

**National Analytical Management Program (NAMP) Education and Training in
Radiochemistry via Public Webinars – 14027**

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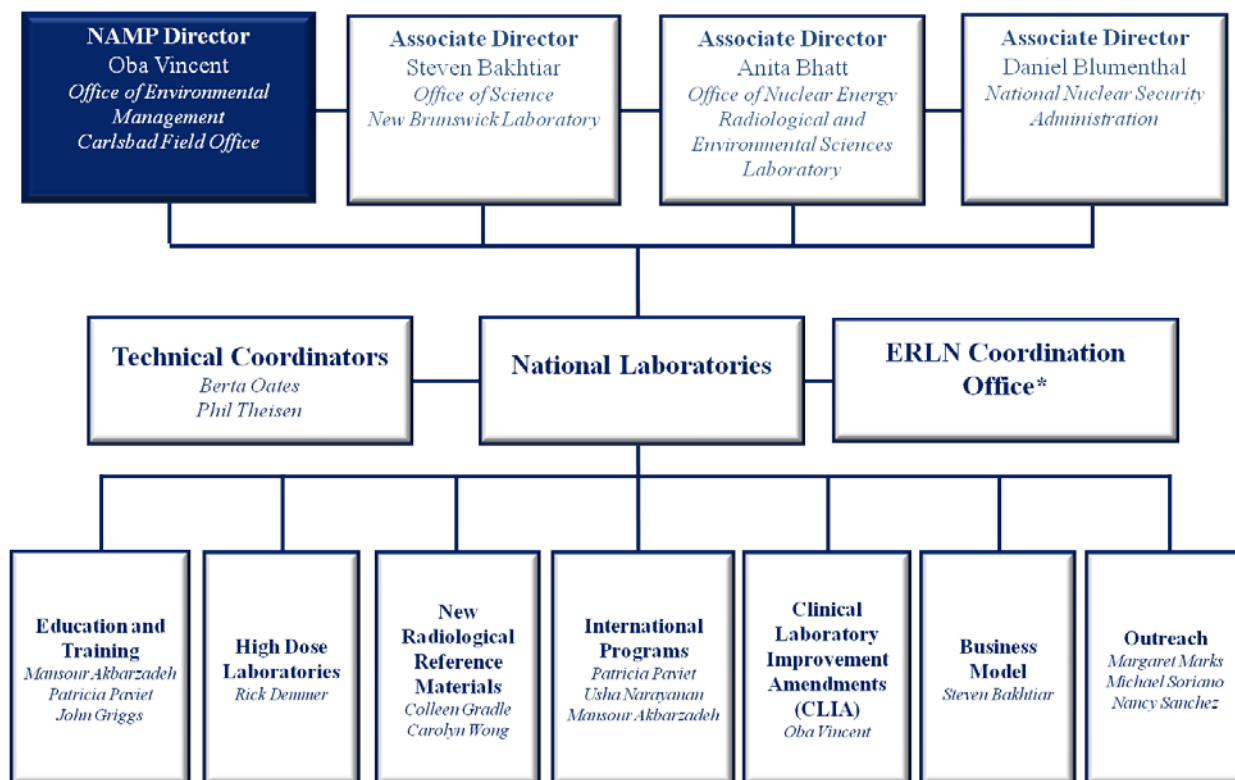
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ABSTRACT

An increasing number of emerging countries are opting for nuclear energy as an important step toward economic development and environmental protection. The use of this carbon-free technology will require personnel specializing in nuclear engineering, health physics, and radiochemistry. Concurrently, a decline in the nuclear energy workforce has been observed in the world's largest consumers of nuclear energy, including countries such as France, Japan, and the United States. Advances in nuclear medicine, nuclear forensics, and nuclear fuel recycling clearly depend on continued development of nuclear technologies and use of radioactive nuclides. To maintain a qualified workforce and to meet the expanding needs for educational opportunities in radiochemistry and nuclear chemistry, the National Analytical Management Program (NAMP) Education and Training subcommittee has launched several series of webinars on different subjects related to nuclear energy. NAMP serves as a central focal point for coordinating analytical resources and capabilities available within the U.S. Department of Energy (DOE) complex. NAMP membership is open to all laboratories providing services to the DOE, i.e., government-owned and government-operated, government-owned and contractor-operated, and private sector laboratories. The expertise provided and services rendered by these laboratories in radiological and physical sciences are available to national and international agencies as required, especially in the event of emergencies such as natural disasters, accidents, or terrorist activities. Using modern internet technologies, the NAMP Education and Training subcommittee is accessible to a broad audience and is educating and strengthening the knowledge of participants in applications related to actinide and fission products chemistry, sample preparation, detection, dosimetry and risk assessment. This achievement is the direct result of partnering with university professors and professionals who conduct live webinars on a monthly basis (<http://www.wipp.energy.gov/namp>). Besides creating a world-wide classroom, the webinars offer unprecedented opportunities for interdisciplinary crosslinking and collaboration in education and research.

