

**Health Physics Society**  
***41st Annual Meeting***

**Seattle, Washington**



**July 21-25, 1996**

**Final Program**

**Headquarters Hotel:**

Sheraton Seattle (206) 621-9000

Guest Fax (206) 621-8441

**Session and Exhibit Location:**

Washington State Convention Center

HPS Registration Desk (206) 447-5064

Email: HPS96AM@AOL.COM

**HPS Secretariat**

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**Registration Hours**

Saturday, July 20 .....	3:00 - 6:00 pm
Sunday, July 21 .....	7:30 am - 8:00 pm
Monday, July 22 .....	8:00 am - 5:00 pm
Tuesday, July 23 .....	8:00 am - 5:00 pm
Wednesday, July 24 .....	8:00 am - 5:00 pm
Thursday, July 25 .....	8:00 am - Noon

**Affiliates Program**

Monday, July 22 .....	Noon-5:00 pm
Tuesday, July 23 .....	9:30 am - 5:00 pm
Wednesday, July 24 .....	9:30 am - 4:00 pm

### **1996 Program Committee**

#### **Karen S. Langley, Chair**

A. John Ahlquist  
Dennis O. Dumas  
Lynne A. Fairbent  
Ken L. Groves  
Kenneth R. Kase  
Bruce D. Pickett  
Melvin R. Sikov  
Paul G. Voillequé

### **Officers**

WILLIAM A. MILLS, President  
RICHARD J. VETTER,  
President-Elect  
KEITH H. DINGER, Treasurer  
RAYMOND A. GUILMETTE,  
Secretary  
RAYMOND H. JOHNSON, JR.,  
Treasurer-Elect  
RICHARD J. BURK, JR.,  
Executive Secretary

### **Board of Directors**

William A. Mills, Chair  
E. Theodore Agard  
Thomas B. Borak  
Gloria E. Chavez  
Robert N. Cherry, Jr.  
Keith H. Dinger  
Brian Dodd  
Marvin Goldman  
Raymond A. Guilmette  
Raymond H. Johnson, Jr.  
Ruth E. McBurney  
Charles E. Roessler  
James E. Tarpinian  
Richard J. Vetter  
Charles A. Willis

### **Advisory Panel to the Board of Directors**

Mary E. Moore, Parliamentarian  
Richard J. Burk, Jr., Executive  
Secretary  
Karen S. Langley, Program Chair  
Lucinda L. Grant, Local  
Arrangements Co-chair  
Debra McBaugh, Local  
Arrangements Co-chair  
Kenneth L. Miller, Editor-in-Chief of  
*Health Physics*  
Genevieve S. Roessler, Editor of  
HPS Newsletter

### **Past Presidents**

1956-1957	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
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	Marvin Goldman



## Local Arrangements Committee

Cindy L. Grant, Co-chair  
Debra McBaugh, Co-chair  
Lynn Albin - Hospitality  
Sandi Green - Hospitality  
Joan Swinth - Hospitality  
Johanna Berkey - Publicity  
Bruce Pickett - Publicity  
Wayne Lei - Ready Room  
Kathy Higley - AV/Students  
Jennifer Johnson - 5K Run  
Stan Addison - PEP Courses  
Carl Bergsagel - PEP Courses  
Jack Higginbotham - Summer School  
Jackie Ghiron - Summer School  
Alex Nazarali - Floor Logistics  
Janet Franco - Welcome Reception and Floor Logistics  
Jim Self - Floor Logistics  
Linda Woodson - Floor Logistics  
Ed Wright - Floor Logistics  
Tracey Patterson - Social Tours  
Brian Pankow - Technical Tours  
Larry Proud - Technical Tours  
Kathy Fox-Williams - Night Out  
Bob Gunther - Hotel Liaison  
Norm Dyer - Finances  
Bill Kreger - Registration

## Registration Fees

Class	Pre-Reg.	On-Site
•Member	\$185	\$245
•Non-Member**	\$260	\$320
☞Student	\$40	\$40
✕Companion	\$45	\$45
Exhibits only	\$25	\$25
Exhibitor (2/Booth)	No Fee	

•Member, 1 Day	n/a	\$125
•Non-Member, 1 Day	n/a	\$135
☞ Student, 1 Day	n/a	\$ 25
Add'l. Awards Luncheon Tickets		\$ 35 \$ 35

Add'l Night Out Tickets		
Adults	\$57	\$ 65
Children 13-19	\$40	\$ 45
Children 6-12	\$30	\$ 35
Children 4-5	\$18	\$ 23
Children 0-3	Free	

- ✦ Includes Sunday Reception and Thursday Awards Luncheon
- ☞ Includes Sunday and Student Receptions, Thursday Awards Luncheon
- ✕ Includes Sunday Reception
- Includes Sessions and Exhibitions ONLY
- \*\* \$65 of fee applicable towards NEW HPS Membership if Completed Application is submitted by September 20, 1996

## Registration Hours

Saturday, 7/20	3-6 PM
Sunday, 7/21	7:30 AM-8 PM
Monday, 7/22	8 AM-5 PM
Tuesday, 7/23	8 AM-5 PM
Wednesday, 7/24	8 AM-5 PM
Thursday, 7/25	8:00 AM-Noon

## Information

### Speaker Instructions

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

The **Ready Room** (Room 613) 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 504/505/506, 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 **Annual Business Meeting** will be convened at 5:30 pm on Wednesday, July 24, in Rooms 611/612.

## Awards Luncheon

The **Awards Luncheon** will be held from 12:30 - 2:30 pm on Thursday, July 25, in the Convention Center Rooms 6A/6B. The following awards are to be presented:

**Founders Award**  
Lew T. Pitchford  
**Elda E. Anderson Award**  
Michael G. Stabin  
**Fellow Class Awards**  
William R. Casey  
Keith H. Dinger  
William R. Hendee  
Bernd Kahn  
William A. Mills  
Bernard Shleien

## Student Awards

To Be Announced

The following menu has been selected for the Awards Luncheon:

Northwest Harvest Salad  
Herb Crusted Halibut Fillet with a Lime Beurre Blanc Sauce  
and  
Grilled Chicken Breast served with a Gorgonzola Sun-dried Alfredo  
Orzo

Fresh Seasonal Vegetables

Seasonal Berry Shortcake

If you have any dietary restrictions, please notify someone at the HPS registration desk.

## Companion Hospitality Suite

The Hospitality Suite in the Sheraton will open at Noon-4:30 pm on Sunday, July 21 and be located in the Madrona Room. Starting Monday, the Hospitality Suite will be located in the Cirrus Room. The hours will be Monday through Wednesday, July 22-24 from 7:30 am-4:30 pm and Thursday in Room 426, July 25 from 8:00 am-Noon. Morning and afternoon refreshments will be served on a cash basis. The suite will be a place to mingle, receive and leave messages and gather information on the many attractions to enjoy in Seattle and the surrounding area. There will be a complimentary Continental Breakfast Monday morning from 7:30-8:30 AM for all registered Companions, which will feature a safety and orientation to Seattle presentation.

## Future Annual Meetings

42nd 6/29-7/3, 1997 San Antonio  
43rd 7/12-16, 1998 Minneapolis

## Future Midyear Topical Meetings

30th 1/5-8, 1997 San Jose, CA

## 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 10CFR20. 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 expert who will be supported by the G. William Morgan Trust Fund.

## Activities and Tours

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

### Sunday, July 21

Whidbey Island 8:30 AM-4:15 PM  
Sample Seattle 1-5 PM  
Opening Reception 6-7 PM

### Monday, July 22

Hospitality Ste. Mixer 7:30-8:30 AM  
Panoramic Tour 9:30 AM-12:30 PM  
NW Wine Tour 12:30-5:30 PM

### Tuesday, July 23

5K Run/Walk 6-8:30 AM  
Pioneer Square 9 AM-Noon  
Snoqualmie Falls 1-5 PM  
Boeing Tour 1:30-5:30 PM  
Night Out 5:45-10:45 PM

### Wednesday, July 24

Victoria, BC Day 8 AM-9:30 PM  
Museum of Flight 1-4 PM  
Boeing Tour 1:30-6 PM

### Thursday, July 25

Mt. Rainer Day Trip 8 AM-6 PM  
Awards Luncheon 12:30-2:30 PM

### Friday, July 26

Whale Watching 6:45 AM-6:30 PM  
Bangor Naval 6:15 AM-5:30 PM

### Friday, July 26/Sunday, July 28

British Columbia Excursion  
Depart-Friday at 1 PM  
Return-Sunday at 9 PM

## Important Events

### Professional Enrichment Program

On **Sunday, July 21** there will be a series of thirty courses offered. The courses will be offered at the Sheraton Hotel in two hour times blocks as noted, 8:00-10:00 am, 10:30 am-12:30 pm and 1:30-3:30 pm. In addition to the Sunday courses, there will be six lectures scheduled at the Convention Center on **Monday, Tuesday and Wednesday** from 12:15-2:15 pm. There will also be six **Thursday** afternoon courses from 3-5 pm.

### Welcome Reception

The Welcome Reception will be held **Sunday, July 21** from 6-7:30 pm in the Sheraton Ballroom.

### Special Exhibit Hall Features

**Monday, July 22** the exhibit hall in the Convention Center will open featuring a complimentary Lunch between Noon-1:30 pm for registered attendees. Make plans to stop by the exhibit hall after the Plenary Session.

The Exhibit Hall will once again feature upgraded Coffee Breaks. Stop by the exhibit hall each break and enjoy the extra goodies you will find. Don't forget to thank our exhibitors for their support.

### Night Out at Tillicum Village

Plan to attend the **Tuesday, July 23** Night Out at Tillicum Village. This event will be a night to remember. Enjoy a narrated harbor cruise on board ship where cocktails will be available on a cash basis. Upon arrival on the Island, appetizers of clams and clam nectar will be served at the beach. Enter the great cedar longhouse for an all-you-can-eat Indian-style salmon feast followed by a Native Dance Presentation. Dress casual, bring a sweater, and enjoy the best in Northwest evening fun. Bus service will be provided to and from the Pier.

### Awards Luncheon

The Awards Luncheon will be held at the Convention Center **Thursday, July 25** from 12:30-2:30 pm.

## Health Physics Society Committee Meetings

(S)=Sheraton Hotel; (W)=Washington State Convention Center

*Saturday, July 20, 1996*

**FINANCE COMMITTEE**  
8:30 am-Noon Boardroom 414 (S)

**RULES COMMITTEE**  
9 am-3 pm Room 412 (S)

**ABHP BOARD MEETING**  
9 am-5 pm Douglas Room (S)

**CONTINUING EDUCATION COMMITTEE**  
Noon-6 pm Madrona (S)

**STRATEGIC PLANNING COMMITTEE**  
1-4 pm Boardroom 414 (S)

**EXECUTIVE COMMITTEE**  
1-5 pm Presidential Suite (S)

**SYMPOSIA COMMITTEE**  
1-5 pm Room 418 (S)

*Sunday, July 21, 1996*

**VENUES COMMITTEE**  
8 am-5 pm Room 426 (S)

**ANSI N13.39**  
8 am-6 pm Room 420 (S)

**HPS BOARD OF DIRECTORS**  
8:30 am-5 pm Cirrus Room (S)

**ABHP BOARD MEETING**  
9 am-5 pm Room 416 (S)

**STANDARDS COMMITTEE**  
10 am-4 pm Room 414 (S)

**ANSI N13.33**  
3-5 pm Room 428 (S)

**ANSI 13.43**  
3-6 pm Room 430 (S)

**SCIENTIFIC AND PUBLIC ISSUES COMMITTEE**  
4-6 pm Room 412 (S)

**STUDENT BRANCH OFFICERS**  
4-6 pm Aspen Room (S)

**ANSI COMMITTEE ON PLUTONIUM**  
6:30-9:30 pm Room 426 (S)

*Monday, July 22, 1996*

**AAHP PROFESSIONAL DEVELOPMENT COMMITTEE**  
10 am-Noon Room 420 (S)

**PUBLICATIONS COMMITTEE**  
11 am-1:30 pm Rooms 422/424 (S)

**ACADEMIC EDUCATION COMMITTEE**  
Noon-2 pm Room 620 (W)

**PLANCO XX**  
2-4 pm Room 507 (W)

**PLANCO-157**  
3-5 pm Room 508 (W)

**AAHP CONTINUING EDUCATION COMMITTEE**  
4-6 pm Room 412 (S)

*Tuesday, July 23, 1996*

**AAHP EXECUTIVE COMMITTEE**  
8 am-5 pm Rooms 426 (S)

**N13.36**  
9-11 am Rooms 508 (W)

**ANSI N13.12**  
9 am-5 pm Rooms 430 (S)

**LABORATORY ACCREDITATION - POLICY**  
11 am-1 pm Room 507 (W)

**HISTORY COMMITTEE**  
11 am-1:30 pm Room 424 (S)

**PUBLIC EDUCATION COMMITTEE**  
11 am-1:30 pm Boardroom 414 (S)

**STRATEGIC PLANNING COMMITTEE**  
11 am-1:30 pm Room 412 (S)

**STUDENT BRANCH COUNCIL MEETING**  
Noon-2 pm Room 615 (W)

**MEMBERSHIP COMMITTEE**  
Noon-2 pm Room 508 (W)

**LABORATORY ACCREDITATION - ASSESSMENT**  
1-2:30 pm Room 507 (W)

**ANSI N43-4 COMMITTEE**  
1-5 pm Room 620 (W)

**ANSI N13.35**  
2:45-5:30 pm Room 422 (S)

**HPSSC PLANCO 56**  
3-6 pm Room 508 (W)

*Wednesday, July 24, 1996*

**SUMMER SCHOOL COMMITTEE**  
11 am-1:30 pm Room 620 (W)

**LIAISON COMMITTEE**  
11 am-1:30 pm Room 508 (W)

**ALL-PROGRAM HP FACULTY MEETING**  
Noon-2 pm Room 615 (W)

**STATE AND FEDERAL LEGISLATION COMMITTEE**  
Noon-2:30 pm Room 507 (W)

**NOMINATING COMMITTEE**  
Noon-4 pm Room 428 (S)

**CONTINUING EDUCATION COMMITTEE**  
4:30-6 pm Room 424 (S)

*Thursday, July 25, 1996*

**AWARDS COMMITTEE**  
7:30-9:30 am Room 420 (S)

**LOCAL ARRANGEMENTS COMMITTEE**  
7:30-9:30 am Room 615 (W)

**HPSSC NORM WORKING GROUP**  
8 am-Noon Room 620 (W)

**HPS BOARD OF DIRECTORS**  
8:30 am-Noon; 2:30 pm-??  
Cirrus Room (S)

**PROGRAM COMMITTEE**  
3-5 pm Room 620 (W)



# Health Physics Society Forty-First Annual Meeting

Seattle, Washington – July 21-25, 1996

## Final Scientific Program

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

**NOTE: All sessions are in the Washington State Convention Center**

## Monday

### Continuing Education Lectures

7:15-8:15 am Room: 606/607

**CEL-1** Recent Developments in Radiation Litigation. *David J. Weidiss; Jose & Weidiss*

7:15-8:15 am Room: 608/609

**CEL-2** Status of Low Level Radioactive Waste Siting. *Patricia Serie; EnviralIssues*

8:45 am-Noon Rooms: 6A/6B

### MAM-A: Plenary Session

(Oral Session)

8:45 AM Introduction and Welcome. *William A. Mills; HPS President*

9:00 AM **MAM-A.1**  
**G. William Morgan Lecture** – Radiation Risk: A Chinese Perspective. *Z. Pan; Chinese Society of Radiation Protection*

9:40 AM **MAM-A.2**  
Economic and Humanitarian Benefits of Radioactivity. *A. Waltars; Westinghouse Hanford Company*

10:10 AM Break

10:30 AM **MAM-A.3**  
**G. William Morgan Lecture** – Low Dose Epidemiology and Adaptive Response: Implications for Risk Analysis. *B. Bennett; UNSCEAR*

11:20 AM **MAM-A.4**  
Nuclear Medicine Advancement in Diagnostic Treatments. *M. Pollycove; US Nuclear Regulatory Commission, Washington, DC*

12:15-2:15 pm

### PROFESSIONAL ENRICHMENT PROGRAM

**M-1 Rooms 618/619** Introduction to Gamma Processing Technology. *Mark A. Smith; SteriGenics International*

**M-2 Rooms 616/617** A Review of Compliance Issues for Medical Licensees. *Suzie Kent; Orange County Health Care Agency*

**M-3 Rooms 611/612** Lower Limits of Detection. *Thomas B. Borak; Colorado State University*

**M-4 Rooms 608/609** Introduction to Instrumentation to Measure Non-Ionizing Radiation and Fields. *John A. Leonowich; Battelle Pacific Northwest Laboratory*

**M-5 Rooms 606/607** Industrial Hygiene Air Sampling Methods and Applications. *Peter Collopy; Carnegie Mellon University*

**M-6 Rooms 602/603/604** External Beta Ray Dosimetry. *Herman Cember; Northwestern University*

2:00-5:15 pm Room: 6A

### MPM-A: Section Session—The Effects of Downsizing on Medical Regulation - Sponsored by the Government Section (Oral Session)

Co-Chairs: Frank J. Congel; US NRC, Washington, DC and James R. Yusko; State of Pennsylvania

2:00 PM Introduction  
*F. J. Congel, President and J. R. Yusko, President-elect, Government Section, HPS*

2:15 PM **MPM-A.1**  
Reinventing Government: An Overview. *A. S. Mohseni; US Nuclear Regulatory Agency*

## Monday

3:15 PM **MPM-A.2**  
Summary of NAS Report on US NRC and Medical Regulation. *W. R. Hendee; Medical College of Wisconsin*

3:45 PM Break

4:15 PM **MPM-A.3**  
Effects of Agreement States. *R. E. McBurney; Texas Department of Health*

4:45 PM **MPM-A.4**  
Effects of Other Federal Agencies/U.S. Military. *R. E. Cherry, Jr.; Department of the Army*

5:15 PM Government Section Business Meeting

2:30-5:15 pm Rooms: 606/607

### MPM-B: Waste Management/Decommissioning (Oral/Poster Session)

Co-Chairs: Joseph Ring; Harvard University and Joseph Dumont; DuPont Merck Pharmaceuticals

#### Oral Presentations

2:30 PM **MPM-B.1**  
Radiochemistry Laboratory Waste Management. *C. F. Wu, S. N. Bakhtiar, R. E. Sleeman, R. L. Whiteley and G. L. Tatro; WIPP/Westinghouse*

2:45 PM **MPM-B.2**  
The Effects of Surface Condition on *In Situ* Measurement of Beta and Alpha Surface Contamination. *E. W. Abelquist and E. E. Walker; Oak Ridge Institute for Science and Education and Bechtel Environmental, Inc.*

3:00 PM **MPM-B.3**  
An Example of a Dose Assessment for the Unrestricted Release of Material with Small Amounts of Volumetric Radioactive Contamination. *D. B. Orley, P. D. Rittmann and T. E. Bratvold; Westinghouse Hanford Company*

3:15 PM **MPM-B.4**  
Assessing the Status of a Nuclear Fuel Fabrication Facility to Support Decommissioning Plans. *G. C. Chapman, J. W. Nagy, R. A. Moore, S. F. Dechert, T. E. Huston and M. A. Hopson; Nuclear Fuel Services, Inc.*

3:30 PM **MPM-B.5**  
Development and Implementation of a Site Radiation Protection Program for a Radioactive Waste Vitrification and RCRA Clean Closure Project at the Savannah River Site. *M. S. Davidson, I. S. Howard and W. A. Veronee, Jr.; GTS Duratek*

3:45 PM Break

#### Poster Presentations—Hallway 605

**MPM-B.6** Radwaste Minimization Successes at Duke Power Company. *C. D. Lan, G. T. Johnson, D. C. Groves and T. A. Smith; Duke Power Company*

**MPM-B.7** Characterization of High Level Radioactive Wastes. *M. W. Enghausen, A. H. Mohagheghi, S. B. Ebara and T. D. Kraus; Science Applications International Corporation, Sandia National Laboratories and Benchmark Environmental Corporation*

**MPM-B.8** Radioactive Material Inventory Control at a Waste Characterization Facility. *L. K. Yong, J. A. Chapman and F. J. Schultz; Oak Ridge National Laboratory*

**MPM-B.9** Now TAM-D.14

2:30-4:30 pm Room: Exhibit Hall

### MPM-C: Risk Analysis (Poster Session)

Co-Chairs: Michael Wangler; US NRC, Washington, DC and Mary Birch; Duke Power

**MPM-C.1** Compensation for Radiation Risks. *P. G. Groer; University of Tennessee*

**MPM-C.2** Risk Control and the Minimum Significant Risk. *F. A. Seiler and J. L. Alvarez; IT Corporation and Auxier & Associates*

**MPM-C.3** Why We Need New Approaches to Low-Dose Risk Modeling. *J. L. Alvarez and F. A. Seiler; Auxier & Associates and IT Corporation*

**MPM-C.4** Tritium Concentrations Inside the Homes of Occupationally Exposed Workers: Dosimetric Implications. *W. J. Workman, R. J. Cornett, A. Trivedi and R. M. Brown; AECL, Canada*

## Monday

**MPM-C.5** Application of the Modular Risk Analysis Approach Health Impact Analyses. *D. L. Strenge, J. W. Buck and K. J. Castleton; Pacific Northwest National Laboratory*

**MPM-C.6** Risks, Costs and Benefits Analysis for Exhumation of Buried Radioactive Materials at a Nuclear Fuel Fabrication Facility. *J. S. Kirk, R. A. Moore, T. E. Huston, G. C. Chapman, S. E. Barron and J. W. Nagy; Nuclear Fuel Services, Inc.*

