of Florida - Gainesville*

P.18 A Field Test of Electret Ion Chambers for Environmental Monitoring for Environmental Remediation Verification. *L. Paulus, D. Walker, K. Thompson; State of Idaho INEEL Oversight Program, BBWI*

EXTERNAL DOSIMETRY

P.19 Modification of MIRD Human Phantom Based on the Comparison of the Dose Calculation with the Realistic Voxel Phantom. *C. Lee, C. Lee, J. Lee; Hanyang University - Seoul, Korea, University of Florida - Gainesville*

Monday

P.20 Construction of Korean Reference Adult Male and Female Voxel Phantoms. *C. Lee, C. Lee, J. Lee; Hanyang University - Seoul, Korea, University of Florida - Gainesville*

P.21 Development of Voxelized Fetal Models for Monte Carlo Dosimetry using 3D Ultrasound Imaging. *C. Shi, T. Zhang, T.-C. Chao, X.G. Xu; Rensselaer Polytechnic Institute*

P.22 Validation of EDCal 2.0 - a user-Friendly Computer Program to Calculate Radiation Doses to Various Organs, Tissues, and Personal Dosimeters. *C.-H. Kim, B. Wang; Rensselaer Polytechnic Institute*

P.23 Neutron Dose Comparison: CR-39 VS TLD. *S. Sengupta, G. Holeman, H. Kahnhauser; Brookhaven National Laboratory, Holeman Consultants, Inc.*

P.24 International Intercomparisons of Beta Particle Dosimetry. *C. Soares, J. Böhm, K. Helmstädter; National Institute of Standards and Technology, Physikalisch Technische Bundesanstalt, Germany*

P.25 Characterization of the Neutron Field in the Irradiation Cell of the Texas A&M University Research Reactor for Boron Neutron Capture Therapy (BNCT). *S.Y. Jang, C.-H. Kim, W.D. Reece; Texas A&M University, Rensselaer Polytechnic Institute*

INSTRUMENTATION

P.26 Rapid Analytical Technique to Identify Alpha Emitting Isotopes in Water, Air-Filters, Urine and Solid Matrices using a Frisch Grid Detector. *S. Scarpitta, N. Carte, R. Miltenberger, R. Gaschott; Brookhaven National Lab, University of Connecticut*

P.27 *in situ* Tritium Probe for Effluent and Ground Water Monitoring. *J. Stutz, C. Hull; University of Nevada - Las Vegas*

P.28 Low Energy Photon Measurement using Plastic Scintillation. *J. Ellis; Westinghouse Savannah River Company*

P.29 Calculation of the Total-to-Peak Ratio of a Low-Energy HPGE Gamma-Ray Detector. *M. Abbas, M. Bassiouni; Alexandria University, Egypt, Arab Academy for Science and Technology, Alexandria, Egypt*

P.30 Using Static Efficiency Measurements for Determination of Instrument Scan Efficiency Calibration Factors for Point and Small Area Sources. *W. Duffy, K. Hart, K. Higley; Puget Sound Naval Shipyard, Oregon State University*

P.31 Comparison of Desiccant Materials used for Monitoring Atmospheric Tritium Concentrations in a High Tritium Background Environment. *J. Case, R. Dunker, L. Paulus, R. Brey; Idaho State University*

P.32 Examination of HPGE Efficiency for Varying Amounts of Similar Density Material. *A. Arndt, R. Brey; Idaho State University*

P.33 Using Gamma Imaging and *in situ* Gamma Spectroscopy in Nuclear Facilities. *F. Bronson; Canberra*

INTERNAL DOSIMETRY

P.34 Uncertainties in Electron Absorbed Fractions within the ICRP-66 Respiratory Tract Model. *E.B. Farfán, T.E. Huston, W.E. Bolch, E.Y. Han, W.E. Bolch, C.H. Huh; University of Florida, University of Arkansas for Medical Sciences*

Monday

P.35 Beta-Particle Dosimetry within the ICRP-66 Respiratory Tract Model: Impact of Uncertainties in Electron Absorbed Fractions on Lung Dose Estimates. *E.B. Farfán, T.E. Huston, W.E. Bolch, E.Y. Han, D.A. Rajon, K.P. Kim; University of Florida, University of Arkansas for Medical Sciences*

P.36 A Revised Dosimetric Model of the Extrathoracic and Thoracic Airways. *E.Y. Han, E.B. Farfán, W.E. Bolch, T.E. Huston, W.E. Bolch; University of Florida, University of Arkansas for Medical Sciences*

P.37 Individual Varations in Mucosa and Total Wall Thickness within the Stomach and Rectum Assesed via Endoscopic Ultrasound. *C. Huh, M.S. Bhutani, W.E. Bolch, E.B. Farfán, W.E. Bolch; University of Florida*

P.38 Chord Length Distribution Measurements through Polygonal Representations of Trabecular Bone Samples. *D. Rajon, A. Shah, C. Watchman, J. Brindle, W. Bolch; University of Florida*

P.39 Coping with Some of ICRP-based Internal Dose Computing Difficulties. *O. Bondarenko, D. Melnichuk; Radiation Protection Institute, Ukraine*

P.40 Calculation of Internal Dose Conversion Factors for Selected Spallation Products. *H.O. Wooten, N.E. Hertel; Georgia Institute of Technology*

P.41 Statistical Analysis of Dose Assignments Resulting from Plutonium Bioassay. *M.P. Krahenbuhl, D.M. Slaughter; University of Utah*

P.42 Dose Evaluation of Metal Tritide Particles using the ICRP 66 and Biokinetic Models. *Y. Zhou, Y.-S. Cheng; Lovelace Respiratory Research Institute*

P.43 Investigation of Medical-Prophylactic Procedures to Reduce Radiation Doses from Internally Incorporated Plutonium. *E. Lyubchansky, A. Sokhranich; Deputy Director on Science, Senior Researcher, Russia*

P.44 Charged Particle Equilibrium Corrections for Photon Point Sources: EGS4-DOSRZ Monte Carlo Calculations. *L. Vasudevan, J. Poston, Sr., W. Reece; Texas A&M University*

MEDICAL HEALTH PHYSICS

P.45 The History and Development of the MOSFET Dosimeter. *A. Jones, D. Hintenlang; University of Florida*

P.46 A Comparison of Radiation Dose and Quantitative Measures of Image Quality in Pediatric Diagnostic X-Ray. *D. Hintenlang, C. Pitcher; University of Florida*

P.47 A Method for Determination of Organ Doses for Pediatric Fluoroscopy Studies. *F. Pazik, J. Sessions, M. Arreola, J. Williams, W.E. Bolch; University of Florida*

P.48 Induced Radioactive Potential for a Medical Accelerator. *V. Evdokimoff, J. Willins, H. Richter; Boston University Medical Center*

P.49 Selection of Radioactive Seeds for Intravascular Brachytherapy: Clinical and Safety Issues. *M. Winslow; Rensselaer Polytechnic Institute*

P.50 The Treatment of Unresectable Hepatic Malignancies using Y-90 Glass Microspheres: A Team Approach. *V. Gates, C. Schultz, R. Salem, H. Dworkin; William Beaumont Hospital*

P.51 Experience in Teaching Monte Carlo Method to Undergraduate NE/HP Students at Rensselaer. *B Wang, A. Al-Ghamdi, X.G. Xu; Rensselaer Polytechnic Institute*

OPERATIONAL HEALTH PHYSICS

P.52 Improving Work Authorizations Required for Radiological Work. *S. Green, R. Bauman; Bechtel Jacobs Company, LLC*

P.53 Occupational Radiation Exposures at DOE Office of Science Laboratories. *B. Parks; US Department of Energy, MD*

P.54 Efficiency of Street Cleaner in Removing Depleted Uranium from Asphalt Roads and Parking Lots. *N. Anderson, M. Bayless, A. Cucchiara, W. Griego; Los Alamos National Laboratory*

P.55 Using an Institution's Financial Software to Manage its Radioisotope Inventory. *S. Dupre; Princeton University*

P.56 Security of Radioactive Material at Academic Institutions. *M. Martz, D. Farley, S. Langhorst, R. Normandin; Medical College of Wisconsin, University of California - Riverside, Washington University at St. Louis*

RADIONUCLIDE NESHAPs

P.57 Database Applications in Clean Air Act Compliance. *S. Terp, D. Fuehne, E. Jones, R. Sturgeon; Los Alamos National Laboratory*

RADON

P.58 Elevated ^{222}Rn Concentration in some Wells in Hail Region of Saudi Arabia. *A. El Megid Mamoon, W.A. El Farag, M. Sohsah; King Abdulaziz University, Egypt*

P.59 Measurement of Radon Emanation from Building Materials using E-PERM Integrating Radon Monitors. *P. Kotrappa, L. Stieff; Rad Elec Inc.*

P.60 Radon and Thoron Measurements around the Radium Silos at Fernald, OH, New York City and New Jersey. *P. Chittaporn, N.H. Harley, R. Medora, R. Merrill; New York University School of Medicine, Nelson Institute of Environmental Medicine*

P.61 Quality Control for Particle Size Measurements at Fernald. *N.H. Harley, P. Chittaporn, M. Heikkinen, R. Medora, R. Merrill; New York University School of Medicine, Fluor Fernald Radiation Control Section, Canada*

REGULATORY/LEGAL ISSUES

P.62 CANCELLED

P.63 CANCELLED

RISK ANALYSIS

P.64 Oak Ridge Dose Reconstruction Project. *J. Buddenbaum, T. Widner; ENSR International Corporation*

P.65 Radiation Quality of Heavy Ions with the Same Stopping Power. *J. Chen; Radiation Protection Bureau, Health Canada*

RSO SECTION

P.66 Developing a Radioactive Waste Program for New RSOs. *S. Austin; CI-Radiation Safety Academy*

WASTE MANAGEMENT

P.67 Sorption/Desorption Kinetics of Cesium in Type V Portland Cements. *R. Turner, M. Rudin, W. Johnson, S. Steinberg, V. Hodge; University of Nevada - Las Vegas*

P.68 Development and Evaluation of a Neutron-Photon Shield for Transuranic (TRU) Waste Drums. *J. Castro, C. Montague, D. Wannigman, R. Wishau; Los Alamos National Laboratory*

INTERNATIONAL RELATIONS COMMITTEE

P.69 Problems of Risk Modeling: Influence of Uranium Storage on Environment. *A. K. Tynybekov; International Scientific Center, Kyrghyz Republic*

P.70 Meta-Analysis of Twenty Epidemiological Case Control Studies of Lung Cancer Risk and Indoor Radon Exposure. *I. V. Yarmoshenko, I.A. Kirdin, M.V. Zhukovsky, S.Y. Astrakhantseva; Institute of Industrial Ecology, Russia*

P.71 Coronary Heart Diseases Prevalence in the Population Living on the Radionuclide Contaminated Territory. *A.I. Stchastlivenko, V.P. Podpalov, O.N. Zhurova; Vitebsk State Medical University, Belarus*

P.72 Benefit and Risk Associated with Radiation Dose from Mammography Procedures in Malaysia. *N Jamal, K-H Ng, L-M Looi, D. McLean; Malaysian Institute for Nuclear Technology Research (MINT), Malaysia, University of Malaya Medical Centre, Malaysia, University of Sydney, Australia*

P.73 Neutron Source for Neutron Capture Synovectomy. *H.R. Vega-Carrillo, E. Manzanares-Acuña; Universidad Autónoma de Zacatecas, Mexico*

P.74 Passive Neutron Dosimeter Design. *H.R. Vega-Carrillo, A.M. Becerra-Ferrerio; Universidad Autónoma de Zacatecas, México*

P.75 Neutron Sources for Calibration. *H.R. Vega-Carrillo, A. Carillo-Nuñez; Universidad Autónoma de Zacatecas, México*

P.76 Evaluation of the Trends of Adult Chest and Abdominal X-Ray Examinations in Malaysia using the FDA Protocol. *A.S. Hambali, K.-H. Ng, B.J.J. Abdullah; Ministry of Health, Malaysia, University of Malaya Medical Centre, Malaysia*

P.77 Peculiarities of Dose-Response Dependence Curves for Cytogenetic Indices after in vitro Irradiation of Human Peripheral Blood Lymphocytes with Ionizing Radiation of Different Types. *T.V. Styazhkina, I.B. Korzeneva, I.B. Gorbunova; Russian Federal Nuclear Center- All-Russian Research institute of experimental Physics*

P.78 Congenital Anomalies of 1-3 Months Infants from the Inhabitants Living Near the Atomic Industry Facility. *T.V. Styazhkina, I.B. Korzeneva; Russian Federal Nuclear Center- All-Russian Research institute of experimental Physics*

P.79 Investigation of the Factors Disguising the Radiation Effects on Human Body. *I.B. Korzeneva, T.V. Styazhkina, Y.E. Dubrova, T.V. Malinina, V.D. Prokhorovskaya, O.N. Kholod; Russian Federal Nuclear Centre - All-Russian Scientific Research Institute Of Experimental Physics, Russian Academy of Science*

P.80 The True Health Effects of Radiation Revealed in the Incident of Co-60 Contamination in Taiwan. *Y.C. Luan, M.C. Shieh, S.T. Chen, M.F.Wu, K.L Soong, W.K. Wang, W.L. Chen, T.S. Chou, S.H. Mong, J.T. Wu, C. P. Sun , C.M. Tsai; Nuclear Science & Technology Association, Taiwan, Nuclear, Biological and Chemical Environment Protection Society, Taiwan, Atomic Technology Foundation, Taiwan*

Monday

P.81 Radioactivity Monitoring on a River – Reservoir Ecosystem. *A.L. Toma, C. Dulama, G.A. Todoran, M. Pavelescu; Institute for Nuclear Research, Romania*

P.82 Determination of the Radon Potential of a Building by a Controlled Depressurisation Technique (RACODE). *W. Ringer, H. Kaineder, F.J. Maringer, P. Kindl; Federal Office of Agrobiology, Austria, Upper Austrian Government, Austria, Austrian Research Centers Seibersdorf, Austria, Technical University of Graz, Austria*

P.83 Age Distribution of Thyroid Cancer in the Bryansk Region of Russia. *E. Parshkov, V. Sokolov, V. Stepaneko; Medical Radiological Research Center – Russian Academy of Medical Sciences, Russia*

CURRENT EVENTS/WORKS-IN-PROGRESS

P.84 Proposed Changes to the ABHP Part II Examination. *K. Pryor, E. Bailey, J. Serabian, M. Birch, G. Vargo, American Board of Health Physics*

P.85 Initial Radiological Characterization of an Inundated University Cyclotron Facility. *J. Cezeaux, E. Fruchnicht, J. Watson, A. Lazarine, R. Turley, L. Stoicescu; Texas A&M University*

P.86 Hot Cell Decontamination and Decommissioning at Battelle Columbus Laboratories. *G. Henderson; Battelle Memorial Institute*

P.87 MARSSIM Update. *C. Petullo, R. Bhat, D. Alberth, S. Doremus, V. Deinnocentiis, H. Peterson, C. Goglak, K. Klawiter, V. Lloyd, R. Meck; US Public Health Service detailed to US Environmental Protection Agency, US Air Force, US Army, US Environmental Protection Agency, US Navy, US Department of Energy, US Nuclear Regulatory Commission*

P.88 MARSSIM Applications: Lessons Learned. *S. Hay; SC&A, Inc.*

P.89 A Case Study of a MARSSIM-Based Final Status Survey for Buildings. *J. Hackett, R. McConn, J. Travers, K. Kadlubak, T. Enroth, J. Cleary; Parsons, U.S. Army Corps of Engineers, New York District, US Army, Seneca Army Depot*

P.90 Analysis of High NORM Levels in a Reactor Decommissioning Project. *M. Shannon, H.O. Wooten, R.D. Ice, N.E. Hertel; Georgia Institute of Technology*

P.91 Pre-Operational Environmental Radiation Survey in the Central Asian Steppe. *J.A. Johnson, R. Meyer, W. Anderson, V. Raykin; MFG Shepherd Miller Inc., Dostyk, Kazakhstan, AATA International Inc.*

P.92 Scintillation Detectors for Radiation Dose Estimation in Boron Neutron Capture Therapy. *D.-S. Kim, G.H.R. Kegel, J.J. Egan; University of Massachusetts, Lowell*

P.93 A New TLD Dose Algorithm to Satisfy HPS N13.11-2001. *N. Stanford; Stanford Dosimetry*

P.94 Optimization of Film Etching Techniques for Track Etch Detectors used in Personal Alpha Dosimetry. *B. Bjorndal, R. Moridi; Radiation Safety Institute of Canada*

Monday

P.95 A Revised Model for Electron Dosimetry in the Human Small Intestine. *N. Bhuiyan, J. Poston, Sr.; Texas A&M University*

P.96 Dose Backscatter Factor Calculation with Monte Carlo Method for Selected Beta Sources. *S.-W. Lee, W. Reece; Texas A&M University*

P.97 A Comprehensive Fluoroscopy Safety Initiative. *A. Jackson, D. Peck, R. Lieto; Henry Ford Health System*

P.98 Use of Radioactive Materials and Medical X-Rays during the Post Pardum Period...A Medical Health Physicist's Guide to Radiation Safety for the New Mother and Baby. *D.A. Koch; ViaHealth Rochester General Hospital*

P.99 Modification and Characterization of a High Energy Photon Irradiation Facility Using Nitrogen-16. *T. Roy, G. Chabot, G. Inglis; University of Massachusetts, Lowell, Lowell General Hospital*

P.100 A Portable Real Time Computer Based Neutron/Photon Monitor with GPS Tracking. *R. Seefred; Stanford Linear Accelerator Center*

P.101 Progress on the Development of a Low Level Radiation Dose Cs-137 Calibration Range. *R. Minniti, P.J. Lamperti, J.H. Sparrow, S.M. Seltzer; National Institute of Standards and Technology*

P.102 Airflow Visualization using Helium-Filled Soap Bubbles. *R. Morris, J. Quillin, J. Smith; The Alpha Group and Associates, L.L.C.*

P.103 Gamma Ray and X-Ray Spectrum of Fiesta Ware and Knowles Uranium Glaze Pottery. *D.M. Peterson, D.W. Jokisch; Francis Marion University*

P.104 European Intercomparison Test "Non-Destructive Assay of 220 Litre Radioactive Waste Packages". *L.P.M. van Velzen, B.G. Brunel, A.G. Pina, C. Morales, r. J.J. Delepine, G.B. Pedersen, R. Berndt, H.J.T. Bucherl, Ch. Lierse, M.A. Lewis, S. Daish, R. Bardon, Sanden, Brugge, May, e, A., P. Filss, man, P. Dodaro, K. van Kroth, R. Iseghem, Odoj, R. Carchon, J. Botte, J.P. Hendrick; NRG, The Netherlands, ENEA and JRC, Italy, CEA, France, FZ and TUM/RCM, Germany, ENRESA and Ciemat, Spain, SCK-CEN and Belgoprocess, Belgium, WQCL-NNC, United Kingdom*

Monday

3:00 - 5:00 pm Room: Ballroom A/B

MPM-A: Medical HP and RSO Section Joint Session: Doses from Medical Procedures-Special Concerns for Women and Children

Co-Chairs: Carmine Plott and Bob Wilson

3:00 PM **MPM-A.1**
Doses from Medical Procedures-Special Considerations for Women and Children: Pregnant Women and Women of Reproductive Age. *R.L. Brent; Jefferson Medical College* ***(G. William Morgan Lecture)***

3:30 PM **MPM-A.2**
AAPM/HPS Draft Standard on Fetal Dose Assessment: Fetal Dose from Nuclear Medicine Procedures. *M. Stabin; Vanderbilt University*

3:45 PM **MPM-A.3**
AAPM/HPS Draft Standard on Fetal Dose Assessment: Fetal Dose from Radiotherapy. *R. Blackwell, M. Stovall; Mayo Clinic/Foundation, UT MD Anderson Cancer Center*

4:00 PM **MPM-A.4**
AAPM/HPS Draft Standard on Fetal Dose Assessment: Fetal Dose from Diagnostic X-Ray Procedures. *E. Donnelly, M. Stabin, L. Williams; Vanderbilt University Medical Center, City of Hope Medical Center*

4:15 PM **MPM-A.5**
AAPM/HPS Draft Standard on Fetal Dose Assessment: Fetal Dose from Occupational Exposures. *V. King; Bechtel BWXT Idaho*

4:30 PM **MPM-A.6**
Radiation Dose and Benefits vs. Risk in Mammography. *L.N. Rothenberg; Memorial Sloan-Kettering Cancer Center*

3:00 - 4:30 pm Room: 20/21

MPM-B: External Dosimetry

Co-Chairs: Jeffrey Hoffman and Bruce Rathbone

3:00 PM **MPM-B.1**
Direct Ion Storage Detectors: Legal Approval of the Personal Dosimetry System DIS-1 and Recent Development on DIS-N Systems. *C. Wernli, A. Fiechtner, M. Boschung; P. Scherrer Institute, Switzerland*

3:15 PM **MPM-B.2**
Development of the Differential Angle Laser Illuminated Track Etch Scattering (DALITES) System for Reading Neutron-Induced Tracks in CR-39. *H.J. Gepford, M.E. Moore, N.E. Hertel; University of Missouri - Rolla, Los Alamos National Laboratory, Georgia Institute of Technology*

3:30 PM **MPM-B.3**
Development of a Temperature Stabilized Light Source for TLD Readers. *M. Nelson, G. Messner, B. Jenkins, J. Cassata; US Naval Academy, Naval Dosimetry Center*

3:45 PM **MPM-B.4**
A Proposal for Virtual Reality Dose Simulation using Image-Based Deformable Anatomical Modeling and Dynamic Monte Carlo Method. *X.G. Xu; Rensselaer Polytechnic Institute*

4:00 PM **MPM-B.5**
A Comparision of Dose Exposure of a Stationary Phantom and a Rotating Phantom. *J.P. Johnson, D.W. Gray, J.M Hoffman, M.W. Mallett, L.L. Romero, R.J. Wishau; Los Alamos National Laboratory*

Monday

4:15 PM **MPM-B.6**
Interplanetary Crew Doses from Large Solar Particle Events: Variations among Different Skin Sites. *J. Hoff, L. Townsend, N. Zapp; University of Tennessee, Lockheed Martin Space Operations*

3:00 - 4:30 pm Room: 22/23

MPM-C: Operational Health Physics

Co-Chairs: David Hwang and Paul Pater

3:00 PM **MPM-C.1**
The Quest for Sustaining Radiation Safety Personnel for Mission-Critical Positions. *M.B. Lee; Los Alamos National Laboratory*

3:15 PM **MPM-C.2**
Assuring Sufficient Future Availability of Health Physicists in the U.S. *R. Andersen, S. Simmons, D. Modeen; Nuclear Energy Institute*

3:30 PM **MPM-C.3**
Radioactive Source Control and Accountability in a Global Environment. *D. Brown, S. Woods; Halliburton Energy Services, Inc.*

3:45 PM **MPM-C.4**
A Novel Radiation Source Security Screening Tool. *M. Charlton, C. Shriver, R. Emery; UT Health Science Center at San Antonio*

4:00 PM **MPM-C.5**
Uncertainty Analysis for Detection Limit Definition and Confidence Interval Estimation. *W. Potter, A. Brodsky; Sacramento, CA, Science Applications International Corporation*

4:15 PM **MPM-C.6**
ALARA Matrix Implementation using the Radiation Protection Automation System. *W.J. Wenzel, B. Campbell, J.L. Bliss, J.E. Salazar, M. Bayless; Los Alamos National Laboratory, GPI*

3:00 - 5:15 pm Room: 24/25

MPM-D: Radiological Security/ Emergency Planning/Response

Co-Chairs: Paul Charp and Greg Komp

3:00 PM **MPM-D.1**
Proactive Radioactive Materials Management in Light of 9/11. *M. Pearson; Self-Employed*

CANCELLED **MPM-D.2**

3:15 PM **MPM-D.3**
International Approaches to Prevention of and Response to Radiological Terrorism. *G. Webb; IRPA, UK*

3:30 PM **MPM-D.4**
Use of ACRID/ERAD Assessment Tools for Homeland Defense. *W. Rhodes, M. Larsen, F. Harper, W. Wente; Sandia National Labs*

3:45 PM **MPM-D.5**
The Nation's Orphan Nuclear Stockpile. *J.A. Tompkins, L.E. Leonard; Los Alamos National Laboratory*

4:00 PM **MPM-D.6**
Orphan Source Perspectives in the Aftermath of 11 September 2001. *J. Lubenau, B. Dodd; International Atomic Energy Agency*