INTRODUCTION

The National Analytical Management Program (NAMP) has been re-established by the U.S. Department of Energy (DOE) Office of Environmental Management (EM) through the DOE Carlsbad Field Office (CBFO) to create an Environmental Response Laboratory Network (ERLN) office to serve as a central coordination point for analytical resources within the DOE. The NAMP also assists other Federal agencies and both national and international organizations in gaining access to DOE radiological analytical capabilities and expertise. Fig. 1 illustrates the organizational structure of the NAMP, including the seven NAMP subcommittees.



*NAMP Laboratories participating in ERLN
 INL Idaho National Laboratory SRS Savannah River Site
 ORISE Oak Ridge Institute for Science and Education WIPP Waste Isolation Pilot Plant
 SNL Sandia National Laboratories Y-12 Y-12 Plant, Oak Ridge, TN

Fig. 1. NAMP Organizational Structure.

The immediate objective of the NAMP Education and Training subcommittee is to introduce the topic of radiochemistry to a new audience, or advance the knowledge of personnel already involved in the unique scientific discipline of radiochemistry. Formal training in radiochemistry is difficult to obtain because, as pointed out in a National Academy of Sciences report [1], only a small number of universities offer radiochemistry courses. It is the sincere belief among NAMP participants that promoting radiochemistry education through these webinars will certainly strengthen radiochemistry resources in developed countries as well as contributing to socioeconomic development of emerging countries. NAMP, through these webinars series, hopes to assist emerging countries as they gain access to nuclear energy as a sustainable energy resource. In addition, initiating this training through webinars and providing a better understanding of radiochemistry to national and international institutions create tremendous opportunities to increase networking among radiochemistry professionals.

STATISTICS IN RADIOCHEMISTRY

Since the 1970s, when declining numbers of radiochemists worldwide was first observed [2], several reports have documented concern that a sizable percentage of the nation's experts in radiochemistry at national laboratories and universities is nearing retirement age. If the current trend is not reversed within one generation or less, the knowledge and expertise accumulated so far in an entire scientific sector through immense effort and dedication will be lost [3]. Unfortunately, because radiochemistry is vital to a number of fields such as nuclear medicine, nuclear waste management, and nuclear fuel cycle, a shortage of qualified staff will hinder the advancement of these fields in both developed and developing countries.

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In Argentina, for example, the University of Buenos Aires radiochemistry and nuclear chemistry programs were closed in 2006, after more than 50 years of continuous activity. As a result, the curriculum for graduates in Argentina no longer includes any coursework in radiochemistry or nuclear chemistry [4]. The American Association for the Advancement of Science and the American Physical Society reported in February 2008, that the difficulty in replacing retiring scientists is exacerbated by a precipitous decline in the number of advanced degree programs in radiochemistry at U.S. academic institutions [5]. Over the past two decades, the nuclear industry, including government and universities, has hired few new graduates and there has been no significant investment in university-based education and research or in nuclear component manufacturing or other aspects of nuclear infrastructure [6].

Fortunately, it appears that a reversal of this trend is occurring in many countries. For the last several years, the U.S. Congress has provided funding for university programs through different agencies, such as the DOE, the Nuclear Regulatory Commission, and the National Nuclear Security Administration. For instance, the Nuclear Energy University Program (NEUP) engages the U.S. university community to conduct program-directed, program-supporting, and mission-supporting research and development. The NEUP also supports related infrastructure improvements and promotes student education to build world-class nuclear energy and workforce capability. These developments have very positive impacts on students' interests. With the prospects of good careers, undergraduate enrollments in nuclear energy related fields including radiochemistry recovered to pre-1990 levels, while graduate enrollments show steady growth with the availability of research funding (Fig. 2).