**MPM-C.7** Relative Biological Effectiveness for Induction of Cancer by Protracted Alpha Versus Beta Internal Irradiation. *O. G. Raabe; University of California-Davis*

**MPM-C.8** Theoretical vs. Measured Risk Estimates for the External Exposure to Ionizing Radiation Pathway - A Case Study of a Major Industrial Site. *S. T. Dundon; IT Corporation*

**MPM-C.9** Risk Assessment and Remedial Policy Evaluation Using Predictive Modeling. *I. Linkov and W. R. Schell; Harvard University and University of Pittsburgh*

**MPM-C.10** Risk Assessment for Transportation of Radioactive Material Within the State of Idaho. *C. Deng, S. G. Oberg and J. L. Downs; State of Idaho and University of Nevada*

**MPM-C.11** A Field Study Comparing Two Methods of Transportation Risk Assessment. *M. F. Harmon, S. G. Oberg, R. R. Brey and T. F. Gesell; Idaho State University and University of Nevada*

**MPM-C.12** Estimated Consequences from Severe Spent Nuclear Fuel Transportation Accidents. *J. J. Arnish, F. Monette, D. LePoire and B. M. Biwer; Argonne National Laboratory*

## Tuesday

### Continuing Education Lectures

7:15-8:15 am Rooms: 606/607

**CEL-3** Skin Injuries and Dose Estimation for Selected Fluoroscopic Procedures. *Edward Tupin; US Food and Drug Administration, Washington, DC*

7:15-8:15 am Rooms: 608/609

**CEL-4** Topic and Speaker TBA

8:30 am-12:15 pm Room: 6B

### TAM-A: Student I (Poster Session)

Co-Chairs: James O'Rear; University of Utah and Susan Stevenson, Amgen Corporation

**NOTE:** All student presenters will give a 2 minute oral summary of their presentations before poster viewing begins.

**TAM-A.1** Upgrade of a Radiation Measurement Laboratory Course at the University of Florida. *L. M. Thomsen, W. E. Bolch and T. H. Wagner; University of Florida*

**TAM-A.2** The Development of a Nuclear Medicine Course for Health Physics Students. *S. E. Binney and J. F. Katanic; Oregon State University*

**TAM-A.3** An Innovative Method of Teaching Gamma Ray Spectroscopy in a Radiation Detection Laboratory Course at the University of Florida. *T. H. Wagner, L. M. Thomsen and W. E. Bolch; University of Florida*

**TAM-A.4** Cancelled

**TAM-A.5** Estimates of Organ Doses for Pediatric Patients Undergoing Diagnostic X-Ray Procedures. *R. A. Reyes, W. E. Bolch and K. M. Hintenlang; University of Florida*

**TAM-A.6** A Survey of Radiographic Technique Parameters Used in Pediatric Diagnostic Examinations. *T. A. Chohan, W. E. Bolch and K. Hintenlang; University of Florida*

**TAM-A.7** Active Contour Segmentation of Knee Replacement Images. *M. C. Tavares, R. J. Hirko and S. A. Banks; University of Florida and Good Samaritan Medical Center*

**TAM-A.8** Estimates of Electron Absorbed Fraction in Trabecular Bone Utilizing Nuclear Magnetic Resonance Imaging Modeling. *D. W. Jokisch and W. E. Bolch; University of Florida*

**TAM-A.9** Boron Neutron Capture Therapy for Osteosarcoma: 3-D Modeling and Dosimetry. *D. E. Miller; Rensselaer Polytechnic Institute*

**TAM-A.10** Problems in Unfolding Bonner Sphere Data for High Energy Neutron Spectra. *Y. Yu, W. H. Casson and H. H. Hsu; University of New Mexico and Los Alamos National Laboratory*

**TAM-A.11** The Calculations and the Measurements of Neutron Moderation Time for Neutron Detectors at SLAC. *R. K. Arora, J. C. Liu, S. Rokni and V. Vylet; San Jose State University and Stanford University*

**TAM-A.12** Development and Testing of a Mixed Neutron-Photon-Beta Field Thermoluminescent Dosimeter for Personnel Monitoring. *J. J. Zummo and J. C. Liu; San Jose State University and Stanford Linear Accelerator Center*

**TAM-A.13** Accelerator Neutron Sources for BNCT: Moving Close to the Target by Eliminating Moderator. *R. Kudchadker, J. F. Kunze and J. F. Harmon; University of Missouri and Idaho State University*

**TAM-A.14** Shielding a Radio-pharmaceutical Target Irradiation System. *J. E. Dumont and G. E. Chabot; DuPont Merck Pharmaceutical Company and University of Massachusetts, Lowell*

**TAM-A.15** A Mathematical Description for Depth-Dose Distribution Due to Monoenergetic Electrons in Lithium Fluoride and Soft Tissue. *J. B. Lemaster, K. J. Kearfott and E. Samei; University of Michigan*



## Tuesday

**TAM-A.16** An Improved Technique for In Vivo Activity Quantification Using a Gamma Camera with  $^{131}\text{I}$ . *G. A. Agrawal, J. E. Carey, K. J. Kearfott and R. J. Ackermann; University of Michigan and University of Michigan Hospitals*

**TAM-A.17** Dual Integral Glow Analysis - Evaluation of the Method in Determination of Shallow Dose and Deep Dose in Selected Beta Radiation Fields. *E. Samei, K. J. Kearfott and E. C. Wagner; University of Michigan*

**TAM-A.18** Time-Specific Measurements of Energy Deposition from Radiation Fields in Simulated Sub-Micron Tissue Volumes. *M. A. Famiano and D. M. Hamby; University of Michigan*

**TAM-A.19** A Comparison of the Angular Dependence of Effective Dose and Effective Dose Equivalent. *M. A. Sitek, D. P. Gierga and X. G. Xu; Rensselaer Polytechnic Institute*

**TAM-A.20** Annual Limits on Intake (ALI) Values in ICRP 61 and 10 CFR Part 20 (1991). *M. Zhu and K. J. Kearfott; University of Michigan*

**TAM-A.21** A Study of the Angular Response of Personnel Dosimeters and Their Conceptual Design. *K. Minter and X. G. Xu; Rensselaer Polytechnic Institute*

**TAM-A.22** Evaluation of a Low Background Proportional Counter for Detection of High Energy Beta Particles with Application to SR-90 Surface Contamination. *K. T. S. Islam, L. Johnson, C. McIsaac, R. R. Brey and T. F. Gesell; Idaho State University and Lockheed Idaho Technologies Company*

8:30-11:30 am Room: 6A

### TAM-B: Special Session-P-32 Incidents at MIT and NIH (Oral Session)

Chair: Richard Vetter; Mayo Clinic

**8:30 AM TAM-B.1**  
Health Physics Experience with a Notable P-32 Ingestion. *F. X. Massé and M. S. Galanek; Massachusetts Institute of Technology*

**9:00 AM TAM-B.2**  
Response to the Internal  $^{32}\text{P}$  Contamination of Biomedical Researchers at the National Institutes of Health. *R. A. Zoon, N. E. Newman and S. W. Googins; National Institutes of Health*

**9:30 AM Break**

**10:00 AM TAM-B.3**  
Estimates of Intakes and Internal Doses from Ingestion of P-32 at MIT and NIH. *M. G. Stabin and R. E. Toohey; Oak Ridge Institute for Science and Education*

**10:30 AM TAM-B.4**  
Findings and Conclusions of a Nuclear Regulatory Commission Investigation of an Ingestion of Phosphorus-32 at the Massachusetts Institute of Technology. *J. E. Glenn; US Nuclear Regulatory Commission, Washington, DC*

**11:00 AM Panel Discussion**

8:30-11:30 am Rooms: 608/609

### TAM-C: External Dosimetry (Oral/Poster Session)

Co-Chairs: James Liu; SLAC and Shawna Eisele; LANL

#### Oral Presentations

**8:30 AM TAM-C.1**  
Improved Personnel Dosimetry Using Copper-Doped LiF TLDS and Neural Network Algorithms. *J. R. Cassata, D. A. Schauer, G. K. Riel, G. A. Pertmer and M. E. Nelson; US Naval Academy, Naval Dosimetry Center, Naval Surface Warfare Center and University of Maryland*

**8:45 AM TAM-C.2**  
Laser-Heated Thermoluminescence Dosimetry. *B. L. Justus and A. L. Huston; Naval Research Laboratory*

**TAM-C.3** Cancelled

## Tuesday

**9:15 AM TAM-C.4**  
Determination of Photon Backscatter from Several Calibration Phantoms. *J. C. McDonald, M. K. Murphy and R. J. Traub; Pacific Northwest National Laboratory*

**9:30 AM TAM-C.5**  
Galactic Cosmic Ray Flux Distributions in the Skin, Ocular Lens and BFO of Astronauts on Deep Space Missions. *L. W. Townsend; University of Tennessee*

**9:45 AM TAM-C.6**  
Early Dose Assessment Following Severe Radiation Accidents. *R. E. Goans and E. C. Holloway; Oak Ridge Institute for Science and Education*

**10:00 AM Break**

#### Poster Presentations - Hallway 610

**TAM-C.7** The Early Internationalization of Safety Culture: The Impact of Yugoslavia's Vinca Reactor Accident of 1958. *L. M. Calkins and K. J. Kearfott; University of Michigan*

**TAM-C.8** Neutron, Photon and Electron Response Functions of  $\text{CaF}_2$  and LiF TLD Chips. *H. H. Hsu, W. H. Casson and J. Chen; Los Alamos National Laboratory and GSF, Germany*

**TAM-C.9** Experimental Comparison of the Responses of  $\text{CaF}_2$  and LiF TLD Chips. *H. H. Hsu, W. H. Casson, J. M. Hoffman, R. McKeever and D. G. Vasilik; Los Alamos National Laboratory*

**TAM-C.10** Calibration and Performance of Radiochromic Dye Dosimeters. *B. J. Mincher and M. K. Zaidi; Idaho National Engineering Laboratory and US Department of Energy, Idaho*

**TAM-C.11** Independent Evaluation of the Temperature and Energy Dependence of a Bubble Dosimeter. *R. D. Boston, R. R. Brey and T. F. Gesell; Idaho State University*

**TAM-C.12** Measurement of the Neutron Energy Spectrum on the Godiva IV Fast Burst Assembly for Application to Neutron Dosimetry Studies. *W. H. Casson, H. H.*

*Hsu, Y. Yu, R. R. Paternoster, K. B. Butterfield, C. C. Cappiello and R. G. Sanchez; Los Alamos National Laboratory and University of New Mexico*

**TAM-C.13** Foil Activation - Neutron Flux Measurements for the Mono-Energetic Neutron Source at NSWC, White Oak, MD. *N. A. Guardala, J. L. Price, G. K. Riel and M. D. Brown; US Naval Surface Warfare Center*

**TAM-C.14** Equivalent Sphere Approximations for BFO, Skin and Eye Dose Estimation in Space Radiation Protection Studies. *S. G. Bier, W. L. Maxson and L. W. Townsend; University of Tennessee*

**TAM-C.15** Rocky Flats Neutron Dose Reconstruction Project (One Year after Inception). *M. E. Anderson, D. E. Hilmas, J. M. Aldrich, D. L. Hart, R. B. Falk and J. P. Moody; DynCorp of Colorado, Inc.*

**TAM-C.16** Transition to a New Dosimetry System for a Small NVLAP Accredited Dosimetry Processor. *W. R. Moroney, C. L. McCollum, D. J. Riemer and A. K. Dhar; Mallinckrodt Medical, Inc.*

**TAM-C.17** Do Your Radiation Readings Give You What You Expect? *J.-M. Légaré; Radioprotection J.-M. Légaré, Canada*

**TAM-C.18** Sensitivity of LiF TLD-100 Irradiated by Co-60 and Cs-137 Gamma Rays. *K. Shortt, C. Ross and I. Janovsky; National Research Council, Canada*

10-11:30 am Room: Exhibit Hall

### TAM-D: Instrumentation I (Poster Session)

Co-Chairs: Ken Alvar; LANL and David Bodansky; University of Washington

**TAM-D.1** A Portable, Battery-Powered, Continuous Airborne  $^{222}\text{Rn}$  Sampler. *S. C. Scarpitta and M. Kadnar; US Department of Energy, New York*

## Tuesday

**TAM-D.2** Angular Response of Neutron Remmeters in Monoenergetic Beams. *G. Riel, J. Price and N. Guardala; Naval Surface Warfare Center*

**TAM-D.3** Neutron-Photon Pulse Shape Discrimination for Radiation Survey Instruments. *Z. Cao, M. A. Buckner and L. F. Miller; University of Tennessee and Oak Ridge National Laboratory*

**TAM-D.4** Evaluation of Phoswich Detectors for Simultaneous Detection of Alpha Beta and Photon Radiation. *Z. Cao and L. F. Miller; University of Tennessee*

**TAM-D.5** Collimated In-Situ Gamma Spectrometry: A New Method for Fast Clearance Measurements of Large Areas or Building Structures of Nuclear Facilities under Decommissioning. *P. Guglhör and L. Hummel; TÜV Bavaria, Germany*

**TAM-D.6** An Imaging Contamination Monitoring System for Surfaces. *J. J. Shonka, D. M. DeBord, T. E. Bennett, J. J. Weismann and R. J. Logan; Shonka Research Associates, Inc.*

**TAM-D.7** Evaluation of a 100 CM<sup>2</sup> Cesium Iodide (CsI) Detector for Contamination Monitoring in Biomedical Research Laboratories. *V. P. Williams and G. M. Sturchio; Merck Research Laboratories*

**TAM-D.8** A Real-Time Pulsed Photon Dosimeter. *D. Brown, R. H. Olsher, Y. Eisen and J. F. Rodriguez; Los Alamos National Laboratory and Soreq Nuclear Research Center, Israel*

**TAM-D.9** Cancelled

**TAM-D.10** Calculations and Measurements of Neutron Moderation Time Distributions for Multisphere LiI Detectors and AB Remmeter at 20-MeV Electron Linac. *J. C. Liu, S. Rokni, V. Yylet, R. Arora, E. Semones and A. Justus; Stanford Linear Accelerator Center and Argonne National Laboratory*

**TAM-D.11** Monte Carlo Calculations of LANL Graphite Pile Response Functions.

*H. H. Hsu and R. S. Clement; Los Alamos National Laboratory*

**TAM-D.12** Measurement of Neutron Emission Rates in the Los Alamos Graphite Pile. *R. S. Clement, H. H. Hsu, J. F. Rodriguez, R. H. Olsher and W. H. Casson; Los Alamos National Laboratory*

**TAM-D.13** The Los Alamos Radiological Instrumentation and Calibration Facility. *S. L. Eisele; Los Alamos National Laboratory*

**TAM-D.14** (Formerly MPM-B.9) The Use and Abuse of Portable HP Instruments in Characterizing Radioactive Waste. *J. A. Chapman, F. J. Schultz, L. K. Yong, D. C. Gregory, R. E. Halliburton, R. L. Coleman and R. S. Thomson; Oak Ridge National Laboratory and Westinghouse Savannah River*

9:30-10:30 am Room: Exhibit Hall

### TAM-E: Computer Applications I (Poster Session)

Co-Chairs: Warren D. Reece; Texas A&M and Judson Kenoyer; Battelle PNNL

**TAM-E.1** Optimization of Analytical Laboratory Work using Computer Networking and Databasing. *R. A. Metcalf and D. L. Upp; Los Alamos National Laboratory*

**TAM-E.2** WASTE\_ACC: A Computer Model for Radiological Analysis of Waste Management Accidents. *B. K. Nabelssi, S. Folga, E. Kohout, C. Mueller, J. Roglans-Ribas, M. Tompkins and T. Koteck; Argonne National Laboratory*

**TAM-E.3** External Exposure Model for Various Geometries of Contaminated Materials. *D. LePoire, S. Kamboj and C. Yu; Argonne National Laboratory*

**TAM-E.4** A Data Management System for Radiological Data. *J. J. Shonka, D. M. DeBord, T. R. Sukalac, J. J. Weismann, T. E. Bennett and R. E. Burns; Shonka Research Associates, Inc.*

**TAM-E.5** Visualization of Combinatorial Geometry for Monte Carlo Calculations with QAD, G33, and MORSE. *R. E. Burmeister, J. J. Shonka, T. R. Sukalac and*

## Tuesday

*A. Ramachandran; Shonka Research Associates, Inc. and Radiation Analytics*

**TAM-E.6** Use of the World Wide Web as a Radiation Safety Program Management Tool. *B. A. Horn, D. Lewis, D. Larson, D. Mercado, K. C. Luk, R. McDermott, L. D. Loo, C. E. Finney, R. Chang and H. Mak; Kaiser Permanente*

**TAM-E.7** Use of the RESRAD-BUILD Code to Calculate Building Surface Contamination Limits. *E. R. Faillace, D. LePoire and C. Yu; Argonne National Laboratory*

8:30-11:00 am Rooms: 606/607

### TAM-F: Special Session— Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Update (Oral Session)

Chair: Colleen Petullo, US EPA, Las Vegas

**8:30 AM OVERVIEW:** Multiagency Radiation Survey & Site Investigation Manual (MARSSIM): Overview/Update. *C. Petullo, A. Wolbarst, M. Doehnert, R. Meck, K. Duvall, L. Fragos, K. Martilla, D. Alberth and S. Keith; US Environmental Protection Agency, Nevada, Washington, DC and Alabama, US Nuclear Regulatory Commission, Washington, DC, US Navy, US Air Force and USACHPPM, APG*

**8:45 AM TAM-F.1** MARSSIM; Data Quality Objectives (DQO) Process. *M. Doehnert; US Environmental Protection Agency, Washington, DC*

**9:00 AM TAM-F.2** Multiagency Radiation Survey and Site Investigation Manual (MARSSIM): Survey Design. *E. W. Abelquist and J. D. Berger; Oak Ridge Institute for Science and Education and Auxier & Associates, Inc.*

**9:30 AM Break**

**10:00 AM TAM-F.3** MARSSIM: Statistical Decision Methodology. *C. V. Gogolak; US Department of Energy, New York*

**10:30 AM Questions & Answers**

12:15-2:15 pm

### PROFESSIONAL ENRICHMENT PROGRAM

**T-1 Rooms 618/619** Internal Dosimetry and Part 20. *John W. Poston, Sr.; Texas A&M University*

**T-2 Rooms 616/617** The Effects of Ionizing Radiation on the Developing Embryo: Estimating Risks and Providing Appropriate Counseling. *Robert L. Brent; Alfred I. Dupont Institute*

**T-3 Rooms 611/612** Conducting the MQSA/ACR Mammographic Unit Physicists Survey: A Practical Approach (hopefully). *Charles C. Chamberlain; S.U.N.Y. Health Science Center*

**T-4 Rooms 608/609** Technical Writing: How to Get Your Work Published! *Tamara Berg; Winona State University*

**T-5 Rooms 606/607** Tips and Tricks for Surveys at Levels Near Background. *Carl V. Gogolak and Kevin M. Miller; U.S. DOE, New York*

**T-6 Rooms 602/603/604** Revision to ANSIN13.1 Guide to Monitoring Radioactive Substances from Stacks and Ducts Facilities. *John A. Glissmeyer; Pacific Northwest National Laboratory*



## Tuesday

2:30-5:00 pm

Room: 6B

### TPM-A: Student II (Poster Session)

Co-Chairs: Norm Sunderland; Utah State University and Kermit Paulson; University of Wisconsin

**NOTE:** All student presenters will give a 2 minute oral summary of their presentations before poster viewing begins.

**TPM-A.1** Reduction of Chloroform to Below Regulatory Limits in Mixed Wastes by  $^{60}\text{Co}$  Gamma Irradiation. *S. Boddeker; University of Florida*

**TPM-A.2** Effect of Leachability on Environmental Risk Assessment for Naturally Occurring Radioactive Materials (NORM) in Petroleum Oil Fields. *G. Rajaretnam, C. Blasio, K. Lovins and H. B. Spitz; University of Cincinnati*

**TPM-A.3** Radiological Assessment of Depleted Uranium Migration Offsite from an Ordnance Range. *D. G. Rynders; Oregon State University*

**TPM-A.4**  $^{222}\text{Rn}$  as an Indicator of Nonaqueous Phase Liquid Contamination in Groundwater. *M. G. Cantaloub, S. Gottipati, J. F. Higginbotham, O. Hopkins and L. Semprini; Oregon State University*

**TPM-A.5** Evaluation of the Error Propagation Technique for Uncertainty Analysis of Select Solutions of the Advective-Dispersive Environmental Transport Equation. *K. L. Compton, T. E. Pollog and R. A. Fjeld; Clemson University*

**TPM-A.6** Dose Reduction Through Automation of Nuclear Weapons Dismantlement and Storage Procedures at the Department of Energy's Pantex Facility. *D. A. Thompson and J. W. Poston, Sr.; Texas A&M University*

**TPM-A.7** Evaluation of Alpha/Beta Pulse Shape Discriminating Flow-Cell Radiation Detectors Using BGO, GSO, YAG:Ce, YAP:Ce, CsI:Ti and  $\text{CaF}_2\text{Eu}$ . *S. D. Branton, T. G. Schuerman, T. A. DeVol and R. A. Fjeld; Clemson University*

**TPM-A.8** Evaluation of a Passive Stack Radon Mitigation System. *M. R. Johns and D. E. Hintenlang; University of Florida*

**TPM-A.9** A Comparison of  $^{137}\text{Cs}$ -ium Radioactivity in Localized Evergreen and Deciduous Plant Species. *R. C. Rangel, M. E. McLain, W. W. Pitt and G. A. Schlapper; Los Alamos National Laboratory and Texas A&M University*

**TPM-A.10** Cancelled

**TPM-A.11** *In Situ* Gamma Spectroscopy for the Yucca Mountain Site Characterization Project. *R. R. Benke, K. J. Kearfott, D. Schoep and C. Tung; University of Michigan and Science Applications International Corporation*