4:15 PM **MPM-D.7**
Common Problem Areas During Emergency Response Events and Exercises. *C. Riland, E. Wagner; Bechtel Nevada*

4:30 PM **MPM-D.8**
Who You Gonna Call? *S.E. Reed, K. Austin, C. Ribaudo, R. Zoon; National Institutes of Health*

4:45 PM **MPM-D.9**
WHO's New Program on Radiation and Health. *M. Repacholi, L. Kheifets; World Health Organization, Switzerland*

5:00 PM **MPM-D.10**
The North American Technical Center's Role in National Radiological Emergency Preparedness. *J. Harris, D. Miller; University of Illinois/NATC*

3:00 - 4:45 pm Room: 18/19

MPM-E: Biokinetics/Bioeffects

Co-Chairs: Matt McFee and Elyse Thomas

3:00 PM **MPM-E.1**
Health Physics Implications of Studies of Brief Irradiation of Reproductive Cells. *O.G. Raabe, J.E. Baulch; University of California - Davis*

3:15 PM **MPM-E.2**
Evaluation of Novel Photosensitizers in Laser Treatments of Brain Cancer. *S.A. Friesen, G.O. Hjortland, H. Hirschberg, O. Engebraaten, Q. Peng, S.J. Madsen; University of Nevada - Las Vegas, The Norwegian Radium Hospital, Norway, The National Hospital, Norway*

3:30 PM **MPM-E.3**
WHO's Recommendations on Health Effects from EMF Exposure. *M. Repacholi, L. Kheifets; World Health Organization, Switzerland*

3:45 PM **MPM-E.4**
Comprehensive Review and Revision of Thyroid Bioassay Procedures in Radionuclide Therapy using Iodine-131. *T.T. Yoshizumi, R.E. Reiman, M.R. Sarder, R.E. Coleman, N.A. Petry, F.R. Schuler; Duke University Medical Center*

4:00 PM **MPM-E.5**
Age-Specific Uncertainty of the I-131 Ingestion Dose Conversion Factor. *R. Harvey, D. Hamby; University of Buffalo, Oregon State University*

4:15 PM **MPM-E.6**
Theoretical Organically Bound Tritium Dose Estimates. *T.A. DeVol, B.A. Powell; Clemson University*

4:30 PM **MPM-E.7**
Probability of Causation for Radiation-Induced Cancer from Internally-Deposited Radionuclides. *O. Raabe; University of California - Davis*

ADJUNCT TECHNICAL MEETING

6:00 - 8:00 pm Marriott Hotel Grand Ballroom C/D

Current Issues in Health Physics Instrumentation
(all presentations are 15 minutes)

Chair: Morgan Cox

Gamma Insensitive Real-Time Fast Neutron Personnel Dosimeter. *S. Kronenberg (deceased), G.J. Brucker; US Army, Fort Monmouth, NJ*

Future Directions for Portable Radiation Detection Instruments. *J.T. Voss, Los Alamos National Laboratory*

EPA/USCS Pilot Testing of the RAD-COMM Grappler-Mounted Radiation Detector. *P. Chiaro; Oak Ridge National Laboratory*

Field Experience with the PRESCILA. *J.T. Voss; Los Alamos National Laboratory*

Conveyor-Driven Contamination Monitors. *M. Cox, M. Overhoff; Consultant, Santa Fe, NM, Overhoff Technology Corporation*

A Personnel Alpha Continuous Air Monitor (CAM). *J.T. Voss; Los Alamos National Laboratory*

Performance of a New Radon Compensation Method in the Canberra Harwell iCAM & Beta Continuous Air Monitor. *D.J. Ryden; Canberra-Harwell*

Tuesday

7:15-8:15 AM **Room: 18/19**
CEL-3 Radiation Protection Quantities: A Critique. *J.R. Cameron; University of Wisconsin*

7:15-8:15 AM **Room: 20/21**
CEL-4 Radiation Accident History. *R. Toohey; Oak Ridge Associated Universities*

8:30 am - Noon **Room: 18/19**

TAM-A: AAHP Special Session: Accidents in the Nuclear Industry; Impacts and Lessons Learned

Co-Chairs: Lee Booth and Syd Porter

8:30 AM **Introduction**
R.C. Ricks; Oak Ridge Associated Universities

9:00 AM **TAM-A.1**
Radiation Accidents Involving "Orphan Sources." *J.G. Yusko; Pennsylvania Department of Environmental Protection*

9:30 AM **TAM-A.2**
Criticality Accidents in Process Facilities-Lessons Learned. *T. McLaughlin; Los Alamos National Laboratory*

10:00 AM **TAM-A.3**
Nuclear Weapon Accidents. *J. Taschner; Los Alamos National Laboratory*

10:30 AM **BREAK**

11:00 AM **TAM-A.4**
The Army Stationary Low-Power Reactor (SL-1) Accident. *T. Gesell; Idaho State University*

11:15 AM **TAM-A.5**
The Pittsburgh Accelerator Accident: Events and Lessons Learned. *N. Wald, J. Lubenau; University of Pittsburgh, Self-Employed*

11:30 AM **TAM-A.6**
The Accident at Three Mile Island. *R. Dubiel; Millennium Services, Inc.*

Noon **AAHP AWARDS LUNCHEON**

8:30 am - Noon **Room: 20/21**

TAM-B: Depleted Uranium Aerosol Characteriziation: Applicability to Soldier Exposure Assessment

Co-Chairs: Mary Ann Parkhurst and Raymond Guilmette

8:30 AM **TAM-B.1**
Historical and Political Background for the Depleted Uranium Capstone Test - How the Bar was Raised. *E. Daxon, M. Melanson, D. Alberth; US Army*

8:45 AM **TAM-B.2**
The Capstone Depleted Uranium Aerosol Test: Background and Experimental Design Overview. *M.A. Parkhurst; Pacific Northwest National Laboratory*

9:00 AM **TAM-B.3**
Aerosol Instrumentation and Sampling System for the Capstone Test Series. *T.D. Holmes, R.A. Guilmette, Y.-S. Cheng, M.D. Hoover; Lovelace Respiratory Research Institute, Los Alamos National Laboratory, NIOSH*

9:15 AM **TAM-B.4**
Depleted Uranium Test Facility and Sample Recovery. *J. Beckman, J. Long, F. Szrom, J. Collins; US Army Aberdeen Test Center, US Army Center for Health Promotion and Preventive Medicine*

9:30 AM **TAM-B.5**
Surface Contamination and Deposition of Depleted Uranium Following Armored Vehicle Impact. *F. Szrom, J. Collins, R. Fliszar, G. Lodde; US Army Center for Health Promotion and Preventive Medicine, US Army Armament Research*

Tuesday

9:45 AM **TAM-B.6**
Characterization of Depleted Uranium Aerosols Formed Exterior to an Armored Vehicle Following Penetrator Impact. *R. Fliszar, K. Gold, F. Szrom, J. Collins, R. Guilmette; US Army Armament Research, U.S. Army Center for Health Promotion and Preventive Medicine, Los Alamos National Laboratory*

10:00 AM **BREAK**

10:30 AM **TAM-B.7**
Disequilibria of Depleted Uranium Progeny following Armored Vehicle Impact. *F. Szrom, J. Collins, G. Lodde, D. Alberth; US Army Center for Health Promotion and Preventive Medicine*

10:45 AM **TAM-B.8**
DU Activity Concentrations as a Function of Time during the Capstone Aerosol Test. *J. Kenoyer, Y.S. Cheng, M.A. Parkhurst; Dade Moeller & Associates, Inc., Lovelace Respiratory Research Institute, Pacific Northwest National Laboratory*

11:00 AM **TAM-B.9**
Particle Size Distribution of Aerosols Generated Inside Vehicles. *Y.S. Cheng, J. Kenoyer, J. Glissmeyer; Lovelace Respiratory Research Institute, Dade Moeller & Associates, Battelle (PNNL)*

11:15 AM **TAM-B.10**
Characterization of Depleted Uranium Oxides and Particle Morphology from the Capstone Aerosol Test. *M.A. Parkhurst, K. Gold, B. Arey, E. Jenson; Pacific Northwest National Laboratory, US Army, ARDEC*

11:30 AM **TAM-B.11**
Measurement of the *in vitro* Solubility of Depleted Uranium (DU) in Aerosols Produced by Impact of DU Penetrators on Armored Vehicles. *R. Guilmette, Y.S. Cheng, T. Krenik; Los Alamos National Laboratory, Lovelace Respiratory Research Institute*

11:45 AM **TAM-B.12**
Applicability of Capstone Aerosol Characterization Data to Soldier Exposure Assessment. *R. Guilmette, M.A. Parkhurst; Los Alamos National Laboratory, Pacific Northwest National Laboratory*

8:30 am - Noon **Room: 22/23**

TAM-C: Accelerator Section Session

Chair: Scott Schwahn

8:30 AM **TAM-C.1**
Laser Wakefield Accelerator, LBNL Experience. *K. Barat, W. Leemans; Lawrence Berkeley National Laboratory*

9:00 AM **TAM-C.2**
Evaluation of the Microdosimetric-Based Neutron Instrument REM500 in Accelerator Neutron Fields at SLAC. *J. Liu, S. Rokni; Stanford Linear Accelerator Center*

9:15 AM **TAM-C.3**
The NIM Platform at CAMD - Beam-Loss Radiation Calculations. *J.D. Scott, M.-L. Marceau-Day; LSU-CAMD*

9:30 AM **TAM-C.4**
High Energy Neutron Measurements at the Weapons Neutron Research Facility at LANSCE. *M. Duran; LANSCE Accelerator Health Physics*

9:45 AM **TAM-C.5**
Radiation Safety Impact of DFELL Upgrade. *V. Vylet; Duke University*

10:00 AM **TAM-C.6**
Induced Radioactivity of Materials by Stray Radiation Fields at an Electron Accelerator. *S. Rokni, A. Fasso, T. Wise, J. Liu, S. Roesler; Stanford Linear Accelerator Center, CERN*

10:15 AM **BREAK**

10:45 AM **TAM-C.7**
Manual Lujan Neutron Scattering Center Radioactive Liquid Waste (RLW) System Blow out and Ensuing Cleanup. *L.S. Walker, J. Bliss, W. Haynes; Los Alamos National Laboratory*

11:15 AM **TAM-C.8**
MARSSIM Application to the Decommissioning of a Synchrotron Light Source Facility. *R. May; Thomas Jefferson National Accelerator Facility*

11:30 AM **TAM-C.9**
Benchmark Studies on the Attenuation and Streaming of D-T Neutrons and Secondary Radiation at the Most Intense 14-MeV Neutron Source Facility. *M.S. Singh, M.T. Tobin, S.J. Brereton, J.F. Latkowski, K.L. Shingleton, J. Yatabe; Lawrence Livermore National Laboratory*

11:45 AM **TAM-C.10**
A Computer Based Program for Accelerator Radiation Safety Training. *S. Butala, J. Corsolini; Argonne National Laboratory*

Noon Room: 22/23

Accelerator Section Meeting

8:30 - 10:00 am Room: 24/25

TAM-D: Medical HP Section Session: 21st Century - The Century of Medical Science

Chair: Jean St. Germain

8:30 AM **TAM-D.1**
The Future of Radiation as a Modality in the Era of the Genome. *W. McBride; University of California – Los Angeles*

9:15 AM **TAM-D.2**
Ethical Issues in Radiation Research. *J. Kahn; University of Minnesota*

10:00 AM **BREAK**

10:30 am Room: 24/25

Medical HP Section Meeting

12:15-2:15 pm PEP Program

2:30 - 5:00 pm Room: 18/19

TPM-A: AAHP Special Session: Accidents in the Nuclear Industry; Impacts of Lessons Learned

Co-Chairs: Lee Booth and Syd Porter

2:30 PM **TPM-A.1**
Major Radionuclide Releases to the Environment from the Russian Mayak Production Association. *B. Napier; Pacific Northwest National Laboratory*

2:45 PM **TPM-A.2**
Internal Contamination in the Goiania Accident. *J.L. Lipsztein, D.R. Melo, C.A.N. Oliveira, A. Ramalho; Instituto de Radioprotecao e Dosimetria, Brazil*

3:00 PM **TPM-A.3**
Health Physics Lessons Learned from the Chornobyl Accident. *G.J. Vargo; Pacific Northwest National Laboratory*

3:30 PM **BREAK**

4:00 PM **TPM-A.4**
Sequoyah Fuels Facility UF_6 Accident. *E. Still; Retired*

4:15 PM **TPM-A.5**
The Criticality Accident at Tokai-Mura, Japan. *R. Toohey; Oak Ridge Institute for Science and Education*

4:45 PM **TPM-A.6**
Generalizing Lessons Learned from Accidents; Predicting Consequences Per Unit Source Term. *D.J. Strom, C.R. Watson, P.S. Stansbury; Pacific Northwest National Lab*

5:00 pm Room: 18/19

AAHP Open Meeting

2:15 - 5:45 pm Room: 20/21

TPM-B: Biokinetics/Bioeffects of the Actinides

Co-Chairs: Jim Griffin and Gus Potter

2:15 PM **TPM-B.1**
Determination of Radiation Doses Received by Workers at the Mayak Production Association. *E. Vasilenko, V. Khokhryakov, S. Miller, J. Rabovsky; Mayak Production Association, Russia, Southern Ural Biophysics Institute, Russia, University of Utah, US Department of Energy, MD* **(Formerly TPM-B.2)**

2:30 PM **TPM-B.2**
Dose Reconstruction Validation and Epidemiological Studies for the Russian Extended Techa River Cohort. *M. Degteva, L. Anspaugh, B. Napier, R.T. Bell; Urals Research Center for Radiological Medicine, Russia, University of Utah, Battelle Pacific Northwest Laboratories, US Department of Energy, MD* **(Formerly TPM-B.1)**

2:45 PM **TPM-B.3**
Acute Radiation Syndrome among Nuclear Workers of Mayak Production Association. *T.V. Azizova, M.V. Sumina, V.S. Pesternikova, S.V. Osovets, N. Wald; Southern Ural Biophysics Institute, Russia, University of Pittsburgh, LRRI, USA, MPI, Russia*

3:00 PM **TPM-B.4**
Influences of Radiation and Non-Radiation Factors in the Occurence of Liver and Biliary Tract Malignancies among Plutonium Production Workers. *Z. Tokarskaya, G. Zhuntova, B. Scott, V. Khokhryakov, E. Vasilenko; Southern Ural Biophysics Institute (SUBI), Russia, Lovelace Respiratory Research Institute, Mayak Production Association (MPA), Russia*

3:15 PM **TPM-B.5**
Human Wound Site Tissue Contaminated with Actinide Material. *J.J. Russell; Washington State University*

3:30 PM **TPM-B.6**
Application of a Four-Compartment Wound Model to Wounds Incurred by Former Workers at Rocky Flats. *R. Falk, N. Daugherty, J. Aldrich, D. Hilmas; Oak Ridge Associated Universities-Arvada, CO*

3:45 PM **BREAK**

4:15 PM **TPM-B.7**
^{238}Pu, ^{239}Pu, ^{237}Np, ^{241}Am, Depleted and Enriched Uranium. Results of Radiotoxicological Studies at Branch No. 1 of the State Research Center - Biophysics Institute during 1949-1999. *E. Lyubchansky, A. Sokhranich, Z. Kalmykova, T. Levdik, O. Kuzmenko; Ozyorsk, Russia*

Tuesday

4:30 PM **TPM-B.8**
Use of NUREG/CR-4214 Models to Estimate Risks for Deterministic Health Effects of Inhaled Weapons Grade Plutonium. *B. Scott, V. Peterson; Lovelace Respiratory Research Institute, ABConsulting, Inc.*

4:45 PM **TPM-B.9**
Uranium Lung Solubility Class Selection at Bechtel Jacobs Company LLC-Operated Facilities. *T. Rucker, K. Fleming, R. Moody, M. Johnson, S. Stevens, S. Green; Science Applications International Corporation, Bechtel Jacobs Company, LLC*

5:00 PM **TPM-B.10**
Absorbed Doses to the Stomach Walls and Colon of the Residents of Rongelap and Utirik Atolls due to their Initial Three-Day Intake of Radioactive Fallout from the Bravo Detonation. *D. Moeller, C. Sun; Dade Moeller & Associates, Inc., Brookhaven National Laboratory*

5:15 PM **TPM-B.11**
Radiological Assessment of the Aerosol Activity Size Distribution at the Object Shelter Conditions. *O. Bondarenko, P. Aryasov, D. Melnichuk, S. Medvedev; Radiation Protection Institute, Ukraine*

CANCELLED **TPM-B.12**

2:30 - 3:30 pm Room: 22/23

TPM-C: Environmental

Co-Chairs: Geoffrey Eichholz and Edward Tupin

2:30 PM **TPM-C.1**
Estimates of Radiation Doses to Members of a Cohort Residing in Villages near the Semipalatinsk Nuclear Test Site. *S. Simon, K. Gordeev, A. Bouville, N. Luckyanov, C. Land, Z. Carr; National Cancer Institute, Institute of Biophysics, Moscow, Russia*

2:45 PM **TPM-C.2**
Residential TENORM in Upstate South Carolina. *R.L. Woodruff, T.A. DeVol; Clemson University*

3:00 PM **TPM-C.3**
A Three-Dimensional Indoor Aerosol Transport Model. *E. Sajo, S. Raja; Louisiana State University*

3:15 PM **TPM-C.4**
Overview of CDC's Ongoing Review of Historical Operations at Los Alamos. *T. Widner, J. Buddenbaum; ENSR International*

3:30 PM **BREAK**

4:00 - 5:45 pm Room: 22/23

TPM-C: Decommissioning

Co-Chairs: Steven Simon and William Passetti

4:00 PM **TPM-C.5**
NRC MARSSIM-Lessons Learned - Technical Reviewer's Point of View. *J.-C. Dehmel, S. Schneider; US Nuclear Regulatory Commission - Washington, DC*

4:15 PM **TPM-C.6**
Benefits of Using ANSI/HPS N13.12-1999. *P.S. Stansbury, D.J. Strom; Pacific Northwest National Laboratory*

Tuesday

4:30 PM **TPM-C.7**
An Investigation of Resuspension Factors During the Decommissioning, Decontamination, and Demolition of a U.S. Department of Energy Facility. *T.A. Brock, D.J. Strom, P.S. Stansbury; Oregon State University, Pacific Northwest National Laboratory*

4:45 PM **TPM-C.8**
Application of a Stochastic Resuspension Factor Model in an Urban Environment. *C. Miller; Centers for Disease Control and Prevention*

5:00 PM **TPM-C.9**
Problems Encountered During the Radiological Remediation of Old Buildings. *K. Krieger, R. Cornell, D. Schillings; Earth Tech Inc*

5:15 PM **TPM-C.10**
An Approach to Decommissioning a Medical Research Facility. *V. Evdokimoff; Boston University Medical Center*

5:30 PM **TPM-C.11**
GTRR Decommissioning: Lessons Learned. *R.D. Ice, N.E. Hertel; Georgia Institute of Technology*

2:30 - 5:00 pm Room: 24/25

TPM-D: Medical Health Physics

Co-Chairs: Mike Grissom and Kelly Classic

2:30 PM **TPM-D.1**
Research Radiation Studies: Improving Informed Consent. *L. Coronado, S. Googins; National Institutes of Health*

2:45 PM **TPM-D.2**
Informing Research Subjects about Radiation. *K. Austin, L. Coronado, S. Googins; National Institutes of Health*

3:00 PM **TPM-D.3**
Challenges of Calculating Effective Dose. *S. Googins, L. Coronado; National Institutes of Health*

3:15 PM **BREAK**

3:45 PM **TPM-D.4**
Patient ALARA Program for Monitoring Fluoroscopy Times in Cardiac Services. *C. Plott, G. Renaldo, B. Reichert, G. Milner, M. Reece; Forsyth Medical Center, University of North Carolina at Chapel Hill*

4:00 PM **TPM-D.5**
Patient Radiation Dose in Percutaneous Vertebroplasty. *B. Schueler; Mayo Clinic*

4:15 PM **TPM-D.6**
A Dose Comparison of CR and DR Chest Examinations of Pediatric Patients. *K. Johnson, D. Hintenlang; University of Florida*

4:30 PM **TPM-D.7**
Cardiovascular CT Dosimetry - Update. *M.R. Sarder, T.T. Yoshizumi, P.C. Goodman, R.E. Reiman; Duke University Medical Center*

4:45 PM **TPM-D.8**
Comparison of Fetal Radiation Exposures from Helical CT and Ventilation Perfusion Scintigraphy for the Diagnosis of Pulmonary Embolism in Pregnant Patients. *M. Sheetz, D. Whitt, J. Rosen, R. Shah; University of Pittsburgh, Magee Womens Hospital*

2:30 pm Room: 3/4

Decommissioning Section Meeting

4:00 pm Room: 5/6

Radon Section Meeting

Wednesday

7:15-8:15 AM **Room: 18/19**
CEL-5 Updated Internal Radiation Dosimetry; ICRP Publication 68. *D. Bernhardt; Salt Lake City, Utah*

7:15-8:15 AM **Room: 20/21**
CEL-6 Depleted Uranium, Why Public Concern Is So Great? *E.G. Daxon; U.S. Army Medical Department*

8:30 am - Noon Room: Ballroom A/B

WAM-A: Government, Medical Health Physics, and RSO Section Plenary Session: Symposium on Homeland Security

Co-Chairs: R. Thomas Bell and Susan Masih

8:30 AM **WAM-A.1**
How Scientific Societies can Contribute to Homeland Security. *A. Brodsky, E. Bailey, C. Plott, K. Langley, B. Wilson, S. Masih, R.T. Bell; Science Applications International Corporation, Department of Health Services, CA, Forsyth Medical Center and University of North Carolina, Chapel Hill, University of Utah, University of Kentucky, Lexington, University of Missouri, Kansas City, MO, US Department of Energy, MD*

9:00 AM **WAM-A.2**
EPA's Activities in the Area of Homeland Security. *F. Marcinowski, US Environmental Protection Agency*

9:30 AM **WAM-A.2A**
Program Overview: Office for Domestic Preparedness. *K.L. Thomas, US Department of Justice*

10:00 AM **BREAK**

Understanding How Societies Can Contribute at All Government Levels

10:30 AM **WAM-A.3**
Observations on Government Response on 9/11. *F.J. Bradley; Health Physics Consultant*

10:45 AM **WAM-A.4**
How Can the States Contribute to Homeland Security. *E. Fordham; CRCPD, Inc.*

11:00 AM **WAM-A.5**
Example Programs at the State and County Level. *J. Wills; Ohio Department of Public Safety (Presented by A. Brodsky)*

11:15 AM **WAM-A.6**
Incorporating Homeland Security into Public Teacher Continuing Education. *M.E. McCarthy; University of Massachusetts - Amherst*

11:30 AM **Discussion**

Noon Room: Ballroom A/B

Government Section Business Meeting

12:15-2:15 pm PEP Program

2:30 - 5:45 pm Room: Ballroom A/B

WPM-A: Government, Medical Health Physics, and RSO Section Session: Symposium on Homeland Security

Co-Chairs: Ian Hamilton and Allen Brodsky

Educating the Public on Homeland Security

2:30 PM **WPM-A.1**
Adapting Recommendations of NCRP Report No. 138 to Education of the Public. *I. Hamilton, J.W. Poston, Sr.; Texas A&M University*

Wednesday

2:45 PM **WPM-A.2**
Preparation of a Concise Pamphlet for Citizen Protection and Fear Prevention. *A. Fentiman, A. Karam; The Ohio State University, University of Rochester*

3:00 PM **WPM-A.3**
Utilizing K-12 School and Higher Education Programs to Incorporate Homeland Security Topics for Public Education. *M.E. McCarthy; University of Massachusetts - Amherst*

3:15 PM **WPM-A.4**
A Practical Guide to Incident Response. *J.G. Barnes; Rocketdyne/Boeing*

3:30 PM **Discussion**

3:45 PM **BREAK**

Preparing Emergency Responders for Homeland Security

4:15 PM **WPM-A.5**
Hospital Preparations for Biological, Chemical and Radiation Terrorism. *K. Miller; Pennsylvania State Hershey Medical Center*

4:30 PM **WPM-A.6**
Lessons for Responders from Nuclear Weapons Tests and Radiation Accidents. *A. Brodsky, L.J. Deal, P.S. Harris, M. Stangler, M. Barbier; Science Applications International Corporation, Private Consultants*

