The HEALTH PHYSICS SOCIETY'S Newsletter

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IN THIS ISSUE

In-Plant Health Physicists Remember TMI-2

Mary Walchuk

Ask people what they remember about the accident at the Three Mile Island Unit 2 (TMI-2) nuclear power plant on 28 March 1979 and they will unhesitatingly provide you with a variety of responses. The accident concerned people all over the United States, especially those working in the field of health physics. Twenty years after the accident, it is interesting to hear how clear the memories of the experience still remain for those who were working at TMI and to see through their eyes the impact the accident had on health physics and nuclear power.

Dick Dubiel was the Supervisor of Health Physics and Chemistry at TMI at the time of the accident. "The core damage was first detected at around 6:50 a.m." he recalled. "The accident had started just after 4:00 a.m., and for practical purposes had reached the end point within minutes. That end point was operating with a steam void in the core and not providing adequate cooling. There were no indications of actual core temperature or whether we had reached saturation temperature. The plant continued in the condition for more than two hours. I had been asked by the station superintendent to follow up on a report from the chemistry technicians that the boron levels in the coolant were decreasing. The primary sampling system for TMI-2 was in the same room as that for TMI-1 and was physically located in Unit 1. While taking a second sample of the coolant to verify the boron levels, we heard an area radiation monitor alarm in the hot machine shop that was located behind the sample room. There was no one in the room, and the doors were locked. While waiting at the door for a technician to get bolt cutters to gain access to the room, I remembered that the sample lines from TMI-2 ran unshielded through that area and were about 12 feet in the air. I held a radiation monitor and noted that the level at my waist was 400 mR h^{-1} and rising slowly. I turned toward the lines and raised the meter. The radiation levels quickly jumped to greater than 1 R h^{-1}. I ran back to the health physics control point and paged the control room. I was informed by others that my page of the superintendent was heard throughout the plant. The excitement in my voice caused many to pick up the line. That apparently was how many in the plant came to know that the core damage was occurring and that we were not in a normal post shutdown situation."

Bev Good was an environmental scientist in the Radiation Safety and Environmental Engineering Department at the corporate headquarters

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EDITORIAL

Hints on How to Commemorate the 20th Anniversary of TMI-2

On 28 March, should you wish to commemorate the 20th anniversary of the Three Mile Island Unit 2 (TMI-2) nuclear power plant accident in a proper fashion, you will first need to get up at 4 a.m. Pull out your file of data, newspapers, photos, and/or journal articles. Ask yourself how this event changed your life.

If you need help in bringing back the memories, this *Newsletter* issue will help you. Most of this issue is centered on the TMI theme. We have chosen not to go into a complete "how it all happened" story. Instead, we are concentrating on the human interest aspects of the event.

Our cover story brings out the in-plant health physics actions and reactions—a story we seldom hear. President Dinger uses his monthly column to tell his TMI-2 tale. Following are pages of recollections from other health physicists. Some of these came in response to our invitation in the January *Newsletter* where we set a 300-word limit. Others are responses that I solicited from especially involved people. I allowed these to run somewhat longer. These stories span the range from dramatic to romantic.

Scattered about the issue are short quotes and photos. My favorite quote is the one-liner from Maggie Reilly: "The day got started on the wrong foot." Many of the photos are courtesy of Bechtel Nevada.

As I reflect on these bits of information, my overwhelming reaction is that it worked. The containment building contained the crisis. The nuclear engineers and the health physicists responded calmly and intelligently. The accident did not affect the environment or the health of the people. In fact, lessons learned from the accident have been applied to improve the entire nuclear industry.

So where are the cheers from the public and media, thanking us for the successful response to the accident? Maybe I should have studied psychology instead of physics.

Gen Roessler

At the Health Physicist Bar

From the President

Ahh! I Remember It Well!

I really couldn't be bothered that Wednesday morning, 28 March 1979, when someone came into my office with a hint of excitement in his voice to ask if I had heard that a nuclear power plant had a serious accident early in the morning. As Director of Radiation Health at the Portsmouth Naval Shipyard, I was facing annual and quarterly report deadlines, was still trying to gather the latest batch of material requested by the National Institute of Occupational Safety & Health to support the on-going worker study, had a training session later in the day with some concerned radiation workers, and was very concerned about finding time to prepare for my Certification Oral Exam which was to take place in less than three months at the Health Physics Annual Meeting in Philadelphia. I was too busy to be bothered by the media's latest attempt to blow a minor incident at a nuclear power plant out of proportion! Of course, I was, once again, wrong.

I received a conference call at home a couple of days later from Murray Miles, Admiral Rickover's Division Head responsible for radiological controls in the Naval Nuclear Propulsion Program (NNPP). The Nuclear Regulatory Commission (NRC) had requested that the Admiral provide some assistance for health physics (HP) support in-plant. There was a group of NNPP-associated health physicists and engineers from Electric Boat Shipyard under contract to Metropolitan Edison, to provide in-plant HP support. They were called the HP Support Group and they wanted some more NNPP-trained people to augment them in the early going. The Admiral agreed to loan to the NRC six people for four weeks and I was asked if I would be the HP to represent the Admiral. (The other representatives were primarily radiological engineers to help with ALARA planning, waste issues, etc.)

I arrived the evening of 4 April, having flown into Harrisburg and rented a car. I didn't know what to expect, but I didn't expect the sight that greeted me as I rounded the last curve on SR 441 coming up to the plant. There on the left was an entire city of trailers, ablaze with lights and bustling with hundreds of people moving about purposefully, complete with helicopters flying overhead. Someone else had shown up too! I was checked in and sent to see the NRC Officer-in-Charge, Victor Stello. When I introduced myself to him in his hot trailer, he interrupted his conversation with a couple of assistants and said, "So, you're one of the Admiral's boys that's going to save the day? Well, go to Trailer (I forget the number) and get started. And thanks for coming." I didn't really like the welcome.

I went to work for the HP Support Group and realized I had the pleasure to be working with some of the best HPs and engineers I had ever met. In particular, the group leader, **Bill Grabor**, and the lead HP, **Tom Peterson**, were outstanding. While there I worked on HP projects supporting the in-plant radiological control response including setting up single channel analyzers at the control points to screen sample cartridges and swipes for ^{131}I, projecting into the future the isotopic mixes of contaminated materials based on the first primary coolant sample results, receipt inspecting new Particulate Iodine Noble Gas air samplers; assisting Radiation Management Consultants with the setup of the Helgeson mobile whole-body counting trailers, and writing procedures for self-frisking with a pancake probe and scaler.

Now, 20 years later, I am just left with impressions, more than exact memories. These include 14-hour working days; every meal in a large canvas tent served military style; walking through the plant with a cartridge respirator in a green bag tied to your belt, waiting for the alarm and announcement to put it on; and every evening checking the latest environmental radiation readings posted in the Observation Center and being thankful the genie was still in its bottle.

I also remember a TMI HP commenting because I was wearing a film badge and he wondered when "the Navy" was going to get up-to-date TLDs. (We had used TLDs for over five years, but they were not designed to respond to radiation associated with a large core melt.) In return, I wondered if he knew that "the Navy" had never had a reactor accident.

This was my first real introduction to the world of health physics outside the Shipyard environment. Although the general "culture" was different (much less prescriptive and generally more permissive), I was certainly impressed with the talent and professionalism of the many HPs I met and worked with in that short period of time. These experiences and associations have certainly played an important part in my development in this still exciting profession of Health Physics.

I still have my yellow and magenta T-shirt with the mushroom cloud over the cooling towers that says "I Survived Three Mile Island—Spring 1979."

Keith H. Dinger, CHP

[COVER, continued from page 1]
of Metropolitan Edison Company (operator of TMI in 1979). At the time of the TMI-2 accident, she was assigned to support health physics supervision during the TMI-1 refueling outage, and her emergency plan assignment was to provide support to the dose assessment and field monitoring efforts. "When I first arrived at TMI's north gate entrance for work that morning and found the gate closed, I was concerned that I was going to be late for a meeting," Good said. "I had come prepared for the meeting with a dozen sugar doughnuts. I soon learned that TMI had declared a General Emergency. I was instructed to report to the health physics laboratory. Later that day, I reported to the TMI-2 Control Room.

Radiological Controls Foreman Pete Velez, right, escorts Pennsylvania Governor Thornburgh and President Jimmy Carter on a tour of TMI shortly after the accident.

"At first, health physics personnel supervised dose assessment and field monitoring from the TMI-2 Control Room. Later, health physics personnel conducting this work moved to the TMI-1 Control Room. Everyone in the control room was very focused on the jobs they had to do. Staff conducted themselves in a highly professional manner. That first day was very long.

"We were wearing respirators as a precautionary measure for a period of time until we could get air samples properly analyzed. We didn't have any food or water for hours and wished we had the doughnuts I left in my car.

"When I left the plant to go home for a few hours of sleep, there was a big difference between what I knew was taking place at the plant and what was being portrayed by the news media."

Good wasn't the only person disturbed by the way the media was handling reports of the accident. "My most vivid memory of the TMI accident was the media coverage that sensationalized the event and ultimately created stress and fear among the public," commented Dave Ethridge, who was then a Radiation/Chemistry Technician at TMI. Pat Donnachie, also a Radiation/Chemistry Technician at the time, also remembers the radiation mania created by the media. "It was interesting to compare what was actually happening in the plant to the imagined news reports of what was happening," he said. "This produced fear, stress, and confusion to members of the public as well as for my friends and family. So much so, that on day three following the accident I came home to find my wife and small children ready to evacuate the area. The rest of the neighborhood had a watch on my house as to whether we evacuated. Fortunately, reason prevailed and I was able to allay my family and friends' fears."

Another strong memory is that of the teamwork involved in handling the accident. "I remember how dedicated, focused, and resourceful the staff at TMI truly was," said Pete Velez, who was the Radiological Controls Foreman assigned to TMI-1. "I also remember how the nuclear industry came together to support TMI and help in overcoming the challenges that followed."

"There was an unusual level of cooperation throughout the nation," added Mike Slobodien, who was a radiation specialist in the Region I office of the U.S. Nuclear Regulatory Commission (NRC). "For example, when the NRC put out a call for lead shielding in anticipation of a great need (this was in the first few days after 29 March 1979) people from across the nation offered lead. We arranged for a consignment of lead from National Lead in Altoona, Pennsylvania, about 150 miles away. There was a Teamsters strike taking place and the State Police escorted a convoy of trucks from National Lead to TMI. "Everybody wanted to be part of the action. At the TMI site itself we had to literally send federal responders away."

"I remember the team that stepped forward and took control of the emergency response," commented Dubiel. "In the control room, things were very much isolated. We were outside the scope of most of our procedures, there was little real time technical data transmission to the outside world to allow for assistance and direction, resulting in little to no guidance to direct our actions. The

management team, headed by Gary Miller, stood up to the challenge and defined and implemented actions with a strong focus on the protection of the public and the employees within the plant. Many of those actions have become standards for emergency plans in nuclear plants today. My memory is of the strength and ability to respond under incredible stress of the management team around me and the calming, focusing influence of Gary Miller, the real hero of TMI.

"The response of the people at the Pennsylvania Bureau of Radiation Protection was also fantastic. Under the stress of the situation, it was so valuable to have people like Maggie Reilly and Tom Gerusky at the other end of the phone. I had developed a great deal of professional respect for them during the licensing process. I felt that they could not only understand the technical information, but understood the human issues inside and outside the plant, as well as the political environment. They did a lot to keep unnecessary pressures off of me and were supportive throughout. I'll always be thankful that they were our link to the state government."

"My view of the people who responded to the accident at TMI-2 is one of heroics," Dubiel continued. "I only hope that there will be recognition of the heroic efforts of those people who found themselves 'outside the envelope,' with a core that had substantial damage, with procedures that were no longer applicable, outside the bounds of the training program, without use of much of the installed instrumentation and little to no guidance from the outside world. Those individuals managed the event with a clear focus on the health and safety of the public and plant workers. I believe that analysis of on and off site doses establishes that their efforts were successful."

"However, I believe we as an industry missed a chance when we didn't emphasize enough the fact that the radiological impact from the worst nuclear accident on the public was minimal," Dubiel added. "That impact was far outweighed by the stress resulting from the panic caused by sensational reporting and poor decisions made far from the site. The industry in general has moved beyond reason in response to the regulatory changes that have occurred since the accident. The result is highly regulated nuclear plants in a deregulated utility industry, resulting in many plants being uneconomical to operate. Many of the regulatory changes were necessary, but I think we have gone too far."

Ethridge said he thinks the nuclear power industry learned a number of important lessons as a result of the accident. "In fact, INPO was born as a direct result of the accident and has been instrumental in bringing the industry to a new level of excellence," he stated. "Although we regret that the accident occurred, nuclear plants are demonstrably safer and more reliable 20 years later. The prime example is TMI-1, a world class plant in performance."

"The health physics community has also benefitted from the accident." Ethridge continued. "There were more than a dozen major independent health effects studies of the accident. All concluded there was no evidence of any excess cancers around TMI years after the accident. The only detectable effect was psychological stress during and shortly after the accident."

"The impact on health physics has been a powerful and positive one," agreed Dubiel. "Prior to the accident, I believe that health physics in a commercial nuclear plant was viewed as marginally necessary, i.e., a safety program for an inherently safe industry. Following the accident, there was a greater understanding of the importance of the program by other groups, and a better realization of how health physics can integrate into the station's activities and be a supportive organization while enhancing safety."

"The technical proficiency in health physics at the nation's commercial nuclear power plants was rather low in 1979 by today's standards," added Slobodien. "One thing that the accident prompted was a substantial upgrading of the technical capabilities in the radiation protection organizations at nuclear power plants. In the early years of commercial nuclear power plant operations through the 1970s, most power reactor health physicists learned their trade in the military (Navy) or through experience. Relatively few had formal health physics education. After the TMI accident, that changed substantially as more and more of the senior health physics staff members at power reactors had formal education as well as professional certification. At the time of the TMI accident it was unlikely you would find a certified health physicist (CHP) on a commercial nuclear power plant staff. Today such is much more common. In 1979 TMI may have had one CHP on staff. Today there are at least ten."

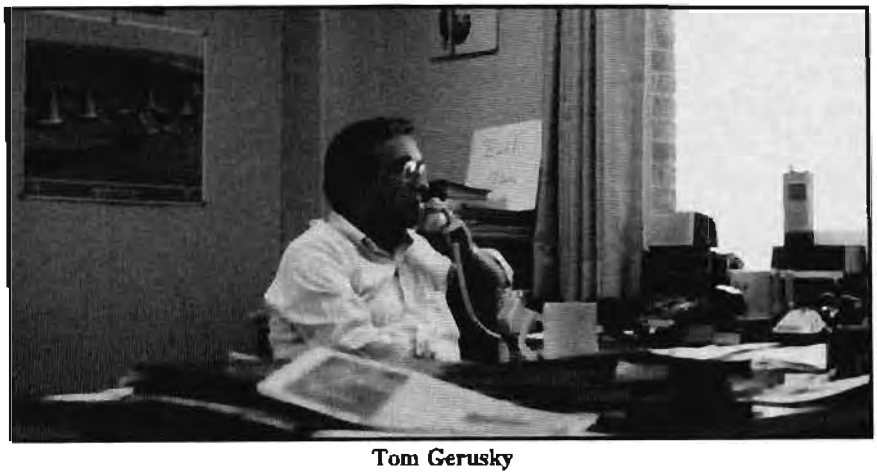
"The cleanup of the damaged nuclear reactor system at TMI-2 took nearly 12 years and cost approximately $973 million," Donnachie added. "This cleanup was developed and carried out safely. Even though the media still refers to this accident as the 'worst or most notorious,' based on over a dozen major, independent health studies, there were no proven radiation-induced health effects. Today, TMI-1, the sister to TMI-2, continues to operate as a world class performer after faithful application of the lessons learned from the TMI-2 accident. I hope, as a result of these lessons learned, there will never be another TMI-2 type accident." ■

Views from the Pennsylvania Radiation Protection Program

Thomas M. Gerusky, CHP

On 28 March 1979, a date I will never forget, I was Director of the Commonwealth of Pennsylvania's Radiation Protection Program. I had been in charge of that program since 1961.

A new administration under Governor Dick Thornburgh had just come on board and, like with every new administration, some changes were destined to be made. The Secretary of Environmental Resources had called me in and proposed that the regulatory part of our program (x rays and radium) be transferred to the Department of Health, since most of those activities involved the healing arts professions. I had fought successfully to keep the radiation protection program staff together when all of our activities were initially moved to the new environmental department in the early seventies. This time the arguments were falling on deaf ears.



Tom Gerusky

Then, I received a telephone call at approximately 7:00 a.m. on the morning of 28 March informing me that an accident had occurred at TMI-2, just a few miles south of Harrisburg. For the next 30 days, the radiation protection office was open 24 hours a day. Our whole staff responded in a qualified and professional manner. We interacted with the governor, giving him our advice on actions that needed to be taken and continually updating him and his staff on current events. We interacted with the utility by establishing an open telephone line between the reactor control room and our office. We interacted with other state and federal agencies in an attempt to coordinate the response to the accident. We kept the Legislature informed. We interacted with the public and the press in an attempt to keep everyone fully informed of what was happening. And we attempted to interact with the health physics community in the area and across the world.

As the emergency aspects of the accident wound down and the mundane problem of defueling and decontaminating TMI-2 became prominent, we continued to participate as representatives of the governor and the state. Initially, we set up with the NRC numerous public meetings to discuss the need to vent the ^{85}Kr from the reactor containment. We established additional environmental monitoring programs, reworked the emergency response plans, and served on the NRC's Citizen Advisory Board on the decontamination. We testified in numerous federal and state hearings on the accident and our response to it.

Our program gained respect in Pennsylvania. Legislation was passed to provide us with additional funds, responsibility, and staff. There was no more discussion on the proposal to split up the Radiation Protection Program.

Ray Urciuolo

The morning of the accident, Jim Kopenhaver and I headed by car from our downtown Harrisburg state office toward TMI to check things out. Our mission was to circle the island on both sides of the river, taking meter readings along the way. We had basic instrumentation, GMs which only went up to 50 mR h^{-1}, an alpha scintillator detector with an internal 1 R h^{-1} GM, and a survey meter with a 1" NaI crystal. Those kinds of things. No anti-Cs. No portable air samplers (not even a Hi Vol). I don't think we really expected to actually find anything. We were young and had unquestioning faith in our technology.

The instruments were turned on as we rode the elevator down from the fifth floor of the Fulton Bank building alongside the capitol complex in downtown Harrisburg. As we walked to the car, I noticed that the background was higher than it should be but dismissed it as a possible environmental effect of going from a warm building to the outside. As we started to follow the river toward Middletown and the Island, it began to dawn on us that the random chirping of the GM meter was no longer random. Readings were slowly increasing as we went. We had actually been detecting the accident in Harrisburg at the μR h^{-1} level.

We circled the plant for the next couple of days until federal support engulfed us and made our contribution insignificant. The measurements had not been that frightening, mostly in the 10ths of mR h^{-1}, though there

was a brief bubble of 5-14 mR h^{-1} that passed by the Observation Center on the east side of the river. Conventional theory says that even though we were seeing the very heavy gases of xenon and maybe krypton, the gases mix at ambient temperature and do not sink. However, from observation, detection was mostly confined to the riverbed and valleys. As we crossed the turnpike bridge to the north, or the valleys on the west side, the readings would rise and then fall away. It seems mixing, or the lack of it, played a greater role.