**TPM-A.12** *In Situ* Field Determination of Radioactive Contamination in Soil using a Wall-Less Gas Flow Proportional Counter. *S. P. Bush and D. M. Hamby; University of Michigan*

**TPM-A.13** Radiological Interferences and Chemical Matrix Effects on the Application of Radiochromatography to Environmental and Waste Samples. *J. E. Roane, J. D. Leyba, T. D. DeVol and R. A. Fjeld; Clemson University and Rust Federal Services*

**TPM-A.14** The Effect of Plutonium Oxidation State on its Sorption in Soils from the Idaho National Engineering Laboratory. *S. M. Ince, R. A. Fjeld and J. D. Leyba; Clemson University and Rust Clemson Technical Center*

**TPM-A.15** Mechanics of Plutonium Metal Aerosolization. *J. M. Alvis; Texas A&M University*

**TPM-A.16** Effects of Engineering Controls on Radioactive Air Emissions from the Los Alamos Neutron Science Center. *D. P. Fuehne and J. W. Poston, Sr.; Los Alamos National Laboratory and Texas A&M University*

**TPM-A.17** An Alternative Method for X-Ray Quality Test Using Electret Ion Chambers (EIC). *G. O. Redmond, J. E. Rodgers and P. Kotrappa; National Institutes of Health, Georgetown University and Rad Elec Inc.*

## Tuesday

2:15-5:15 pm

Room: 6A

### TPM-B: Special Session-The Politics of Radioactive Waste Disposal (Oral Session)

Chair: James Tripodes; UC, Irvine

**2:15 PM** **TPM-B.1**  
A National Overview of the Politics of LLW Disposal. *R. Carretta; Organizations United for Solutions to Radioactive Waste Disposal*

**2:45 PM** **TPM-B.2**  
The Politics of Radioactive Waste Disposal Site Development. *K. V. Haynes; Southeast Compact Commission (presented by M. H. Mobley)*

**3:15 PM** **TPM-B.3**  
Ward Valley Science, Law and Politics. *A. Pasternak; California Radioactive Materials Management Forum*

**3:45 PM** **Break**

**4:15 PM** **TPM-B.4**  
The Political Science of Radioactive Waste Disposal. *L. R. Jacobi, Jr.; Texas Low Level Radioactive Waste Disposal Authority*

**4:45 PM** **TPM-B.5**  
The Politics of LLW Disposal in a Go It Alone State. *Bill Lukens; Michigan Coalition of Radioactive Materials Users, Inc*

2:30-5:00 pm Rooms: 606/607

### TPM-C: Medical Health Physics (Oral/Poster Session)

Co-Chairs: Kimberlee Kearfott; University of Michigan and Jerry Thomas; US Navy

#### Oral Presentations

**2:30 PM** **TPM-C.1**  
A Revised Dosimetric Model of the Adult Head and Brain. *L. G. Bouchet, W. E. Bolch, D. A. Weber, H. L. Atkins and J. W. Poston, Sr.; University of Florida, University of California-Davis, State University of New York and Texas A&M*

**2:45 PM** **TPM-C.2**  
Design of a Capillary-Based Prompt Gamma

System for Neutron Capture Therapy Research at the McClellan Nuclear Radiation Center. *R. D. Rogus, W. Richards, J. Boggan, Q.-F. Xiao and R. G. Downing; University of California-Davis, McClellan Nuclear Radiation Center and X-Ray Optical Systems, Inc.*

**3:00 PM** **TPM-C.3**  
Scattered Fractions of Dose from 6, 10, 18 and 25 MV Linear Accelerator X-Rays in Radiotherapy Facilities. *J. Shobe, J. E. Rodgers, P. L. Taylor, J. Jackson and C. E. Dick; National Institute of Standards and Technology and Georgetown University*

**3:15 PM** **TPM-C.4**  
Mazes for Medical Accelerator Treatment Rooms. *P. H. McGinley and M. S. Miner; Emory University School of Medicine*

**3:30 PM** **Break**

#### Poster Presentations - Hallway 605

**TPM-C.5** Cubical S Values for Use with SPECT, PET, and Autoradiographic Imaging Data in Performing Small-Scale Dosimetry. *S. V. Costes, L. G. Bouchet and W. E. Bolch; University of Florida*

**TPM-C.6** Radiation Safety Concerns for Patients on Renal Dialysis Receiving Radiopharmaceutical Sr-89. *E. I. Parsai, J. A. Battle and K. M. Ayyangar; Medical College of Ohio*

**TPM-C.7** Estimation of Absorbed Dose Uncertainties Due to the Parameter Estimation and Inter-Patient Biokinetic Variabilities. *B. Aydogan, R. B. Sparks, J. B. Stubbs and L. F. Miller; University of Tennessee, Oak Ridge Institute for Science and Education and Dosimetry Services of Oak Ridge, Inc.*

**TPM-C.8** Radiation Protection for Gamma Probe-Guided Surgical Procedures. *P. R. Flicek and J. D. Dunavant; Walter Reed Army Medical Center*

**TPM-C.9** Evaluation of Sand as a Shielding Material for Radiation Therapy Facilities. *S. M. Darwish, L. T. Fitzgerald, W. J. Walker; Oncology Services Corporation and Robert Boissoneault Oncology Institute*



## Tuesday

**TPM-C.10** An Overview of Radiological Protection in Medical Uses of Ionizing Radiation in China. *J. Z. Zheng; Ministry of Health, China*

**3:00-4:00 pm Room: Exhibit Hall**

### TPM-D: Instrumentation II (Poster Session)

Co-Chairs: Ken Alvar; LANL and David Bodansky; University of Washington

See TAM-D for listing of Papers

**2:30-3:30 pm Room: Exhibit Hall**

### TPM-E: Computer Applications II (Poster Session)

Co-Chairs: Warren D. Reece; Texas A&M and Judson Kenoyer; Battelle PNNL

See TAM-E for listing of Papers

## Wednesday

### Continuing Education Lectures

**7:15-8:15 AM Room: 606/607**

**CEL-5** The Linear No-Threshold Dose-Response Model: Both Sides of the Story. *Daniel Strom; Battelle PNNL*

**7:15-8:15 AM Room: 608/609**

**CEL-6** P-32 Ingestion Incidents Which May Have Been Deliberate. *John Glenn; US Nuclear Regulatory Commission, Washington, DC*

**8:30-11:15 am Rooms: 606/607**

### WAM-A: Operational Health Physics I (Oral Session)

Co-Chairs: John Laferriere; DuPont Merck Pharmaceuticals and John Nagy; Nuclear Fuel Services

**8:30 AM WAM-A.1**  
Cosray-The Decommissioning. *N. R. Sunderland; Utah State University*

**8:45 AM WAM-A.2**  
Tritium Contamination at EG&G/EM in North Las Vegas, Nevada. *C. V. Sowell and L. J. Arent; US Department of Energy, Las Vegas*

**9:00 AM WAM-A.3**  
Lessons Learned from Two Very Different Large Radioactive Spills. *J. K. Waggoner; Oak Ridge National Laboratory*

**9:15 AM WAM-A.4**  
Emergency Response to the Uncontrolled Release of Tritium. *J. J. Darman, D. O'Connell and K. Craig; NES, Inc.*

**9:30 AM WAM-A.5**  
Cancelled

**9:45 AM Break**

**10:15 AM WAM-A.6**  
EPA's Occupational Radiation Safety and Health Protection Program. *M. S. Boyd, S. C. Colwell and N. M. Matusewicz; US Environmental Protection Agency, Washington DC and SC&A, Inc.*

**10:30 AM WAM-A.7**  
University ALARA and Operational Risk Optimization. *B. L. Hardy and G. M. Sandquist; University of Utah*

**10:45 AM WAM-A.8**  
A Method to Optimize the Lower Limit of Detection for a "Bag Monitor". *D. A. Barron, D. C. DiCello and H. N. Trimble, III; PECO Energy Company*

**11:00 AM WAM-A.9**  
Leakage Radiation Measurements Around the Tube Housing of Industrial X-Ray Tubes: Preliminary Results. *H. P. Maharaj; Radiation Protection Bureau, Canada*

**8:30-11:00 am Rooms: 608/609**

### WAM-B: Special Session-The CHP in a Court of Law - Sponsored by the AAHP (Oral Session)

Co-Chairs: Carol D. Berger; Integrated Environmental Management, Inc. and Kenneth R. Kase; SLAC

**8:30 AM WAM-B.1**  
Pre-Litigation Strategies. *P. D. Robinson; Winston & Strawn*

**9:00 AM WAM-B.2**  
The CHP as an Expert in Legal Processes. *D. S. Gooden; St. Francis Hospital*

**9:30 AM WAM-B.3**  
Serving as an Expert Witness: Pre-trial and Trial Matters. *J. M. McGarry III; Winston & Strawn*

**10:00 AM WAM-B.4**  
Radiation Risk Communication with Attorneys and Juries. *R. H. Johnson, Jr.; Communication Sciences Institute*

**10:30 AM Question and Answer Period**

**11:00 AM AAHP Open Meeting**

## Wednesday

8:30-11:30 am Rooms: 602/603/604

### WAM-C: Environmental I (Oral Session)

Co-Chairs: Maria Gavrilis-Guinn; US DOE, Washington, DC and Laura Quintana; General Atomics

**8:30 AM WAM-C.1**  
Advances in Dose Reconstruction at Oak Ridge. *F. O. Hoffman and T. E. Widner; SENES Oak Ridge, Inc. and ChemRisk/McLaren Hart Environmental Services Inc.*

**8:45 AM WAM-C.2**  
Characterization of Historical Iodine-131 Emissions from Oak Ridge Radioactive Lanthanum Processing. *T. E. Widner, R. E. Burns, Jr. and J. J. Shonka; ChemRisk Division, McLaren/Hart Environmental Services and Shonka Research Associates*

**9:00 AM WAM-C.3**  
Monitoring Radioactive Plumes by Airborne Gamma-Ray Spectrometry. *R. L. Grasty, J. Hovgaard and J. Multala; Exploranium, Canada, Danish Emergency Management Agency and Geological Survey of Finland*

**9:15 AM WAM-C.4**  
Statistical Methods for Determination of Background Levels for Naturally Occurring Radionuclides in Soil at a RCRA Facility. *S. Guha and J. H. Taylor; International Technology Corporation*

**9:30 AM WAM-C.5**  
Radiological Environmental Monitoring Programs at Nuclear Power Plants: A Status Report. *T. H. Essig and L. A. Peluso; U.S. Nuclear Regulatory Commission, Washington, DC and PA*

**9:45 AM Break**

**10:15 AM WAM-C.6**  
Recycling of NORM- Contaminated Equipment. *J.-C. Dehmel, I. Supernaw and T. McNulty; S. Cohen & Associates, Inc., Texaco and T. P. McNulty and Associates*

**10:30 AM WAM-C.7**  
Radiological Criteria for Unrestricted Use of Sites Containing NORM. *D. E. Bernhardt,*

*V. C. Rogers and K. K. Nielson; Rogers & Associates Engineering Corporation*

**10:45 AM WAM-C.8**  
Washington State Environmental Radiation Standard. *J. L. Erickson, D. Wells and R. E. Jaquish; Washington State Department of Health*

**11:00 AM WAM-C.9**  
State of Washington Radiation Guidance for Hanford. *J. L. Erickson and R. E. Jaquish; Washington State Department of Health*

**11:15 AM WAM-C.10**  
Radioactivity in Municipal Sludge. *M. J. Brennan, J. L. Erickson and C. L. M. Albin; Washington State Department of Health*

8:30-11:00 am Room: Exhibit Hall

### WAM-D: Works in Progress (Poster Session)

Co-Chairs: Stan Addison; University of WA and Carl Bergsagel; Fred Hutchison Research Inst.

**WAM-D.1** Radiographic Image on Slightly Radioactive Contaminated Metal Surface. *H. Jung, J. F. Kunze and W. H. Miller; University of Missouri and Idaho State University*

**WAM-D.2** Comparative Studies of Dosimetric Phosphors: LiF:Mg, Cu, P Single Crystals, LiF:Mg, Cu, P (MCP-N) and TLD 100. *T. Niwa, T.-C. Chen, F. S. Ohuchi and T. G. Stoebe; The University of Washington*

**WAM-D.3** Development of Al<sub>2</sub>O<sub>3</sub>:C Thermoluminescence (TL) and Optically Stimulated Luminescence (OSL) Dosimeters. *M. S. Akselrod, L. E. Colyott, S.W.S. McKeever and V. Whitley; Oklahoma State University*

**WAM-D.4** Patient Safety and Quality Assurance for 10 Curie IR-192 HDR Applications. *P. Mahesh, B. Ward and P. Bustillo; V.A. Medical Center, Florida*

**WAM-D.5** A Pharmacokinetic Model for <sup>131</sup>I Sodium Iodide in Breast Milk. *A. L. Turner and S. H. Fong; Georgia Institute of Technology*

## Wednesday

**WAM-D.6** Dosimetric Implications of Non-Uniform Radionuclide Deposition in the Embryo/Fetus. *T. E. Hui, M.R. Sikov and S. S. Yaniv; Pacific Northwest Laboratory*

**WAM-D.7** Development of a Computer Code for Internal Dosimetry. *R. J. Traub, T. E. Hui, R. M. Loesch and J. C. McDonald; Pacific Northwest National Laboratory and U.S. Department of Energy*

**WAM-D.8** Thyroid Mass in Children: A Comparison of Autopsy and Ultrasound Data. *S. G. Bier and K. F. Eckerman; The University of Tennessee and Oak Ridge National Laboratory*

**WAM-D.9** GW.Risk: A Computer Code for Calculating Dose and Risk to the Public from Exposure to Contaminated Ground Water. *S. R. Adams; IT & Las Vegas*

**WAM-D.10** The Effects of Graded-Z Lining and a Human Subject on Low-Energy Background in a Counting Shield used for Lung Examinations. *J. L. Webb, D. J. Fingleton, S. C. Lee and H. B. Spitz; New Mexico State University and University of Cincinnati*

**WAM-D.11** Gross Alpha and Beta Determinations by Liquid Scintillation Counting on Savannah River Site Waste Materials. *D. P. DiPrete, S. F. Peterson and R. A. Sigg; Westinghouse Savannah River Company*

**WAM-D.12** Development of a Rapid Procedure for the Measurement of Uranium in Drinking Water by PERALS<sup>®</sup> Spectrometry. *J. M. Duffey, F. I. Case, R. L. Metzger and B. J. Jessop; ORDELA, Inc. and Radiation Safety Engineering*

**WAM-D.13** Environmental Monitoring at a Nuclear Power Plant Using a 3 x 3 Inch Sodium Iodide Gamma Ray Spectrometer. *R. L. Rasty and J. Lamarre; Exploranium G.S. Ltd. and Ontario Hydro, Canada*

**WAM-D.14** A New Method for Cleanup of Soil Contaminated by Alpha Emitters such as <sup>238</sup>Pu. *J. A. Woods and E.T. Bramlett; Thermo NUtech*

**WAM-D.15** Depleted Uranium Characterization and Release Surveys of Outdoor and Indoor Facilities with Real-Time Mapping. *C. R. Flynn, M. S. Blair and R. J. Selfridge; CHEMRAD Tennessee Corporation*

**WAM-D.16** Gross Gamma Scanning Surveys with USRADS in the Canyons Around a DOE Facility. *C. R. Flynn, M. S. Blair and B. Lawrence; CHEMRAD Tennessee Corporation (Presented by P. Flynn)*

**WAM-D.17** Dissolution of Radium from Soil Contaminated with Naturally Occurring Radioactive Materials Subjected to Accelerated Aging. *C. J. Blasio, H. B. Spitz, C. W. Becker and G. Rajaretnam; University of Cincinnati*

**WAM-D.18** Substitution of Natural Thorium in Consumer Products and the Resulting Dose Consequences to the Public. *T. L. Aldridge, R. L. Hill, R. G. Schreckhise and J. R. Johnson; U.S. Department of Energy; Washington Battelle; Pacific Northwest National Laboratory and Washington State University*

**WAM-D.19** The Status and Current Research Projects of the Radiochemical Division of United States Transuranium and Uranium Registries Program. *R. H. Filby, S. E. Glover, D. B. Stuit, V. T. Norton, H. Qu, C. A. Grimm, S. F. Love, J. E. Northon, C. A. Moody, M. Billings, R. L. Kathern; Washington State University; Pullman and Richland*

**WAM-D.20** The Identification of Generic Radiation Protection Issues Using the DOE Occurrence Reporting System. *D. M. Minnema, D. Abbott, C. Stroud and R. Engelmann; U.S. Department of Energy; Lawrence Livermore National Laboratory; Pacific Northwest National Laboratory and Oak Ridge Institute for Science and Education*

12:15-2:15 pm

### PROFESSIONAL ENRICHMENT PROGRAM

**W-1 Rooms 618/619** Introduction to Microdosimetry. *Joseph C. McDonald; PNNL*

## Wednesday

**W-2 Rooms 616/617** Recent Trends in Radiation Detector Development. *Glenn F. Knoll; University of Michigan*

**W-3 Rooms 611/612** Current Approaches to Regulating Public Exposure to Radionuclides and Hazardous Chemicals. *David C. Kocher; Oak Ridge National Laboratory*

**W-4 Rooms 608/609** Radioactive Sources in Recycled Metal: Preventing the Problem. *Joel O. Lubenau and James G. Yusko; Nuclear Regulatory Commission and Pennsylvania Department of Environmental Protection*

**W-5 Rooms 606/607** NORM in Phosphate Fertilizers and Fertilizer By-Products. *Carter D. Hull; Florida State University*

**W-6 Rooms 602/603/604** Methods to Determine Compliance with the Requirements of the Updated ANSI N13.1 Standard (Stack Sampling). *Andrew R. McFarland; Texas A&M University*

2:30-5:00 pm Room: Hallway 605

### WPM-A: Operational Health Physics II (Poster Session)

Co-Chairs: John Laferriere; DuPont Merck Pharmaceuticals and John Nagy; Nuclear Fuel Services

**WPM-A.1** Sharing Best Practices. *T. D. Gallacher, S. L. Bravinder and L. J. Gremillion; The Boeing Company*

**WPM-A.2** Validation and Optimization of Nasal Swipe Analyses. *R. W. Martin, R. A. Metcalf and A. A. Montoya; Los Alamos National Laboratory*

**WPM-A.3** Assessment of Commercially Available Safety Glasses for Use as Laser Protective Eyewear. *E. O. Ciprazo, D. D. Sprague and K. L. Barat; University of California-Berkeley and Lawrence Berkeley Laboratory*

**WPM-A.4** Neutron and Gamma Ray Attenuation of Asphalt; Comparison with Paraffin and Water. *S. Abdul-Majid and I. I. Kutbi; KAAU, Saudi Arabia*

**WPM-A.5** Teenage Experiments Contaminate Suburban Property. *W. Sass, D. Kassel, P. C. Lall, L. Jensen and J. Mitchell; Ecology and Environment, Inc. and US Environmental Protection Agency, Michigan and Illinois*

**WPM-A.6** Radiological/Health Physics Program Assessment at Rocky Flats, The Process. *P. P. Psomas and W. D. Rodgers; U.S. Department of Energy, CO and M. H. Chew and Associates, Inc.*

**WPM-A.7** Use of Metrics in an Effective ALARA Program. *B. B. Bates, Jr.; Los Alamos National Laboratory*

**WPM-A.8** Statistical Sampling Method for Releasing Decontaminated Vehicles. *J. W. Lively and J. A. Ware; Rust Geotech*

**WPM-A.9** Spatial Mapping and Computational Fluid Dynamics Modeling of Radioactive Aerosol Releases for Optimized CAM Placement in a Nuclear Facility. *J. C. Rodgers, J. J. Whicker, Y. Yang and R. C. Lopez; Los Alamos National Laboratory*

**WPM-A.10** Sources, Exposures, Intakes and Ontakes, and Irradiation: Careful Use of Language is the Key to Successful Communication. *D. J. Strom; Pacific Northwest National Laboratory*

**WPM-A.11** Effects of Aerosol Particle Size on Dispersion and Continuous Air Monitor Response in a Plutonium Laboratory. *J. J. Whicker, J. C. Rodgers, R. C. Scripsick, C. I. Fairchild and R. C. Lopez; Los Alamos National Laboratory*

**WPM-A.12** An Operational Health Physics Quality Assurance Program. *S. A. Costigan, J. L. McAtee III, W. M. Somers and R. L. Huchton; Los Alamos National Laboratory*

2:30-5:30 pm Rooms: 608/609

### WPM-B: Regulatory/Legal (Oral Session)

Co-Chairs: Thomas D. Murphy; US NRC, Washington, DC and George W. Campbell; LLNL

## Wednesday

**2:30 PM WPM-B.1**  
Art in the Nuclear Age. *J. L. Acord; Hanford Nuclear Sculpture Works*

**3:00 PM WPM-B.2**  
Ensuring Control and Proper Disposal of Radioactive Devices: A Public Review. *J. O. Lubenau and R. Free; US Nuclear Regulatory Commission and Texas Department of Health*

**3:15 PM WPM-B.3**  
ANSI/HPS NORM Standard - Update of Development Activities. *J.-C. Dehmel and S. Y. Chen; S. Cohen & Associates, Inc. and Argonne National Laboratory*

**3:30 PM WPM-B.4**  
Radiation Protection of Radiosensitive Populations. *K. L. Mossman; Arizona State University*

**3:45 PM Break**

**4:15 PM WPM-B.5**  
Final Compliance Criteria (40 CFR Part 194) for the Waste Isolation Pilot Plant (WIPP). *F. Marcinowski, M. Kruger and E. Forinash; US Environmental Protection Agency, Washington, DC*

