Health Physics Society
1999 Final Program
44th Annual Meeting
June 27-July 1, 1999
Philadelphia
Pennsylvania

Table of Contents

Registration Hours

Saturday, June 26 ..... 2:00 - 5:00 pm (Philadelphia Marriott)
Sunday, June 27 .... 7:00 am - 7:00 pm (Philadelphia Marriott)
Monday, June 28 ..... 8:00 am - 4:00 pm (Conv. Center)
Tuesday, June 29 ..... 8:00 am - 4:00 pm (Conv. Center)
Wednesday, June 30 ..... 8:00 am - 4:00 pm (Conv. Center)
Thursday, July 1 ..... 8:00 am - Noon (Conv. Center)

Affiliates Program

Monday, June 28 ..... Noon - 5:00 pm
Tuesday, June 29 ..... 9:30 am - 5:00 pm
Wednesday, June 30 ..... 9:30 am - 4:00 pm

1999 PROGRAM COMMITTEE

LYNNE A. FAIROBENT, CHAIR
CINDY BOGGS
KATHLEEN D. DINNEL
ROBERT J. EMERY
JANET A. JOHNSON
MICHAEL LEWANDOWSKI
CRAIG A. LITTLE
JOHN J. MILLER
HOWARD M. PRICHARD

Thank You to the Following Sponsors

Canberra Industries
Georgia Institute of Technology
MooreRad, Inc.
Scientific Consultant Insurance Services/
St. Paul Fire & Marine Insurance Co.

Officers

KEITH H. DINGER, President
RAYMOND H. JOHNSON, JR., President-Elect
JOHN R. FRAZIER,Treasurer
RICHARD E. TOOHEY, Secretary
RUTH E. McBURNEY, Secretary-Elect
RICHARD J. BURK, JR., Executive Secretary

Board of Directors

Keith H. Dinger, Chair
Theresa L. Aldridge
David J. Allard
George Anastas
Nancy M. Daugherty
Paul W. Frame
John R. Frazier
Raymond H. Johnson, Jr.
Elizabeth P. Katsikis
William E. Kennedy, Jr.
Kent N. Lambert
Ruth E. McBurney
David W. Miller
Otto G. Raabe
Richard E. Toohey

Advisory Panel to the Board of Directors

Paul S. Rohwer, Parliamentarian
Richard J. Burk, Jr., Executive Secretary
Lynne A. Fairobent, Program Chair
Kent N. Lambert, Local Arrangements Co-Chair
Elizabeth Ullrich, Local Arrangements Co-Chair
Keith J. Schiager, Presidents Emeritus Chair
Kenneth L. Miller, Editor-in-Chief of *Health Physics*
Genevieve S. Roessler, Editor-in-Chief of *HPS Newsletter*

Past Presidents

1955-1957	K. Z. Morgan
1957-1958	F. P. Cowan
1958-1959	L. S. Taylor
1959-1960	E. E. Anderson
1960-1961	J. S. Laughlin
1961-1962	W. D. Claus
1962-1963	C. M. Patterson
1963-1964	W. T. Ham, Jr.
1964-1965	H. L. Andrews
1965-1966	M. Eisenbud
1966-1967	J. R. Horan
1967-1968	W. S. Snyder
1968-1969	W. H. Langham
1969-1970	J. N. Stannard
1970-1971	C. C. Palmiter
1971-1972	D. W. Moeller
1972-1973	R. D. Evans
1973-1974	N. Wald
1974-1975	J. C. Hart
1975-1976	P. L. Ziemer
1976-1977	J. C. Villforth
1977-1978	J. A. Auxier
1978-1979	C. M. Unruh
1979-1980	M. W. Carter
1980-1981	W. C. Reinig
1981-1982	C. B. Meinhold
1982-1983	R. J. Cloutier
1983-1984	B. L. Rich
1984-1985	W. J Bair
1985-1986	J. E. Watson, Jr.
1986-1987	J. W. Poston, Sr.
1987-1988	D. A. Waite
1988-1989	R. E. Alexander
1989-1990	R. L. Kathren
1990-1991	G. S. Roessler
1991-1992	F. X. Massé
1992-1993	K. J. Schiager
1993-1994	K. L. Mossman
1994-1995	M. Goldman
1995-1996	W. A. Mills
1996-1997	R. J. Vetter
1997-1998	O. G. Raabe

Local Arrangements Committee

Kent Lambert, Co-Chair
Betsy Ullrich, Co-Chair
Mike Bernstein
Tony Dimitriadis
Mike Drzyzga
Sue Dupre
Jeanette Eng
Bill Fendt
Rob Forrest
Jean Gresick-Shugsta
John Keklak
Tom LaVake
John Leutzelschwab
Larry Martino
George McDurmon
Jack McFadden
Craig Miller
Sheri Minnick
Kathy Modes
Mary Moore
John Nicholson
Laurie Peluso
Mark Roberts
Richard Shimko
Glenn Sturchio
Duncan White
Bob Wickline

Registration Fees

Class	Pre-Reg.	On-Site
◆Member	$265	$340
◆Non-Member**	$315	$390
♋Student	$ 55	$ 55
♓Companion	$ 50	$ 50
Exhibits only	$ 25	$ 25
Exhibitor (2/Booth)	No Fee	No Fee
●Member, 1 Day	n/a	$195
●Non-Member, 1 Day	n/a	$195
♋ Student, 1 Day	n/a	$ 30
Add'l. Evening Awards Banquet Tickets	$ 55	$ 55

- ◆ Includes Sunday Reception, Monday Lunch and Tuesday Evening Awards Banquet
- ♋ Includes Sunday and Student Receptions, Monday Lunch and Tuesday Evening Awards Banquet
- ♓ Includes Sunday Reception, Monday Hospitality Mixer Breakfast, Monday Lunch
- ● Includes Sessions and Exhibitions **ONLY**

** $75 of fee applicable towards NEW HPS Membership if **Completed Application is submitted by September 24, 1999**

Registration Hours

Saturday, 6/26 ..... 2–5 PM
Sunday, 6/27..... 7 AM–7 PM
Monday, 6/28..... 8 AM–4 PM
Tuesday, 6/29 ..... 8 AM–4 PM
Wednesday, 6/30..... 8 AM–4 PM
Thursday, 7/1 ..... 8 AM–Noon

Information

Speaker Instructions

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

The **Ready Room** (104 B) in the Convention Center will be open Monday from 7:00–11:00 am and 1:00–4:00 pm, Tuesday from 8:00–10:30 am and 1:00–4:00 pm and Wednesday from 8:00–10:30 am and 1:00–3:30 pm. Slides are to be brought to the designated ready room for loading and previewing no later than the time indicated below:

Present. Time	Delivery Deadline
Monday PM	7 – 11 am Monday
Tuesday AM	1–4 pm Monday
Tuesday PM	8–10:30 am Tues.
Wednesday AM	1–4 pm Tuesday
Wednesday PM	8–10:30 am Wed.
Thursday AM	1–3:30 pm Wed.

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 Rooms 304/305 (Philadelphia Marriott), with hours from 8:00 am to 5:00 pm, Monday through Wednesday, and 8:00 am - Noon on Thursday. Interviews may be conducted in the designated areas of the Placement Center.

Business Meeting

The **HPS Annual Business Meeting** will be convened at 5:30 pm on Wednesday, June 30, in Room 107 A/B(Convention Center).

Evening Awards Banquet

The **Evening Awards Banquet** will be held at the Marriott on Tuesday, June 29. The reception will begin at 6:30 pm in Franklin B with dinner following at 7:30 pm in Salons E-H. The following awards are to be presented:

Elda E. Anderson Award
Glenn M. Sturchio

Fellow Class Awards
Jack J. Fix
John J. Kelly
Aaron J. Padgett*
Walter F. Wegst
*Posthumous

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

Mediterranean Salad

Choice of:
Herb Roasted Chicken,
Grilled New York Strip Steak or
Grilled Filet of Salmon

Chef's Choice of Accompaniments

Assorted Miniature Pastries

Coffee, Tea, Decaf

Future Annual Meetings

45th 6/25-29, 2000 Denver

46th 6/10-14, 2001 Cleveland

Future Midyear Topical Meetings

33rd 1/30-2/2, '00 VA Beach, VA

Companion Hospitality Suite

The Hospitality Suite in **JW's Restaurant** at the Marriott will open Noon-2 pm on Sunday, June 27 and 8 am-2 pm Monday through Wednesday, June 28-30. The suite will be a place to mingle, receive and leave messages and gather information on the many attractions to enjoy in Philadelphia and the surrounding area. There will be a complimentary Continental Breakfast Monday morning from 8-8:45 AM in Salons C/D at the Marriott for all registered Companions, which will feature a safety and orientation program to Philadelphia.

ACTIVITIES AND TOURS

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

Sunday, June 27

City Tour	2-5 PM
Opening Reception	6-7:30 PM

Monday, June 28

Hospitality Ste. Mixer	8 AM
Brandywine Valley	9 AM-5 PM
Walking Tour	9 AM-Noon
Univ. PA Tech. Tour	12:30-5 PM
Atlantic City	6 PM-Midnight
Pinochle Party	8 PM

Tuesday, June 29

5K Run/Health Walk	6:30 AM
City Tour	9 AM-Noon
Food Irradiator Tour	9 AM-Noon
3 Mile Island Tour	9 AM-5 PM
Medical Mecca Tour	Cancelled
Evening Awards Banquet	6:30 PM

Wednesday, June 30

Golf Tournament	7 AM
Arts Walking Tour	8 AM-Noon
PA Dutch Tour	9 AM-5 PM
NRC Mobile Lab	Cancelled

Child Care

Child care during the Annual Meeting may be arranged with the following organizations or you may wish to find another child care service:

The Philadelphia Nanny Network
215-546-3002
www.nannyagency.com
Rates: $25/day referral fee (for hotel sitting) and $6-$10 per hour (depending on experience of the nanny).

Future Stars Camp
610-783-6336
www.futurestarscamps.com
Rates: $195/week (6/28-7/2) with full payment by 5/31/99.

Call A Granny
215-924-8723
Rates: $9/hour for 1-2 children, $12/hour for 3 children; 3 hour minimum. $5 transportation charge per day.

HPS assumes no responsibility or liability for child care.

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.

New This Year

The **HPS Awards Banquet will feature a dinner,** Tuesday, June 29, Philadelphia, Marriott. The reception will be at 6:30 pm in Franklin B; entertainment will be provided by the Mummers Ferko String Band. Dinner will be served at 7:30 pm in Salons E-H.

Important Events!

Welcome Reception

The HPS Welcome Reception will be held Sunday, June 27 from 6–7:30 pm at the Philadelphia Marriott Hotel Ballroom, Salons E-F.

Sessions

Saturday – AAHP Courses will be held in the Philadelphia Marriott Hotel.

Sunday – PEP Sessions will be held in the Philadelphia Marriott Hotel.

Monday–Thursday – Sessions will be held at the PA Convention Center.

ABHP Exam

ABHP Exam will take place Monday, June 28 at the Marriott, Salon F. Part 1, 8-11 am and Part 2, 12:30-6:30 pm. Good Luck!

Exhibits

Free Lunch! Free Lunch! – Noon, Monday, June 28. All registered attendees are invited to attend a complimentary lunch in the exhibit hall immediately following the Plenary Session.

Breaks Monday Afternoon-Wednesday Afternoon – Featuring morning Continental Breakfasts and afternoon refreshments. Be sure to stop by and visit with the exhibitors while enjoying your refreshments!

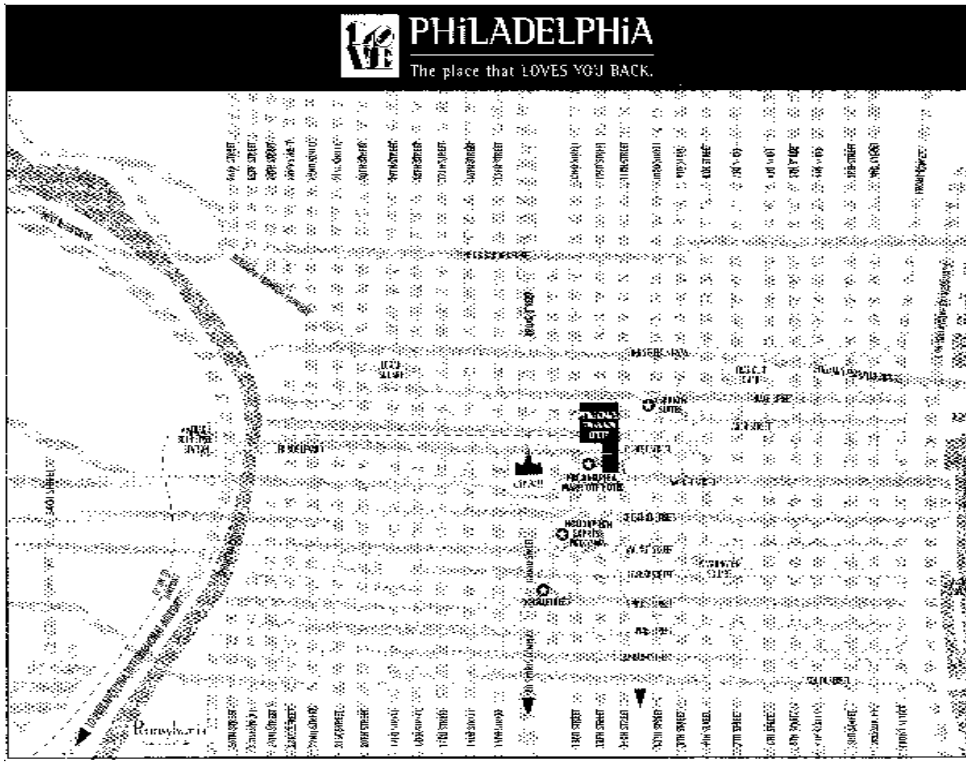
THINGS TO REMEMBER!

All posters up Monday, Noon–Wednesday, Noon in Exhibit Hall

Posters MUST be taken down Wednesday, Noon-2 pm

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

AAHP Awards Luncheon - Tuesday, Noon-1:30 PM in the Convention Center, Room 113 A/B (see following page)



AAHP Awards Luncheon

The AAHP is sponsoring an Awards Luncheon on Tuesday, June 29, from Noon-1:30 pm, Convention Center, Room 113 A/B

The following rate structure will apply:

1) Persons certified in 1998 ..... Free
2) CHPs other than #1 ..... $10.00
3) Guests and others wishing to attend..... $15.00

To sign up for the Luncheon, stop by the Registration Desk

HEALTH PHYSICS SOCIETY COMMITTEE MEETINGS

(M) = PHILADELPHIA MARRIOTT; (CC) = PENNSYLVANIA CONVENTION CENTER

Saturday, June 26

FINANCE COMMITTEE ***(M)***
8:30 am-Noon *Room 402*

RULES COMMITTEE ***(M)***
8:30 am-Noon *Room 403*

ABHP BOARD MEETING ***(M)***
9 am-5 pm *Room 410*

HP PROGRAM DIRECTORS ORGANIZATION EXEC. COMM. ***(M)***
10 am-Noon *Room 406*

CONTINUING EDUCATION COMMITTEE ***(M)***
Noon-6 pm *Room 404*

HPS EXEC. COMMITTEE ***(M)***
1-5 pm *Presidential Suite*

HP PROGRAM DIRECTORS ORGANIZATION – OPEN MEETING ***(M)***
1-5 pm *Rooms 309/310*

SYMPOSIA COMMITTEE ***(M)***
1-5 pm *Room 403*

PUBLICATIONS COMM. ***(M)***
1-5 pm *Room 402*

HPJ EDITORIAL BOARD ***(M)***
3-6 pm *Rooms 304/305*

Sunday, June 27

VENUES COMMITTEE ***(M)***
8 am-1:30 pm *Room 301*

HPS BOARD OF DIRECTORS ***(M)***
8 am-5 pm *Salon A*

ABHP BOARD MEETING ***(M)***
9 am-Noon *Rooms 302/303*

AAHP EXECUTIVE COMM. ***(M)***
1- ??? pm *Rooms 302/303*

PROGRAM COMMITTEE ***(CC)***
1 pm *Room 104B*

BEIR VII – OPEN MEETING ***(M)***
3-5:30 pm *Rooms 304/305*

STUDENT BRANCH COUNCIL ***(M)***
4-6 pm *Room 301*

BRPS ***(M)***
7:30-9 pm *Conference Suite 1*

Monday, June 28

ABHP PPW ***(M)***
9 am-Noon *Room 410*

ACADEMIC EDUCATION COMMITTEE ***(CC)***
Noon-2 pm *Room 101A*

PUBLICATIONS COMM. ***(CC)***
Noon- 4 pm *Room 106B*

ANSI N43.1 ***(CC)***
1-6 pm *Room 102B*

CHAPTER COUNCIL MEETING ***(CC)***
1-2:30 pm *Room 103C*

RSO EXECUTIVE BOARD ***(M)***
1-3 pm *Room 303*

AWARDS COMMITTEE ***(M)***
1:30-2:30 pm *Room 410*

Tuesday, June 29

ACCEL. SECTION BOARD ***(M)***
7-8:30 am *Room 406*

COMM. CHAIR BREAKFAST*(M)*
7:30-9 am *Rooms 408/409*

DOE RAD. CONTROL COORDINATING COMM. ***(M)***
8 am-5 pm *Room 404*

LAB ACCRED.-POLICY ***(M)***
11 am-1 pm *Room 407*

INTERNATIONAL RELATIONS COMMITTEE ***(CC)***
Noon-2 pm *Room 102B*

MEMBERSHIP COMMITTEE ***(CC)***
Noon-2 pm *Room106 B*

PUBLIC EDUCATION COMMITTEE ***(CC)***
Noon-2 pm *Room105A*

ANSI N323C COMMITTEE ***(M)***
1:30-3:30 pm *Room 405*

ANSI N323D COMMITTEE ***(M)***

E. ANDERSON BREAKFAST*(M)*
7:30-9 am *Rooms 402/403*

AFFILIATES COMMITTEE ***(M)***
7:30-9:30 am *Rooms 408/409*

ANSI N13.48 ***(CC)***
8-11 am *Room 106 B*

STANDARDS COMMITTEE ***(M)***
8-11:30 am *Room 407*

ANSI WORKING GRP. HEALTH & SAFETY TECHNICIANS ***(M)***
8:30 am-6 pm *Room 413*

ANSI N13.12 ***(M)***
9 am-Noon, 1-3 pm *Room 401*

IRPA DELEGATES ***(CC)***
9:30-11 am *Room 102A*

LIAISON COMMITTEE ***(M)***
11:30 am-3 pm *Room 410*

HISTORY COMMITTEE ***(CC)***
Noon-2 pm *Room105A*

STRATEGIC PLANNING COMMITTEE ***(CC)***
Noon-2 pm *Room 106B*

SUMMER SCHOOL COMM.*(CC)*
Noon-2 pm *Room101A*

LEGISLATION AND REGULATION COMMITTEE ***(CC)***
Noon-2 pm *Room102B*

NOMINATING COMMITTEE ***(M)***
Noon-3 pm *Room 406*

ASTM E10.04 ***(M)***
1-4 pm *Room 411*

ANSI/HPS N13.53 ***(M)***
1-5 pm *Room 407*

NESHAP-ANSI N13.1 ***(M)***
1-5:30 pm *Rooms 408/409*

SPI COMMITTEE ***(M)***
7-8:30 am *Room 401*

LOCAL ARRANGEMENTS COMMITTEE ***(CC)***
7:30-9:30 am *Room 104A*

ANSI WORKING GROUP HEALTH & SAFETY TECHNICIANS ***(M)***
8:30 am-6 pm *Room 413*

HPS BOARD OF DIRECTORS ***(M)***
9 am-12:30 pm *Salon D*

PROGRAM COMMITTEE **(M)**

Health Physics Society 44th Annual Meeting
Philadelphia, Pennsylvania – June 27-July 1, 1999
Final Scientific Program

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

Monday

7:15-8:15 AM Room: 107 A/B
CEL-1 Lessons Learned from the McCafferty v. Centerior Trial. *David J. Wiedis; Jose & Wiedis*

7:15-8:15 AM Room: 108 B
CEL-2 Decommissioning Issues as We Approach Y2K-Rulemakings, MARSSIM, and Dose Modeling. *Eric Abelquist; ORISE*

Plenary Session: Radiation Regulations in the New Millennium

(Oral Session)

Chair: HPS President Keith H. Dinger

8:30 Introduction and Welcome. *Local Arrangements Committee and Keith Dinger*

8:45 Radiation Regulations in the New Millennium. *Keith H. Dinger; President HPS*

8:55 Introduction of G. William Morgan Lecturers. *Keith J. Schiager, Chair, Presidents-Emeritus Committee*

9:00 MAM-A.1
Prospect for the RERF Studies to Influence Radiation Regulations in the Next Millennium. ***(G. William Morgan Lecture)*** *Dr. Shigenobu Nagataki, Chairman, RERF*

9:30 Introduction of Robert S. Landauer, Sr. Lecture. *Keith H. Dinger, HPS President*

9:35 MAM-A.2
Prospect for the BEIR VII Report to Influence Radiation Regulations in the Next Millennium**.** ***(Robert S. Landauer, Sr. Lecture)*** *Richard R. Monson, Chair BEIR VII Committee*