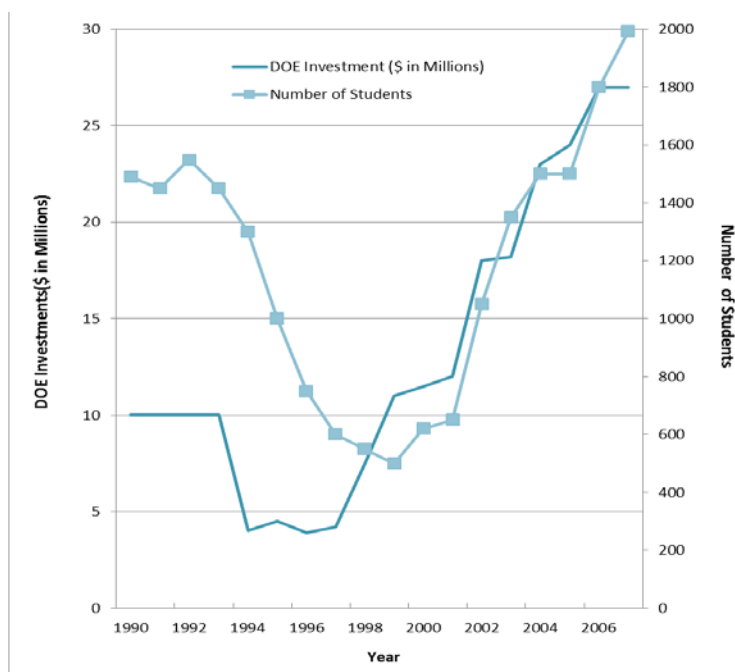


Fig. 2. Student Enrollment in U.S. Universities (adapted from [5]).

To bolster interest and increase awareness in radiochemistry, NAMP has created a subcommittee that is dedicated to education and training in radiochemistry. Primary objectives are: 1) education of scientists, engineers, and technicians needing specialized knowledge in radiochemistry, 2) preparation of the radiochemical and radiological workforce for U.S. industry and government, 3) provision of intellectual underpinnings for continued U.S. leadership in

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radiochemistry and nuclear chemistry. As pointed out by Landsberger [7] “No single book can truly fulfill all the aspects of radiochemistry for the purposes of teaching and training.” In order to foster and develop skills in radiochemistry, the NAMP Education and Training subcommittee has chosen to develop webinars to provide a basic understanding of the fundamental chemical and physical properties of different actinides.

NAMP WEBINARS IN RADIOCHEMISTRY

Webinars are on the cutting edge of education on the internet, and this newly available resource prompted the NAMP Education and Training subcommittee to make use of it to reach a broad audience. The first series of lectures on actinide chemistry was launched in April 2012 (see TABLE I) and continued through April 2013. Each webinar consists of 90- to 120-minute educational lectures on topics in radiochemistry, conducted by renowned university professors and leading scientific experts.

TABLE I. Webinars series 1 – actinide chemistry April 2012 to April 2013

Presenter	Title of Webinar	Webinar Presentation
<i>Dr. Alena Paulenova</i> Oregon State University	Overview of Actinide Chemistry	20 April 2012
<i>Dr. Mikael Nilsson</i> University of California-Irvine	Uranium Chemistry (General chemical properties of uranium)	14 June 2012
<i>Dr. Patricia Paviet</i> Idaho National Laboratory	Plutonium Chemistry (General chemical properties of plutonium)	12 July 2012
<i>Dr. Brian Powell</i> Clemson University	Environmental Chemistry of Uranium and Plutonium (Part I)	07 August 2012
<i>Dr. Brian Powell</i> Clemson University	Environmental Chemistry of Uranium and Plutonium (Part II)	14 August 2012
<i>Dr. Ralf Sudowe</i> University of Nevada Las Vegas	Analytical Chemistry of Uranium and Plutonium	11 October 2012
University of Iowa <i>Dr. Michael Schultz</i>	Source Preparation for Alpha Spectroscopy	15 November 2012
<i>Dr. Ralf Sudowe</i> University of Nevada Las Vegas	Sample Dissolution	13 December 2012
<i>Dr. Alena Paulenova</i> Oregon State University	Neptunium Chemistry	5 February 2013
<i>Dr. Alena Paulenova</i> Oregon State University	Trivalent Actinides Chemistry (Americium and Curium)	28 February 2013
<i>Dr. Lester Morss</i> George Washington University	Transplutonium Chemistry	28 March 2013
<i>Dr. Bahman Parsa</i> New Jersey Department of Health	Radium Chemistry	25 April 2013