Events fade into the past now, but three small events stand out. A trailer village of support personnel and media grew up in the substation just south of the Observation Center. One morning as I walked from my car to attend a meeting, it was misting rain. I raised my umbrella under the canopy of high voltage wires far above. Upon hearing a crackling sound coming from the wire ribs of the umbrella, I quickly folded it back up and decided a little water never hurt anyone. Another day when the sky was clear, we had stopped in the parking lot behind the Observation Center to take a lunch break. While we were there, the aerial monitoring helicopters all came down at the same time in back of us about at the spot where the training center now stands. It was impressive. The third memory involves an end of a shift. I live 11 miles from the plant. I could detect the releases all the way home on Interstate 283 right up to my exit ramp a mile from the apartment. The chirping GM finally quieted down just as I got home.

I only saw a small part of the action. Sometimes I was answering phones, fielding calls. One woman called and asked if it was safe for her child to be at college. It turned out she was talking about a location north of Pittsburgh, over 200 miles away! Another morning, I spent babysitting a local legislator. He insisted that someone be assigned to him in case he needed a translation of the techno-babble. Politicians, news reporters, and the general population were all at a loss trying to understand most of what was said.

All in all, neither I nor my family suffered from the event. My son was one year old at the time; he had been subjected to a fetal bone x ray just before he was born because he was three weeks late in coming. Then he lived through this. The result was he skipped kindergarten, went on to be recognized in the national merit scholarship, and finished second in the Jeopardy Television College Tournament two years ago. My daughter was born a couple of years later and is just as intelligent, but she wears size 11 shoes.

Maggie Reilly, CHP

At the time of the accident, I was a health physicist in the Bureau of Radiation Protection (BRP) in the Pennsylvania Department of Environmental Resources (DER). My job was to run the group that handled emergency planning, environmental monitoring, the Rad Lab, and nuclear engineering (all nine of us). We were located in downtown Harrisburg, about ten miles from the Island. The Bureau had a reputation for radiological "firsts" among state rad programs.

Bill Dornsife, our duty officer for the month and sole nuclear engineer, notified me at home at a few minutes after 7:00 a.m. By the time I got to the office around 7:30, Tom Gerusky was getting the word that the situation had escalated to a General Emergency. By 8:00 a.m., based on operator dose projections and subsequent verification, we called for and then canceled a recommendation to evacuate downwind areas. What a way to start the day!

My role in the accident was as liaison with Pennsylvania Emergency Management, Health and Agriculture; the rest of DER; USDOE, NRC, EPA, HHS/FDA; and non-essential players. An unwritten role was to help kahunas avoid making dumb decisions.

There is at least one story behind each of the following observations:

- Reliable information and its communication to those who need it are all that matter in a crisis.
- Post-accident dose assessment is the best motive for maintaining extensive, passive environmental monitoring programs.
- Nothing beats a physical on-site presence for gathering reliable information.
- Negative data has the same dignity as positive data, a fact frequently forgotten.
- Some information/data will be bogus.
- Some people will behave better than your wildest dreams; some worse.
- Basic physical requirements of the responders need attention: things like eating, sleeping, and a change of clothes.

As one can imagine, I place events in my life as being before or after the accident. The same is true for radon, and graduate school, and so on.

The best recounting of the accident can be found in Mitchell Rogovin's *Three Mile Island—A Report to the Commissioners and to the Public*, Volume I (January 1980). It reads like a dime novel!

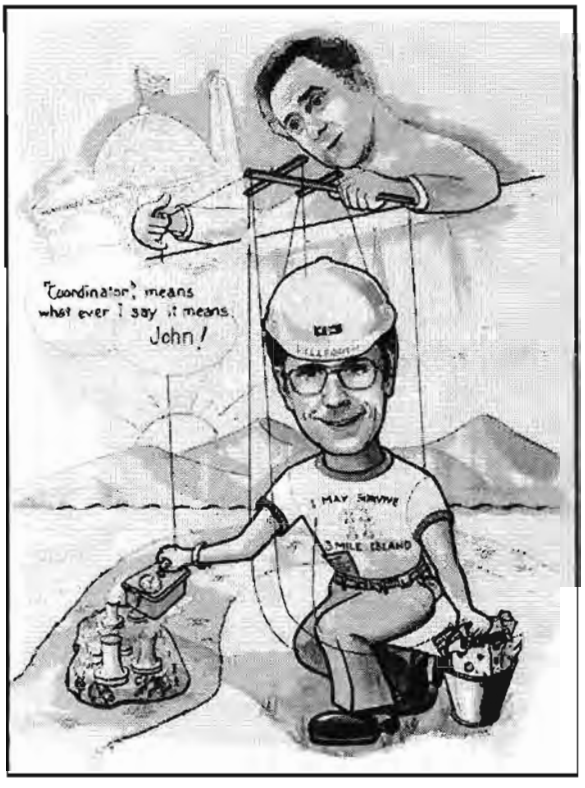
A bit of TMI trivia: the DOE project name for its response to the accident was "Ivory Purpose."

TMI Memories from the Health Physics World

John C. Villforth, CHP

Three Mile Island Accident: 20 years later

Over the years, the Food and Drug Administration (FDA), Department of Health, Education and Welfare (HEW) has been particularly effective in dealing with emergencies in products it regulates. It has assured the public on how to handle problems such as the deliberate cyanide poisoning in Tylenol or botulism-contaminated canned foods. Under the Federal Preparedness Agency's guidelines that existed in 1979, HEW was also responsible for establishing radiation safety limits for radioisotopes in foods. So FDA was prepared to swing into action and collect food samples around the TMI area.



Soon after I was alerted of the TMI problem by Tom Gerusky, Director of Pennsylvania's Bureau of Radiation Protection, I assumed (incorrectly) that considerable radioiodine and other fission products were probably released from the reactor containment. I asked FDA's District Office to move into action without specific instructions of what to collect, so I was a bit surprised that the samples they collected were items that were packaged well before the accident or produced outside of Pennsylvania—chocolate bars from supermarket shelves and fish from Norway, among others. Needless to say, the results were reassuring that no activity had escaped *before* the accident! However, it didn't take long before FDA was collecting and analyzing appropriate products, and by 30 days after the accident, about 1,300 milk, food, and water samples were analyzed at FDA's laboratory in Winchester, Massachusetts. Of all the samples collected, only 49 milk samples were found to contain measurable amounts of ^{131}I. Interesting was the fact that the results of this analysis at Winchester were transmitted electronically to FDA's computer in Rockville, as were the results of similar samples from the Environmental Protection Agency's laboratory in Montgomery, Alabama. Today with most of us using email, this electronic transmission of data doesn't seem so unusual, but it was for 1979. It was also an example of interagency cooperation that should be a model for future collaborations.

As the Director of FDA's Bureau of Radiological Health (BRH) at the time of the accident, I had been designated by the Secretary of HEW (now HHS), Joseph A. Califano, to be the coordinator of all the Department's activities related to the TMI accident. When Secretary Califano designated me to "coordinate" the Department's activities, it wasn't necessarily apparent to me what all was involved. It soon became clear as the events surrounding the accident unfolded. In addition to milk and food analysis, the Department was involved in off-site TLD measurements; the novel use of photographic film collected from stores around TMI, processed by Kodak, and read in BRH's laboratory as a type of dosimeter; the emergency procurement of KI to be distributed in the event the containment was breached; and providing an overall public health presence.

On the first anniversary of TMI, the BRH staff presented me with a caricature to remind me exactly what it was that Califano meant by "coordinate." You can see on the drawing that I have a bucket of food samples—including Hershey bars—to assure the public that there was no significant release of radioactivity.

RADM Jerome Halperin, USPHS (Retired)
Executive Vice President and CEO, US Pharmacopeia

KI at TMI

On Friday, 30 March, FDA received a call from Pennsylvania health officials for specific label information for the use of potassium iodide solution (KI solution) as a "radiation-blocking agent" to reduce the uptake of radioiodine in the event that the containment at TMI was breached. It was estimated that the drug might be needed within a 30-mile radius and would require 250,000 one-ounce dropper bottles of KI with proper instructions. Also, no one in industry had ever filed a New Drug Application for the use of KI solution or KI tablets as radiation-blocking agents. And drug industry leaders could hardly be expected to risk

possible negligence injury claims.

Because of my position at that time as Deputy Director of the FDA's Bureau of Drugs, I promptly moved to head up an FDA team to find a company and secure a supply of the drug for over one million people as quickly as possible. About eight tons of raw material were needed to produce this supply. My associates and I started working the phones and at midnight we contacted Mallinckrodt, Inc., in St. Louis and explained the problem to the security guard at the plant. Minutes later I was talking to a company official, who said that they could produce the material. At 3:00 a.m., with no formal contract, not even a handshake, I gave the go-ahead.

At 3:30 a.m., the plant manager had roused his crew. But there was a hitch: the company had the bottles, but they did not have the droppers, and since the normal adult dose is two drops for ten consecutive days, droppers were necessary. By Saturday afternoon, we found a manufacturer in New Jersey that agreed to supply the droppers. That night an Army truck picked up the droppers and rushed them to Harrisburg. About the same time, the first shipment (11,000 bottles) arrived in Harrisburg by an Air Force plane from Decatur, Illinois, Mallinckrodt's Pharmaceutical Division office.

I had to solve another problem: how to inform the people around TMI of the proper dosage and side effects. On Saturday afternoon I requested that the Department's printing crew return to work to print 250,000 patient information leaflets. Meanwhile, the Mallinckrodt plant manager informed me that he didn't have the technical facilities to fill all of the bottles fast enough. I immediately contacted Parke Davis in Detroit and that company agreed to help in the filling process. Hours later a chartered plane flew some of the KI solution in 55-gallon drums from Decatur to Detroit. Parke Davis chartered another plane on Sunday and started shipping its bottles to Harrisburg. By Tuesday night, 237,000 bottles were on hand in Harrisburg, as well as a sufficient quantity of patient information leaflets.

And who was the "official" manufacturer? FDA itself. For the first time in history, this emergency made FDA a manufacturer and this was indicated on the bottle label. We were able to satisfy—at least temporarily—all federal drug regulations. Soon thereafter, Pennsylvania health authorities judged that the health "emergency" was not an emergency after all and that the use of KI solution was not deemed necessary. It was great satisfaction that the FDA team and I were able to demonstrate that paperwork, legal issues, and cost were all considered secondary to meeting the crisis.

Andrew Grossman

Three Mile Island: Love Triumphs

Chris and I were walking down College Avenue; no, we were sitting in the outdoor patio of the Bistro Cafe on College Avenue, the closest thing I knew to an upscale establishment for lunch. The setting was State College, home of Pennsylvania State University, which we both attended. The date was somewhere in the spring of 1979. If I'm fuzzy on the details, it's because she and I had gone around and around for three years, talking about the same subject, and were both dizzy from the whirl.

"If you come with me, I will take you to beautiful places where we will lounge in each other's arms until time has no meaning." (I hoped she wouldn't reply, "Where, for instance?")

"But Steve needs me. He's really very gentle when he's not drinking. I know he will always be there for me. Romance and poetry are great, but . . ."

Yeah, yeah, yeah, I'd been hearing that line for three years, since the first day of Freshman English when I looked at her and something about her broken-tooth smile set off my extraordinarily easy-to-set-off love alarm. Three years and I still had not given up. Maybe if she had fixed the tooth, I would have retreated. She had been the focal point of at least three-quarters of my journal (it's not a "diary" if you write about "meaningful" stuff) entries.

I didn't think of her sexually. She was "The Other," the unattainable, and somewhere not too far from consciousness I was aware of wanting to avoid all the problems of "attaining" her. If she had been swayed by my efforts to win her, we would have had to find something to say to each other, something beyond the cryptic quasi-poetic utterances I could get away with currently. I might have to support her, since she wasn't the independent sort, and I had no idea at age 20 how to negotiate the world and no inclination to learn.

"Anyway," she said, "what's it matter? A nuclear reactor just blew up over at Harrisburg. We could all be dead by tomorrow if the wind blows right."

There were a lot of cars passing on College Avenue, she pointed out, with back seats full of boxes and suitcases. I couldn't see any difference in the traffic, but her words caused me about 30 seconds of fear. The image of a deadly white cloud blanketing Happy Valley flashed across my mind. I tried to guess how many valleys there might be in the 80 miles between where we sat and the reactor. Enough to slow it down, whatever it was, I decided.

"Don't worry, Chris, I'll get you out somehow. We'll go to the hills and learn to live by our hands."

"That would be wild," she said.

Sydney Porter, Jr., CHP

Day 1 of TMI Remembered—20 Years Later

March 28, 1979—I was in the Porter Consultants Inc. (PCI) office early, ~7:30 a.m., because I knew I would be at Salem Nuclear Generating Station most of the day to calibrate its fancy new Canberra gamma spectroscopy system. I was looking forward to that! Metropolitan Edison (MetEd) called me at ~8:00 a.m. to ask how to expand its offsite REMP (radiological environmental monitoring program) to the emergency phase. I was told there were low-level releases that were "under control" but "just to be safe." I spent the better part of an hour walking them through the details of the emergency REMP procedures I had written some seven or eight years earlier. Mike Buring of MetEd Corporate HP asked me to "stand by for a few hours." I called MetEd headquarters at ~10:30 a.m. and asked if I could go to Salem as per my original plans. Mike said, "Fine, things seemed to have settled down at TMI-2." I drove leisurely down to Salem Plant, stopping for lunch and arriving about 1:00 p.m.

> *"I spent the night of March 28 on the office floor, with a rolled up trench coat as a pillow. NRC headquarters staff called periodically for updates on milk data. One could tell when NRC HQ was calling because the voice was preceded by a beep, indicating that the call was being recorded. I also got the impression that they didn't realize that dairy animals can only be 'sampled' twice a day. Dairy farms use milking machines, not catheters."*
>
> *– Maggie Reilly*

I was greeted by the Salem main gate guard who said, "There is an emergency message for you in the Plant Superintendent's office." The message was from Gary Miller, TMI-2 Director. It said, "Things are bad. Come immediately. We are sending a helicopter for you." I called the TMI-2 control room shift supervisor's office—it took me ~20 minutes to get through to his unlisted number! Things at the TMI-2 control room were hectic. There was a release in progress. Everyone was giving 150 percent to understand the situation and what was really happening. Although the total radioactive effluent releases were well known, details of the entire release pathway took many weeks to sort out.

From time to time they were getting noble gases in the control room and had to wear respirators for a while. Because of the high background, all counting labs on site were useless. They were running low on respirator cartridges and their monitoring teams were tired and needed relief. I was to come immediately and bring help. There was a high radioiodine reading one mile west of TMI—should they believe it? My reply was "Don't send a helicopter for me, use it to continuously take the environmental air samples to the Pennsylvania State Bureau of Radiation Protection (BRP) labs for counting" (since none of the TMI counting labs were useable). I called my friend Maggie Reilly, CHP, at BRP and asked that the State count TMI samples ASAP. Maggie graciously complied.

About 4:00 p.m. I arrived on the TMI site with my Chevy Impala loaded with counting equipment and HP supplies. At my request, the Salem Plant radiation protection manager plus five HPs followed me to TMI in Salem's two emergency vans loaded with emergency counting equipment and supplies. Luckily, the Salem personnel and emergency equipment were immediately useful because I had trained and equipped the emergency teams of all four sister nuclear utilities with the same procedures and the same equipment as TMI used.

When I arrived at TMI, I was directed immediately to Jack Herbein's office (V.P. nuclear). Because I had worked with TMI so closely for the past eight or nine years, PCI was given three areas of responsibility: (1) all radioeffluent assessment (gas and liquid), (2) the TMI radiological environmental monitoring program—all phases, and (3) personnel dosimetry review and high-level assessment including bioassay.

To me, this was an incredibly big request. I was scared —how could we (PCI) possibly do a good job in all these areas? There were so many problems and there was so little time to solve them!

It was 7:00 p.m. and many of the TMI reactor operators had worked 12 hours and been in the Auxiliary Building—which I learned was >5000 times maximum permissible concentration for ^{131}I. The Radiation Management Consultants (RMC) whole-body counter was on site, but useless because it was in a high radionoble gas environment. RMC called to say they had lost the key and couldn't move it till the next morning.

I didn't want these operators, who had just spent the worst 12 hours of their lives, to go home worrying about radioiodine intakes. I remember jury rigging a portable NaI crystal detector in the TMI control room kitchen and counting each operator before he went home. Thank God there were no significant intakes.

It was 2:00 or 3:00 a.m. the next day when I got my first sleep (only a few hours). The TMI operators had thoughtfully set up a cot for me behind the TMI-2 control room big board. I remember falling asleep thinking that in real emergencies, people do take care of each other!! (Little did I know what was ahead or that I would be at TMI for three years, or that I would be involved as

an expert witness in a terrible lawsuit for another 15 years.)

I called my wife Lynn each evening at 10:00 (she could not call in). The third day of the accident she was crying when I called—the *Philadelphia Inquirer* newspaper had four-inch-high headlines: "TMI Hydrogen Bubble about to Explode." I laughed at her, thinking she was kidding—she cried harder—I felt terrible about laughing. The next day there was a retraction on page 12. The press can be SO BAD!

Roger E. Linnemann, MD

TMI & I

I remember it well . . . Very Well!

I was in Hanover, Germany. I had just completed the opening summary statement for the pro-nuclear side in a week-long seminar (trial?) before the Parliament of Lower Saxony. The issue: whether or not the Parliament should approve a waste disposal site in the salt mines of Gorleben near Braunswick in Lower Saxony. Prime Minister Albrecht had invited 25 international scientists on each side of the issue to debate before his Parliament.

At 11:30 a.m. on Wednesday, 29 March, just as I finished my opening statement, news of TMI hit the gathering. The anti-nukes immediately began shouting "See, we told you so!" Chaos reigned. Finally the Prime Minister declared, "We are here to discuss waste disposal, not nuclear reactors," and brought the room to order. Later I told a colleague that I felt like I had just jumped into the English Channel for a race and as I hit the water someone threw a sack of lead on my back!

Because Radiation Management Consultants (RMC) was heavily involved in environmental monitoring and emergency medical support for TMI, I was called home. I made my presentation on the biological effects of radiation to the Parliament in the afternoon and left that evening for the United States.

In those days, RMC had large radiation-measurement laboratories. We were immediately called upon to perform analytical services for General Public Utilities, the Nuclear Regulatory Commission, and industries such as the Hershey company. It wasn't long before the general public heard of our capabilities and individuals began sending us everything from milk to peas to grass for analysis. One day we received a box from a person who lived near the reactor. Inside was a chicken with a tag on its toe which read "It Died." Looking at my colleague Frazier Bronson I remarked that even I could have made that diagnosis. He pointed out that perhaps the resident wanted to know if radiation had caused its demise. (Our analysis proved, by the way, that radiation exposure had not killed the chicken.)

How did TMI change my life? I joined the Atomic Industrial Forum speaker's circuit with Gen Roessler. It was funny. Like monkeys, we were taken from one TV station to another. Did our thing. They gave us a banana, put us back in the cage, and on to the next station. But it was useful and fun.

The Health Physics Society? I saw it become much more visible and engaged in public information programs. TMI was a wake-up call for the nuclear industry in many respects. However, I believe a new generation of health physicists have picked up the nuclear standard again and continue to move forward.

L. Joe Deal

TMI Accident: Personal Experience of L. Joe Deal

At the time of the TMI accident, my office was responsible for managing the safety aspects of the Department of Energy's (DOE) radiological accident response program. Our involvement in TMI began on 28 March when the Pennsylvania Bureau of Radiological Protection and the Nuclear Regulatory Commission (NRC) requested the assistance of the Aerial Measuring System (AMS) and Brookhaven National Laboratory's (BNL) Radiological Assistance Team. Both the AMS and the BNL team arrived around the middle of the day and began monitoring the radioactivity in the area. On 30 March I went to Harrisburg as the Senior, on-scene DOE representative. Within the next few days there were more than 150 people from various installations involved in the response program. The Bettis Lab brought in a laboratory for sample analysis and there were several airplanes for cloud tracking, as well as other groups who provided monitoring services. At the outset we realized that it would be necessary to pull all this monitoring data into a form that the users, i.e., state and NRC, could use for decision making. We began hosting a series of meetings at 5:00 p.m. each day where representatives from all the various agencies would review their activities and the results were then displayed on a large map that was duplicated and provided to the state, NRC, and Metropolitan Edison.