10:05
BREAK

10:30 MAM-A.3
NRC Radiation Regulations in the New Millennium. *The Honorable Greta Joy Dicus, Commissioner, US NRC*

10:45 MAM-A.4
DOE Radiation Regulations in the New Millennium. *Joseph Fitzgerald, Deputy Assistant Secretary; US DOE, Washington, DC*

11:00 MAM-A.5
EPA Radiation Regulations in the New Millennium. *Steve Page, Director, Office of Radiation and Indoor Air, US EPA, Washington, DC*

11:15 Panel Discussion
Prospect for a Consolidated and Coordinated Radiation Regulatory Framework in the New Millennium. ***Moderator*** *- Keith H. Dinger.* ***Panel*** *- Commissioner Greta Dicus; Joseph Fitzgerald; Steve Page and Robert Hallisey, Chair of CRCPD.*

Noon-1:00 pm — Exhibit Hall B

Lunch in Exhibit Hall for all Registrants and Opening of Exhibits

Monday

P: Poster Session
(Poster Session)

COMPUTER APPLICATIONS

P.1 Modifications of SKYSHINE-III to Analyze Interim Spent Fuel Storage Installations. *N. E. Hertel, H. Pfeifer, D. G. Napolitano; Georgia Institute of Technology*

P.2 A Customized Database for a Radiation Safety Office. *J. C. Strydom, E. Jawdeh, R. D. Ice; Georgia Institute of Technology*

P.3 REMIT Upgraded for Windows. *D. A. Hagemeyer, M. L. Thomas; Science Applications International Corporation, and US Nuclear Regulatory Commission*

P.4 Comparison of MCNP4B and EGS4 for Dose Calculations in Small Voxelized Target. *T. C. Chao, X. G. Xu; Rensselaer Polytechnic Institute*

P.5 Use of Spreadsheets and Add-ins in Probabilistic Dose/Risk Assess-ments. *K. R. Marlow, M. A. McKenzie-Carter, M. D. Otis; Science Applications International Corporation*

P.6 Detection and Display of Three-Dimensional Source Distributions using Augmented Reality - The Static Case. *J. D. Sanders, C. J. Branch, K. J. Kearfott, B. Stojadinovic, D. K. Wehe; University of Michigan*

P.7 Computer-Based Radiation Safety Training for Hospital Radiation Workers. *H. Yu, D. S. Hamilton, M. Peck, K. J. Kearfott; University of Michigan*

P.8 A Screening Methodology for Evaluating Doses to Biota - Derivation and Application. *K. A. Higley, G. Bilyard, E. Antonio, D. C. Kocher, S. L. Domotor, D. S. Jones, B. E. Sample; Oregon State University, Pacific Northwest National Laboratory, Oak Ridge National Laboratory, and US Department of Energy*

INSTRUMENTATION

P.9 Ceramic Tiles as Inexpensive Large Area Test-Beds for Electret Ion Chambers and Other Instruments Used for Measuring Alpha Contamination on Surfaces. *S. K. Dua, P. S. Jawalikar, M. V. Reddy, P. Szerszen, R. W. Rose, M. A. Ebadian, P. Kotrappa; Florida International University, and Rad Elec Inc.*

P.10 Characterization of Contamination Depth in Concrete Structures in Situ. *X. G. Xu, E. Naessens; Rensselaer Polytechnic Institute*

P.11 Techniques for Beta Spectroscopy using Monte Carlo Methods and Spectral Deconvolution. *S. P. Bush, D. M. Hamby; University of Michigan*

P.12 Application of Anti-Coincidence Shielding using a Low Energy Germanium Detector. *J. B. Walker, J. F. Harmon, R. R. Brey; Idaho State University*

P.13 Backscattering Measurements and Calculations on Large Area Cobalt-60 Sources. *J. M. R. Hutchinson, M. P. Unterweger, P. A. Hodge, M. Ortiz; National Institute of Standards and Technology and The Source Inc.*

Monday

EXTERNAL DOSIMETRY

P.14 Evaluation of the Neutron Response of the Copper-Doped TLD. *A. R. Kline, M. E. Nelson, J. R. Cassata, G. K. Riel; US Naval Academy, Navy Environment Health Center Detachment and Naval Surface Warfare Center Carderock Division*

P.15 Characterization of Angular Dependence of p-Mosfet Dosimeters for Lung, Soft and Skeletal Tissue-Equivalent Phantoms in the Diagonostic Energy Range. *C. H. Huh, B. D. Pomije, W. E. Bolch, M. A. Tressler, D. E. Hintenlang ; University of Florida*

P.16 Organ Dose Calculations for High Energy Protons using Anthropomorphic Phantoms. *A. Bozkurt, X. G. Xu; Rensselaer Polytechnic Institute*

P.17 Monte Carlo Modeling of the Neutron Response for a Lithium Fluoride Albedo Dosimeter System. *M. A. Montes, K. J. Kearfott, W. Casson; University of Michigan, and Los Alamos National Laboratory*

P.18 Modeling the Neutron Response Function of LANL's Current Neutron Criticality Dosimeter Using Monte Carlo Calculations. *B. P. Hanson, M. A. Montes, K. J. Kearfott, H.-H. Hsu, R. T. Devine ; University of Michigan, and Los Alamos National Laboratory*

P.19 Cavity Effects in the Case of Measurements of Personal Absorbed Dose from Beta Particles using TLDs. *C. Frujinoiu, R. Cummings, T. F. Gesell, R. R. Brey; Idaho State University*

P.20 Angular Dependence of Neutron Effective-Dose-Equivalent for Calibration Geometries. *K. G. Veinot, N. E. Hertel; Georgia Institute of Technology*

P.21 TLD Dose Review Program Development and Experiences at BNL. *B. Murray, G. R. Holeman; Brookhaven National Laboratory*

P.22 Personnel Dosimeter Calibration with Thermal Neutrons at the BNL High Flux Beam Reactor. *S. Sengupta, G. R. Holeman, H. F. Kahnhauser, R. N. Reciniello, N. E. Holden; Brookhaven National Laboratory*

P.23 Radiation-Induced Breaks in Plasmid DNA. *B. J. Morabito, W. E. Bolch, D. T. Marshall, B. Aydogan, K. E. Wilson; University of Florida*

NEW P.23A Safe Manual Handling of Samarium 153. *J. E. Pattison; University of South Australia*

P.23B (from THAM-D.7) Review of Fetal Radiation Dose Protection and Dosimetry Issues. *J. E. Baciak, E. J. Skarpac, K. J. Kearfott; University of Michigan*

ENVIRONMENTAL

P.24 An Investigation of the Origin of Eu-152 in Columbia River Sediment. *G. J. Gibbons, D. P. Wells, V. Johnson, T. F. Gesell; Idaho State University, and Battelle Pacific Northwest National Laboratory*

P.25 An Investigation of Po-210 Fate and Transport. *J. J. Helms, T. F. Gesell, R. R. Brey; Idaho State University*

P.26 Developing a Methodology for Analysis of Sr-90 in Milk using 3M Empore Rad Discs. *K. T. Claver, R. R. Brey, T. F. Gesell; Idaho State University*

Monday

P.27 Photon Activation Analysis of Iodine-129. *J. C. Seeber, R. R. Brey, J. F. Harmon, T. F. Gesell; Idaho State University*

P.28 Selenium Sorption on Reservoir Sediments. *A. S. Dyke, W. H. Johnson; University of Nevada-Las Vegas*

P.29 Tritium Extraction Facility Stack Height Determination Using Ventsar XL Dose Calculation Spreadsheet. *A. A. Simpkins; Westinghouse Savannah River Company*

P.30 Radiological Assessments of a Contaminated Material Storage Area Using DANDD and RESRAD. *K. Hong, L. Dauer, G. Re; New York Power Authority*

P.31 A Comparison of Dose Estimates from Radiological Monitoring With and Without As-Measured Data Reporting. *K. A. Marcinkowski, K. J. Kearfott, K. A. Johansen; University of Michigan, and Wisconsin Electric Power Company*

P.32 A Tool for Environmental Dose Assessments-Creating a Web-Accessible Database of Environmental Parameters. *S. M. Beach, K. A. Higley, M. Yundt, S. L. Domotor, C. F. Baes (Presented by K. Brock); Oregon State University, US Department of Energy, and Oak Ridge National Laboratory*

P.33 Experimental Determination of Optimum Counting Geometry for a Low-Energy Gamma Emitter in Soil. *S. A. Menn, K. A. Higley; Oregon State University*

P.34 Radionuclide Concentrations in Fish Collected from the Confluences of Major Canyons that Cross Los Alamos National Laboratory Lands with the Rio Grande. *P. R. Fresquez, D. H. Kraig, M. A. Mullen, L. Naranjo, Jr; Los Alamos National Laboratory*

P.35 Radionuclide Uptake by Alternanthera Philoxeroides in Three Surface Waters at the Savannah River Site. *M. N. Richard, T. Hinton, R. A. Fjeld; Clemson University, and Savannah River Ecology Laboratory*

P.36 Radionuclide Uptake by an Aquatic Macrophyte in a Microcosm of Pond 4 at the Savannah River Site. *J. A. Rubrake, T. Hinton, R. A. Fjeld; Clemson University, and Savannah River Ecology Laboratory*

P.37 The Effectiveness of Fidlers in Detecting Low Energy Hot Particles While Scanning a Land Area. *C. M. Marianno, K. A. Higley; Oregon State University*

P.38 Application of Autoradiographic Methods for Contaminant Distribution Studies in Soils. *O. G. Povetko, K. A. Higley; Oregon State University*

INTERNAL DOSIMETRY

P.39 Comparison of Trabecular Chord Length Distributions Obtained from Nuclear Magnetic Resonance Imaging and Optical Microscopy. *P. W. Patton, D. W. Jokisch, D. A. Rajon, E. J. Eschbach, D. L. Wheeler, S. L. Myers, W. E. Bolch; University of Florida*

P.40 Dose Coefficients for Tritium Intakes in Asians. *A. Trivedi; AECL, Canada*

P.41 Automatic Identification of Organ/Tissue Regions in CT Image Data for Treatment Planning in Cancer Therapy. *R. B. Sparks, L. F. Miller, K. F. Eckerman; Creative Development Enterprises Inc., The University of Tennessee, and Lockheed Martin Energy Research*

Monday

P.42 Estimation of "Missed Collective Dose" by Pooling Routine Bioassay Data. *D. J. Strom; Pacific Northwest National Laboratory*

P.43 Probabilistic Lung Dosimetry with Application to Uranium Dioxide and Octoxide Aerosols. *E. Farfan, W. E. Bolch; University of Florida*

RADON

P.44 Radon in Ontario Public Drinking Water Supplies. *A. G. Scott; Ontario Ministry of Labor, Canada*

P.45 Development of a Dynamic Prediction Model for Indoor Radon Concentrations of Slab-on-Grade Houses. *S. Lee, D. E. Hintenlang; University of Florida*

P.46 Assay of Radon-222 in Potable Water from Some Wells in Taif Region of Saudi Arabia. *A. M. Mamoon, W. H. Abulfaraj, M. A. Sohsah; King Abdulaziz University, Saudi Arabia*

P.47 Measuring Aqueous ^{222}Rn in 5 ML Samples by Liquid Scintillation Analysis with Pulse Shape Discrimination. *M. G. Cantaloub, J. H. Higginbotham, J. Istok, L. Semprini; Oregon State University*

OPERATIONAL TOPICS

P.48 A Comparison of Techniques for the Evaluation and Verification of Gamma-Ray Analysis Software. *D. Van Cleef, R. Keyser, T. Twomey; EG&G Instruments*

P.49 Tracking Use, Transfer and Disposal Via the Net: an "On-Line" Radioactive Materials Inventory Management System. *C. W. Kuechle; Abbott Laboratories*

P.50 Development of a Web Based Radiopharmaceutical Database. *T. M. Jue, S. E. Binney; Oregon State University*

P.51 A Method for Characterizing Photon Radiation Fields. *J. J. Whicker, F. H. Hsieh, H. H. Hsu, T. B. Borak; Los Alamos National Laboratory, and Colorado State University*

WASTE MANAGEMENT

P.52 Identification of Factors Affecting the Amount of Locally Generated Radwastes. *W. H. Abulfaraj, A. M. Mamoon, K. H. Al-Sulaiman; King Abdulaziz University, and King Abdulaziz City for Science and Technology, Saudia Arabia*

P.53 Characterization of a Plutonium Assay Device Based on Spectral Discrimination. *R. E. Apfel, F. d'Errico; Apfel Enterprises Inc., and Yale University*

P.54 A Comparison of Experimental and Theoretical Detection Efficiencies of Large Area Plastic Scintillators. *K. B. Shurtz, T. A. DeVol, J. A. Chapman; Clemson University, and Canberra Industries Inc.*

P.55 Investigation of Radiocolloid Transport Parameters. *D. K. Garretson, R. R. Brey, T. F. Gesell; Idaho State University*

P.56 Improving Sampling and Counting Methodologies to Decrease the MDC of Environmental Radiological Air Samples. *P. A. Jenkins, T. F. Gesell, R. R. Brey, D. P. Wells, A. J. Schilk; Idaho State University, and INEEL Oversight Program*

Monday

DECOMMISSIONING

P.57 C-14 Cleanup at "Mad Chemist" Site. *D. Kassel, R. L. Wise; Ecology and Environment Inc.*

P.58 Diffusion of Selected Radionuclides through Encasement Concrete and Soil Material. *K. Schwab, J. Serne, K. Higley; Oregon State University*

ACCELERATOR

P.59 The Accelerator Health Physics Program at Duke University. *V. Vylet; Duke University*

P.60 High-Energy Neutron Conversion Coefficients. *M. R. Sutton, N. E. Hertel, L. S. Waters, L. S. Walker; Georgia Institute of Technology, and Los Alamos National Laboratory*

P.61 Fourth Intercomparison of Personnel Dosimeters Used in US Department of Energy Accelerator Facilities. *R. D. Stewart, J. C. McDonald, T. Otto, R. M. Loesch; Pacific Northwest National Laboratory, European Laboratory for Particle Physics, Switzerland and US Department of Energy, Washington, DC*

P.62 Radiation Intensity Measurements and Shielding Studies at a 16-MEV Short-Pulsed Linear Accelerator. *T. B. Sundsmo, M. S. Singh; Lawrence Livermore National Laboratori*

EMERGENCY PLANNING

P.63 Moved to WAM-E.1A

P.64 Radiological Assistance Program Transportation Emergency Response - Rapter. *R. D. Boyer, R. M. Wright, J. C. Taschner, R. B. Stump; Westinghouse Electric Corporation, US Department of Energy, NM, Los Alamos National Laboratory, and Sandia National Laboratories*

WORKS IN PROGRESS

P.65 P2PRO(RSM): A Computerized Management Tool for Implementing DOE's Authorized Release Process for Radioactive Scrap Metals. *J. Arnish, S. Kamboj, L. Nieves, S. Y. Chen; Argonne National Laboratory*

P.66 Groundwater Transport Mod-els in RESRAD-OFFSITE. *E. K. Gnanapragasam, D. J. LePoire, C. Yu; Argonne National Laboratory*

P.67 Dose Comparison of RESRAD-BUILD and DandD Computer Codes for Building Contamination. *S. Kamboj, E. Faillace, D. LePoire, C. Yu, A. Wallo, W. A. Williams, H. Peterson; Argonne National Laboratory and US Department of Energy, Washington, DC*

P.68 Updating the MILDOS-AREA Software System. *D. LePoire, J. Arnish, E. Faillace, S. Kamboj, S. Y. Chen; Argonne National Laboratory*

P. 69 The Final Status Survey of an Incinerator. *S. LaRosa; Harvard University and University of Massachusetts Lowell*

P.70 Considerations for the Implementation of an Effective Laser Safety Program. *R. Michel, K. C. Kerns, R. Michel, T. L. Zimmerman; Iowa State University and Laser Power Optics, Inc.*

P.71 NRC's Streamlined Inspection and Enforcement Initiative for Materials. *R. E. Zelac; US Nuclear Regulatory Commission, Washington, DC*

Monday

P.72 Policy Changes

in Managing Public Exposures at a University-Based Biomedical Research Institution. *T. Yoshizumi, R. Reiman, W. Thomann, B. Pulliam, M. Brueckner, K. Ryan, D. Jorgensen; Duke University*

P.73 Improvements in Managing the Radiation Safety Aspects of Inpatient Care. *R. Reiman, C. Faulkner, B. Aaron, G. Egan, T. Mangum, M. Brueckner, W. Conroy, M. Creel, D. Jorgensen, B. Pulliam, K. Ryan, W. Thomann, T. Yoshizumi; Duke University*

P.74 Personnel Dosimetry Investigations in Radiation Safety Operations. *R. Michel, S. C. Perle, P. Pater, P. J. Papin; Iowa State University, ICN Dosimetry Division and San Diego State University*

P.75 Personnel Contamination Monitoring Sensitivity Evaluation. *M. C. Wynn, E. F. Maher; University of Massachusetts Lowell and Duke Engineering & Services.*

P.76 Improved Calibration Method for *In Vivo* Measurement of Stable Lead in Bone using X-Ray Fluorescence. *C. Horn, J. O'Hare, J. Lodwick, B. Kassing, H. Spitz; University of Cincinnati*

P.77 Biokinetic Modeling of Plutonium: The Deposition, Removal and Long-Term Retention in the Skeletal System. *D. A. Halter, J. W. Poston; Texas A&M University*

P.78 Determining the Effective Dose Equivalent and Effective Dose for Anthropomorphic Phantoms with Different Torso Thickness for Broad Parallel Beam of External Photon Radiation. *I. Chichkov; Texas A&M University*

P.79 Probabilistic Dose Reconstruction: Input Parameters and Associated Uncertainties. *I. Linkov; Menzie-Cura and Associates, Inc.*

MPM-A: Waste Management

(Oral Session)

Co-Chairs: Cindy Boggs and Jay Maisler

3:00 **MPM-A.1**
Pilot Study Evaluating Liquid and Solid Shreddate Activity Fractions from Liquid Scintillation Vial Shredding Operations. *M. A. Charlton, R. G. Costello; University of Texas Health Science Center at Houston*

3:15 **MPM-A.2**
A Characterization Update of Orphan Mixed Wastes. *J.-C. Dehmel, S. Schaffer, K. Czyscinski, C. E. Foutes; S. Cohen & Associates Inc., and US Environmental Protection Agency, Washington, DC*

3:30 **MPM-A.3**
Development of an Irradiation Treatment Technique for Low-Level Mixed Waste. *O. Gandou, D. E. Hintenlang; University of Florida*

3:45 **MPM-A.4**
Gamma Irradiation for the Treatment of Hazardous Wastes. *M. S. Taylor, O. Gandou, D. E. Hintenlang; University of Florida*

4:00 **MPM-A.5**
Estimation of Percent Activity of ^{3}H and ^{14}C in Ash in a Fuel-Controlled Incinerator. *D. L. Trim, K. C. Li, G. A. Baker; BMSB*

Monday

4:15 **MPM-A.6**
ALARA Analysis in a Low-Level Radiological Waste Performance Assessment. *L. McDowell-Boyer, J. R. Cook, E. L. Wilhite, A. Yu; Alara Environmental Analysis Inc., and Westinghouse Savannah River Company*

4:30 **MPM-A.7**
Overview of Dose Assessments for Clearance of Equipment and Materials from Nuclear Facilities. *M. A. McKenzie-Carter, M. D. Otis, R. L. Gotchy; Science Applications International Corporation*

4:45 **NEW MPM-A.8**
Radiation Protection for the U.S. Staff Helping Build the Fissile Material Storage Facility Near "Mayak." *P. S. Stansbury; Battelle Northwest Division*

MPM-B: Special Session: Internal Dosimetry for Inhalation of Stable Metal Tritide Aerosols

(Oral Session)

Co-Chairs: Y. S. Cheng, M. Gavrilas-Guinn and J. Zimmerman

3:00 **MPM-B.1**
Workplace Indicators and Bioassay Limitations when Dealing with Stable Metal Tritides. *M. Rogers; Babcock & Wilcox of Ohio*

3:15 **MPM-B.2**
Pitfalls in Tritiated Aerosol Dosimetry. *A. Trivedi; AECL, Canada*

3:30 **MPM-B.3**
Limitation of Tritium Metabolic Models in Interpreting Retention and Excretion Data for Dosimetry. *D. Galeriu, A. Trivedi; AECL, Canada*

3:45 **MPM-B.4**
Classification of Dissolution Rate and Radiation Dosimetry of Stable Metal Compounds of Tritium. *Y. S. Cheng, Y. S. Wang, W. Mulberry, H. N. Jow, W. C. Inkret; Inhalation Toxicology Research Institute, Sandia National Laboratories, and Los Alamos National Laboratory*

4:00 **MPM-B.5**
Self-Absorption of Tritium Betas in Metal Tritide Particles. *Y. Wang, R. F. Kropf, Y. S. Cheng; Lovelace Respiratory Research Institute*

4:15 **MPM-B.6**
Dosimetric Properties of Selected Tritide Particulates. *R. J. Traub, R. D. Stewart, J. C. McDonald, R. M. Loesch; Pacific Northwest National Laboratory and US Department of Energy, Washington, DC*

4:30 **MPM-B.7**
Use of Scanning Electron Microscope in Evaluation of Characterization Surveys and Workplace Monitoring Samples for Stable Metal Tritides. *C. J. Miles, D. P. Cornwell; Lawrence Livermore National Laboratory and Babcock & Wilcox of Ohio*

4:45 **MPM-B.8**
Radiological Controls for Work Involving Stable Metal Tritides at Mound. *A. S. Collas; Babcock & Wilcox of Ohio*

5:00 **MPM-B.9**
Technical Basis for Internal Dosimetry and Air Monitoring for Stable Metal Tritides. *D. T. Abbott, C. J. Miles, D. P. Hickman, T. B. Sundsmo; Lawrence Livermore National Laboratory*

Monday

5:15 **MPM-B.10**
Internal Dosimetry for Inhalation

of Hafnium Tritide Aerosols. *W. C. Inkret, M. E. Schillaci, Y. S. Cheng, D. W. Efurd, T. H. Little, G. Miller, J. A. Musgrave, J. R. Wermer; Los Alamos National Laboratory, and Lovelace Respiratory Research Institute*

MPM-C: Environmental Section: Radioecology

(Oral Session)

Co-Chairs: Kathryn Higley and Marvin Goldman

3:00 **MPM-C.1**
Future Directions in Environmental and Radioecological Research. *F. W. Whicker; Colorado State University*

3:30 **MPM-C.2**
Forest Radioecology: Recent Developments in Risk Identification and Future Perspectives. *I. Linkov, W. R. Schell; Menzie-Cura and Associates Inc. and University of Pittsburgh*

4:00 **MPM-C.3**
The Environmental Impact of Improperly Disposed Medical Radiation Sources. *C. Boras; Pan American Health Organization*

4:30 **MPM-C.4**
Using Science, Policy and Partnerships to Develop Requirements and Guidance for Evaluating Doses to Biota: DOE's Graded Approach. *S. L. Domotor, H. T. Peterson, Jr., A. Wallo III, K. A. Higley, G. R. Bilyard, D. C. Kocher; US Department of Energy, Washington, DC, Oregon State University, Pacific Northwest National Laboratory, and Oak Ridge National Laboratory*

5:00 **Environmental Section Business Meeting**

MPM-D: Special Session: Health Risks from Exposure to Low Levels of Ionizing Radiation (BEIR VII)

(Oral Session)

Chair: Evan Douple

Discussion with BEIR VII Committee Members.