4:45 PM **WPM-A.7**
Lessons Learned from the Early Health Physics Responders to the TMI Accident. *S. Porter, Jr., G. Lodde; Porter Consultants, Inc., Health Physics Consultant*

5:00 PM **WPM-A.8**
Lessons Learned from Expert Response Teams. *R. Toohey, R. Goans; Oak Ridge Institute for Science & Education*

5:15 PM **WPM-A.9**
Adapting NCRP Report No. 138 for Training First-Responders. *J.W. Poston, Sr., I.S. Hamilton; Texas A&M University*

5:30 PM **Discussion**

2:30 - 5:30 pm Room: 20/21

WPM-B: MARLAP

Co-Chairs: Carl Gogolak and John Griggs

2:30 PM **WPM-B.1**
An Overview of the Multi-Agency Radiological Laboratory Analytical Protocols Manual. *J. Griggs; US Environmental Protection Agency/NAREL, AL*

2:45 PM **WPM-B.2**
Data Quality Objectives and the Development of Measurement Quality Objectives. *C. Gogolak; US Department of Energy/EML, NY*

3:30 PM **BREAK**

4:00 PM **WPM-B.3**
Multi-Agency Radiological Laboratory Protocols Manual - the Selection and Application of an Analytical Method. *S. Morton; US Department of Energy/RESL, ID*

4:30 PM **WPM-B.4**
Multi-Agency Radiation Laboratory Protocols Manual - Summary and Applications of Chapters 5, 7 and 8. *D. McCurdy; Duke Engineering*

5:00 PM **Panel Discussion**

2:30 - 3:45 pm Room: 22/23

WPM-C: Radionuclide NESHAPs

Co-Chairs: John Glissmeyer and Andy McFarland

2:30 PM **WPM-C.1**
NESHAP Monitoring for On-site Receptors. *B. McElhoe; CDM Federal Services Inc.*

Wednesday

2:45 PM **WPM-C.2**
Deposition in the Stack Sampling System of a Research Facility. *M. Ballinger, D. Edwards, T. Gervais; Battelle Seattle Research Center, Battelle Pacific Northwest National Laboratory*

3:00 PM **WPM-C.3**
Effects of Particulate Deposition in Air Monitoring System - Case Study of an Aging Facility. *J. Glissmeyer, K. Hadley, L. Diediker; Pacific Northwest National Laboratory, Fluor Hanford*

3:15 PM **WPM-C.4**
Results of Mixing Experiments with Scale Models. *C.A. Ortiz, D.L. O'Neal, A.R. McFarland; Texas A&M University*

3:30 PM **WPM-C.5**
Aerosol Particle Losses in Compound Elements of a Transport System. *N. Ramakrishna, A. McFarland; Texas A&M University*

3:45 PM **BREAK**

4:15 pm Room: 22/23

Joint Radionuclide NESHAPs Annual Meeting

2:30 - 4:00 pm Room: 24/25

WPM-D: Medical HP Section Session: Shielding for Medical Facilities

Co-Chairs: Kenneth Kase and Jean St. Germain

2:30 PM **WPM-D.1**
Diagnostic X-ray Shielding; An update from NCRP SC-9. *D.J. Simpkin; St. Luke's Medical Center*

3:00 PM **WPM-D.2**
Shielding of Medical Accelerator Facilities. *K. Kase; Stanford Linear Accelerator*

3:30 PM **WPM-D.3**
Shielding of HDR, IVB and PET/CT Facilities. *J. St.Germain; Memorial Sloan-Kettering Cancer Center*

4:00 PM **BREAK**

4:30 - 5:30 pm Room: 24/25

WPM-D: Medical HP and Government Section Session: Regulation in Medicine

Co-Chairs: Richard Vetter and Tom Bell

4:30 PM **WPM-D.4**
The Advisory Committee on Medical Use of Isotopes - a Health Physicist's Perspective. *R. Vetter; Mayo Clinic*

5:00 PM **WPM-D.5**
The Role of a State Program in Quality Assurance? The New Jersey Experience. *M. Moore, J. Lipoti; NJ Commission on Radiation Protection, NJ Department of Environmental Protection*

2:30 - 3:30 pm Room: 18/19

WPM-E: Regulatory/Legal Issues

Co-Chairs: John Hageman and Ed Bailey

2:30 PM **WPM-E.1**
The Trefoil Needs Help. *B. Dodd; IAEA, Austria*

2:45 PM **WPM-E.2**
US Nuclear Workers, Ethics, and the Compensating Wage Differential. *K. Shrader-Frechette; University of Notre Dame*

3:00 PM **WPM-E.3**
Experience with Initial Implementation of EP Reactor Oversight Process. *R. Sullivan; US Nuclear Regulatory Commission, DC*

Wednesday

3:15 PM **WPM-E.4**
Closure of Files on Formerly Terminated AEC Licensed Sites in Colorado. *R. Terry; Colorado Department of Public Health and Environment*

3:30 PM **BREAK**

4:00 - 4:45 pm Room: 18/19

WPM-E: Waste Management

Co-Chairs: Ruth McBurney and Linda Morris

4:00 PM **WPM-E.5**
The Use of an Agitator to Decrease Residual Activity of Long Lived Contaminates in the Y-90 Therasphere Delivery Device. *V. Gates, C. Schultz, R. Salem, H. Dworkin; William Beaumont Hospital*

CANCELLED **WPM-E.6**

4:15 PM **WPM-E.7**
Radiation Streaming and Skyshine Assessment for a LLW Assured Isolation Facility. *M. Arno, I. Hamilton; Texas A&M University*

4:30 PM **WPM-E.8**
Influence of Source Material and Solids-to-Water Ratio on Cesium Leaching from Cement. *J. Sessoms, D. Stephenson, W. Johnson, M. Rudin; University of Nevada - Las Vegas*

5:45 - 6:30 pm Room: 24/25

HPS Business Meeting

Followed at 6:30 pm by:

A 30-40 minute presentation: **Orphan Source Recovery in Georgia** about the history of orphan source problems in Georgia and particularly the Radioisotopic Thermoelectric Generators (RTGs). A short videotape showing the recovery of the two unshielded 40,000 Ci sources discovered by woodcutters over Christmas will be played. Two of the woodcutters are still critically ill.

ADJUNCT TECHNICAL MEETING

6:30 - 8:30 pm Marriott Hotel Grand Ballroom C/D

Aerosol Measurements
(all presentations are 15 minutes except where noted)

Chair: Morgan Cox

Anthrax and Smallpox to Plutonium and Uranium- Understanding Aerosol Dispersion and Human Exposure. *M. Hoover; NIOSH* **(30 minute presentation)**

Monitoring a Process Facility Stack for Radon Emissions. *D. Draper, B&W Services*

Operating Experience with the Eberline Alpha-7L CAM at LANL. *D. Wannigman, J.T. Voss; Los Alamos National Laboratory*

Current Status of ANSI N323C. *M. Johnson, M. Hoover; PNNL, NIOSH*

A Comparison of Personnel Air Sampling and Bioassay Data. *R. Redmond; Y-12, Oak Ridge, TN*

Use of Alpha Spectroscopy to Increase Internal Dosimetry Program Sensitivity. *M. Ford; Pantex Plant*

Operating Experience with the LANL Critical Flow Control Orifice in Aerosol Sampling. *T.J. Voss, M. Hoover; Los Alamos National Laboratory, NIOSH*

Wireless Modbus Network of Alpha/Beta Air Monitors with Spectral Capabilities. *S. Lopez; MGPI*

Thursday

7:15-8:15 AM **Room: 18/19**
CEL-7 Basics of PET. *J. Jacobus; National Institutes of Health*

7:15-8:15 AM **Room: 20/21**
CEL-8 Current Status of Agents used in Nuclear Medicine Therapy. *M. Stabin; Vanderbilt University*

8:30 am - Noon Room: 18/19

THAM-A: Probability of Causation

Co-Chairs: F. Owen Hoffman and Charles Land

8:30 AM **THAM-A.1**
Report of the NCI-CDC Working Group to Revise the 1985 NIH Radioepidemiological Tables: Overview. *C. Land, E. Gilbert, J. Smith, O. Hoffman, I. Apostoaei, B. Thomas; National Cancer Institute, Centers for Disease Control and Prevention, SENES Oak Ridge, Inc.*

9:00 AM **THAM-A.2**
The Role of Uncertainty Analysis in Estimating the Probability of Causation of Radiogenic Cancer. *F.O. Hoffman, A.I. Apostoaei, B. Thomas, C. Land, E. Gilbert; SENES Oak Ridge, Inc., National Cancer Institute*

9:15 AM **THAM-A.3**
Relative Biological Effectiveness Factors for Different Radiation Types. *D.C. Kocher, A.I. Apostoaei, F.O. Hoffman; SENES Oak Ridge, Inc.*

10:00 AM **BREAK**

10:30 AM **THAM-A.4**
Transfer of Risk between Populations Applied to Estimating Probability of Cancer Causation. *A.I. Apostoaei, F.O. Hoffman, B. Thomas, C. Land, E. Gilbert; SENES Oak Ridge, Inc., National Cancer Institute*

10:45 AM **THAM-A.5**
National Academy of Sciences Review of IREP—A Committee Member's View. *D. Stram; University of Southern California - Los Angeles*

11:15 AM **THAM-A.6**
Results for Specific Case Studies using the Interactive Radioepidemiological Program (IREP). *B. Thomas, F.O. Hoffman, A.I. Apostoaei; SENES Oak Ridge, Inc.*

11:45 AM **Discussion**

8:30 - 11:30 am Room: 20/21

THAM-B: Our Role in Reducing Terror from a Radiological Incident

Co-Chairs: Eric Daxon and Ray Guilmette

8:30 AM **THAM-B.1**
Science Is Not Enough. *E. Daxon; U.S. Army*

9:00 AM **THAM-B.2**
Canada, Depleted Uranium, and Belief Systems. *K. Scott; Canadian Forces Medical Services*

9:30 AM **THAM-B.3**
Uranium Mining: a Legacy of Fear in Navajo Communities. *T. Coons; Saccomanno Research Institute*

10:00 AM **BREAK**

CANCELLED **THAM-B.4**

10:30 AM **THAM-B.5**
Helping to Prevent Terror Following a Radiological Incident. *C. Salter; Armed Forces Radiobiology Research Institute*

11:00 AM **THAM-B.6**
Getting Past Risk Communication. *J. Graf; Los Alamos National Laboratory*

Thursday

8:30 - 11:15 am Room: 22/23

THAM-C: RSO Section Session

Co-Chairs: Mack Richard and Paul Lavely

8:30 AM **THAM-C.1**
A Model to Determine if External Personnel Monitoring is Required in a Research Laboratory. *D. Burkett, C. Elam, D. Anglin; Vanderbilt University*

8:45 AM **THAM-C.2**
Statisical Validation of a Commonly Used Method for Personnel Dosimetry Issuance Determinations. *R.A. Gorham, R.J. Emery; University of Texas - Houston*

9:00 AM **THAM-C.3**
Conceptual Method to Dispose of Low Enriched Radioactive Materials in Waste at a Permitted Commercial Disposal Facility. *D. Draper, M. Morris, J. Newburn; BWXT, Nuclear Fuel Services, IT Group*

9:15 AM **THAM-C.4**
A Project Teams Approach for Improving Radiation Safety Programs. *B. Edwards; Duke University*

9:30 AM **BREAK**

10:00 AM **THAM-C.5**
Cause and Effects of a Cease and Desist Order. *M. Reynolds; Western Kentucky University*

10:15 AM **THAM-C.6**
Tropical Storm Allison's Inundation of a 40 Mev University Cyclotron. *R. Emery; University of Texas Health Science Center at Houston*

10:30 AM **THAM-C.7**
Radiation Safety Issues in Large Open Laboratories. *V. Morris; University of Cincinnati*

10:45 AM **THAM-C.8**
Release Criteria for I-131 Therapy Patients. *M.L. Richard; Indiana University Medical Center*

11:00 AM **THAM-C.9**
Training for New RSOs - What is Most Important? *R. Johnson; Radiation Safety Academy*

11:15 am Room: 22/23

RSO Section Meeting

8:30 - 11:00 am Room: 24/25

THAM-D: The History and Development of Portable Gamma Spectrometers: Use and Practical Applications

Co-Chairs: Syd Porter and Stanley DeFilippis

8:30 AM **THAM-D.1**
A Historical Perspective on the Applications of *in situ* Gamma-Ray Spectometry. *K. Miller, P. Shebell; US Department of Energy Environmental Measurements Laboratory, NY*

8:45 AM **THAM-D.2**
in-situ Germanium Gamma Spectrosocopy, Where We Are; How We Got Here; and Where We Are Going. *F. Bronson; Canberra*

9:00 AM **THAM-D.3**
Performance Standard on the Calibration of Germanium Detectors for *in-situ* Gamma Ray Measurements. *P. Shebell; US Department of Energy Environmental Measurements Laboratory, NY*

9:15 AM **THAM-D.4**
SAM's Birth and Milestones to Maturity. *J. McQuaid; Berkeley Nucleonics Corp.*

9:30 AM **THAM-D.5**
History of Portable Germanium Detector Spectroscopy Systems. *R. Keyser, T. Twomey; ORTEC*

9:45 AM **BREAK**

CANCELLED **THAM-D.6**

10:15 AM **THAM-D.7**
Development and Use of Multipurpose Handheld Gamma Spectrometers. *R. Arlt, J. Stein, J. Fellinger, F. Lueck, A. Kreuels; International Atomic Energy Agency, Austria, target systemelectronic GmbH*

10:30 AM **THAM-D.8**
The Evolution of Multi-Detector Spectrometer Systems for Field Applications. *J. Cox; Canada*

10:45 AM **THAM-D.9**
The Use of Hand Held Gamma Spectrometers in Law Enforcement. *K.E. Duftschmid; Techn. University Graz, Austria*

12:15-2:15 pm PEP Program

AAHP Courses

Saturday, June 15, 2002 – 8:00 am-5:00 pm

AAHP COURSE 1
RADIOACTIVITY IN RECYCLED MATERIALS AND MUNICIPAL AND RESIDUAL WASTE. ***Tony LaMastra, Health Physics Associates, Inc.***

This course will discuss the types and forms of radioactivity likely to be present in recycled materials and in waste traditionally considered to be non-radioactive, monitoring methodologies being used and the problems introduced by the monitoring of these recycling and waste streams for radioactivity, likely detection efficiencies, current and proposed management approaches, including the proposed NCRP report, Managing Potentially Radioactive Scrap Metal. If available, a copy of the NCRP report will be distributed.

AAHP COURSE 2
FOOD IRRADIATION TECHNOLOGY. ***Daniel L. Engeljohn, US Department of Agriculture, Washington, DC***

This session will discuss the role food irradiation can play in reducing foodborne illness and in increasing the availability of exotic fruits and vegetables. Information will be presented on the concepts underlying the food irradiation process, as well as the operational issues associated with implementing the technology, providing government oversight, and educating the food industry and consumers about the technology.

AAHP COURSE 3
APPLICATION OF ANSI/HPS N13.1-1999: SAMPLING AND MONITORING RELEASES OF AIRBORNE RADIOACTIVE SUBSTANCES FROM THE STACKS AND DUCTS OF NUCLEAR FACILITIES. ***John Glissmeyer, Pacific Northwest National Laboratory.***

This course will cover the content of the standard ANSI/HPS N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities.* Subject areas that will be addressed include:

- Objectives and approaches for sampling programs
- Qualified sampling locations
- Sampling system design
- Quality assurance and control
- Misconceptions about the size of particulate material in nuclear facilities
- Sample collection, and
- Special considerations for sampling radioiodine and tritium.

Class exercises will explore the basic concepts of estimating potential uncontrolled plant emissions, the collection and interpretation of contaminant mixing data and flow characterization data, estimating particle line loss, and the parameterization of scale model tests. Class attendees will be able to apply the concepts to their own facilities.

Professional Enrichment Program

Sunday, June 16 Through Thursday, June 20, 2002

The Professional Enrichment Program (PEP) provides a continuing education opportunity for those attending the Health Physics Society Annual Meeting. The topics for the PEP are specifically chosen to cover a broad range of subjects. Some of the sessions are popular repeats from last year and the rest are completely new lectures in response to your suggestions. 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. The class size is limited to allow for interaction between the lecturer and the students.

The speakers, course titles, and the times for each presentation are listed on the following pages. On Sunday, June 16, the day before the Annual Meeting, a series of 30 courses will be offered. The Sunday sessions begin early to allow for 3 sessions that day. The program begins at 8:00 am and finishes at 4:00 pm. The Welcome Reception begins at 6:00 pm.

In addition to the above-mentioned sessions for Sunday, six PEP lectures are scheduled on Monday, Tuesday, Wednesday, and Thursday afternoons. Routine PEP attendees should note that the times of the mid-week sessions are 12:15 - 2:15 p.m. again this year, to be consistent with the scheduling of the Annual Meeting.

Registration for each two-hour course is $40 and is limited to 60 attendees on a first-come, first-served basis. Those whose registrations are received before the pre-registration deadline will be sent confirmation of their PEP course registration.

In order to further the Society's commitment to the next generation of Health Physicists, 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.

Continuing Education Credits from the American Academy of Health Physics have been granted for the PEP. Each course is two (2) hours in length and will earn four (4) continuing education credits.

Please Note!!

Please remember to 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. We understand that there are circumstances that will prevent you from being on time, but we do not want to turn people away and have empty seats due to no-shows.

Sunday, June 16 8:00-10:00 am

1-A Currently Applicable ANSI and International Standards for Health Physics Instruments. ***M. Cox; Santa Fe, New Mexico***

This interactive presentation is a brief review of American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC) standards covering health physics instrumentation. This review includes the status of revised and new standards demanded by new technology, more restrictive regulation or a combination of both. The initial focus is on a discussion of the various standards organizations, how they function, composition of membership, scope and objectives, schedules and timelines and the impacts of these standards. Next the review covers the standards encompassing some of the various types of health physics instrumentation, including portable survey meters with various levels of sensitivity for various applications, aerosol monitors and samplers, installed radiation monitoring systems such as the wide variety of contamination and area, personnel and equipment types, plus special monitors such as those used for tritium and noble gases, radon and radon progeny. Other types of health physics instruments covered include personnel, area and environmental dosimeters. Audience participation is necessary for the overall success of this presentation. This brief summary is augmented with more details of several important standards in an "HP instruments standards workshop" which follows shortly.

1-B NEPA Strategy and Analysis: The Health Physicist's Perspective. ***T. Ikenberry; Dade Moeller & Associates, Inc.***

An important step in the progress of large Federal projects is the analysis of potential environmental impacts required by the National Environmental Policy Act (NEPA). This presentation examines the NEPA process and analyses from the health physicist's perspective, focusing on the evaluation of environmental impacts of projects where radiation or radioactive materials may be produced, stored, handled, or disposed. A brief introduction to NEPA and the NEPA process is provided, then activities and strategies are examined that a health physicist would employ in preparing the prospective analysis for an environmental assessment or environmental impact statement. The potential impacts from several different alternative actions may need to be examined, and the differences between them clearly explained. For example, a "no action" alternative may differ considerably from several prospective "actions". Typically a health physicist would mainly be concerned with the radiation dose to the public and workers from releases of man-made radioactive material or direct exposure to man-made radiation from the proposed operations, but under NEPA this involvement may include a much wider range of health and safety evaluations. The evaluation and description of "cumulative" impacts often represents a particular challenge. Because the NEPA process has a strong public involvement aspect, writing in a manner readily understood by the public is very important, as is interacting with members of the public at public meetings and responding to public comments both formally and informally.

1-C The History of Release Criteria: From de minimis to BRC, to Clearance. ***W. Kennedy; Dade Moeller & Associates, Inc.***

Over the past forty years, attempts have been made by several organizations to develop and define a lower level for radiation protection dealing with trace amounts of either surface or bulk radioactive contamination. Release criteria are important both in terms of metal recycle from nuclear facilities, and for establishing general criteria for the release of materials from radiological control. Early attempts included those of the Atomic Energy Commission (AEC) to develop Regulatory Guide 1.86 and the early efforts of the Health Physics Society, with the American National Standards Institute (ANSI) to develop early drafts of ANSI Standard N13.12. On the international front, early efforts included those of the International Atomic Energy Agency (IAEA) to develop de minimis concentrations, first for ocean disposal, then later for disposal of material to municipal landfills. More recent efforts include the U.S. Nuclear Regulatory Commission's attempts to develop a "Below Regulatory Concern" policy, the IAEA's program on Clearance, and the final ANSI Standard N13.12 on "Surface and Volume Radioactivity Standards for Clearance." The purpose of this course is to provide an historical overview of the evolution of release criteria, both in the United States and abroad, as applied to surface and volume radioactive contamination.

1-D U.S. Environmental Protection Agency's Risk Assessment Methodology for Radioactive Contaminants. *A. Fellman; CSI - Radiation Safety Academy*

Under the Superfund law, the U.S. Environmental Protection Agency (EPA) must establish the existence of an unacceptable risk to human health and/or the environment prior to authorizing the expenditure of resources for site remediation. Absent such a risk, a site is ineligible for cleanup under the Superfund remedial program.

EPA has published several Risk Assessment Guidance (RAGs) documents which detail the approved methodology for performing quantitative risk assessments at Superfund sites. This PEP session will consist of a review of the major elements of a risk assessment as described in the RAGs methodology, including identification of radionuclides of concern, determination of exposure point concentrations, and analysis of environmental pathways, future use scenarios, and exposure pathways. The various sources of uncertainty will also be discussed.

Students should bring a calculator to this PEP session. During the second hour, students will be asked to work (in groups) on a sample problem to evaluate the magnitude of risk posed by radionuclide contamination of soil and groundwater.

1-E Accelerator Radiation Safety. *V. Vylet; Duke University*

The purpose of this course is to examine general aspects of radiation safety programs at accelerator facilities. The topics described include: characterization of radiation hazards and implications for facility design, principles of safety system design and implementation, radiation monitoring and instrumentation, operational and administrative aspects. Since the scope of a particular program will greatly depend on the type and size of a facility, we will illustrate the above aspects with examples from several existing accelerator installations in medical, university and DOE settings. The course will include a brief overview of existing guidance documents and recommended literature.

1-F Introduction to MARLAP. *P. Frame; Oak Ridge Institute for Science and Education*

MARLAP (Multi-Agency Radiological Laboratory Analytical Protocol) is a manual currently being developed by a multi-agency committee. In some ways

it can be considered a laboratory counterpart to MARSSIM. MARLAP, however, does not restrict itself to the decommissioning arena. Its intent is to provide guidance for "the planning, implementation, and assessment of projects that require the laboratory analysis of radionuclides." At present the document is in draft form. The expectation is that a final version, not significantly different from the draft, will be released by the summer of 2002. This presentation will focus on Part I of the manual which is primarily intended for project planners and managers. Part II, which will not be covered, provides a general overview of the various options for the laboratory analysis of radionuclides and the related technical issues. Topics that will be reviewed include:

- The Directed Planning Process
- The development of a Statement of Work (including the Measurement Quality Objectives and the Analytical Protocol Specifications). Of necessity, this will require a brief consideration of the gray region, and the acceptable rates of Type I and Type II errors.
- The selection of the analytical protocols.
- The evaluation of the contracting laboratory.
- Data evaluation (including data validation and verification).

This program assumes that the attendees have no working knowledge of MARLAP and are basically unfamiliar with the data quality objectives process, data validation, data verification, etc.

1-G Military Uses and Exposures to Depleted Uranium. *M. Melanson; U.S. Army Medical Department*

The United States Department of Defense used depleted uranium anti-armor munitions for the first time during the 1991 Persian Gulf War (Operation Desert Storm) and more recently the North Atlantic Treaty Organization (NATO) conducted airstrikes in Bosnia and Kosovo using depleted uranium munitions. It is also used in armor on the Abrams series tanks. Since its first use in combat, it has been labeled as everything from "nuclear waste" to the "silver bullet" that won the Gulf War. Depleted uranium has been allegedly linked to illness in Gulf War Veterans, to cancers in Iraq, and to widespread environmental poisoning in the Balkans. During this presentation, the military aspects of depleted uranium use in munitions and armor will be explained. Also, the Army's effort to assess uniquely military exposure scenarios will be presented to include a discussion on the challenges of sampling depleted uranium airborne concentrations during the violent penetration of armor by depleted uranium penetrators. The talk will also highlight the speaker's observations of the international scientific efforts to assess the health and environmental impacts of depleted uranium by the International Atomic Energy Agency, the United Nations, and the World Health Organization and his insights into the ongoing international political controversies surrounding this unique metal.