We were well aware of all the misinformation coming from the media and from uninformed spokesmen, particularly in Washington. However, the press officer for the DOE secretary advised me not to deal with the media and to refer all such inquiries to NRC. Our mission was to assist the state and NRC.

It is unfortunate that TMI was perceived as a major hazard to the public, rather than a vote of confidence in the successful manner in which the U.S. nuclear power plants' safety features that were built into the plants worked to minimize a radiation hazard to the public.

After returning home I spent many hours with the various post-accident groups, including the Presidential Commission, Congressional Hearings, and NRC Commission meetings. We also spent a lot of time updating the Interagency Radiological Assistance Plan which provided the means and basis for the deployment of the extensive technical assistance and resources of the DOE labs and contractors.

TMI Safety Advisory Board for Cleanup of TMI-2 (1981-1988)

Standing left to right: Lombard Squires, Ronald Fillnow, Norman Rasmussen, Merril Eisenbud, Robert Friedman, William Stratton, John Auxier. Seated left to right: Bruce Lundin, Robert Marston, Jacob Fabrikant, Howard Raiffa.

"The very same 'human factor' that helped cause the accident became crucial in efforts to contain the crisis of Three Mile Island. . . . What mattered was the prompt response of an army of professional scientists from the national laboratories who had had experience in previous nuclear tests and accidents. Many of these 'old faces' knew each other well from laboratory training, weapons tests, study of fallout from the Marshall Islands, earlier emergencies or work for the Atomic Energy Commission. The experience and know-how of these veterans often made communications easier, trust greater, response quicker and contingency planning better. What made the response effective was an existing cadre of professional radiation scientists who could be called upon in an emergency."

—from Crisis Contained: The Department of Energy at Three Mile Island by Philip L. Cantelon and Robert C. Williams

John Auxier, CHP

Health Physics Came to the Rescue

I was the Director of the Health Physics Division of Oak Ridge National Laboratory when we got word of the accident and a request for a health physics survey team. We sent Roy Clark and a team of surveyors who were at the site for about a week; there wasn't much to be measured around TMI. My personal involvement commenced with a call to put together a Task Group on Dosimetry for the President's Commission. Our task was to do a radioactivity release and dose reconstruction study on the accident. Carol Berger, Charlie Eisenhauer, Tom Gesell, Alan Jones, and Mary Ellen Masterson all agreed to participate.

My first trip to TMI was to search for information that no one else had discovered. The need existed because the fixed monitors in the stacks had gone off-scale during the first 40 minutes or so. I was confident that an HP of Dick Dubiel's caliber would have health physics monitoring devices that were intended for purposes other than stack monitoring, but which would have useful data. Dick and I discussed all of his fixed instrumentation. Great good luck! Just as had been the case at the Vinca research reactor accident in Belgrade, Yugoslavia, in 1958, health physics came to the rescue. There were fixed monitors in the auxiliary building between the filter banks for the reactor building exhaust. These filters did not get contaminated because the reactor building "went into containment" when the accident began. Therefore these monitors could "see" the ducts in the auxiliary building where they passed directly overhead to the stack, and they did not go off scale. Using the stack monitors to calibrate these filter monitors before the stack monitors went off scale, we had a calibrated trace of the total releases from the accident. This provided the point of departure for the subsequent successful studies done by the team. We provided a solid estimate of the releases, doses to people in the various geographical areas, and collective doses. It was evident that the highest exposures were indeed trivial. The result of this work got me involved with the media, with the Institute of Nuclear Power Operations, and with the TMI-2 Safety Advisory Board. A broadening of my professional life.

Ray Johnson, CHP

Three Mile Island Radiation Phobias

Careful risk assessments following the accident at Three Mile Island clearly indicated the very low probability of identifiable health effects. And yet, many millions of dollars have been spent on health effects studies in that area. How come?

The answer is related to public perceptions of radiation risks and, more specifically, radiation phobias. Subsequent studies based on the Myers-Briggs Type Indicator, show that most people (70 percent) rely upon their ***Sensing*** functions for acquiring information. This means they seek data which they can verify with their five senses. They want information that is real, specific, tangible, and quantitative. They want to know that it is safe, or not safe, right now. They do not want to know about future theoretical risk probabilities.

When specific information was not available during the early phase of the accident, the public was forced to rely upon their normally unused ***Intuitive*** function for gathering data. This function is commonly used (65 percent) by health physicists who are comfortable with abstract concepts, models, probabilities, imagination, theories, and hunches.

Phobias arise when normal ***Sensing*** types are forced to use their ***Intuitive*** functions, because ***Intuition*** is undeveloped, immature, childish, awkward, and slow. Consequently, ***Sensing*** types will imagine the worst possibilities and assume they are true for lack of any real evidence. One local citizen said at a public hearing on venting of ^{85}Kr that "TMI is like having something loaded pointed at your head. We cannot stand it anymore; we are scared and our children are scared."

Unfortunately, the normal ***Intuitive*** communication process used by HPs is received with great skepticism and suspicion by ***Sensing*** types. By quantifying risks as probabilities, rather than saying it is safe or not safe, HPs are viewed as covering up. HPs can be more effective in emergencies by making specific efforts to communicate in the ***Sensing*** language. One answer discovered belatedly at TMI was to provide citizens with survey meters to directly verify their exposures.

Jim Martin

Where's the Iodine?

I spent the first two weeks in the NRC's incident response offices in Bethesda, Maryland. There's a lot to tell, but I'll center on part of the radioiodine story. The first night and next day I was asked repeatedly, "Where's the iodine?" "In the water where it's supposed to be!" said I. "But according to Regulatory Guides 1.3 and 1.4, it's supposed to be in the air," they said. "That's a conservative postulate used to assure a tight containment," I said. Few understood. Most were puzzled. To assure myself, I requested the DOE AMS helicopter crew to set down in the morning of 29 March on a farm, where the plume had shifted away, and scan the ground for radioiodines. They found none, so we knew early on that there would be no radioiodine-in-milk problem. Lesson: Iodine combines with cesium to form a salt that loves water. (In the core, there are about ten times as many cesium atoms as iodine atoms.)

One of NRC's trailers in "trailer city."

For the most part, the early releases of noble gases from the core were trapped in the tight containment. Water pumped from the containment into the auxiliary building was chock full of particulate and dissolved radioactive material. The tellurium in this water made iodine. The iodines made xenons, which gleefully left the hot water and the auxiliary building and floated over the countryside. The bulk of the noble gas releases off-site stopped after the contaminated water was pumped into holding tanks. Lesson: Know your decay schemes.

Regarding the "release" of ^{131}I (15 Ci, or so, as I recall), either there was no such "release" or our atmospheric deposition models are very wrong. Given an atmospheric release of 15 Ci over a short period of time, ^{131}I should have been observed all over the environs, which it was not. I suspect that the filter on which the ^{131}I was found was wet and captured iodine very efficiently, whereas a much lower efficiency was assumed for the erroneous, I believe, release estimate. Lesson: Keep your filters dry!

Bill Kreger

12-Hour Night Shift

I was working in the Office of Nuclear Reactor Regulation (NRR), NRC, when the TMI-2 accident happened.

Two days after the initial event, President Carter asked Harold Denton, Director of NRR, to take a team up to the plant to monitor the accident and advise the licensee. Tom Murphy and I, from the Radiological Assessment Branch, were the two radiation protection specialists who were asked to accompany the group. Right from the office, with no advance warning, we were taken to an Air Force helicopter at the Bethesda Naval Hospital and whisked up to the plant, landing in a muddy field near the Observation Center. Reporters and plant personnel greeted us and soon we were escorted to the plant.

I spent the next ten days on 12-hour night shifts in the plant control room and in the turbine room, with other members of the NRC team and plant personnel. Our wives had been instructed to pack clothes to be sent up to us for our extended stay.

We got to be part of the escort for President Carter on his plant visit. (I had gotten a call from the White House physician before his visit, asking if it would be safe for the President to enter the plant. It was).

I also got to be part of one of Denton's TV press conferences, explaining the radiation safety aspects of the accident. By the time we were involved, there was no radiation hazard and things were remarkably calm in the plant. Reporters were not very interested to hear that there was no longer a radiation or radiological problem. The thing I was most surprised to learn each day after leaving my shift was how blown up and distorted the accident had been portrayed by the members of the media. Radiologically, the accident had been quite harmless to the public, although in the following years, we were to learn how very bad it had been psychologically.

In my subsequent years with the NRC, I learned a lot about "radiation phobia." It is a difficult task that faces health physicists to keep the public informed on the ease of measuring radiation and on protecting people from the hazards. Of particular importance is informing the public about the many beneficial uses of radioactivity and radiation.

Allen Brodsky, CHP

Frustration with the Media

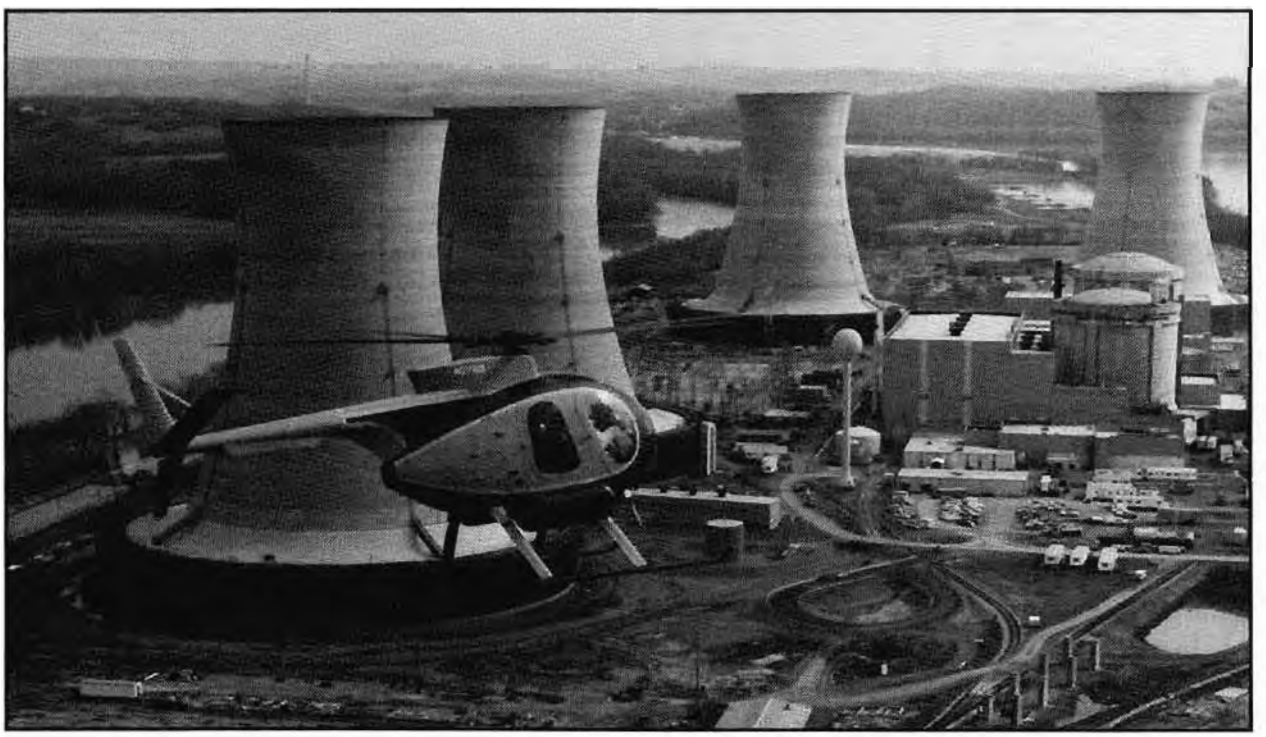
I was surprised to hear of the TMI accident and was called in early at headquarters to an NRC official's office along with other staff for advice. I advised against evacuation, but management decided to recommend it to Pennsylvania officials. I was no longer asked for advice as an NRC staffer.

The following weekend I was in Pittsburgh for a friend's early retirement party. Feeling guilty about not helping, with my previous experience at the University of Pittsburgh with Niel Wald on human contamination accidents, I called Ken Miller to see if he could use help since he was in charge at the Hershey hospital for managing any contaminated personnel. He said he could use me, so I excused myself from the retirement party and headed across Pennsylvania to Ken's home. News on the car radio was frightening, highlighting possible hydrogen explosions. Realizing possible embarrassment as an HP without a meter, I stopped and borrowed a high-range dosimeter from State Police.

Arriving at Ken's home at about 9:00 p.m. Saturday, I turned on a GM counter on his living room table and noticed it read about background level, just a few miles downwind from TMI. That evening on 11:00 p.m. TV, I saw my former colleague Ernie Sternglass on prime time, exaggerating dangers; only after the main news did they air a factual but truncated statement from Mort Heller. On Monday, Ken had me brief medical staff. Already even some department chairs had left patients in order to evacuate with families. I explained that they would all be safer in the hospital rather than outside, particularly in the radiotherapy department.

News items later reached me from about seven health physicists around the country, where Sternglass had quoted me in articles as an NRC scientist who claimed doses would be much higher than NRC advised. He was misquoting from my 1965 paper on fission product release in *Health Physics*. None of my letters refuting his statements made the press. He had quoted from a 1965 paper in *Health Physics* my results for a full fission product release and made it seem as if he had talked with me about TMI. Even if all fission products had been as volatile as the iodines, no more than 10^{-6} would have been released. Nobody would have sustained a serious dose from TMI. Since the news media would not publish this, I included it in my ". . . Is 10^{-6} a Magic Number?" paper in *Health Physics* 39, 992-1000, 1980.

I wonder how many of my colleagues in health physics have read my refutation in *Health Physics*, and how many might still think I supported Sternglass' contentions. My frustrations with media reporting took a quantum jump after TMI, and they still remain with me. Our public information program is our most important Society effort. I wish I could be a media star like Gen. I'd sing if they'd let me.



Reg Gotchy, CHP

750 Whole-Body Counts

The week after the meltdown, I was sent by NRC to Middletown, Pennsylvania, by Harold Denton to set up and manage a public whole-body counting program. I met with borough officials immediately and had a program operating the next morning. Operating continuously, we did about 750 counts of over 700 people during the next ten days.

I hand picked a local dairy farmer located about a mile from the island (his farm had the highest measured concentration of ^{131}I detected and his family drank milk). Needless to say, when no measurable iodine was found, the farmer provided a wide smile for the waiting media and gave hope to many people in the local area that they too had been spared.

I worked 16- to 18-hour days in Middletown for about ten days (through Easter) and met my "significant other" late one evening. We're still together 20 years later.

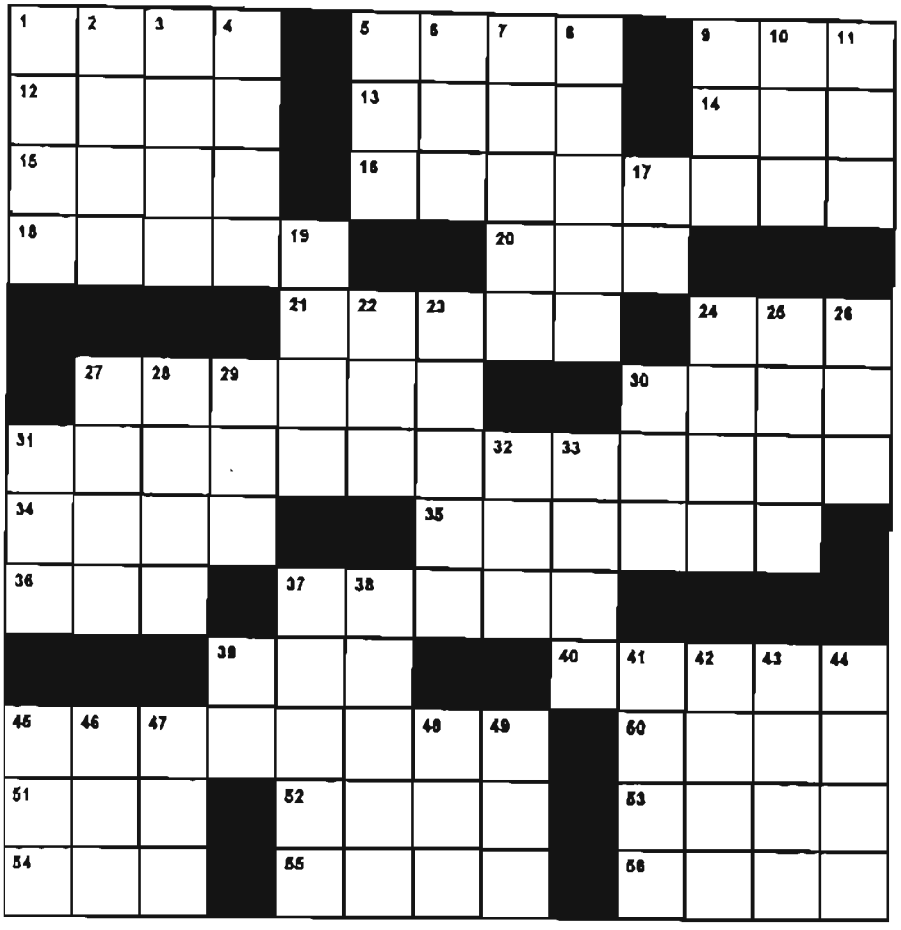
Following the counting program, I made invited presentations about radiation risk to numerous groups. The first was to pediatricians and staff at Harrisburg Hospital who were trying to cope with a panic among pregnant women after Ernest Sternglass had advised pregnant women to abort their babies because he expected a high rate of birth defects to result from the accident.

When the counting program was completed and the data analyzed, it was found that the only measurable radioactivity present (besides ^{40}K) was from short-lived radon daughters. I was directed to talk to each family about the potential radon problems in their homes (all homes turned out to be either brick, block, stone, or some combination thereof, and most had their own well). This action may have led to the development of the Pennsylvania radon program.

After the counting program was completed, Denton sent me out to talk about risk from the accident and nukes in general (I had recently completed an NRC assessment of the nuclear fuel cycle). I visited a wide variety of groups, ranging from the Ohio United Auto Workers, the Philadelphia Academy of Sciences, and the Delaware Chapter of the American Industrial Hygiene Association.

In the months following the accident I continued to assist with the recovery efforts, including preparation of an Environmental Impact Statement for the venting of ^{85}Kr from the TMI-2 containment building. One day I was asked to sit in at a public meeting in Middletown. When I arrived at the meeting hall, the facility was packed to overflow capacity, and the Fire Marshall had locked out over 100 concerned citizens because of fire regulations. It was an ugly and potentially dangerous scene getting into the building to participate on the NRC panel. Unfortunately, I was successful and soon found myself with a group of NRC experts and a radiologist where we were cursed by frightened and angry local people.