Richard R. Monson, Chairperson

Speakers:

John Boice
Charles Waldren

Tuesday

7:15-8:15 AM **Room: 107 A/B**
CEL-3 Neutrons at Hiroshima and

Nagasaki. *John Auxier; Auxier and Associates*

7:15-8:15 AM Room: 108 B

CEL-4 Highlights of the 1999 Annual NCRP Meeting: Radiation Protection in Medicine: Contemporary Issues. *Jerrold T. Bushberg; University of California Davis Medical Center*

TAM-A: Accelerator Section

(Oral Session)

Co-Chairs: Joe McDonald and Steve Musolino

8:30 TAM-A.1

Data for Use in Radiation Protection at High Energies. **(G. William Morgan Lecturer)** *M. Pelliccioni; Laboratori Nazionali di Frascati, Italy*

9:00 TAM-A.2

Radiation Safety System of the B-Factory at the Stanford Linear Accelerator Center. *J. C. Liu, X. S. Mao, W. R. Nelson; Stanford Linear Accelerator Center*

9:30 TAM-A.3

Radiation Issues, Code Developments, and Shielding Studies for Muon Colliders. *N. V. Mokhov; Fermi National Accelerator Laboratory*

10:00 BREAK IN EXHIBIT HALL

10:30 TAM-A.4

Skyshine and Dose Considerations Outside Thick Shielding at Jefferson Lab. *P. V. Degtiarenko, S. O. Schwahn; Jefferson Lab*

11:00 TAM-A.5

Shielding Calculations for RHIC. *A. J. Stevens; Brookhaven National Laboratory*

11:30 Accelerator Section Business Meeting

TAM-B: Operational Topics

(Oral Session)

Co-Chairs: John White and Ian Hamilton

8:30 TAM-B.1

Characterization of the US Army's Radiation Detection Kit AN/PDR-77. *C. Moss, K. Higley; Oregon State University*

8:45 TAM-B.2

Retrospective Air Sampling at ANL-E. *S. I. Baker, A. L. Justus, M. J. Robinet, C. M. Sholeen; Argonne National Laboratory*

9:00 TAM-B.3

Results of Gamma Scanning Performed at the Los Alamos National Laboratory's Solid Waste Operations Area and Plutonium Facility. *B. Rees, C. Olson, S. Jones, M. Settles; Los Alamos National Laboratory, BNFL Instruments Inc., and AIL Systems Inc.*

9:15 TAM-B.4

Radiation Safety Education in Laboratory Animal Science. *J. G. Emrich, K. N. Lambert, J. Silverman; MCP Hahnemann University*

9:30 TAM-B.5

Radiation Protection Program for the Declared Pregnant Worker at Los Alamos National Laboratory. *J. M. Clark; Los Alamos National Laboratory*

9:45 BREAK IN EXHIBIT HALL

Tuesday

10:15 TAM-B.6

Contamination Spread by Flying Insects on the Hanford Site, Fall 1998. *T. J. Froelich, D. B. Ottley; Fluor Dan-*

iel Hanford Inc.

10:30 **TAM-B.7**
Radiation Protection for the Chornobyl Shelter Implementation Project. *R. A. Hoover, A. A. Korneev, A. Sukhoruchkin, G. J. Vargo; Battelle Memorial Institute, Ukraine, Chornobyl Nuclear Power Plant, Ukraine, and Battelle Memorial Institute*

10:45 **TAM-B.8**
Stabilizing the Chornobyl Unit 3/4 Ventilation Stack: An ALARA Success. *J. K. Neal, G. J. Vargo, R. A. Hoover, B. F. Gore, A. A. Korneev; Pacific Northwest National Laboratory, and Chornobyl Nuclear Power Plant, Ukraine*

11:00 **TAM-B.9**
Improving Radiation Worker Safety at the Chornobyl Shelter. *G. J. Vargo, J. K. Neal, R. A. Hoover, A. A. Korneev; Pacific Northwest National Laboratory, and Chornobyl Nuclear Power Plant*

11:15 **TAM-B.10**
Key Factors Analysis (KFA)-An ALARA Tool. *M. L. Walsh, W. Goodman; W&W Radiological and Environmental Consultant Services Inc., Canada and Decision Opportunities, Canada*

TAM-C: AAHP Special Session U.S.-Russian Joint Radiation Health Effects Studies in the Southern Urals

(Oral Session)

8:30 Welcome and Introductions. *R. L. Kathren, AAHP Past President, Session Arranger*

8:40 Overview of the JCCRER Sponsored Radiation Health Effects Research Program. *P. Seligman, U.S. Department of Energy*

9:00 Preservation of Existing Data for Mayak Workers and Population. *E. Melamed, U.S. Department of Energy*

Session 1: Radiation Exposure to the General Population

(Oral Session)

Co-chairs: Alexander Akleyev and Frank Hawkins

9:20 **TAM-C.1**
Effects of Activities at Mayak on the Environs and Nearby Population. *A. Akleyev; Urals Research Center for Radiation Medicine*

9:50 **TAM-C.2**
Dose Reconstruction for the Exposed Population Living Along the Techa River. *M. O. Degteva, V. P. Kozheurov, M. I. Vorobiova, D. S. Burmistrov, N. G. Bougrov, E. I. Tolstykh, A. N. Kovtun, A. A. Romanyukha, L. R. Anspaugh, B. A. Napier; Urals Research Center for Radiation Medicine, Russia, Institute of Marine Transport Hygiene, Russia, Institute of Metal Physics, Russia, University of Utah and Battelle Pacific Northwest Laboratory*

Tuesday

10:10 **TAM-C.3**
Retrospective Reconstruction of Radionuclide Contamination of the Techa River Caused by Liquid Waste Discharge from Radiochemical Production at the Mayak Production Association: 1949-1956. *Y. Mokrov,*

Y. Glagolenko and B. Napier; Mayak Production Association, Russia and Pacific Northwest National Laboratory

10:30 BREAK IN EXHIBIT HALL

11:00 TAM-C.4
Cancer Incidence in the Exposed Population. *T. Thomas, D. Hoffman, M. Kossenko; Uniform Services University of Health Sciences, George Washington University and Urals Research Center for Radiation Medicine*

11:30 TAM-C.5
Cancer Mortality in the Exposed Population. *E. Ron, M. Kossenko, D. Preston; National Cancer Institute, Urals Research Center for Radiation Medicine and Radiation Effects Research Foundation*

NOON AAHP AWARDS BANQUET

TAM-D: Government Section: NRC's Decommissioning Guidance

(Oral Session)

Co-Chairs: Stephen McGuire and Mark Thaggard

8:30 TAM-D.1
Conclusions on How to Perform Dose Modeling for Decommissioning. *C. Hornibrook; Electric Power Research Institute*

9:00 TAM-D.2
How to Move From Screening to Site-Specific Dose Modeling. *C. Daily; US Nuclear Regulatory Commission, Washington, DC*

9:30 TAM-D.3
Re-evaluation of the Indoor Resuspension Factor and Other Parameters for Dose Modeling Analysis of Decommissioning Sites. *R. Abu Eid, S. A. McGuire; US Nuclear Regulatory Commission, Washington, DC*

10:00 BREAK IN EXHIBIT HALL

10:30 TAM-D.4
Dose Modeling for Residual Radioactivity in Subsurface Soil. *M. Thaggard; US Nuclear Regulatory Commission, Washington, DC*

11:00 TAM-D.5
Methods to Demonstrate Compliance with the ALARA Requirement. *S. A. McGuire; US Nuclear Regulatory Commission, Washington, DC*

11:30 Government Section Business Meeting

TPM-A: Special Session: NCRP Update of Science Committee 1 Activities

(Oral Session)

Chair: Charles Meinhold

2:30 TPM-A.1
Current Interests of the Committee. *J. Adelstein; Harvard Medical School*

3:00 TPM-A.2
SC1-4 Extrapolation of Risk From Non-Human Experimental Systems to Man. *D. Hoel; Medical University of South Carolina*

3:30 BREAK IN EXHIBIT HALL

Tuesday

4:00 TPM-A.3
SC1-7 & SC75 Space Radiobiology, Guidance on Radiation Received in Space Medicine, and Information Needed to Make Radiation Protection Recommendations for Travel Beyond Low-Earth Orbit. *M. Fry; ORNL*

4:30 **TPM-A.4**
SC1-8 Risk to the Thyroid From Ionizing Radiation. *P. Zanzonico; Memorial Sloan Kettering Cancer Center*

TPM-B: RSO Section
(Oral Session)

Chair: Kelly Classic

2:30 **TPM-B.1**
Development of Web-Based Radiation Safety Training to Meet the Needs of a Small Academic Institution. *S. M. Dupre; Princeton University Office of Environmental Health & Safety*

2:45 **TPM-B.2**
Contamination Control in a Pharmaceutical Radiosynthesis Research Laboratory. *P. Linsalata, M. L. Maiello; Wyeth-Ayerst Research*

3:00 **TPM-B.3**
Radionuclide Specific Multipliers for Evaluating Removable Contamination Survey Results. *G. M. Sturchio, G. C. Ziegler, M. J. Dorman; Merck Research Laboratories*

3:15 **TPM-B.4**
Monitoring Liquid Effluents. *A. E. Desrosiers; Bartlett Services Inc.*

3:30 **TPM-B.5**
Radioactive Medical Waste Monitoring and Management at the National Institutes of Health. *S. M. Austin, R. A. Goodman; National Institutes of Health*

3:45 **BREAK IN EXHIBIT HALL**

4:15 **TPM-B.6**
Cardiovascular Brachytherapy: A New Challenge for the Radiation Safety Officer. *B. G. Bass, R. Waksman; Washington Hospital Center*

4:30 **TPM-B.7**
Nonionizing Radiation Sources: New Topics in Radiation Safety. *A. T. Harri; Imation Corporation*

4:45 **TPM-B.8**
Radiation Protection Program Outcomes as Assessed by Regulatory Compliance Activities. *R. J. Emery, M. A. Charlton, G. R. Goodman; University of Texas*

5:00 **TPM-B.9**
Improvement of Radiation Safety Oversight of a University-Based Biomedical Research Institution: Administrative and Operational Challenges. *T. T. Yoshizumi, R. E. Reiman, W. R. Thomann, K. W. Lyles, J. R. Clapp, C. E. Putman; Duke University*

5:15 **TPM-B.10**
The Operational Audit Process in Radiation Safety Operations. *R. Michel, F. N. Eichner; Iowa State University and Consultant, WA*

5:30 **RSO Section Business Meeting**

TPM-C: AAHP Special Session Session 2: Health Effects of Occupational Exposure to Radiation at Mayak
(Oral Session)

Co-Chairs: Sergey Romanov and Paul Seligman

2:00 **TPM-C.1**
Overview of Mayak Occupational Exposures. *S. Romanov, E. Vasillenko;*

Tuesday

First Institute of Biophysics and Mayak Production Association

2:30 **TPM-C.2**
Mayak Worker Dosimetry. *S. Miller, V. Khokhryakov; University of Utah and First Institute of Biophysics*

2:50 **TPM-C.3**
Metabolism and Dosimetry of Actinide

Elements in Occupationally-Exposed Personnel of the United States and Russia. *R. E. Filipy, J. R. Alldredge, S. E. Glover, R. L. Kathren, V. F. Khokhryakov,K. G. Suslova, E. E. Aladova, V. V. Vostrotin; The United States Transuranium and Uranium Registries and Branch No. 1 of the Federal Research Center Institute of Biophysics, Russia*

3:10 TPM.C.4
Risk of Cancer From Mayak Occupational Exposures. *E. S. Gilbert, N. A. Koshurnikova; National Cancer Institute and Branch 1 of the Biophysics Institute, Ozersk*

3:30 TPM-C.5
Deterministic Effects in Occupationally Exposed Mayak Workers. *G. Claycamp, N. Olkadnikova; University of Pittsburgh and First Institute of Biophysics*

3:50 BREAK IN EXHIBIT HALL

Session 3: Molecular Epidemiology and Biodosimetry Studies of Mayak Production Association Workers

(Oral Session)

Co-Chairs: Sergey Romanov and Ruth Neta

4:00 TPM-C.6
Promise of Molecular Epidemiology in Understanding Health Effects. *R. Neta, U.S. Department of Energy*

4:10 TPM-C.7
Lung Cancer in Workers From the Mayak Nuclear Enterprise. *S. A. Belinsky, R. E. Crowell, K. J. Nikula, V. Telnov, G. Rysinova, G. Adamova, N. Olkadnikova; Lovelace Respiratory Research Institute and The Branch of Biophysics Institute, Russia*

4:20 TPM-C.8
Lung Microdosimetry and Risk Assessment. *R. Guilmette, S. Romanov; Lovelace Respiratory Research Institute and First Institute of Biophysics*

4:30 TPM-C.9
Molecular Epidemiology and Biodosimetry Studies. *W. Bigbee, R. Day, N. Olkadnikova; University of Pittsburgh and First Institute of Biophysics*

4:40 TPM-C.10
Establishment of a Repository Containing Tissues of Organs of Deceased Workers of Mayak Industrial Association Exposed to Actinide Elements. *J. J. Russell, K. N. Muksinova, R. L. Kathren; United States Transuranium and Uranium Registries and Russian Federation*

4:50 TPM-C.11
Reproductive Health Among Mayak Industrial Association Workers. *F. Davis, A. Kurbatov; University of Illinois and First Institute of Biophysics*

5:00 AAHP General Meeting

Tuesday

TPM-D: Decommissioning Section

(Oral Session)

Co-Chairs: Eric Abelquist and David Fauver

2:30 TPM-D.1
The Regulation of Recycling of Radioactively Contaminated Material. **(G.**

William Morgan Lecturer) *S. Menon; OECD/NEA*

3:00 TPM-D.2
Management Aspects of a Characterization Survey at a Graphite Research Reactor. *B. J. Dionne, S. Moss, C. Newson, E. Lilimpakis, F. Petschauer; Brookhaven National Laboratory*

3:15 TPM-D.3
Contaminated Soil Remediation Using MARSSIM Methodology at the University of Utah. *T. E. Rasmussen, R. E. Meyer, G. M. Sandquist, J. J. Thompson; University of Utah*

3:30 TPM-D.4
Comparison of Final Status Survey Design MARSSIM Approach and the Former NUREG/CR-5849 Guidance at a Power Reactor Facility. *E. W. Abelquist; Oak Ridge Institute for Science and Education*

3:45 BREAK IN EXHIBIT HALL

4:15 TPM-D.5
Determining Radionuclide Depth Distributions in Large Area Sources Using in Situ Gamma-Ray Spectrometry. *R. R. Benke, K. J. Kearfott; University of Michigan*

4:30 TPM-D.6
Analysis of Drinking Water Pathway used to Develop Remediation Standards for Radioactively Contaminated Soils in New Jersey. *T. W. Amidon; New Jersey Department of Environmental Protection*

4:45 TPM-D.7
Health Physics Challenges Encountered During the Quehanna Hot Cell Decommissioning Project. *K. M. Kasper, W. P. Kirk; NES Inc., and Pennsylvania Department of Environmental Protection*

5:00 Decommissioning Section Business Meeting

Wednesday

7:15-8:15 AM ROOM: 107 A/B
CEL-5 Bayesian Statistics in Health Physics. *Dan Strom; Pacific Northwest National Laboratories*

7:15-8:15 AM ROOM: 108 B
CEL-6 NRC Pilot Program for Regulation of DOE Activities. *Francis Costello; NRC Region I*

WAM-A: Decommissioning

(Oral Session)

Chair: Dale Gergely and Elmer Wilhite

8:30 WAM-A.1
Field Use of E-PERM® Alpha Monitors for Alpha Chrecerization Surveys During Decommissioning and Decontamination Activities in Building K-1401, East Tennessee Technology Park, Oak Ridge, TN. *P. Kotrappa, L. R. Stieff, S. A. Meacham, R. Simmons; Rad Elec Inc., AMS, and American Technologies Inc.*

8:45 WAM-A.2
Decommissioning and License Termination. *E. Jawdeh, J. Strydom, N. Hertel, R. D. Ice; Georgia Institute of Technology*

9:00 WAM-A.3
Brownfield and Contaminated Site Legislation and the Impact on Radiological Site Remediation in NJ. *P. L. Gardner, J. Goodman; New Jersey Department of Environmental Protection*

9:15 WAM-A.4
Implementation of New Jersey Soil Remediation Standards for Radioactively Contaminated Sites. *J. A. Goodman, T. W. Amidon, P. L. Gardner, R. J. Stern; New Jersey Department of Environmental Protection*

9:30 WAM-A.5
Historical Site Assessment of the GTRR Reactor: A Case Study for Stakeholder Involvement. *E. M. Fort, N. Hertel, R. D. Ice, A. Bostrum; Georgia Institute of Technology*

WAM-B: Internal Dosimetry I

(Oral Session)

Co-Chairs: Joseph Alvarez and Wesley Bolch

8:30 WAM-B.1
Estimation of Electron Absorbed Fractions in the Extrathoracic Airways. *H. M. Moussa, K. F. Eckerman, L. W. Townsend; University of Tennessee, and Oak Ridge National Laboratory*

8:45 WAM-B.2
Use of the ICRP-66 Lung Model to Calculate Committed Effective Doses from Lung Data. *C. A. Potter; Sandia National Laboratories*

9:00 WAM-B.3
Effect of Uncertainty in Nasal Airway Deposition of Radioactive Particles on Effective Dose. *R. A. Guilmette, A. Birchall, N. Jarvis; Lovelace Respiratory Research Institute, and National Radiological Protection Board,UK*

9:15 WAM-B.4
The Variation of Lung Deposition and Urinary Excretion Following the Inhalation of One ALI of Plutonium. *R. J. Traub; Pacific Northwest National Laboratory*

9:30 WAM-B.5
Development of Realistic Body Models for Organ Dose Calculations. *X. G. Xu, T. C. Chao, K. F. Eckerman; Rensselaer Polytechnic Institute, and Oak Ridge National Laboratory*

Wednesday

9:45 WAM-B.6
Current ICRP Recommendations and the Genmod Internal Dosimetry Code. *R. B. Richardson, D. W. Dunford; AECL,Canada*

10:00 BREAK IN EXHIBIT HALL

10:30 WAM-B.7
Assessment of Minimum Voxel Size for Trabecular Bone NMR Imaging for Dosimetry Calculation. *D. A. Rajon, D. W. Jokisch, P. W. Patton, L. G. Bouchet, W. E. Bolch; University of*

Florida

10:45 **WAM-B.8**
Monte Carlo Electron Transport Within Voxels from a Three Dimensional Image of Human Trabecular Bone. *D. W. Jokisch, P. W. Patton, D. A. Rajon, L. G. Bouchet, W. E. Bolch ; University of Florida*

11:00 **WAM-B.9**
New Estimates of Specific Effective Energy for Use in Skeletal Dosimetry. *L. G. Bouchet, W. E. Bolch; University of Florida*

11:15 **WAM-B.10**
Comparison of a Mathematical Specific Absorbed Fraction Model for a Pregnant Woman at Three-Months Gestation with Experimental Results. *D. L. Georgeson, R. R. Brey, T. F. Gesell, R. D. Spall, M. Rudin; Idaho State University, and University of Las Vegas*