**4:30 PM WPM-B.6**  
Standardization of Calibration Terminology for Measurement and Test Equipment. *P. T. Kelly; S. Cohen & Associates, Inc.*

**4:45 PM WPM-B.7**  
Modification of the US Department of Energy's (DOE) System of Radiation Protection Requirements and Guidance. *P. V. O'Connell, J. L. Rabovsky and S. G. Zobel; US Department of Energy, Washington, DC*

**5:00 PM WPM-B.8**  
The U.S. Department of Energy's (DOE) Response to Requests for Exemption from Provisions of Title 10 Code of Federal Regulations Part 835. *S. G. Zobel, J. L. Rabovsky and P. V. O'Connell; US Department of Energy, Washington, DC*

**5:15 PM WPM-B.9**  
The Interrelationship of the Science of Health Physics and the Art of Radioactive Materials Management - An International Public Policy Perspective. *P. MacDowell; St. Helen's Trading Ltd.*

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

### WPM-C: Environmental II (Poster Session)

Co-Chairs: Dawn J. Skinner; JPL and James K. Channell; S. Cohen and Associates

**WPM-C.1** Contamination and Radiation Exposure in Central Europe after the Chernobyl Accident. *A. Bayer, K. Mück and H. H. Loosli; Bundesamt für Strahlenschutz, Germany, Österreichisches Forschungszentrum Seibersdorf, Austria and Universität Bern, Switzerland*

**WPM-C.2** Radioecological Exposure Assessment for the Chernobyl Cooling Pond (Lake) with Hydrodynamics Impacts. *Y. Feng, L. F. Miller and S. M. Bartell; Ohio EPA, University of Tennessee and SENES Oak Ridge, Inc.*

**WPM-C.3** Chernobyl: Lessons Learned One Decade After the Accident. *V. Poiarkov; Ukrainian Radiation Training Center, Ukraine*

**WPM-C.4** Uncertainty Analyses for Radiological Assessments of St. Louis FUSRAP Sites. *K. M. Spencer, D. E. White, L. E. Miller; University of Tennessee*

**WPM-C.5** Effect of Distribution Coefficient, Contaminated Area, and Depth of Contamination on the Guidelines for Uranium Residual Radioactive Material in Soil. *S. Kamboj, M. Nimmagadda, E. Faillace, C. Yu and W. A. Williams; Argonne National Laboratory and US Department of Energy, Washington, DC*

**WPM-C.6** Environmental Sampling at Remote Sites Based on Radiological Screening Assessments. *M. H. Ebinger, G. Wenz, T. P. Oxenberg and W. R. Hansen; Los Alamos National Laboratory, White Sands Missile Range and US Army*

**WPM-C.7** A Screening Model for Depleted Uranium Testing Using Environmental Radiation Monitoring Data. *M. H. Ebinger, E. L. Dunfrund, T. P. Oxenberg and W. R. Hansen; Los Alamos National Laboratory, Yuma Proving Ground and U.S. Army Test and Evaluation Command, APG*



## Wednesday

**WPM-C.8** A Field Measurement Approach to the Quantification of Depleted Uranium in Soil. *C. J. Olenik, G. K. Riel and M. E. Nelson; Naval Surface Warfare Center and United States Naval Academy*

**WPM-C.9** Evaluating Plutonium-239 Levels Using Field Detectors. *L. E. Wahl, W. J. Smith, II and B. Martin; ERM Program Management Company and Los Alamos National Laboratory*

**WPM-C.10** The Efficiency Calibration and Development of Correction Factors for an In-Situ High-Resolution Gamma Spectroscopy Well Logging System. *J. R. Giles, R. R. Brey and T. F. Gesell; Idaho State University*

**WPM-C.11** Recent Trends in Radionuclide Air Emissions from Department of Energy Facilities. *K. Rhoads and K. C. Duvall; Pacific Northwest National Laboratory and US Department of Energy, Washington, DC*

**WPM-C.12** Determination of Radionuclide Concentrations in Ground Level Air Using the ASS-500 High Volume Sampler. *D. Arnold, M. Biernacka, U. Fischer, E. Frenzel, J. Jagielak, W. Kiesewetter, H. Wershofen and R. Zarucki; Central Laboratory for Radiological Protection, Poland, Physik-Technik-Innovation, Germany, Steinweg, Germany, Deutscher Wetterdienst, Germany and Physikalisch-Technische Bundesanstalt, Germany*

**WPM-C.13** Investigation of Low-Volume Air Particulate Sampling Variation and Directional Effect of Sampler Head Orientation. *R. E. Dunker and B. W. Graham; Idaho State University and Wilkes University*

**WPM-C.14** A "State" of Quality Assurance in the Environment or How to Guard the Hen House!! *R. A. Danielson and J. W. Schmidt; Washington State Department of Health and Westinghouse Hanford Company*

**WPM-C.15** Avoiding Potential Problems from Radionuclides in Municipal

Wastewater. *M. L. Miller, C. R. Bowman and M. G. Garcia; Roy F. Weston, Inc. and City of Albuquerque Waste Water Utility Division*

**WPM-C.16** Natural Radioactivity Concentration in Different Types of Inorganic Fertilizer Imported by Saudi Arabia. *I. I. Kutbi, S. Abdul-Majid and W. H. Abulfaraj; KAAU, Saudi Arabia*

**WPM-C.17** Radionuclide Content of Las Vegas Wash Sediments. *M. J. Rudin, A. M. Meyers and W. H. Johnson; University of Nevada, Las Vegas*

**WPM-C.18** Radionuclide Concentrations in Bees and Honey in the Vicinity of Los Alamos National Laboratory. *P. R. Fresquez and D. R. Armstrong; Los Alamos National Laboratory*

2:30-5:15 pm Rooms: 602/603/604

### WPM-D: Training/Public Information (Oral/Poster Session)

Co-Chairs: Kathy Shingleton; LLNL and Mike Knight; Pantex

#### Oral Presentations

**2:30 PM WPM-D.1**  
Stakeholder Involvement and Public Outreach at Two Department of Energy Sites. *R. H. Gray; Battelle Pantex*

**2:45 PM WPM-D.2**  
Elements of Effective Training, "In 25 Words or Less". *N. W. Couch and L. D. Hyde; ACT and Occupational Safety & Health Educational Resource Center*

**3:00 PM WPM-D.3**  
International Experience with a Multidisciplinary Table Top Exercise for Response to a PWR Accident. *J. R. A. Lakey; John Lakey Associates, UK*

**3:15 PM Break**

**3:45 PM WPM-D.4**  
A National Conference on Bachelor of Science Degree Programs in Health Physics. *L. D. Hendrick; Francis Marion University*

## Wednesday

**4:00 PM WPM-D.5**  
UNLV/FVSC 3+2 Dual Degree Program in Health Physics. *I. J. Crumbly, W. H. Johnson and M. J. Rudin; Fort Valley State College and University of Nevada, Las Vegas*

**4:15 PM WPM-D.6**  
The Radioactive Waste Management Videoconference Training Series for an International Audience. *C. Callan and J. M. Hylko; The University of New Mexico and Roy F. Weston, Inc.*

**4:30 PM WPM-D.7**  
What Positive Information is on the World Wide Web about Nuclear Energy? *E. N. Cramer; Assistance to Education*

#### Poster Presentations

**WPM-D.8** The Use of HPS Newsletter Cartoons to Effect Training in a Medical Center Environment. *W. K. Tuttle, III; VA Medical Center, Oregon*

**WPM-D.9** Community Outreach - A Success Story. *D. M. Halliday, M. G. Knight and G. E. Williams; Pantex Plant*

5:30-6:30 pm Rooms: 611/612

### HPS Annual Business Meeting

7:00-8:30 pm Metropolitan Ballroom Sheraton Hotel

### WPM-E: Special Session-Aerosol Measurements (Oral Session)

Chair: Morgan Cox; Westinghouse

**WPM-E.1** Revision to ANSI N13.1 Guide to Monitoring Releases of Radioactive Substances from Stacks and Ducts of Nuclear Facilities. *J. Glissmeyer; Battelle Pacific Northwest National Laboratory*

**WPM-E.2** Continuous Air Monitoring for Alpha-Emitting Radionuclides: Manual of Good Practice. *G. J. Newton and M. D. Hoover; Inhalation Toxicology Research Institute*

**WPM-E.3** Assessment of Potential Doses to Workers during Postulated Accident Conditions at the Waste Isolation Pilot Plant. *M. D. Hoover, G. J. Newton and R. F. Farrell; Inhalation Toxicology Research Institute and US Department of Energy, New Mexico*

**WPM-E.4** Evaluation of Minimum Detectable Activity and False Alarm Rate Relationships for the Eberline Alpha-6 Continuous Air Monitors at the Waste Isolation Pilot Plant. *M. D. Hoover, G. Newton, M. Cox and B. A. Walker; Inhalation Toxicology Research Institute, Westinghouse Waste Isolation Division and Environmental Evaluation Group*

**WPM-E.5** The Influence of Aerosol Particle Collection Mechanisms on the WIPP Alpha-6 CAM Detection Efficiency. *W. T. Bartlett; Environmental Evaluation Group*

**WPM-E.6** On the Detection of Plutonium Aerosols in a Salt-Laden Atmosphere. *F. A. Seiler and J. L. Alvarez; IT Corporation*

## Thursday

### Continuing Education Lectures

7:15-8:15 am Rooms: 606/607

CEL-7 "But That's Not What I Said!" A Guide to Media Relations. John Billett; Billett & Quinn, Ltd.

7:15-8:15 am Rooms: 608/609

CEL-8 Quantifying the Goodwill Value of your Radiation Safety Program. Robert Emery; University of Texas

8:30-10:30 am Rooms: 606/607

### THAM-A: Operational Health Physics III (Oral Session)

Co-Chairs: John Laferriere; DuPont Merck Pharmaceuticals and John Nagy; Nuclear Fuel Services

8:30 AM THAM-A.1  
Transfer of Irradiated Actinide Burning Sub-assemblies to the Hot Fuel Examination Facility. J. C. Courtney, E. Hylsky and R. D. Phipps; Louisiana State University and Argonne National Laboratory

8:45 AM THAM-A.2  
Restart of the Armenia-2 Nuclear Power Station: Radiological Emergency Preparedness Considerations for the Nearby American Community. G. J. Vargo and G. L. Sherwood; Pacific Northwest National Laboratory and US Department of Energy, Washington, DC

9:00 AM THAM-A.3  
Plan A: Off the Shelf -- Plan B: Make it Yourself. J. L. Westbrook; Oak Ridge National Laboratory

9:15 AM Break

9:45 AM THAM-A.4  
A Garage Sale Bargain: A Leaking 2.2 GBq Ra-226 Source, Phase I - the Incident. B. Freeman, M. Andrews and A. Hogan; Tennessee Department of Environment and Conservation

10:00 AM THAM-A.5  
A Garage Sale Bargain: A Leaking 2.2 GBq Ra-226 Source, Phase 2 - Internal Dose Assessment. R. E. Toohey and R. E. Goans; Oak Ridge Institute of Science and Education

10:15 AM THAM-A.6  
A Garage Sale Bargain: A Leaking 2.2 GBq Source, Phase III - The Radiological Cleanup. T. Vitkus, W. L. Beck and B. Freeman; Oak Ridge Institute of Science and Education and Tennessee Department of Environment and Conservation

8:30-11:30 am Rooms: 611/612

### THAM-B: Radon (Oral/Poster Session)

Co-Chairs: Michelle Kaufman; State of Pennsylvania and Edward Maher; Yankee Atomic Electric Company

#### Oral Presentations

8:30 AM THAM-B.1  
Personal Alpha Dosimetry and Measurement of Exposure to Radon and Thoron Progeny and Long-Lived Radioactive Dust. B. Bjorndal, G. Cubbon and R. Moridi; Canadian Institute for Radiation Safety

8:45 AM THAM-B.2  
Measurements of Indoor Radon and Radon Progeny in Mexico City. Y. S. Cheng and G. P. Rodriguez; Inhalation Toxicology Research Institute and National Autonomous University of Mexico

9:00 AM THAM-B.3  
Radon Reduction Using Sub Floor Fans. N. H. Harley and P. Chittaporn; New York University School of Medicine

9:15 AM THAM-B.4  
n - direct Measurement of Sub Floor Radon Using Passive Detectors. P. Chittaporn and N. H. Harley; New York University School of Medicine

9:30 AM Break

10:30 AM THAM-B.5  
Alpha Track Detectors (ATD) for Indoor Radon Measurements. C. Papastefanou; Aristotle University of Thessaloniki, Greece

10:45 AM THAM-B.6  
Radon Exposure Assessment in a Former Uranium Production Facility. F. Akbar-Khanzadeh and E. A. Merrill; Medical College of Ohio

## Thursday

11:00 AM THAM-B.7  
Factors Affecting Yearly Variations of Indoor Radon Concentrations. D. J. Steck and S. A. Baynes; St. John's University

11:15 AM THAM-B.8  
An Evaluation of <sup>222</sup>Rn Concentrations in Idaho Ground Water. L. R. Paulus, T. F. Gesell, R. R. Brey and D. J. Parlman; Idaho State University and USGS, Idaho

#### Poster Presentations - Hallway 610

THAM-B.9 Indoor Thoron Progeny Levels in Hong Kong. H. L. Pai, J. M. N. Ch'ien and C. W. Fung; R.A.D. Service and Instruments Limited, Canada, EPS Business Centre, Hong Kong and All Saints Church, Hong Kong

THAM-B.10 Radon Counting Statistics - A Monte Carlo Investigation. A. G. Scott; Radiation Protection Service, Canada

THAM-B.11 Methods for Identifying High-Radon Areas of the U.S.: The Case of Minnesota. A. V. Nero, M. G. Apte, J. Fridlyand, P. R. Price and K. L. Revzan; Lawrence Berkeley Laboratory

THAM-B.12 The Problem of Indoor Radon in Lithuania. A. Mastauskas and G. Morkunas; State Public Health Center, Lithuania

8:30-11:30 am Rooms: 616/617

### THAM-C: Internal Dosimetry (Oral/Poster Session)

Co-Chairs: T. E. Hui; PNNL and R. G. Thomas; Montana

#### Oral Presentations

8:30 AM THAM-C.1  
Moved to THAM-C.17

8:45 AM THAM-C.2  
Comparisons of Biokinetic Models for Actinide Elements with Observed Tissue Analysis Data from Occupationally-Exposed Humans of Two Countries. R. E. Filipy, V. F. Khokhryakov, K. G. Suslova, S. A. Romanov and R. L. Kathren; Washington State University and Branch No. 1 of the Biophysics Institute, Russia

9:00 AM THAM-C.3  
Measurement of Tritiated Species in Urine for Characterization of an Exposure. T. Duong and A. Trivedi; AECL, Canada

9:15 AM THAM-C.4  
Metabolic Kinetics and Dosimetry of Titanium Tritide Particles in the Lung. Y. S. Wang, Y. S. Cheng, M. B. Snipes and H. N. Jow; Inhalation Toxicology Research Institute and Sandia National Laboratories

9:30 AM THAM-C.5  
Analysis of the Uncertainties Associated with the Age-Dependent Thyroid Doses and Risk of Thyroid Cancer Due to Exposure to <sup>131</sup>I. F. O. Hoffman, A. I. Apostolaei and S. K. Nair; SENES Oak Ridge, Inc. and University of Tennessee-Knoxville

9:45 AM Break

#### Poster Presentations - Hallway 605

THAM-C.6 Optimization of <sup>239</sup>Pu Bioassay by Application of Mass Spectrometry. W. C. Inkret, D. W. Efurud, D. Lewis and G. Miller; Los Alamos National Laboratory

THAM-C.7 A "Two-Eyed" Vision of a Whole Body Counter. G. I. Lykken and B. Momcilovic; University of North Dakota and Institute Medical Research Occupational Health, Croatia

THAM-C.8 In-Vivo Thorium Monitoring Using a Thoron in Breath Monitor. J. R. Johnson and P. C. Olsen; Battelle, Pacific Northwest National Laboratories

THAM-C.9 Uncertainties in Lung Dose from Plutonium Oxide Using the Revised ICRP Respiratory Tract Model. T. E. Huston, E. Bolch and W. G. Vernetson; Nuclear Fuel Services, Inc. and University of Florida

THAM-C.10 Inhalation Class for Depleted Uranium at a Major Uranium Applications Facility. D. C. Barg and H. L. Grewing; Lockheed Idaho Technologies Company

THAM-C.11 Evaluation of *In Vitro* Dissolution Rates of Thorium in Uranium Mill Tailings. R. H. Reif; US Department of Energy, New Mexico

## Thursday

**THAM-C.12** In Vitro Dissolution of Strontium Titanate to Estimate Clearance Rates in the Human Lung. *J. Anderson, B. Kahn, R. Rosson and T. LaBone; Georgia Institute of Technology and Westinghouse Savannah River Company*

**THAM-C.13** Particle Size Associated with the Surface Oxides on Low Enriched Uranium Metal Plates. *S. H. Linauskas, F. Szostak and A. Trivedi; AECL, Canada*

**THAM-C.14** Land-Based Whole-Body Counting on Enewetak Island in the Marshall Islands for Cesium-137. *L. C. Sun, J. H. Clinton, E. Kaplan, N. M. Barss and R. T. Bell; Brookhaven National Laboratory and US Department of Energy, Washington, DC*

**THAM-C.15** Assessment of  $^{137}\text{Cs}$  Exposure in Marshallese Populations Based on Whole-Body Counting Measurements (1989-1995). *L. C. Sun, J. H. Clinton, E. Kaplan and C. B. Meinhold; Brookhaven National Laboratory*

**THAM-C.16** Development of a Definitive Internal Dosimetry Code. *G. Miller, W. C. Inkret and M. E. Schillaci; Los Alamos National Laboratory*

**THAM-C.17** Monte Carlo Simulation of K-40 In-Vivo Body-Count Spectra for Different Body Shapes. *M. E. Schillaci and T. H. Brown; Los Alamos National Laboratory*

8:30-11:00 am Rooms: 602/603/604

### THAM-D: Section Session-Work Management - Sponsored by the Power Reactor Section (Oral Session)

Co-Chairs: Ben L. Granados, Jr.; Yankee Atomic Company and Regis Greenwood; Davis Besse Nuclear Power Plant

#### WORK MANAGEMENT

**8:30 AM THAM-D.1** Swedish Approaches to Radiation Protection at Nuclear Power Stations. *P. Knapp and D. W. Miller; Southern California Edison Company and Illinois Power Company*

**8:45 AM THAM-D.2** Finnish Outage Management Practices to Reduce Occupational Doses and Shorten Outage Duration. *S. Barrett and D. W. Miller; Commonwealth Edison Company and Illinois Power Company*

**9:00 AM THAM-D.3** Outage Dose Reduction Achievements During Shorter Refueling Outages. *W. O. Harris and S. Taylor; PECo*

**9:15 AM THAM-D.4** Highlights of NEA Work Management Expert Group Report. *D. W. Miller; Illinois Power Company*

**9:30 AM THAM-D.5** The International System on Occupational Exposure, ISOE 1995 Dose Trends and Results. *T. Lazo and D. W. Miller; OECD Nuclear Energy Agency, France and Illinois Power Company*

9:45 AM Break

#### OPERATIONAL TOPICS

**10:15 AM THAM-D.6** Dose Rate and Spectral Photon Measurements Around a Large BWR. *J. L. Lobdell and N. E. Hertel; Tennessee Valley Authority and Georgia Institute of Technology*

**10:30 AM THAM-D.7** Maine Yankee Steam Generator Tube Modification, From a Radiological Perspective. *E. Heath and B. Granados; Maine Yankee*

**10:45 AM THAM-D.8** Scanning Personnel for Internal Deposition of Radioactive Material with Personnel Contamination Whole Body Friskers and Portal Monitors. *J. L. Lobdell; Tennessee Valley Authority*

8:30 am-Noon Rooms: 608/609

### THAM-E: Special Session-Workshop on International Studies on Biological and Health Effects of Electromagnetic Fields (Oral Session)

Chair: Charles Meinhold; NCRP

**8:30 AM** Introduction to the Workshop. *C. B. Meinhold; NCRP*

## Thursday

**8:40 AM THAM-E.1** National Council on Radiation Protection and Measurements (NCRP) Program on Nonionizing Electromagnetic Fields. *T. S. Tenforde; Pacific Northwest National Laboratory*

**9:10 AM THAM-E.2** Summary of Activities of NCRP Scientific Committee 89-4: Modulated Radiofrequency Fields. *O. P. Gandhi; University of Utah*

**9:40 AM THAM-E.3** Summary of Activities of NCRP Scientific Committee 89-5 on Biological Effects and Exposure Criteria for Radiofrequency Fields. *J. C. Lin; University of Illinois*

10:15 AM Break

**10:30 AM THAM-E.4** Summary of Activities of the International Commission on Non-Ionizing Radiation Protection. *J. H. Bernhardt; Federal Office for Radiation Protection, Germany*

**11:00 AM THAM-E.5** Summary of Activities of the National Radiological Protection Board. *R. H. Clarke; National Radiological Protection Board, United Kingdom*

**11:30 AM THAM-E.6** Summary of Activities of the Board on Radiation Effects Research Related to the United States Research Program on Extremely-Low-Frequency Electric and Magnetic Fields. *J. D. Zimbrick; National Academy of Sciences*

12:30-2:30 pm Rooms: 6A/6B

### Health Physics Society Annual Awards Luncheon

3:00-5:00 pm

### PROFESSIONAL ENRICHMENT PROGRAM

**TH-1 Rooms 618/619** Pathway to a Paradigm: The Linear Nonthreshold Dose-Response Model in Historical Context. *Ronald L. Kathren; Washington State University*

**TH-2 Rooms 616/617** A Workshop on the Do's and Don'ts of Risk Communication for the Technically Inclined. *David A. Waite; CH2M Hill*

**TH-3 Rooms 611/612** Radiochemistry Practices and Requirements Related to Environmental Characterization and Monitoring. *Gary L. Troyer; Westinghouse Hanford, Co.*

**TH-4 Rooms 608/609** A Field Perspective for Implementing 10CFR835. *Gene E. Runkle; U.S. Department of Energy*

**TH-5 Rooms 606/607** Environmental Remediation. *Mark L. Miller; Roy F. Weston, Inc.*

**TH-6 Rooms 602/603/604** Limitations to Pathway Analysis. *Bruce A. Napier; Battelle, Pacific Northwest Laboratories*



# PROFESSIONAL ENRICHMENT PROGRAM

Sunday, July 21, 1996 through Thursday, July 25, 1996

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, July 21, the day before the Annual Meeting, a series of 30 courses will be offered. These courses are divided into 10 topical areas. The Sunday sessions begin early to allow for 3 sections that day. The program begins at 8:00 am and finishes at 3:30 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. There will be six Thursday afternoon PEP sessions from 3:00-5:00 pm.