TMI Anniversary — *Joyce P. Davis*



ACROSS
1. Bodily attitude
5. Result of radiation exposure
9. Young women's association
12. __gate, lengthen
13. Galway Bay Islands
14. Vienna is its cap. city
15. Detective Wolfe
16. Results of losses of containment
18. Xenon gas, for example
20. Sprite
21. Spencer or Dick
24. Property related to Quality Factor
27. Firma and cotta
30. Whittle
31. Anniversary event locale (var.)
34. Term of polite address (fem.)
35. Rub out
36. Belonging to something
37. Population internal and external dose?
39. Mammal pelt
40. Legal tender
45. What was damaged at TMI
50. Gambling town
51. Branch
52. "The frost __ __ the pumpkin"
53. Military mail stations
54. Explosive
55. Exxon, formerly
56. Final

DOWN
1. Anniversary event St.
2. Margarine
3. Take up and hold
4. Organic compound
5. ___ es Salaam
6. Pitchblende, for example
7. Relating to minerals containing silica and alumina
8. Foe
9. Krypton or helium, e.g.
10. Institute legal proceedings
11. Donkey
17. News org.
19. To be in Saclay
22. Kind of computer mem.
23. In reserve
24. Final
25. ____ Stanley Gardner
26. To a ____, perfectly
27. Which
28. Periods of time
29. Centisleven
30. Kind of chart
31. Shorthand for Anniversary event/place
32. Preceded
33. Fundamental (abbrev.)
37. Replaced by Becquerel
38. X
39. Orange St.
41. Kind of exam
42. Impact Statement Law
43. Hall-of-famer Slaughter
44. ____ Arena, U. Michigan
45. Obese
46. Coffee dispenser
47. Ambulance medic
48. Runs PCs
49. Cherenkov detector near Sudbury, Ont.

Answers to the TMI Anniversary puzzle appear on page 34.

"At the Middletown gymnasium, Harold Denton and a staff of tired and overworked Nuclear Regulatory Commission and Department of Energy public relations personnel held twice-daily press briefings amid a forest of bright lights, cables snaking across the floor, and hungry reporters trying to meet deadlines. At times the world's entire press corps seemed to be jammed into the old building at one time, asking endless questions about the reactor and trying to understand the jargon of nuclear reactor technology. By Tuesday a number of Department of Energy public relations people . . . assisted the Commission's press staff. Conditions were not ideal—the xerox machine was in the kitchen and the daily bulletins were handed out from the pantry after being collated on chairs set up along the gymnasium wall. By the end of the first week after the accident, a regular system had developed for answering, or trying to answer, endless questions about nuclear technology and terminology."

— from Crisis Contained

Walter L. Robinson

The Radiologist Called me

On 28 March 1979 I lived seven miles east of TMI during the accident (I now live 15 miles east). As a consultant medical health physicist, I was providing services to a client hospital when I started to get phone calls from clients asking what they should do. Strangely enough it was clients 175 miles from TMI who were calling to ask if they should evacuate patients and "run" themselves. The closer clients were less emotional. I told them that they need not evacuate their hospitals and to just keep their windows closed. I tried to explain that the only risk from the gaseous effluents would to be to those in the direction of the plume's movement and that no one was sure which direction that would be. Even if it was in their direction, I told them that the dispersion would modify the risk drastically.

Most of the nuclear medicine clients understood the characteristics of xenon gas, as they used it. Members of the radiology department staff were a little more ignorant on this issue. Lay physicians were absolutely no help to their patients, as they were calling the radiologists, and the radiologists were calling me.

By the second or third day, half of my neighborhood was evacuated, oblivious to the uncertainties of the adiabatics. I took my two young sons, and we walked around the neighborhood to answer any questions that the brave stalwarts might have. None ventured out.

I drove by TMI with my side-windowed Geiger-Müller survey meter and was getting the usual background readings, so I concluded whatever the xenon was doing, it was not stagnating. I called the Pennsylvania Bureau of Radiological Health to ask if they needed my assistance. They told me I would not be covered by their indemnity, so I could not help.

The worst offenders, however, were the opportunists selling two-week (400 mg d^{-1}) supplies of potassium iodide "to block all radiological hazards from TMI." The only radioactive material of any significance released was ^{133}Xe! So, I wrote a letter to the editor of *The Lancaster New Era* explaining the misgivings of the KI. Fortunately, the letter was published directly across from the advertisement. Thankfully, very few Lancastrians fell for the ploy.

No, I'll never forget 28 March 1979 any sooner than what I was doing when I heard of JFK's assassination.

Ed Nickoloff, CHP

Family Near TMI

At the time that the TMI meltdown occurred, I was the Acting Director of Physics and Engineering and Assistant Professor of Radiology at the Johns Hopkins Hospital in Baltimore, Maryland.

The events have a very personal meaning to me because I was born and raised and went to school in Harrisburg, Pennsylvania. I had a number of family members in Harrisburg at the time this occurred. I was familiar with the controversy during the construction of TMI Nuclear Power Station which is located on the Susquehanna River. TMI had flooded during construction, which necessitated a major refurbishing of the electronic controls. Moreover, there had been union strikes and some damage occurred during this period. So TMI was faced with some real challenges from the start.

> *"The day got started on the wrong foot."*
> — *Maggie Reilly*

I remember being called by one of the Baltimore television stations during the meltdown incident to appear as a technical commentator for the evening news programs. I was reluctant at first, but after obtaining approval from the Public Relations Department of the University, I appeared on the news telecasts the entire week and on several talk shows as well. For a short period of time, I was a local celebrity and I was recognized in the stores and restaurants.

The people in Maryland were concerned with radioactivity getting into the milk. They also feared that radioactivity would flow down the river into the Chesapeake Bay, which would affect the shellfish industry. In fact the regulatory agencies in Pennsylvania and Maryland had a disagreement about the amount of radioactive iodine and cesium being found in milk, and I was asked to review the data and provide advice. One of the states was considering issuing an order to dump all the recently produced milk.

Of course, my family was also nervous about the situation and considering temporarily leaving the Harrisburg area, which is less than ten miles from TMI.

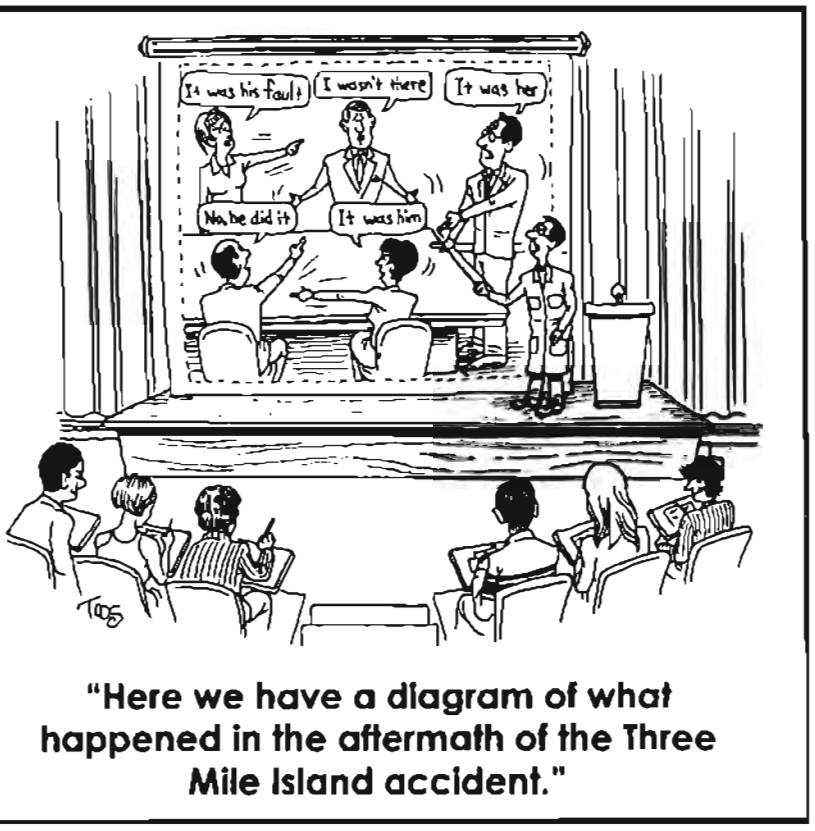
I feel the TMI accident made the public aware of the importance of physicists for radiation safety and the physicists aware of the care and manner in which to conduct public interviews.

John Luetzelschwab, CHP

We Went to Church

Where was I when the TMI accident happened? I was asleep, only two kilometers away, totally unaware that anything was happening. I didn't learn about it until later in the day at work at Dickinson College 30 km away in Carlisle, Pennsylvania, when a colleague heard a news report about the accident. I grabbed a survey meter and a colleague, and we headed back to my home area to get readings. The next morning I collected a soil sample from my garden for analysis in the lab. That analysis showed the presence of xenon. That is when I learned that xenon is very soluble in water and we had a brief rain shower the night before. Several students and I continued soil sampling around the area for the next week with no detectable radioactivity coming from TMI. Classes were canceled for the week after the accident, not because the administration felt it was necessary, but because many parents from outside the area called their sons and daughters and told them to come home.

How did this accident change my life and the health physics profession? I think it made us aware of how sensitive the public is to radiation issues. I saw lots of emotions and irrationality that I could not comprehend, but now realize it is something with which we have to deal. I also saw that there can be trust among the public if we are sensitive to it. When I was busy collecting samples on the Sunday morning after the accident, we thought we might both skip attending church, but my wife Marcia thought we should make an appearance. We learned later that several families decided not to leave the area after seeing that we were still here.



"Here we have a diagram of what happened in the aftermath of the Three Mile Island accident."

Floyd L. Galpin

TMI and My Wife's Birthday

The TMI event is a well-remembered one at our household. The 29th of March (the day of the TMI burps) is my wife's birthday. I was on leave and picking up a cake for a surprise party the evening of 28 March. As the Environmental Protection Agency (EPA) Division Director with responsibility for emergency response, I dropped off the cake and headed for the office when I heard the radio reports. My initial activities were concerned with trying to get a better handle on what was happening (as was everyone else). I made the decision to send someone to the scene. The surprise birthday party was held, but it did start late.

My subsequent role was to coordinate and participate in manning an EPA office at the Nuclear Regulatory Commission emergency operations center. Primary activities were to relay information to EPA headquarters and to explain and discuss the possible implementation of the EPA Protective Action Guides.

Follow-on activities included the assignment of staff to the three agency groups to make initial dose assessments (a report completed on Easter Sunday), participation in discussions on the application of drinking water maximum concentration limits to considerations of proposed releases to the river, and plans for EPA to take responsibility for the long-term environmental monitoring around the plant.

Needless to say, my wife's birthday never goes by without us remembering TMI.

R. William Field

We Took Our Wedding Pictures

The TMI accident had a profound and lasting impact on my life. I was a graduate student in biology at Millersville University of Pennsylvania at the time of the accident. In fact, I was on my way to class from my home in Elizabethtown, a small town a short distance from the plant, when I heard the news about the "leak at the plant." Over the following days, reports of releases of radioactive materials to the environment and the accumulation of hydrogen in the reactor-pressure vessel increased the level of fear in nearby residents, including my wife and me, that a major release of significant amounts of radioactive materials was imminent.

We tried to maintain our normal schedule, but it became more difficult as school was suspended so that students and faculty could evacuate. Because my wife was completing her medical residency at Pennsylvania State's Hershey Medical Center about ten miles from the plant, we were committed to stay near the medical center and await orders to move the patients. Several days after the initial release a fire truck came by our house in Elizabethtown, announcing that people should keep their windows closed because of the elevated ^{131}I concentrations reported in the area. That same afternoon, we decided to move to the medical center. We packed our clothes and took our wedding pictures because we were unsure if we would ever get back to our home again.

While waiting for updates, we heard on the television that samples of cow's milk showed there was little release of ^{131}I to the environment. Because we had to stay in Hershey, which had now become a ghost town, I decided to visit a few of the farms where milk samples were obtained to assess off-site release of ^{131}I. Not surprising for this time of year, the farmers reported that the cows were fed predominantly stored food, which would not be affected by the release. My interest in improved dose assessment methods began that day. From 6 to 16 April 1979 my time was spent trapping voles (meadow mice) in the vicinity of TMI, including a site next to the TMI Observation Center. The research found that the meadow vole is a good monitoring organism for ^{131}I contamination of ecosystems (see *Health Physics* 41:297-301, 1981). The unfunded research continued into an assessment of ^{137}Cs in white-tailed deer near TMI (see *Health Physics* 64:671-674, 1993).

It has been an interesting road since March 1979 with stops along the way as a health physicist at the University of California, Berkeley, private consulting, and additional graduate work in preventive medicine and environmental health. I am now back to my 20-year-old interest in improving radiation dose estimates. However, this time around, the dose assessments are for case-control epidemiologic radon studies.

Enquiring Minds Want to Know!

Mary Walchuk

Two stories about the Three Mile Island accident covered the centerfold spread of the 24 April 1979 *National Enquirer* paper. Expected in the *Enquirer* would be sensational headlines like "Nuclear Accident Causes Two-Headed Cows" or "Pennsylvania Evacuated after Power Plant Meltdown." Instead, one of the headlines seemed uncharacteristically in support of nuclear power: "Nuclear Plant Crisis Was a Massive Hoax." The article explains that the accident was not anywhere near as bad as the public was led to believe. It even supports the findings that the public was not in danger: "The ENQUIRER airlifted a top team of radiation experts directly to the power plant site to carry out a series of independent radiation checks—and they found no significant levels of radiation. In one test, the experts were just 100 yards from the reactor, and in another 2,000 feet in the air directly over it. Their firm conclusion: no health hazard whatsoever. The bright side of the incident, say experts, is that it shows, while there can be mishaps, nuclear power is safe." The newspaper's source of information was health physicist Stanley J. Waligora, Jr. Unfortunately the article follows the typical style of the paper when it claims "outlandish scare tactics" when "the media, antinuclear alarmists and worst of all, the government's own Nuclear Regulatory Commission (NRC) blew the incident all out of proportion . . ." The article points out that most of the fears caused by reports of meltdown and a possible hydrogen bubble explosion were unfounded, "but the truth didn't stop fear-mongers from spewing vicious falsehoods."

The second article, "Experts Blame Sabotage for 'Accident'," continued the story in true tabloid style. Claims are made that someone purposely shut the backup valves—possibly an employee, a former employee, or an intruder. It is implied that other happenings at the plant could have been sabotage: "A whole series of strange events have taken place within the plant in recent years. A mysterious fire broke out, equipment has broken down under suspicious circumstances and other problems have caused the plant to be cited for an incredible 22 violations of safety regulations."

So did the government and media purposely and maliciously spread fear after the accident? Did someone shut the valves on purpose? This enquiring mind will take the word of the health physicists who tell their story in this *Newsletter*.

Arland (Red) Carsten

TMI—The View from Vienna

There could not have been a more apropos time than 28 March 1979 for being at a symposium on "Biological Implications of Radionuclides Released from Nuclear Industries." And indeed, when the world's attention focused on a single nuclear plant in Pennsylvania, there were 198 health physics and radiation biology types in Vienna, Austria, attending a five-day (26-31 March) International Atomic Energy Agency (IAEA) symposium by that name.

This was a major conference of the year for the IAEA. It was complete with press coverage and simultaneous translations in at least four languages. The full proceedings published in two volumes totaled 923 pages (STI/UB/522 - ISBN 92-0-010579-3. 1979).

At the lunch break on 29 March I was eating with a member of the public relations staff from DOE Headquarters when she was paged for a telephone call. When she returned, she seemed a bit concerned.

As I best remember, our conversation went something like:

"I hope it wasn't bad news."

"I'm not sure. Headquarters wanted me to know that there is a problem at TMI." (I then asked a question that neither myself nor anyone even peripherally involved in health physics would ever ask again.)

"What's TMI?"

"Three Mile Island plant in Pennsylvania."

"Is it serious?"

"There are no details as yet."

"Are you supposed to make this public?"

"No, but it is on TV so they just wanted me to know in case someone asks."

Later in the day a television set, showing a German station with direct coverage from TMI, appeared in the lobby outside the conference hall.

Unfortunately it did not have English subtitles and my German was not good enough to follow the action. But even without knowledge of the language you could feel that something important was being discussed.

Over the next few hours a couple of familiar faces appeared. Tom Gerusky, who was Director of Radiation Protection for the State of Pennsylvania, was being interviewed from TMI, and Charles Meinhold, who as head of health physics at BNL had sent a REACT team to TMI, was on "Good Morning America."

Great! Now we'll find out what's going on at TMI—no such luck! I assume they both spoke in English, but what came over TV were their pictures, but with a German translation overlay. However, seeing them brought the emergency to a more personal level since both Charles and Tom were graduate students in the 1957 Brookhaven AEC Radiological Physics Fellowship program which I supervised, and both began their health physics careers when they joined the BNL Health Physics Division after completing the fellowship.

"Jim Kipenhaver and Ray Urciuolo, who at the time comprised the local regional health physics staff for the Harrisburg region, were dispatched to do some plume chasing, again according to plan. Their equipment included a roll of dimes. Remember, the Deputate had no radio-equipped vehicles. The only other option was pay phones. Around mid-morning they left to do some mobile monitoring. Several hours later they were back in the office with a list of readings. When asked why they didn't call they indicated that the only pay phone near the site was at the TMI Observation Center across from the Island along PA 441, and that it had a group of reporters lined up to use it. Also a call to Harrisburg from that phone was an 80-cent toll call, which a roll of dimes could not long support."

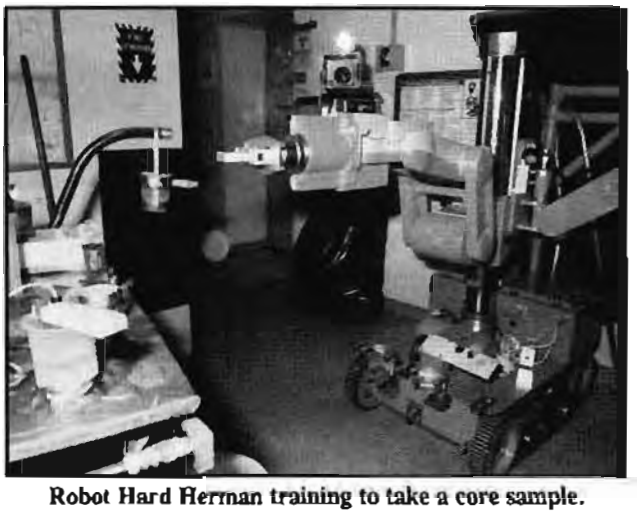
—Maggie Reilly

Certainly many other people at the meeting must have heard the TMI news. However it is interesting that, to my knowledge, there was never a mention of TMI during the remainder of the symposium.

Here was an international conference addressing the precise subject of critical interest to a synchronous event having the great political, psychological, and historical impact of TMI and it was allowed to pass without mention.

Apparently none of us from the United States knew enough about it to comment, and I have never found out whether the non-United States attendees did not hear about it or were just being polite enough to not say anything.

At any rate, for TMI, "The View from Vienna" was hazy—but unforgettable.



Robot Hard Herman training to take a core sample.

James R. Noyce

Vivid Images of TMI

A large stainless steel tray, a convoy of trucks, and dire predictions—these are three vivid images that I retain from shortly after the TMI-2 core meltdown.

Dr. Kenneth Inn and I worked in the Radioactivity Group at the National Bureau of Standards (NBS) (now National Institute of Standards and Technology). Reacting to the news, we had just hauled a heavy tray outside the Radiation Physics Building when we saw semitrailer trucks leaving the NBS campus. They were bound for TMI-2 with all the lead bricks the Bureau could spare. Seeing this reinforced the seriousness of the reactor accident, the extent of which was then uncertain.

The gray sky fit our somber mood, but we were thankful for the clouds because we hoped they would bring rain, hence the tray. In our Ph.D. work, each of us had used radioactive fallout in air and water as tracers of atmospheric processes. So collecting air particulates and rainfall came naturally! We did a series of measurements, but never found radionuclides that we could attribute to TMI-2 with confidence.

The dire predictions came several times a day on news broadcasts that seemed to emphasize the worst possible scenarios and consequences. These far exceeded reality but, unfortunately, not some citizens' expectations. The resulting negative perceptions still exist somewhat.

What happened on that 28 March did not greatly change my life. The accident did provide some interesting and challenging TMI-2 site samples that I helped analyze radiochemically a few years later. More significant for me, and for Americans as a whole, this accident curtailed the building of additional nuclear power plants for the generation of electricity in the United States. Much useful knowledge resulted from the studies of the event and from its cleanup. However, I think that, overall, the reduction of the nuclear power option has had a negative effect on the country.