11:30 **WAM-B.11**
Absorbed Dose Estimates to Adults and Newborns from the PET Radiopharmaceutical (F-18)-Fluorodeoxyglucose. *E. S. Niven, M. Thompson, C. Nahmias; McMaster University, Canada*

11:45 **WAM-B.12**
Photo Biophysical Studies on the Effect of UV-Irradiation on Hemoprotein Structure and Function. *M. A. Fadell, A. A. Salama, M. S. Abd El-Baset, A. M. Sherief; Cairo University, Egypt, Al-Azhar University, Egypt and National Research Center, Egypt*

WAM-C: Radon Section
(Oral Session)

Co-Chairs: Arthur Scott and Phillip Kearney

8:30 **WAM-C.1**
An Aerosol Particle Size Sampler using ^{222}Rn Decay Products as Tracers. *N. H. Harley, P. Chittaporn, M. Heikkinen, D. Daniels; New York University School of Medicine, and Fermco Dosimetry Section*

8:45 **WAM-C.2**
A New Personal ^{222}Rn and ^{220}Rn (RnTn) Monitor. *P. Chittaporn, N. H. Harley; New York University School of Medicine*

9:00 **WAM-C.3**
Eyeglass Lenses for Personal Radon Dosimetry. *S. A. Hadley, N. R. Meyer, R. L. Fleischer, A. Cavallo; Union College, and US Department of Energy, NY*

9:15 **WAM-C.4**
Radon Testing as a Means of Identifying Homes on Land Contaminated by Radium. *R. Moridi, R. Stager, B. McCallum; CAIRS-Canadian Institue for Radiation Safety, Toronto, SENES Consultants Ltd., Canada and Low-Level Radioactive Waste Management Office, Canada*

9:30 **BREAK IN EXHIBIT HALL**

10:00 **ROUNDTABLE**
A Risk Analysis of ^{222}Rn in Drinking Water. *T. Borak, Moderator; N. Harley, K. Eckerman, R. Toohey – Panelists*

Wednesday

11:00 **DISCUSSION**

11:30 **Radon Section Business Meeting**

WAM-D: Special Session: Radiochemistry
(Oral Session)

Co-Chairs: C. F. Wu and S. N. Bakhtiar

8:30 **WAM-D.1**

Strengthening the Connections Between Radiochemistry and Health Physics. *C. F. Wu; Waste Isolation Pilot Plant*

8:45 WAM-D.2
Radiobioassay Intercomparison Studies Program at Oak Ridge National Laboratory. *G. F. Payne; Oak Ridge National Laboratory*

9:00 WAM-D.3
SRS Environmental ALARA Release Management Program. *M. S. Dodgen, B. S. Crandall, J. D. Heffner; Westinghouse Savannah River Company*

9:15 WAM-D.4
Nuclear Waste Vitrification at Hanford. *C. K. Liu; US Department of Energy, Richland, WA*

9:30 WAM-D.5
Radiochemical Services at Hanford - The Waste Management Laboratories. *S. N. Bakhtiar; Waste Management, Inc.*

9:45 BREAK IN EXHIBIT HALL

10:15 WAM-D.6
The Role of Cocktail Solvent on ^{222}Rn Measurement by Liquid Scintillation Analysis. *M. G. Cantaloub, J. Higginbotham, J. Istok, L. Semprini; Oregon State University*

10:30 WAM-D.7
A Bone Ash Standard Reference Material for Low-Level Actinides and Fission Radionuclides Measurements. *Z. Lin, K.G.W. Inn, Z. Wu; National Institute of Standards and Technology*

10:45 WAM-D.8
On-Line Monitoring of Technetium with Selective Radiochemical Sensors. *T. A. DeVol, J. E. Roane, A. Paulenova, J. D. Leyba, J. M. Williamson, J. M. Duffey, J. T. Harvey; Clemson University, Westinghouse Savannah River Technology Center, and Eichrom Industries Inc.*

11:00 WAM-D.9
Isotopic Analysis of Plutonium using a Combination of Alpha and Internal Conversion Electron Spectroscopy. *A. H. Ringberg, T. A. DeVol, R. A. Dewberry; Clemson University, and Westinghouse Savannah River Technology Center*

11:15 WAM-D.10
GE Detector Efficiency Calibrations for Laboratory Samples Without Radioactive Sources. *F. L. Bronson, R. Venkataraman, B. Young; Canberra Industries, Inc.*

WAM-E: Regulatory/Legal
(Oral Session)

Co-Chairs: Joel Lubenau and Jim Yusko

10:00 NEW WAM-E.1A; Former P.63
DOE Phased-Response Components of the Federal Radiological Monitoring and Assessment Center. *C. A. Riland, R. J. Tighe, D. M. Daigler; Bechtel Nevada, and US Department of Energy, NV*

Wednesday

10:15 WAM-E.1
Status Report on Radiation Research Activities at the National Research Council. *S. L. Simon; National Academy of Sciences*

10:30 WAM-E.2
ANSI/HPS N13.53 TENORM Standard - Update of Development Activities. *J.-C. Dehmel; S Cohen & Associates Inc.*

10:45 WAM-E.3
Environmental Radiation Protection Standards for DOE Facilities. *A.*

Wallo, III, H. T. Peterson, Jr.; US Department of Energy, Washington, DC

11:00 **WAM-E.4**
The US Department of Energy's Amendment to Title 10 Code of Federal Regulations Part 835. *J. L. Rabovsky, P. V. O'Connell, J. D. Foulke; US Department of Energy, Washington, DC*

11:15 **WAM-E.5**
Legal Issues of X-Ray Body Searches. *R. A. Scott; Roger Williams Medical Center*

11:30 **WAM-E.6**
Hormesis and Radiation Protection. *K. L. Mossman; Arizona State University*

WPM-A: Special Session: Current Issues in Health Physics Instrumentation

(Oral Session)

Chair: Morgan Cox

2:30 **WPM-A.1**
An Effective Testing and Standardization Program for Health Physics Instruments. *D. Snowder; Alpha Group-Idaho*

2:45 **WPM-A.2**
Recent Developments in Neutron Detectors. *R. Olsher; Los Alamos National Laboratory*

3:00 **WPM-A.3**
Performance of the Eberline Model DD-300 Alarming Electronic Dosimeter at High Altitudes. *M. Cox; Lovelace Respiratory Research Institute*

3:15 **WPM-A.4**
ANSI N323 and N42.17 Testing on the Eberline E-600. *D. Snowder; Alpha Group-Idaho*

3:30 **BREAK IN EXHIBIT HALL**

4:00 **WPM-A.5**
ANSI N42.17A and C Testing Capabilities at the Idaho National Engineering and Environmental Laboratory. *G. LaBruyere; Lockheed Martin Idaho*

4:15 **WPM-A.6**
Tests of Sourceless Efficiency Calibration of Ge Detectors with ISOCS at LLNL. *R. Radev, D. Hickman; Lawrence Livermore National Laboratory*

4:30 **WPM-A.7**
The Health Physics Instrumentation Committee (HPIC) Home Page. *D. Hickman, D. Snowder, P. Krumpe; Lawrence Livermore National Laboratory, Alpha Group-Idaho and US Department of Energy, Washington, DC*

4:45 **WPM-A.8**
The Instrument Testing and Evaluation Program at the Environmental Effects Laboratory at Oak Ridge National Laboratory. *P. Chiaro, Jr.; Oak Ridge National Laboratory*

Wednesday

WPM-B: Internal Dosimetry II

(Oral Session)

Co-Chairs: Alan Brodsky and Howard Prichard

2:30 **WPM-B.1**
Assessing Intake Mode from Sequential Whole-Body Counts. *R. E. Toohey, R. L. Nimitz, R. Pedersen; Oak Ridge Institute for Science and Education, US Nuclear Regulatory Commission, PA, and Washington, DC*

2:45 **WPM-B.2**
Investigation of Elevated Airborne Radioactivity Concentrations and As-

sociated Intakes During Enriched Uranium Operations at the Y-12 Plant. *J. M. Thomas, C. A. England; Lockheed Martin Energy Systems Inc.*

3:00 WPM-B.3
Solubility of Airborne Uranium Compounds at the Fernald Environmental Management Project. *H. Spitz, T. E. Heffernan, J. C. Lodwick, J. Neton, M. Soldano; University of Cincinnati, and Fernald Environmental Management Project*

3:15 WPM-B.4
Estimation of Transuranic Intakes Based on Corrosion Product Activity. *C. D. Stretch; Ameren UE Callaway Plant*

3:30 BREAK IN EXHIBIT HALL

4:00 WPM-B.5
Competitive Binding of Plutonium and Americium with Bone Mineral and Novel Chelating Agents. *R. Hakimi, R. Rocha, P. W. Durbin, K. N. Raymond, J. Xu, R. A. Guilmette, D. M. Hamby; University of Michigan School of Public Health, Lovelace Respiratory Research Institute, and University of California, Berkeley*

4:15 WPM-B.6
Traditional Formulas for Decision Level are Wrong for Small Numbers of Counts. *J. A. MacLellan, D. J. Strom; Process Technology & EM Resources, and Pacific Northwest National Laboratory*

4:30 WPM-B.7
Optimal Decision Levels - A Classical Approach to the Application of Bayesian Statistics. *M. E. Schillaci, W. C. Inkret, T. H. T. Little, H. Martz, G. Miller; Los Alamos National Laboratory*

4:45 WPM-B.8
Statistical Model for Fission Track Analysis of Plutonium in Human Samples. *A. Brodsky, D. M. Schaeffer, S. O'Toole, E. Kaplan, N. Barss, J. Dancz, W. J. Klemm, D. A. Raine III, J. Stiver; Science Applications International Corporation, Defense Threat Reduction Agency, and Brookhaven National Laboratory*

5:00 WPM-B.9
Calibration and Interpretation of Fission Track Analysis of Plutonium in Urine. *D. M. Schaeffer, S. O'Toole, E. Kaplan; Defense Threat Reduction Agency, and Brookhaven National Laboratory*

5:15 WPM-B.10
Using Blood Samples to Assess Plutonium Intake. *L. C. Sun; Brookhaven National Laboratory*

Wednesday

WPM-C: Environmental
(Oral Session)

Co-Chairs: Nancy Daugherty and David Kocher

2:30 WPM-C.1
Uncertainty of the H-3 and I-131 Internal Dose Conversion Factors and Their Impact on Dose Reconstruction. *D. M. Hamby; University of Michigan*

2:45 WPM-C.2
Correlation Between Measured and Modeled Tritium Air Concentrations in the Environment Following Emissions from a Facility at the Hanford Site. *K. Rhoads, S. F. Snyder, B. M. Gillespie; Pacific Northwest National Laboratory*

3:00 **WPM-C.3**
Tritium and Carbon-14 Migration from Buried Activated Beryllium. *P. D. Ritter; LMITCO*

3:15 **WPM-C.4**
A Comparison of Two Tritium-In-Air Sampling Methods. *T. M. Pearson, P. D. Fledderman; University of South Carolina, Aiken, and Westinghouse Savannah River Company*

3:30 **BREAK IN EXHIBIT HALL**

4:00 **WPM-C.5**
Applications of Spectral Component Analysis to Gamma Ray Data. *R. L. Grasty, J. Hovgaard; Exploranium G.S. Ltd., Canada*

4:15 **WPM-C.6**
Radioactivity in the Groundwater! Or Not. *A. Fellman; Malcolm Pirnie Inc.*

4:30 **WPM-C.7**
Transfer of ^{137}Cs, ^{40}K and ^{7}Be from Soil to Plants. *C. Papastefanou, Aristotle University of Thessaloniki, Greece*

4:45 **WPM-C.8**
Radionuclides in Big Game from a Nuclear Power Research Site in Idaho: 1972-1996. *R. W. Warren, R. G. Mitchell; Environmental Science and Research Foundation Inc.*

5:00 **WPM-C.9**
Current Issues Related to Radium-224 in Drinking Water. *E. J. Simpson; US Environmental Protection Agency, NY*

5:15 **WPM-C.10**
Environmental Monitoring to Assess Mobiliation and Transport of Depleted Uranium in Soils and Water. *T. P. Oxenberg, F. M. Saunders, R. R. Rosson, B. Kahn; Department of the US Army, and Georgia Institute of Technology*

WPM-D: Special President-Elect Session: Radiation Risk Communication and Education

(Oral Session)

Chair: Raymond Johnson

2:30 **WPM-D.1**
Communication About Radiation - Lessons from Research. *A. Bisconti; Bisconti Research, Inc.*

3:00 **WPM-D.2**
Concept Mapping as a Tool to Facilitate Communication. *J. D. Novak; Cornell University*

3:30 **BREAK IN EXHIBIT HALL**

4:00 **WPM-D.3**
Intuitive vs. Technical Views of Risk: Is There a Conflict? *J. Baron; University of Pennsylvania*

Wednesday

4:30 **WPM-D.4**
Radiation Risk Communication - Time for New Approaches. *R. Johnson; Communication Sciences Institute, Inc.*

WPM-E: Special Session: Aerosol Measurements

(Oral Session)

Chair: Morgan Cox

6:00 **WPM-E.1**
Continuous Air Monitoring in Dusty Environments. *M. Koskelo, J. Rodgers; Canberra Industries and Los Alamos National Laboratory*

6:15 **WPM-E.2**
Improved High-Volume Continuous

Air Monitor. *K. Patch, S. Bittenson, F. Becker, M. Hoover, M. Cox; Thermo Power Corporation and Lovelace Respiratory Research Institute*

6:30 WPM-E.3
Siting and Qualification of WIPP Air Effluent CAMs. *W. T. Bartlett; Environmental Evaluation Group*

6:45 WPM-E.4
Lapel Air Sampling Within the Environmental Restoration Contractors. *G. Ceffalo; Bechtel-Hanford*

7:00 BREAK

7:30 WPM-E.5
Update on RadNet and Other Communications Protocols for Networking Health Physics Instruments and Systems. *K. Olson; Los Alamos National Laboratory*

7:45 WPM-E.6
Evaluation of Sintered Metal Filters for Air Sampling at the Savannah River Site. *T. Philips; Westinghouse Savannah River Company*

8:00 WPM-E.7
Update on Qualification of Filter Media for Alpha Air Monitoring. *M. Hoover; Lovelace Respiratory Research Institute*

8:15 WPM-E.8
Particle Sizing of Alpha-Emitters on Personnel Air Samplers using CR-39 Autoradiography. *R. B. Richardson, G. Hegyi, S. C. Starling; AECL, Canada*

8:30 WPM-E.9
An Update of NESHAPs Activities at the WIPP. *R. Farrell; US DOE, New Mexico*

8:45 WPM-E.10
The Status of Currently Applicable ANSI and International Standards Governing Radioactive Aerosol Monitoring. *M. Cox, M. Hoover; Lovelace Respiratory Research Institute*

Thursday

7:15-8:15 AM Room: 107 A/B
CEL-7 Update of National Primary Drinking Water Regulations. *Barbara Smith; EPA Region III*

7:15-8:15 AM Room: 103 A
CEL-8 History and Description of Radiation Regulations in the United States. *David R. Simpson; University of Nebraska*

THAM-A: Risk Analysis
(Oral Session)

Co-Chairs: Craig Little and Tracy Ikenberry

8:30 THAM-A.1
Use of Probabilistic Dose Estimates in Regulatory Decision Making. *M. D. Otis, M. A. McKenzie-Carter, M.*

E. Anderson; Science Applications International Corporation

8:45 THAM-A.2
The Benefits from Food Irradiation: Even "Fools" Need a Safe Food Supply. *H. G. Claycamp; University of Pittsburgh*

9:00 THAM-A.3
Update on the RESRAD Family of Codes. *C. Yu, A. Wallo, H. Peterson, W. A. Williams; Argonne National Laboratory and US Department of Energy, Washington DC*

9:15 THAM-A.4
Development of Radionuclide Partitioning Factors for use in the Dose Assessments Concerning Recycling of Radioactively Contaminated Aluminum Scrap Metal. *J. J. Cheng, C. Yu; Argonne National Laboratory*

9:30 BREAK

10:00 THAM-A.5
Sample Transportation Risk Assessments for WIPP and Yucca Mountain Shipments. *R. L. Steinman, R. F. Weiner, K. J. Kearfott; University of Michigan, and Sandia National Laboratories*

10:15 THAM-A.6
Is the Ecological Fallacy a Fallacy? *F. A. Seiler, J. L. Alvarez; Sigma Five Associates, and Auxier & Associates*

10:30 THAM-A.7
Evidence Supporting Nonlinear Effective Threshold Dose-Response Relationships for Radiation Carcinogenesis. *O. G. Raabe; University of California, Davis*

THAM-B: External Dosimetry
(Oral Session)

Co-Chairs: Harry Ing and Toshihide Ushino

8:30 THAM-B.1
Development of a Dosimetry Standard for Beta-Particle Reference Radiation Fields. *C. G. Soares; National Institute of Standards andTechnology*

8:45 THAM-B.2
Comparability of Neutron Dose Equivalent Evaluations. *R. J. Traub, J. C. McDonald; Pacific Northwest National Laboratory*

9:00 THAM-B.3
Determination of Positron Contributions to Shallow Dose from F-18. *G. E. Jones; Lawrence Berkeley National Laboratory*

9:15 THAM-B.4
A Unified Characterization of Superheated Drop and Bubble Detectors. *F. D'Errico, R. Nath, R. E. Apfel; Yale University*

Thursday

9:30 BREAK

10:00 THAM-B.5
High Energy Neutron Depth Dose Distribution Determination with Neutron Track-Etch Detectors. *H. J. Gepford, M. R. Sutton, N. E. Hertel, L. S. Waters; Georgia Institute of Technology, and Los Alamos National Laboratory*

10:15 THAM-B.6
DOE Personnel Dosimetry Record Systems. *J. J. Fix, B. G. Brooks, N. Rao, D. Hagemeyer; Pacific Northwest National Laboratory, US Department of Energy, MD, and Science Applications International Corporation*

10:30 THAM-B.7
Experimental Evaluation of the Dual Integral Glow Analysis Method in ANSI N13.11's Low LET and Beta Radiation Fields. *E. C. Wagner, K. J.*

Kearfott; University of Michigan

10:45 THAM-B.8
Use of Two Dosimeters in a Steam Generator Channel Head. *C. H. Kim, W. D. Reece; Texas A&M University*

THAM-C: Special Session: NESHAPs

(Oral Session)

Co-Chairs: John Glissmeyer and Andrew McFarland

8:00 THAM-C.1
Stack Sampler Calibrations. *J. A. Glissmeyer, A. D. Maughan; Pacific Northwest National Laboratory*

8:15 THAM-C.2
Mixing Studies for Compliance with EPA Single Point Aerosol Sampling Requirements. *R. Gupta, A. R. McFarland, N. K. Anand; Texas A&M University*

8:30 THAM-C.3
CAP88-PC Version 2.0. *B. Parks; US Department of Energy, MD*

8:45 THAM-C.4
Flow Measurements for Compliance with the Revised ANSI N13.1 Standard. *A. R. McFarland, J. G. Olin; Texas A&M University and Sierra Instruments, Inc.*

9:00 THAM-C.5
Air Sampler Filter Holder Leak Tests. *J. H.Bussell; Numatec Hanford Corporation*

9:15 THAM-C6
Real-time Continuous Air Monitoring in the Environment for Pollution Prevention and Worker Protection. *J. C. Rodgers; Los Alamos National Laboratory*

9:30 BREAK

10:00-Noon NESHAPs Meeting

1999 Radionuclide National Emmission Standards for Hazardous Air Pollutants

Co-Chairs: Kenneth Duvall and William Davis

THAM-D: Medical Health Physics

(Oral Session)

Co-Chairs: Coleman Rosen and Michael Nunno

8:30 THAM-D.1
A Dose Comparison of Axial and Helical Computed Tomography Examinations of the Pediatric Torso. *K. A. Johnson, D. E. Hintenlang; University of Florida*

Thursday

8:45 THAM-D.2
Construction of a Newborn Dosimetry Phantom for Measurement of Effective Dose. *M. A. Tressler, D. E. Hintenlang; University of Florida*

9:00 THAM-D.3
Scatter Spectra from a Fluoroscopy Unit: A Comparison of Experimental and Simulated Data. *M. A. Montes, B. Hanson, K. Marcinkowski, S. E. Sibert, S. Shah, B. Stratton, K. J. Kearfott; University of Michigan*

9:15 THAM-D.4
Transformation of a Pediatric "Dynamic" Fluoroscopy Study into a Series of Static Projections for Use in Organ Dose Reconstructions. *B. D. Pomije, C. H. Huh, J. B. Sessions, W. E. Bolch; University of Florida*

9:30 THAM-D.5
The Impact of Age and Gender on

Estimates of Detriment at a Large Tertiary Care Medical Center. *L. K. Ngutter, J. M. Kofler, C. H. McCollough, R. J. Vetter; Mayo Foundation*

9:45 BREAK

10:15 THAM-D.6
Radiation Safety Issues Associated with Intravascular Brachytherapy Clinical Trials. *V. Sehgal, K. Hintenlang, W. E. Bolch; University of Florida*

THAM-D.7 MOVED TO P.23B

10:30 THAM-D.8
Predicting Radiation Damage at the Molecular Level with Applications to Radiation Therapy. *B. Aydogan, W. E. Bolch, B. J. Morabito, D. T. Marshall, K. E. Wilson; University of Florida*

10:45 THAM-D.9
Radiation Protection Considerations for the Development and Implementation of a Nuclear Medicine Program Involving the Use of ^{131}I in Cats. *R. Michel, K. C. Kerns, D. D. Woodruf; Iowa State University, and Avondale Veterinary Health Care Complex*

11:00 Medical Section Business Meeting

AAHP COURSES

Saturday, June 26, 8 am-5 pm – *Each Course is worth 16 CEC's*

AAHP COURSE 1

Health Physics Applications Using the Monte Carlo Program MCNP. *Dick Olsher, CHP and David Seagraves of the Health Physics Measurements Group, Los Alamos National Laboratory*

Monte Carlo type calculations are now encountered in a variety of HP areas. This course provides the HP with the opportunity to become familiar with the concepts of one of the more widely used codes, MCNP. The concepts covered in this course are useful to those who will be users of the results of Monte Carlo calculations as well as those who will actually perform the calculations.