1-H Facility Decommissioning Surveys: Instrumentation Selection and Survey Strategies. *S. Brightwell; Professional Radiation Consulting, Inc.*

Radiation detection instrumentation consists of useful and integral components for radiological facility assessment and decommissioning processes. With the newly promulgated decommissioning rule establishing cleanup criteria that are in the range of background radiation levels, close attention must be paid to the selection and operational parameters of instrumentation. The consequences of poor instrumentation selection or setup could include releasing a facility that exceeds the release criteria, or performing unnecessary/expensive remediation of a facility that meets the release criteria.

Equally as important as the selection of instrumentation are the survey methods for which they are put to task. In recent years, the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) has become the standard for performing statistically based decommissioning surveys. Although its utility is unquestionable, even those who developed MARSSIM readily agree that it is not all encompassing, and that there are certainly other viable and statistically defensible survey methods that may be less expensive based on facility-specific radiological conditions.

This PEP session focuses on strategies for selecting radiation detection instrumentation and subsequent survey methods for performing effective and economical facility surveys based on facility-specific radiological conditions.

1-I Analysis of Radiotherapy Misadministrations: Sources of Problems, Lessons to be Learned. *B. Thomadsen; University of Wisconsin - Madison*

Health care organizations and the general public have become much more aware of mistakes happening in medical settings. Gathering data on errors is most often a difficult problem, since, for many reasons, hospitals are reluctant to share that information. The reports of misadministrations involving radioactive materials to the U.S. Nuclear Regulatory Commission offer a unique opportunity to investigate errors in a small set of medical procedures across institutions. This presentation discusses an analysis of the reported misadministrations involving brachytherapy.

For each event, the investigators talked with one of the physicists involved to clarify details that may not have been accurate in the NRC release. Physicists at only two facilities refused comment. The events were studied by a health physicists and an industrial engineer using the tools the should be applied in any event analysis as now required by the Joint Commission on Accreditation of Healthcare Organizations. The process will be discussed during the presentation.

For high dose-rate brachytherapy, the most significant cause of errors involved failure to change default settings for the treatment distance. For all types of brachytherapy, using factors in the calculation based on the wrong source strength quantities commonly lead to errors. Ineffective use of verification procedures often accompanied other errors allowing the events to occur.

Events are almost always due to multiple causes. The findings of the analysis correspond closely with those of studies in other fields requiring high accuracy, such as aviation.

1-J Laser Safety Basics (Lasers Part 1). *T. Johnson; Uniformed Services University*

This class is designed to familiarize attendees with basic laser operation, the electromagnetic spectrum and laser terminology. Common uses of lasers will be discussed, along with the hazards associated with each. Laser pointers, supermarket scanners, laser printers and surgical laser hazards and their potential for injury will be presented. The laser classification system and photo-biology basics will also be covered. The class will assume no prior knowledge of lasers. Class objectives:

- Understand how a laser works and basic laser terminology
- Recognize the hazards associated with the different classes of lasers

- Understand which types of lasers present the most immediate hazard
- Determine the sensitive tissue for different laser wavelengths

Sunday, June 16 10:30 am-12:30 pm

2-A Health Physics Instruments Standards Workshop. *M. Cox (moderator) and several other instruments standards experts*

This "workshop" is a logical sequel to the earlier PEP course covering ANSI and IEC health physics instruments-related standards. Here the panel of standards experts goes into more detail for some of the more important instrument standards to health physicists. Some of the specific ANSI standards covered are: ANSI N323A for portable survey meters; 323B covering portable survey meters for near background measurements; 323C for aerosol sampling and monitoring; 323D for fixed or installed radiation monitoring systems such as contamination and area monitors; ANSI N42.17A for portable survey meters and N42.17B for aerosol monitoring; ANSI N42.20 for alarming electronic dosimeters; ANSI N42.18 covering on-site aerosol monitoring; and ANSI N320 for emergency level monitoring following a nuclear reactor accident. Some of the IEC instrument standards that can be included are those related to radioactive aerosol measurements, liquid measurements and aerial surveillance of terrestrial gamma ray sources. Audience participation is a must for this workshop.

2-B New Regulations and Guidance for Dealing With Radioactivity in Solid Waste in Pennsylvania. *D. Allard; Pennsylvania Dept. of Environmental Protection*

The Pennsylvania Department of Environmental Protection has the responsibility for protecting the health and safety of the citizens in the Commonwealth, and the environment, from hazardous material contaminants. This includes most sources of radiation. With increasing frequency, radioactive material (RAM) is detected in municipal and residual solid waste by radiation monitors installed at processing and disposal facilities. The vast majority of the detection events are due to short-lived nuclear medicine radionuclides (e.g., I-131, Tc-99m, Tl-201, etc.). However, often naturally occurring radioactive material (NORM), technologically enhanced NORM, consumer products with RAM, or lost sealed sources (e.g., Ra-226, Cs-137, Ir-192) are detected. These materials that set off facility radiation alarms may be regulated through specific or general license, but more likely are deregulated, exempt or unregulated. Additionally, in the past there have been no federal or state regulatory requirements to have radiation monitors at solid waste facilities, nor standards for alarm set point, system background limit, or gamma energy discrimination level. Regardless of the probable type of RAM in the solid waste (i.e., short-lived medical radionuclides), Department Radiation Protection Program staff promptly respond to numerous alarms on a weekly basis. This has caused a measurable impact on other program activities, such as x-ray equipment and RAM user inspections. With the potential for serious impact on human health, safety and the environment from some types of RAM found in the solid waste stream, the Department Bureaus of Radiation Protection and Land Recycling & Waste Management have jointly developed regulations requiring monitoring for radiation and radioactive materials at all municipal and residual solid waste facilities in Pennsylvania. A comprehensive guidance document has also been developed for the regulated community, to assist with implementation during a 2-year transition phase. This presentation describes the nature of the problem, program experience, new regulatory limitations and radiation monitoring requirements, and alarm set point and equipment standards. Also outlined are the required facility Action Plan, instrumentation performance checks, training and records, and the public dose limits that will be applied to operations and effluents. A graded response to alarms at two radiation Action Levels, with appropriate onsite RAM characterization, is expected to allow facilities and the Department to more effectively manage the radioactive materials that might be discovered in solid waste.

2-C Environmental Radiation Exposure Litigation, Part 1. ***R.H. Johnson; Schmeltzer, Aptaker & Shepard, P.C.***

This is the first of two lectures concerning environmental radiation litigation. Two case studies (based on actual cases), the first involving a uranium mill and the second involving petroleum production activities, will be used to discuss this type of litigation. This lecture will focus on lawyers and health physicists working together on issues involving radiation measurements, dose calculations, the preparation of expert reports, deposition and trial testimony. Special emphasis will be placed on the vital role of health physicists as consultants and/or expert witnesses during the investigatory, discovery and trial phases of radiation lawsuits. Procedures for the effective direct and cross-examination of scientific witnesses will be considered. Methods used for persuasively communicating these scientifically complicated concepts to jurors and the general public will be demonstrated.

2-D Fundamentals of External Dosimetry. ***H. Prichard; Auxier & Associates, Inc.***

CANCELLED

2-E Introduction to Food Irradiation. ***G. Claycamp; US Food and Drug Administration***

Food irradiation has been used for decades to preserve foods, inhibit sprouting in roots, and to reduce or eliminate contamination by harmful bacteria, yeasts and molds. While the safety of irradiated food for human consumption is grounded in peer-reviewed research spanning nearly a century, the public has been slow to accept ionizing radiation in routine food processing. Nevertheless, outbreaks food-borne illness and concern about bioterrorism have fueled interest in the topic, in turn suggesting that continued expansion of food irradiation is on the horizon. The overall objective of the course is to provide health physicists with a basic background and resource material on food irradiation. The course will begin with a review of fundamental radiobiology and the physicochemical aspects of irradiated animal and plant tissues. These topics will be followed by an examination of the efficacy of ionizing radiation in inactivating pathogens and the likelihood that toxicants could be formed as unwanted by-products of irradiation. A brief look at the myriad of regulations governing food quality and safety will be presented. Finally, benefits and risks from food irradiation will be presented in the final portion of the course, including consideration of both real and perceived health risks to the public and to radiation workers. (The opinions expressed here are those of author and do not represent opinion or policy of the FDA.)

2-F Backgrounds, Detection Limits, and Treatment of Uncertainties in Survey Data, Part 1. ***J. Shonka; Shonka Research Associates, Inc.***

This course will review the basic statistical elements of radiation detection and data analysis. It will provide users with the means to evaluate and treat the data from surveys and to assess the technical adequacy of a survey program. These methods, not in common use, include the establishment of the inherent background in any survey unit without the direct need for comparison to reference areas, and an efficient sorting method that can provide direct evidence for the presence (or absence) of contamination, permitting consideration of additional confirmatory measurements. Methods to control and limit the uncertainties of radiation measurements using commonly available instrumentation will be discussed.

The MARSSIM tests are relatively insensitive for the detection of small quantities of localized radiation, as their emphasis is on comparisons of differences. MARSSIM stresses the need for scan surveys to assure that localized sources of contamination are identified and considered. More sensitive tests can be performed using simple graphical techniques. These tests will be demonstrated using real survey data. The course will show that a properly performed survey is an element of an overall program of contamination control that exploits a defense in depth approach that includes taking credit for the multiple surveys normally performed in the course of routine operations or decommissioning.

Part I of this course includes tutorials on normal and log-normal statistics and plotting of survey data. Factors that create large uncertainties in survey data will be described. Methods for separating background readings from areas of contamination will be demonstrated.

2-G Radioactive Materials Transportation, Part 1. ***S. Austin; CSI - Radiation Safety Academy***

This session is Part 1 of a two-part series. This session will review Nuclear Regulatory Commission and Department of Transportation regulations concerning the transportation of radioactive materials. During this first part we will review DOT and NRC requirements for training of HAZMAT employees, classification of hazardous materials, DOT and NRC exemptions, normal form and special form radio active materials, limited quantities of materials and articles and instruments, low- specific activity shipments (LSA-I, LSA-II, LSA-III), and surface contaminated objects (SCO-I and SCO-II). We will review requirements for radioactive material packagings, design requirements for Type A packages, and labeling of radioactive material packages.

2-H Biological Defense Mechanisms Induced by Low Doses of Ionization Radiation. ***D.R. Boreham; Chalk River Laboratories***

Radiation protection practices are in place because exposure to large doses of ionizing radiation is known to cause harm to living organisms. Radiation can alter the genetic program contained within the DNA of living cells and if the genetic information is damaged or altered the cell may become cancerous. However, cells have evolved efficient mechanisms that protect their DNA and repair damaged DNA or eliminate cells that contain abnormal DNA.

The presentation will focus on two of these cellular protective mechanisms: the adaptive response and apoptosis. The adaptive response has been well characterized in many organisms including humans. When cells are exposed to small doses of radiation, they can subsequently undergo an adaptive response and increase their ability to repair carcinogenic damage. This transient cellular state of resistance is believed by some scientists to reduce the health risks associated with radiation exposure. Apoptosis, another cellular mechanism that is responsive to low doses of radiation, can also function to alter the biological outcome of radiation exposure. It is a genetically programmed form of cell death or cell suicide that can be selectively remove damaged cells from the population and therefore eliminate them as a potential cancer risk to the organism.

The implications of the above studies in radiation protection at low doses and dose-rates, near background radiation levels, will be discussed; particularly, the challenges that such studies pose to current radiation protection practices based on the Linear No-Threshhold (LNT) hypothesis.

2-I Recent Advancement of CT Technology and Associated CT Dosimetry in Adult and Pediatric Protocols. ***T. Yoshizumi; Duke University***

This is an introductory course for audiences with no special background in CT. Computed tomography (CT) has been revolutionized by the technical advances in the last ten years. Major advances include spiral CT in 1989 and multi-detector system in 1998. We now have CT fluoro and Cardiovascular CT in our clinical protocols. At the same time, we just began to understand substantially higher dose issues in multi-detector system.

This course will present:

(1) A brief review of CT history;
(2) A brief overview of recent technological advances in spiral CT and multi-detector CT;
(3) A review of various dose indexes such as CTDI, weighted CTDI, and dose-length product (DLP);
(4) A technical review of CT fluoro, cardiovascular CT, and associated dosimetry issues;
(5) A review of various CT dose estimation methods including a Monte Carlo method, manual hand calculations, and direct measurements;
(6) A review of current dosimetry issues in pediatric CT, CT fluoro, cardiovascular CT, and body CT;
(7) Fetal dose consultation in pregnant women - important points to remember in doing fetal dose estimation;
(8) A review of radiation risk issues from CT in recent months.

The student should expect to benefit from the course by gaining basic understanding of recent technological advances of CT, how to estimate organ doses from modern CT system, and more importantly where to look for information pertaining CT technology and CT dosimetry.

2-J Laser Safety Calculations (Lasers Part 2). ***T. Johnson; Uniformed Services University***

This class assumes attendees have taken the "Laser Safety Basics" class or have a working knowledge of laser terminology and the ANSI Z136.1 standard. Laser safety calculations have undergone significant changes in the latest revision of ANSI Z136.1-2000. Especially significant are changes to Table 5, multi-pulse calculations, and sub-nano second pulse limits. This class will give a brief overview of some of the changes in the standard, cover some examples of multi-pulse calculations utilizing all three of the latest techniques specified by Section 8, and review single pulse, NOHD and OD calculations in detail. Attendees will be presented with a set of laser exposure conditions and perform safety calculations on their own by the end of the session. Each attendee will need a calculator, capable of performing power calculations (t^0.75).

Class objectives:

- Be able to utilize Table 5 to find an MPE
- Calculate an MPE for a single pulse or simple multipulse laser
- Recognize factors that influence NOHD, OD and protective eyewear selection

Sunday, June 16 2:00-4:00 pm

3-A Some HP Instrument Electronics. ***M. Cox; Santa Fe, New Mexico***

Since the human senses cannot detect radiation, instrumentation has necessarily been developed to provide that vital capability. So, health physics instruments are among the most valuable tools used in the practice of the profession. This presentation is intended to offer the health physicist some perspective into the basic electronics used in these instruments. This paper will cover some of the types of instruments, detectors and electronics used in an illustrative and generic manner, with a minimum of circuit diagrams and specific designs. Many instrument manufacturers and suppliers are sensitive about the precise design of their products because of the keen competition that exists today. So, a few specific designs will be discussed. Some time will be devoted to analog designs of fairly longstanding plus some modern innovations, and otherwise effort will be devoted to current digital technology. Low current measurements will be highlighted, along with instrument stability with time, temperature and shock. Some currently applicable national and international standards for these instruments will be outlined. There will be plenty of time available for questions and answers.

3-B Implications of Proposed Future Human Tissue Studies of the USTUR. ***J.J. Russell; USTUR, Washington State University***

Cancer in a general sense, results from the alteration in the structure or rearrangement of genes that control normal cell growth. These genetic changes usually result from damage to DNA inflicted by environmental agents / insults including radiation. Thus, a human population with well-documented exposures to carcinogens could provide useful tissue samples for studying DNA induced damage of genes involved in cancer progression. Two population groups that meet this requirement are those exposed to the actinides or radium through occupational accidental intakes or medical application. Many of the radium dial painters developed bone cancer, primarily osteosarcoma or carcinoma of the paranasal and mastoid tissues. Because of the low natural incidence of these cancers, alpha particle radiation emitted by radium is ascribed to be the etiological agent. Thus, the USTUR registrant tissues, including those of the dial painters and Thorotrast patients, provide an unusual resource for the study of human tumor induction because, 1) the etiological agent is known; 2) quantitative dosimetry in tissues is possible; and 3) a correlation between a damaged DNA target or gene can be correlated with actinide or radium dose and or dose rate.

We will discuss several ideas that the Registries believe will help identify important biological targets and their dose response relationship to alpha radiation-induced human carcinogenesis. These ideas include:

a) biological effects of alpha radiation on cell division cycle control.
b) determine if alpha radiation induced DNA damage is due to alteration in the DNA excision

repair (ER) or mismatch repair (MMR) systems.
c) genomic instability
d) tumor suppressor genes

3-C Environmental Radiation Exposure Litigation, Part 2. *R.H. Johnson; Schmeltzer, Aptaker & Shepard, P.C.*

This is the second of two lectures concerning environmental radiation litigation. Two case studies (based on actual cases), the first involving a uranium mill and the second involving petroleum production activities, will be used to discuss this type of litigation. This lecture will focus on lawyers and health physicists (and other scientists interested in radiobiology) working together on issues involving epidemiology, medical causation, heath effects risk assessment, and related regulatory remediation standards. Courtroom confusion engendered by misapplication of the linear (no threshold) hypothesis will be examined. The current status of regulatory agencies' TENORM remediation standards will be outlined. Methods used for persuasively communicating these scientifically complicated concepts to jurors and the general public will be demonstrated.

3-D Radiation Dosimetry Management: Dosimeter Characteristics, Quality Assurance, and Investigations. *S. Perle; ICN Pharmaceuticals, Inc.*

In a litigation-prone society, it is prudent for any business to evaluate its potential exposure to legal action, initiated by either an employee or a member of the general public. This potential is exacerbated when the phobia of radiation exposure and radioactive materials is interjected into the equation. This phobia is fuelled by the perceived risks of radiation exposure, be they fact or fantasy. With the current cancer incidence rate being approximately 1 in every 2.5 individuals (for all types of cancer), it is imperative that all facilities take a proactive look at their business vulnerability. When radiation exposure is the issue, records documentation is a critical factor, and a significant amount of effort should be expended to implement a comprehensive records management system. A comprehensive Radiation Dosimetry Management Program is essential if a business is going to mitigate any regulatory or legal intervention. This PEP session will focus on the basic configuration of various types of dosimeters, i.e., TLD, film ,CR39 and criticality accident dosimetry, and the appropriate applications for which each should be selected for personnel use. Also addressed will be the appropriate Quality Assurance activities focused for each type of dosimeter, and, the appropriate requirements for investigations of dosimetry results, records quality management and software quality assurance.

3-E Radiation Quantities and Units: Their Evolution and Proper and Not Quite So Proper Usage and Applications. *R. Kathren; USTUR, Washington State University*

This PEP course examines the development of radiological quantities and units, showing how and why the current system of SI radiological quantities and units evolved and how the modern quantities and units relate and compare to their predecessors. Correct and proper application and usage of quantities and units will be stressed. Common errors, pitfalls, misuse, misapplication, and areas of abuse will be identified. The presentation is primarily descriptive with a minimum of mathematical rigor and topics considered will include the cgs and SI systems, quantities and units of activity, exposure-dose relationships, absorbed dose and kerma, dose equivalent quantities, and derivative and subsidiary quantities.

3-F Backgrounds Detection Limits and Treatment of Uncertainties in Survey Data, Part 2. *J. Shonka; Shonka Research Associates, Inc.*

This course will review the basic statistical elements of radiation detection and data analysis. It will provide users with the means to evaluate and treat the data from surveys and to assess the technical adequacy of a survey program. These methods, not in common use, include the establishment of the inherent background in any survey unit without the direct need for comparison to reference areas, and an efficient sorting method that can provide direct evidence for the presence (or absence) of contamination, permitting consideration of additional confirmatory measurements. Methods to control and limit the uncertainties of radiation measurements using commonly available instrumentation will be discussed.

The MARSSIM tests are relatively insensitive for the detection of small quantities of localized radiation, as their emphasis is on comparisons of differences. MARSSIM stresses the need for scan surveys to assure that localized sources of contamination are identified and considered. More sensitive tests can be performed using simple graphical techniques. These tests will be demonstrated using real survey data. The course will show that a properly performed survey is an element of an overall program of contamination control that exploits a defense in depth approach that includes taking credit for the multiple surveys normally performed in the course of routine operations or decommissioning.

Part II of this course will use the methods from Part I along with actual survey data to show how to alter the survey practices to minimize the uncertainties that occur. In addition, a posteriori methods of analysis to account for any remaining uncertainties and to explicitly take credit for multiple surveys will be described.

3-G Radioactive Materials Transportation, Part 2. *S. Austin; CSI - Radiation Safety Academy*

This session is Part 2 of a two-part series. This session will continue the re view Nuclear Regulatory Commission and Department of Transportation regulations concerning the transportation of radioactive materials begun in the previous PEP session. This session will review DOT requirements for marking packages, placarding vehicles, and shipping paper requirements. There will be a review of hazardous material descriptions applicable to radioactive material shipments, emergency response requirements, special requirements for different modes of conveyance. There will be a discussion of U.S. Postal Service requirements for shipment of radioactive materials via U.S. mail. NRC requirements for the receipt and inspection of radioactive materials will be reviewed.

3-H Environmental Continuous Air Monitor (ECAM). *J. C. Rodgers; Los Alamos National Laboratory*

The lecture on alpha-ECAM technology is designed to provide the participant with background information on topics related to the need for alpha-ECAMs, details of their design, and case studies of some on-going applications. Topical areas to be presented include:

Real-time Alpha-ECAM design factors and performance criteria based on air monitoring needs such as emergency response, D&D operations, waste management operations, and on-site air quality surveillance

ECAM component review, including the design of inlets for ambient conditions, CAM sampling head design, filter selection for long-term operation, onboard MCA with alpha spectrum data processing for background correction and alarm logic, meteorological data collection, and GPS

ECAM data communication from remotely located ECAMs to a base station, including application of the new RadNet protocol, spread-spectrum radio based LANs, antenna selection, and range concerns

ECAM-HOTSPOT meteorological/radiological/geo-reference data processing, modeling, and forecasting for assessment and downwind worker and asset protection

ECAM environmental enclosure design, motor-generator power supply, transport packaging, and tripod setup

Case studies of selected field trials and applications of ECAM air monitoring, including field trials at Tonopah Test Range, on-site monitoring at Los Alamos and planned ARG response support

The discussion will be based on the alpha-ECAM design developed at Los Alamos National Lab and being manufactured by Aquila Technologies Group of Canberra Industries.

3-I Particle Size and Pulmonary Hazard. ***H. Cember; Purdue University***

Particle size is the single most important factor that influences the inhalation hazard from any given aerosol. This PEP course will deal with particle size distributions, transport of airborne particles, the structure and function of the respiratory system, pulmonary deposition and clearance of inhaled particles, and the mean lung dose based on the three compartment lung model on which the current 10 CFR 20 inhalation safety standards are based.

3-J Conducting a Comprehensive Laser Safety Evaluation in the Research University Setting. ***B. Edwards; Duke University***

Entering an accomplished research scientist's laboratory to conduct a laser safety audit can present an overwhelmingly complex and intimidating task. Adopting a methodical approach ensures that every aspect of the lab's laser safety program receives a thorough review, in a manner that conveys professionalism and establishes credibility. Employing a standardized evaluation process also improves consistency, reducing the probability that a deficiency noted in one lab gets overlooked in the audit of the adjacent lab. Finally, a systematic approach to laser hazard analysis offers the most effective and efficient means to identify, and thereby create the opportunity to correct, potentially unsafe working environments.

This course provides a step-by-step approach for conducting a rigorous hazard evaluation of a research university laboratory containing class 3b and 4 lasers. This method provides a concise distillation of the requirements in the ANSI Z136.1-2000 and ANSI Z136.5-2000 standards for the safe use of lasers. Course attendees will learn a flexible yet rigorous procedure to efficiently prepare for, conduct, and document a useful, professional laser safety hazard evaluation. This method can expand to accommodate an arbitrary number of lasers and adapt to a wide range of experimental set ups.

While some knowledge of laser hazards will be helpful, both experienced and novice health physicists with laser safety responsibilities will benefit from this course. Although basic laser hazard calculations are outside of this course's scope, participants should bring a scientific calculator to allow a "walk through" of example pre-worked hazard calculations. Students will also find their own copy of ANSI Z136.1-2000 a helpful reference.

Monday, June 17 12:15-2:15 pm

M-1 Is Radiation an Essential Trace Energy? ***J.R. Cameron; University of Wisconsin***

During the last century dietitians found numerous essential trace minerals and vitamins which were necessary for good health. UV-B in sun light was found to produce Vitamin D in the skin and can be considered the first essential trace energy. The talk will suggest a study to determine if the health benefits of low dose rate radiation are sufficient to classify it as an essential trace energy because of its stimulation of the immune system. When there are arguments In science, as in the case of health effects at low dose rates, it indicates a lack of good data. This talk will not provide proof about health effects of low dose rate radiation. It will present the hypothesis that low to moderate dose rates stimulate the immune system. Data from several large epidemiological studies of radiation workers which support this hypothesis will be presented. They will show significantly reduced deaths of radiation workers from all causes, which is consistent with the hypothesis. The data do not prove the hypothesis. More data is needed. A 1998 study of three Gulf States Vs. three U.S. Mountain States showed that the mountain states have three times the background of the Gulf States. However, the cancer death rate in the Gulf States is 25% greater than in the mountain states. This suggests that people in the Gulf States are suffering from radiation deficiency. I will argue that it is ethical to consider a double blind human study of increased background to senior citizens in the U.S. Gulf States with the aim to determine the health effects of increased background with emphasis on longevity. The talk will close with two methods to reduce radiation phobia. the talk will describe the BERT method to reduce radiation phobia by explaining radiation dose to all x-ray patients in terms of the time to get the same dose from background radiation. I will describe an educational program on the Internet-a Virtual Radiation Museum (VRM) which will improve understanding of radiation.