"Three Mile Island, then, should be understood as an event of historical significance not only because of what actually happened, but because of what people thought was happening or feared might happen."

– from Crisis Contained

Jerry M. Cuttler

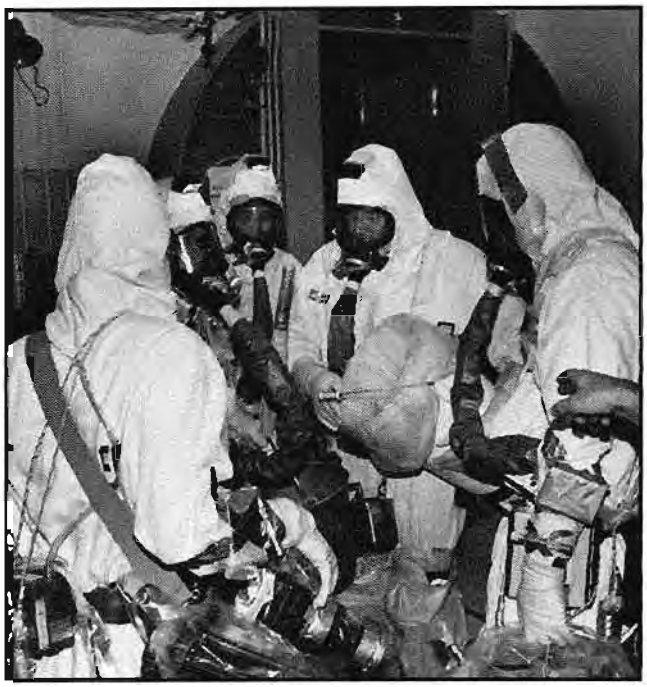
TMI in Perspective

TMI didn't affect us much; we at Atomic Energy Canada, Ltd., just improved the human-machine interface of our CANDU reactor design.

But later in 1979, a Canadian Pacific train derailed in Mississauga and released 80 tons of chlorine from a tanker car. Fortunately, the adjacent tanker car was filled with propane. When it exploded, a tremendous updraft was created that lifted the chlorine far above our homes. Since it would take several days to seal up the many tons of liquid chlorine remaining in the car, the 250,000 residents downwind of the derailment were evacuated within a day or so. Our family returned home a week later and resumed our normal lives (with the addition of a pet dog). A colleague became so excited, she gave birth two months early.

The terrible fear of the potential exposure to radiation from TMI seemed way out of proportion to the concern we felt about the real, immediate hazard of the chlorine gas.

TMI-1 producing electricity in 1998.



Final briefing for workers outside the personnel airlock preparing to enter the TMI-2 Reactor Building.

Robert Quillin, CHP

Not in Political Science Texts

In 1979 I was the Radiation Safety Officer at the Walter Reed Army Medical Center in Washington, D.C. Several requests were made to the Army relative to TMI but the only one I know that they responded to was a request for dedicated communications capability between TMI and Washington. However, several HP technicians who worked for me were given leave to help out at TMI on a temporary basis. They had some interesting tales to tell about the first few weeks at TMI when they returned.

TMI changed my life through what I think was an unexpected consequence of the accident. That consequence was the Low-Level Radioactive Waste Policy Act of 1980 and the Amendments Act that followed in 1986. After leaving the Army in 1980 and moving to Ohio I found myself involved in the negotiations surrounding the creation of the Midwest Low-Level Radioactive Waste Compact and its subsequent enactment in Ohio and serving on the Compact itself. Choosing a host state for a low-level radioactive waste site is a process not described in political science texts. Now that I am in Colorado I serve on the Rocky Mountain Low-Level Radioactive Waste Compact.

Those of us who were low-level radioactive waste generators in 1979 know how the handling, disposal, and cost of such waste has changed in 20 years. The change has been significant.

Andy Hull

Population Dose Estimate: 2,000 Person Rem

Little did I realize that the TMI-2 accident would launch me into a minor place in the radiation protection firmament, when on the morning of 29 March 1979, as a member of the DOE Region I RAP team, I was called to respond to the accident. A few hours later, I was on board a Coast Guard helicopter enroute to Harrisburg. By the time we arrived, plant field survey personnel had found nearby off-site external radiation levels of 10-20 mR h^{-1}. However, their air samples suggested ^{131}I concentrations of up to 10^{-7} μCi cm^{-3}, warranting protective actions. So our initial surveys were directed toward verifying the radioiodine concentrations. Using Brookhaven-developed silver-loaded silica gel cartridges (which did not retain radiogases), we found much smaller concentrations, thereby reducing the concern about them.

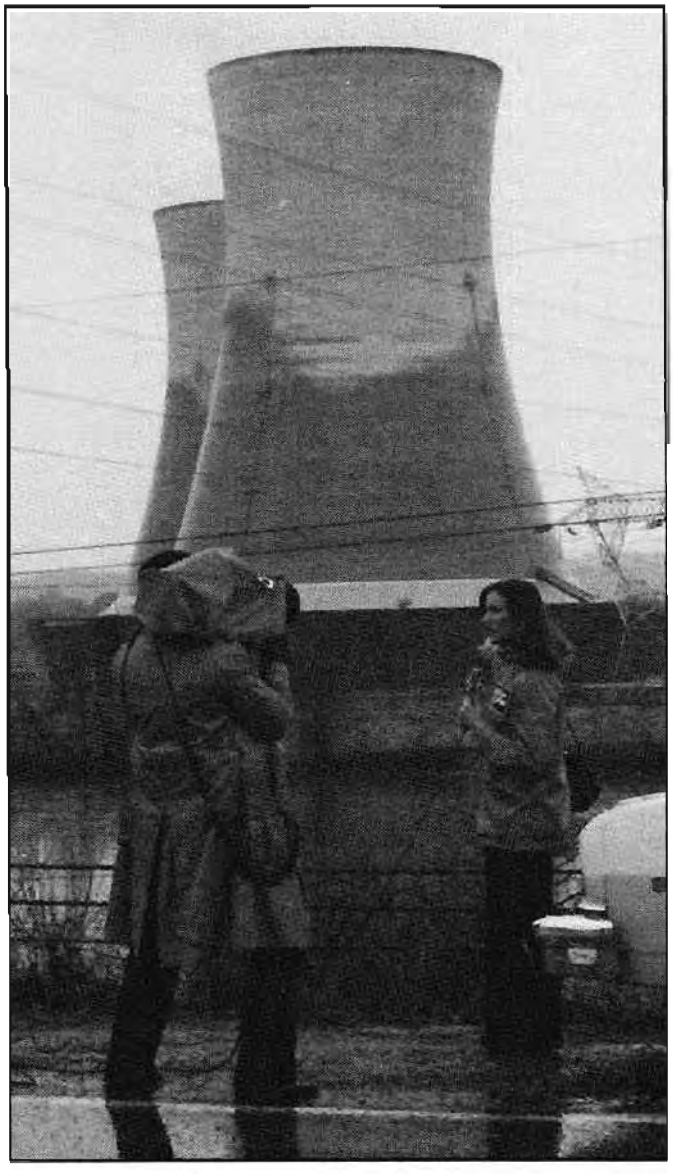
To make a long story short, over the next few days we were joined by over 100 personnel from other DOE entities, as well as teams from EPA and a liaison from the NRC. We set up a protocol for sharing data with all concerned, including the Pennsylvania Bureau of Radiological Health. This became the prototype for what has subsequently become the Federal Monitoring and Assessment Program.

As the de facto principal Dose Assessor, I was asked to make a population dose estimate. More by serendipity than skill, using data provided by regular airborne measurements of ambient external radiation levels by the helicopter platform, meteorological data, a pocket calculator and semi-log graph paper (this was in the pre-PC days), I was able to make an estimate of about 2,000 person rem. It turned out to be in gratifyingly close agreement with that made by NRC and other agencies (3,300 person rem) using TLD data.

Andy Hull supervising data collection.

The experience at TMI was one of the most memorable of my career in health physics.

John R. Sowa



RE: TMI Incident—First-Hand Experience.

Early the morning of the TMI accident, I was taking Union College students from Schenectady to a science conference in Pennsylvania, passing through Hershey. We didn't have details but thought the state police would send us back if necessary.

At the conference, the buzzing was quite a concern to me; panic was setting in. One of our Union College students had been told by his father that "often those concerned with nuclear incidents never give the whole truth and even give misinformation." He was agitated so we went to call the Pennsylvania State Police for advice and information.

At the phones another student showed she was really upset. I asked, "What's the matter?" The answer, "We are all going to die. We do not have a chance being here. I want to get out of here!" Finding where she was from, I told her we were protected here by an intervening mountain and if we left to go back east the west wind would put us in the path of the radioactive dust. Somehow this and the state police report calmed the woman student.

The Union College student still was not happy so a few of us watched television. We heard an interview from a waitress at McDonald's, who said her father was in on handling the incident and told her it was okay to stay in the area. Geographically, she was closer than where we were. A spokesperson certainly very high up kept the television audience informed.

The Union College student was calmed by the TV shots around the facility because workers were moving around without shirts. "They must know how much radiation is around the plant and being shirtless, it must be okay." I breathed a sigh of relief.

"The accident now appears to have been more human drama than technological failure. Its principal actors were not scientists but plant operators, politicians and public officials. It was not so much a mechanical breakdown as a series of human choices that crippled a nuclear reactor and threatened public health and safety. The principal cause of the accident was human, not technical, error. From the outset plant operators chose to take actions that helped complicate a loss-of-coolant accident and release radiation from the plant. Federal and state officials then made numerous statements and recommendations, often on the basis of incomplete or inaccurate data, that were magnified by the media and transmitted to the world as the "Harrisburg Syndrome." In sum, Three Mile Island rapidly became a battleground because of what people feared might happen, rather than because of an accurate knowledge of what was actually happening. The major feature of Three Mile Island would appear to be a breakdown in human communications, not a breakdown of a nuclear reactor."

— from Crisis Contained

CHAPTER NEWS

Savannah River Chapter

Al Goodwyn

The Savannah River Chapter of the Health Physics Society is off and running with the 1998-99 chapter year. The chapter recently participated in the annual Science Education Enrichment Day (SEED) held at the University of South Carolina-Aiken on 24 October 1998. SEED provides an opportunity for area businesses and organizations to provide informative and entertaining science activities for students in grades four through eight. Participating from the chapter were Matt McFee and Mitch Findley, who operated the Savannah River Site mobile whole-body counter and provided an overview to students on the purpose and function of the counting equipment. Mike Matheny and Russ Morgan provided assistance. Bob Kellner, Buddy Crowder, and Al Goodwyn provided an informative and interactive display on natural radioactivity as well as on radioactive materials found in consumer products.

Buddy Crowder (right) at the recent SEED display on radioactivity.

Chapter President Bob Kellner (left) presents a plaque to outgoing president Russ Morgan, thanking him for his service to the chapter.

The kick-off meeting for the 1998-99 chapter year was held on 9 December 1998, attended by approximately 65 chapter members and friends, and sponsored by Canberra. The guest speaker for the meeting was Dr. Mike Ryan of the Medical University of South Carolina. Ryan spoke on his recent visit to the Mayak Production Association in Oxyrsk and Chelyabinsk in the southern Ural Mountains as part of the Department of Energy Science Review Group. Ryan's talk provided health information on exposed populations as well as the current environmental conditions from routine and accidental releases. ■

CORRESPONDENCE

Reflections on the KI Issue

The letter by Charlie Willis on the potassium iodide (KI) issue got me to ruminating and I write this letter in the hope that a constructive conversation by readers will ensue. My intent is not to be definitive.

I think that KI administration to emergency workers should be revisited. The nuclear power work force tends to be older, and an increase in age of a population is usually associated with a decrease in wellness and an increase in maintenance medications. The healthy worker assumption becomes less valid as time continues.

Supersaturated potassium iodide solution has been prescribed as an expectorant and has proven to be a safe drug in competent hands. This leads me to two conclusions:

1. How KI is administered is at least as important as when.
2. Competent individuals administering a safe drug to a given population should not cause anxiety. It's done every day.

If I had my druthers, there would be a triage system with intake being a sign-off sheet containing the following questions:

1. Do you have an allergy to iodine or shellfish (usually an allergy to iodine in the shellfish)?
2. Are you taking any medication?
3. Do you have any thyroid problems?
4. Do you have any kidney problems?

If the answer to all questions is no, then KI is given. If the answer to any of the questions is yes, then the individual is referred to a pharmacist or physician depending on the "yes" answers.

Does somebody out there have any ideas or comments?

Dave Horn
Powhatan, Virginia

COMMITTEE ACTIVITIES

Publications Committee

Diane S. Flack, Committee Chair

The Health Physics Society (HPS) Publications Committee is having a busy year identifying Editors-in-Chief for three of the Society's major publications. The Committee has recently completed its review of the applications for the Web Site Editor-in-Chief position and has given the President and Board of Directors its recommendations. The members are now embarking on a search for Editors-in-Chief of two other Society publications—the *Health Physics* Journal and the Health Physics Society's *Newsletter*. The Committee recognizes how fortunate the Society has been to have the "Dynamic Duo" of Ken Miller and Gen Roessler as Editors-in-Chief of the Journal and *Newsletter*, respectively, over the past several years. These editorial positions are key to the future of the Society because these publications not only serve the needs of the membership, but also serve as a very visible symbol of the Society, its mission, and its membership to both the general public and to non-member professionals.

The request for applications for both the Journal and *Newsletter* positions appears below. Please note that even though both of the positions require submittal of similar information, the applications must specifically (1) state which position the applicant is applying for and (2) address the evaluation criteria, etc., as it applies to either the Journal or *Newsletter* position. If an applicant would like to be considered for both positions, separate applications must be submitted. The Publications Committee will review the applications/proposals and present its recommendations to the HPS President and Board of Directors at the Annual Meeting in Philadelphia in June 1999. Both Editor-in-Chief appointments will be effective in September 2000. However, it is expected that the new editors will begin to work with the current editors shortly after their appointments in June 1999 to ensure a smooth transition of the editorial responsibilities for these major Society publications.

HPS Journal Editor-in-Chief

OVERVIEW OF RESPONSIBILITIES: The Journal Editor-in-Chief is responsible for planning and overseeing the HPS Journal, including its content, format, and style. The editor also serves as the bridge between the Society and other individuals involved in the publication of the Journal.

APPOINTMENT: The appointment of Journal Editor-in-Chief will be made by the President, with approval by the Board. This position is initially a three-year appointment that will begin in September 2000.

HPS *Newsletter* Editor-in-Chief

At the midyear meeting, the Board of Directors approved a revision to Rule 9.2 that changes the position of *Newsletter* Editor-in-Chief from a position with a mandatory term limit to a contract position with no specified limit on the contract period. The contract for this position will be with the HPS Executive Secretary, similar to the current arrangement for the HPS Director of Special Publications. All members of the Society, including the current *Newsletter* Editor-in-Chief, are welcome to submit an application/proposal for this contracted position.

OVERVIEW OF RESPONSIBILITIES: The *Newsletter* Editor-in-Chief is responsible for planning and overseeing the HPS *Newsletter*, including its content, format, and style. The editor also serves as the bridge between the Society and other individuals involved in the publication of the *Newsletter*.

APPOINTMENT: The President will appoint the contracted *Newsletter* Editor-in-Chief, with approval by the Board of Directors. The term of the Editor-in-Chief will be as contracted by the Society's Executive Secretary.

Applications for Journal and *Newsletter* Editor-in-Chief Positions

APPLICATION: Interested individuals are invited to submit a written application consisting of a current résumé, a statement addressing each of the Evaluation Criteria listed below, a statement of goals for the publication, a proposal for expected staff and budget, and any other information considered relevant to qualifications and capability to serve in these positions.

EVALUATION CRITERIA: As stated above, the criteria should be specifically addressed for either the Journal or *Newsletter* position.

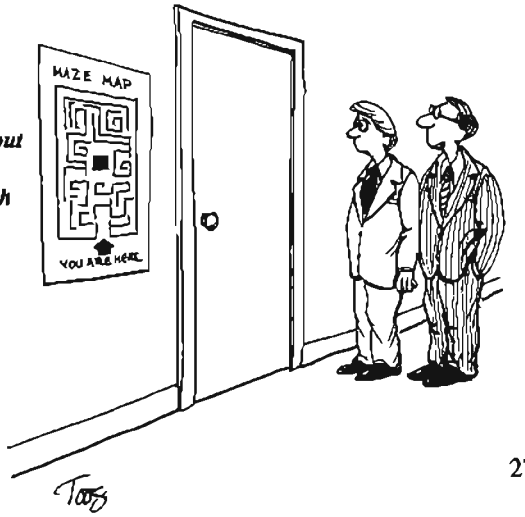
1. Has a working knowledge of and experience with the publication of a professional society journal/newsletter.
2. Has the education and experience required to understand current health physics issues and make objective editorial judgements about the content of the Journal/*Newsletter*.
3. Has the experience within the Society to understand the sensitivity of Society management issues involving liability, financial, and political considerations associated with publishing a Society publication.

4. Has the editorial experience required to evaluate the style, grammar, and format of documents that are put in the Journal/*Newsletter*.
5. Has the management skills necessary to oversee publication of a major professional journal/newsletter.
6. Shows initiative and is innovative, e.g., as required to institute changes in the Journal/*Newsletter* either (a) to respond to changes in the need of the membership or (b) to keep the appearance and content of the Journal/*Newsletter* up-to-date.
7. Is an active member of the Society, is known by Society members, understands the purpose and function of the Society, and understands what the Society wants and might need in the Journal/*Newsletter*.
8. Is able to communicate clearly and effectively, both orally and in writing, with the different components of the Society, e.g., the other editors, members, sections, and chapters.
9. Has no other Society jobs or positions that will conflict with the editor's responsibilities.
10. Is fiscally responsible and knowledgeable, e.g., of both the resources required to publish a journal/newsletter and on the revenue generated from publication of the Journal/*Newsletter*.
11. Has institutional, secretarial, and administrative support. This includes hardware, software, and firmware.

SUBMITTAL: Applications should be sent to:
Diane S. Flack
HPS, Publications Committee Chair
14023 Welland Terrace
Gaithersburg, MD 20878
Daytime: 301-415-5681 or DSF1@nrc.gov
Evening: 301-424-0038 or edflack@erols.com

APPLICATION DEADLINE: Applications must be received no later than 17 May 1999.

Direct any questions to Diane or any other member of the Publications Committee. Submissions will be held in strictest confidence. ■



"You can fill out the application when you reach the center of the maze."

SECTION NEWS

Decommissioning Section

Eric Abelquist, CHP

Update on Decommissioning Section Activities

Are you planning to attend the American Nuclear Society's (ANS) Decommissioning, Decontamination & Reutilization (DD&R) topical meeting in Knoxville, Tennessee, in September 1999? The Decommissioning Section is currently working out the details with ANS for involvement in this meeting. It is anticipated that the Decommissioning Section will host a session during the meeting titled "Health Physics Aspects of DD&R." Abstracts are due 15 March 1999, with final papers needed by 15 June 1999. Please contact Greg Chapman (gcchapman@naxs.com) or me (abelquie@orau.gov) if you have ideas for this session or are interested in presenting a paper at this meeting. The Decommissioning Section plans to continue identifying opportunities to co-sponsor topical meetings related to decommissioning with other professional groups like ANS.

The Decommissioning Section is continuing its efforts to develop a Section Web site that will serve as the primary communication forum for its members. An early listing of Web site subject matter includes D&D-related training courses, decommissioning guidance documents, D&D bibliography, Section officers and members, Bylaws and Charter, MARSSIM experiences, radiological survey instruments, characterization, and scrap metal recycling. While there is no final word on where the Web site will reside, Section officers are hopeful that the new Health Physics Society server will be our home. And once the Web site is up and running, a new logo for the Decommissioning Section will adorn the home page. The Section is soliciting ideas and designs for the new logo. The Decommissioning Section will forward candidate logo designs to Section members for a vote in the near future.