MCNP is ideally suited to the needs of the HP interested in performing radiation shielding and skyshine calculations, detector simulation studies, in situ geometries, or dosimetry. With a little coaching and study of the examples, many HPs will find they are able to solve problems that have, in the past, been out of reach. Problems that involve a complex geometry can be easily solved using MCNP (e.g., designing a maze entrance to a radiation room). The calculations in MCNP are based on detailed physics models and very accurate cross section tables that require no energy group compromises to be made.

This course introduces the basic concepts of Monte Carlo, demonstrates how to put together a MCNP input file, and illustrates some health physics applications of the code. No prior knowledge of Monte Carlo is assumed. The course will not attempt to overwhelm the student with all of the details necessary to independently perform useful calculations. Instead, the focus of the lectures and demonstrations will be on providing a practical boost toward learning the program and guiding the student toward further study.

The Los Alamos MCNP program is a general and powerful Monte Carlo transport code for photons, neutrons, and electrons. MCNP can be safely described as the "industry standard" with more than 600 person-years of development effort behind it. The code is supported on a variety of platforms and is now accessible to HPs using desktop or laptop personal computers.

Lectures will include: Overview of the MCNP code and the Monte Carlo method, basic concepts; input file preparation, geometry, source definition, data cards; discussion of standard MCNP tallys; and methods of dose and exposure calculation. Demonstrations include: Point Source, fluence calculation; Area Source, fluence calculation; Calculation of Cs-137 Gamma Ray Constant. Each demonstration will include a discussion of input and output files.

The course will provide information on how to obtain a copy of MCNP and its data libraries from the Radiation Safety Information Computational Center (RSICC) at Oak Ridge. Only RSICC is authorized to distribute licensed copies of the MCNP code package. All of the input and output files for the class demonstrations will be provided for self-study on a diskette. Additional training opportunities will be described and a bibliography will be included in the course notes.

AAHP COURSE 2

OSHA 8-Hour Refresher Training. *Janet A. Johnson, CHP, Shepherd Miller Inc., and Nancy M. Daugherty,*

CHP, Colorado Department of Public Health and Environment

The purpose of this course is to provide eight-hour refresher training in Hazardous Waste Operations and Emergency Response in accordance with the requirements of 29 CFR 1910.120(e). It is hoped that, with sufficient interest in the course, it can be offered each year at the HPS Annual Meeting and provide a further benefit to employers and employees in attending the HPS meeting. A general review and update will be provided on the following topics: regulatory requirements; health and safety plans; MSDS; PPE; site control; detection and measurement; and physical, biological, chemical and ergonomic hazards. Valuable information resources, including those available on the Internet, will be identified. Students will be asked to share their own health and safety experiences and knowledge. Certificates of completion will be provided.

AAHP Course 3
MARSSIM for Managers (Pilot Course). *Cdr. Colleen Petullo, US Public Health Service detailed to US EPA, Carl Gogolak, US DOE Environmental Measurements Lab, Eric Abelquist, ORISE and Scott Hay, Sanford Cohen and Associates*

MARSSIM is an EPA, DOE, NRC and DOD technical consensus guidance document that provides the methodology used to demonstrate compliance with dose or risk based regulations. This awareness level one day course, presented by the manual's principal authors, is designed for the 1st line manager of organizations responsible for developing, reviewing or implementing MARSSIM survey plans.

Keeping the managers perspective in mind, the following MARSSIM topics will be discussed: MARSSIM overview, data life cycle, integrated survey design and interpretation of results. In addition, a lessons learned session will be provided that focuses on identifying and avoiding common pitfalls found in MARSSIM survey plans. Time will be allotted at the end of the course for a feedback/discussion session.

PROFESSIONAL ENRICHMENT PROGRAM

Sunday, June 27 through Thursday, July 1, 1999

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 26, the day before the Annual Meeting, a series of 30 courses will be offered. The Sunday sessions begin early to allow for 3 sections 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 revised 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. The PEP lecture registration fees should be included with registration fees for the Annual Meeting. The PEP registration is included on the Annual Meeting Pre-registration form.

Please remember to be on time for your sessions. The lecturer will begin [redacted] 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.

Note: Each course is two (2) hours in length and will earn four (4) continuing education credits.

Requests for PEP refunds will be honored if received in writing by May 28. All refunds will be issued AFTER the meeting. Exceptions will be handled on a case-by-[redacted]

1-A - The DQO Process. *Richard Gilbert, Battelle Pacific Northwest National Laboratory*

The U.S. Environmental Protection Agency has developed the 7-step Data Quality Objectives (DQO) process as a method for doing systematic planning for obtaining environmental measurements. The objective of this PEP lecture is to explain and illustrate the DQO process as it may be applied to environmental sampling conducted to assess the need for or achievement of the cleanup of chemical or radionuclide contamination in environmental media such as soil, biota, sediment, surface water and groundwater. This lecture will use presentation materials used in short courses being taught at Department of Energy sites or for the U.S. Air Force and Navy. It should be noted that the DQO process applies to the planning of the entire environmental sampling effort, not just to the sample handling and measurement process in the analytical laboratory or the measurement characteristics of in-situ radiation detectors. The lecture will illustrate how to use the DQO process to set up decision rules, select appropriate statistical tests and/or estimations, and develop field sampling strategies so that the probabilities of making cleanup decision errors on the basis of the environmental measurements are controlled to tolerable small values.

1-B - ATSDR, Role in Superfund and Its Methodology for Determining Impacts on Public Health. *Paul Charp; Agency for Toxic Substances and Disease Registry*

US Department of Health and Human Services was established in 1980 as the primary public health agency to address health issues under the Comprehensive Environmental Response, Compensation and Liability Act, the Superfund law. To carry out its legislative mandate, ATSDR developed a public health assessment methodology that differs from EPA risk assessment methodology. This course will discuss that methodology, the organizational structure of ATSDR, its mandates under Superfund and related federal laws, and how the agency applies health physics in the process of developing various ATSDR health documents including public health advisories, public health assessments, and public health consultations. Of these three documents, the advisories are the highest priority for their issuance, indicating immediate and severe consequences for public health. These advisories can lead to hazardous waste sites being added to the National Priorities List of Superfund. During the life of the agency, ATSDR has issued less than 30 advisories of which 5 have been associated with radiologically contaminated sites. The particulars of these sites will be discussed.

1-C - Ultraviolet Radiation Protection. *Tim Hitchcock; IBM Corporation*

Ultraviolet (UV) radiation is a type of nonionizing radiation that is both naturally-occurring and man-made, and has been shown to be the causal agent in a number of acute and chronic health effects. This course will provide an overview of ultraviolet (UV) radiation protection. This will include information on applicable characteristics and nomenclature, sources and uses, interaction mechanisms, health effects, exposure guidelines, control measures, and instrumentation and measurement.

Following completion of this brief overview, the student will be able to:

1. Recognize and define important terms.

2. Understand the biological basis of the UV exposure guidelines.

3. Describe elementary control measures.

1-D - Basic Principles of Environmental Control by Ventilation. *Herman Cember; Purdue University*

This course will deal with an overview of the basic principles of environmental control of airborne toxicants by ventilation. The introductory material will include the properties of air and air-vapor mixtures, units of measurement of airborne contaminants, permissible exposure limits (PEL's), toxicity vs. hazard, and explosive levels. This information will be applied to the calculation of airflow requirements for dilution ventilation for control of toxicants and for flammable vapors. We will then address contaminant control at the source by local exhaust ventilation. Our discussion will include the major components of a local exhaust system,

and the important design parameters of each component.

1-E -Compliance with the Final MQSA Regulations - a Primer for Physicists. *Trisha Edgerton, California Department of Health Services*

The Mammography Quality Standards Act (MQSA) was originally passed in 1992. Since then the Act has expired and been reauthorized as the Mammography Quality Standards Reauthorization Act of 1998 (MQSRA). In addition to new requirements in the recently passed legislation, facilities must comply with the Final MQSA regulations that will be effective April 28, 1999. These regulations were published in the Federal Register October 28, 1997, and facilities were allowed 1.5 years to prepare themselves for compliance. As of February, 1999, this author has many requests from facilities wondering where to start making the large number of operational changes necessary. Informal inquiries of facilities concerning compliance, the responses indicate less than 5% of facilities have actually read the regulations, developed new policies and procedures, and sit ready for their inspection under the new requirements. Physicists are in a unique position to be valuable and indispensable resources to their mammography clients. During the annual survey, you can make a real difference to these facilities that have waited until the last minute, and beyond! This course will prepare the physicist to help their customers succeed in implementing required policies and procedures. In addition, all of the new tests and procedures required of mammography physicists will be discussed in detail. The latest FDA guidance documents will be reviewed and ways to keep on top of new information will be provided.

1-F - The Development and Performance of Optically Stimulated Luminescence for Personal Monitoring. *Craig Yoder; R. S. Landauer, Inc.*

During the past several years, scientists have reported about several variations of optically stimulated luminescence (OSL) dosimetry methods. During the development of Landauer's Luxel system, research examined several methods and materials leading to the selection of a pulsed optically stimulated luminescence method using aluminum oxide powder for commercialization. The session will contain technical descriptions of cooled OSL, delayed OSL, pulsed OSL and coincident stimulation and luminescence. Performance, in terms of sensitivity, energy dependence, re-analysis ability and imaging, for each method can be adjusted by changing the stimulation conditions, detector material properties and dosimeter construction. The Luxel dosimetry system will be used to demonstrate the different technical attributes of OSL with aluminum oxide.

1-G - Preparation for Part I of the ABHP Certification Examination. *Clayton French; Univ. of Massachusetts*

This course is intended for individuals who are planning to take Part I of the ABHP certification examination. A brief review will be given of techniques/ methods for preparing for the examination and strategies for taking the examination. Most of the session will be devoted to discussions of questions similar to those on the ABHP examination and to consideration and discussion of specific questions from course participants. A handout will include practice questions similar to those on the ABHP examination.

1-H - Occupational Radiation Epidemiology Study Methods. *Tim Taulbee; National Institute for Occupational Safety and Health*

This course will provide information on epidemiology and exposure assessment methods used to examine risks from occupational radiation exposures. This course is sub-divided into the three components of modern occupational radiation epidemiologic studies: an overview of epidemiology, industrial hygiene exposure assessment and health physics exposure assessment. The epidemiology overview will examine study types, study populations, outcome measures, risk and causal inference, measures of association, and precision/ validity as applied to the study of health outcomes in radiation workers. The industrial hygiene exposure assessment will discuss various types of monitoring that have been conducted for chemical exposures and the records that are available for use in epidemiological studies. This section will also provide

an overview of exposure matrices used to estimate exposures when individual monitoring information is not available. Issues such as protective monitoring data vs. actual contaminant levels will also be addressed. The health physics exposure assessment will provide an overview of the types and limitations of dosimetry used for epidemiologic studies. Issues such as internal exposure, neutron exposure, missed dose, censored data, and availability of records will be addressed. Recent occupational studies will be used as examples throughout this course.

1-I - Nuclear Power Plant Self-Assessment Programs in the New Regulatory Oversight Environment.
Scott Schofield, Michael J. Russell, and Eric M. Goldin; San Onofre Nuclear Generating Station
PART 1: New Regulatory Oversight

The Nuclear Regulatory Commission is developing improvements to their reactor inspection, assessment, and enforcement processes. These changes represent a significant departure from current practice. The purpose of these changes is to improve objectivity, clearly tie NRC action to performance, and risk inform the process, that is, focus on aspects of performance that have the greatest impact on safe plant operation. A regulatory oversight framework was established which defines the overall agency mission, strategic performance areas, and important cornerstones to safety. One of the three strategic performance areas is radiation safety which consists of two cornerstones: occupational radiation safety and public radiation safety. Each cornerstone will be evaluated by a combination of performance indicators and baselines inspection.

We will review the new regulatory process, schedule for implementation and impact on operating facilities.

PART 2: Health Physics Self-Assessment at a Nuclear Power Plant

Self-Assessment has been defined as a proactive process that identifies potential problem areas, and searches for improvements to enhance overall management effectiveness (1). These work process' include management monitoring observations, event investigations, root-cause analyses, bench marking, and problem reporting systems. The Health Physics Division at SONGS has a proactive Self-Assessment program that identifies potential weakness or negative trends and improves performance through timely evaluation, corrective action and effectiveness reviews. HP self-assessment utilizes six fundamental principles to implement the above Self-Assessment points. These six principles are: 1. Staff Knowledge; 2. Staff Participation; 3. Evaluation/Corrective Action; 4. Management Involvement; 5. Informed Staff; 6. Monitoring and Trending. We will review the SONGS Health Physics Self-Assessment program from the perspective of a management tool which evaluates workforce and HP staff performance and seeks continual improvement in radiological practices.

1-J - NORM and TENORM - Producers, Users, and Proposed Regulations.
Carter Hull; Oxford Instruments, Inc.
NOTE:THIS IS A TWO-PART COURSE (See 2-J)

NORM (Naturally Occurring Radioactive Material) is disseminated throughout the planet and TENORM (Technologically Enhanced Naturally Occurring Radioactive Material) is prevalent in industrial societies. This course provides definitions and examples of materials that contain NORM and a review of major producers and users of the products that contain naturally occurring radionuclides. TENORM contains these same naturally occurring radionuclides, but activities in these materials are usually elevated. This is because ^{238}U and ^{232}Th decay chain nuclides are redistributed and often concentrated during industrial or chemical processing of bulk materials that contain NORM. A variety of products such as chemical fertilizers, some petroleum products and mine tailings, rare earths and zircon sands, metals produced from certain types of ores, etc., contain TENORM. The industrial processes that concentrate these nuclides shall be reviewed and discussed in this course. NORM and TENORM are not directly regulated at this time. However, the Conference of Radiation Control Program Directors (CRCPD) Commission on NORM recently

completed the public review portion of Part N - the suggested State regulations for NORM and TENORM. One outcome of the work of the Commission on NORM is the recommendation that only TENORM be regulated. The Commission on NORM also emphasized that Part N contains only suggested regulations. A review Part N and its implications on the distribution and uses of TENORM shall also be presented and discussed in this course.

2-A - Rank Set Sampling. *Richard Gilbert, Battelle Pacific Northwest National Laboratory*

Ranked Set Sampling (RSS) is an environmental sampling strategy first suggested in 1952 by G..A. McIntyre wherein expert judgment or a quantitative auxiliary measurement method is used in combination with simple random sampling to determine which locations in the field should be collected and measured for the variable of interest. The data so obtained may be used to estimate the true mean or, in some cases, to conduct statistical tests of hypotheses. Expert judgment or auxiliary measurements are used to rank (order) field locations with respect to the variable of interest to determine which locations to sample and measure. RSS is a unique sampling strategy in that it permits the use of expert judgment to select field locations for sampling if candidate locations are first selected using simple random sampling. Rather than using expert judgment, auxiliary (inexpensive) quantitative measurements such as in-situ radiation detector measurements can be used when appropriate. RSS will always, on the average, give a better estimate of the mean than pure simple random sampling for the same number of measurements. This lecture will explain and illustrate how the RSS process works and its advantages and disadvantages relative to other possible sampling strategies such as pure judgment sampling, pure simple random sampling, double sampling, and grid sampling.

2-B - Estimating Thyroid Doses and Risks from Iodine-131 in Fallout Following Nevada Atmospheric Nuclear Bomb Test. *Andre Bouville and Ethel Gilbert; National Cancer Institute, National Institutes of Health*

In October 1997, the National Cancer Institute (NCI) released a report containing results of a study to assess the exposures of Americans to Iodine-131 (^{131}I) fallout from atmospheric nuclear bomb tests carried out at the Nevada Test Site in the 1950s and 1960s, and the radiation doses to the thyroid resulting therefrom. In that report, thyroid dose estimates are presented for the populations of each county of the contiguous United States for each of the 90 nuclear tests that were considered, for 14 age and gender categories, and for 4 milk consumption scenarios. The collective thyroid dose to the population of the contiguous United States from all atmospheric bomb tests detonated at the Nevada Test Site is estimated in that report to be about 4 x 106 person Gy, corresponding to a per capita thyroid dose of about 20 mGy. The greatest contributions to the collective thyroid dose are estimated to have been due to the Plumbbob test series in 1957, the Tumbler-Snapper test series in 1952, and the Upshot-Knothole test series in 1953. Thyroid doses to representative individuals vary mainly according to age, origin and consumption rate of milk, and place of residence at the time of the tests. It is estimated that the highest thyroid doses were received by the individuals who were children in the 1950s, consumed large quantities of fresh cows' or goats' milk, and lived in Utah, Idaho, or Montana. The manner in which the thyroid dose estimates were obtained will be presented and discussed. A short presentation of the results obtained in other studies related to the Nevada nuclear bomb tests will also be given.

On the basis of evidence from studies of persons exposed to external radiation, excess thyroid cancers would be expected, with most occurring in persons who were children during the period of exposure, since both thyroid cancer risks and thyroid doses are estimated to be much larger for exposures in childhood than in adulthood. However, because direct data on the effects of exposure to ^{131}I are limited, and because exposure to ^{131}I differs from external exposure in both dose rate and dose distribution within the thyroid gland, the magnitude of the excess is highly uncertain. In the second part

of this session, relevant epidemiologic studies for estimating risks of thyroid cancer from doses received as a results of ^{131}I exposure will be briefly reviewed. These studies include several studies of persons exposed to external radiation in childhood, studies of persons exposed to ^{131}I for diagnostic or therapeutic reasons, and studies of persons exposed to ^{131}I from radioactive fallout in the Marshall Islands, in southwestern Utah, and in Belarus, Ukraine and Russia. Special attention will be given to a recent study in which available U.S. thyroid cancer mortality and incidence data were examined for evidence that thyroid cancers occurred as a result of ^{131}I exposure from atmospheric nuclear tests conducted in Nevada. This is accomplished by determining whether county- and state-specific thyroid mortality and incidence rates are related to county- and state-specific dose estimates, and by determining whether evidence of an association is strongest among those who were children during the period of exposure. Results of this ecologic study and limitations and biases inherent in such studies will be discussed.

2-C - Radiation Dosimetry Management: Dosimeter Characteristics, Quality Assurance, and Investigations. *Sander Perle; ICN Dosimetry Division*

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 and CR39, 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.

2-D - Risk for Toxic Agent Mixtures. *Fritz Seiler; Sigma 5*

Exposures to multiple agents in man's environment are the rule rather than the exception. In most accidents, such as crashes, fires and explosions, a mixture of many toxic agents is usually present. Similarly, the protracted exposures of an occupational sub-population or the chronic exposures of the general population involve mostly two or more toxic agents. Some of these toxicants will act independently of all other agents on the receptor system, while a number of other agents will act in concert, strengthening or weakening the response of the receptor. In this context, radioactivity is just another toxic agent, but in many ways it is an ever present agent. Statements about the combined action of radiations and other toxic agents are usually characterized as both difficult and quite uncertain. In this course, we will show that quite a lot of predictive power can be brought to bear on such problems, while using only a minimum of information. Our practical approach will use only a few etiological facts or mechanistic assumptions and some basic toxicological data for the agents involved. This is as much as is usually available. From this data base, we will construct some simple phenomenological, semi-mechanistic models which can be used at least as guidelines when less than sufficient information is available about the interaction of the effects of several toxic agents. It is often the case, that the risks for exposure to one agent only, the so-called marginal risks, are the data available for both agents, and no or only little data can be found for different combinations of the two agents. This mostly due to the fact that many data points are needed to document an interaction of just two agents, for three or more agents there are no data in sufficient quantity or quality to evaluate the interaction. On the other hand, the simpler

models can be used to predict theoretically the combined risks of three or more agents. Thus the first assumption that will be made here is that agents interact only in pairs. The second assumption is that for both agents, the marginal risks are sufficiently well known, and it is implicitly assumed that they contain sufficient etiological information to help approximate the combined risks. These assumptions lead to a phenomenological, semi-mechanistic approach which will then be discussed for independent action of the toxic agents as well as for synergistic, potentiating, and several kinds of antagonistic interactions. It is shown that this approach can be quite powerful and directly solve the total risks of many combined exposures. If a fit to these models is not possible, their predictions can be compared to the actual data, and used in a less explicit formulation. It is shown in a simple mechanistic discussion of the etiology of the health effects, that the multiplicative model and the independent action model often reflect the actual mechanisms sufficiently well to reflect the basic properties of the risks. Some experimental data for the various types of interactions are discussed and compared to the predictions of several models. In addition, some important aspects of data analysis, and several aspects of cost-effective experimental layouts can be discussed using this approach. Another important theoretical and experimental point, made for all types of interaction terms, is that the risks at combinations of low doses are uniformly small, even in the presence of strong synergistic interactions at higher doses

2-E - Final Status Surveys Using the MARSSIM Process. *James Berger; Science and Ecology Corporation*

The process described in the Multi-Agency Radiation Survey and Site Assessment Manual (MARSSIM) for designing a final status radiological survey need not be intimidating. This is particularly true when it is not necessary to establish site-specific dose-based guidance levels-a situation commonly encountered when dealing with radioactive contaminants classified as mill tailings and state-regulated NORM and for cases where "default" values or other predetermined criteria have been identified by the cognizant organization. Following the guidance and direction fo MARSSIM, the average physicist, equipped with basic fundamentals of radiation measurement and statistics, and using logic and common sense, should have little difficulty in designing an effective final status survey. Likewise, evaluation and interpretation of MARSSIM-approach survey data need not be a difficult task. This course will "walk" the participants through the design and data evaluation processes. Examples will progress from a single radioactive contaminant that is not present in the background to multiple, naturally-occurring contaminants. Design and evaluation of surveys for hard-to-detect contaminants, using composite samples to limit analytical costs, will be described.