Registration for each two-hour course is \$40. Attendees may register for courses in one topic area or may attend courses in several topic areas. Registration will be limited to 60 attendees (except as noted) per course 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.

## Please Note!!

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

Attendees not present at the starting time of the session cannot be guaranteed a space, as empty spaces will be filled from the waiting list at that time. Spaces left after the waiting 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.

- |            |                                |
|------------|--------------------------------|
| Category A | Communications/Training        |
| Category B | General                        |
| Category C | Computers in Health Physics    |
| Category D | Radiological Evaluations       |
| Category E | Dosimetry                      |
| Category F | Operational Health Physics     |
| Category G | Industrial Health/Non-Ionizing |
| Category H | Environmental Radiation        |
| Category I | Interactive Workshops          |
| Category J | Medical                        |

Sunday, July 21 8:00-10:00 am

## 1-A (Communications/Training) Public Relations - How to Effectively Influence Opinion - John W. Billett (Billett & Quinn, Ltd.)

The course will provide a basic introduction to public relations. It is designed to address the interests of both the novice and the experienced practitioner.

Whether for an individual, small organization, or complex entity, the material presented will furnish attendees with the basic concepts and methodologies of public relations. Among the subjects to be discussed are establishing your goals, identifying your publics, crafting your message, choosing your communication vehicles, and evaluating your results.

The session will be conducted in an interactive seminar format.

## 1-B (General) Legal Issues and Developments in Radiation Litigation - David Wiedis (Jose & Wiedis)

The course begins with a discussion of basic legal concepts which are fundamental to understanding radiation litigation. Among the topics covered are: the Price Anderson Amendments Act, how lawyers investigate a radiation case, how the case proceeds from the incident through the discovery process, preparation for trial and trial, and the role of the health physicist in the pre-trial and trial phase of a case. The course then addresses the major issues currently being litigated in this field. These include: What is the standard of care required of a utility, the role of the federal dose standards, the role of ALARA, radiation protection and the fetus, the impact of new part 20 on radiation litigation, "junk science," what constitutes compensable injury, what is adequate proof of causation, and the role of the NIH probability of causation. Practical examples from cases will include strategy developed for depositions and trial. A major focus of the course is how to avoid litigation. We will examine common mistakes that have resulted in litigation, how to avoid them in

the future, record keeping strategies, and what to do in the event you are sued.

## 1-C (Computers in Health Physics) Health Physics Resources on the Internet - Melissa Woo (University of Illinois at Urbana-Champaign)

This session will provide health physicists with information on the vast health physics-related resources available on the Internet. An overview of basic Internet functions and commonly used Internet jargon will be provided for attendees unfamiliar with the Internet. General information about the various methods for accessing information from the Internet will be discussed, such as Internet mailing lists, ftp sites, gopher sites, and World Wide Web pages. Locating specific information on the Internet will be covered using methods such as World Wide Web search engines and WAIS searches. Much of the session will involve real-time online demonstrations of some of the many resources available to health physicists on the Internet, with an emphasis on information on the World Wide Web.

## 1-D (Radiological Evaluations) Bioassay Data Evaluation Workshop for the Estimations of Intakes, Exposures, and Doses from Internal Radiation Sources, Part I- Clayton French and Kenneth Skrable (University of Massachusetts Lowell); Thomas LaBone (Westinghouse Savannah River Company) NOTE: This is a two part course; you must register for both parts to participate.

This special 4 hour Professional Enrichment Program (PEP) is devoted to the evaluation of in vivo and in vitro bioassay data. Following a concise summary of the biokinetic models and methods used for evaluation of bioassay data, actual data from events are evaluated in terms of estimated intakes, exposures, and internal radiation doses. The NIH P-32 incident will be discussed.

## 1-E (Dosimetry)

### Internal Dosimetry and Part 20 - John W. Poston, Sr. (Texas A&M University)

The "new" standards for protection against radiation (10CFR20) were implemented effective January 1, 1994 by all NRC and agreement state licensees. These regulations require the addition of external and internal radiation exposure and the controlling of the total effective dose equivalent (TEDE) within a single dose equivalent limit. In addition, the approaches to internal dose assessment, using the ICRP Publication 30 techniques, have changed. For these reasons, internal dose assessment has taken on a new importance. This presentation will address the NRC recommended approaches to internal dose assessment contained in 10CFR20, Regulatory Guide 8.9, and the other documents and guidance available for use in such assessments. Included in the discussion will be a series of problems designed to illustrate the use of these important documents.

### 1-F (Operational Health Physics) A Review of the September 1995 Revisions to DOT/NRC to the Nuclear Materials Transportation Regulations - Al Grella (Grella Consulting, Inc.)

On September 28, 1995, the U.S. Department of Transportation (DOT) and the U.S. Nuclear Regulatory Commission (NRC) finalized rule-making changes to 49 CFR (Docket HM-159A) and 10 CFR Part 71. The stated purpose of these amendments was to achieve consistency with the international standards of the International Atomic Energy Agency's (IAEA) 1985 Edition of Safety Series #6 (as amended 1990). Although many of the amendments were minor or editorial, several of the substantive revisions are expected to have impacts on transport of radioactive materials, particularly radwaste, in varying degree. The two most major amendments include:

1. Redefinition of the "LSA" category and establishment of a new "SCO" category
2. Codification of formal radiation protection program requirements with dose

limits during transportation to occupationally exposed persons and numbers of the general public.

In this course, these revisions as well as several others are discussed in detail; and probable impacts on shipment practices are covered. Effective dates for mandatory compliance are also discussed. Information from this course should be helpful to persons who are in the process of updating their procedures for nuclear transportation.

### 1-G (Industrial Hlth./Non-Ionizing) Fundamentals of Non-Ionizing Radiation Protection - John A. Leonowich (Battelle Pacific Northwest Laboratory)

No prior knowledge of the field is required. It is clear that the use of non-ionizing radiation (NIR) continues to cause concern to both workers and the general public. Many misconceptions have clouded the appreciation of the actual hazards associated with this type of radiation. This course will review the fundamentals of NIR protection and will provide the basis for the health physicists to pursue further study in this area. Included among the topics to be covered are: radiofrequency and microwave radiation (3 kHz 300 GHz), lasers, optical and ultraviolet sources, and extremely low frequency (ELF) electromagnetic fields (0-3 kHz). 1992 marked the release of extensive revisions to both the ANSI/IEEE Radiofrequency/Microwave Standard and the ANSI Z136.1 Laser Standard. Both these revisions will be reviewed, as well as the ACGIH recommendations for magnetic fields and non-coherent optical radiation.

### 1-H (Environmental Radiation) NEPA Compliance - Charles D. Massey (Sandia National Laboratories)

The National Environmental Policy Act (NEPA) has specific requirements for assessing and documenting potential environmental impacts before a federal agency makes certain decisions. The course will be designed to provide basic information on the NEPA process from a preparer's standpoint. The course will cover the NEPA documentation process from initial activities to final

document issuance. Primary focus will be placed on the preparation of Environmental Assessments (EAs). The content and format of EAs will be discussed, along with tips on what to do and not to do in their preparation. Questions on defining alternatives, determining the affected environment, and how to estimate environmental impacts will be addressed. Experience with several recently issued NEPA documents will be drawn upon for many of the "lessons learned." Additionally, focus will be placed on public involvement aspects of the NEPA process and latest trends in incorporating environmental justice and cumulative impacts. At the conclusion of the course, a participant will have a sound basic understanding of the NEPA process and how to prepare a good NEPA document.

### 1-I (Interactive Workshops) Teaching Radiation Protection Using Non-traditional Methods - Tony Loyd (Washington Public Power Supply)

What impact would it have on the nuclear industry if we could find ways to help learners assimilate information on a deeper level and to retain that information for a longer period of time? How can we take the Radiation Protection professionals we teach from passive listeners to active participants?

These are the promises brought to us by Accelerated Learning. Accelerated Learning had its foundation in the work of Dr. G. Lozanov of Bulgaria. Dr. Lozanov was able to teach foreign language at the phenomenal rate of 1,600 words in 31 school days at 45 minutes per day with 90% retention 2 weeks later. That's 51 words per 45 minute session! Simply put, Accelerated Learning is the use of non-traditional training methods to take advantage of the latest research on how the brain takes in and stores information.

In this workshop, participants will experience Accelerated Learning first-hand as we explore such topics as the "Learner-Centered Model," a method of presenting information that will activate learners and their natural desire to learn and "Brain-Train," the latest in brain-based learning and teaching. An extensive bibliography of Accelerated Learning contacts and resources will be provided.

## 1-J (Medical)

### Internal Dosimetry by MIRD and MIRDOSE: Theory and Dose Calculations - Wesley E. Bolch (University of Florida)

The safety assessment of potential new imaging agents requires the determination of their biokinetics and resulting absorbed dose distributions. The MIRD methodology has been used for a number of years to compute internal dose from radiopharmaceuticals. The software package MIRDOSE provides a routine to utilize biokinetic data in the computation of average absorbed doses to organs of interest. While this methodology was intended for use in nuclear medicine, it has been widely used in radiation protection. Recent developments within the MIRD committee will be highlighted including a new head and brain dosimetry model as well as techniques for rapid and simplified calculations of isodose contours within organs imaged by SPECT, PET, or autoradiography. This course will review the MIRD methodology and will provide instruction on the use of MIRDOSE which is written for IBM-compatible PCs. Approximately 3/4 of the course will be devoted to formal instruction in the use of MIRD methodology and 1/4 devoted to applications in nuclear medicine and radiation protection. Each student will receive information on obtaining a free copy of the program. MIRDOSE Version 3 will be featured. This version includes the standard Cristy & Eckerman family of pediatric phantoms as well as three new phantoms describing pregnant women at various stages of gestation.

**Sunday, July 21, 10:30 am-12:30 pm**

### 2-A (Communications/Training) Computer-Based and Web-Based Radiation Safety - Carolyn J. Owen (Lawrence Livermore National Laboratory)

The traditional approach to radiation safety training has been to provide a stand-up lecture and/or video on the topic and a repeat performance periodically of the same material. New approaches to meeting training requirements are needed to address the ad-



vent of flexible work hours, telecommuting, and the employee that would like a different approach to learning than the traditional lecture. Creating different refresher training classes than the initial training material is a common request of employees. Computer-based and Web-based training will be reviewed, along with their advantages and disadvantages. Demonstrations of computer-based training will be provided and Web-based training addresses shared. At the end of the course, a participant shall be well acquainted with alternative radiation safety training options on the computer and Web and have the necessary information for implementing similar approaches at their own facilities.

## **2-B (General)** **Biological Safety for the Health Physicist** - *Robert Emery (University of Texas)*

Radiation safety professionals encounter biological hazards in a variety of workplace settings, including health care institutions, biomedical research facilities, bioassay programs, waste programs, and emergency response. This course is designed to provide health physicists with the practical information necessary to anticipate, recognize, evaluate, and control the various biological hazards present in these environments. An overview of the regulations and guidance documents associated with the discipline of biological safety is also provided, along with an extensive listing of useful references.

## **2-C (Computers in Health Physics)** **Putting Health Physics Information on the Internet** - *Melissa Woo (University of Illinois at Urbana-Champaign); Mark Selikson (University of Pennsylvania)*

This session is intended for health physics professionals that are interested in using the Internet to distribute health physics information to peers, users and/or the general public. The various methods of providing information on the Internet will be covered with an emphasis on the use of the World Wide Web. The session will be

presented in two parts. The first portion will be an overview of technical aspects and general hardware/software issues as well as an introduction to the concepts needed for those wishing to utilize the Internet to deliver information.

The second portion of the session will be a case study on the University of Pennsylvania's ongoing effort to set up resources to provide information using the Internet. Examples of the information management system will be given for specific radiation safety tasks including manuals, remote RAM ordering, worker registration, worker training and research authorizations. Design, development, debugging, system conversion and quality assurance issues will be discussed.

Some knowledge of computers and the Internet is desirable.

## **2-D (Radiological Evaluations)** **Bioassay Data Evaluation Workshop for the Estimations of Intakes, Exposures, and Doses from Internal Radiation Sources, Part II** - *Clayton French and Kenneth Skrable (University of Massachusetts Lowell); Thomas LaBone (Westinghouse Savannah River Company)*

See PEP 1-D for description. This is a continuation of a 2 part course.

## **2-E (Dosimetry)** **Beta Dosimetry and Personnel Contamination Monitoring** - *Gloria T. Mei (Oak Ridge National Laboratory)*

Beta particles can sometimes contribute significantly to the skin dose in personnel contamination. However, personnel monitoring for beta contamination has played a minor role in radiation protection mainly due to the inherently more difficult measurement techniques it requires in comparison with photon monitoring. Field measurement of beta contamination is complicated by difficulties in instrument calibrations, the presence of low-energy photons, and the lack of adequate training and procedures.

The course will review the basic principles of beta dosimetry and consider

the challenges facing health physicists who provide beta dosimetry and/or contamination monitoring in the radiological workplace. Regulations and guidelines on radioactive surface contamination limits will be discussed. The technical basis for the method of manual frisking will be presented. On the practical side, the estimation of beta skin dose with a portable instrument will be illustrated. The relationship of the portable instrument's output to an equivalent skin contamination level and the dose distribution will be discussed.

An evaluation of selected portable instruments for low-energy beta contamination monitoring based on detector response, detection sensitivities, and general performance characteristics will be given.

## **2-F (Operational Health Physics)** **Radiation Protection Program Reviews for 20.11018** - *William H. Barley (Washington Public Power Supply System)*

10CFR20.1101(c) requires periodic (at least annual) reviews of radiation protection program content and implementation. This course is designed to assist both broad based licensees and smaller radioactive material licensees to develop a review process tailored to each licensee's specific program content. Included will be recommended documentation methods. Various types of radioactive material licenses will be cited as examples during the course and recommended review processes structured for each cited example to assist students with application of techniques presented to their own specific license conditions.

## **2-G (Industrial Hlth./Non-Ionizing)** **Industrial Hygiene** - *Peter Collopy (Carnegie Mellon University)*

Industrial Hygiene is the practice of anticipation, recognition, evaluation, and control of hazardous agents in the work place. This course builds upon basic introductory industrial hygiene courses and training by introducing more specific methods for the evaluation and control of non-radiological hazardous agents in the work place. Students taking this course should

have a fundamental understanding of OSHA regulations and basic industrial hygiene principles such as application of PELs and TLVs. A brief review of new standards and regulations will be presented in this course. Evaluation of hazardous agents through modeling and measurement techniques will be introduced with specific work place examples. Control methods for various exposure scenarios will also be discussed. This course is intended for personnel currently performing some non-radiological industrial hygiene activities.

## **2-H (Environmental Radiation)** **10CFR834 and its Implementation at DOE Facilities** - *Rex J. Borders (U.S. Department of Energy)*

The Department of Energy has been continuing to develop 10CFR834 - Radiation Protection of the Public and Environment - since the notice of proposed rule making. This rule will represent DOE's primary standard for the protection of the public and the environment from ionizing radiation. All DOE contractors will be required to develop Environmental Radiological Protection Programs (ERPP) which comply with this rule. In addition, they must develop program documentation to demonstrate compliance and correct identified shortfalls. To assist with this process, DOE has created the Environmental Radiation Control Coordinating Committee (ERCCC) to guide the implementation of this rule at all DOE facilities and to develop further technical standards.

The course will focus on the content of 10CFR834 and is appropriate for all persons interested in Environmental Radiation. The secondary purpose of the course will review the current status of the DOE activities underway to implement the rule at its facilities.

## **2-I (Interactive Workshops)** **Effective Strategies for Communicating Risk** - *Jerrold T. 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.

## **2-J (Medical)**

### **Internal Dosimetry by MIRD and MIRDOSE: Biokinetic Modeling - Michael G. Stabin (Radiation Internal Dose Information Center)**

Often the most difficult parameter to obtain for solution of the MIRD internal radiation dose equation is the residence time (or cumulated activity), which is the area under the time-activity curve for an organ, tissue, the whole body, etc. In an internal dosimetry problem, the kinetics of all source regions must be characterized in order to calculate all contributions to the radiation dose in various target regions. After the kinetics are well characterized, the areas under the time-activity curves for the source regions must be estimated. This program will demonstrate through description and example several approaches to the characterization of source region kinetics and integration of the time activity curves. The use of direct integration, least squares analysis, and compartmental modeling techniques will be discussed; and results using the different methods will be compared. Theoretical aspects of the different approaches will be described as time permits. Inclusion of the results of biokinetic modeling into the MIRD (and other)

calculational systems will be explained and demonstrated.

*Sunday, July 21, 1:30-3:30 pm*

### **3-A (Communications/Training) Performance Based Objectives - Ellen Hochheiser (Westinghouse Hanford Company)**

The objective of this course is to have health physicists create performance based objectives. The acceptance criteria will be that at least 4 out of 5 objectives will meet the standard as presented in class and in the handouts.

Radiation protection professionals are frequently required to present training to individuals who have a wide variety of education, abilities and skills. Performance based objectives are an important tool to simplify the specific requirements of each task and set a standard by which the objective is met. This seminar will introduce you to the techniques of creating specific and general performance based objectives including acceptance criteria. This course will include the use of performance based objectives as an aid in meeting departmental and company goals. Attendees will actively participate in the session by meeting the listed objective.

### **3-B (General) Practical Applications of Internal Dosimetry Calculations - Eugene H. Carbaugh (Pacific Northwest National Laboratory)**

Assessment of intakes and internal doses often requires the health physicist to exercise a substantial amount of professional judgment, as well as knowledgeable use of computer codes or hand calculations. While it would be nice to say that internal dosimetry is a precise science, the reality is that many assumptions tied to an assessment are taken for granted. At one extreme is the complete use of default assumptions; at the other is the attempt to specifically tailor a detailed assessment to a unique individual. This course, presented with humor in a down-to-earth style, will discuss nine types of calculational adjustments and provide practical insights into dealing with some real-world bioassay and internal dose puzzles.

### **3-C (Computers in Health Physics) The Use of Desktop Software in Operational Health Physics Programs - Glenn M. Sturchio, (Merck Research Laboratories)**

This course will examine the use of commercially available desktop software applications for increasing the efficiency of operational health physics programs. "Lessons learned" will be discussed to help attendees steer clear of potential pitfalls, as well as facilitate the introduction of these ideas within their organizations. Real world examples using standard business software will be presented, such as: the development of a comprehensive health physics database to track personnel, authorizations, laboratories, inventory, and instrumentation; creation of a radiation protection audit report using a document template, autotext entries, and mail merge; documentation of a laboratory decontamination survey using a document template and linking it to a spreadsheet for data analysis; and the analysis of bioassay measurements and tracking of cumulative dose equivalents in a spreadsheet. Additionally, the use of specialty software (e.g., VARSKIN, etc.) in the performance of operational health physics tasks will be presented.

### **3-D (Radiological Evaluations) Medical Management of Radiation Accidents - Jerrold T. Bushberg (University of California, Davis)**

Medical response and management of radiological accidents begins with education of medical and ancillary health care personnel in the fundamentals of radiation exposure and its biological effects. Additional training and hands-on experience in radiation protection principles are necessary to minimize patient and personnel radiation exposure and contamination. This course will present the essential elements necessary to train medical personnel regarding priorities for medical management of these patients and how to recognize and evaluate different types of radiation injuries. Information is also presented to help

educate ancillary health care workers on how to set up and use radiation monitoring and decontamination equipment and facilities. This course provides an overview of acute radiation injury and the principles which are essential to the appropriate medical management of radiation accident victims.

### **3-E (Dosimetry) Practical Internal Dosimetry - Richard Toohey (ORISE)**

This course will cover methods of relating bioassay and air monitoring data to internal doses. The ICRP 26/30 methodology, currently the basis for both DOE and NRC regulations, will be discussed in detail. The changes published in ICRP publications 60 and 66 will also be covered.

The use of intake retention fractions (IRF's) to convert bioassay measurements to intake estimates, and the use of dose conversion factors (DCF's) to convert intakes to committed doses will be explained. Good practices for record-keeping, reporting, and quality assurance will be highlighted. Examples and problems taken from incidents at fuel cycle facilities, universities, and the ABHP certification exam will be used to demonstrate application of the methods.

### **3-F (Operational Health Physics) Recent Trends in Radiation Detector Development - Glenn F. Knoll (University of Michigan)**

Recent developments in methods for the detection and spectroscopy of ionizing radiation will be reviewed, with emphasis on those that hold promise for improving measurement capabilities over the next decade. Topics will include new scintillators, photo detectors, advanced semiconductor materials and configurations, micro strip gas detectors, and other devices under active development. Applications will also be shown of novel gas-filled detectors, liquid and plastic scintillators, position-sensitive detectors, and digital pulse processing techniques.