To close, I am saddened to report that our president-elect, Bruce Mann, announced that he had come to the decision that he must resign his position. Ed Cumming will serve as the Chair of the Nominations Committee, which includes three additional Section members. The first task for this committee will be to have a special election to fill the vacant president-elect position. The Nominations Committee will then prepare for the normal Section election process. Please contact Ed Cumming (ercummin@dukeengineering.com) to volunteer to run for one of the Section offices or to forward your nomination of a Section member for one of the offices. ■

ABHP Exam Q's and A's

ABHP Comprehensive Exam—13 July 1998

Ken Skrable, CHP

Question 4

You are a health physicist assigned to a research reactor. The reactor is equipped with a number of sample irradiation locations, including a pneumatic sample delivery system ("rabbit"). The reactor operators are performing extended activation runs with the reactor and would like to measure thermal neutron flux levels in the rabbit sample location using gold foil activation analysis. After inserting the sample into the reactor, the pneumatic system develops problems that do not allow retrieval of the sample. Six hours after insertion of the sample into the reactor, the rabbit problems are repaired and the sample is retrieved. The next morning (11 hours after being removed from the reactor), the sample is counted in a NaI(Tl) well detector with a multi-channel analyzer.

GIVEN:

Rabbit transit time from reactor to rabbit portal = 2 s
Inner diameter of rabbit tube = 4 cm

Target foil (thin) is ^{197}Au with a mass of 25 mg
The thermal activation cross-section for $^{197}Au(n,\gamma)^{198}Au$ is 98.8 barns

^{198}Au β^- E_{max} = 961 keV abundance = 98.65%
γ 412 keV abundance = 95.5%
half-life = 2.695 d

Ignore self-shielding in gold foil
Measured net photopeak counts = 827,410 in 1 minute
NaI(Tl) detector efficiency at 412 keV = 27.3%

Points:

20 A. Using the measured values for the sample, what is the ^{198}Au activity, in Bq, when it was removed from the reactor? **Show all work.**

20 B. For this part only, assume the sample activity upon exiting the reactor is 3.5 mCi. Estimate the gamma dose rate, in mR/h, at 10 cm. **Show all work.**

10 C. If the gold foil target contains 1×10^{24} ^{197}Au atoms and the incident thermal neutron flux is 1×10^{11} n/cm^2-s, what is the saturation activity?

1. 9.88×10^{36} Bq
2. 9.88×10^{12} Bq
3. 10^{35} Bq
4. 10^{11} Bq
5. 98.8 Bq

GIVEN: Neutron activation of thin gold foil and required data:

T_1 ≡ irradiation time = **6 h**;
T_2 ≡ time after irradiation to beginning of count = **11 h**;
m ≡ mass of gold foil = **0.025 g**;
σ_{act} ≡ activation cross section = 98.8×10^{-24} **cm**^{2} **at**$^{-1}$;
E_γ ≡ gamma energy = **0.412 MeV**;
Y_γ ≡ gamma yield = **0.955** γ **d**$^{-1}$;
λ ≡ decay constant = (ln 2)/(2.695)(24 h) = **0.0107 h**$^{-1}$;
C ≡ net counts in peak = **827,410 c**;
T_3 ≡ counting interval = 1 minute = **60 s**; and
ϵ_γ ≡ gamma peak detection efficiency = **0.273 c** γ^{-1}.

***Answers/Solutions:**

A. Activity $A(T_1)$ in Bq when foil is removed from reactor is calculated:

$$\langle C\rangle = A(T_1)\, e^{-\lambda T_2}\, Y_\gamma\, \epsilon_\gamma\, T_3;\ \text{so,}$$

$$* \quad A(T_1) = \frac{C\, e^{\lambda T_2}}{Y_\gamma\, \epsilon_\gamma\, T_3} = 59{,}500\ \text{Bq}.$$

B. Gamma exposure rate $\dot{X}$ in mR h^{-1} at distance **d** of **0.1 m** from an activity **A** of **3.5 mCi** is approximated:

$$* \quad \dot{X} \approx 0.5\, \frac{A\, Y_\gamma\, E_\gamma}{d^2} = 68.9\ \text{mR h}^{-1}.$$

C. The saturation activity **A** in Bq in a foil with **N** of 1×10^{24} **atoms** exposed to a thermal fluence rate ϕ of 1×10^{11} **n cm**$^{-2}$ **s**$^{-1}$ is calculated:

$$* \quad A = \sigma_{act}\, \phi\, N = 9.88\times10^{12}\ \text{Bq; so, answer is 2.}$$

The *Newsletter* is indebted to Dr. Ken Skrable, University of Massachusetts Lowell, who is responsible for this effort. To accurately reflect the ABHP exam, questions in this column are printed as they appeared in the exam. ■

Seventh Annual J. Newell Stannard Lecture Series

"Excellence in Radiation Protection"—9-10 April 1999

9 April 1999—Professional Enrichment Program, King's Beach, California. The topic of the PEP is "Decommissioning and Decontamination." Speakers include Colleen Petullo, Carl Gogolak, and Jim Reese.

10 April 1999—The Lecture Series at the Lakeshore Lodge, Hyatt Regency, Incline Village, Lake Tahoe, Nevada. Speakers include Ray Johnson, Ralph Thomas, Richard Griffith, Joel Cehn, Steve Rima, and others.

Contact George Anastas to obtain a registration packet or for further information—email: anastas@csus.edu, phone: 916-278-5447, or mail to Sierra Nevada Chapter, Health Physics Society, P.O. Box 160414, Sacramento, CA 95816-0414.

Special room rate at the Hyatt at Incline Village, $105 single, Hyatt phone 702-832-1234. Please ask for the block of rooms reserved for the "Health Physics Meeting 9 and 10 April 1999." ■

NOTES

Meeting Activities:
Technical Tours in Philadelphia and the Region

Robert Wickline

In recognition of the 20th anniversary of the incident at **Three Mile Island,** we have scheduled a tour of TMI. The tour begins with a presentation of the history of the incident and the current status of the power plant. This presentation will include photographs and videotapes. Scale models will be used to demonstrate the remediation program. After this presentation, a walking tour of the plant will include the control room and the turbine room. This is a full-day trip with travel and the on-site visit.

The **United States Department of Agriculture's Eastern Regional Research Center** (ERRC) conducts research on food safety and is located just north of Philadelphia. Irradiation is used to control a variety of food-borne pathogens. Each pathogen and specific food requires a different treatment, since the product's absorbed dose is affected by many factors. Dr. Donald Thayer will give a presentation on food irradiation research conducted at the ERRC with its 100,000 Ci ^{137}Cs irradiator (a 1.5 million Ci irradiator has been proposed).

What do you do when your tiger has a toothache? Or your giraffe has a pain in the neck? The Philadelphia Zoo, horse breeders and racers, and owners of other large animals may call on the services of the **University of Pennsylvania's New Bolton Large Animal Veterinary Facility** near Longwood Gardens (one of the social tours). If it can be done on humans, it's probably done to animals here. In addition to the non-radiation studies and treatments the animals receive a variety of x-ray and nuclear medicine procedures. These studies present health physics challenges for the staff. Visitors to this site may see a horse exercising on a treadmill or in the exercise pool for post-arthroscopic rehabilitation.

The **Nuclear Regulatory Commission's Mobile Van (Region 1)** will be at the Convention Center for one day. This mobile lab contains analytical equipment for assessing environmental levels of radioactivity. Currently it is used to support on-site sample analysis at facilities that are being decommissioned. Touring the van will be open-house style and Jim Kottan, Health Physics Manager for the Region 1 Laboratory, will be present for questions. ■

New Members of the HPS

Heide Rohland

The Health Physics Society reports 27 new members of the Society during January.

Daniel A. Berkley
Phone: 724-832-4267 Fax: 729-832-5092
Email: berkley@westol.com

Patti Brennan
Phone: 805-685-9880 Fax: 805-685-7981
Email: pbrennan@miravant.com

Ronald Butler
Phone: 781-386-0806 Fax: 781-386-0880
Email: butlerr@polaroid.com

Laelia Campos
Phone: 55 (081) 271 8252 Fax: 55 (081) 271 8250

Donna Djinovich
Phone: 630-322-5333 Fax: 630-969-6511
Email: ddjinovich@packardinst.com

Ward Dougherty

Daniel Dunn
Phone: 818-242-8816 Fax: 818-242-0610

Alfred Erdelji
Phone: 602-965-6140 Fax: 602-965-6609
Email: erdelji@asu.edu

Steven Farmer
Phone: 371-494-2693 Fax: 317-494-7403

Steve Flury
Phone: 828-227-7443 Fax: 828-227-7198

Catalin Frujinoiu
Phone: 208-236-2311
Email: catalin@physics.isu.edu

Robin Gill
Phone: 330-829-7578 Fax: 380-829-7432
Email: robin.k.gill@merdermou.com

L. Robert Greger
Phone: 213-580-5712 Fax: 213-580-5789

Ryan Hakimi

Ellen A. Hensley
Phone: 423-843-4252 Fax: 423-843-4133
Email: eahensle@tva.gov

Jasjit Jolly
Phone: 312-942-5751
Email: jjolly@rushu.rush.edu

Jack Kelley
Phone: 210-674-1410 Fax: 210-670-3305

Sung-Woo Lee
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Email: swlee@tamu.edu

James Lewis
Phone: 440-993-1933 Fax: 440-993-1908

Eric S. Nielsen
Phone: 203-796-5257 Fax: 203-792-3168

James Patton
Phone: 606-432-1910 Fax: 606-432-2838
Email: jmmon@kymtnnet.org

Thaddeus Sokolowski
Phone: 214-820-2510 Fax: 214-820-7540
Email: twsokol@prninc.com

David Soltysik
Phone: 352-392-1401 Fax: 352-392-3380

Kenneth Thompson
Phone: 208-528-2623
Email: thomkenn@isu.edu

Mary Van Baalen
Phone: 409-772-2279 Fax: 409-772-8921
Email: mvanbaal@utmb.edu

Kathryn Wilson

Stanley Wilson
Phone: 404-727-0729 Fax: 404-727-5904
Email: swilson@ehso.emory.edu ■

Charles A. Willis, CHP

Thomas Essig, CHP

Charles A. Willis, Senior Health Physicist in the Emergency Preparedness and Radiation Protection Branch of the Nuclear Regulatory Commission, died on 27 January 1999. Charlie had intended to present a paper at the recent Health Physics Society (HPS) Midyear meeting in Albuquerque, but due to pending heart surgery, asked me to present it on his behalf. Upon returning to the office, I had expected to share with Charlie the good news that his paper was well-received and that a number of HPS colleagues had wished him well regarding his pending surgery. Unfortunately, that opportunity did not present itself.

Charlie joined the Atomic Energy Commission (AEC) in 1972 after an illustrious career with Lockheed, McDonnell Douglas, General Electric, Atomics International, and Potomac Electric Power Company. He was recognized as an international expert in health physics and radiobiology. While employed by the AEC (and its successor, the Nuclear Regulatory Commission), Charlie had been involved in standards development for and licensing of nuclear power plants with a focus on effluent and radwaste treatment systems.

Charlie was a recent candidate for the President-elect of the HPS and has served on numerous national HPS activities and local chapter activities, including President of the Baltimore-Washington Chapter and as an officer in the Southern California Chapter. Charlie authored over 100 technical papers and publications, served on numerous American Nuclear Society, American Society of Mechanical Engineers, and American Society for Testing and Materials Standards Committees, and, as an International Atomic Energy Agency Reactor Safety Expert, was an advisor to the Philippine government.

Charlie received his B.S. and M.S. in physics from Northwestern Louisiana University, was a Fellow under the AEC Radiation Physics Fellowship Program, and was a graduate of the Nuclear Engineering Program at the University of Washington. Charlie was certified in health physics by the American Board of Health Physics. He also taught health physics as an Adjunct Assistant Professor at Georgetown University and was a mainstay in the Baltimore-Washington Chapter HPS Health Physics Certification Review Course.

Charlie will be missed by the health physics community as a whole, but particularly the Baltimore-Washington Chapter. His numerous contributions to the Chapter's newsletter on a continuing basis and his insights relative to a wide variety of health physics issues during Chapter meetings will be especially missed. Survivors include his wife Wynnora and three adult children. Wynnora Willis' address is 8607 Hidden Hill Lane, Potomac, MD 20854.

A complete obituary will appear in a future issue of *Health Physics*. ■

Excerpts from the *Federal Register*

Gregory D. Smith

• 63 FR 71232, 24 December 1998, Request for public input on rule development: The Nuclear Regulatory Commission (NRC) made available through the Internet, draft rule language and associated guidance documents governing Domestic Licensing of Special Nuclear Material and requested public comment. The Commission directed staff to continue public discussion of all relevant documents with the stakeholders, including use of the Internet, and submit a revised proposed rulemaking package for Commission approval by June 1999. A copy of the draft rule language and associated documents can be obtained either electronically at the NRC Technical Conference Forum Web site under the topic "Revised Requirements for the Domestic Licensing of Special Nuclear Material (Part 70)" (http://techconf.LLNL.gov/cgi-bin/topics) or from the NRC's Public Document Room, 2120 L Street NW (Lower Level), Washington, DC 20555; 202-634-3273; fax 202-634-3343. Comments may be posted electronically on the NRC Technical Conference Forum Web site (http://techconf.llnl.gov/cgi-bin/messages?dom–lic). Comments submitted electronically can also be viewed at that Web site. Comments may also be mailed to the Office of the Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

• 63 FR 71516, 28 December 1998, Notice of public meeting: The NRC held a public meeting on 8 January 1999 to obtain input for initiatives to streamline both inspection and enforcement for certain medical use licensees. Editor's Note: The temporary instruction relative to this matter may be found at <http://www.nrc.gov/NRC/NMSS/INSPECTION/TI2800xxx.html>.

• 64 FR 3052, 20 January 1999, Withdrawal of Proposed Rule: The NRC withdrew a proposed rulemaking that would have amended the Commission's regulations to provide additional regulatory control over certain measuring, gauging, and controlling devices to prevent unnecessary radiation exposure to individuals resulting from the use of the devices that contain radioactive sources.

• 64 FR 3139, 20 January 1999, Notice of availability and request for comments. Comments were due 15 February 1999: The NRC made available the draft document "Contingency Plan for the Year 2000 Issue in the Nuclear Industry." The document describes the current plan and approach the NRC staff plans to use in addressing contingencies resulting from potential unanticipated events due to the Year 2000 problem.

Note: The last issue reviewed was 28 January 1999. ■

INSIDE THE BELTWAY

Karen Smith and Liz Gemski

Profile: Congressman Rush Holt

Congressman Rush Holt (D) defeated Congressman Michael Pappas (R) in the November 1998 elections and represents New Jersey's 12th District. Holt is one of four Members of the House of Representatives with a doctorate in physical science to serve in the 106th Congress. Holt ran for the Democratic nomination for the twelfth Congressional district seat in 1996 but finished in third place. His father, the late Senator Rush Holt, served as a Democrat in the United States Senate from 1935 to 1941 representing West Virginia.

Holt's career has remained focused on science and education. In 1997, he was the Assistant Director at the Princeton Plasma Physics Laboratory in Princeton, New Jersey. Prior to his position at Princeton, he served as the Acting Chief of the Nuclear & Scientific Division in the Office of Strategic Forces Analysis at the United States State Department for two years. His work at the State Department included specialized analysis in strategic science and technology, including nuclear weapons proliferation and international science. Holt launched his career as a professor at Swarthmore College in Swarthmore, Pennsylvania, in the early 1980s. He taught courses in physics, arms control, and public decision making.

Holt currently serves on the House Budget and Education and the Workforce Committees. He believes his experience as a scientist will help focus Congressional attention on the reduction of global warming and increasing biodiversity conservation. Throughout his campaign he was a strong advocate for nuclear power.

In addition to nuclear power issues, Holt is an advocate for education and gun control issues. As a member of the House Education and the Workforce Committees, Holt will likely push for legislation that would reduce class size and increase federal funding of after-school programs. He would also like to extend the waiting period for handgun purchases and increase federal funding for background checks on gun purchasers. Furthermore, Holt would like to require all new weapons to be "childproof" and prohibit the purchase of guns in bulk.

As an advocate for nuclear power and a professor of physics, Holt will likely be interested in many of the same issues which interest the Health Physics Society. It will be important to watch Holt's legislative actions on bills relating to radiation safety standards and to offer the Society as a resource to him. ■

American Academy of Health Physics
American Board of Health Physics

CHP Corner

Address contributions for *CHP News* and "CHP Corner" to:
GARY KEPHART CHP CIH
ILLINOIS POWER COMPANY
BOX 678 ATTN: T-31 H
CLINTON IL 61727
work: 217-935-8881 x4211
fax: 217-935-4279
email: Gary_Kephart@illinova.com

NRRPT—A CHP Pipeline

Kevin J. Collins, CHP, RRPT

Recently, I took the time to conduct some research to determine how many individuals who have become Certified Health Physicists (CHPs) were previously Registered (RRPTs) with the NRRPT (National Registry of Radiation Protection Technologists). I obtained this information from past *NRRPT News* articles, *NRRPT Handbooks*, articles from the Health Physics Society's *Newsletter*, and review of the Health Physics Society's *Radiation Protection Professional's Directory & Handbooks*. I reviewed information for the years 1993 through 1998.

As of 1998, there were 1,093 Active CHPs. The 140 RRPTs who are CHPs represent 13 percent of the total active CHPs. A respectable percentage (96 out of 450, ~21 percent) of CHPs who have become certified since 1993 have been previously registered with the NRRPT. Since 1993, the percentage of RRPTs who have passed the Part I CHP exam (AAHP Associates) has also been very good (141 out of 624, ~23 percent).

Based on this review, it is clear to see that the NRRPT has provided a continuous supply of personnel who have become CHPs. The percentages have been higher in the last six years than in the previous years. This review supports the need to continue to promote the NRRPT. It also validates that the NRRPT has been aggressive in pursuing its mission of promoting the knowledge, training, and expertise of radiation protection personnel. The HPS and the Academy should continue their past support of NRRPT endeavors.

1 Year	2 # CHP	3 % CHP	4 Total CHP/Year	5 # Part I	6 % Part I	7 Part I/Year
Pre 1993	44	--	--	20	--	--
1993	15	19	77	29	27	107
1994	12	23	52	30	22	136
1995	7	18	38	27	20	136
1996	32	24	136	29	28	104
1997	5	11	44	20	21	96
1998	25	24	103	6	13	45
Total	140 RRPTs are also CHPs					

Notes and Considerations:

1. Column Information: 1. Year researched, 2. Number of personnel becoming CHPs that year who were RRPTs, 3. Percent total of RRPTs who became CHPs that year, 4. Total number of personnel becoming CHPs that year, 5. Number of RRPTs who passed Part I CHP exam that year, 6. Percentage of RRPTs who passed Part I CHP exam that year, 7. Total number of personnel who passed Part I CHP exam that year.
2. Some RRPTs who are CHPs may not have maintained Active CHP status. If so, the above numbers are understated.
3. Percentage of people currently ABHP Associates (passed either part of CHP exam) is not totaled since a large percentage has subsequently become CHPs.
4. The numbers above may be understated if personnel passed the NRRPT exam *after* taking either part of the CHP exam. ▪

CROSSWORD SOLUTION

TMI Anniversary Puzzle—Solution

Joyce P. Davis

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To advertise in the Newsletter, call Sharon at 507-362-8958 or email: hpsnews@frontiernet.net

Canadian Radiation Protection Association

Saskatoon, Saskatchewan, Canada
May 31 – June 3, 1999

Saskatoon is Saskatchewan's largest city with a population of about 210,000. It is located at the centre of the province's potash, oil and wheat industries. In more recent years, the city has also become the Western World's uranium capital.