2-F - Preparation for Part 2 of the ABHP Certification Exam. *George Chabot; Univ. of Massachusetts*

This course is intended for individuals who are considering or planning to take Part 2 of the ABHP certification examination. Some time will be spent in a quick review of techniques for preparing for and taking the examination and considerations of weaknesses in past examinations, but most of the time will be devoted to a review of the concepts and technical approaches involved in the solutions of typical examination questions. A handout will include a summary of selected equations and concepts that have appeared in the solutions of specific categories of questions. Representative questions from recent examinations will be reviewed and solutions demonstrated. Solutions to the 1998 Part 2 Examination will be made available to participants.

2-G - Communicating the Real Hazards of Electromagnetic Fields to the Public. A Less Risky Management Option? *B. J. Klauenberg; Clear Communications*

Successful siting and continued operation of electromagnetic field (EMF) emitting systems such as radar, cellular telephone/personal communication systems, and associated transmission sites requires effective communication between the involved stakeholders. Beyond compliance with increasing regulatory/legal requirements for appropriate information sharing and

public involvement, an effective program in communication of health/environmental and risk issues can help avoid costly, time-consuming delays. Communication of risks to health from exposure to EMFs requires understanding of the biological research, the physics and technology involved, and the principles of good communication. A successful communication program requires the communicator be knowledgeable, credible, and committed to providing the information the public needs. Communicating risk of EMF is not a unidirectional information flow such as commonly found with public relations, but rather a two way interactive process. Risk communication ideally sets up a dialogue with the public or workforce that provides information that allows them to make informed choices. All too often, the risk communicator is the last to be called. The earlier and more proactive the risk communications program is, the more successful it will be. Many spokespersons fear stating that the EMFs can be potentially hazardous. This is the first message the communicator must present. This PEP will review the current regulatory environment regarding EMFs and present a strategy for effective risk communication to the concerned laymen.

It is assumed that the course participant has a basic understanding of the electromagnetic spectrum and has taken an introductory course/PEP in the basics of non-ionizing radiation.

2-H- Bayesian Inference for Radiation Protection. *Tom Tadfor Little; Los Alamos National Laboratory*

This PEP will be an introduction to Bayesian inference and hypothesis testing. Bayesian statistical methods, which incorporate estimates of the a priori likelihood of rival hyptheses into data interpretation, are becoming increasingly important in many areas of science and technology. This course gives an overview of Bayesian methods for the nonstatistician. Bayesian inference is explained and contrasted with classical methods of hypothesis testing, such as the use of significance levels. The focus is on detection problems and decision levels, particularly in circumstances where data uncertainties are large but real events are unlikely. Applications to internal dosimetry and radiological monitoring will be described. The course will also cover the practical and philosophical issues involved in the selection of prior probability distributions, the use of loss functions to evaluate the effectiveness of different decision procedures, and how to communicate the results of a Bayesian analysis. Simple, practical examples will be used to illustrate the differences between Bayesian and classical approaches.

2-I - Current Issues in Health Physics Instrumentation. *Dale Snowder; Alpha-Idaho, L.L.C.*

This course will discuss and evaluate some of the more current and significant issues that are arising in the arena of HP instrumentation. A partial listing of these topics are: Y2K compliance of microprocessor based HP instruments, ANSI N42.17A & C testing requirements & results, the new ANSI N323 -1997 requirements, manufacturer modifications (does the customer always know?), MDA / RDA , (what is practical, what is not), etc. Resources for these and other related topics will be partially derived from the experience and documentation of the Dept. Of Energy Contractors Health Physics Instrumentation Committee (HPIC) which was organized and has been involved with these issues since 1994.

2-J - Current Status of TENORM Regulations and Developing Issues from Federal, State, and International Perspectives. *Philip Egidi; Oak Ridge National Laboratory*

NOTE: THIS IS A TWO-PART Course (See 1-J)

The second NORM session will start with a brief overview of industries that have been identified with TENORM contamination and with estimated volumes and concentrations of TENORM generated by these industries. The majority of the session will focus on:

current drafts of the basis for proposed standards by the Health Physics Society Working Group on NORM,

the Council of Radiation Control Program Directors' (CRCPD) suggested State regulations for control and release of TENORM, and

draft American National Standards

Institute (ANSI) standards for release of volumetrically contaminated material in the United States (U.S.).

These will be compared to the recommendations of the International Atomic Energy Association (IAEA) Safety Series and the European Commission (EC) proposals. The new draft proposals are dose- or risk-based and are grounded in the linear no threshold hypothesis (LNT).

Currently, eight states (Arkansas, Georgia, Louisiana, Mississippi, New Mexico, Ohio, South Carolina, Texas) have specific regulations pertaining to TENORM predicated on addressing oil field related wastes. These regulations are primarily based on uranium mill tailings cleanup criteria. Oregon also has NORM regulations to control the mineral sands industry, but the regulations apply to all forms of TENORM in the State. Michigan allows for disposal of some TENORM in industrial landfills.

The current debate over the validity of LNT at low doses and low dose rates is particularly germane to this discussion. Most standards-setting organizations and regulatory agencies base their recommendations on the LNT. However, some scientific and professional organizations are openly questioning the validity of LNT and its basis for regulations, practices, and costs to society in general. A review of reports recently published by the Environmental Protection Agency, National Council on Radiation Protection and Measurements, and the National Research Council will also be conducted to add perspective to the discussion.

3-A - Integrated Safety Management of Work. *Gene Runkle; US Department Of Energy*

The Department of Energy (DOE) is embarking on full implementation of the principles of the Integrated Safety Management System in all DOE operations. This Secretarial initiative documented in DOE P 450.4, focuses on performing work and mitigating hazards in an integrated manner, prior to initiation of the work. Radiological protection is a key consideration in many DOE work activities along with other hazards such as potential chemical exposures and operational safety considerations. Title 10 CFR 835 was established by the Department in December 1993 to codify the radiation protection requirements for the DOE contractor sites. Full compliance was required by January 1, 1995, and continuing adherence to the rule is ensured by Price-Anderson Amendment Enforcement processes. Full integration of the regulatory requirements of 10 CFR 835 with other work hazards is a continuing challenge, particularly with limitations in project budgets. Line management led project teams composed of expertise in engineering, budget, rad protection, industrial hygiene, safety and security; along with operational experience are key to the success of integrating safety into the management and performance of DOE work. This session will discuss the 10 CFR 835 requirements and the principle of Integrated Safety Management as they relate to performing work that involves radioactive materials, penetrating radiation, chemicals and physical hazards that must be addressed to provide a safe work environment. Some lessons learned from the integration process and the verification process will be shared. Participants will be encouraged to discuss their own experiences and barriers from their respective work sites.

3-B - The Internal Dosimetry of the 10CFR20 Regulations. *John Poston, Sr.; Texas A&M Univ.*

The practice of radiation protection has changed significantly since the implementation of the new 10CFR20 regulations in January 1994. The regulations have had a impact in a number of areas, including our approach to ALARA, the summation of internal and external dose, the use of respiratory protection, to name only a few. No area has changed more than the approach now taken to internal dose assessment. This basic course will provide a foundation for and introduce the concepts currently used in internal dose assessment, will discuss the approach taken in 10CFR20 and the associated Regulatory Guides. In addition, the tools now available to conduct an internal dose assessment will be discussed. Finally, a series of problems will be presented and solved which will illustrate the use of the tools and the

appropriate approaches to internal dose assessment.

3-C - Health Effects and Their Consequences for Radiation Protection. *Clive Greenstock; AECL Chalk River Laboratory*

Exposure to ionizing radiation can result in a variety of biological effects including cancer and cell death. These effects are dependent upon the nature of the radiation and the overall biological response, particularly DNA repair and antioxidant defence processes. The results of acute versus chronic exposure, effects of dose, dose-fractionation, dose-rate and radiation quality, will be described. Data from such experiments, and Hiroshima and Nagasaki provide the foundation for new regulations and dose limits including ICRP 60.

The lecture will give an historical perspective, and provide the audience with basic principles and concepts. The talk will discuss the interaction of radiation with biological targets, mechanistic insight into the radiation damage, and details of those factors that influence the biological consequences. These include the radiobiological oxygen effect, DNA damage control, the oxidative stress response, adaptation and immuno-modulation, cell signaling and bystander effects, combined effects, genetic instability and gene induction.

In bio-monitoring of unplanned events or emergencies, it is important to distinguish between radiation dose and biological risk. This task is compounded by the stochastic nature, long latency and high, variable non-radiological background of generic health effects. Also, there is an on-going debate over a linear versus threshold response at low doses. The importance of biological response modifiers and other environmental and genetic determinants of individual radiosensitivity in the fields of radiation protection, regulatory limits and epidemiological risk estimation, will be discussed.

3-D - ISO-lating the Requirements for Quality Internal Dosimetry - ISO-9000 Applied to Internal Dose Programs. *Alex J. Boerner, Carol D. Berger and Brian A. Kelly, Integrated Environmental Management, Inc.*

Quality assurance should be a standard feature in laboratory operations, such as those that support internal dosimetry services. However, users (clients) of these laboratories rarely accept a “commitment to quality” at face value. In general, some form of certification that laboratory operations and quality assurance programs are effective is required.

Certain regulatory bodies (e.g., the State of Utah) and some “big ticket” clients (e.g., the U.S. Army Corps of Engineers) have developed their own certification standards, and demand that laboratories who want to do business with them comply. Other agencies have promulgated standardized quality assurance methods that have been (or soon will be) incorporated into an agency-specific certification processes. Two examples of these are the U. S. Department of Energy’s DOELAP program, and the Multi-Agency Radiation Laboratory Protocols (MARLAP) Manual program. On the other hand, many commercial firms are adopting an approach to certification that is based upon implementation of the ISO-9000 standard. Interestingly, however, is that a byproduct of achieving ISO-9000 certification is a reduction in operating costs. In this day and age of tight funding for radiation safety programs, stringent regulatory oversight, and increasing legal pressures, there may, indeed, be some benefit in applying ISO-9000 concepts to internal dosimetry programs.

This course provides a brief overview of the ISO-9000 process, emphasizing applications to internal dosimetry programs. Included will be a review of the standard’s history and a comparison of the standard to existing quality assurance guidance, mainly ASME/ASQC NQA-1. In addition, a step-by-step approach for applying the standard to a “marginal” internal dosimetry program without “breaking the bank” will be presented. Participants in the course should have a basic understanding of the key components of an internal dosimetry program (i.e., subject selection criteria, monitoring/measurement methods, intake and dose assessment methods, and recordkeeping requirements).

3-E - Health Physics at Research Reactors. *Les Slaback; National Institute of Standards and Technology*

The following topics will be selectively, and in some cases very briefly, discussed: types of research reactors (with emphasis on design features that impact HP concerns); reactor systems, operations and related HP assessments; reactor effluents and dose assessments; experiments, with emphasis on the HP issues; monitoring programs; emergency planning; and general HP programmatic issues. Specific HP issues for each topic will be presented, but, in general, topics will be limited to those peculiar, if not unique, to research reactors.

3-F - How to Have Fun Teaching Kids and Adults about Radiation. *Carolyn Owen and Kathy 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.

3-G - New Technologies in Project Planning and Execution - Geographic Information System (GIS). *Dixie Wells; Rad*Ware*

This course will present an informational overview of the GIS and it's capabilities today. It is a computer system that records, stores, and analyzes information about the features that makeup the earth's surface. A GIS can generate two- or three- dimensional images of an area, showing natural features such as hills and rivers with artificial features such as roads and power lines. Scientists use GIS images as models, making measurements, gathering data, and testing ideas. GIS is a strong tool which can make project planning much easier for all professionals. Cost preparations can be pinpointed by eliminating unknowns from the project makeup. Presentation of materials in both proposal and final drafts of reports can be enhanced by GIS. GIS technology can be used for scientific investigations, resource management, and development planning. For example, a GIS might be used to find wetlands that need protection from pollution, or calculate the probable contamination flowpath based on actual geographic representation. The future of a GIS in characterization, remediation, and decommissioning is offered for group discussion. Many GIS databases consist of sets of information called layers. Each layer represents a particular type of geographic data. The GIS combines these layers into one image, showing how various types of data relate to one another. A GIS accepts geographic data from a variety of sources, including maps, satellite photographs, and printed text and statistics. Operators program the GIS to process the information and to produce the images or information they need.

3-H - Development of Primary Standards and Transfer Standards at NIST. *Christopher Soares; National Institute for Standards and Technology*

Lectures will describe the role of the NIST in developing, maintaining and disseminating the national standards for ionizing radiation and radioactivity. This will include descriptions of NIST detector based standards for x-rays, gamma rays, electrons and neutrons. Standards, calibrations and standard reference materials (SRMs) for radioactivity will also be described. Finally, lecturers will describe transfer standards for the secondary laboratories and some successful models for measurement assurance programs.

3-I - Beyond Dose and Response: What We Really Need to Know to Relate Radiation and Detriment. *Dan Strom; Battelle Pacific Northwest National Laboratory*

As George Box says, "All models are wrong, and some are useful." The International Commission on Radiological Protection (ICRP) and National Council on Radiation Protection and Measurements (NCRP) use the linear nonthreshold (LNT) dose-response model as the basis for relating detriment (fatal and non-fatal cancer and heritable ill-health) to effective dose for purposes of setting radiation protection standards. The LNT model is

known to be wrong for a few stochastic endpoints in humans, such as bone cancer in radium dial painters and liver cancer in thorotrast patients, where there are clear thresholds based on human data. There may be practical thresholds for other cancers, non-linear response with dose, or linear response with dose. Comprehensive models relating radiation to detriment must consider the patterns of deposition of ionizing energy over time (rate and fractionation) and over space (e.g., distributions of lineal energy in cell nuclei). Energy deposition patterns must be separated by species, target tissue, age at exposure, sex of individual, individual susceptibility (e.g., polymorphisms in DNA repair genes), effect modifiers (e.g., tobacco smoke, diet, antioxidants) in order to predict incidence of and mortality from various neoplastic diseases and inherited traits as a function of age at appearance of cellular damage, pre-clinical changes, and clinical changes. Traditional dosimetry for irradiation by external sources and intakes of radionuclides is not adequate for predicting detriment using complete models. For any endpoint for which the LNT model is wrong, it makes no sense to add doses as is currently done by dosimeters and calculational models for doses from intakes. After presenting complete models of radiation detriment, I present requirements for radiation measuring and recording devices, and for calculational models. Rational radiation protection standards for both practices and interventions can be derived from enhanced radiation detriment models.

3-J - Naturally Occurring Radioactive Materials in Oil and Gas Production. *Lew Cook; Chevron Research and Technical Co.*

NORM can occur in several aspects of oil and gas production. Most oil wells produce water in addition to the oil and gas. Typically, but not always, this water is very high in dissolved solids which can include traces of radium and radon. The accumulation of radium in scales which can precipitate from produced water can result in a substantial deposit of scale accumulated over years of operation. Past management of scales may have been conducted without knowledge that they contained NORM and accumulations of NORM may exist in oil production areas. Radon originates from the decay of radium in the underground reservoir, and concentrations in produced fluids may be independent of concentrations of radium in the producing formations. Radon is also more mobile than radium underground, and can be produced in concentrations unrelated to the dissolved radium concentration in produced fluids. ^{222}Rn, when present, tends to follow the flow of natural gas, and to a lesser extent, the produced water. As a result, ^{222}Rn may be found in the downstream processing of the gas and radon decay products and can collect in some equipment. This can pose a potential for exposure to workers performing maintenance on this equipment. External and internal exposures must be considered for workers who work with NORM scales and other deposits. Solubilities of radium and thorium from deposits may also warrant evaluation to accurately determine the characteristics of the doses and alternate values for DAC's developed.

M-1 - The Hiroshima Neutron Dosimetry Problem: An Update. *Tore Straume; University of Utah*

It is now well known that a discrepancy exists between thermal neutron activation measurements and calculations based on the DS86 dosimetry system for Hiroshima. During the past few years, a substantial number of neutron activation measurements have been made in mineral and metal samples from Hiroshima using various isotopes (^{60}Co, ^{152}Eu, and ^{36}Cl) and analysis methods. The results demonstrate that thermal neutron activation measured beyond ~1 km in Hiroshima is 2 to 10 times higher than that calculated based on DS86. Because similar measurement results were obtained by several independent laboratories (some using very different analytical methods), it is believed that the DS86 calculations for low-energy neutrons are in error. As DS86 is based principally on computer modeling, these findings cast doubt on the neutron dosimetry generally.

The potential impact of the neutron discrepancy on Hiroshima risk values has been estimated. Most importantly, adding neutron dose in Hiroshima consistent with

the discrepancy observed for thermal neutrons would actually reduce the gamma ray risk estimates by factors of 2 to 3 at low to moderate doses. This would result because a greater fraction of the total observed risk (i.e., from neutrons + gammas) would be attributed to neutrons if the neutron doses were increased.

Because neutron dose from the Hiroshima bomb was primarily from fast (not thermal) neutrons, the most direct way to resolve this problem would be to develop a method to measure fast neutron activation in samples exposed to the Hiroshima bomb. During the past two years, we have developed such a method. The key technological advances were breakthroughs in the ultra separation of nickel from copper and the measurement of ^{63}Ni using accelerator mass spectrometry. The reaction, $^{63}Cu(n,p)^{63}Ni$, results in the production of ^{63}Ni (half life, 100 y) by neutrons above ~1 MeV. This reaction is now being used to reconstruct the high-energy neutron fluence in Hiroshima and should hopefully provide the data required to resolve the neutron dosimetry issue.

M-2 - Radiation Litigation Deposition Workshop: What You Should Know if Your Deposition is Taken in a Radiation Exposure Case. *David Wiedis; Jose and Wiedis*

NOTE: Workshop limited to 35 attendees

This workshop will address the legal and practical issues that are involved when the health physicist is required to testify in a deposition or at trial. The importance of the HP's testimony in relation to the specific case as well as the potential for setting legal precedent that can affect the outcome of cases that are litigated in the future will be discussed. The workshop will address practical "do's and don'ts" when testifying, and will discuss proper deposition preparation, how to answer certain types of questions and avoid potential "landmines" and typical lawyer "traps." We will use actual case studies and will do role playing with audience participation.

M-3 - Using the MIRD System Effectively for Medical Internal Dose Calculations. *Darrell Fisher; Battelle Pacific Northwest National Laboratory*

Anyone can look up a dose conversion factor or run a simple computer program to calculate internal dose. However, the real key to effective use of the medical internal radiation dose (MIRD) system is to understand how it works and what the essential data input requirements are. The fundamental data are acquired from medical imaging. Image interpretation involves 1) collecting data to determine the source-organ activities, 2) plotting the source-organ time-activity curves, 3) integrating the time activity curves for an estimate of the residence time, and 4) applying the residence time values (for each important source organ) within the MIRD system to calculate the tissue absorbed dose to target organs and tumors of interest. This course will also describe selection of sampling times, integration techniques, and customizing a dose assessment for a patient who doesn't quite resemble the MIRD phantom. Sample dose assessments will be presented, together with common mistakes to avoid. With the increased use of radiopharmaceuticals for cancer therapy, this course is essential for persons who desire better understanding of medical internal dose for treatment planning and follow-up evaluations.

M-4 - Neutron-Sensitive Scintillating Glass Fiber Sensors for Plutonium Monitoring and Analysis. *Richard S. Seymour and Carter D. Hull; Oxford Instruments Nuclear Measurements Group*

Researchers at Pacific Northwest National Laboratory (PNNL) have developed a glass fiber technology for neutron detection. Cerium-activated, lithium-silicate glass fibers respond to thermal neutrons and gamma rays and signals produced by each can be differentiated and quantified. This glass fiber technology has been refined and applied for the detection and measurement of thermal neutron and gamma ray fluxes. These commercially available detectors and detector systems are referred to as PUMA, an acronym for plutonium (Pu) Monitoring and Analysis. PUMA detectors generally have neutron detection efficiencies that are comparable or superior to ^{3}He and BF_3 gas tubes, but are more robust and safer. Since bundles

of neutron glass fibers are flexible, detector geometries can be optimized for specific applications, thus increasing the intrinsic efficiencies of PUMA detectors. Neutron glass fiber sensors offer large active areas, significant improvements in sensitivity versus costs, a wide dynamic counting range, fast response time, and lower microphonic susceptibility than conventional neutron sensors. This PEP course provides a background and review of the basic nuclear and optical principles of neutron glass fibers. PUMA detector panels and systems will be described in detail. First principles involved in MCNP models, detection and decision limits for neutron detection, and results of empirical testing will be discussed. Various applications for PUMA neutron and gamma ray detection systems for portal, freight, and vehicle monitoring will be presented.