Since the first series, NAMP, in cooperation with the U.S. Environmental Protection Agency (EPA), other federal agencies, and its university partners, has conducted 17 free, live, interactive conferences as part of an initiative to meet the expanding need for radiochemists in the U.S. workforce. Each live presentation is recorded and archived as an on-line resource vital to promoting and encouraging the field of radiochemistry as a career choice [8, 9]. Two NAMP radiochemistry webinars have been awarded Continuing Education Credits from the American

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Academy of Health Physics: “Source Preparation for Alpha Spectroscopy,” presented by Dr. Michael K. Schultz of the University of Iowa, and “Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation,” presented by Dr. Thomas Rucker of Science Applications International Corporation (now a part of Leidos).

The first NAMP webinar series, “Actinide Chemistry,” included 11 presentations on actinide chemistry and one presentation on radium chemistry, as shown in TABLE I. The actinide chemistry series laid the foundation for the next series, “Environmental Radiochemistry and Bioassay” (TABLE II).

TABLE II. Webinars series 2 – environmental radiochemistry and bioassay May 2013 to May 2014

Presenter	Title of Webinar	Webinar Presentation
Dr. Thomas Rucker Science Applications International Corporation	Validation and Verification of Radiological Data	23 May 2013
Dr. Kenneth Inn National Institute of Standards and Technology	Traceability and Uncertainty	25 July 2013
Dr. Robert Jones Centers for Disease Control and Prevention	Radiobioassay	22 August 2013
Bob Shannon David C. Burns Environmental Management Support	Gamma Spectrometry (Part I)	19 September 2013
Bob Shannon Dr. Robert Litman Environmental Management Support	Gamma Spectrometry (Part II)	26 September 2013
Dr. John Griggs Environmental Protection Agency	EPA Incident Response Guide and Rapid Methods Overview	21 November 2013
Dr. Keith McCroan Environmental Protection Agency	Detection Decisions and Detection Limits	12 December 2013
Dr. Donovan Porterfield Los Alamos National Laboratory	Mass Spectrometry	24 January 2014
Dr. Michael Soriano New Brunswick Laboratory	Guide to Uncertainty Measurement (GUM)	20 February 2014
Dr. Ralf Sudowe University of Nevada Las Vegas	Alpha Spectrometry	27 March 2014
Dr. Ralf Sudowe University of Nevada Las Vegas	Liquid Scintillation Counting	24 April 2014
Dr. Michael Schultz University of Iowa	Radioactivity and “Fracking” Environmental Monitoring/Remediation	22 May 2014

In September 2013, presenters David C. Burns, Bob Shannon, and Dr. Robert Litman completed a two-part webinar on gamma spectrometry, marking the fifth of 12 webinars planned for this series. As shown in Fig. 3, Gamma Spectrometry Part 1 became the webinar with the highest number of attendees (273).