In addition to the meeting in Saskatoon, a trip to the McArthur River uranium mine and McClean Lake mill is scheduled for the Sunday before the opening of the conference. These facilities are located about 500 miles north of Saskatoon. The uranium deposit at Cameco's McArthur River mine is the world's largest and richest. As activities increase, Cogema's mill at McClean Lake will expand to become the planet's largest uranium mill.

Come to Saskatoon in May!
Everything is 1/3 off -- 66¢ U.S buys $1.00 Cdn.

For more information, contact:
Sunil Choubal
44 Campus Drive, Saskatoon, Saskatchewan, Canada S7N 5B3
phone: 306-966-8495 fax: 306-966-8394
e-mail: sunil.choubal@usask.ca

Surf the Sites:
www.safety.ubc.ca/crpa/ - *for Conference Information*
www.sasktourism.com - *for Saskatchewan information*
www.city.saskatoon.sk.ca/tourism/ - *for Saskatoon information*

Conference Sessions:	
Radon Progeny Dosimetry	Internal and External Dosimetry
Training and Accreditation	Communicating with the Public
Workshop on NORM	Workshop on High Level Waste
The New R-F Standards (Safety Code 6)	ELF Hazards
Workshop on new Canadian Nuclear Safety Commission Regulations and Guidance Documents	Radiation Safety and the Internet
	Controlling radon levels in offices
Software for the radiation professional	Canada's Synchrotron
• Dosimetry (Internal or External) • Shielding and Epidemiology	Work of Major International Committees
• Environment and Radiation Program Management	Other Topics of Interest

Francis Marion University

Francis Marion University is a state-supported institution of approximately 4,000 students, offering both graduate and undergraduate degrees, with a primary mission of teaching. Students are drawn largely from South Carolina, but with the expansion of student housing, the University attracts a greater number of students from throughout the nation, as well as internationally. The University is located in the northeast section of South Carolina, just east of Florence. The city and county constitute a large and growing urban area of 125,000. The University is 55 miles from Myrtle Beach and 80 miles from Columbia. For additional information about Francis Marion University, visit our web site: http://www.fmarion.edu.

Assistant Professor of Physics

Tenure-track position #99-22. Earned doctorate required. Teaching experience preferred but not required. The successful candidate should have a strong interest in undergraduate instruction in health physics and physics, including undergraduate research, scholarly activity and involvement in the continued development of quality physics and health physics programs. Teaching load would be 12-15 contact hours per week of undergraduate physics and physical science lectures and laboratories. The Department offers Bachelor of Science degrees in Chemistry, Physics, and Health Physics and also administers several cooperative programs in engineering and engineering technology.

IMPORTANT INFORMATION – PLEASE NOTE:

Successful candidate will be expected to demonstrate ability to integrate technology into the learning process, a commitment to foster global awareness, a willingness to participate in distance learning and an appreciation of cultural diversity. Successful candidate must demonstrate a commitment to teaching excellence, continuous improvement, close interaction with students, and the ability to prepare students to live and work in a technologically sophisticated and culturally diverse society. Academic advising, committee work, and involvement in scholarship/professional activities will be expected. Some night and off-campus teaching will be expected of all faculty positions.

MINORITIES AND WOMEN ARE STRONGLY ENCOURAGED TO APPLY. Initial screening of applicants will begin immediately and continue until the position is filled. (Starting date is August 16, 1999)

Applicants should send a letter of interest referencing position #, a resume, copies of transcripts of all graduate work (official ones will be requested of successful candidate), three current letters of reference and three additional names, telephone numbers and addresses of references to:

Mrs. Alice C. Baker
Assistant Vice President for Human Resources
Francis Marion University
PO Box 100547
Florence, SC 29501-0547
Tel: (843) 661-1140; FAX: (843) 661-1484;
email: abaker@fmarion.edu

SHORT COURSES

There is a **$100** fee for each training course advertised. A check, made payable to the Health Physics Society, must accompany each submission. The maximum length for each course description is 300 words. All short course advertisements should be sent to:

SHARON R HEBL
MANAGING EDITOR
RR 1 BOX 139H
ELYSIAN MN 56028
Phone: 507-362-8958
Fax: 507-362-4513
Email: hpsnews@frontiernet.net

Listings that reach the office by the 25th of March will appear in the May issue of the *Newsletter*.

The *Newsletter* retains the right to edit short course listings to conform to *Newsletter* format.

For information about specific short courses, contact the offeror.

Applied Radwaste Management Inc., Attn: Charles Smith, P.O. Box 2225, West Columbia, SC 29171; 803-926-8558; fax: 803-939-0108; email: arminc01@aol.com; Web page: http://armnet.com/armonline/; to receive an autoresponder brochure by email, send info request to <info@armnet.com>.
TITLE: RADIOACTIVE MATERIAL TRANSPORTATION AND DISPOSAL SEMINAR — What's NEW for 1999? — Air Transport (IATA) Overview, USDOT Training CD-ROM for all attendees. This course continues to integrate the latest transportation and disposal requirements for shippers of radioactive materials. Topics include general hazardous material definitions, hazardous material table explanation, class 7 material and subclasses, radioactive material packaging, specification communications (marking, labeling, placarding, shipping papers, emergency response, training, radiation protection programs), operational limitations (radiation and contamination limitations), waste classification and characterization, current and new manifesting requirements, advance and prior notifications, disposal site (SC, WA, UT) licenses, NORM/NARM, and IATA requirements. The reference manual is organized in a very user-friendly format. After course

completion, the nearly 1,000-page reference manual enhances the students' ability to properly locate and apply NRC/DOT/Agreement State regulations in the supplied USDOT Title 49, Parts 100-185. All participants are reminded to bring calculators. CHP continuing education units are available for qualified individuals.

DATES: 12-16 April 1999
FEE: $950.00 (includes all texts, materials, and lunch each day) MC/Visa/Amex/POs accepted
PLACE: Emerald Springs Holiday Inn
Las Vegas, NV 702-732-9100
Ask for Applied Radwaste Management Group Rate ■

Bevelacqua Resources, Attn: Dr. Joseph J. Bevelacqua, Ph.D., CHP, 343 Adair Drive, Richland, WA 99352; 509-628-2240; email: bevelresou@aol.com

TITLE: HEALTH PHYSICS CERTIFICATION REVIEW COURSE (PART I)/HEALTH PHYSICS CERTIFICATION REVIEW COURSE (PART II)/PART I SELF-STUDY COURSE/ PART II SELF-STUDY COURSE/COURSE MATERIALS PART I/COURSE MATERIALS PART II. These courses focus on preparing Part I and II candidates for the successful completion of the American Board of Health Physics Certification Examination. Our students currently have achieved a 90+ percent passing rate. The instructor, Dr. Bevelacqua, was a former ABHP Part II Comprehensive Panel of Examiners member, vice-chairman, and chairman, and the experience gained in the development of the certification examination and the weaknesses of candidates attempting the examination have affected the content of these courses. Examination strategies and solution presentation techniques are emphasized. In addition, all certification exam areas are addressed. The courses utilize the instructor's textbooks: *Basic Health Physics: Problems and Solutions*, John Wiley & Sons, Inc. (1999) for Part I, and *Contemporary Health Physics: Problems and Solutions*, John Wiley & Sons, Inc. (1995) for Part II. These courses are very intense with lectures followed by problem-solving sessions. A brief mathematical review is included with each course. About 60 percent of the course time for Part II (30 percent for Part I) is devoted to problem solving with instructor critique and guidance provided to each student. Part I course materials, including over 700 Part I-style questions, the instructor's textbook, and detailed lecture notes are available for $1,050.00. Part II course materials are also available for $1,050.00, which includes the instructor's textbook with 375 worked example problems, 12 Part II certification examinations with solutions, and exam preparation materials. Two self-study courses, which include the course materials, are also available. The Part I self-study course contains an additional 550+ problems. A block of rooms with special rates has been reserved under "HEALTH PHYSICS." Since class sizes are limited, early registration is strongly recommended.

DATES: PART I COURSE (12-16 April 1999)
DATES: PART II COURSE (1-5 March 1999, 26-30 April 1999, and 10-14 May 1999)
FEE: $1,950.00 (Part I Course); $1,950.00 (Part II Course); $1,400.00 (each self study); and $1,050.00 (each course materials)
PLACE: Best Western Tower Inn & Convention Center
1515 George Washington Way
Richland, WA 99352
509-946-4121 ■

CSI-Radiation Safety Training, Program Manager: Greg Johnson, 481 N. Frederick Ave Ste 302, Gaithersburg, MD 20877; 301-990-6006 or 800-871-7930; fax: 301-990-9878; Web site: http://www.radtrain.com; email: info@radtrain.com

TITLE: RADIATION SAFETY OFFICER TRAINING. This is our 16th year offering this intensive 40-hour course to qualify you as a Radiation Safety Officer on an NRC or Agreement State license. Our course is highly acclaimed by several hundred representatives from government and industry who have attended since 1983. We provide the necessary technical information and practical experience to assure that you are well prepared to serve as an RSO for successfully managing a radiation safety program wherever radioactive materials are used. We specialize in training for radiation safety at facilities engaged in research, medical, biomedical, and educational programs, as well as the safe use of radioactive materials in irradiators, and sealed sources in measurement devices and density gauges. We place special emphasis on meeting the requirements of the NRC (Agreement States), DOT, and EPA and how to motivate your staff to effectively implement your radiation safety program. We use a combination of lecture, hands-on laboratory exercises, and extensive reference materials. General subjects include a review of radiation fundamentals, radiation measurements, radiation risks, radiation risk communication (based on the Myers-Briggs Type Indicator), radiation protection standards, internal and external dosimetry, radiation statistics, quality assurance, radiation surveys and personnel monitoring, record keeping, transport of radioactive materials, radioactive and mixed-waste management, radiation safety training, emergency response, radioactive materials licensing, and preparing for inspections. Our highly experienced instructors will provide practical tips on radiation safety program management. Our 1,000-page Radiation Safety Officer manual includes reference material developed specifically for this course. Each student will also be given a *Regulations Handbook for Radiation Safety Professionals*, which contains pertinent federal regulations and regulatory guides. Our goal is to provide both the training and the reference materials that you will need to be a successful RSO. Previous training and experience are not required. The course includes a final examination and a certificate suitable for framing. The primary instructors are Ray Johnson, a Certified Health Physicist and RSO, and Tom Johnson, a Certified Health Physicist who has a Ph.D. in health physics. Other instructors are also CHPs and Radiation Safety Officers. Continuing education credits are approved by the ABHP and the ABIH. We can customize and present this or other courses at your facility. Contact us for details.

DATES: 8-12 March 1999
12-16 April 1999
10-14 May 1999
7-11 June 1999
12-16 July 1999
16-20 August 1999
FEE: $1,495.00 (includes all materials and lunches)
PLACE: Gaithersburg, Maryland

TITLE: RADIATION SAFETY OFFICER REFRESHER. This course is for RSOs and Assistant RSOs who have previously completed a 40-hour RSO course and who could use an update on current regulations and compliance issues. Each class will focus on specific needs of those attending. We will emphasize practical answers for compliance issues, licensing, amendments, audits, dosimetry, instruments, training, wastes, transport, decommissioning, emergency response, ALARA programs, and troubleshooting RSO issues. Participants in this 20-hour course will receive our *Radiation Safety Officer Refresher* manual and a *Regulations Handbook for Radiation Safety Professionals*, which contains pertinent federal regulations and regulatory guides. You will receive a certificate suitable for framing.

DATES: 12-14 May 1999
18-20 August 1999
FEE: $895.00 (includes all materials and lunches)
PLACE: Gaithersburg, Maryland

TITLE: FUNDAMENTALS OF RADIATION SAFETY TRAINING—PART 1 & PART 2. This is two intensive one-day courses combined. Part 1 on the first day is an eight-hour course on Basic Radiation Safety to meet the training needs of new radiation workers as required by radioactive material licenses for all radionuclide users. This course, offered since 1983, also provides a good introduction to radiation fundamentals for others who are interested in radiation safety. Participants will receive the *Basic Radiation Safety Manual* with over 400 pages of material developed specifically for this course. Part 2 on the second day is an eight-hour course in Applied Radiation Safety with emphasis on practical applications of radiation fundamentals in the use of radiation instruments, contamination control, emergency response, safety audits, shipping and receiving of packages, operation of radiation safety programs, and problem solving. The instructors are Ray Johnson, CHP, and Dr. Tom Johnson, who bring more than 40 years of radiation safety experience to the classroom.

DATES: 2-3 March 1999

5-6 April 1999
4-5 May 1999
1-2 June 1999
5-6 July 1999
FEE: $275.00 for Part 1 - Basic Radiation Safety
$275.00 for Part 2 - Applied Radiation Safety
$495.00 for Parts 1 & 2 together
PLACE: Gaithersburg, Maryland

TITLE: CHP EXAM PREPARATION COURSE (PARTS I & II). This intensive 40-hour course will prepare CHP candidates for successful completion of Parts I & II of the ABHP examination. This course is highly acclaimed by former attendees for the clear and comprehensive teaching of Dr. Thomas Johnson, CHP, and Ray Johnson, CHP. The course will include 20 hours of technical review and 20 hours of problem solving based on Dr. Johnson's book, *The Health Physics SOLUTIONS MANUAL: Introduction to Health Physics Problems Made Easy* (co-authored with Dr. Herman Cember). The *SOLUTIONS MANUAL* provides answers to every question given in the Third Edition of *Introduction to Health Physics*. Detailed lecture notes are provided along with a large number of solved problems, including problems from previous exams. This course also presents problem-solving techniques that do not require highly complex calculations or hand-held computers. Class sizes will be limited to assure maximum attention for each student's needs.
DATES: 19-23 April 1999
FEE: $1,495.00 (includes all materials and lunches)
PLACE: Gaithersburg, Maryland

TITLE: NRRPT EXAM PREPARATION COURSE. This five-day class is designed to assist you in preparing for and passing the NRRPT exam. The class will cover the general required knowledge areas delineated by the NRRPT. The areas to be covered include Source of Radiation, Atomic Structure, Interaction of Radiation with Matter, Evaluating Internal and External Exposures and Controls, Prescribed Dosimetry and Radiation Equipment, Personnel Dosimetry, Biological Effects, Guides and Regulations, Radioactive Material Control and Transportation, Surveys and Inspections, Contamination Control, Emergency Preparedness, Procedures and Programs (ALARA), Analytical Methods, Instrument Calibration and Maintenance, and Equipment Operation. The presentations will be based upon the text recommended by the NRRPT for exam preparation *Introduction to Health Physics* by Herman Cember. All students will receive a copy of the text as well as copies of all of the overhead slides used in the class. The classes will be given by Dr. Tom Johnson, NRRPT, CHP, and Ray Johnson, CHP, PE, at our training facility in the Washington, D.C., area. Note: successful completion of N.R.R.P.T. certification is recognized for up to 30 college credits towards a four-year degree at select institutions.
DATES: 29 March-2 April 1999
20-24 September 1999
FEE: $1,495.00 (includes all materials and lunches)
PLACE: Gaithersburg, Maryland ■

Environmental Management and Controls, Inc., (EMC) Manager: Dan Tallman, 3106 S. Faith Home Rd., Turlock, CA 95380; 209-667-1102; fax: 209-667-1583; email: EMCTGA@AOL.com; Web site: http://www.TGAinc.com
TITLE: PACKAGING, TRANSPORTATION, AND DISPOSAL OF RADIOACTIVE MATERIAL. As a leader in radioactive waste processing and brokerage services, EMC now provides another significant waste management tool. Designed not only to meet the training requirements of 49 CFR 172.700 and NRC Information Notice 79-19, these seminars provide attendees with the information and experience necessary to successfully navigate the complexities of the radioactive material transportation and disposal regulations and disposal facility license requirements to ensure fully compliant shipments. Utilizing electronic visual aids and small class sizes, the material is presented in an easy-to-understand format with multiple classification and characterization examples, challenging each student to exercise his/her abilities. Students receive current editions of the regulations and a concise seminar guidebook for future reference. This course provides those new to the radioactive materials field with an excellent introduction to the regulations as well as a comprehensive review for those experienced personnel in need of the required refresher training mandated by 79-19 and the DOT training standards. These courses also detail the many changes implemented in the most current revision of the DOT regulations including those to LSA, SCO, domestic transportation, and radiation protection program requirements. Presenting these seminars will be the newest member of the Environmental Management & Controls team, Mr. Dan Tallman. Dan brings nearly 20 years of nuclear industry experience to the program, including US Ecology's Richland, Washington, Low-Level Radioactive Waste Disposal Facility and the Rancho Seco Nuclear Power Plant. In addition to his extensive experience in the radioactive waste industry is a Bachelor of Science in radiation protection, plus ten years of experience in the presentation of these regulatory seminars. At under $900.00 per attendee, these seminars provide an economical means to comply with the training requirements for radioactive material shippers. (Onsite and group discount options available.) **32 CEU approved by the AAHP (#98-00-021).**
DATES: 20-22 September 1999
FEE: $800.00
PLACE: Denver, Colorado
DATES: 16-19 November 1999
FEE: $850.00
PLACE: Anaheim, California ■

K.A.L., Inc., 18 Sue Ann Drive, Dracut, MA 01826; phone and fax: 978-957-4110. K.A.L., Inc., has scheduled the following workshops, to be conducted by Drs. Kenneth W. Skrable, George E. Chabot, Clayton S. French, and Michael T. Ryan.
TITLE: ABHP CERTIFICATION EXAMINATION REVIEW - PARTS I and II. The Certification Review for Health Physicists (CRHP) workshop is designed to help prepare participants for Part I and Part II of the American Board of Health Physics (ABHP) certification examination. The first day is comprised of concise lectures on health physics fundamentals. The remainder of the workshop will be two separate, concurrent sessions for Part I and Part II candidates dedicated to reviewing practice Part I examinations and actual ABHP Part II examinations. It is highly recommended that participants bring a calculator to the workshop approved by the ABHP for use during the actual examination. This calculator should be capable of performing scientific calculations including statistical applications and linear regression, numerical integration, and root solving applications. Participants receive an extensive set of course manuals that include material on health physics fundamentals, practice examinations similar to Part I of the ABHP examination, solutions to ABHP Part II examinations from 1987 to 1998 written by the course instructors, and strategies for preparing for and taking the ABHP examinations. The manuals alone constitute a self-study program (Option II) that can be purchased for $700. The full CRHP program (Option I) includes the manuals and the intensive review workshop. Registrants can request to have the CRHP manuals shipped before the workshop if the application is received at least six weeks before the workshop date. Please call for information on group discounts.
DATES: 8-12 March 1999
FEE: $1,750.00 for new and $1,450.00 for past CRHP participants
PLACE: The Sheraton Nashua Hotel
Tara Boulevard
Nashua, NH 03062 ■

Los Alamos National Laboratory, Group ESH-4, MCNP Class/ Paulette Sanchez, Mail Stop G761, Los Alamos, NM 87545. For further information, on the Internet visit http://esh-4.lanl.gov/ric1/mcnp.htm; or contact Dick Olsher, 505-667-3364, email: dick@lanl.gov; or contact David Seagraves, 505-667-4959, email: dseagraves@lanl.gov. Inquiries regarding registration and class space availability should be made to Paulette Sanchez, 505-665-6068; fax: 505-665-6071.
TITLE: PRACTICAL MCNP FOR THE HP, MEDICAL PHYSICIST, AND RAD ENGINEER (4.5 days). Monte Carlo-type calculations are ideally suited to solving a variety of problems in radiation protection and dosimetry. The Los Alamos MCNP code is a general and powerful Monte Carlo transport code for photons, neutrons, and

electrons. MCNP can be safely described as the "industry standard" with more than 600 person-years of development effort behind it. The code is supported on a variety of platforms including desktop and laptop personal computers. This course is aimed at the HP, medical physicist, and rad engineer with no prior experience with Monte Carlo techniques. The focus is almost entirely on the application of MCNP to solve a variety of practical problems in radiation shielding and dosimetry. The intent is to "jump start" the student toward using MCNP productively. Extensive interactive practice sessions are conducted on a personal computer. Topics will include overview of the MCNP code and the Monte Carlo method, basic concepts, input file preparation, geometry, source definition, standard MCNP tallies, interpretation of the output file, exposure and dose rate calculations, radiation shielding, photon skyshine, detector simulation, and dosimetry. The course fee includes a complete MCNP code package, distributed directly from the Radiation Safety Information Computational Center (RSICC). Students will also be provided with a comprehensive class manual and a diskette containing all of the practice problems. This course has been granted 32 Continuing Education Credits by the AAHP. The course is offered by the Health Physics Measurements Group at the Los Alamos National Laboratory and is co-sponsored by RSICC. Registration is available online at http://esh-4.lanl.gov/ric1/mcnp.htm, however to guarantee a space, payment must be received prior to the registration deadline. Make checks payable to the University of California (checks must be in U.S. dollars on a U.S. bank) and mail together with name, address, and phone number to the address above.