M-5 - Radiation Protection: Cellular Defense Mechanisms Against Ionizing Radiation. *Doug Boreham; AECL Chalk River Laboratory*

Radiation protection practices are in place because high doses of ionizing radiation can cause harm to living organisms. Exposure to 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. Fortunately, organisms have evolved efficient cellular mechanisms to protect and repair DNA or eliminate cells with misrepaired defective DNA. This lecture focuses on two of these mechanisms: adaptive DNA repair mechanisms and programmed cell death/ apoptosis.

The adaptive response has been well characterized in many organisms including humans. When cells are exposed to sublethal low level doses of radiation, they can subsequently undergo an adaptive response and develop resistance to further radiation exposure. This transient cellular state of resistance is believed by some scientists to alter the health risks (cancer) associated with radiation exposure. The research presented during this seminar will introduce the audience to the health effects of ionizing radiation and describe the biological risks associated with radiation. The purpose of the presentation will be to identify the factors that affect risk, and show how risk may be modified by the adaptive response.

Apoptosis is another cellular mechanism that is responsive to radiation exposure and can alter the biological outcome of further radiation exposure. It is a genetically programmed form of cell death or cell suicide. Cells damaged by radiation can be selectively removed from the population by apoptosis and therefore eliminated as a potential cancer risk to the organism. We have previously shown that apoptosis is a sensitive indicator of radiation damage in human cells. We will present new evidence that shows how this process is influenced by chronic radiation exposures and relate this to cancer risk from chronic radiation exposures.

Overall, this course will educate the audience on current trends in radiobiological research and introduce concepts that may affect new approachs to radiation risk assessment. Supported by the CANDU Owners Group

M-6 - International Occupational Exposure Databases for Specialists in Radiation Safety. *David Miller; North American Regional Technical Center*

The North American Regional Technical Center (NARTC), Information System on Occupational Exposure (ISOE) sponsored by NEA/OCED & IAEA provides specialists in radiation safety with the analytical tools necessary to implement and maintain an effective occupational dose reduction program at nuclear facilities. The course describes the global standardization initiatives implemented for occupational dose reporting and analysis. The NEA expert group report on work management concepts for nuclear facilities will be presented. The report has been translated into 6 languages and describes important planning aspects of radiological work management including work selection, scheduling, training, implementation and feedback. Participants in the course will receive a copy of the NEA report as a part of their course syllabus.

Highlights from the 60 technical papers on dose reduction presented at the 1998 European and 1999 North

American International ALARA symposium will be provided. Topics addressed include electronic dosimetry outage work management, comparative studies in dose optimization and regulatory initiatives in ALARA. ISOE software programs will be demonstrated including occupational dose trends for the nuclear fuel cycle and effluent trends. A review of dose reduction software will be presented.

T-1 - Application of Radiological Data Usability, Verification, and Validation in Support of Environmental Remediation. *Steven Adams; IT Corporation*

Evaluation of risk to human health from exposure to ionizing radiation at radiologically contaminated sites is an integral part of the decision-making process for determining the need for remediation and selecting the appropriate remedial action alternative. The radioanalysis of environmental samples provides much of the information necessary for evaluating the risk and assessing the relative advantages and disadvantages of remedial action alternatives. This course presents a process for developing data usability, validation, and verification procedures tailored to the site-specific data quality objectives. Examples are given on how to develop a cost- effective process that can be used to demonstrate that the needed level of quality is achieved. Emphasis will be placed on how to determine what data test should be performed, the acceptable criteria for each test, and how to ensure that perfectly usable data is being used and that poor data is being rejected. Data usability discusses criteria for reviewing data sources, data documentation, analytical methods, detection limits, data review, and data quality indicators. Data verification will cover how to develop the appropriate site-specific requirements for completeness, consistency, correctness, and compliance. The validation process covers detection, unusual uncertainty, and rejection of data. In addition, it includes the statistical uncertainties specified in terms of precision and accuracy and unquantifiable uncertainties associated with out of control data.

T-2 - National Research Council's Evaluation of Guidelines for Exposures to Naturally Occurring Radioactive Materials. *David Kocher; Oak Ridge National Laboratory*

This course describes a recent National Research Council study of guidelines for controlling exposures of the public to technologically enhanced naturally occurring radioactive materials (TENORM). The study was undertaken in response to a concern that guidelines for indoor radon and other forms of TENORM developed by the Environmental Protection Agency (EPA) differed from guidelines developed by other organizations, but the basis for the differences was not apparent. The main conclusion from the study was that the differences between EPA guidelines for TENORM and guidelines developed by other organizations are not based on scientific and technical information, but are based on differences in policy judgments for risk management. In support of this conclusion, the Council's report includes reviews or discussions of (1) basic approaches to regulating radiation exposures of the public, (2) the role of dose or risk assessment in developing radiation standards, (2) existing or proposed EPA guidances and regulations for naturally occurring radionuclides and guidances for indoor radon and other forms of TENORM developed by other organizations, (3) technical issues involved in developing guidelines for TENORM, such as differences in approaches to risk assessment developed by EPA and other organizations and the transferability of standards for uranium or thorium mill tailings to other wastes containing TENORM, and (4) the different kinds of policy judgments for risk management involved in developing guidelines for TENORM.

T-3 - Domestic Transportation of Radioactive Material. *Dan Tallman; Environmental Management and Controls*

In a condensed version of the normal three day seminar presented on the subject of radioactive transportation regulations, this class will cover the basic organization and authority of the DOT and NRC over radioactive transportation. Also covered will be their recent revision to provide a higher degree

of consistency with the regulations of the IAEA. In addition, the requirements and basic philosophy associated with characterization, packaging, marking, labeling, shipping paper and certification development, placarding and surveys will be covered. The means to except a majority of the routine shipments made from many of these requirements will also be discussed. A brief overview on mixed waste and consignment compatibility will be provided. In order to get the most from this review, some previous knowledge of the regulations, a recent copy of 49CFR100-185, and a calculator will be helpful.

T-4 - Elements of a Radiation Safety Program. *Wesley Van Pelt; Van Pelt Associates*

This course covers the many elements which make up a radiation safety program in an industrial, educational or research organization. The radiation safety program elements include management, professional and technical aspects. The course outline can serve as a checklist for anyone starting or taking responsibility for a radiation safety program. Compliance with NRC or equivalent Agreement State radiation protection regulations is emphasized. Examples of detailed program elements will be discussed, but students are encouraged to ask specific questions relating to their own particular organizations.

T-5 - Putting MARSSIM to Work I. *Ken Kasper and Eric Nielsen; NES*
NOTE: THIS IS A TWO-PART COURSE (Second part given as TH-5)

Application of the methodology prescribed by the MARSSIM process can be a daunting task. During this four-hour course, participants will learn the practical application of MARSSIM. The MARSSIM process will be evaluated regarding structures and land uses. The class is intended to provide attendees with overview information that will help them effectively use MARSSIM at their site.

T-6 - Volunteered for Laser Safety Officer? *Joe Greco, Eastman Kodak, Inc., Tom LaVake, Johnson & Johnson, Inc.*

Have you been tasked with laser safety responsibilities at your facility? Do you want to enhance your current laser safety program? In this PEP, two laser safety officers with experience in industrial, manufacturing, and R&D laser environments will discuss successful approaches to situations that may be commonly encountered. Topics of discussions will include: elements of a laser safety program, current standards and regulations (including proposed changes to the ANSI Z136.1 Standard), training for LSOs and laser users, medical surveillance requirements, approaches to laser inspections, eyewear selection, laser pointers, "tools of the trade," web sites of interest, and others. Attendees are encouraged to bring their questions to class for group discussion.

W-1 - Effective Strategies for Communicating Risk. *Jerry Bushberg; University of California, Davis*

This presentation will focus on risk communication strategies in order to enable professionals to more effectively communicate radiation risks in public settings. The seminar will discuss the fundamentals of effective communications, common perceptions and misconceptions regarding radiation health risks, understanding the factors that engender public "outrage," and managing those issues. The first part of the seminar will begin by reviewing the fundamentals of effective communication and understanding public perceptions as described above. The second part will be interactive, utilizing a mock public hearing to practice and sharpen your communication skills. Participants will have the opportunity to work in teams during mock public hearings both as proponents and opponents of a proposed controversial project. At the conclusion of this seminar, participants should have a better understanding of effective communication strategies and the nature of public controversy and its management.

W-2 - Strategy for Release Measurements in Nuclear Power Facilities. *Matthais Franz; RADOS Technology*

The experiences in release measurement techniques as developed in the Federal Republic of Germany are described from the points of view

of the facility operating company, the manufacturer of measurment systems, and the company performing the measurements. Fundamental aspects of release measurement strategy are discussed along with experiences from dismantling a nuclear power station. A strategy of total gamma measurement and its procedures is discussed in relation to regulatory requirements, material provisions, initial surveys, decontamination, release measurements, and disposal. The measurement strategy and requirements drive the development and application of the measurement procedures. A comparison of the total gamma measurement method to competing methods will be discussed.

W-3 - Health Physics Applications using the Monte Carlo Program MCNP. *Richard Olsher and David Seagraves; Los Alamos National Laboratory*

Monte Carlo type calculations are now encountered in a variety of HP areas. This course introduces the basic concepts of Monte Carlo and illustrates a range of possible health physics applications using the Los Alamos MCNP code. No prior knowledge of Monte Carlo is assumed.

MCNP can be safely described as the "industry standard" with more than 600 person-years of development effort behind it. It is supported on a variety of platforms and is now accessible to HPs using desktop or laptop personal computers.

MCNP is ideally suited to the needs of the HP interested in performing radiation shielding and skyshine calculations, detector simulation studies, or dosimetery. Problems that involve a complex geometry can be easily solved using MCNP (e.g., designing a maze entrance to a radiation room). Calculations are based on detailed physics models and very accurate cross section tables that require no energy group compromises to be made.

W-4 - Current Approaches to Regulating Public Exposures to Radionuclides and Hazardous Chemicals. *David Kocher; Oak Ridge National Laboratory*

Under current law and regulations, two different approaches are used to control exposures of the public to hazardous substances in the environment. The different approaches to risk management apply to (1) radionuclides only as regulated under the Atomic Energy Act and (2) hazardous chemicals or radionuclides as regulated under any other laws (e.g., Safe Drinking Water Act, Clean Air Act and CERCLA). This course discusses the two different approaches to risk management, the resulting inconsistencies in lifetime cancer risks that are regarded as "acceptable" or "unaccepatable," and the potentially adverse impacts of the current regulatory approach for chemical carcinogens on the traditional approach to regulating radiation exposures of the public. The course then discusses how the apparent inconsistencies between the two regulatory approaches can be reconciled based on recognition of (1) the fundamental difference between the use of exposure limits for radionuclides and risk goals for hazardous chemicals, (2) the different meanings of "acceptable" and "unacceptable" risks in the two approaches, and (3) the primary importance of the ALARA principle in risk management decisions using either approach. Based on these concepts, a unified regulatory framework which is consistent with all current regulations and guidances for limiting risks to the public from routine and accidental exposures to radionuclides and hazardous chemicals is developed.

W-5 - Radioactivity Measurements, Statistics, and the Scientific Method. *Fritz Seiler; Sigma 5*

The Scientific Method is the basis of everything we do both in pure or applied science; and the discipline of Health Physics is no exception. In this course we will use it to track and evaluate a number of recent developments in handling uncertainties in measurements and statistics, in particular, in counting statistics. First, we will briefly review the requirements of the Scientific Method and study some pertinent examples, among them the appropriate selection of a null hypothesis for statistical tests, and the proper way to make comparisons. The application of the Scientific Method almost always involves the comparison of a predicted model value or a set of accepted measurements with a set of new measurements, and this means the comparison of at least two quantities which are usually of a stochastic nature.

Therefore, any comparison involves not only the values of the quantities but, in cases of near equality, often also their uncertainties and thus their probability distributions. Therefore, we will talk, in step Two, about uncertainties in general, use the latest national and international definitions applicable, and discuss some issues that have become rather hotly debated in recent years, such as "uncertainty" versus "variability," as well as "random" versus "systematic" errors. Subsequently, we will look in more detail into aspects such as using the Scientific Method in the selection of probability distributions, and into the merits of different methods of error propagation. Thirdly, we will present some recent developments involving second order errors and their distributions. It has been known for some time that experimentally found deviations from the mean do not follow a Gaussian distribution but have wider, quasi-exponential tails. We will first show that even for sizeable samples taken from a normal parent distribution, the tails are quasi-exponential, and not Gaussian. Since most of the statistical tests involve the tails of the distributions chosen, the quasi-exponential tails of actual distributions will considerably influence almost all statistical tests. Therefore, we will next discuss the amended second order rules for fractiles, for outliers, and rules for the far-out tails such as the 3 and the 5 rules, all of which can be derived from the quasi-exponential distributions. The fourth part deals with an often badly understood and inadequately managed kind of error: the errors of scale. Usually, these errors are ignored, leading quite often to bad, if not inappropriate, fits to the data, and consequently to conclusions drawn from them which are often misleading. Several practical examples from the counting of radioactivity in different media will be discussed in some detail. The fifth part will deal with the aspect of commensurate accuracy of the various variables in a calculation, using different rationales for different methods of error propagation. This will have direct consequences for the experimental measurement protocols, and may result in a considerable savings of experimental time, while providing sufficient accuracy for all variables. The sixth part, finally, will discuss some of the typical statistical tests in the second order approximation. We will look at the second order equivalents of the Z- and the t-distribution, as well as the changes introduced in the problems of minimum detection limits and related quantities.

W-6 - University and Medical Radioactive Waste Management. *Joseph Ring; Harvard University*

This presentation discusses the aspects of a radioactive waste management program designed for a large university and medical research complex to contain costs and to reduce the impact of waste regulations. The presentation includes discussion of decay-in-storage, incineration, packaging, mixed wastes and training for the waste programs. Emphasis is placed on a cooperative effort with investigators to pre-plan operations as well as simple techniques to implement and contain costs. The presentation discusses how to review research applications with an eye to waste in the program, how the laboratory group packages and how the safety office manages the generated waste. To ensure oversight for cost containment and generation rates, a series of metrics, or numerical ratios, is presented which one can use to evaluate the effectiveness of a radioactive waste management program.

TH-1 - Radiological Characterization Surveys: Getting the Most Bang for the Buck. *Armin Ansari and Howard Prichard; Auxier & Associates, Inc.*

There is a general misconception that radiological site characterizations, by definition, have a broad scope and are, therefore, costly. Performing cost-effective characterization surveys is indeed a challenging task. Characterization surveys can have a variety of objectives and a wide range of approaches for meeting those objectives. This is in contrast with, for example, radiological confirmatory surveys where the overall objective (i.e., demonstrating regulatory compliance) is clearly defined and standard approaches have been developed. Pitfalls in performing characterization surveys can stem from poorly defined or undefined survey

objectives, inappropriately designed survey plans, poorly implemented survey and sampling procedures, unreliable analytical data, or poor communication of survey findings. Often, significant financial and/or legal exposure may be at risk. In this course, the "nuts and bolts" of various characterization survey procedures are presented while constantly keeping in perspective the reasons for performing each task and evaluating cost-vs-benefit issues with respect to case-specific survey objectives. General topics include overview of applicable federal and state guidance documents, evaluating historical information, developing appropriate survey and sampling plans, instrumentation, survey measurements, sample collection, record keeping, and data interpretation and presentation. Particular emphasis will be placed on understanding state-of-the-art survey data collection and positioning techniques and how to evaluate when automated data collection becomes economically advantageous; how to choose, evaluate, and work with a commercial laboratory; how to evaluate and interpret analytical data; and how to effectively communicate the survey findings.

TH-2 - Introduction to Bayesian Statistics. *Dan Strom, Battelle Pacific Northwest National Laboratory*

Most health physicists use classical or "frequentist" statistics for problems in counting statistics and statistical inference. Classical statistics says that if a population has a certain distribution of some parameter, then a random sample from the population has certain probabilities of having various values. Did you ever wonder about turning this kind of prediction around, that is, making inferences about the population from a single sample? This reverse method is essentially a Bayesian process, although frequentists do it all the time without explicitly recognizing it. In the past few decades, increasing numbers of people in diverse fields have turned to Bayesian statistics. Bayes's methods are based on a theorem developed by the Reverend Thomas Bayes (1702-1761) in 1753. According to Bayesian statisticians, evidence in the form of a likelihood function must be interpreted through Bayes' theorem using a prior probability distribution to produce a posterior probability distribution. For radioactivity counting results, the evidence consists of the results of measurements of background, unknown, and counting efficiency. A Bayesian asks, "What are the probabilities of various amounts of activity being in the sample in the light of the evidence?" This course introduces health physicists to Bayesian statistics, with examples and applications in radiation protection. Advantages, drawbacks, and controversies are discussed. Participants are directed to articles, texts, and web resources. The pioneering work at Los Alamos National Laboratory (http://drambuie.lanl.gov/~bayes/) and the U.S. Department of Energy Bayesian Statistics Workshop (http://www.pnl.gov/bayesian/) is presented.

TH-3 - Air Sampling Environmental Radioactivity. *Ed Maher; Duke Engineering*

Collecting, analyzing, and interpreting environmental air samples around nuclear facilities are linchpins of regulatory compliance, public confidence, and data defensibility. This overview course will provide useful and practical information on environmental air sampling such as: developing a sampling strategy, selecting the appropriate collection media and equipment, minimizing sampling line losses, and obtaining representative air samples. The course, designed for the health physicist and environmental scientist, will provide specific and directly applicable guidance for the selection of air sampling methods for the more common radionuclides, calibration of air sampling equipment, isokinetic sampling, minimum detectable activity considerations, selection of filter media, and measurement of the aerosol activity size distribution.

TH-4 - Simplified Problem Solving for Health Physicists. *Tom Johnson*

This class will review basic problem solving principles using example problems. Additionally, the limitations of thumbrules and their origin will also be covered.

TH-5 - Putting MARSSIM to Work II. *Ken Kasper and Eric Nielsen; NES*

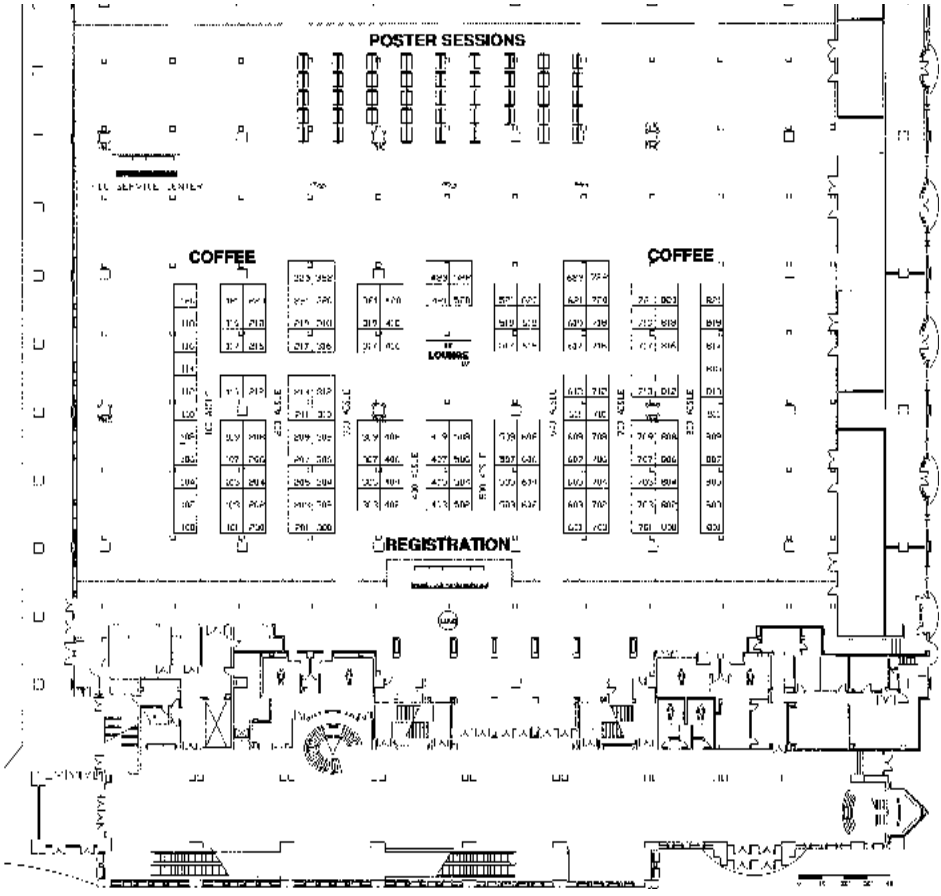
NOTE: THIS IS A TWO-PART COURSE (First part given as T-5)

Application of the methodology

prescribed by the MARSSIM process can be a daunting task. During this four-hour course, participants will learn the practical application of MARSSIM. The MARSSIM process will be evaluated regarding structures and land uses. The class is intended to provide attendees with overview information that will help them effectively use MARSSIM at their site.

