DE-FG02-07ER15853 (SJSU)
DE-FG02-07ER15854 (MSU)

SUMMER SCHOOLS IN NUCLEAR AND RADIOCHEMISTRY

FINAL TECHNICAL REPORT

For the Period
March 1, 2007 – February 28, 2013

Paul Mantica, Past National Director
Herb Silber, Site Director, San Jose State University
Louis Peña, Site Director, Brookhaven National Laboratory

Department of Chemistry
Michigan State University
East Lansing, MI 48824
Phone: (517) 908-7456
Fax: (517) 353-5967
Email: mantica@msu.edu

Department of Chemistry
San Jose State University
San Jose, CA 95192
Phone: (408) 924-4954
FAX: (408) 924-4956
Email: hbsilber@sjsu.edu

Biosciences Department
Brookhaven National Laboratory
Upton, NY 11973-5000
Phone: (631) 344-8041
FAX: (631) 344-5311
Email: lpena@bnl.gov

PREPARED FOR THE
U.S. DEPARTMENT OF ENERGY
UNDER GRANT NOs. DE-FG02-07ER15853 (SJSU)
and DE-FG02-07ER15854 (MSU)

Table of Contents

FINAL TECHINCAL REPORT
SUMMER SCHOOLS IN NUCLEAR AND RADIOCHEMISTRY

Introduction

The ACS Summer Schools in Nuclear and Radiochemistry (herein called "Summer Schools") were funded by the U.S. Department of Energy and held at San Jose State University (SJSU) and Brookhaven National Laboratory (BNL). The Summer Schools offer undergraduate students with U.S. citizenship an opportunity to complete coursework through ACS accredited chemistry degree programs at SJSU or the State University of New York at Stony Brook (SBU). The courses include lecture and laboratory work on the fundamentals and applications of nuclear and radiochemistry. The number of students participating at each site is limited to 12, and the low student-to-instructor ratio is needed due to the intense nature of the six-week program. To broaden the students' perspectives on nuclear science, prominent research scientists active in nuclear and/or radiochemical research participate in a Guest Lecture Series. Symposia emphasizing environmental chemistry, nuclear medicine, and career opportunities are conducted as a part of the program. The Department of Energy's Office of Basic Energy Sciences (BES) renewed the five-year proposal for the Summer Schools starting March 1, 2007, with contributions from Biological and Environmental Remediation (BER) and Nuclear Physics (NP). This Final Technical Report covers the Summer Schools held in the years 2007-2011.

Applicant Pool and Selected Students

A summary of the class demographics over the 5-year period covered by this Final Technical Report is presented in Table 1.

Table 1. Student demographics of the Summer Schools.

	Class of 2007	Class of 2008	Class of 2009	Class of 2010	Class of 2011	Summary (%)
Gender (male/female)	14/10	16/7	12/12	18/6	17/6	65/35
College Type (small college v. research university)	14/10	13/10	10/14	6/18	9/14	35/64
Undergraduate Major						
Chemistry	16	17	19	16	17	72
Physics	1	1	0	1	2	4
Chemistry/Physics	2	0	0	3	2	6
Engineering	1	4	2	2	0	8
Biology related	4	1	3	2	2	10
GPA overall (max. 4.00)	3.78	3.63	3.76	3.81	3.73	3.74 (ave)
Completed applications	72	64	85	119	109	

A four-person committee evaluated the qualifications of the applicants and ranked the candidates based on their perception of each to handle the rigors of this intensive six-week program. Committee membership during the reporting period is presented in Table 2.

Table 2. Summer Schools application reviewers.

Role	2007	2008	2009	2010	2011
Reviewer	Lever (Missouri)	Lever (Missouri)	Lever (Missouri)	Lever (Missouri)	Robertson (Missouri)
Reviewer	Thomas (LANL)	Thomas (LANL)	Paulenova (OSU)	Paulenova (OSU)	Paulenova (OSU)
Reviewer	Clark (WSU)	McGrath (INEL)	McGrath (INEL)	Wilson (ANL)	Wilson (ANL)
Reviewer	Stoyer (LLNL)	Stoyer (LLNL)	Bronikowski (SRNL)	Bronikowski (SRNL)	Rundberg (LANL)

Summer Schools Curriculum

A complete listing of the instructional staff at BNL and SJSU is provided in Tables 3 and 4, respectively. The formal course and laboratory work at both sites was supplemented with guest lecturers, seminar speakers, and site visits/field trips to broaden the scope of nuclear science topics presented to the students. Social and cultural events rounded out the intensive six-week program. Additional information is available on the webpages of the individual Summer Schools sites:

BNL - http://www.bnl.gov/ncss
SJSU - http://kinardf.people.cofc.edu/NuclearSummerSchool/2012NSSHomepage.htm

Detailed information on Guest Lecturers and Course Syllabi are provided in Appendicies A-D.

Table 3. Instructional staff at BNL.

Role	2007	2008	2009	2010	2011
Site Director	Ferrireri (BNL)	Ferrireri (BNL)	Ferrireri (BNL)	Ferrireri (BNL)	Peña (BNL)
Lecture Coordinator	Ferrireri (BNL)	Ferrireri (BNL)	Ferrireri (BNL)	Ferrireri (BNL)	Peña (BNL)
Laboratory Coordinator	Ferrireri (BNL)	Ferrireri (BNL)	Ferrireri (BNL)	Dodge (BNL)	Dodge (BNL)
Teaching Assistant	Chen	Henry	Klose	Deri	Surtz
Teaching Assistant	Emmer	Reilly	Litton	Shustermann	Shaffer
Lecturer, Week 1	Landsberger (UT Austin)	Landsberger (UT Austin)	Mantica (MSU)	Folden (TAMU)	Folden (TAMU)
Lecturer, Week 2	Mantica (MSU)	Robertson (Missouri)	Robertson (Missouri)	Robertson (Missouri)	Robertson (Missouri)
Lecturer, Week 3	Robertson (Missouri)	Jia (Stony Brook)	Jia (Stony Brook)	Mantica (MSU)	Mantica (MSU)

Lecturer, Week 4	Lacey (Stony Brook)	Karol (CMU)	Karol (CMU)	Jia (Stony Brook)	deSouza (Indiana)
Lecturer, Week 6	Czerwinski (UNLV)	Czerwinski (UNLV)	Czerwinski (UNLV)	Czerwinski (UNLV)	Czerwinski (UNLV)

Table 4. Instructional staff at SJSU.