DATES: 17-21 May 1999 (registration deadline 3 May 1999)
18-22 October 1999 (registration deadline 4 October 1999)
FEE: $1,650.00 per person (includes the MCNP code package)
PLACE: The Canyon School Complex
Los Alamos National laboratory ■

Oak Ridge Associated Universities, Registrar of Professional Training Programs, P.O. Box 117, Oak Ridge, TN 37831-0117; 423-576-3576; fax: 423-576-9383; email: registrar@orau.gov; Web site: http://www.orau.gov./ptp/ptp.htm

TITLE: IMPLEMENTING MARSSIM FOR DESIGN AND CONDUCT OF RADIOLOGICAL SURVEYS. This five-day course emphasizes the decision-making processes involved in the design and implementation of a MARSSIM-based decommissioning survey. Topics include an overview of radiological survey types, the data quality objectives process, selection and application of DCGLs, background reference area selection, survey instrument detection sensitivity, area classification, statistical design of surveys, measurement uncertainty, and performing statistical tests. It is expected that the course instructors will include the following consultants to the MARSSIM Committee: Eric Abelquist, CHP, and James Berger, CHP.

DATES: 9-13 August 1999
FEE: $1,595.00 (includes all materials)
PLACE: Oak Ridge, Tennessee

TITLE: APPLIED HEALTH PHYSICS. This intensive five-week training course consists of lectures and laboratory exercises. Participants spend approximately 40 percent of their time performing laboratory exercises using radiation detection and measurement equipment. Laboratory exercises complement the health physics principles learned in the lectures. Lecture and laboratory topics include radiation physics, radiation detection and measurement techniques, radiation dosimetry, radiation biology, assay techniques, shielding and facility design, health physics principles, radioactive materials control techniques, and environmental monitoring.

DATES: 12 April-14 May 1999
13 September-15 October 1999
FEE: $7,995.00 (includes all materials)
PLACE: Oak Ridge, Tennessee

TITLE: INTRODUCTION TO RADIATION SAFETY. This one-week lecture/laboratory course is designed for users of radionuclides in industry, medicine, research, and education. The emphasis will be on health, safety, and the application of the ALARA concept. Lectures include a description of various radiation sources, their interactions, methods of detection, and biological effects. Laboratory exercises will stress radiation detection and measurement techniques, utilizing fixed and portable instrumentation.

DATES: 2-6 August 1999
FEE: $1,595.00 (includes all materials)
PLACE: Oak Ridge, Tennessee

TITLE: AIR SAMPLING FOR RADIOACTIVE MATERIALS. This one-week, laboratory-oriented course introduces participants to the basic theories and mechanics of air sampling for radionuclides. Approximately 40 percent of the time is spent collecting and analyzing air samples; the remainder is devoted to lectures. Lecture and laboratory topics include particle sizing, stack sampling, instrument calibration, air sampling equations, environmental air sampling, air sampling in the workplace, and characteristics of absorbers, adsorbers, and filters.

DATES: 17-21 May 1999
FEE: $1,595.00 (includes all materials)
PLACE: Oak Ridge, Tennessee

TITLE: ENVIRONMENTAL MONITORING. This one-week, laboratory-oriented course introduces participants to the basic theories and mechanics of environmental monitoring for radioactivity. Approximately 50 percent of the time is spent collecting and analyzing samples; the remaining time will be devoted to lectures. Lecture and laboratory topics include air monitoring, soil sampling (surface and subsurface), sediment sampling, water sampling, regulatory requirements, vegetation and food sampling, borehole logging, and direct gamma measurements.

DATES: 21-25 June 1999
23-27 August 1999
FEE: $1,595.00 (includes all materials)
PLACE: Oak Ridge, Tennessee

TITLE: RADIOLOGICAL SURVEYS IN SUPPORT OF DECOMMISSIONING. This one-week lecture and field course introduces course participants to the timely issue of designing and implementing radiological surveys in support of the decommissioning process. This course emphasizes several recently issued and relevant NUREG and other guidance documents. Lecture topics include decommissioning criteria and guidelines, design of radiological surveys, statistical considerations, radiation instrumentation, RESRAD, D&D, survey techniques, MARSSIM, sample preparation and analysis, and quality assurance.

DATES: 15-19 March 1999
16-20 August 1999
FEE: $1,595.00 (includes all materials)
PLACE: Oak Ridge, Tennessee ■

Radiation Safety Associates, Inc., 19 Pendleton Drive, P.O. Box 107, Hebron, CT 06248; 860-228-0487; fax: 860-228-4402

Call us and we will confirm your registration immediately. These and other courses can be cost-effectively presented at your facility for as few as four or five students AND customized to your needs for no additional charge. Please call for details.

TITLE: RADIATION SAFETY OFFICER (five days). RSA, Inc., is recognized by government and industry alike as a leader in the education and training of Radiation Health and Safety professionals. This course has been designed to fully meet the 40-hour training requirement of the NRC and Agreement States for most Radiation Safety Officers. It provides the technical and practical information required to prepare an individual to be an effective RSO regardless of past experience. The course begins with a review of the basic theories and concepts required to productively serve in the Radiation Safety profession. Review topics range from basic math and calculations to the different types of radiation and how they interact with matter. As the week progresses, all aspects of Radiation Safety are discussed; personal dosimetry, radiation detection and measurement,

exposure controls and required surveys, survey methods, state and federal x-ray standards, skin dose calculations, interpreting regulations and guidelines, licensing requirements, dealing with regulatory audits and items of non-compliance, and emergency planning are some of the topics discussed in detail. Our experienced instructors can also offer suggestions for setting up and running a meaningful radiation protection program at a licensed facility. Course materials include a two-volume textbook, a scientific calculator, and a student copy of selected, pertinent federal regulations. This text, unavailable from any other source, will serve as a reference and guidebook for the RSO throughout his or her career. The course also includes a series of hands-on laboratory exercises and a voluntary final exam for those who need a course grade. Some prior knowledge of algebra and science is desirable, but the course can be satisfactorily completed by someone with limited science and math experience. This course is presented only five times per year and is always fully subscribed.

DATES: 8-12 March 1999
7-11 June 1999
13-17 September 1999
15-19 November 1999
FEE: $1,275.00 (includes all texts and materials)
PLACE: Hartford, Connecticut

TITLE: RADIATION SAFETY OFFICER REFRESHER (two days). Here's a course which has been requested by many of our RSO course participants. This two-day refresher will help sharpen the RSO's math skills and review survey methods, record keeping, and many other aspects of an existing radiation protection program. Participants will also have an opportunity to discuss specific problems and to get suggestions from the instructor and the other students. Also covered: license amendments, procedures, current topics of special interest, a review of recent incidents, and new changes to the regulations. This course is a refresher for fully qualified Radiation Safety Officers who are currently overseeing a licensed radiation safety program. It is not designed to meet basic qualification requirements.

DATES: 27-28 September 1999
FEE: $495.00
Place: Hartford, Connecticut

TITLE: FUNDAMENTALS OF RADIOLOGICAL PROTECTION (two days). This is the introductory course for radiation workers and for others desiring an introduction to nuclear phenomena and protection practices. It is a qualitative approach to nuclear science, and only elementary mathematics is used in the presentation. Laboratory periods give the students an opportunity to perform surveys for radiation and contamination and to use various types of protective clothing and equipment. Opportunities for discussion and question/answer sessions are included. Materials include the text *Fundamentals of Radiological Protection*, summary exercises, and activity sheets. The course features demonstrations of various types of detection instruments and equipment used in radiation protection, which the attendees will have an opportunity to use.

DATES: 7-8 October 1999
FEE: $495.00
PLACE: Hartford, Connecticut

TITLE: HEALTH PHYSICS TECHNICIAN LEVEL I BASIC (five days). This is an introduction to the principles and practices of health physics and radiation protection. Students should have some knowledge of nuclear phenomena to obtain maximum benefit. Another course offered by RSA, Inc., titled "Fundamentals of Radiological Protection," would be adequate preparation. Casio scientific calculators are provided, but participants may bring their own, if they prefer. This class is a must for those who have never worked in the nuclear field before, or who have started directly in the field and now need theory and laboratory training for advancement. It will equip students with the basic tools they need to develop into fully qualified health physics technicians. Daily quizzes, laboratory exercises, and homework assignments supplement the classroom presentation.

DATES: 3-7 May 1999
18-22 October 1999
FEE: $1,195.00 (includes all texts and materials)
PLACE: Hartford, Connecticut ▪

Reed College Reactor Facility, Attn.: Stephen Frantz, Reactor Director, 3203 Southeast Woodstock Blvd., Portland, OR 97202-8199; 503-777-7222; fax: 503-777-7274; email: sfrantz@reed.edu

TITLE: RADIATION SAFETY OFFICER, PRACTICAL APPLICATIONS. This course is designed to provide RSOs and Assistant RSOs with an introduction to the practice of health physics. While regulation and documentation will be covered, the emphasis will be on the practical skills necessary to perform the duties of RSO. Topics will include radioactivity, radiation, and its biological effects; personal dosimetry; instrument selection, use, and calibration; air sampling; laboratory instrumentation; radioisotope counting and analysis; ventilation analysis; facility design and use; radioactive waste management; and transportation. The facility includes an operating TRIGA nuclear reactor which will provide the basis for some of the laboratory exercises. The course will conclude with a final exam and certificate. Three hours of college credit is available through Concordia University in Portland ($225 additional fee).

DATES: 22-26 March 1999
FEE: $1,200.00 (includes all course material)
PLACE: Portland, Oregon ▪

Risk Assessment Corporation will sponsor the following four-day course. For more information, contact CAPS, Ltd., 1715 N. Wells St., Suite 34, Chicago, IL 60614 or call 312-988-7667 or fax 312-649-9383 or visit our course Web page at <http://www.racteam.com/>.

TITLE: CALCULATING AND UNDERSTANDING RISK FROM CHEMICALS RELEASED TO THE ENVIRONMENT. This course will focus on the practical application of risk assessment techniques and risk-based decisions for corrective action being used today. A case study will be introduced on Monday and instructors will use the case study throughout the week to illustrate their topics. Emphasis will be placed on the fundamentals of risk calculations and critical data that should be collected and applied. Attendees will be provided with insight into the future of chemical risk assessment and an opportunity to learn about the state-of-the-art methodologies for estimating risk.

DATES: 12-15 April 1999
FEE: $1,495.00
PLACE: San Antonio, Texas ▪

PLACEMENT CENTER

Employers Seeking Health Physicists

There is a **$100** fee for each job description listing advertised. A check, made payable to the Health Physics Society, must accompany each submission. The maximum length for each description is 300 words. All placement advertisements should be sent to:

SHARON R HEBL
MANAGING EDITOR
RR 1 BOX 139H
ELYSIAN MN 56028
Phone: 507-362-8958
Fax: 507-362-4513
Email: hpsnews@frontiernet.net

Listings that reach the office by the 25th of March will appear in the May issue of the *Newsletter*.

Listings are by equal opportunity, affirmative action employers. The *Newsletter* retains the right to edit ads to *Newsletter* format.

For information about job listings, contact the offeror.

Afftrex Ltd., Clairton, PA; note the **Job #99-0102** and salary requirements, send résumés and cover letter to Mr. Paton Park, 600 State Street, Suite 201, Clairton, PA 15025; 1-800-536-8783, ext. 1961; fax: 412-233-8111; email: pjpark@afftrex.com; Web site: www.afftrex.com

Afftrex Ltd. is an established government contractor who provides Health Physics and Radiological Decontamination & Decommissioning Services throughout the U.S. Interested in a successful organization that is expanding within a vital environmental business, we may have the opportunity you seek. We are looking for career-minded professionals to join our successful engineering staff. We offer competitive wages, tuition reimbursement, life and dental insurance, health benefits, paid holidays and vacation, and a 401K plan.

Location of Openings: **The Bettis Atomic Laboratory (BAPL)**, West Mifflin, PA (Pittsburgh); the BAPL's mission has been to develop advanced Navy Nuclear Propulsion technology and provide technical support for the safe and reliable operation of existing Naval Reactors.

Brief Description: **Radiological Engineer** (Job #99-0102) (3 openings) — The Radiological Engineer reports to the Engineering Manager. This position is responsible for the preparation of detailed work procedures for the radiological decontamination of specific site areas. The successful candidate must prepare project estimates for individual assignments which includes ordering materials and equipment required to complete assigned projects; responsible for monitoring workers in the field for job proficiency and safety. The candidate will prepare and submit test runs and technical reviews for techniques and equipment tests. **Contact Mr. Paton Park for additional information.** *Requirements:* B.S. in Engineering (Mechanical, Civil, Environmental) REQUIRED; U.S. Citizenship REQUIRED for the DOE "L" or "Q" clearance; three to five years of field work in radiological materials decontamination PREFERRED; Navy Nuclear Power Program experience is a PLUS.

CSI-Radiation Safety, 481 N. Frederick Ave., Suite 302, Gaithersburg, MD 20877; 301-990-6006; fax: 301-990-9878; email: info@radtrain.com

Description: CSI-Radiation Safety is expanding training and consulting services and is looking for a CHP with a minimum of a master of science degree and six years of experience in radiation safety and training. The position will require the supervision of radiation safety technicians and administrative support staff in the Washington, D.C., area. The successful candidate will have strong communication skills. Responsibilities will include monitoring the performance of employees through quality assurance checks. The candidate will also be expected to develop and present training classes and seminars in addition to other consulting duties. CSI offers continuing education opportunities, retirement benefits, and a generous bonus program. Please respond ONLY if you are a CHP with a master's degree or higher to CSI at the address or phone numbers above.

Oregon State University, 130 Radiation Center, Corvallis, OR 97331-5902; 541-737-2343; fax: 541-737-0480; email: kleina@ne.orst.edu; additional information is available at www.ne.orst.edu

Attn: Dr. A.C. Klein, Head, Department of Nuclear Engineering

Description: Assistant Professor, Health Physics Specialization, Department of Nuclear Engineering, Oregon State University (OSU). The Department of Nuclear Engineering at OSU is seeking qualified candidates for a tenure track faculty position at the Assistant Professor level. A Ph.D. in health physics, nuclear engineering, medical physics, or a closely related field is required. Preference will be given to candidates with teaching and research interests in the areas of environmental health physics, radiological risk assessment, instrumentation, imaging, radioactive waste management and remediation, radioactive material transportation, or radiation dosimetry. Prior industrial, national laboratory, and teaching experience will be favorably considered as well as a candidate's interests and abilities to make use of the Oregon State TRIGA Reactor and the facilities of the OSU Radiation Center. Principal assignments will be teaching courses at both the undergraduate and graduate levels in the general areas of radiation health physics and nuclear engineering, developing a sponsored research program, and supervising graduate research leading to M.S. and Ph.D. degrees. Rank and salary will be commensurate with educational qualifications and previous experience. OSU is one of only ten American universities to hold the Land Grant, Sea Grant, and Space Grant designation and is located in Corvallis, a community of 49,000 people situated in the Willamette Valley between Portland and Eugene. Ocean beaches, lakes, rivers, forests, high desert, and the rugged Cascade and Coast Ranges are all within a 100-mile drive of Corvallis. The university has an institution-wide commitment to diversity and multiculturalism and provides a welcoming atmosphere with unique professional opportunities for leaders who are women and people of color. All are encouraged to apply. OSU offers an excellent academic atmosphere with an outstanding fringe benefit program and is an EOE/AA employer with a policy of being responsive to the needs of dual-career couples. Individuals wishing to be considered for this position should submit a curriculum vita or résumé and the names of three references to Dr. A.C. Klein at the address above. Although applications will be accepted until the position is filled, review of completed application files will begin around 1 March 1999.

Stanford Linear Accelerator Center, P.O. Box 4349, M/S 11, Stanford, CA 94309

Description: Radiation Health Physicist. Stanford Linear Accelerator Center (SLAC), a high-energy research facility, has the following opportunity available. Will assume responsibility for radiological considerations, operational safety and shielding design, working closely with facility physicists and beam line designers. Requires a recent Ph.D. in health physics, nuclear engineering, or physics (an M.S. with equivalent accelerator experience will be considered) and experience with nuclear instrumentation and radiation detection, as well as familiarity with shielding of accelerators, radiation transport calculations, neutron, photon, and charged particle dosimetry. Computer proficiency (UNIX & PC) is essential. Candidates must have excellent communication skills and demonstrated ability to work both independently and as a member of a cohesive team. SLAC offers competitive compensation and excellent benefits. Please send your résumé, referencing Job #17502 to the address above. ■

Article II, Section 1, of the Bylaws of the Health Physics Society declares: "The Society is a professional organization dedicated to the development, dissemination, and application of both the scientific knowledge of, and the practical means for, radiation protection. The objective of the Society is the protection of people and the environment from unnecessary exposure to radiation. The Society is thus concerned with understanding, evaluating, and controlling the risks from radiation exposure relative to the benefits derived." This *Newsletter* is intended as a medium for the exchange of information between members. The *Newsletter* is published monthly and is distributed to the members of the Society as a benefit of membership. Subscriptions for non-members are available. Libraries, institutions, commercial firms, government agencies, and any person not eligible for membership may obtain a subscription. A small inventory of recent back issues is maintained by the Society at the Office of the Executive Secretary to supply copies to new members not yet on the mailing list. Inquiries about back copies and about subscriptions should be directed to the HPS Secretariat.

*** CHANGE OF ADDRESS NOTICE ***

ARE YOU ANTICIPATING A CHANGE IN YOUR ADDRESS? IF SO, PLEASE READ THE FOLLOWING FIRST:

It takes at least six (6) weeks for your address change to become effective for your *Newsletter*. If you anticipate a move, please let the Secretariat's office know as soon as you are sure of what your address will be. By doing this, there will be a better chance that the receipt of Journals, *Newsletters*, and other Society mailings will be uninterrupted. Please be aware of this time factor! Thank you.

CHANGE OF ADDRESS: Effective Date _____ (please read paragraph above)

Please make any changes or corrections BESIDE YOUR MAILING LABEL (on the reverse side of this notice or on the envelope) or email changes to <hps@Burkinc.com>.

If you have any change in your work phone number, fax number, or email address, please note it near the label or email changes to <hps@Burkinc.com>.

MAIL THIS FORM TO:
HEALTH PHYSICS SOCIETY
1313 DOLLEY MADISON BOULEVARD, SUITE 402
MCLEAN VA 22101