### **3-G (Industrial Hlth. /Non-Ionizing) Introduction to Extremely Low**

**Frequency Electromagnetic Fields (0-3 kHz) - John A. Leonowich (Battelle Pacific Northwest Laboratory)**

This course will introduce the controversial topic of extremely low frequency electromagnetic fields (ELF-EMF's). These fields have been linked to a number of health effects, including cancer. The course will provide a non-technical review of the basic physics of ELF electric and magnetic fields, as well as explore the potential health effects of these EMF's. In particular, the established biological effects of magnetophosphene induction, reproductive effects, and melatonin suppression will be reviewed. Additionally, cancer epidemiological research will be discussed, with the aim of pointing out some of the strengths and weaknesses of current studies. Both public and occupational exposure studies will be explored. Current exposure criteria recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), as well as the International Commission for Non-Ionizing Radiation Protection (ICNIRP), will be reviewed. The course will also familiarize the student with some of the instrumentation currently used to perform hazard assessments of ELF-EMF's. At the end of the course, the student should be able to understand the risks associated with these fields, as well as to be able to intelligently explain these risks to the concerned layman. The course has no prerequisite, though attendance at the PEP course Introduction to Non-Ionizing Radiation is recommended.

**3-H (Environmental Radiation) Regulatory Aspects of Radioactive Contamination in Recycled Products - Michael G. W. Phillips (Jupiter Corporation)**

During the past 5 years there has been growing concern over residual radiation in reprocessed materials such as residential wallboard, fence posts, dishware, aggregate for roadmaking and even gold jewelry.

This course will look at the regulation of contaminated material and products. The significance of these regulations is in the questions they do not address as much as the ones that they do.

The various approaches by the international community and US federal and state regulators will be discussed and compared. In light of the numerous policy, regulatory and guidance being concurrently promulgated at all three of these levels (which will affect recycling), certain trends will become clear.

This seminar will touch upon some of the common fundamental assumptions or requirements used in the regulations. Underlying questions such as what is "background radiation," and the more complex question, "What is the background for a product composed of recycled materials?" will be discussed. Another fundamental question, that of detectability and how this moving target meets regulatory requirements, will also be assessed.

**3-I (Interactive Workshops) Electronic Personal Dosimeters (EPD's): Fundamentals and Applications - Paul L. Ziemer (Purdue University)**

Electronic personal dosimeters are state-of-the-art dosimeters that make use of the latest micro-circuitry and modern battery technology. EPD's typically detect radiation by means of multiple diode detectors that are sensitive to different types and energies of radiation. The devices are capable of determining total dose equivalent and dose equivalent rates for both superficial (shallow) and penetrating doses. Visual and audible alarm capabilities for specified doses and dose rates are also provided.

The course will include a discussion of the fundamental operation and characteristics of EPD's, their capabilities and limitations, and typical applications. The calibration of EPD's in accordance with the recommendations of the recent NCRP Report 122 on estimating effective dose to workers will also be reviewed. A selection of commercially available EPD's will be available for some hands-on familiarization with the devices.

**3-J (Medical) Introduction to the Physics of Mammographic Imaging - Charles C. Chamberlain (S.U.N.Y. Health Sci-**

**ence Center)**

At the present time, x-ray mammography is the only means available for the earliest detection of breast cancer. The production of a high quality diagnostic mammogram is arguably the most challenging task in radiologic imaging, involving a high degree of expertise on the part of the radiologist who reads the films, the x-ray technologist who positions the patient and makes the exposure, and the medical physicist or medical health physicist who may evaluate the proper functioning of the imaging system. It is important that the physicist have an understanding of the basic physical principles which dictate the required photon energies, x-ray generator construction, imaging systems, and patient dosimetry. The course will include discussion of photon interactions with tissue, radiologic and image contrast, production, and effects of scatter and related topics. State-of-the-art mammographic imaging systems will also be covered. Discussion will include implications of the federal Mammography Quality Standards Act of 1992, as time permits.

*Monday, July 22, 12:15-2:15 pm*

**M-1 Introduction to Gamma Processing Technology - Mark A. Smith (SteriGenics International)**

Gamma processing involves using high energy gamma radiation to treat materials. The largest market for this service is medical device manufacturing, where radiation from sealed sources, typically cobalt-60, is used to sterilize the product before it is distributed for public use. Irradiation of food to extend shelf life and inactive microorganisms is a widely-publicized application. Other applications of gamma processing include cross-linking polymers for resin hardening, effecting color changes in gem stones, fungal inhibition in bee hives, male insect sterilization for pest control, and others. This session will describe several applications for gamma processing and explain how material is managed to achieve the desired effect. The discussions will include a brief review

of the history of gamma processing; the basic science of radiation effects on materials and the typical treatment doses for the various desired effects; dosimetry systems that operate in the multiple kilogray (or megarad) ranges; categories of irradiators and the respective safety requirements; designs of the most common types of irradiation facilities, including safety systems; and a short survey of the history of some operating problems at irradiators. Competing or complementary technologies, such as electron-beam irradiators and sterilization using ethylene oxide gas will be mentioned for comparison purposes.

**M-2 A Review of Compliance Issues for Medical Licensees - Suzie Kent (Orange County Health Care Agency)**

This course reviews the regulatory requirements for medical licensees in 10CFR35 and other agreement states. Topics which will be addressed include the requirements for radiation safety programs, survey and measurement protocols, personnel dosimetry and bioassay, use of sealed sources, and management of misadministrations. The most frequent compliance problems are discussed, as well as some unusual circumstances related to medical use of isotopes. Examples of unusual concerns include the disposition of corpses containing radioisotopes and contamination at morgues and crematoria.

In recent years, attention has turned to the way medical use of radioisotopes is regulated in the US. Congressional attention was focused on a fatality from the misuse of a therapy source left in a patient who subsequently died. Time will be allotted for discussion of where we are headed in the regulation of medical use of isotopes.

**M-3 Lower Limits of Detection - Thomas B. Borak (Colorado State University)**

Judgments on whether or not a sample contains contamination in excess of background must often be based on the stochastic nature of radioactive decay and sample processing. In many instances, formulas can be applied to assess a "lower limit of detection" or



"minimum detectable activity" for a certain methodology. This lecture will review the underlying assumptions involved in the derivation of several popular formulas. Information will be presented to indicate how the results are affected when the assumptions in the derivation are not satisfied. Examples of alternative computational methods will be presented and applied to real data. The discussions will focus on the following two questions:

1. At what level can you conclude that there is excess contamination in a given sample?
2. How much excess contamination is required in order to routinely identify its presence in samples?

#### M-4

#### **Introduction to Instrumentation to Measure Non-Ionizing Radiation and Fields - John A. Leonowich (Battelle Pacific Northwest Laboratory)**

It is often necessary to make measurements of non-ionizing radiation and fields in order to ensure compliance with applicable standards. This class will review the types of instrumentation available to the health physicist/industrial hygienist for making compliance measurements, and discuss the unique problems the surveyor faces in making accurate assessments due to the limitations of currently available instrumentation. The following types of instruments will be discussed: low frequency (0 - 3 kHz) electric and magnetic field sensors, radiofrequency/microwave narrow- and broad-band instruments (3 kHz - 300 GHz), ultraviolet meters (100 - 400 nm), and instruments used to quantify coherent (i.e., laser), radiation (100 nm - 1 mm). Representative types of instruments will be available for demonstration and inspection by class participants. It is recommended that the PEP course Introduction to Non-ionizing Radiation be attended as a prerequisite to this class.

#### M-5

#### **Industrial Hygiene Air Sampling Methods and Applications - Peter Collopy (Carnegie Mellon University)**

The sampling of airborne hazardous agents involves a wide spectrum of collection techniques, equipment, and analytical methods. This course will provide a survey review of those techniques and methods. Use and calibration of air sampling pumps for particulate and chemical airborne materials will be demonstrated. The application of various sampling media such as impingers, sorbents, and filter media will be explained. The use of real time field monitors and passive monitoring devices will be introduced and their detection capabilities and limitations outlined. Sources of information on air sampling and analytical protocols will be discussed including representative examples. Finally, some statistical methods for evaluating air sample results and their relevance to action levels and regulatory exposure limits will be introduced.

#### M-6

#### **External Beta Ray Dosimetry - Herman Cember (Northwestern University)**

This course will begin with a review of the physics of beta decay and the interaction of beta radiation with matter. The physics of beta radiation will then be combined with the basic principles of radiation dosimetry to calculate the external radiation dose from contaminated surfaces, from skin contamination, and from submersion in a cloud of a beta-emitting gaseous radionuclide.

*Tuesday, July 23, 12:15-2:15 pm*

#### T-1

#### **Internal Dosimetry and Part 20 - John W. Poston, Sr. (Texas A&M University)**

See PEP 1-E for description.

#### T-2

#### **The Effects of Ionizing Radiation on the Developing Embryo: Estimating risks and providing appropriate counseling. - Robert L. Brent (Alfred I. Dupont Institute)**

Many physicians are unfamiliar with the quantitative and qualitative effects of ion-

izing radiation and consultations to health physicists indicate that exposed women have received erroneous information. In the field of ionizing radiation, health physicists have a better comprehension of the biologic effects and the quantitative maximum risks than for any other environmental hazard. Animal and human data support the conclusion that there is a threshold dose for the production of the congenital malformations, namely, that no increases in the incidence of gross congenital malformations, intrauterine growth retardation, or abortion will occur below specific exposures. Medically indicated diagnostic roentgenograms are appropriate for pregnant women, and there is no medical justification for terminating a pregnancy in women exposed to 5 rem (0.05 Sv) or less because of radiation exposure. Counseling women of reproductive age should be based on sound information about the risks of radiation exposure.

#### T-3

#### **Conducting the MQSA/ACR Mammographic Unit Physicists Survey: A Practical Approach (hopefully) - Charles C. Chamberlain (S.U.N.Y. Health Science Center)**

The Medical Health Physicist has an essential role in assuring that mammographic images contain the maximum diagnostic information possible while delivering an acceptable patient dose. This assurance is provided by conducting certain tests mandated by accrediting boards or agencies. We will discuss conducting the ten physicist tests as mandated by the principal accrediting body, the American College of Radiology (ACR). Proper calibration and use of test equipment will be emphasized. In addition, assessment of image viewing conditions, film processing, acceptance testing, and assisting the mammographic technologists in her/his required testing will be covered. Contributions from the knowledge and experience of the attendees will be encouraged. Practical tips on completion of the tests will also be presented as will available sources of testing information. Since the amount of material to cover is large, some topics will be addressed in less detail than others.

#### T-4

#### **Technical Writing: How to Get Your Work Published! - Tamara Berg (Winona State University)**

This course will give a general overview of technical writing strategies, as well as detailed advice for individuals interested in publishing their work in *Health Physics Journal*. *Health Physics* publishes manuscripts in the theoretical or applied fields of ionizing and nonionizing radiation protection, and the goal of this course will be to provide current and prospective authors with some guidance on how to prepare a manuscript for publication in *Health Physics*. While much of the information will be directly related to *Health Physics* style requirements, most of it can be applied to the writing of any technical document. Manuscript classification, submission requirements, and manuscript preparation will be covered in detail.

#### T-5

#### **Tips and Tricks for Surveys at Levels Near Background - Carl V. Gogolak and Kevin M. Miller, (U.S. DOE, Environmental Measurements Laboratory)**

For some radiation surveys, especially those to determine final status before site de-commissioning, it may be necessary to detect activity concentrations that are a small fraction of natural background. Gross counting techniques may be inadequate or inefficient for such surveys. In this course, some of the considerations important in choosing a measurement method in those circumstances will be discussed.

The Data Quality Objectives (DQO) process can be used to define survey goals so that the most appropriate data are taken for the decision that must be made. This involves an understanding of both the variability of background at a site, and the capabilities of different measurement methods. In designing a survey, consideration should be given to whether small areas of elevated activity, as well as the overall average concentration, are important.

Alternative radionuclide specific methods, especially in situ gamma spectrom-



etry, may be the most efficient counting method in many cases, but require an understanding of the calibration methodology and its limitations.

Often a combination of techniques will be needed to detect both small areas of elevated activity and an average level near background. Examples of survey planning for choice of instrumentation will be given both for cases when the radionuclide of interest appears in background and when it does not.

#### T-6

##### **Revision to ANSI N13.1 Guide to Monitoring Radioactive Substances from Stacks and Ducts Facilities - John A. Glissmeyer (Pacific Northwest National Laboratory)**

The ANSIN13.1-1969 Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities is currently being revised and is approaching the end of the revision process. The revision is being drafted by a working group under the auspices of the Health Physics Society Standards Committee. The main differences between the original and the revised standards are a narrowed scope, a greater emphasis on the design process, and the verification of meeting the performance criteria. The new scope is focused on air sampling from stacks or ducts and the new title is "Guide to Monitoring Releases of Radioactive Substances from Stacks and Ducts of Nuclear Facilities." The approach taken in the revision is essentially based on meeting performance criteria as opposed to following design prescriptions as was done in the past. This standard presents a new approach to representative sampling. The goal of achieving a representative sample is accomplished by requiring that samples are extracted from air streams meeting rigorous criteria for being well mixed for potential airborne contaminants. This standard sets forth guidelines and performance criteria for the use of air sampling nozzles, transport lines, sample collection and monitoring devices, and gas flow measuring methods in obtaining valid measurements of airborne radioactive materials in ducts or stacks.

Wednesday, July 24, 12:15-2:15 pm

#### W-1

##### **Introduction to Microdosimetry - Joseph C. McDonald (PNNL)**

Microdosimetry is the study of radiation transport and energy deposition on a distance scale of micrometers and smaller. Investigations seek to understand the different chemical and biological effects of radiation in terms of the track structures of different kinds of radiation. The course deals with radiation transport and its simulation by Monte Carlo procedures, track structure and radical production in liquid water, and modeling of the chemical and biological effects of ionizing radiation. The microdosimetric concepts and quantities defined by the International Commission on Radiation Units and Measurements and in common use are covered.

#### W-2

##### **Recent Trends in Radiation Detector Development - Glenn F. Knoll (University of Michigan)**

See PEP 3-F for description.

#### W-3

##### **Current Approaches to Regulating Public Exposure to Radionuclides and Hazardous Chemicals - David C. Kocher (Oak Ridge National Laboratory)**

Under current law and regulations, two different approaches are used to limit 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 "unacceptable," 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 but risk goals for hazardous chemicals, (2) the different meaning 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 nearly all regulations and guidances for limiting risks to the public from routine and accidental exposure to radionuclide and hazardous chemicals is developed.

#### W-4

##### **Radioactive Sources in Recycled Metal: Preventing the Problem - Joel O. Lubenau (Nuclear Regulatory Commission) and James G. Yusko (Pennsylvania Department of Environmental Protection)**

Radioactive sources mixed with metal scrap have become a major problem for the metal recycling industry. Metals that have been affected include ferrous, aluminum, copper, zinc, vanadium, and gold. Radioactive sources mixed with metal scrap have resulted in radiation injuries to unknowing workers and the public. Contamination of steel mills that have inadvertently smelted radiation sources has resulted in financial losses of as much as \$23 million. This lecture will review the problems caused by radioactive materials entering the recycled metal stream, the protective measures being taken by the recycling metal stream, the protective measures being taken by the recycling industry, possible regulatory initiatives being explored jointly by the NRC and the Agreement States and, most importantly, steps that can be taken by health physicists who, in their capacities of radiation safety officers, consultants, or licensees, can help prevent the entry of licensed radioactive sources into recycled metal.

#### W-5

##### **NORM in Phosphate Fertilizers and Fertilizer By-Products - Carter D.**

Hull (Florida State University)

Inorganic phosphate fertilizer and the by-products of fertilizer production contain significant quantities of Naturally Occurring Radioactive Material (NORM). These phosphate fertilizers are usually a major constituent of high yield fertilizers, tens of millions of tons of which are applied annually to cultivated regions in North America. Nearly 1.2 billion tons of NORM-bearing solid by-products and billions of liters of solutions used in fertilizer production are stored throughout North America. This course focuses on the source, fractionation paths, redistribution, specific activities, and facts of NORM in phosphate fertilizers and fertilizer by-products. The locations of phosphate fertilizer production sites in North America and approximate quantities of NORM stored at these sites in solid and liquid by-products will be summarized. Case studies will be presented of phosphate fertilizer production facilities in Florida, the location of the great majority of the phosphate industry in North America.

#### W-6

##### **Methods to Determine Compliance with the Requirements of the Updated ANSI N13.1 Standard (Stack Sampling) - Andrew R. McFarland (Texas A&M University)**

The compliance approach for ANSI N13.1, "Guide to Monitoring Releases of Radioactive Substances from Stacks and Ducts of Nuclear Facilities," is essentially based on meeting performance criteria as opposed to following design prescriptions, as was done in the past. Single point representative sampling is one of the technological bases of the standard, and the suitability of a sampling location is based on the uniformity of concentration and velocity profiles at a candidate site. Methodology for determining uniformity of aerosol, gas and velocity profiles will be presented. For aerosol sampling, the nozzle of a sampling system must transmit between 80% and 100% of 10 micrometer aerodynamic diameter particles from the free stream to the transport line, and the overall sampling system must transmit at least 50% of 10 micrometer aerodynamic particles from

the free stream to the collector or analyzer. Software for demonstrating this attribute will be distributed to attendees. Flow monitoring may be needed in some applications, and approaches to satisfying this requirement will be discussed. Quality assurance aspects are emphasized in the updated standard, and the QA/QC elements will be considered.

*Thursday, July 25, 3:00 - 5:00 pm*

**TH-1**  
**Pathway to a Paradigm: The Linear Nonthreshold Dose-Response Model in Historical Context - Ronald L. Kathren (Washington State University)**

This course traces the evolution of the linear nonthreshold dose-response model and its acceptance as a paradigm in radiation protection practice and risk analysis beginning with the very earliest observations of radiation effects in humans up to the present time. The pathway to this paradigm begins, of course, with the discovery of x-rays and radioactivity in 1895/1896. Deterministic effects such as skin burns and even deep tissue trauma were associated with excessive exposure to x-rays shortly after the discovery; and carcinogenicity was observed as early as 1902. For three decades, these limits were based on the concept of a tolerance dose which, if not exceeded, would result in no demonstrable harm to the individual and implicitly assumed a threshold dose below which radiation effects would be absent. After World War II, largely because of genetic concerns related to atmospheric weapons testing, radiation protection dose limits were expressed in terms of a risk-based maximum permissible dose which clearly implied no threshold. By the mid 1970's the LNT Model began to assume the status of a paradigm, or even a fundamental axiom of protection, a process which was virtually complete a few years later. But as the first century following the discovery of x-rays and radioactivity drew to a close, a serious and often contentious debate has developed within the health physics community regarding the validity and general applicability of the linear nonthreshold for radiation protec-

tion, and threatening to change the previously accorded paradigm status of the linear nonthreshold hypothesis as the basis for protection standards.

**TH-2**  
**A Workshop on the Do's and Don'ts of Risk Communication for the Technically Inclined - David A. Waite (CH2M Hill)**

The objectives of this workshop are to (1) examine our personal and professional goals for risk communication, (2) compare our goals with others to whom we try to communicate risk information, and (3) understand the most effective risk communication techniques, considering the different goals. These differences are examined in terms of motivation, based on generally observed characteristics and behaviors, often derived from backgrounds and training. Salient points of these characteristics will be documented through the use of recent case studies. Recognizing that accommodating the differences among key groups involved in risk communication will require some time and a process, the course workshop will conclude with a discussion of a possible strategy for moving from the present state of risk communication disarray to a status more attractive to us technically inclined.

**TH-3**  
**Radiochemistry Practices and Requirements Related to Environmental Characterization and Monitoring - Gary L. Troyer (Westinghouse Hanford, Co.)**

In addition to survey instruments and dose meters, radiation protection in both the workplace and environment relies on radiochemistry techniques to sort out and quantify source term nuclides of interest. These techniques may be applied to low level environmental and bioassay samples as well as high activity nuclear process materials. Traditional bioassay sample analyses are well developed due to reasonable uniformity of matrix. However, environmental samples may have a large range of chemical challenges which must be considered in the se-

lection of an appropriate analytical method. In some situations, high radiation level samples are also encountered such as those found in site or facility characterization in preparation for decontamination and decommissioning. In addition, regulatory agencies are establishing criteria and guidance on laboratory performance and reporting protocols.

This PEP course will survey the generally accepted techniques, correlate practice with target needs, identify limitations and discuss current issues. The topics of sample chain of custody, data verification and validation, data reporting standards, and new guidance documents will be presented. The student will obtain general information on a broad range of radiochemistry methods, challenges, and trends.

**TH-4**  
**A Field Perspective for Implementing 10CFR835 - Gene E. Runkle (U.S. Department of Energy)**

The U.S. Department of Energy (DOE) issued 10 CFR 835 "Occupational Radiation Protection" in December 1993 with full implementation required by January 1, 1995. This rule contains the general standards for the radiation protection programs for the DOE complex. The DOE Radiological Control Manual, that contains prescriptive methods for implementing radiological control requirements such as radiological posting, contamination control, and training, was recently changed from a mandatory Manual to a guidance document. Some DOE sites use direct references to their site-specific RadCon Manuals to demonstrate compliance with the 10 CFR 835 requirements. The DOE sites have implemented 10 CFR 835, obtained an exemption per the 10 CFR 820 Subpart E process or self-reported non-compliance.

This session will discuss the 10 CFR 835 requirements and associated documents; the practical implementing processes; cost-saving methods; exemption process; and the overall lessons learned. Other field perspectives will include the proposed revision to 10 CFR 835, non-compliance tracking and enforcement, DOE Notice 441.1 and the application of Necessary and Sufficient to Rad Protection.