M-2 Coronary Artery Radiation Therapy [CART]. ***P. Vernig; Department Veterans Affairs Med Center***

Approximately 80 percent of coronary arteries receiving angioplasty treatment to widen the openings narrowed by cholesterol build up will renarrow unless a stent is used. Use of a stent, which is a mesh tube, which is inserted in the artery to hold it open, cuts the restenosis or renarrowing to about 40%. The use of coronary artery radiation therapy in the form of irradiation by sealed source or brachytherapy decreases the re-narrowing or restenosis rate to about 20%. In November of 2000, two devices were approved by the FDA for treatment of "in-stent" restenosis. One was the Cordis, Checkmate(TM) system employing Ir-192 sources and the other was the Novoste, Beta Cath(TM) system using strontium/yttrium-90 sources. In November of 2001 the FDA approved a third device, the Guidant, Galileo(TM) system employing a phosphorous-32 loaded wire driven by a "low dose rate afterloader". Two other devices may potentially be approved, a radioactive stent using P-32 and a radioactive angioplasty balloon also using P-32. In the summer of 2001 University [of Colorado] Hospital began using a Novoste Beta Cath device and in July the Denver VA Medical Center began the process to become licensed to use the same device, initially intending to execute a sharing agreement with University Hospital. In October VAMC, Denver did its first CART case. This talk will discuss the process, the different devices, focusing on those that are approved for use, licensing and radiation safety issues related to CART, also called intravascular brachytherapy or IVB.

M-3 ICRP 66 Respiratory Tract Model. ***H. Cember; Purdue University***

The ICRP 30 three compartment model of the human respiratory tract was the basis for the 1977 ICRP recommendations for safety standards for inhaled radioactive aerosols on which the current NRC limits in 10 CFR 20 are based. This model was designed for calculating only the average dose from inhaled aerosols to blood-filled lungs of an adult reference person. Since then advances in knowledge of the respiratory system's structure and physiology, the kinetics of deposition and clearance of particles, and the relative radiation sensitivity of the different tissues and cell lines in the respiratory tract led to the development of a more comprehensive physiologically-based pharmacokinetics (PBPK) model.

The new ICRP 66 model consists of three sub-models: One for deposition of particles and gases, one for clearance from the respiratory tract, and a third one for radiation dosimetry. The deposition model describes the fractional deposition of inhaled aerosols in each of five anatomical compartments of the respiratory tract. The ICP 30 three compartment model deals only with inhaled aerosols. The new five-compartment model deals with aerosols and also with the deposition and absorption of inhaled gases and vapors. The clearance sub-model describes the kinetics of removal and redistribution of the deposited particles; and the dosimetry sub-model allows the evaluation of radiation doses to each of six different target tissues that may be at risk from inhaled radioactivity. The details of the five-compartment model and its sub-models will be presented.

M-4 Public and Scholarly Perceptions of Radiation Risks. ***O. Raabe; University of California, Davis***

International recommendations, radiation protection standards, national and international policy, and radiation safety practice are all affected by both public and scholarly perceptions of the potential risks associated with human exposure to ionizing radiation. These perceptions have far-reaching impact on societal advances or impediments. This PEP lecture is a collage of the elements that compose the fabric of these perceptions concerning ionizing radiation. Among the public perceptions overlay the images presented by the media, the antinuclear activists, environmental groups, the presumed experts, the nuclear industry, and political candidates, and elected officials. Among the scholarly perceptions are the contrasting views concerning the shape or lack of shape of the dose response curve, the meaning of the linear no-threshold theory (LNT), the reality or lack of meaningfulness of beneficial radiation effects or hormesis, the underlying models of radiation carcinogenesis and genetic alterations. All of these issues will be laid out and systematically discussed. Ultimately the direction of many important societal options such as the use of nuclear power, food irradiation, scientific research goals, and expenditures of portions of our wealth for environmental restoration, that may significantly affect human welfare in the 21st Century, will depend on the course taken by public and scholarly perceptions of radiation risks.

M-5 Role of the Health Physicist In Radiation Accident Management. ***R. Toohey, REAC/TS; Oak Ridge Associated Universities***

As an emergency response asset of the Department of Energy, the Radiation Emergency Assistance Center/Training Site (REAC/TS) is charged with providing support, advice, and training on the medical management of radiation accident victims. When a radiation accident occurs, close coordination is required between medical and health physics personnel; however, unless extraction of a victim from a very high radiation field is required, medical care always takes priority over radiological considerations. Health physicists must be familiar not only with the application of radiation protection principles to accident management, but also with medical terminology and procedures, and both on-scene and in-hospital emergency medical care. Challenges include interaction with medical personnel, dose assessment, public information, and post-accident interactions with managers and investigators, and possibly attorneys. Medical personnel must be taught basic radiological terminology, the difference between irradiation and contamination, radiological triage, contamination control procedures during evacuation and treatment, methods for patient decontamination, possible therapies (e.g., administration of DTPA), waste management, and preservation of evidence. Dose estimation includes radionuclide identification; intake estimation; deep, shallow and lens dose measurement or estimation; accident reconstruction; and use of opportunistic dosimeters and/or biological dosimetry. Public information concerns include patient privacy, release of facts vs. assumptions, determinations of the effectiveness of plans and procedures, and transmitting technical information to a lay audience. Post-accident interactions include refinements or revisions of dose estimates, stochastic risk estimates, review of operations, review of emergency plans and procedures, and development of lessons learned, as well as potential involvement in litigation. Some actual experiences in radiation accident management will be used to illustrate these points.

M-6 Technical Basis for an Internal Dose Program. ***J. Alvarez; Auxier & Associates, Inc.***

The technical basis for an internal dosimetry program requires knowledge of the workplace contaminants and the potential intake for the contaminants. Potential for intake requires analysis of the workplace, the work performed, and the chemical and physical form of the contaminants. Workplace monitoring and engineered controls may greatly reduce the potential for intake. Nevertheless, bioassay may be to verify the performance of the monitoring or controls. The ability of bioassay to serve as a test for monitoring or controls is limited by the detection limits possible. Detection limits also restrict the ability to assign dose, therefore, detection limits are a major factor in developing a technical basis for an internal dose program.

Signal detection by counting events has well-established methods that are widely practice. The usual convention of working near the detection limit results in important uncertainties that may not be included or appreciated in bioassay or other low-level counting. There have been recent attempts to account for the uncertainties using Bayesian methods. The approached used here is to perform the exact calculation using Poisson statistics and to present an alternate method for detection limits and propagating uncertainty.

The exact calculation may not be amenable to most situations because samples are sent to a laboratory whose statistical methods are beyond the investigator's control. An alternate method to the exact calculation is to examine the distribution of results from the laboratory by fitting two or more distributions to the data and obtain a practical if not exact detection limit.

Tuesday, June 18 12:15-2:15 pm

T-1 Revisions in Internal Radiation Dosimetry; ICRP Publication 68. ***D. Bernhardt; Salt Lake City, Utah***

The International Commission on Radiological Protection (ICRP) has published updated dosimetry models and parameters, for internal dosimetry, in ICRP Publication 68 and related publications. This dosimetry system has been applied by the International Atomic Energy Agency and many countries, and there has been limited implementation in the U.S. Current radiation protection standards in 10 CFR 20 and Federal Guidance Reports 10 and 11 are based on the dosimetry of ICRP Publication 30, and related publications. ICRP 68 provides updated dosimetry for radiation workers and the general public, including age specific models and parameters. The revisions since ICRP 30 are primarily due to the new ICRP respiratory model, updated biokinetic models, and specific models for the general population, including specific age groups. Revised models for dose assessments from bioassay data are also given. The Nuclear Regulatory Commission (NRC) and at least one Agreement State have granted license amendments to allow use of ICRP 68 dosimetry.

Application of the models requires a cohesive implementation of the ICRP 68 concepts. The PEP will provide an overview of the models related to ICRP 68, differences from the previous models, and comparison of the parameters for the different models. The use of the ICRP Dosimetry CD will be shown and examples of calculations of dose parameters and bioassay calculations will be provided.

T-2 Medical Management of Patients Vis-a-Vis Radiological Terrorist Events. ***V.K. Lanka; UMDNJ - Newark Campus***

This PEP course will mainly focus on the radiological and safety issues relevant to the threat of radiological terrorist activities. This course provides information on the medical management of patients with radiological injuries associated with the dispersal of radioactive materials. Additionally, this course is designed to provide basic principles of effective planning and response to terrorist activities associated with the dispersal of radioactive materials. Health effects associated with the "dirty bombs" and guidelines for internal and external exposure, as well as decontamination and cleanup will be discussed. An overview of the containment of the contamination to the treatment area and prevention of contamination of other personnel will be presented. This course will provide the essential elements necessary to train medical personnel regarding the priorities and how to identify and assess different types of radiation injuries. The role of health physicist during the emergency response to the "dirty bomb" will be discussed.

T-3 Steering a Course Through the Regulatory Maze. ***R. McBurney; Texas Department of Health***

This course will describe the current federal and state regulatory framework for sources of ionizing and non-ionizing radiation (who does what). Areas of overlap and "gray areas" of state and federal jurisdiction will also be included. The course will also cover licensing issues for several types of radioactive material use, such as medical diagnostic

and therapeutic uses, broad scope use, and industrial applications. Technical and financial requirements and lists of guidance materials available to assist in preparing license applications will be provided and discussed. Hands-on exercises and examples of license conditions and procedures for license applications, certain amendments, and decommissioning plans for site termination will be presented.

T-4 The Art and Science of "Selling" Your Radiation Safety Program. ***R. Emery; University of Texas at Houston***

Ask any experienced practicing radiation safety professional and they will likely tell you that the ultimate success or failure of any program is contingent upon the ability to effectively "sell" its attributes. Radiation safety professionals are constantly trying to persuade, induce, convince, affect, impress, convert, discourage, or prompt actions. We must be able to "sell" ourselves to gain employment, start new initiatives, or successfully interact with regulatory agencies. Although salesmanship is an essential skill for the profession, training in this area is not normally included in our academic or continuing education curricula. To cultivate an awareness of the importance of sales and marketing skills in our profession, this presentation will serve to answer some very basic, but essential questions, such as: what are we "selling", who are we "selling" to, and how do we go about "selling" effectively.

T-5 Use of MARSSIM for Decommissioning Medical Facilities. ***E. Abelquist; Oak Ridge Institute for Science and Education***

The Multi Agency Radiation Survey and Site Investigation Manual (MARSSIM), published in December 1997, has been used to design final status surveys at a number of sites, including uranium and thorium sites, power reactor facilities, and research laboratories. The implementation of MARSSIM at each of these facilities is somewhat different depending on the radionuclides involved and the types of media that are potentially contaminated. For example, the Sign test for alpha and beta surface activity measurements, via the unity rule, might be the MARSSIM survey design at a sealed source production facility. Similarly, a site contaminated with depleted uranium might use the WRS test for contaminated land areas. This course will discuss the implementation of the MARSSIM methodology at university and medical research laboratories.

The expected radionuclides at research facilities include H-3, C-14, I-125, P-32 and a number of other short-lived radionuclides used primarily for tracer studies. Final status surveys should focus on the areas likely to be contaminated, such as bench tops, fume hoods, floors and sinks. The MARSSIM survey design discussion will include the application of derived concentration guideline levels (DCGLs), selection of survey instrumentation, classification of laboratory areas, and statistical design for the number and location of surface activity measurements, for both direct measurements and smears. The COMPASS code (MARSSIM software) will be used to design an example final status survey for a research facility, and the Data Quality Assessment process will be applied to hypothetical data set.

T-6 Effective Communication Tools for Improved Radiation Safety Programs. ***R. Johnson; CSI - Radiation Safety Academy***

While most HPs and RSOs are well prepared to deal with technical issues for implementing a successful radiation safety program, many are not well prepared for communication or people issues. Few are trained to deal with issues involving feelings, such as an upset worker, an overly alarmed worker, or an overly complacent worker. How many know how to deal with anger in the workplace or resistance to safety program requirements? How do you motivate safety program performance and ALARA, with the carrot or the stick? What do you do when a worker refuses to implement radiation safety requirements? How do you deal with the images that workers may have about the consequences of exposure to radiation? How do you deal with grievances or union issues? What about a worker who files a complaint with the regulatory authorities and threatens legal actions? How do you respond to members of the public who believe that your facility is causing unacceptable radiation exposures? How do you answer questions from the news media?

HPS and RSOs are successful because of the many tools they can apply to solving problems. But, what tools do you have to apply to communication and people issues that are often the greatest day-to-day challenge. We will review a number of tools available from the fields of psychology, behavioral, and communication sciences for practical help in dealing with some of the questions outlined above. Many of these tools have been presented in monthly columns in the HPS Newsletter "Insights in Communication" from 1994 to 2001. This will be an opportunity for dialogue and discussion about how to apply communication tools for improving your radiation safety program.

W-1 How to Have Fun Teaching Kids and Adults about Radiation. *C. Owen, K. Shingleton; Lawrence Livermore National Laboratory*

Teaching children and adults about radiation is both fun and challenging. This course demonstrates two different 1-hour presentations (with demonstrations and experiments) suitable for all ages. Come get ideas and handouts you can use for enjoyable presentations to schools, science fairs, career days,or other public education forums. These presentations have been well tested and received by a wide variety of audiences. Learn how to make this topic fun for both you and your audience

W-2 Obtaining Optimal Image Quality and Minimal Patient Dose in X-ray Imaging. *D. Howe; University of South Carolina*

As X-ray image quality is improved the patient dose will increase. From chest X-rays to mammography, the need for increased contrast and detail to detect subtler and smaller lesions without sacrificing optimal density is achieved with techniques that increase the number of X-rays absorbed in tissue. This PEP will discuss the effect on tissue dose and image quality of 1) one's choice of image receptor, 2) choice of X-ray tube voltage, current and time, 3) choice of anode material, 4) choice of filter material, 5) and the body part being imaged. Traditional plain film and digital imaging receptors will be discussed and compared with regard to their influence on tissue doses. The image quality resulting from a specific technique choice will also be explained in terms of the interaction of photons in this energy range with biological material.

W-3 Introduction to Non-Ionizing Radiation Safety: Practical Strategies. *J. Greco; Eastman Kodak Company*

Health Physicists are increasingly requested to assess the potential hazards of non-ionizing radiation sources, and provide control strategies that are effective as well as meet requirements of applicable exposure guidelines. To accomplish this, the assessor should have a basic knowledge of proper measurement techniques and the various exposure guidelines. In this introductory PEP, an overview will be provided which addresses common sources of NIR [ultraviolet, radiofrequency/microwave, power frequency (60 Hz) and static magnetic fields], biological effects, instrumentation, exposure guidelines, and control strategies. In addition, special circumstances will be discussed, such as magnetic field effects on implanted medical devices, and ozone production from UV sources. A listing of references and useful websites will also be provided. (Please note that lasers will not be addressed during this PEP session.)

W-4 A Risk Management & Insurance Primer for Institutional Health Physicists. *R. Emery; University of Texas at Houston*

In recent years, many institutional radiation safety programs have been involved in organizational re-alignments, shifting from stand-alone units to assimilation into comprehensive environmental health and safety programs. Such shifts compelled health physicists to expand their professional knowledge base to better understand the roles of their new organizational colleagues. But the trend of institutional transformation has not stopped. A current phenomenon is the creation of comprehensive institutional risk management programs, which incorporate all health and safety functions, along with other institutional loss control and insurance activities. In recognition of this trend, it is imperative that practicing health physicists become familiar with the risk management and insurance profession to ensure that issues are effectively communicated within the context of this new paradigm. This course will provide an overview of the risk management and insurance profession, specifically addressing (1) how an organization's loss exposures are identified and analyzed, (2) how risk management alternatives are evaluated, (3) how the most desirable option is selected, (4) the implementation of selected risk management techniques and (5) the monitoring of effectiveness. Suggested strategies for adapting radiation safety programs to the risk management organizational environment will be

W-5 University Medical Center Radiation Safety Programs. *D. Derenzo; University of Illinois at Chicago*

Universities with large medical centers and medical schools present a challenging environment for radiation safety professionals. This session will review the important aspects of effective radiation safety programs for broad scope medical research licensees. Topics will include licensing, committees, dosimetry programs, radiation safety during radiation therapy procedures, project authorizations and reviews, radiation safety in biomedical research laboratories, radioactive material accountability, inspection of medical and non-medical radiation producing equipment, instrument calibrations, radiation surveys, sealed source leak testing, waste management, training, and more. This course should be helpful to anyone involved with a university or hospital radiation safety program regardless of the size or scope of program.

W-6 Calculating and Reporting Fetal Radiation Exposure from Medical Procedures. *A. Karam; University of Rochester*

On occasion, pregnant women receive diagnostic medical procedures using radiation or radioactivity. This may occur because they are unconscious from trauma and are not visibly pregnant or because they discover their pregnancy after the procedures. In such cases, medical health physicists should be called upon to calculate a fetal radiation dose and to report this to the woman's physicians. However, dose information alone is not sufficient because many physicians are not familiar with the fetal effects of ionizing radiation. It is essential to present supporting information to the woman's obstetrician so both doctor and patient can make a reasonable decision based on facts and not on fears. It is also important to remember that, as health physicists, we cannot make medical recommendations; we can only calculate the dose and provide references to the medical literature.

This PEP will discuss some standard methodologies for calculating fetal radiation exposure, the current medical guidelines based on the exposure and gestational age, and how this information can be presented. In addition, some legal aspects of these reports will be discussed.

Thursday, June 20 12:15-2:15 pm

TH-1 Radiation Safety in Brachytherapy. *J. O'Rear; GammaWest Brachytherapy, Salt Lake City, Utah*

This course will be designed to familiarize attendees with the various radiation safety issues surrounding the clinical practice of brachytherapy. The primary emphasis will be on High Dose Rate Remote Afterloading with other techniques being covered as time permits. A review of the regulatory requirements related to brachytherapy including U.S. NRC Regulatory Guidance, 10 CFR Parts 19, 20 and 35. The new NRC Reg. Guide 1556, Vol. 9 will be addressed and new requirements relative to the previous Policy and Guidance Directives FC86-4, Rev. 1, and 83-20, Rev. 2 will be outlined. In addition to regulatory guidance and requirements, current recommendations and professional standards of good practice will be covered.

Course material will include the most common applications of HDR brachytherapy such as treatment of prostate cancer, breast cancer, head and neck cancer sites and gynecological treatments. Radiation safety concerns will be addressed for various treatment regimens including exposures to staff performing the procedures, nurses and other ancillary hospital staff.

TH-2 Back to Nature: The Sources and Origins of NORM. *A. Karam; University of Rochester*

We all know that NORM stands for Naturally Occurring Radioactive Materials. What is not as well-known is where in nature NORM originates. Some mineral deposits are enriched in NORM while others are not, and processing NORM-enriched rocks and minerals can lead to subsequent regulatory concerns.

This PEP will review the sources of NORM in the environment, paying special attention to those sources that are commercially important or that have the potential to affect radiation dose to the population.

TH-3 Medical Internal Dose Calculations - Current Practice and Future Trends. *M. Stabin; Vanderbilt University*

The recent emphasis on the use of nuclear medicine therapy agents against many forms of cancer has brought about an increase in the need for reliable and clinically meaningful internal dose calculations. Traditional mathematical model-based internal dose calculations, as developed by the Medical Internal Radiation Dose (MIRD) Committee of the Society of Nuclear Medicine, are still in widespread use, for diagnostic and therapeutic agents, but strong trends are developing toward more patient-specific dose calculations. Adjustments to traditional dose calculations based on patient measurements are routinely made in therapy trials, including marrow activity (based on measured blood parameters), and organ mass (based on volumes measured by ultrasound or Computed Tomography (CT)). A more revolutionary approch, using truly patient-specific models developed from patient image data, fusing CT or Magnetic Resonance data (to describe patient anatomy) with Positron Emission Tomography or Single Photon Emission Computed Tomography data (to describe the spatial distribution of the radioactive tracer and its biokinetic behavior). More data and resources are becoming available through the internet, and the power and speed of available tools is increasing rapidly. This progam will give an overview of current tools and common practice in internal dose assessment in nuclear medicine, describing both diagnostic and therapeutic applications, but with an emphasis on the latter.

TH-4 Subsurface Radiological Characterization. *J. Alvarez; Auxier & Associates, Inc.*

The investigation of subsurface radiological contamination whether for characterization, control, or site closure requires methods similar to but not included in MARSSIM. The MARSSIM model is a good place to start for subsurface surveys and investigations, but the planning, modeling, measurements, and statistical tests differ. The differences can be substantial. This course will provide:

- An overview of the Subsurface Radiological Survey and Investigation Process
- A MARSSIM-like structure for planning preliminary investigations and development of a basis for compliance
- An introduction to subsurface modeling
- Survey planning and design based on subsurface modeling
- Calibration and selection of measurement techniques
- Statistical methods for evaluating the contaminated volume against models of subsurface contamination

TH-5 Obtaining Optimal Myocardial Perfusion Images with Minimal Patient Dose. *D. Howe; University of South Carolina*

Today, myocardial imaging is one of the most common nuclear medicine procedures. Image production must obtain a minimum image quality that enables the physician to make a well-informed decision on the course of treatment. This PEP discusses those factors that effect image quality and their influence on the dose that the patient receives from the procedure. Some of these factors have subtle effects on dose, others have significant effects. Non-camera factors include the selection of the radionuclide (201-Tl, 99m-Tc, 18-F) and the associated pharmaceutical (TlCl, sestamibi, tetrofosmin, deoxy glucose). Camera factors include geometric spatial resolution (collimator choice), intrinsic spatial resolution (crystal selection and thickness; photomultiplier tube efficiency, number, and uniformity; light to voltage pulse conversion; X-Y location circuitry; matrix size), scatter resolution (pulse height analyzer setting, source to camera distance), intrinsic energy resolution, and patient attenuation. The relation between object contrast and spatial resolution and between spatial resolution and sensitivity will also be discussed in the context of patient dose.

TH-6 Patient Radiation Safety and Fluoroscopy. *C. Plott; Forsyth Medical Center and University of North Carolina at Chapel Hill*

X-ray guided interventional procedures, often performed instead of invasive surgeries, can result in high patient skin dose. Although the incidence of serious radiation injury is small compared to the number of procedures completed annually, physicians who perform these interventions should be well trained in radiation safety. Furthermore, for continuous quality improvement, a patient ALARA program that includes monitoring of fluoroscopy times and doses should be implemented.

The United States Food and Drug Administration (FDA) first issued public health advisories in September 1994 regarding procedures involving prolonged fluoroscopy times and the resultant radiation-induced skin injuries. More recently in May 2001, the Conference of Radiation Control Program Directors (CRCPD) issued a resolution regarding its commitment to the prevention of unnecessary radiation exposure to patients from fluoroscopy; CRCPD is cooperating with the FDA and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) to implement at healthcare facilities recommendations related to physician training, communication of risk to patients, and monitoring patient doses.

This course will provide information needed to establish and implement a patient ALARA program. Topics will include potential biological effects of skin exposure, a description of various interventional procedures, and guidelines/standards from organizations such as the CRCPD, FDA, JCAHO, the American College of Radiology, and the Society of Cardiovascular and Interventional Radiology. Suggestions will be made for program content, including physician training to operate x-ray equipment, patient education (general information, consent, and post-procedure follow-up), physician information and feedback, and Radiation Safety Committee oversight. Sample data from an existing ALARA program will be shared.