TH-6 - DOE Health Physics Instrumentation Committee. *Dale Snowder; Alpha-Idaho L.L.C.*
Since 1994, contractors for the Dept. of Energy have organized and implemented a unique collaborative approach to testing, evaluating, and standardizing on suitable instrument models which comply with ANSI N323 and N42.17 criteria. In addition, this committee has achieved notable results in developing technical basis documents for such instrumentation, controlling manufacturer modifications, implementing standard practices, and providing numerous resources for its members to identify and resolve instrumentation issues. Estimated cost savings to the contractor facilities is currently over $11M from such efforts. Much of the information and test results developed from the HPIC committee is available for public use to those individuals and small business's that do not have such resources. This class will discuss the accomplishments of the HPIC and how to obtain access to the HPIC resources on HP instrumentation.

Philadelphia Convention Center



Health Physics Society 1999 Exhibitors

2000 VIRGINIA BEACH MIDYEAR MEETING ***Booth TBD***

2000 DENVER ANNUAL MEETING ***Booth TBD***

AAHP ***Booth 621***

ACURI ASSOCIATION, INC. ***Booth 811***
ACURI is a trade association of users of radioactive materials. It covers the states of Delaware, Maryland, Pennsylvania and West Virginia and specializes in waste management issues.

ADCO SERVICES, INC. ***Booth 309***
Adco Services, Inc. provides cost effective olume reduction, destruction and disposal alternatives for radioactive, mixed and hazardous waste streams. Additionally, we provide turn-key packaging, labeling, manifesting and transportation services.

AEA TECHNOLOGY ENG. SERVICES, INC. ***Booth 322***
Recycling, disposal, re-use of sealed radiation sources.

AEA TECHNOLOGY QSA INC. ***Booths 611, 613***
Formerly trading as Amersham Corporation, AEA Technology QSA offers a complete range of Isotrak reference sources and solutions for instrument calibration and environmental monitoring.

AIL SYSTEMS INC. ***Booth 719***
AIL Systems' GammaCam™ is a portable gamma ray imaging system that captures images of gamma sources and presents them on a remotely located computer. Captured images depict source location, shape, relative strength and dose rate. The GammaCam™ has been deployed for refueling and D&D activities in applications such as remote surveys and shielding evaluation.

ALPHA SPECTRA INC. ***Booth 609***
Alpha Spectra manufactures scintillation detectors for health physics academic, industrial, medical and exploration applications. Materials used include most of the scintillation phosphors e.g. NaI(Tl), BGO, plastics, etc.

AMERICAN NUCLEAR SOCIETY ***Booth 817***
ANS provides a forum for nuclear science and technology professionals through individual and organization membership benefits, Nuclear news and Radwaste magazine (advertising accepted), pubic information and outreach, meetings and exhibits, scientific publications and journals, ANS standards, and more...

ANALYTICS, INC. ***Booth 421***

Analytics manufactures/sells the world's highest quality radionuclide calibration standards (NIST traceable). We also specialize in custom calibration standards, radiochemistry cross check programs, environmental cross check programs and consulting services.

APFEL ENTERPRISES INC. ***Booth 307***

Affel features REMbrandt™, a lightweight, microprocessor-controlled survey meter/area monitor providing dose equivalent neutron measurement, high dynamic range, PC interface, history download. Neutrometer -S and -HD are passive immediate readoutneutron devices covering 1*Sv to 50mSv. REM-SPEC will permit plutonium assay and neutron spectrometry. www.apfelenterprises.com

APTEC INSTRUMENTS INC. ***Booths 705, 707, 709, 804, 806, 808***

Surface contamination instrumentation plus PC-based and portable MCAs will be available for demonstration.

ATL INTERNATIONAL INC. ***Booth 718***

ATL's Solution Areas include Environmental Management, Information Technologies, Occupational Safety and Health, Public Outreach and Comm-unication and Emergency Management.

BERKELEY NUCLEONICS CORP. ***Booth 807***

BNC (Berkeley Nucleonics Corp., San Rafael CA) has announced a new technology in Nucalear Detection and Radionuclide Identification. With BNC's new Model 935, non-technical users can Alarm & from a 100+ isotope library in real time. Further more, Health Physicists will enjoy the sophisticaiton on a MCA that touts faster and more accurate analysis & ID than *all others in its class.*

BICRON RMP ***Booths 406, 408***

Bicron manufactures a full line of Health Physics products from handheld survey meters and personnel monitors to large vehicle monitoring and dosimetry systems.

BIONOMICS ***Booth 717***

Radioactive and mixed waste disposal services.

BUBBLE TECHNOLOGY INDUSTRIES, INC. ***Booth 217***

Latest advances in Microspec portable spectroscopic survey systems featuring spectral dosimetry with on-board GPS for neutron, x-ray, gamma, beta. Neutron bubble detector dosimetry systems.

CANBERRA INDUSTRIES ***Booths 209 ,211, 213, 308, 310, 312***

Canberra will exhibit various products for lab/field radiation measurements and record keeping, including DSA-2000, ISOCS, EasySpec hand held MCA, Alpha Analyst Spectroscopy System and the Genie family of spec software platforms. We will also exhibit our HIS-20 HP record keeping software and Open CDM Chemistry Data Management products.

CONTACT CONGRESS BOOTH ***Booth 720***

Stop by for specifics on a quick and easy way to write to members of Congress. Write to your Representative and Senators from this booth sponsored by Capitol Associates, Inc.

CRCPD ***Booth 803***

CSI-RADIATION SAFETY ***Booth 407***

A leader in radiation safety training since 1983, offering Radiation Safety Officer, RSO Refresher, CHP and NRRPT Exam Preparation and Fundamental training courses. CSIs Certified Health Physicists also provide auditing and consulting services.

DOSIMETER & TGM DETECTORS, DIV. OF ***Booth 712***

Manufacturer of radiation detectors and instrumentation for nuclear, medical and non-destructive testing industries, including personal dosimeters, survey and alarming rate meters and geiger-mueller pancakes, tubes, probes and neutron detectors.

DUKE ENGINEERING & SERVICES ***Booth 206***

Decontamination and decommissioning services, dosimetry and radioanalytical laboratory services, health and safety consulting, health physics consulting, nuclear engineering, environmental monitoring, and emergency planning.

EBERLINE INSTRUMENTS ***Booths 617, 619***

Eberline Instruments is a leading supplier of Health Physics instrumentation which includes personnel monitors, air monitors and portable survey instruments.

EG&G LIFE SCIENCES ***Booth 816***

TriAthler is a small, manual single-well instrument that performs liquid scintillation counting, gamma counting and lumin-escence counting. It is easy to use and yet affordable and doesn't take up any more space on your desk than a laptop computer.

EG&G ORTEC ***Booths 505, 507, 509, 604, 606, 608***

eV PRODUCTS ***Booth 208***

eV Products designs and manufactures room temperature operation radiation detectors. Combining expertise in crystal growth and hybrid nuclear electronics, eV is the leader in CdZnTe based detection devices.

EXPLORANIUM ***Booth 300***
Exploranium is the leading manufacturer of vehicle monitoring systems with over 800 systems installed worldwide. In addition, Exploranium manufactures a complete line of environmental radiation detection instruments from our hand held spectrometer to large area survey equipment.

F&J SPECIALTY PRODUCTS, INC. ***Booth 223***
Air sampling systems, air flow calibrators, sample heads, filter paper, radon products and accessories for the Health Physics air monitoring specialist.

FEMTO-TECH INC. ***Booth 801***
Tritium monitors, continuous radon monitors with carbon monoxide, portable tritium monitors.

FRAMATOME TECHNOLOGIES, INC. ***Booth 218***
Framatome's Radiation Protection Integrated Monitoring System, (RPIMS), provides remote audio/ video communications, personnel and area dose monitoring and networking capabilities in a single package.

G/O CORPORATION ***Booth 812***
Health physics and radwaste consumable supplies. Also custom signs, tags and labels for Health Physics application.

GAMMA LABORATORIES, LTD. ***Booth 519***
Geiger Mueller (GM Tubes), Helium - 3 Neutron detectors, x-ray proportional counters, pancake GM tubes.

GAMMA PRODUCTS INC. ***Booth 316***
Low level alpha/beta systems, automatic gamma counting systems, low level shielding source and sample storage cabinets.

GENERAL ENGINEERING LABS, INC. ***Booth 704***
Chemical, Radiochemical, Bioassay and Geotechnical environmental laboratory testing.

GEORGIA INSTITUTE OF TECHNOLOGY ***Booth 820***
Co-60 irradiations, hot cell facility. Graduate education health phusics programs (on campus and distance learning).

GTS DURATEK ***Booth 815***
GTS Duratek provides a full line of radiological services including shipping, waste processing, decommissioning services, engineering support, portable instrumentation sales, service and rental, training, staff augmentation and exam preparation classes.

HEALTH PHYSICS INSTRUMENTS ***Booth 700***
HPI manufactures high quality portable and fixed radiation

measuring instruments, including alpha, beta, and gamma survey meters, area monitors, personnel dosimeters, REM meters, environmental monitors and multichannel analyzers.

HPS ***Registration Area***
PUBLICATIONS

STANDARDS ***Booth TBD***

HI-Q ***Booth 520***
ENVIRONMENTAL PRODUCTS CO.
Hi-Q is a leading manufacturer of air sampling equipment and accessories. Hi-Q's product line includes: High & low volume air samplers, air flow calibrators and calibration services, radioiodine sampling cartridges, filter paper, filter holders andcomplete stack sampling systems.

ICN DOSIMETRY ***Booths 601,***
SERVICE ***603, 605***
ICN offers a full range of services for radiation monitoring, primarily through film, thermoluminescent, and track etch badges. ICN's personnel dosimetry services are marketed by a dedicated full-time technical sales force to large customers, and bydirect mail to private office practitioners. ICN has more than 45,000 customers representing over 1/2 million individuals who use dosimetry service in four continents.

IDS-SCINTREX ***Booth 423***
Premier manufacturer of complete instruments for health physics applications, complete reactor control equipment, tritium-in-breath-monitor, failed fuel and spent fuel location system, etc.

INOVISION ***Booths 200, 202***
RADIATION MEASUREMENTS
Inovation Radiation Measurements, combining the Victoreen and Keithley products, makes us the leaders in Radiation Measurements. These products include a wide variety of Survey Meters, Precision Electrometer/ Dosimeters, X-ray Field Service Equipmentnd Quality Assurance Products.

INTERNATIONAL ***Booth TBD***
COMMITTEE

ISOTOPE ***Booth 508***
PRODUCTS LABORATORIES
Isotope Products Laboratories is a NIST traceable laboratory supplying radioactive standards, sources and nuclides for counting room use, instrument calibration and environmental monitoring, specializing in custom requirements.

J. L. SHEPHERD ***Booth 701***
& ASSOC.
Gamma, beta and neutron instrument calibration and dosimeter irradiation facilities, gamma research irradiators, process irradiators, and blood component irradiators. Source/ device decommissioning.

K & S ASSOCIATES ***Booth 713***
Calibration of survey instruments,

health physics services, TLD measurement services, dosimetry equipment calibrations, repair services, kVp meter calibrations, other consulting.

LABORATORY ***Booth 710***
IMPEX SYSTEMS LTD.
Laboratory Impex Systems Ltd. (LIS) is a leader in the design, development and manufacture of advanced radiation detection and Health Physics Instrumentation. Catering for numerous applications, over the years LIS have compiled a comprehensive rangeof nucleonic products and systems; from scaler timers, through stack monitors to a complete turnkey system for lung dose assessment.

LANDAUER INC. ***Booths 317, 319, 321, 416, 418, 420***
Personnel radiation monitoring.

LND, INC. ***Booths 618, 620***
Products: Nuclear Radiation Detectors, GM tubes, BF3, He3, Ionization Chambers, Proportional Counters, Gas Sampling, Flow and Fission Chambers-standard and custom designed. LND will manufacture to your specifications.

LUDLUM ***Booths 403, 405***
MEASUREMENTS, INC.
Ludlum Measurements, Inc., a manufacturer, will display instrumentation used to detect and measure nuclear radiation.

MGP INSTRUMENTS ***Booth 409***
MGP Instruments provides a full range of instrumentation and engineering services for health physics applications and radiation monitoring systems for all nuclear facilities. Experience and close collaboration with our clients have made MGP world renowned.

MOHAWK ***Booth 702***
INDUSTRIAL & NUC. SUPPLY
Provider of radiation protection consumables including: health physics and plant maintenance supplies, rad waste reduction products, and custom manufacturing of clothing. “Head to toe” industrial safety

NATIONAL ***Booth 302***
NUCLEAR CORP.
NNC, a division of Thermo Nucleonics, manufactures contamination monitors for personnel, tools, laundry, DAW, and vehicles. XETEX and REACTOR EXPERIMENTS, divisions of NNC, manufacture dosimeters ratemeters, area monitors, sample counters, radiation shielding and neutron activation foils & flux wires.

NES INC. ***Booth 503***
D&D services

NORTH ***Booths 402, 404***
AMERICAN SCIENTIFIC, INC.

NASI is a NIST traceable laboratory manufacturing a wide variety of radioactive standards and sources for the nuclear industry. Products include standardized solutions, Marinelli beakers, alpha, beta and gamma disc sources, radioactive gases, and Co-57 Flood sources.

NRRPT ***Booth 207***

NSSI ***Booth 318***
Radioactive, hazardous, and mixed waste treatment. Tritium recovery. Treatment of high hazard chemicals, gases, and radioactives.

NUCLEAR NEWS/ RADWASTE MAGAZINE ***Booth 819***
Nuclear News, the world's leading nuclear monthly, carries articles about nuclear power, plant operations, maintenance, radiological protection, nuclear medicine and much more. Radwaste Magazine, a bi-monthly, is focused on practical approaches andsolutions in all fields of radwaste management and environmental restoration. Considered essential reading by industry professionals, both publications will bring your marketing message to the decision-makers you need to reach.

NUCLEAR PLANT JOURNAL ***Booth 205***
Nuclear Plant Journal magazine featuring the following topics: Health Physics and waste and fuel management, plant maintenance, outage management, plant services and decontamination decommissioning and info technology.

ORDELA INC. ***Booth 320***
Alpha particle radiation detecting and measurement instrumentation.

ORISE ***Booth 521***
Health Physics Training and Radiological Surveys in Support of Decommissioning.

OUTREACH LABORATORY ***Booth 221***
Outreach is a full-service analytical laboratory specializing in lung solubility classification and radiochemical analyses on bioassay, hazardous waste and environmental samples. Customer satisfaction guaranteed. Quality data, rapid turnaround, fair prices.

OVERHOFF TECHNOLOGY CORP. ***Booth 219***
Tritium monitors for all applications, air, surface, stacks, water, process; general line of gamma, beta and neutron detection systems.

PACIFIC NORTHWEST NATIONAL LAB. ***Booth 522***
Health Physics research and development, services and integrated programs. Internal and external dosimetry, instrument calibration and evaluation, radiological records, dosimetry irradiations and accreditations.

PANASONIC INDUSTRIAL COMPANY ***Booth 306***
TLD readers and pocket dosimeters.

PERMA-FIX ENVIRONMENTAL SERVICES ***Booth 220***
Handling of Radioactive, mixed and hazardous wastes to include: Processing & Disposal of LSVs; distillation; bulking of organics for incineration; Research & Devleopment of disposal options for "orphaned" wastes; site remediation; decay-in-storage &analytical services.

PRINCETON GAMMA TECH, INC. ***Booth 805***
Gamma Spectroscopy systems for a wide range of applications as well as reliable mechanically cooled HpGe detectors.

PRO-TEM, INC. ***Booth 502***
Pro-Tem provides client-server information systems for the energy industry. These include the ARACS™ access control system, the ProRad™ health physics records management system, our Survey Map Utility and Genesis™, our final site survey management tool. Hands-on demonstrations offered at our booth.

PROTEAN INSTRUMENT CORPORATION ***Booth 602***
Protean Instrument specializes in a complete line of alpha/beta counting instruments featuring thin window and windowless gas-flow proportional detectors. Products include low-background models with automatic planchet sample changers, manual single-drawer/single-detector models and multiple-drawer/multiple-detector models. In addition, Protean Instrument offers the TRAC air sample system providing a seamless trail from sample collection to sample reporting.

PROXTRONICS INC ***Booth 212***
Proxtronics, Inc. is a NVLAP accredited dosimetry service. It offers film, TLD, rings, wallet cards and environmental badges. It also provides radiation management training services.

QUANTRAD SENSOR, INC. ***Booth 716***
Ranger™ - An automated, rugged, portable, hand-held nuclear detection and analysis system which allows untrained personnel to be "experts" in radionuclids identification. Scout™ - A truly portable Nuclear Spectroscopy System used to immediately identify alpha, gamma, x-rays and neutrons in nuclear power and environmental operations.

RAD ELEC INC. ***Booth 821***
E-PERM®s provide passive, accurate detection of radiation (alpha, beta, gamma and neutrons) and radioactive gasses and vapors (radon, thoron and tritium) for monitoring surfaces, soils,

equipment and area monitoring.

RADIATION DETECTION COMPANY *Booth 703*

RDC is managed by the following principles: 1) Integrity, honesty and financial stewardship. 2) Provision of quality Personnel Dosimetry at fair and competitive prices. 3) Establishment of a safe and affirming employment environment offering equal employment opportunity.

RADIATION SAFETY ASSOCIATES *Booth 204*

Radiation consulting services, radiochemical analysis, decontamination and decommissioning, publications and software for health physicists.

RADOS TECHNOLOGY, INC. *Booth 616*

RADOS Technology, a leading supplier of radiation detection and contamination monitoring systems, will be featuring the RAD-5X Dosimetry product line to include the RAD-50/51/52 Dosimeters, ADR-1000 and ADR-1 Readers, and TransDose 51 System

RSO, INC. *Booth 802*

RSO, Inc. is celebrating 25 years of sales and service. RSO, Inc. is a full service health physics and radiation safety company. Visit our web page at www.rsoinc.com

S. E. INTERNATIONAL, INC. *Booth 607*

Manufacturer of Radiation Alert® products-handheld ionizing radiation detectors for alpha, beta, gamma and x-rays. Instruments for surface and air contamination, dosimeters, etc.

SAFE TRAINING SYSTEMS LTD. *Booth 722*

The SMF3 Surface Monitoring Fluorimeter, an Instrumentation System for investigating the spread of contamination on skin and clothing and quantifying the result; together with the full range of STS Simulators for Radiation Monitoring Training.

SAIC *Booths 303, 305*

When it comes to detecting, measuring and monitoring radiation, no one gives you more capability than SAIC. Providing state of the art dosimeters, dose management systems, area and personal monitoring systems, and a complete line of air sampling andair monitoring equipment-all built in the USA and all backed with over 25 years of experience.

SCIENTIFIC CONSULTANT INSURANCE SERVICES/ST. PAUL FIRE & MARINE INSURANCE CO. *Booth 506*

Professional liability insurance coverage for health physicists.

SIEMENS ENVIRONMENTAL ***Booth 517***
Electronic dosimetry systems; wireless telemetry systems; ALARA technology

TECHNICAL ASSOCIATES ***Booth 201***
Recent additions to T/A's Health Physics instrument line include smarter, more sensitive and more rugged contamination monitors including pipe and plume monitors and iodine and tritium detection systems.

TELETRIX ***Booth 708***

THE GILLETT PARTNERSHIP ***Booth 721***
ISOSTOCK - Inventory, tracking and waste management system for radioisotopes.

THE SOURCE INC. ***Booth 504***
Calibration standard for low-level radiation traceable to National Institute of Standards and Technology.

THERMO RETEC ***Booth 216***
Health physics services, radiochemistry and dosimetry.

THOMAS GRAY & ASSOCIATES, INC. ***Booth 706***
Processing and disposal of LLRW, mixed waste, sealed sources, NORM & NARM waste, decay in storage, transportation and health physics services.

TVA NUCLEAR RADIOLOGICAL SERVICES ***Booth 203***
Radiological support services for the Nuclear Industry. Services include: Radioanalytical Analyses, Radiological Environmental Monitoring, Instrument Calibration and Repair, External Dosimetry.

US ECOLOGY NMMC ***Booth 304***
Complete brokerage services including multiple processing and disposal options for LLRW and mixed waste. Also provide field services including remediation and survey.

US NUCLEAR REGULATORY COMMISSION ***Booth 800***
The mission of the US Nuclear Regulatory Commission is to ensure adequate protection of the public health and safety, the common defense and security, and the environment in the use of nuclear materials in the United States.

WORLDWIDE INNOVATIONS AND TECH INC. ***Booth 623***
WIT provides new and unique lead-free, sterile, x-ray protective surgical drapes/shields designed for use in fluoroscopic x-ray

procedures. Shields are proven to reduce radiation by 75% or more; also available: lead-free thyroid shields with hygienic disposable covers.

XRF CORPORATION ***Booth 813***

Hand held nuclear spectrometers, x-ray, fluorescence spectrometers, multichannel analyzers, custom radiation detectors