**TH-5**  
**Environmental Remediation - Mark L. Miller (Roy F. Weston, Inc.)**

This course will introduce the basic components of successful remediation programs at radioactive and hazardous waste sites. Topics will cover regulatory compliance, site characterization, removal techniques, waste management, decontamination and release of materials for unrestricted use, health and safety, and quality assurance/quality control program. Several case studies will be presented; discussions will focus on problems routinely encountered in the field and how these might be mitigated.

**TH-6**  
**Limitations to Pathway Analysis - Bruce A. Napier (Battelle, Pacific Northwest Laboratories)**

The current process for evaluating environmental impacts and/or individual doses and risks from radionuclides in the environment is centered on pathway analysis. This course will outline the current approaches to pathway analysis for both retrospective and prospective releases, including the general nature of required inputs. The topics of model uncertainty/sensitivity analysis and model reliability and model validation will be introduced with specific examples. These topics lead to the idea of limitations to what can be reasonably expected from pathway analysis. The new popularity of risk assessment as a means for allocating resources must be tempered with the realization that the answers provided generally reflect the questions asked, and that public concerns frequently differ from "technical" concerns. The evolving mechanisms for inclusion of public concerns will be discussed, along with the current inability to effectively evaluate issues such as social justice and environmental impacts on cultural resources. This course should be valuable to people working in the areas of safety analysis, NEPA, remediation, and dose reconstruction.



## Health Physics Society 1996 Exhibitors

**1997 ANNUAL MEETING-SAN ANTONIO, TX** *Booth 502*

**1997 MIDYEAR MEETING-SAN JOSE, CA** *Booth 431*

**1997 INTL CONFERENCE ON RADIATION DOSIMETRY & SAFETY** *Booth 103*

Information/material for the 1997 International Conference on Radiation Dosimetry & Safety (to be held in Taipei, April 1997; co-sponsored by HPS and ANS).

**3M OCCUPATIONAL HEALTH & ENVIRONMENTAL SAFETY** *Booth 234*

A full line of air purifying respirators, positive pressure respirators, air monitoring devices, hearing products, and sorbents for spill cleanup.

**3M** *Booth 232*  
3M Empore™ Rad Disks - A combination of 3M Empore Membrane technology and element selective particles for separation and counting of radiochemical samples.

**AMERICAN ACADEMY OF HEALTH PHYSICS** *Booth 434*

**ADCO SERVICES INC** *Booth 429*  
LLRW Disposal, Decay in Storage, Source and NORM, Decontamination and Decommissioning.

**AIL SYSTEMS INC.** *Booths 320, 322*

The Gamma Cam is a prototype imaging system that is comprised of a sensor head, control electronics and a processor display. The purpose of the Gamma Cam is to provide a spatial indication of radiation "hot spots." This information can be used in generating improved work plans, especially for shielding or as a general ALARA tool. The Gamma Cam has been evaluated at Con Edison's Indian Point (IP) 1 and 2 Nuclear Power Generating Stations.

**ALPHA SPECTRA** *Booth 418*

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.

**AMERSHAM CORP** *Booths 240, 242*

The complete range of reference sources and solutions for instrument calibration and environmental monitoring.

**ANALYTICAL RESOURCES INC.** *Booth 122*

**ANALYTICS INC** *Booth 113*

**APFEL** *Booth 530*

**ENTERPRISES INC**  
Neutron measuring equipment based on superheated drop (bubble) technology REMbrandt™ - close equivalent survey monitors weighing under 3 pounds. Neutronmeter-s, passive, immediate readout, and dose-equivalent.

**APTEC NUCLEAR INC** *Booths 206, 208*

Aptec's line of advanced WINDOWS 95 based MCA products plus PC-based alpha and beta surface contamination monitors will be exhibited.

**BATTELLE, PNNL** *Booths 212, 214*

Battelle's Health Protection Department offers services in all aspects of health protection. These include: Instrument Testing, Dosimeter Irradiations, HP Program Assistance, Emergency Preparedness, Exposure Assessment, Dosimetry Services, Industrial Hygiene, and Rad Engineering.

**BECTON DICKINSON** *Booth 129*  
**DIAGNOSTIC INSTRUMENT SYSTEMS**

Featured will be the solid state tritium and Beta Gas Monitors, along with programs to upgrade current units in the field. Training and warranty programs are available.

**BICRON NE** *Booths 104, 106, 108*  
Bicron NE provides a full line of contamination monitoring and dosimetry products.

**BIONOMICS INC** *Booth 329*  
Disposal and transportation of radioactive, hazardous and mixed waste. Consulting services available.

**BUBBLE TECHNOLOGY INDUSTRIES** *Booth 428*

Personal neutron dosimetry using the BD-PND neutron bubble detector MICROSPEC-2 portable spectroscopic survey system provides dose and complete spectral information from X-ray, photon and beta sources.

**CANBERRA INDUSTRIES INC** *Booths 529, 531, 533, 535, 628, 630, 632, 634*

Canberra will demonstrate a wide variety of equipment for environmental restoration, decommissioning and decontamination, waste assay and health physics applications. The Gamma Analyst automatic gamma spectrometer and Alpha Analyst, an integrated alpha spectroscopy system will be on display. We will also show a complete line of solutions for in situ counting of soil and other objects - complimented by our recently introduced ISOCS (In Situ Object Calibration Software) which allows calibrations to be developed for virtually any matrix and sample geometry without calibration sources. We will also show our AutoScan Self Service Whole Body Counting software and HIS-20 Health Physics Recordkeeping software. All Canberra products are supported by a full array of training, consulting, engineering and service capabilities.

**CHEMCHek** *Booth 436*  
**INSTRUMENTS INC**

Kinetic phosphorescence analyzer for ultra trace analysis of uranium in urine, soils, water, bioassay, environmental samples, air and liquids. Systems for easy, precise, sensitive, computerized manual, automatic and continuous sampling.

**CONSULTEC SCIENTIFIC INC** *Booth 143*  
Consultec Scientific provides innovative

training solutions through computer based learning packages and traditional, live instructor taught short courses.

**D A SERVICES** *Booth 141*  
Featuring a full line of Anti-C clothing and radiation protection supplies. Highlighting D.A. Services Rad-waste volume reduction programs and Inventory Management Partnerships.

**DOSIMETER** *Booth 102*  
Survey instruments for Health Physics, Medical Physics and dosimetry products for the real user.

**DOSITEC INC** *Booth 433*  
Dositec Electronic Dosimetry System is a Real-Time Access Control System providing supervisory access to entry and exit data, personnel records, and RWP authorization information.

**EBERLINE INSTRUMENTS** *Booths 330, 231*  
Supplier of radiation detection and counting instrumentation including portable instruments, personal contamination monitors, hand probes and air monitoring.

**EG&G NUCLEAR INSTRUMENTS** *Booths 413, 415, 417, 419, 512, 514, 516*

DSPEC is the world's first integrated, DIGITAL, DSP-based Gamma-Ray Spectrometer. Network ready, with a BUILT-IN ETHERNET adaptor, DSPEC is easily integrated into existing Local Area Networks and is part of the ORTEC "Connections" family. DSPEC provides via its "INSIGHT" virtual oscilloscope, an automated means of optimizing the performance of ANY HPGe detector under all conditions of count-rate, and with all sizes of detector. DSPEC delivers unmatched performance in STABILITY.

**EUCLID GARMENT MFG CO** *Booth 114*

Euclid Garment will display a complete line of re-usable protective apparel: Coveralls, headwear, footwear, and gloves, plus many other items such as tape, rope, signs, tackmats, and polyethylene garments.



**EXPLORANIUM** *Booth 217*  
Radiation environmental monitoring systems for aircraft, truck/car, ground/network, and portable handhelds, using sodium iodide spectrometer technology to identify specific nuclides, dose rates, etc. designed to meet your specific requirements.

**F&J SPECIALTY PRODUCTS INC** *Booth 230*  
Airborne monitoring equipment and supplies for health physics applications, including air flow calibration systems, radon detection products, and air sampling systems.

**FEMTO-TECH INC** *Booth 239*  
Manufacturers of continuous air and process instrumentation.

**GAMMA PRODUCTS INC** *Booth 508*  
Gamma Products, Inc. manufactures automated gamma counting systems for Marinelli beakers and other samples, and manual and automated alpha/beta counting systems. We also specialize in low level shielding.

**GE REUTER-STOKES INC** *Booth 534*  
Introducing the NEW Reuter-Stokes Environmental Monitoring System. Also exhibiting Reuter-Stokes' reliable He3 neutron counters and gamma ion chambers.

**GTS DURATEK** *Booth 142*  
Health physics training, professional staff augmentation, 10 CFR 20 and DOE Rad Con Manual compliance, assessments, temporary HP technical support, radioactive waste treatment technologies, radiation instrumentation calibration and rental service.

**HALLIBURTON NUS CORP** *Booth 202*

**HEALTH PHYSICS INSTRUMENTS** *Booth 313*  
Manufactures Portable and INED Radiation Measuring Instrument including survey instruments, area monitors, personnel dosimeters and neutron REM meters.

**HEALTH PHYSICS SOCIETY PUBLICATIONS** *Booths 115, 117*

**HELGESON SCIENTIFIC SERVICES** *Booth 414*  
HSS provides a complete range of state-of-the-art personnel and waste monitoring equipment and complementary health physics services, including mobile whole body counting units and surface survey instruments.

**HI-Q ENVIRONMENTAL PRODUCTS CO** *Booth 213*

**HOLADAY INDUSTRIES INC** *Booth 308*  
Non-ionizing radiation detection and measurement instrumentation. RF induced current instrumentation.

**ICN DOSIMETRY SERVICES** *Booth 301*  
Dosimetry Services.

**ISOTOPE PRODUCTS LABORATORIES** *Booths 203, 205, 207, 209*

Isotope Products Laboratories Supplies over 85 different nuclides in many different and unusual configurations. IPL is a NIST traceable laboratory and is audited by a member of Nuclear Procurement Issues Committee (NUPIC). IPL specializes in supplying standards and sources built to the customer's specifications. For over 28 years IPL has been a major supplier of radioactive standards, sources and nuclides.

**J L SHEPHERD & ASSOC** *Booths 536, 538*

New products and state-of-the-art upgrades for existing devices featured. First time showing of CHAMMP for Windows NT. Gamma Beam and Self-contained Calibrators for instrument calibration, Dosimeter Irradiators, Beam and Self-contained Irradiation Facilities, Beta and Neutron Calibrators/Irradiators, custom devices, and D.O.T. Shipping Containers. Cs-137 & Co-60 Device Reload/Decommissioning/Relocation Programs. CHAMMP and Quest

demonstrations.

**LANCS INDUSTRIES, INC** *Booth 300*

Health Physics/Radiological control items. Tents, containments, glove bags, lead wool blankets, shielding, protective clothing, tubing, bags, hepa filters, signs, air fed hoods, and related accessories. Specialty manufacturing.

**LANDAUER INC** *Booths 337, 339*  
Landauer, headquartered in Glenwood, IL is a leading provider of analytical services to determine personal exposure to occupational and environmental radiation hazards in the workplace and home.

**LND INC** *Booth 412*  
Nuclear radiation detectors-GM tubes, BF3 HE3, proportional counters. Ionization chambers, gas sampling, fission chambers-standard detectors or custom designed.

**LUDLUM MEASUREMENTS INC** *Booths 420, 422*  
Ludlum will display Health Physics instrumentation manufactured by Ludlum including portable and laboratory radiation detection devices.

**MGP INSTRUMENTS, INC.** *Booth 218*  
MGP Instruments provides a complete range of instrumentation and engineering services for Health Physics applications and radiation monitoring for all nuclear facilities.

**MJW CORPORATION INC** *Booth 437*  
MJW Corporation provides Radiological Consulting Services and Multimedia Computer Software. Titles on display include the Graphical Electronic Dosimetry Display system, Visual Survey Data System, Interactive Video Tour System and Health Physics Fundamentals Training Program.

**MOHAWK INDUSTRIAL & NUCLEAR SUPPLY, INC.** *Booth 123*

**NATIONAL NUCLEAR CORP** *Booth 229*  
NNC offers contamination monitors, scrap monitors and waste monitors. NNC division: Xetex offers dosimeters, ratemeters, area monitors, and the Abacus Alpha/Beta Sample Counter; NNC division: Reactor Experiments offers radiation shielding and high purity metal foils and wires.

**NFS-RADIATION PROTECTION SYSTEMS** *Booth 222*  
Radiological control software and hardware for the nuclear industry.

**NORTH AMERICAN SCIENTIFIC, INC.** *Booths 334, 336*  
North American Scientific, Inc. offers a broad line of high quality NIST traceable radiation reference standards for environmental, medical and industrial applications. Special bioassay and laboratory cross-check programs are available utilizing samples supplied from our new *Gold Standard* line of reference materials. Please visit our booth for details and product information.

**NORVELL PROT CLOTHING MFGS** *Booth 338*  
Recognized as the innovator of many of the nuclear industry's standard protective garments, Norvell is a woman-owned business with a 25-year history of reliable service and quality garment manufacture, as well as a full range of safety supplies and accessories. Professional Laundry Management meets your laundry challenges, too.

**NRRT NUCLEAR MEDICINE RESEARCH COUNCIL AND WORKING GROUP** *Booth 139*

The Nuclear Medicine Research Council is an informal group of scientists, educators, administrators, retirees, cancer patients, and other interested citizens devoted to beneficial applications of radionuclides for the diagnosis and treatment of cancer. We promote research at the Hanford Site toward development and applications of radioisotopes for medicine. Our group is a non-profit organization incorporated in the

State of Washington, and it has no affiliation with any commercial, private, or government entity.

**NUCLEAR FUEL SERVICES INC.** *Booth 220*

NFS provides site characterization, remedial investigation, remediation and value added program management to the customer with mixed or rad waste challenges.

**NUCLEAR MEASUREMENTS CORP** *Booth 237*

Nuclear Measurements will display internal gas flow proportional counters for low level alpha/beta measurements; gamma & neutron area and criticality monitors; continuous air monitors for airborne particulates, iodine and noble gases; stack monitor systems; tritium & liquid monitors.

**NUCLEAR NEWS/RADWASTE MAGAZINE** *Booth 321*

Nuclear News is the monthly news magazine of the nuclear industry, published by the American Nuclear Society. Also published by ANS is Radwaste Magazine, a bimonthly covering radwaste management at utilities, U.S. Department of Energy sites, etc.

**NUCLEAR RESEARCH CORP** *Booths 401, 403*

Nuclear Research Corporation manufactures a complete line of radiation monitoring systems; Health Physics Instrumentation with "smart" probes; environmental monitors utilizing global positions and GM tubes.

**ORDELA INC** *Booth 409*

ORDELA, Inc. provides alpha spectrometry instrumentation for RAPID alpha assay of water, soil, smears, and air filter samples. Also offered is a line of position-sensitive proportional counters for x-rays and neutrons. Custom instruments are a specialty!

**ORISE** *Booth 532*

Photographic display and catalogs of the training activities in the health physics training classes offered.

**OXFORD INSTRUMENTS INC** *Booths 219, 221, 223*

Oxford Instruments Inc, Nuclear Measurements group is a manufacturer of nuclear counting systems. Product lines include gamma and alphaspectroscopy systems, low level alpha and beta counting systems, NIM, and educational counters.

**PACKARD INSTRUMENT COMPANY** *Booth 528*

Packard Instrument Company manufactures Tri-Carb® low level liquid scintillation counting (LSC) systems for environmental and radioactive waste sample analysis from <sup>3</sup>H to <sup>90</sup>Sr/<sup>90</sup>Y, including simultaneous total alpha-total beta analysis.

**PICODAS GROUP INC.** *Booth 435*

Airborne and truckborne "Radiation Footprinting" of areas producing, storing, using or being exposed to nuclear materials.

**PRINCETON GAMMA-TECH INC** *Booth 109*

PGT will display nuclear products-detectors, lab coolers.

**PRO-TEM INC** *Booth 101*

Cost effective, client-server information solutions for the Energy Industry. Health Physics products include modular systems from the ARACS access control system to PRORAD for complete health physics management. Hands-on demonstrations.

**PROTEAN INSTRUMENT CORP** *Booth 400*

Automatic Ultra Low-Background Alpha/Beta Counting Instrument; Automatic Alpha/Beta Air Filter Counting System with Air Pumps; Manual Windowless Alpha/Beta Counter.

**QUANTRAD SENSOR** *Booth 236*

Development, design and manufacture of components and systems for the detection and analysis of alpha, beta, and gamma radiation. Products include Si detectors, NaI detectors and a truly portable "Scout" MCA.

**RAD ELEC INC** *Booth 309*

Rad Elec offers the E-PERM® System for accurate, effective passive radiation monitors with electret ion chamber technology.

**RADCAL CORP** *Booth 416*

Radcal manufactures and markets a wide variety of products for x-ray QA and compliance. Our ionization chambers cover 10Kev to 6Mev and 0.01 NR to 1.4 MR.

**RADIATION DETECTION COMPANY** *Booth 107*

TLD and film dosimetry service

**RADIATION SAFETY ASSOCIATES** *Booth 303*

Radiation surveys, assessments and plans; decontamination and decommissioning, radiochemical analysis; publications and software for healthphysicists

**RADOS TECHNOLOGY INC** *Booth 439*

Rados Technology is one of the leading companies in contamination monitoring and dosimetry systems with representatives in virtually every country with a nuclear presence.

**RSO INC** *Booth 204*

RSO, inc. is a full service health physics company. Visit our Web Site at: <http://www.us.net/nicosoft/rso>

**SAFE TRAINING SYSTEMS LTD.** *Booth 238*

STS designs and manufactures simulators for radiation monitoring training: 800 series for surface contamination, 900 series for radiation field measurements including dosimeters; plumes system for airborne fallout training.

**SAIC/RADeCO** *Booths 128, 130*

SAIC RADeCO provides a complete line of quality products and services including: RADeCO air samplers, air flow calibrators, portable alpha analyzers, calibration services, alarming dosimeters, personnel contamination monitors, radioiodine sampling cartridges, radiation monitoring systems, training and consulting services.

**SCINTECH** *Booth 305*

**S E** *Booth 216*

**INTERNATIONAL INC**

Handheld ionizing radiation detection and monitoring equipment including survey meters, monitors, dosimeters, and fixed or remote systems.

**SEG** *Booth 105*

**SIEMENS** *Booth 200*

**DOSIMETRY SERVICE/ICN**

Siemens Dosimetry Service exhibits a complete line of film badges, TLD badges, track etch dosimeters, electronic alarming dosimeters and fast neutron bubble detectors.

**SPECTRUM SCIENCES, INC** *Booth 323*

Low background Alpha/Beta counting systems, nuclear spectrometers, DOSICARD (personal dosimeter), Silicon & Germanium detectors and a complete line of health physics instruments.

**TECHNICAL ASSOCIATES** *Booth 235*

Current version of health physics equipment includes sensitivity to EP levels, tritium monitoring equipment and recent advances in micro processor controls.

**TELEDYNE BROWN ENGINEERING** *Booth 228*

TLD systems, TLD badge service, NaI Scintillation Detectors, Radiological Services

**TGM DETECTORS INC** *Booth 335*

Radiation Detectors for every application. GM tubes BF3 and He3 Neutron Detectors, Fission and Ion Chambers and X-ray proportional counters that will meet your design needs.

**THE SOURCE INC** *Booth 138*

Calibration standards traceable to NIST for nuclear measurement instruments.

**THERMO NUCLEAR SERVICES** *Booth 328*

**THOMAS GRAY & ASSOCIATES, INC.** *Booth 201*

Processing and disposal of LLRW, mixed waste, sealed sources, NORM & NARM waste, decay in storage, transportation, health physics services.

**US DEPARTMENT OF ENERGY/ ENVIRONMENTAL MANAGEMENT PROGRAM** *Booths 302, 304*

The Department's EM exhibit highlights some of the technologies being used to address environmental contaminants. This Program manages the treatment, storage, and/or disposal of waste resulting from nuclear weapons production.

**US ECOLOGY INC** *Booth 215*

Brokerage services including processing and disposal of LLRW and mixed waste, field services including remediation projects.

**US NUCLEAR REGULATORY COMMISSION** *Booth 438*

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.

**VICTOREEN INC** *Booth 312*

**WALLAC INC** *Booth 518*

**WILLIAMS AND WILKINS** *Booth 306*

**YANKEE ATOMIC ELECTRIC CO.** *Booth 500*

Environmental laboratory services, TLD processing services, decommissioning, general health physics services, auditing (ISO 14000), and Nuclear Engineering services.