Continuing Education Lectures

Included with Registration

Each course is worth 2 CECs

Monday, June 17 7:15-8:15 am

CEL-1 Backgrounds, Detection Limits, and Treatment of Uncertainties in Survey Data. *J. Shonka; Shonka Research Associates, Inc.*

This lecture will review the basic statistical elements of radiation detection and data analysis. It will provide users with the means to evaluate and treat the data from surveys and to assess the technical adequacy of a survey program. These methods, not in common use, include the establishment of the inherent background in any survey unit without the direct need for comparison to reference areas, and an efficient sorting method that can provide direct evidence for the presence (or absence) of contamination, permitting consideration of additional confirmatory measurements. Methods to control and limit the uncertainties of radiation measurements using commonly available instrumentation will be discussed.

The MARSSIM tests are relatively insensitive for the detection of small quantities of localized radiation, as their emphasis is on comparisons of differences. MARSSIM stresses the need for scan surveys to assure that localized sources of contamination are identified and considered. More sensitive tests can be performed using simple graphical techniques. These tests will be demonstrated using real survey data. The course will show that a properly performed survey is an element of an overall program of contamination control that exploits a defense in depth approach that includes taking credit for the multiple surveys normally performed in the course of routine operations or decommissioning.

Actual survey data will be used as examples to show how to alter the survey practices to minimize the uncertainties that occur. In addition, a posteriori methods of analysis to account for any remaining uncertainties and to explicitly take credit for multiple surveys will be described.

CEL-2 The Oklo Natural Nuclear Reactor. *A. Karam; University of Rochester*

About 2 billion years ago, a uranium-rich sandstone formation in what is now the African nation of Gabon changed from uranium ore to an operating nuclear reactor. Although there has been some speculation about other natural reactors, Oklo remains unique in science. In this CEL, we will look at the conditions that led to Oklo - the geological and geochemical conditions that allowed a critical configuration to form, and how the configuration of the several reactor zones compares to that of a modern nuclear reactor. Finally, we'll look at what we can learn from Oklo that might apply to radioactive waste disposal, and whether or not Oklo was really likely to have been unique in the history of the Earth.

Tuesday, June 18 7:15-8:15 am

CEL-3 Radiation Protection Quantities: A Critique. *J.R. Cameron; University of Wisconsin*

The inspiration for this talk is Harald H. Rossi's statement in the March 1996 Health Physics "During the last two decades the concepts of radiation protection and the applicable physical quantities have drifted into what must be regarded as chaos." The talk will review the evolution of radiation protection quantities and discuss their advantages and disadvantages.

The talk will discuss the following topics:

1. Is it scientifically possible to define radiation protection quantities that are quantitatively related to health risks?
2. While physics aspects are usually straight forward, the biological aspects are not.
3. Radiation protection quantities primarily serve a bureaucratic purpose rather than a medical purpose.
4. A possible scientific quantity to replace effective dose is imparted energy.
5. Victor Bond related imparted energy to radiation induced cancer of the a-bomb survivors.
6. Do we need a radiation protection quantity the public can understand?

CEL-4 Radiation Accident History. ***R. Toohey; REAC/TS, Oak Ridge Associated Universities***

The Radiation Emergency Assistance Center/Training Site (REAC/TS) maintains a registry of serious radiation accidents that have occurred worldwide since 1944. The criteria for an accident to be included in the registry include a whole-body dose exceeding 250 mSv or a local dose exceeding 6 Gy to one or more individuals; i.e., doses that would require medical intervention. As of December 2001, 421 accidents are included in the registry, resulting in 3,044 significant exposures with 134 fatalities. Of these accidents, 20 have involved critical assemblies, 313 have involved radiation-generating devices (including sealed sources), and 88 have involved uncontained radionuclides. In the United States, there have been 30 fatalities associated with radiation accidents, 21 of which involved the medical applications of radiation. In practically every case, human error of one sort or another has been the primary or contributing cause of the accident. The effects of radiation accidents may be divided into the general categories of medical, psychological, environmental, economic, and of course, legal consequences. It is important to remember, however, that irradiation or contamination by itself is not immediately life threatening; therefore, emergency medical treatment for trauma or other conditions takes priority over decontamination of radiation accident victims.

Wednesday, June 19 7:15-8:15 am

CEL-5 Updated Internal Radiation Dosimetry; ICRP Publication 68. ***D. Bernhardt; Salt Lake City, Utah***

Current radiation protection standards in 10 CFR 20 are based on the dosimetry from International Commission on Radiological Protection (ICRP) Publication 30 for radiation workers. Revised dosimetry for radiation workers and the general public is published in ICRP Publication 68 and related publications. The revisions since ICRP Publication 30 are primarily due to the new ICRP respiratory model and updated biokinetic models, and specific models for the general population. Revised models for dose assessments from bioassay data are also given. The Nuclear Regulatory Commission (NRC) and at least one Agreement State have granted license amendments to allow use of ICRP 68 dosimetry.

Application of the models requires a cohesive implementation of the ICRP 68 concepts. The CEL will provide an overview of the models related to ICRP 68, differences from the previous models, and comparison of the dosimetry parameters for the different models.

CEL-6 Depleted Uranium, Why Public Concern Is So Great? ***E.G. Daxon; U.S. Army Medical Department***

The issue of the use of depleted uranium (DU) in military munitions has highlighted, more than any other issue, that science is not enough to allow the development of sound health and environmental quality decisions. In many respects, science, our culture and our language, actually hinders the development of these policies. DU is a good example because the science is so well established and the conclusions are so clear yet the controversy continues and will probably continue to continue. The purpose of this talk is to focus on how the practice of scientific investigation and the translation of these investigations into policy decisions contributed to this controversy for depleted uranium.

Thursday, June 20 7:15-8:15 am

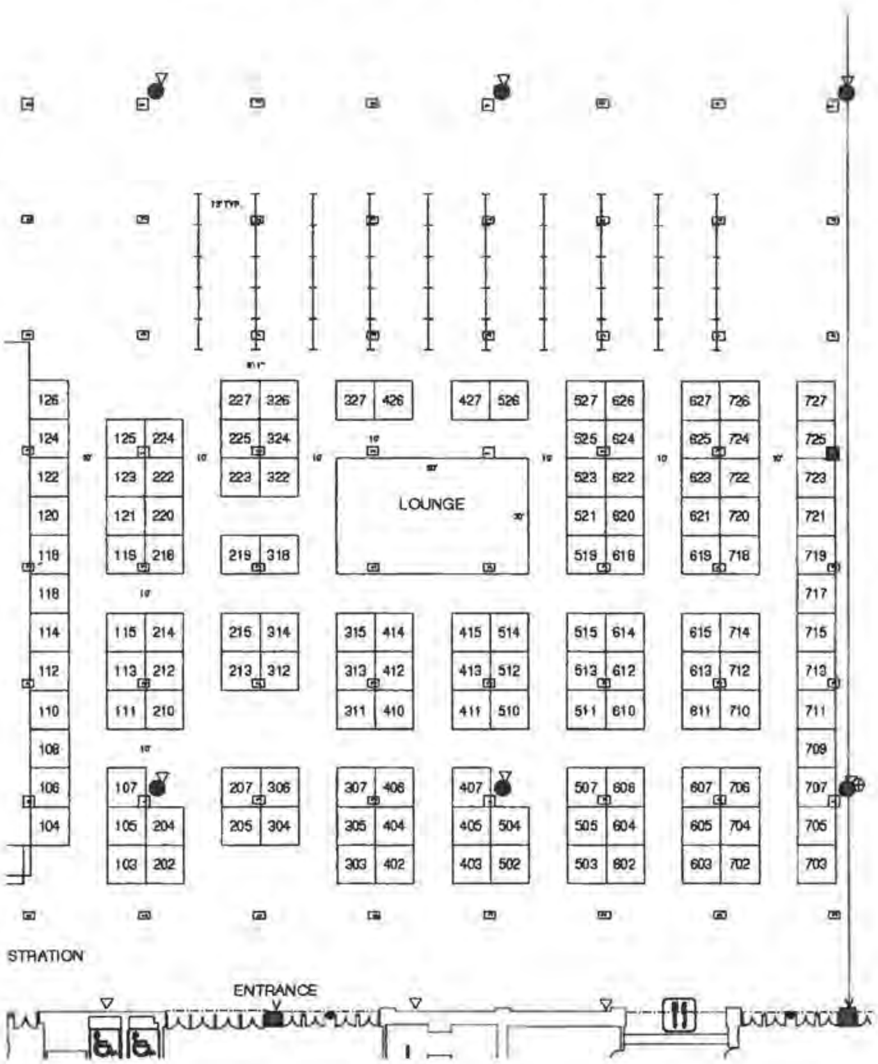
CEL-7 Basics of PET. ***J. Jacobus; National Institutes of Health***

As an imaging modality, positron emission tomography (PET) is gaining an increasing foothold in nuclear medicine and the public's attention. While PET shares some common characteristics with nuclear medicine, it has a number of attributes that make it superior, along with some disadvantages. An overview of equipment design, radionuclide production, biological uptake mechanisms, and image construction will be examined.

CEL-8 Current Status of Agents used in Nuclear Medicine Therapy. ***M. Stabin; Vanderbilt University***

Nuclear medicine therapy is used increasingly in the treatment of cancer, including thyroid cancer, leukemia and lymphoma with radioimmunotherapy (RIT), primary and secondary bone malignancies, and neuroblastomas. The use of internal emitters, specifically targeted to diseased tissues, is resulting in significant benefits in the treatment of many of these neoplasms. Both electron and alpha emitters are being used in a variety of new approaches to the fight against cancer, and positive responses have been recorded in many patient populations, resulting in the commercial development of new approved agents and techniques. The highest rates of success of course are with traditional ^{131}I NaI therapy against hyperthroidism and thyroid cancer, but significant gains are being seen in the treatment of bone and marrow cancers, and some novel targeting strategies and radionuclides are being proposed for other cancers. The use of high LET emitters, including alpha and Auger electron emitters, is also on the increase in newly proposed regimens. A general overview of a number of these promising technologies and some results will be given, with emphasis on the radiation dose calculations needed to ensure their safe use.

Exhibitor Hall Floor Plan



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International Relations Committee Abstracts

P.69 Problems of Risk Modeling: Influence of Uranium Storage on Environment. *A.K. Tynybekov; International Scientific Center, Kyrghyz Republic*

Because of mountainous terrain and seismic activity on the territory, synergetic or natural-technological disaster can occur in Kyrghyz. These events could disrupt chemical or radiological dangerous objects, resulting in geodynamical and ecological catastrophe. Critical situations occur where the conditions of geology and environment under influence of natural and especially industrial factors threaten the system of life support of population. The total of ecological problems can rise up to a crisis level. The object of this research is the Ton region, which is located on the south coast of the lake Issyk-Kul. The general radioactive background of the territory and physical-chemical contents of surface waters was analyzed. The results of the research showed the radiation is higher indoors than outdoors, and the separate areas with high level of radiation were identified. The study of surface waters is characterized by high level of pyritization and lack of essential components. Frequent earthquakes, floods, snow avalanches and landslides distinguish the territory from others. In our case there is a high level of possible influence of the uranium storages that are located is the risk zone. The location in the risk zone can lead to the ecological catastrophe, because the preventive dam is not secure enough. The destruction of uranium storages will cause radioactive, chemical pollution of the huge area with rivers, agricultural lands, villages and the coast of the lake Issyk-Kul. It is necessary to carry out practical researches and complex testing on modeling of risk for risk assessment.

P.70 Meta-Analysis of Twenty Epidemiological Case Control Studies of Lung Cancer Risk and Indoor Radon Exposure. *I.V. Yarmoshenko, I.A. Kirdin, M.V. Zhukovsky, S.Y. Astrakhantseva; Institute of Industrial Ecology, Russia*

Epidemiological case control studies should be considered to be primary instrument for investigation the dose effect relationship between radon exposure and risk of lung cancer. Due to statistical power issues, any case control study by itself does not allow reliable estimations of risk. To assess the shape of the dose response relationship and obtain significant estimation of its parameters the pooled analysis of case control studies' data should be performed. While raw data of each study are not available, a meta-analysis was undertaken using published details of the studies and estimates of odds ratios (OR) in intervals of radon exposure. Eighteen publications on results of case control studies conducted around the world have been found. Additionally two studies performed in Ural region of Russia were engaged. In total, twenty studies involving 12,044 cases and 20,932 controls were involved in the analysis. Two approaches were applied for combined consideration of published results. By first approach the cases and controls of each study were redistributed by equal ranges of radon concentration with regard to parameters of log-normal distribution and OR were re-estimated. Then the weighted average OR were calculated. The size of the case and control meta-analysis groups allows significant conclusions on increasing linear dose-response relationships in the range of radon concentration above 75 Bq/m^3. The slope factor of linear function representing the coefficient of relative risk is 0.0012 (0.007-0.0017) Bq m^{-3}. Estimation in lower exposure range (bellow 75 Bq/m^3) gives some evidence for U-shaped relationship. The non-linearity in that range may result from confounder influence or radon exposure assessment errors being likely at lower radon concentration range.

P.71 Coronary Heart Diseases Prevalence in the Population Living on the Radionuclide Contaminated Territory. *A.I. Stchastlivenko, V.P. Podpalov, O.N. Zhurova; Vitebsk State Medical University, Belarus*

The accident at the Chernobyl nuclear power station on April 26, 1986, is the most serious ecological catastrophe of the twentieth century. It is a problem for Belarus because almost 2 million people live in the zones with cesium-137 contamination at levels of more than 37 kBq/m2. A study was conducted to study the coronary heart disease frequency with assessment of cardiovascular risk factors in populations living on the radionuclide contaminated zones (RCZ) as compared with the control populations living in the clear regions. The study group was aged 20-64 years. Ecological research expeditions were held in January & March 2001. During the expeditions four representative groups were formed: the first consisting of 214 adults from RCZ with Cs137 activity of 555-1480 kBq/m2; the second - 168 adults from RCZ with Cs137 activity from 185 - 555 kBq/m2; the third - 205 adults from RCZ with Cs137 activity of 37 to 185 kBq/m2; the fourth (control group) - 263 adults from RCZ with cesium-137 activity of 3.7 to 37 kBq/m2. All groups were of similar mean age. The survey included standard questionnaires (WHO) for detection of cardiovascular risk factors (family history of premature cardiovascular diseases, sedentary lifestyle, smoking, alcohol abuse), the Lusher and Teilor psychological test for depression detection, anthropomorphic measurements, blood pressure (BP), and lipid metabolism). Frequency of coronary heart diseases in the first group; 17.4% ($P<0.05$), second; 14.9% ($P>0.05$), third; 12.2% ($P>0.05$) compared with the fourth control group; 11.0%. As a result of multiple regressive analysis, it was clear that the primary risk factors for coronary heart disease were age ($p<0.001$), family history of premature cardiovascular diseases ($p<0.001$), systolic BP ($p<0.001$), sedentary lifestyle ($p<0.001$), total cholesterol ($p<0.01$). Systolic BP most depends on age ($p<0.001$), body mass index ($p<0.01$) and total cholesterol ($p<0.05$). Cs-137 contamination was not correlated to either physical condition.

P.72 Benefit and Risk Associated with Radiation Dose from Mammography Procedures in Malaysia. *N Jamal, K-H Ng, L-M Looi, D. McLean; Malaysian Institute for Nuclear Technology Research (MINT), Malaysia, University of Malaya Medical Centre, Malaysia, University of Sydney, Australia*

All published studies on benefits and risks from screening mammography are from the advanced countries, such as US, UK and Australia. There has been no such published study for the South East Asian women. The purpose of this study is to estimate benefit and risk associated with radiation dose from mammography procedures in Malaysia. The recent trend is that the number of younger women presenting themselves for mammography is increasing. The study population is from three major ethnic groups, namely Malay, Chinese and Indian. Thus, this study is important for the region as our population have quite similar ethnic composition, diet and genetic makeup. We chose to use an absolute risk model with known risk factors for breast cancers. The average mean glandular dose to the standard

breast for Malaysia is 1.23 mGy per view, while for the US, UK and Australia are 1.6, 1.34 and 1.7 mGy respectively. Estimated benefit increases with age, from age group of 30-34 up to the age group of 50-54 and then falls sharply to the age group of 60-64. The risk could be regarded as negligible, with benefit/risk ratio of more than 300 per 1000 women. The benefit/risk ratio increases with age, for women aged 40 years and older. From a radiation dose viewpoint (ignoring economic factors), it indicates that an age of about 40 years seems most appropriate to start breast-screening program. In comparison, the starting age for mammography of US, UK and Sweden are 40, 50 and 40 years respectively. This is a first attempt at estimating benefit and risk from mammography procedures for a defined population in the region. This information will help to allay some current concerns regarding mammography doses, and to assist in the eventual decision regarding starting age for mammography mass screening, as a mean of reducing the mortality caused by breast cancer. This type of analysis also provides useful information to patients, physicians and health care planners in order to optimize the clinical utility of mammography.

Keywords: Mammography, breast cancer, benefit and risk.

P.73 Neutron Source for Neutron Capture Synovectomy. *H.R. Vega-Carrillo, E. Manzanares-Acuña; Unidades Académicas de Estudios Nucleares, Mexico, Ingeniería Eléctrica, Mexico, Matemáticas de la Universidad Autónoma de Zacatecas, Mexico*

Monte Carlo calculations were performed to obtain a thermal neutron field from a ^{239}PuBe neutron source inside a cylindrical heterogeneous moderators for Neutron Capture Synovectomy. Studied heterogeneous moderators were light water/heavy water, graphite/heavy water, Lucite/heavy water, and polyethylene/heavy water. In these moderators arrays the heavy water volume was 26 liters. Best results were obtained with the polyethylene/heavy water array, that produces 6.07E(-5) cm^{-2}, were 50.4% are thermal, this results are better to those produced with a spherical heterogeneous light water/heavy water that uses 61 liters of heavy water.

The neutron spectrum of polyethylene/heavy water moderator was used to determine the neutron spectra inside a knee model. In this model the elemental composition of synovium and synovial liquid was assumed alike blood tissue. With the neutron spectra the neutron doses were calculated. Doses were higher in those knee points located close to neutron source suggesting the use of neutron reflector to improve dose distribution. Neuron Kerma factors for synovium and synovial liquid were calculated to compare with water Kerma factors, in this calculations the synovium was loaded with two different concentrations of Boron. This work was supported by CONACyT (Mexico) under contract 31288 U

P.74 Passive Neutron Dosimeter Design. *H.R. Vega-Carrillo, A.M. Becerra-Ferrerio; Unidades Académicas de Estudios Nucleares, Ingeniería Eléctrica, Matemáticas de la Universidad Autónoma de Zacatecas, Unidad Académica de Ingeniería de la Universidad Autónoma de Zacatecas, México*

A passive neutron dosimeter was designed to be used in mixed radiation fields. The design was carried out using Monte Carlo method. The dosimeter model was a 25.4 cm-diameter polyethylene sphere with a thermoluminescent dosimeter, TLD600, located at the sphere center. This model was irradiated with 50 monoenergetic neutron sources with energies from 10^{-8} to 20 MeV. A 506.71 cm^2-area disk was used to model the source term whose center was located at 100 cm from polyethylene sphere's center. The dosimeter response was compared with the responses of SNOOPY, Harwell 95/0075 and PNR-4. With these responses it was calculated the dosimeters responses for ^{252}Cf, $^{252}Cf/D_2O$ and $^{239}PuBe$ neutron sources. The passive dosimeter relative response has the same shape of SNOOPY, Harwell 95/0075 and PNR-4 dosimeters. Due to the type of thermal neutron detector used in the passive dosimeter the absolute response per unit fluence, is lower than the absolute response of SNOOPY, Harwell 95/0075 and PNR-4 dosimeters. However, the passive dosimeter response in function of the average neutron energy of the ^{252}Cf, $^{252}Cf/D_2O$ and $^{239}PuBe$ neutron energy results more linear. This work was supported by CONACyT (Mexico) under contract 31288-U.

P.75 Neutron Sources for Calibration. *H.R. Vega-Carrillo, A. Carillo-Nuñez; Unidades Académicas de Estudios Nucleares, Ingeniería Eléctrica, Matemáticas de la UAZ, Apdo, Universidad Tecnológica del estado de Zacatecas, Guadalupe, Zac. México*

The neutron spectra produced by an isotopic neutron source located at the center of moderating media were calculated using Monte Carlo method in the aim to design a set of neutron sources for calibration purposes. To improve the evaluation of the dosimetric quantities, is recommended to calibrate the radiation protection devices with calibrated neutron sources whose neutron spectra being similar to those met in practice. Here, a ^{239}Pu-Be neutron source was inserted in H_2O, D_2O and polyethylene cylindrical moderators in order to produce neutron spectra that resembles spectra found in workplaces. It was found that such neutron fields could be produced by a ^{239}Pu-Be neutron source located inside light water, heavy water and polyethylene moderators. These neutron fields have the capability to evaluate neutron dosimeters over a range of neutron energies to which the dosimeter is likely to be exposed. The most common geometrical configuration of isotopic neutron sources is cylindrical, then this sources should be inserted in cylindrical moderators. These have the inconvenience of producing non isotropic neutron fields. A single isotopic neutron source in combination with water, heavy water and polyethylene moderators produce a wide range of neutron spectra that allow to have a set of relatively inexpensive calibrating neutron sources. The spectra here calculated will be modified by the calibrating room features, if it is small room return effects should be calculated, on the other hand if it is large skyshine neutrons need to be estimated. This work was supported by CONACyT (Mexico) under contract 31288 U.

P.76 Evaluation of the Trends of Adult Chest and Abdominal X-Ray Examinations in Malaysia using the FDA Protocol. *A.S. Hambali, K.-H. Ng, B.J.J. Abdullah; Ministry of Health, Malaysia, University of Malaya Medical Centre, Malaysia*

This study is aimed at evaluating the trend of adult chest and abdominal x-ray examinations in Malaysia in terms of the entrance skin dose (ESD) received by the patients and the quality of the images produced in various types of medical establishments in this country. This study will provide a framework for similar evaluation on various types of x-ray examinations performed in this country and it is envisaged that similar evaluations of other examinations would be done in the future. We have adopted the Nationwide Evaluation of X-Ray Trend (NEXT) protocol established by the United States' Food and Drug Administration (FDA). The ESD measurements are performed using standard patient-equivalent phantoms. The use of a standard phantom ensures that the patient exposure data is obtained using a reproducible and precise survey protocol and it facilitates data comparison. The use of standard phantoms also eliminates the ethical and practical problems arising from the use of real patients. Besides ESD and image quality, other pertinent information such as information on x-ray machines, exposure techniques, image receptors and processing conditions are also gathered and analyzed. The results obtained are analyzed according to the types of medical establishments, i.e. the public hospitals with the service and supervision of radiologist and qualified radiographers, private hospitals (inclusive of university hospitals and radiological clinics with the service and supervision of radiologist and qualified radiographers) and general practitioners (GPs) clinics. For chest x-ray examination, the mean and median values for ESD are 0.28 mGy and 0.25 mGy across all centers. For this examination, the mean and median values for the number of meshes visible (limiting resolution indicator) for all centers are 5.1 and 5; while the number of contrast holes visible (indicator for low contrast sensitivity) has the mean and median values of 4.9 and 5 respectively. As for abdominal x-ray examinations, the mean and median values for ESD are 3.13 mGy and 3.01 mGy across all the centers surveyed. The mean and median values for the number of meshes visible are 4.4 and 4 and these values for the number of contrast holes visible are 4.2 and 4.

The survey reveals that there is a wide variation in the exposure parameters (kVp, mAs) and the beam qualities used for conducting both examinations. However, all the centers are in good agreement in using long (more than 180 cm) source-image-distance for chest x-ray examination. The ESD values obtained are comparable to the results of the NEXT surveys.

P.77 Peculiarities of Dose-Response Dependence Curves for Cytogenetic Indices after in vitro Irradiation of Human Peripheral Blood Lymphocytes with Ionizing Radiation of Different Types. *T.V. Styazhkina, I.B. Korzeneva, I.B. Gorbunova; Russian Federal Nuclear Cener- All-Russian Research institute of experimental Physics*

The project investigated how ionizing radiation (IR) of different types (α-, β-and γ-) affects human peripheral blood lymphocytes. Lymphocytes were irradiated in vitro using ^{60}Co, ^{3}H and ^{239}Pu as radiation sources. Cytogenetic indices were measured. Dose response curves showing the frequency of aberrant cells, the sum of chromosome aberrations, and the frequency of chromosome exchanges – dicentrics all showed dose-response curves plateauing at doses lower then 30 cGy. We speculate that ionizing radiation disturbs the permeability of membranes of the cell nucleus in a certain interval of small doses. This interval depends on the type of IR, and on its relative biological intensiveness (RBI) compared to γ-radiation.