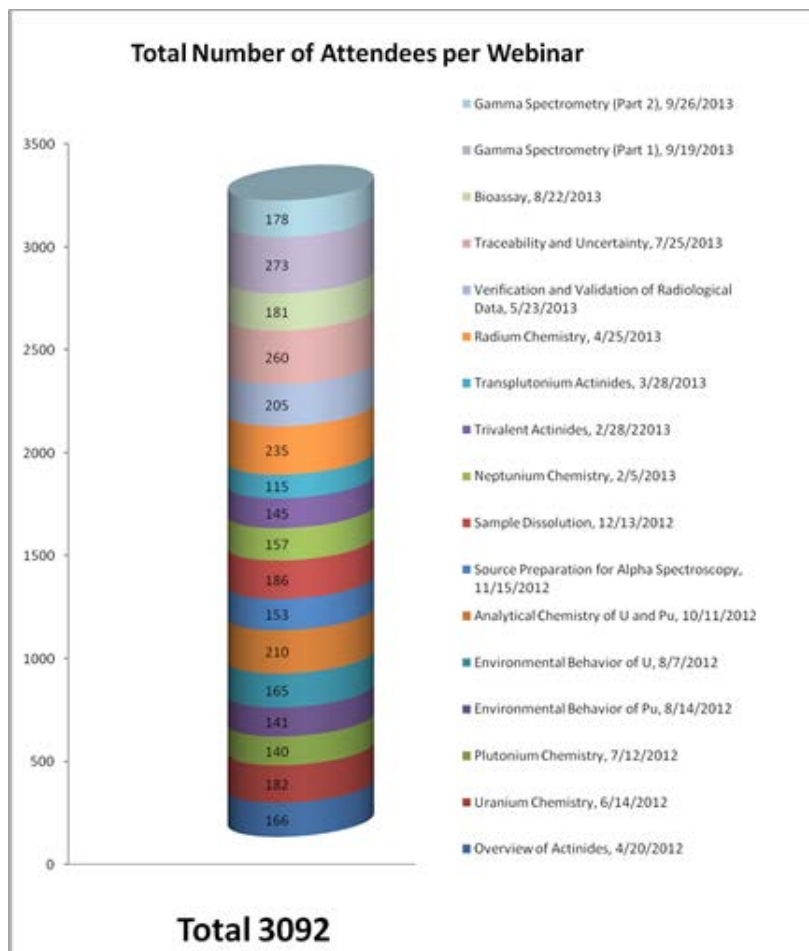


Fig. 3. Total Number of Attendees per Webinar.

To date, representatives from various state and local public health agencies in 40 different states have attended at least one webinar, as depicted in Fig. 4. With attendance at the live broadcasts totaling 3092, and nearly 1600 viewings of archived webinars to date (October 2013), NAMP's efforts toward advancing knowledge of radiochemistry have clearly been received with great interest.

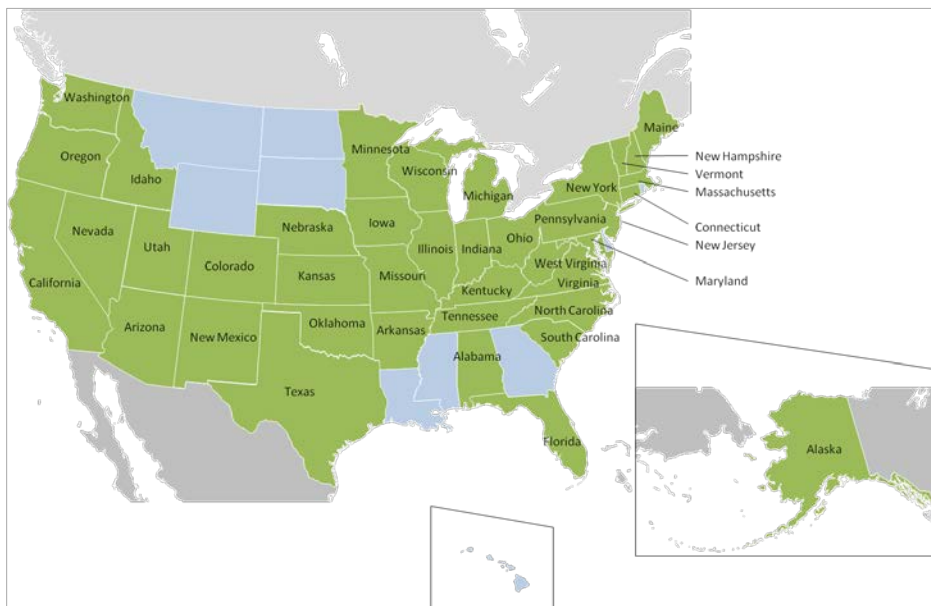


Fig. 4. NAMP Webinar Attendance by Various State Agencies in 40 States.

Participants at the live webinars can communicate with the presenter in a question and answer session at the end of the presentation. The live webinars are recorded as an efficient way to reach out to new audiences and accommodate individuals who are unable to attend the live presentations. The archived recordings allow participants to select and review previously recorded sessions at any time. The development of a specific series is guided by the webinar attendees, who are asked at the end of each webinar to submit topics of interest to the NAMP committee.

A third webinar series is tentatively scheduled to begin in the summer of 2014 and will include topics ranging from uranium mining, nuclear fuel fabrication, nuclear fuel recycling, waste forms, and final disposal. Additional series on nuclear forensics and nuclear medicine are in development.

CONCLUSION

Despite the fact that over the past 30 years, a marked decrease in teaching and training in nuclear and radiochemistry worldwide has been observed, opportunities in radiochemistry exist and are widespread. The NAMP webinars have been very successful and have demonstrated a strong need for such resources if the U.S. is to maintain its level of expertise in radiochemistry. The attendance numbers and overwhelmingly positive feedback from participants clearly demonstrate a renewed interest in the field of radiochemistry, and prove that the NAMP webinars are making a difference by providing unique, accessible educational opportunities.

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