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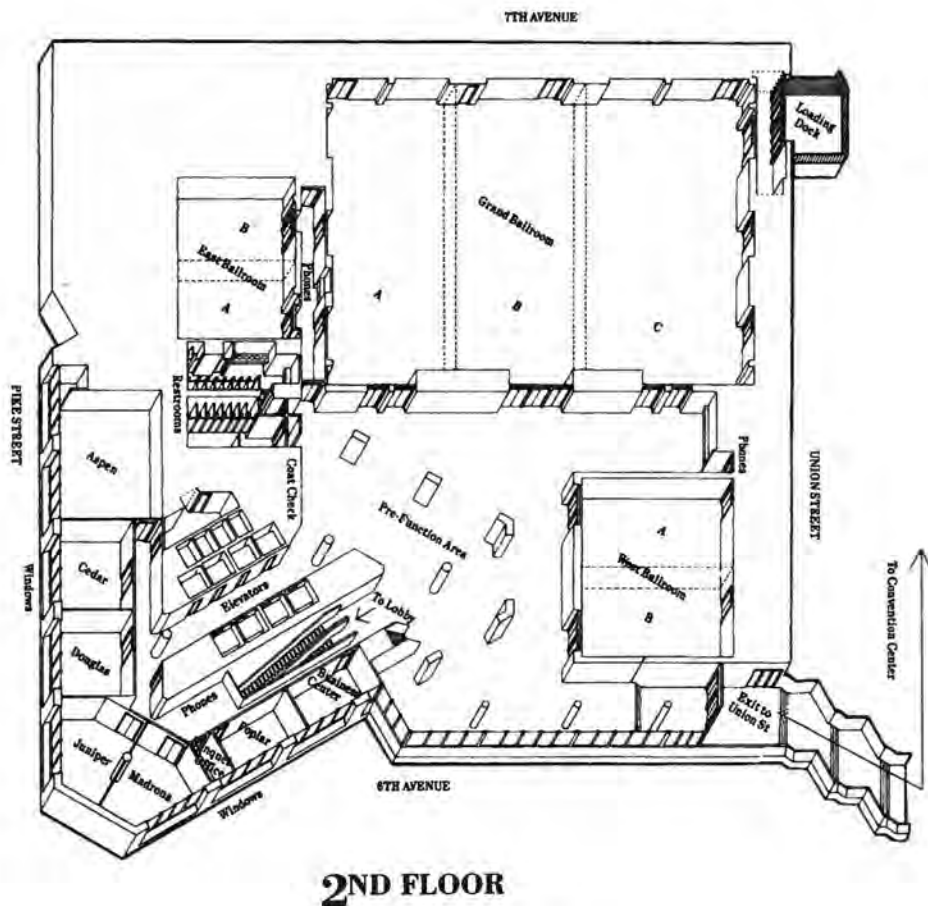
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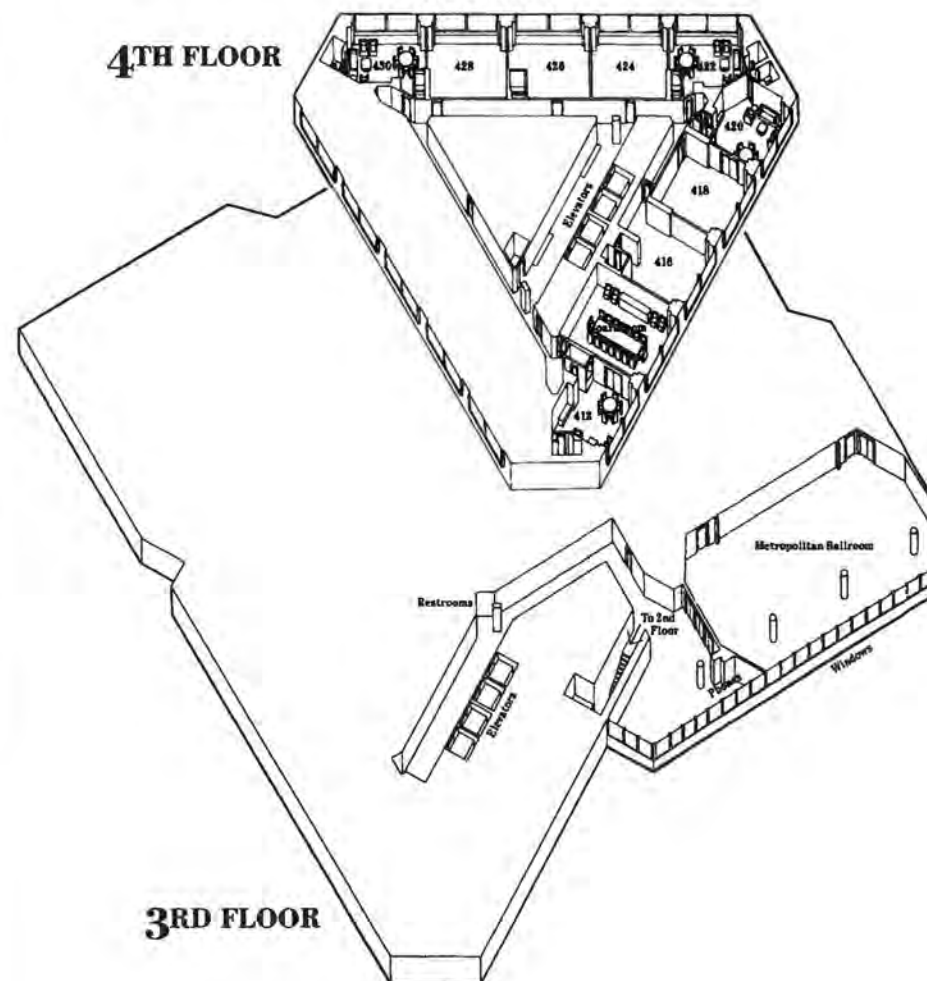
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 Zhu, M., TAM-A.20  
 Zimbrick, J. D., THAM-E.6  
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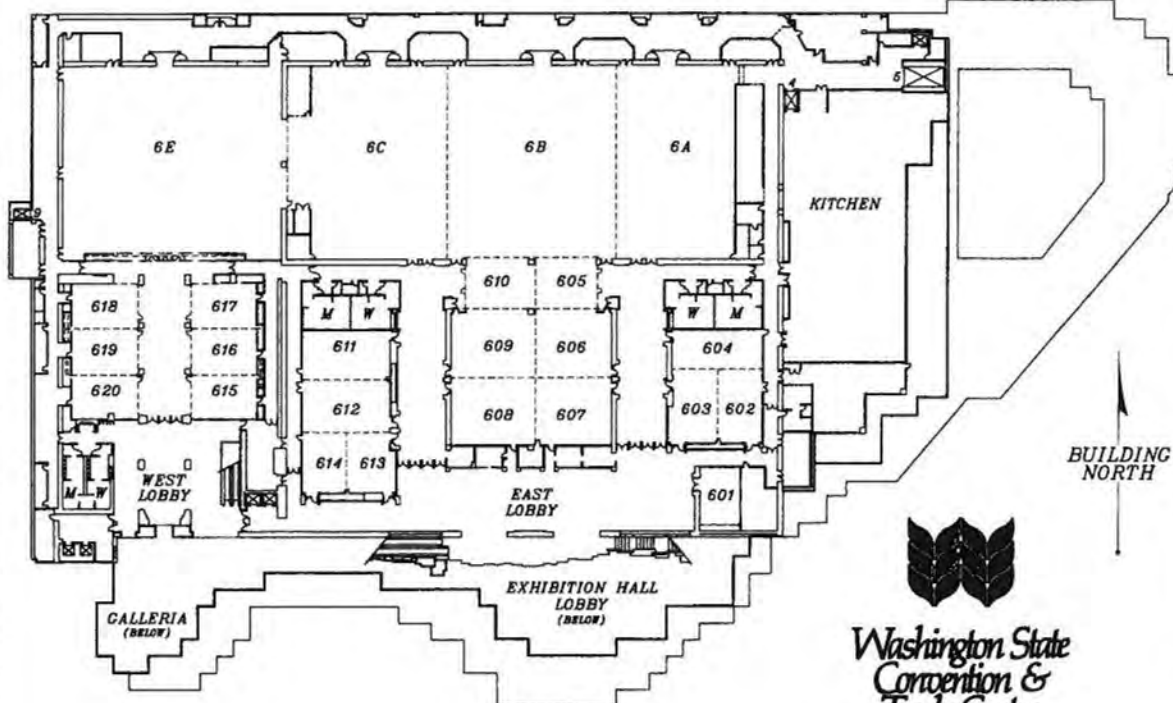
**Seattle Sheraton Hotel**  
**2nd Floor**



**Seattle Sheraton Hotel**  
**3rd (Metropolitan Ballroom) & 4th Floors**



# Washington State Convention Center Meeting Rooms, Level 6



Washington State  
Convention &  
Trade Center

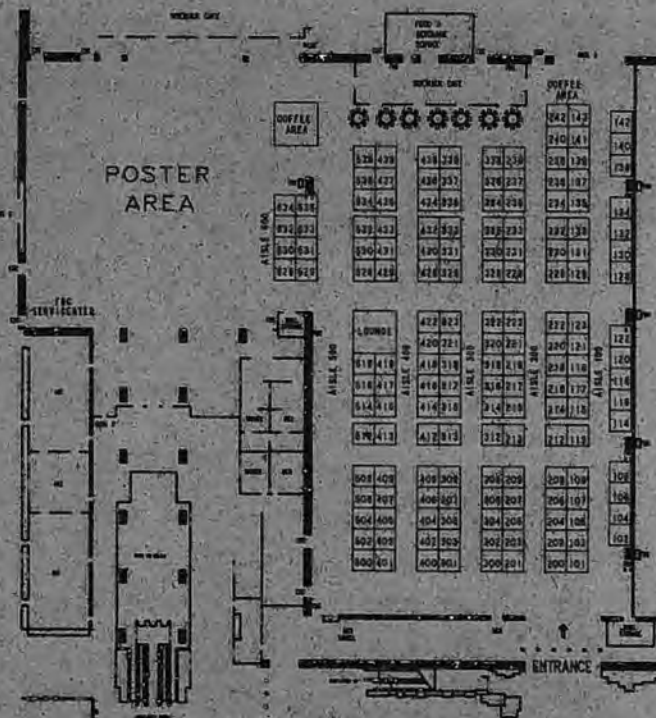
## MEETING ROOMS LEVEL 6

Sunday, July 20		Monday, July 21		Tuesday, July 22	
<b>AAHP I. Health Physics at Research Reactors</b> 8 am-5 pm Sheraton Hotel		<b>Continuing Education Lectures</b> CEL-1 Recent Developments in Radiation Litigation 7:15-8:15 am Rooms 606/607		<b>Continuing Education Lectures</b> CEL-3 Skin Injuries and Dose Estimation for Subacute Fluoroscopic Procedures 7:15-8:15 am Rooms 606/607	
<b>AAHP II. The Basic DOT/NRC Nuclear Transportation Regulations</b> 8 am-5 pm Sheraton Hotel		<b>CEL-2 Status of Low Level Radioactive Waste Shipment</b> 7:15-8:15 am Rooms 606/609		<b>CEL-4 TBA</b> 7:15-8:15 am Rooms 606/609	
<b>AAHP III. Health Physics Records Management</b> 8 am-5 pm West Room B Sheraton Hotel		<b>MAM-A Primary Session</b> 8:45 am-Noon Rooms 6A/6B		<b>TAM-A Student I</b> 8:30 am - 12:15 pm Room 6B	
<b>PEP Courses</b> 1-A thru 1-3 2-A thru 2-1 3-A thru 3-1 Rooms: TBA Sheraton Hotel 8 - 10 am 10:30 am-12:30 pm 1:30-3:30 pm		<b>Professional Enrichment Program</b> 12:15-2:15 pm Rooms 6A/6B		<b>TAM-B P-32 Incidents at NRT and NHT</b> 8:30 - 11:30 am Room 6A	
		<b>M-1 Introduction to Gamma Processing Technology</b> M-2 A Review of Compliance Issues for Medical Licensees M-3 Lower Limits of Detection M-4 Introduction to Instrumentation to Measure Non-Ionizing Radiation and Fields M-5 Industrial Hygiene Air Sampling Methods and Applications M-6 External Beta Ray Dosimetry		<b>TAM-C External Dosimetry</b> 8:30 - 11:30 am Rooms 6A/609	
		<b>M-7A The Effects of Downsizing on Medical Regulation - Sponsored by the HPS Government Section</b> 2 - 6:15 pm Room 6A M-7B Waste Management/Decommissioning 2:30 - 5:15 pm Rooms 606/607 M-7C Risk Analysis 2:30 - 4:30 pm Exhibit Hall		<b>TAM-D Instrumentation I</b> 10 - 11:30 am Exhibit Hall TAM-E Computer Applications I 9:30 - 10:30 am Exhibit Hall TAM-F Multi-Agency Radiation Survey and Site Investigation Manual (MARSIM) Update 8:30 - 11 am Rooms 606/607 Accelerator Section Business Meeting 11:30 am - 12:30 pm Room 6A	
<b>Note: All events will take place in the Washington State Convention Center except when noted otherwise.</b>		<b>Professional Enrichment Program</b> 12:15-2:15 pm		<b>T-1 Internal Dosimetry and Part 20</b> T-2 The Effects of Ionizing Radiation on the Developing Embryo: Estimating Risks and Providing Appropriate Counseling T-3 Conducting the MQSA/ACR Mammographic Unit Physics Survey: A Practical Approach T-4 Technical Writing: How to Get Your Work Published! T-5 Tips and Tricks for Surveyors at Levels Near Background T-6 Revision to ANSI N43.1 Guide to Monitoring Radioactive Substances from Streets and Direct Facilities	
		<b>TPM-A Student II</b> 2:30 - 5 pm Room 6B		<b>TPM-B Politics of Waste</b> 2:15 - 5:15 pm Room 6A	
		<b>TPM-C Medical Health Physics</b> 2:30 - 5 pm Rooms 606/607		<b>TPM-D Instrumentation II</b> 3 - 4 pm Exhibit Hall	
				<b>TPM-E Computer Applications II</b> 2:30 - 3:30 pm Exhibit Hall	



## 1996 Exhibitors

1997 ANNUAL MEETING -SAN ANTONIO, TX	Booth 302	GE REUTER-STOKES INC	Booth 534
1997 MIDYEAR MEETING -SAN JOSE, CA	Booth 431	GTS DURATEK	Booth 142
1997 INTL CONFERENCE ON RADIATION DOSIMETRY & SAFETY	Booth 103	HALLIBURTON NUS CORP	Booth 202
3M OCCUPATIONAL HEALTH & ENVIRONMENTAL SAFETY	Booth 234	HP INSTRUMENTS	Booth 313
3M	Booth 232	HPS PUBLICATIONS	Booths 115, 117
AMERICAN ACADEMY OF HEALTH PHYSICS	Booth 434	HELGESON	Booth 414
ADCO SERVICES INC	Booth 429	SCIENTIFIC SERVICES	
AIL SYSTEMS INC.	Booths 320, 322	HI-ENVIRONMENTAL PRODUCTS CO	Booth 213
ALPHA SPECTRA	Booth 418	HOLADAY INDUSTRIES	Booth 308
AMERSHAM CORP	Booths 240, 242	ICN DOSIMETRY SERVICES	Booth 301
ANALYTICAL RESOURCES INC.	Booth 122	ISOTOPE PRODUCTS LABORATORIES	Booths 203, 205, 207, 209
ANALYTICS INC	Booth 113	JL SHEPHERD & ASSOC	Booths 536, 538
APFEL ENTERPRISES INC	Booth 530	LANCS INDUSTRIES, INC	Booth 300
APTEC NUCLEAR INC	Booths 206, 208	LANDAUER INC	Booths 337, 339
BATTELLE, PNNL	Booths 212, 214	LND INC	Booth 412
BECTON DICKINSON	Booth 129	LUDLUM	Booths 420, 422
DIAGNOSTIC INSTRUMENT SYSTEMS		MEASUREMENTS INC	
BKRONNE	Booths 104, 106, 108	MGP	Booth 218
BIONOMICS INC	Booth 329	INSTRUMENTS, INC.	
BUBBLE TECHNOLOGY INDUSTRIES	Booth 428	MJW CORPORATION INC	Booth 437
CANBERRA INDUSTRIES INC	Booths 529, 531, 533, 535, 628, 630, 632, 634	MOHAWK	Booth 123
CHEMCEK INSTRUMENTS	Booth 436	INDUSTRIAL & NUCLEAR SUPPLY	
CONSULTEC SCIENTIFIC	Booth 143	NATIONAL NUCLEAR CORP	Booth 229
DA SERVICES	Booth 141	NFS RADIATION PROTECTION SYSTEMS	Booth 222
DOSIMETER	Booth 102	NORTH AMERICAN SCIENTIFIC	Booths 334, 336
DOSITEC INC	Booth 433	NORVELL PROT CLOTHING MFGS	Booth 338
EEERLINE	Booths 330, 231	NRRPT	Booth 139
INSTRUMENTS		NUCLEAR FUEL SERVICES	Booth 220
EG&G NUCLEAR INSTRUMENTS	Booths 413, 415, 417, 419, 512, 514, 516	NUCLEAR MEASUREMENTS	Booth 237
EUCLID GARMENT MFG CO	Booth 114	NUCLEAR MEDICINE	Booth 408
EXPLORANUM	Booth 217	RES. COUNCIL & WORKING GRP	
F&J SPECIALTY PRODUCTS	Booth 230	NUCLEAR NEWS/ RADWASTE MAGAZINE	Booth 321
FEMTO-TECH INC	Booth 239	NUCLEAR RESEARCH CORP	Booths 401, 403
GAMMA PRODUCTS INC	Booth 508	ORDELA INC	Booth 409
		ORISE	Booth 532
		OXFORD	Booths 219, 221, 223
		INSTRUMENTS INC	
		PACKARD	Booth 528
		INSTRUMENT COMPANY	



PICODAS GROUP INC.	Booth 435	SPECTRUM SCIENCES, INC	Booth 323
PRINCETON	Booth 109	TECHNICAL ASSOCIATES	Booth 235
GAMMA-TECH INC		TELEDYNE BROWN ENGINEERING	Booth 228
PRO-TEM INC	Booth 101	TGM DETECTORS INC	Booth 335
PROTEAN INSTRUMENT	Booth 400	THE SOURCE INC	Booth 138
QUANTRAD SENSOR	Booth 236	THERMONUCLEAR SERVICES	Booth 328
RADELEC INC	Booth 309	THOMAS GRAY & ASSOCIATES, INC.	Booth 201
RADCAL CORP	Booth 416	US DEPARTMENT OF ENERGY/ENVIRONMENTAL MANAGEMENT PROGRAM	Booths 302, 304
RADIATION DETECTION COMPANY	Booth 107	USECOLOGY INC	Booth 215
RADIATION SAFETY ASSOCIATES	Booth 303	US NUCLEAR REGULATORY COMMISSION	Booth 438
RADOS TECHNOLOGY	Booth 439	VICTOREEN INC	Booth 312
RSO INC	Booth 204	WALLAC INC	Booth 518
SE INTERNATIONAL	Booth 216	WILLIAMS AND WILKINS	Booth 306
SAFE TRAINING SYSTEMS LTD.	Booth 238	YANKEE ATOMIC ELECTRIC CO.	Booth 500
SAIC/RADCO	Booths 128, 130		
SEG	Booth 105		
SIEMENS	Booth 200		
DOSIMETRY SERVICE/ICN			

Saturday, July 20

**AAHP I** Health Physics at Research Reactors  
8 am-5 pm East Room  
Sheraton Hotel

**AAHP II** The Basic DOT/NRC Nuclear Transportation Regulations  
8 am-5 pm Aspen Room  
Sheraton Hotel

**AAHP III** Health Physics Records Management  
8 am-5 pm West Room B  
Sheraton Hotel

**Continuing Education Lectures**

**CEL-1** Recent Developments in Radiation Litigation  
7:15-8:15 am Rooms 606/607

**CEL-2** Status of Low Level Radioactive Waste Siting  
7:15-8:15 am Rooms 608/609

**MAM-A** Plenary Session  
8:45 am-Noon Rooms 6A/6B

**Professional Enrichment Program**  
12:15-2:15 pm

**M-1** Introduction to Gamma Processing Technology

**M-2** A Review of Compliance Issues for Medical Licensees

**M-3** Lower Limits of Detection

**M-4** Introduction to Instrumentation to Measure Non-Ionizing Radiation and Fields

**M-5** Industrial Hygiene Air Sampling Methods and Applications

**M-6** External Beta Ray Dosimetry

**MPM-A** The Effects of Downsizing on Medical Regulation - Sponsored by the HPS Government Section  
2-5:15 pm Room 6A

**MPM-B** Waste Management/Decommissioning  
2:30-5:15 pm Rooms 606/607

**MPM-C** Risk Analysis  
2:30-4:30 pm Exhibit Hall

**Continuing Education Lectures**

**CEL-3** Skin Injuries and Dose Estimation for Selected Fluoroscopic Procedures  
7:15-8:15 am Rooms 606/607

**CEL-4** TBA  
7:15-8:15 am Rooms 608/609

**TAM-A** Student I  
8:30 am-12:15 pm Room 6B

**TAM-B** P-32 Incidents at MIT and NIH  
8:30-11:30 am Room 6A

**TAM-C** External Dosimetry  
8:30-11:30 am Rooms 608/609

**TAM-D** Instrumentation I  
10-11:30 am Exhibit Hall

**TAM-E** Computer Applications I  
9:30-10:30 am Exhibit Hall

**TAM-F** Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Update  
8:30-11 am Rooms 606/607

**Accelerator Section Business Meeting**  
11:30 am-12:30 pm Room 6A

**Professional Enrichment Program**  
12:15-2:15 pm

**T-1** Internal Dosimetry and Part 20

**T-2** The Effects of Ionizing Radiation on the Developing Embryo: Estimating Risks and Providing Appropriate Counseling

**T-3** Conducting the MQSA/ACR Mammographic Unit Physicists Survey: A Practical Approach

**T-4** Technical Writing: How to Get Your Work Published!

**T-5** Tips and Tricks for Surveys at Levels Near Background

**T-6** Revision to ANSI N18.1 Guide to Monitoring Radioactive Substances from Stacks and Ducts Facilities

**TPM-A** Student II  
2:30-5 pm Room 6B

**TPM-B** Politics of Waste  
2:15-5:15 pm Room 6A

**TPM-C** Medical Health Physics  
2:30-5 pm Rooms 606/607

**TPM-D** Instrumentation II  
3-4 pm Exhibit Hall

**TPM-E** Computer Applications II  
2:30-3:30 pm Exhibit Hall

Sunday, July 21

**PEP Courses** Rooms: TBA  
Sheraton Hotel

1-A thru 1-J 8-10 am

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

3-A thru 3-J 1:30-3:30 pm

*Note: All events will take place in the Washington State Convention Center except when noted otherwise.*