P.78 Congenital Anomalies of 1-3 Months Infants from the Inhabitants Living Near the Atomic Industry Facility. *T.V. Styazhkina, I.B. Korzeneva; Russian Federal Nuclear Center- All-Russian Research institute of experimental Physics*

Radiological medicine and epidemiology is vitally interested in the study of physical development and health in the posterity of people who populate areas in the vicinity of nuclear weapons-related facilities. The present work is the first report of a study examining congenital anomalies including congenital morphogenetic variants (CMGV) as indicators of environmental effects on the sex cells of parents prior to conception and embryonic development during the prenatal pregnancy period. 5920 newborns from the population of the town of Sarov between 1968 and 1974 were in included in the study. In the result of the study, the frequency of inborn anomalies and their distribution among the bodies' systems were evaluated. It was found that the maximum frequency of infants with congenital anomalies occurred in the years 1973-1974, and it was three and two times as large as that in 1968-1970 and in 1986-1988, respectively. Throughout the mentioned years, the infants with congenital anomalies such as hip inborn dislocation, atrezia of gastric-intestinal system organs, gemangioms made up 13.8±0.49% and exceeded reliably the corresponding indices from Russian and foreign authors. Cause-and-effect relationships between inborn anomalies in newborns and different hazardous influences, including radiation, are discussed.

P.79 Investigation of the Factors Disguising the Radiation Effects on Human Body. *I.B. Korzeneva, T.V. Styazhkina, Y.E. Dubrova, T.V. Malinina, V.D. Prokhorovskaya, O.N. Kholod; Russian Federal Nuclear Centre - All-Russian Scientific Research Institute Of Experimental Physics, Russia, Russian Academy of Science, Russia*

Technical advancements result in a continuous growth of environments that are hazardous to human health. The frequency and probability of ecological accidents have dramatically increased. Of the greatest concern are those events which are followed by an increase of genetically harmful factors, particularly radiation. Thus, investigating of how this factor impacts irradiated people's descendants is of burning interest. Radiation effects on children, however, may hide under other hereditary and environmental factors which also depress immunologic state and adaptivity. That is why the effects of these factors could be mistaken as being caused by radiation. These "disguising" effects should be characterized so that the radiation component effects can be determined. This is essential for predicting the state of health of radiation site residents or radiation accident survivors. The present paper aims at studying the number of hereditary and environmental factors effecting children's propensity to a wide range of diseases intrinsic to the first three years of life. They are as follows: eighteen characteristics of mother (age, suckling period, number of previous pregnancies, number of spontaneous abortions, sex of child, child prematurity, present pregnancy pathologies, chronic diseases of mother by 7 organ systems); genetic factors (heterozygosis of child's -number of heterozygous loci in every child- in 8 polymorphic gene loci, coding erytrocyte enzymes and blood serum proteins synthesis, such as 6-phosphogluconate dehidrogenase (6-PGD), glyoxalasa (GLO), esterase D (ESD), asid phosphotase (ACP), phosphoglucomutase (PGM), group specific component (GC), haptoglobine (HP) and transferrine (TF); outcrossing degree of parents); and social factors (number of children per family, educational level of parents, age of entrance to kindergarten). We have analyzed cases of 626 children (326 male, 300female) who's parents and grandparents permanently lived at the vicinity of the large atomic site "RFNC." The acquired results should be consulted when planning investigations aiming at study of radiation effects on human health.

P.80 The True Health Effects of Radiation Revealed in the Incident of Co-60 Contamination in Taiwan. *Y.C. Luan, M.C. Shieh, S.T. Chen, M.F. Wu, K.L Soong, W.K. Wang, W.L. Chen, T.S. Chou, S.H. Mong, J.T. Wu, C. P. Sun, C.M. Tsai; Nuclear Science & Technology Association, Taiwan, Nuclear, Biological and Chemical Environment Protection Society, Taiwan, Atomic Technology Foundation, Taiwan*

The conventional radiation health effects observed from the atomic bomb explosion in Japan include the deterministic effects of gastrointestinal damage, skin lesions, death at extreme high dose. They also include the less apparent stochastic effects of increasing cancer mortality. The LNT dose and response model by ICRP which has been accepted by most nuclear countries in the world as a basis for the radiation protection policy and standard is derived (not observed) from these effects demonstrated at higher doses. As there were no convincing methods to demonstrate that radiation constantly received in low doses or in low-dose-rates does or does not have an observable effect, the LNT is still in controversy. In Taiwan, about 10,000 residents had unknowingly received quite large doses (0.34 Sv - 4 Sv) of chronic, low-dose-rate radiation (from a few uSv/hr to about 1 mSv/hr) for 8 to 19 years in apartments built with steel contaminated with Co-60. The cancer mortality of these residents did not increase in 19 years based on the risk coefficient estimated from the LNT or modified with DDREF, On the contrary, their spontaneous or natural cancer mortality was sharply reduced to about 3.4 % of the general population (as though it had been immunized by vaccine), and the prevalence of hereditary defects of their children under age 19 was also reduced to about 6.5% of general children. The result of the event reveals that the health effects of chronic radiation is contradictory to what would be expected from acute radiation received instantaneously at high dose-rates, but quite similar to the radiation constantly received by workers and public in the peaceful use of nuclear energy or the medical use of radiation. Therefore, regarding chronic radiation, one should not apply the LNT model but should assume that it is always beneficial to human health, and even could be effective in immunity of cancers and other diseases in higher doses.

P.81 Radioactivity Monitoring on a River – Reservoir Ecosystem. *A.L. Toma, C. Dulama, G.A. Todoran, M. Pavelescu; Institute for Nuclear Research, Romania*

In the performance of their various processes, nuclear facilities use large amounts of water. In addition, the aquatic systems offer the possibility of the dilution of radioactive effluents. For these reasons, such facilities are placed near water sources. The location of the Institute for Nuclear Research (SCN) and the Nuclear Fuel Factory (FCN) from

Pitesti is typical. The major part of radioactivity discharged from SCN/FCN plant flows into the Doamnei River – Arges Reservoir system, and is subsequently fixed into the solid phase: bottom sediment and suspended particles. Radioecological studies on aquatic systems need specific parameters evaluated for radionuclides transfer. The source term is more than 90% composed of ^{58}Co and ^{60}Co from TRIGA reactors cooling system. Measurable amounts of ^{137}Cs from Chernobyl accidental fallout (1986) is also coming into the system from the atmosphere (resuspension) and from the catchment area (soil erosion). Field experiments show the distribution of radionuclides in depth of sediment and in suspended particles with the downstream distance from the release point. Laboratory experiments show the time dependent evolution of the dissolved radionuclides adsorption to the solid phase. This work was performed under Romanian government supported Environmental Protection R&D Program.

P.82 Determination of the Radon Potential of a Building by a Controlled Depressurisation Technique (RACODE). *W. Ringer, H. Kaineder, F.J. Maringer, P. Kindl; Federal Office of Agrobiology, Derfflingerstr, Austria, Upper Austrian Government, Austria, Austrian Research Centers Seibersdorf, Austria, Technical University of Graz, Austria*

Action levels and limits for radon in homes apply to the annual mean radon concentration. Because the indoor radon concentration varies strongly with time short term measurements are often not accurate; on the other hand, long term measurements do not allow rapid assessment of the exposure to radon. This paper presents methodology and results of a new method for the rapid determination of the building radon potential (RACODE (radon potential determination by controlled building depressurisation)). A fan produces a small pressure differential (10 – 50 Pa) between building and outdoors and the measurement of the flow rate and the radon concentration of the fan exhaust air at steady state yields the convective radon entry rate. Furthermore building characteristics like air exchange rate, equivalent leakage areas, and leakage distribution are determined. With appropriate modelling the mean radon concentration is deduced from these data. RACODE was applied to eight buildings and the results were compared to the radon concentrations obtained from long term passive measurements (3 months). The radon concentrations obtained by RACODE agree well in most cases with those from the long term measurements. The uncertainty depends strongly on the type of building, i.e. whether it is possible to simulate stack effect conditions well enough with the fan(s) and whether the leakage distribution can be determined accurately. Besides the determination of the mean radon concentration RACODE should be useful for the rapid assessment of the effectiveness of mitigation measures if the same kind of measurements at defined pressure conditions are performed before and after mitigation. This study was a research project which was conducted by the authors without extra funding; the Federal Office of Agrobiology is an Office of the Ministry of Agriculture, Forestry, Environment and Water Management.

P.83 Age Distribution of Thyroid Cancer in the Bryansk Region of Russia. *E. Parshkov, V. Sokolov, V. Stepaneko; Medical Radiological Research Center – Russian Academy of Medical Sciences, Russia*

The study demonstrates that the increase of radiation-induced thyroid cancer cases after the Chernobyl accident takes place not only in children, but in all age groups of the population of the Bryansk Region. Demographic data from the State statistical bodies of the Bryansk Region as well as the data on thyroid cancer morbidity from the Bryansk oncodispensary were used. Analysis of the distribution of thyroid cancer cases has been performed by age groups, formed on the basis of age at the moment of the accident and at the moment of diagnosis. Some details of calculation of the relative incidence rates in different age groups are presented. New evidence is presented, which demonstrates that an increase of thyroid cancer incidence after the Chernobyl accident has taken place in all age groups of the affected population. It was also shown that the radiosensitivity of the thyroid gland to the action of radioiodine has definite dependence on age. This dependence is similar in form to the age dependence of spontaneous cancer occurrence. This fact reveals that the minimal latency periods of radiation-induced cancers are equal in children and adults (approximately 5 years). The question is discussed of why thyroid cancers in children after the Chernobyl accident attracted so much more attention than that of adults.

CURRENT EVENTS/WORKS-IN-PROGRESS ABSTRACTS

P.84 Proposed Changes to the Abhp Part II Examination. *K. Pryor, E. Bailey, J. Serabian, M. Birch, G. Vargo, American Board of Health Physics*

This presentation describes planned changes to the American Board of Health Physics Part II Examination. The ABHP intends to transition from the existing free-response type examination to a multiple-choice format as early as 2004. The examination will be based on eight broad categories: measurements, instrumentation, standards and requirements, engineered controls, administrative practices, operations and procedures, hazards analysis and control, and training and education. Several different question formats will be used. These include objective recall or calculation (Type A, similar to the familiar Part I format), matching (Types B and C), true/false (Type X), compound true/false (Type K), and serial scenario-based (Type S). The use of different question structures provides effective analysis of a candidate's cognitive abilities (knowledge (30%), understanding (45%), and problem solving (i.e., synthesis, 25%). Examples of each question type will be displayed and handout materials include guidance on question development.

P.85 Initial Radiological Characterization of an Inundated University Cyclotron Facility. *J. Cezeaux, E. Fruchnicht, J. Watson, A. Lazarine, R. Turley, L. Stoicescu; Texas A&M University*

On June 8, 2001 tropical storm Allison caused catastrophically high water in Houston, Texas. One expensive casualty of this high water was the University of Texas Health Sciences Center's cyclotron facility. Since cyclotrons can cause activation in the room in which they are contained, and are radioactive themselves, the fact that the cyclotron was rendered unusable caused a large problem. The University of Texas Health Sciences Center's board of directors asked a research team from Texas A&M University to characterize the radioisotopes present in the cyclotron vault to give them options for a course of action. Noticeable amounts of Co-57, Co-58, Co-60, Eu-152, Na-22, Zn-65, and Mn-54 were found in the cyclotron components as well as the surrounding walls. Due to the presence of nuclides whose half-lives exceed the 300 day requirement for disposal in a non-radiological waste facility, the Texas A&M University team recommended that all cyclotron components as well as the concrete in the surrounding walls to a depth of 40 cm. be stored for decay.

P.86 Hot Cell Decontamination and Decommissioning at Battelle Columbus Laboratories. *G. Henderson; Battelle Memorial Institute*

Battelle Memorial Institute owns a former nuclear sciences area near Columbus, Ohio. Decontamination and decommissioning (D&D) activities are scheduled for completion in this area by 2006. The Battelle Columbus Laboratories Decontamination and Decommissioning Project (BCLDP) is funded by a cost-share partnership between the Ohio Field Office of the U.S. Department of Energy and Battelle. Because Battelle is licensed under the Nuclear Regulatory Commission, the project is regulated radiologically to 10 CFR 20. The scope of work includes decontaminating several unique hot cell areas currently under remediation. The radiological nature of the work and hot cell source term consisting of mixed fission and activation products (from contracts for nuclear fuels research from the mid-1940s through the mid-1980s) make this task especially formidable. This presentation reviews transferring D&D operations from material removal work performed remotely with the assistance of a manipulator, through gross decontamination of the hot cell, and on to actual manual decontamination to prepare the facility for eventual structural disassembly. The case history and the technical approach used in removing radioactive waste, keeping personnel exposures manageable, and removing the various hot cell utilities are illustrated in this current-events/works-in-progress poster session.

P.87 MARSSIM Update. *C. Petullo, R. Bhat, D. Alberth, S. Doremus, V. DeInnocentiis, H. Peterson, C. Goglak, K. Klawiter, V. Lloyd, R. Meck; US Public Health Service detailed to US Air Force, US Army, US Environmental Protection Agency, US Department of Energy, US Nuclear Regulatory Commission*

The Department of Defense, Department of Energy, Environmental Protection Agency and the Nuclear Regulatory Commission are meeting as a joint Workgroup to provide for the updates, maintenance and administration of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). To facilitate the use and understanding of MARSSIM, the Workgroup has developed web-based user tools in the form of a Frequently Asked Questions (FAQs) section at the MARSSIM homepage (http://www.epa.gov/radiation/marssim/) and technical conferencing capability (http://techconf.llnl.gov/cgi-bin/messages?marssim). In addition, the MARSSIM Workgroup is now developing two supplements to expand the MARSSIM scope to include the survey and assessment of materials, equipment and subsurface soils. These supplements will broaden the existing scope of MARSSIM to better assist users in conducting final status surveys to meet established dose or risk-based release criteria. This poster provides updates on the existing Workgroup products and an outline of the supplements mentioned above.

P.88 MARSSIM Applications: Lessons Learned. *S. Hay; SC&A, Inc.*

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) provides guidance on designing, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with a dose- or risk-based regulation. Most of the guidance in the MARSSIM focuses on the final status survey, where the results are used to support a decision regarding regulatory compliance. This poster provides information on lessons learned applying MARSSIM guidance to preliminary surveys, specifically characterization and remedial action support surveys. The results of these preliminary surveys are critical for providing information to support a decision that a site is ready for a final status survey, as well as providing the information necessary for designing an efficient and effective final status survey. Subjects of particular concern include area classification, clearing to provide access, selection of measurement techniques, numbers of measurements, measurement locations, and discussions with regulators.

P.89 A Case Study of a MARSSIM-Based Final Status Survey for Buildings. *J. Hackett, R. McConn, J. Travers, K. Kadlubak, T. Enroth, J. Cleary; Parsons, U.S. Army Corps of Engineers, New York District*

This poster presents a case study for the final status survey of a series of decommissioned buildings. This survey was based on the methods outlined in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and other supporting documents such as NRC DG-4006, "Demonstrating Compliance with the Radiological Criteria for License Termination." The case study being presented is a work-in-progress that uses the MARSSIM methodology in all aspects of the project, from planning and execution to site closure. This poster will focus on practical considerations during the application of MARSSIM methodology for conducting building surveys and sampling. The following topics will be presented:

1. Overview of regulatory status of Derived Concentration Guideline Levels (DCGLs) applicable for building surfaces;
2. Development of isotopic DCGLs for average and hot-spot contamination;
3. Selection of survey instruments that comply with DCGLs;
4. Classification of rooms and survey units;
5. Application of statistics in survey design and survey data analysis; and,
6. Use of As Low As Reasonably Achievable (ALARA) principles in assessing the end state of the remediation.

The case study involves the decommissioning and final status survey of US Army Corps of Engineers facilities potentially contaminated with various radionuclides at Seneca Army Depot, NY. The US Army used the facilities for storage and maintenance of military items that may or may not have contained radioactive materials. The final status survey report is in Draft Status, pending state and federal agency review.

P.90 Analysis of High Norm Levels in a Reactor Decommissioning Project. *M. Shannon, H. Omar, W.R. Ice, D. N. Hertel; Georgia Institute of Technology*

One of the most influential aspects of decommissioning a reactor is the site characterization process. Site characterization is arduous, time consuming and extremely expensive; however, the benefits of a rigorous study are incalculable in terms of protection, risk reduction and cost savings. The Georgia Tech Research Reactor decommissioning project began in 1997. Currently, the reactor and associated equipment are demobilized. In the course of the final survey for license termination, higher than normal levels of gamma radiation were found in several areas of the facility. In response to this discovery, work began to understand the isotope concentration and its potential source. This work included exposure surveys, high-resolution gamma spectroscopy and radiochemical analyses in order to determine the radioisotopes and their concentrations. These results show Co-60, K-40, Ra-226 and Ra-228 maximum concentrations of 0.43 pCi/g, 48.40 pCi/g, 16.50 pCi/g and 3.52 pCi/g, respectively. Empirical exposure measurements show a range from 24-50 mR/hr. With this data, RESRAD 6.1 was used to determine the immediate and protracted (1-year) dose. This preliminary analysis found an immediate dose of 78.5 mrem/yr and a protracted dose of 88.7 mrem/yr. The initial hypothesis is that higher than acceptable levels of NORM exist. These initial results, as well as further analysis, will be used to determine the strategy for future work which will ultimately have a direct impact on resources, budget, manpower and scheduling.

P.91 Pre-Operational Environmental Radiation Survey in the Central Asian Steppe. *J.A. Johnson, R. Meyer, W. Anderson, V. Raykin; MFG Shepherd Miller Inc., Dostyk, Kazakhstan, AATA International Inc.*

Kazakhstan is a country rich in natural resources including uranium. Shepherd Miller Inc. (now MFG Shepherd Miller) was tasked in mid-2001 with performing a one-year pre-operational surface environmental radiation survey associated with a 16 square kilometer, deep uranium deposit located approximately 600 km northwest of the former capitol, Almaty. The site is flat and remote with an annual precipitation of approximately 5 inches. Both summer and winter present extremes of temperature. Shepherd Miller conducted a gamma radiation survey using 2-inch NaI detectors coupled to digital data loggers, portable computers and global position system (GPS) units. Three surveyors walked the 16-km block in a predetermined pattern. Exposure rates and GPS coordinates were recorded every two seconds. Surveys were conducted in the early morning and evening hours to avoid the hottest part of the midsummer day. Data were downloaded after each survey session and backed up to hard drive, floppy disk and optical disk. Survey meters were cross-calibrated in the field against a Pressurized Ion Chamber (PIC). Corrected gamma exposure rate data for some 160,000 locations have been displayed graphically on a map of the area. Average background gamma exposure rates ranged from 12 to 14 microR per hour. Limited areas, apparently influenced by previous drilling (by others) to the deep uranium deposit, exhibited significantly higher readings. Soil and vegetation samples were taken in fourteen locations at the area's perimeter. Environmental TLDs and radon monitoring cups were placed at these same locations and are currently being exchanged quarterly. Three particulate air samplers and a meteorological station have been installed at the site. Potential doses to members of the public from proposed operation of the eventual *in situ leach* facility will be projected using the MILDOS-AREA code.

P.92 Scintillation Detectors for Radiation Dose Estimation in Boron Neutron Capture Therapy. *D.-S. Kim, G.H.R. Kegel, J.J. Egan; University of Massachusetts, Lowell*

The natural boron loaded plastic scintillator BC-454 and the ^{6}Li loaded ZnS(Ag) inorganic scintillator BC-702 were evaluated for radiation dose estimation in a head phantom to be used in boron neutron capture therapy. Monoenergetic neutrons of different energies were generated through the $^{7}Li(p,n)^{7}Be$ reaction using the 5.5 MV Van de Graaff accelerator at University of Massachusetts Lowell. BC-454 was quite appropriate to detect signals due to both fast and thermal neutrons, as well as gamma rays. The pulse height distributions from BC-454 show that a boron loaded scintillator could be used to distinguish the doses from different radiation sources in boron neutron capture therapy. BC-702 showed a pronounced response to thermal neutrons with low gamma ray sensitivity. Polymethylmethacrylate (PMMA) was used to form a primitive head phantom. With this material BC-702 was used to find the optimum thermal neutron fluence thickness.

P.93 A New TLD Dose Algorithm to Satisfy HPS N13.11-2001. *N. Stanford; Stanford Dosimetry*

A TLD dose algorithm has been designed for the Panasonic UD-802 personnel dosimeter in use at Callaway Plant to satisfy the revised NVLAP proficiency testing prescribed in HPS N13.11-2001. The revised testing protocol incorporates changes that are beyond the scope of the standard dose algorithm provided by Panasonic, widely used in systems employing the popular four element UD-802 TLD. Of specific concern are: 1) the addition of over 50 new photon fields, and 2) mixtures of neutron or beta fields with low energy photons. This presentation describes the design of a function-based dose algorithm for the Panasonic UD-802 that meets these challenges. The design follows the general principles first described by the author in Health Physics Vol. 58, No 6 and subsequently implemented at both NVLAP and DOELAP accredited facilities. By using a curve as opposed to discrete steps to determine the photon correction factors, the algorithm is able to accommodate the photon energies between the test points. In addition, using a function to estimate the photon interference on the beta or neutron elements allows excellent performance for mixed fields, including neutron or beta with low energy photons. The design of the new algorithm is presented, along with the results of synthetic testing of the algorithm to over 130 field conditions.

P.94 Optimization of Film Etching Techniques for Track Etch Detectors used in Personal Alpha Dosimetry. *B. Bjorndal, R. Moridi; Radiation Safety Institute of Canada*

The Radiation Safety Institute of Canada provides personal alpha dosimetry to individuals routinely exposed to radon progeny and to long-lived radioactive dust during work activities. Personal monitoring is carried out with personal alpha dosimeters (PAD's) which utilize track etch detectors.

During processing, the LR-115 cellulose nitrate film from the track etch detectors are etched in a sodium hydroxide (NaOH) solution at 60°C with slow mixing. The etching process enlarges the tracks produced on the film by alpha radiation from radon progeny. When properly etched, the tracks can be counted using a standard image analysis system and radon progeny potential alpha energy concentrations calculated.

Etching is by far the most critical step in track etch detector processing.

Many factors affect etching quality including solution concentration and temperature, etching time, film orientation, the presence of contaminants and whether the solution is stirred during etching.

While the Institute's existing film etching system functions adequately, it is highly sensitive to some the aforementioned factors and thus requires close attention by technicians during etching. In 2001-2002, the Institute's long-standing film etching system was re-evaluated with the aim of improving etching consistency and quality while at the same time simplifying etching procedures. Factors including system design, solution stirring conditions, etching time and film orientation were examined in relation to etching rate, film background, alpha track geometry and quality, and track etching accuracy.

Based on preliminary test results, optimized etching conditions and procedures have been developed for use in a new film etching system. The new simplified procedures eliminate problems associated with stirring, film orientation and temperature nonuniformity. In addition, the new etching system uses standard off-the-shelf laboratory equipment.

Testing with the new film etching system is to be completed in 2002 and the system commissioned thereafter. The results of this study have applications in all types of track etch detector processing.

P.95 A Revised Model for Electron Dosimetry in the Human Small Intestine. *N. Bhuiyan, J. Poston, Sr.; Texas A&M University*

This study evaluated the absorbed dose to the small intestine (SI) of an adult human from electrons emitted in the lumen contents and the implication of the absorbed dose to the most radiosensitive cells in the wall. The effects on the dose and on specific absorbed fraction (SAF) due to the variations, observed within and between individuals, in the characteristic parameters of the SI, namely lumen radius and wall-thickness, also were studied. The parameter values, summarized in this paper, were gleaned from anatomic and histologic reviews of the adult human SI. The review revealed that the stem cells are the most radiosensitive and critical to the SI which itself is the most radiosensitive in the gastrointestinal tract. Hence, the absorbed dose to the stem cells was considered as the SI dose in this study. Histologic and radiological analyses of the SI suggested that the microscopic intricacy in the internal surface of this walled organ could be ignored for dosimetric purposes and a set of concentric cylinders could be used to model the SI without seriously affecting estimated doses. The model was coded into the Monte Carlo N-Particle (MCNP) version 4A computational package to simulate energy deposition in the SI by electrons of fifty discrete energies ranging from 10-500 keV. The depth dose distribution for each energy studied was developed throughout the SI wall. The depth dose data showed that the energy absorbed at the stem depth (the radiosensitive target) is a small fraction of the dose routinely estimated at the contents-mucus interface. This fraction was found increasing with increasing electron energy from 1.66E-6 to 1.21E-1 over the energy range 10-500 keV. These results clearly demonstrated that the interface dose that is routinely reported as the "wall" dose might be a severe overestimation of the actual dose to the stem cells for many electron energies. The Medical Internal Radiation Dose (MIRD) S-values were recalculated for several weakly-penetrating radiation emitting radionuclides to demonstrate the effect of the revised model on internal dosimetry. The S-value obtained using the present model was smaller by a factor of 3.22E-5 for Tm-171 and 2.64E-3 for Cs-137, than that provided by the MIRD Committee. The dose variation as a function of stem cell depth (845 ± 75 mm) was estimated to be as high as one order of magnitude for the energies above 330 keV, the electron energy whose range in soft tissue corresponds to the stem cells depth used in this research. The study showed that the effect of the variations in the wall-thickness on contents' dose as well as on depth doses in the wall are indiscernible while the variation in the lumen radius significantly affects the doses. The results suggest that there is an inverse square relationship between the doses and lumen radius. But the dosimetric parameters, namely the SAF and dose per source electron per unit contents' mass, are almost independent of the lumen radius while the SAF strongly depends on the stem cell depth for the electrons (>330 keV) penetrating through this depth. The relative errors associated with all these calculations were kept below 0.05.

P.96 Dose Backscatter Factor Calculation with Monte Carlo Method for Selected Beta Sources. *S.-W. Lee, W. Reece; Texas A&M University*

Backscatter factors for beta particles up to now have varied depending on the experimental setup and were generally performed for monoenergetic electron beams which makes direct application of these factors to beta sources difficult. The calculated values in this study can be readily incorporated into dose point kernel methods using analytical fits. This model can aid in choosing a source support or mixing materials for beta brachytherapy sources because the dose backscatter factor can be calculated. Dose backscatter calculation factors were calculated with mcnp 4c-general purpose monte carlo code- for beta sources that are currently used sources (p-32 and sr/y-90), as well as other sources (ca-45, pr-142 and w-185). The calculation was done using beta spectra generated by the sadde mod2 code. Specifically, the factors were calculated for point source on the interface between water and surrounding or supporting the source materials and contrast agents that are commonly used in brachytherapy procedure for imaging purposes. Because it is a high-z material, significant dose backscatter was observed for the contrast agent near water interface due to iodine (z=53) content. As expected, log (z+1) dependence (bailey et al.) Of backscatter factors were observed for all the beta sources with high correlation coefficient, r (> 0.95).

P.97 A Comprehensive Fluoroscopy Safety Initiative. *A. Jackson, D. Peck, L. Ralph; Henry Ford Health System*

A number of workers, especially Wagner, have published reports regarding injury caused by fluoroscopy equipment. The FDA issued an advisory in 1994 urging documentation of patient procedure times. We performed a comprehensive analysis of fluoroscopy procedure times at a large, midwestern health system. Innovative methodologies were developed to collect and process this data. This study was able to ascertain which procedures and also which departments conducted procedures, that were potentially long enough to be at risk of causing acute radiation injuries in patients. Experience was gained in how to effectively communicate this information to administrative decision maker to create a fluoroscopy training policy. This policy requires that all individuals who operate, or direct the operation of fluoroscopy equipment be trained in the safety considerations of this equipment. Thus a training program for these individuals, which includes physicians from a wide range of disciplines, was developed. The primary method of delivery for this training was through didactic lectures but videotape and web-based training methods were also developed. A substantial amount of high quality graphics material for this training was assembled. Some of this material was obtained from Sorenson and Wagner but a large amount of this material was originally developed. Experience about the appropriate level for these materials was gained. We will present conclusions from our analysis of procedure areas, key elements of our training policy, graphical materials developed, and experiences gained in this process.

P.98 Use of Radioactive Materials and Medical X-Rays during the Post Pardum Period...A Medical Health Physicist's Guide to Radiation Safety for the New Mother and Baby. *D.A. Koch; ViaHealth Rochester General Hospital*

The Medical Health Physicist faces numerous challenges each day maintaining a Hospital based Radiation Safety program. Patient safety and effectiveness of treatment are among the highest priority to the Medical Health Physicist when the use of ionizing radiation is deemed necessary for a patient's care. The most challenging situations encountered are those that present during the post pardum period. Various unplanned circumstances may present post delivery. The Medical Health Physicist is forced to take decisive action to ensure that the quality of care for both Mother and infant is not compromised while he/she implements a plan of action to ensure the dose of radiation to the infant is as low as possible. Patient guidelines and complementary worksheets are established by the Medical Health Physicist for the use of common radionuclides and or imaging modalities. Guidelines pertaining to infant care and breast feeding are provided for the patient. Additionally, the patient information packet considers and discusses obstacles encountered for use with each modality.

P.99 Modification and Characterization of a High Energy Photon Irradiation Facility Using Nitrogen-16. *T. Roy, G. Chabot, G. Inglis; University of Massachusetts, Lowell, Cancer Center, Massachusetts*

This work involves fabrication and characterization of a reactor source of high energy nitrogen-16 photons for application in evaluation of dosimetric responses of personnel devices and portable instruments.The source has been established by continuously flowing coolant water from the reactor core through a cylindrical thin- walled aluminium chamber.Exposure and dose measurements have been made at selected distances of interest using condenser-R and cable-connected ionization chambers while the source was covered by an equilibrium plastic wall.Areal uniformity measurements have been made with Kodak Readypack films used along with selected radiators to enhance secondary electron production.More extended depth dose measurements will be made with particular emphasis on the specific depths of interest in personnel dosimetry.Additional work to be completed includes NaI(Tl) and/or germanium photon spectral measurements,beta measurements, and evaluation of any neutron component of the radiation field.

P.100 A Portable Real Time Computer Based Neutron/Photon Monitor with GPS Tracking. *R. Seefred; Stanford Linear Accelerator Center*

The Stanford Linear Accelerator Center utilizess several portable radiation monitors to measure neutrons and photons produced during accelerator operations. This poster presents the latest improved portable monitoring system using a small touch screen computer and resides in a standard attaché case. The system uses internal batteries capable of supporting its operation for up to eight hours and can be extended by charging from the standard AC power source or using the cigarette lighter attachment from most automobiles. Most standard pulse detectors may be used which include Bf-3 and He-3 for neutrons, most proportional/Geiger tubes for photons, and even a sodium iodide detector for greater sensitivity. This system also uses a PCMCIA global positioning receiver for locating the position of the system in the environment. This system will provide ease of transport and will offer a wide variety of uses for accurate assessments of potential radiation doses to members of the general public.

P.101 Progress on the Development of a Low Level Radiation Dose Cs-137 Calibration Range. *R. Minniti, P.J. Lamperti, J.H. Sparrow, S. Seltzer; National Institute of Standards and Technology*

There are currently available at the National Institute of Standards and Technology (NIST) a total of three Cs-137 sources calibrated in terms of the quantity exposure. These sources have been calibrated using a suite of graphite cavity ionization chambers which constitute the primary standards for exposure and air-kerma. The range of exposure rates available from these sources is from 400 R/hr down to 0.5 R/hr. In an effort to extend the currently available rates down to the 100s of uR/hr, we have recently started calibrating a low-activity Cs-137 source using two cavity ionization chambers previously calibrated at the higher exposure rates. Preliminary measurements of exposure rates between 200 uR/hr and 1000 uR/hr have been performed using both of these instruments. Although the two chambers have considerably different properties such as volume, internal pressure and wall material, the values of exposure obtained at several distances from the source with both instruments agree reasonably well. The uncertainty of these measurements as well as the progress on this work will be discussed. Additional investigations in support to this development will be presented.

P.102 Airflow Visualization using Helium-Filled Soap Bubbles. *R. Morris, J. Quillin, J. Smith; The Alpha Group and Associates, L.L.C.*

A new method is available to visualize airflow in contaminated areas. Knowledge of airflow patterns helps determine the correct location of CAMs and air sampling devices, which is an important part of radiological hazard assessment and control. Contamination control often depends on local exhaust systems or room air exhaust dynamics. Each of these functions requires detailed knowledge of airflow patterns. Equipment (manufactured by sai™) used to generate non-toxic, neutrally buoyant, "BB"-sized, helium-filled soap bubbles with a 2-minute lifetime will be demonstrated. Typical applications and advantages of the technology will be described. Neutrally buoyant bubbles exactly follow airflow and are not damaged by louvers, ducts, and fans. They enable highly resolved pattern visualization and estimates of transit time. Photographic techniques produce images that can simultaneously illustrate air velocity and direction. Placement at remote or elevated release points through wands is possible. Bubbles have none of the undesirable features associated with smoke testing, an alternate method used to detect airflow patterns. Use of the bubble technology eliminates smoke-testing related problems, such as false CAM alarms, fear and confusion for uninformed people, the need for preplanning with fire officials, and poor quality airflow visualization.

P.103 Gamma Ray and X-Ray Spectrum of Fiesta Ware and Knowles Uranium Glaze Pottery. *D. Peterson, D. Jokisch; Francis Marion University*

In the mid-20th century, several china manufacturers produced a popular monotone series of pottery. In order to obtain the orange-red color, such as Fiesta Ware's "Fiesta Red", a glaze containing naturally occurring Uranium was used. These pieces of radioactive china have become popular demonstration tools and collectors items for health physicists and nuclear scientists. This work analyzes emissions from two such pieces of differing origin.

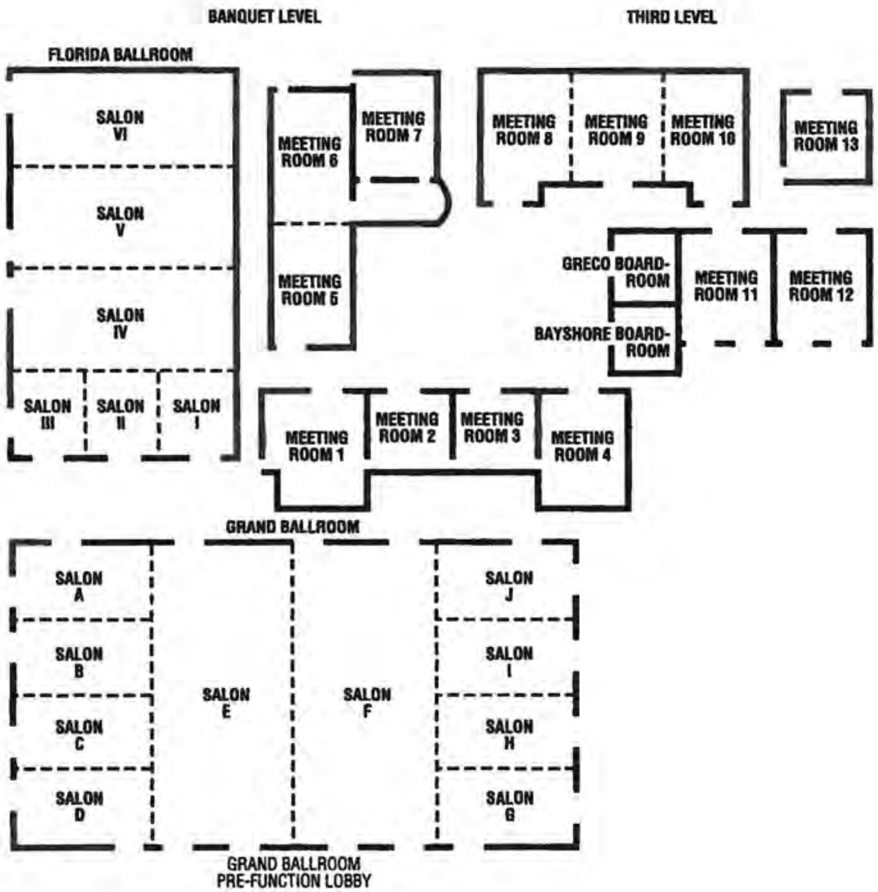
The gamma ray and x-ray spectra from a Fiesta Ware pitcher and Edward M. Knowles plate were measured with HpGe detectors. The content of Uranium and Uranium daughter products was identified. This work includes analysis of L and K x-rays, as well as gamma rays with less than 3.0 MeV of kinetic energy.

P.104 European Intercomparison Test "Non-Destructive Assay of 220 Litre Radioactive Waste Packages". *L.P.M. van Velzen, B.G. Brunel, A.G. Pina, C. Morales, r. J.J. Delepine, G.B. Pedersen, R. Berndt, H.J.T. Bucherl, Ch. Lierse, M.A. Lewis, S. Daish, R. Bardon, Sanden, Brugge, May, e, A., P. Filss, man, P. Dodaro, K. van Kroth, R. Iseghem, Odoj, R. Carchon, J. Botte, J.P. Hendrick; NRG, The Netherlands, ENEA and JRC, Italy, CEA, France, FZ and TUM/RCM, Germany, ENRESA and Ciemat, Spain, SCK-CEN and Belgoprocess, Belgium, WQCL-NNC, United Kingdom*

An intercomparison test on NDA analysis of 220 ltr drums containing fissile and non-fissile radioactive material has been performed to validate and to improve the QA & QC procedures. Various European national laboratories involved in the independent checking of radwaste agreed that such a test would be a beneficial method for validation of their procedures and results of present NDA techniques for 220 ltr waste packages. The test involved fourteen drums containing non-fissile and three drums containing fissile material. 220 ltr standards were prepared in the laboratories and transported between them. All data collected during the test has been collated. Overall conclusion of the test; the non-fissile testing produced a good comparison and achieved the project objectives.The fissile test was not satisfactory. The gained experience enables the setting up of a clear set of recommendations of best practice.

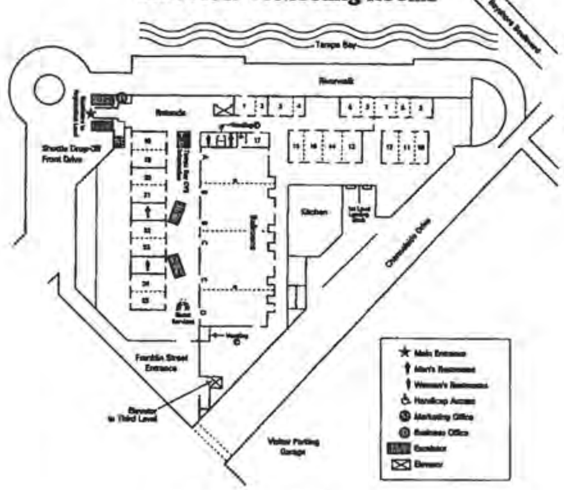
Author Index

Tampa Marriott Waterside



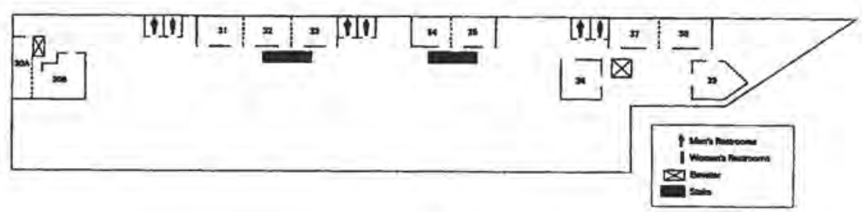
Tampa Convention Center

FIRST FLOOR
Ballrooms & Meeting Rooms



SECOND FLOOR
Exhibit Halls

Third Floor
Meeting Rooms



Notes

Saturday, June 15

AAHP 1 Radioactivity in Recycled Materials and Municipal and Residual Waste.
8:00 am - 5:00 pm Marriott Salon H

AAHP 2 Food Irradiation Technology.
8:00 am - 5:00 pm Marriott Salon I

AAHP 3 Application of ANSI/HPS N13.1-1999: Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities.
8:00 am - 5:00 pm Marriott Salon J

Sunday, June 16

All Sunday PEPs will be held at the Tampa Marriott

PEP **1-A thru 1-J**
8:00 - 10:00 am

PEP **2-A thru 2-J**
10:30 am - 12:30 pm

PEP **3-A thru 3-J**
2:00 - 4:00 pm

Welcome Reception
6:00 - 7:30 pm Marriott Grand Ballroom E/F

Monday and Wednesday Plenarys *in Convention Center Ballroom*

Monday - Thursday *All Technical Sessions and PEPs will be held at the Convention Center*

Monday, June 17

CEL-1 Backgrounds, Detection Limits, and Treatment of Uncertainties in Survey Data
7:15 - 8:15 am CC 18/19

CEL-2 The Oklo Natural Nuclear Reactor
7:15 - 8:15 am CC 20/21

ABHP Exam - Part I
8:00 - 11:00 am Marriott Florida Ballroom V & VI

MAM-A Plenary Session
8:30 am - Noon CC Ballroom A/B

Lunch in Exhibit Hall for all Registrants and Opening of Exhibits
Noon - 1:30 pm West Exhibit Hall

PEP Program *12:15-2:15 PM*

M-1 Is Radiation an Essential Trace Energy? *(CC 3/4)*

M-2 Coronary Artery Radiation Therapy [CART]. *(CC 5/6)*

M-3 ICRP 66 Respiratory Tract Model. *(CC 13)*

M-4 Public and Scholarly Perceptions of Radiation Risks. *(CC 14)*

M-5 Role of the HP in Radiation Accident Management. *(CC 15)*

M-6 Technical Basis for an Internal Dose Program. *(CC 16)*

ABHP Exam - Part II
12:30 - 6:30 pm Marriott Florida Ballroom V & VI

HPS Chapter Council
1:00 - 2:00 pm CC 20/21

Poster Session
1:30 - 3:00 pm CC Exhibit Hall

MPM-A MPM-A: Medical HP and RSO Section Session: Doses from Medical Procedures-Special Concerns for Women and Children
3:00 - 5:00 pm CC Ballroom A/B

MPM-B External Dosimetry
3:00 - 4:30 pm CC 20/21

MPM-C Operational Health Physics
3:00 - 4:30 pm CC 22/23

MPM-D Radiological Security/Emergency Planning/Response
3:00 - 5:15 pm CC 24/25

MPM-E Biokinetics/Bioeffects
3:00 - 4:45 pm CC 18/19

Student Reception
5:30 - 6:30 pm Marriott Room 10

Adjunct Technical Meeting: Current Issues in HP Instrumentation
6:00 - 8:00 pm Marriott Grand Ballroom C/D

Tuesday, June 18

CEL-3 Radiation Protection Quantities: A Critique
7:15 - 8:15 am CC 18/19

CEL-4 Radiation Accident History
7:15 - 8:15 am CC 20/21

TAM-A AAHP Special Session: Accidents in the Nuclear Industry; Impacts and Lessons Learned
8:30 am - Noon CC 18/19

TAM-B Depleted Uranium Aerosol Characterization: Applicability to Soldier Exposure Assessment
8:30 am - Noon CC 20/21

TAM-C Accelerator Section Session
8:30 am - Noon CC 22/23

TAM-D Medical HP Section Session: 21st Century - The Century of Medical Science
8:30 - 10:00 am CC 24/25

Medical HP Section Meeting
10:30 am CC 24/25

Accelerator Section Meeting
Noon CC 22/23

AAHP Awards Luncheon
Noon - 1:30 pm CC 10-12

PEP Program *12:15-2:15 PM*

T-1 Revisions in Internal Radiation Dosimetry; ICRP Publication 68 *(CC 3/4)*

T-2 Medical Mgmt. of Patients Vis-a-Vis Radiological Terrorist Events *(CC 5/6)*

T-3 Steering a Course Through the Regulatory Maze *(CC 13)*

T-4 The Art and Science of "Selling" Your Radiation Safety Program *(CC 14)*

T-5 Use of MARSSIM for Decommissioning Medical Facilities *(CC 15)*

T-6 Effective Communication Tools for Improved Rad. Safety Programs *(CC 16)*

TPM-A AAHP Special Session: Accidents in the Nuclear Industry; Impacts of Lessons Learned
2:30 - 5:00 pm CC 18/19

TPM-B Biokinetics/Bioeffects of the Actinides
2:15 - 5:45 pm CC 20/21

TPM-C **Environmental**
2:30 - 3:30 pm CC 22/23

TPM-C **Decommissioning**
4:00 - 5:45 pm CC 22/23

TPM-D **Medical Health Physics**
2:30 - 5:00 pm CC 24/25

Decommissioning Section Meeting
2:30 pm Room: CC 3/4

Radon Section Meeting
4:00 pm Room: CC 5/6

AAHP Open Meeting
5:00 pm CC 18/19

HPS Awards Reception and Dinner
7:00 - 10:00 pm Tampa Marriott Grand Ballroom

Wednesday, June 19

CEL-5 Updated Internal Radiation Dosimetry; ICRP Publication 68
7:15 - 8:15 am *CC 18/19*

CEL-6 Depleted Uranium, Why Public Concern Is So Great?
7:15 - 8:15 am *CC 20/21*

WAM-A Government, Medical Health Physics, and RSO Section Plenary Session: Symposium on Homeland Security
8:30 am - Noon *CC Ballroom A/B*

PEP Program *12:15-2:15 PM*

W-1 How to Have Fun Teaching Kids and Adults about Radiation (CC 3/4)

W-2 Obtaining Optimal Image Quality and Minimal Patient Dose in X-ray Imaging *(CC 5/6)*

W-3 Intro. to Non-Ionizing Radiation Safety: Practical Strategies *(CC 13)*

W-4 A Risk Management & Insurance Primer for Institutional Health Physicists *(CC14)*

W-5 University Medical Center Radiation Safety Programs *(CC 15)*

W-6 Calculating and Reporting Fetal Radiation Exposure from Medical Procedures *(CC 16)*

WPM-A Government, Medical Health Physics, and RSO Section Session: Symposium on Homeland Security
2:30 - 5:45 pm *CC Ballroom A/B*

WPM-B MARLAP
2:30 - 5:30 pm *CC 20/21*

WPM-C Radionuclide NESHAPs
2:30 - 3:45 pm *CC 22/23*

WPM-D Medical HP Section Session: Shielding for Medical Facilities
2:30 - 4:00 pm *CC 24/25*

WPM-D Medical HP and Government Section Session: Regulation in Medicine
4:30 - 5:30 pm *CC 24/25*

WPM-E Regulatory/Legal Issues
2:30 - 3:30 pm *CC 18/19*

WPM-E Waste Management
4:00 - 4:45 pm *CC 18/19*

Joint Radionuclide NESHAPs Annual Meeting
4:15 pm *CC 22/23*

HPS Business Meeting
5:45 - 6:30 pm *CC 24/25*

Adjunct Technical Meeting: Aerosol Measurements
6:30 - 8:30 pm *Marriott Grand Ballroom C/D*

Thursday, June 20

CEL-7 Basics of PET
7:15 - 8:15 am *CC 18/19*

CEL-8 Current Status of Agents used in Nuclear Medicine Therapy
7:15 - 8:15 am *CC 20/21*

THAM-A Probability of Causation
8:30 am - Noon *CC 18/19*

THAM-B Our Role in Reducing Terror from a Radiological Incident
8:30 - 11:30 am *CC 20/21*

THAM-C RSO Section Session
8:30 - 11:15 am *CC 22/23*

THAM-D The History and Development of Portable Gamma Spectrometers: Use and Practical Applications
8:30 - 11:00 am *CC 24/25*

RSO Section Meeting
11:15 am *CC 22/23*

PEP Program *12:15-2:15 PM*

TH-1 Radiation Safety in Brachytherapy *(CC 3/4)*

TH-2 Back to Nature: The Sources and Origins of NORM *(CC 5/6)*

TH-3 Medical Internal Dose Calculations - Current Practice and Future Trends *(CC 13)*

TH-4 Subsurface Radiological Characterization *(CC 14)*

TH-5 Obtaining Optimal Myocardial Perfusion Images with Minimal Patient Dose *(CC 15)*

TH-6 Patient Radiation Safety and Fluoroscopy *(CC 16)*

Registration Hours

Saturday	*2:00 - 5:00 pm*	*Tampa Marriott*
Sunday	*7:00 am - 7:00 pm*	*Tampa Marriott*
Monday	*8:00 am - 4:00 pm*	*Tampa Convention Center*
Tuesday	*8:00 am - 4:00 pm*	*Tampa Convention Center*
Wednesday	*8:00 am - 4:00 pm*	*Tampa Convention Center*
Thursday	*8:00 am - Noon*	*Tampa Convention Center*

Exhibit Hall Hours

Convention Center

Monday	*Noon - 5:00 pm*
Tuesday	*9:30 am - 5:00 pm*
Wednesday	*9:30 am - Noon*

Breaks Monday pm-Wednesday am

Featuring morning continental breakfasts and afternoon refreshments. Be sure to stop by and visit with the exhibitors while enjoying your refreshments!