Role	2007	2008	2009	2010	2011
Site Director	Silber (SJSU)	Silber (SJSU)	Silber (SJSU)	Silber (SJSU)	Silber (SJSU)
Lecture Coordinator	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)
Laboratory Coordinator	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)
Radiation Safety	Pickering (SJSU)	Calvert (LBNL)	Maraschin (SJSU)	Maraschin (SJSU)	Maraschin (SJSU)
Teaching Assistant	Stacy	Clark	DeGraffenreid	Gilman	Wiebold
Teaching Assistant	Talkington	Twist	Sharp	Rolfes	Cisneros
Lecturer, Week 1	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Benny (WSU)
Lecturer, Week 2	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Ensor (TTU)
Lecturer, Week 3	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	VanBrocklin (UCSF) Cutler (Missouri)	VanBrocklin (UCSF) Cutler (Missouri)
Lecturer, Week 5	VanBrocklin (UCSF) Cutler (Missouri)	VanBrocklin (UCSF) Cutler (Missouri)	VanBrocklin (UCSF) Cutler (Missouri)	Kinard (Charleston)	Baisden (LLNL)
Lecturer, Week 6	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)	Kinard (Charleston)

The Summer Schools have two components: a lecture course consisting of a series of lectures given Monday through Friday mornings; and a laboratory course given afternoons Monday through Friday (though not necessarily every day), 1 PM - 5 PM. During the six weeks that comprise the Summer Schools, the students were enrolled as students at SBU or SJSU and received 3 college credits for the lecture course and 3 credits for the laboratory course. Students at SJSU also earned 1 college credit for Radiation Training. All participating students received stipend support that topped out at $4,000 per student for the 2011 Summer Schools.

The lecture portion of the Summer Schools covered fundamentals of nuclear chemistry, including natural radioactivity, modes of decay, decay rates, interactions of radiation with matter, nuclear reaction types, nuclear structure and models, fission and fusion, accelerators and reactors, nuclear power, actinide chemistry, nuclear waste management, environmental

radiochemistry, and fundamentals of nuclear medicine. The laboratory portion of the Summer Schools covered a sequence of experiments that illustrate fundamentals of radiation detectors and data acquisition systems, nuclear-based methods of chemical quantitative analysis, and preparation and purification of a radiopharmaceutical compound. The syllabi for the 2011 Summer Schools program at SJSU and BNL are provided in Appendix A and B, respectively, to give a perspective on the topics covered over the 6-week duration of the Summer Schools.

Guest lecturers were invited to talk at each site about their areas of expertise, generally in a one hour invited lecture accompanied by an opportunity to interact socially with the students. Major themes at both locations included environmental radiochemistry, actinide chemistry, and radiobiology. The students had the opportunity to meet and go to dinner with the speakers and talk with them in a setting outside of the classroom. A breakdown of the guest lecturers by their employer type is provided in Figure 1. A complete listing of the guest lecturers at BNL and SJSU is given in Appendix C and D, respectively. The BNL site also held topical symposia, including a Career Opportunities Symposium was used as an avenue to more formally acquaint participants with opportunities for careers in nuclear and radiochemistry and to provide advice on future directions in their graduate education.

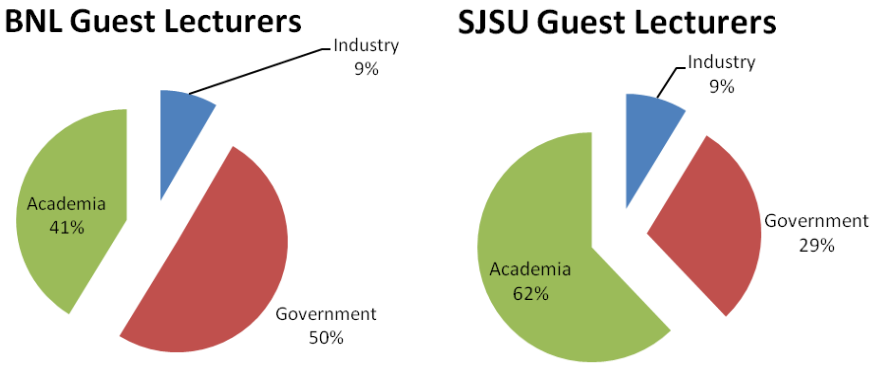

Figure 1. Breakdown of Summer Schools guest lecturers by employer type.

Field trips to geographically accessible institutions relevant to nuclear and radiochemistry were also included in the program. At BNL, students toured facilities in the N.Y. Metropolitan Region (Indian Point Nuclear Power Plant, Memorial Sloan Kettering Cancer Center, Stony Brook University) and research facilities at BNL (Relativistic Heavy Ion Collider, Brookhaven LINAC Isotope Producer, National Synchrotron Light Source). At SJSU, students visited Lawrence Livermore National Laboratory (National Ignition Facility, Seaborg Institute, Center for Accelerator Mass Spectrometry), Lawrence Berkeley National Laboratory (88-inch Cyclotron , Actinide chemistry laboratories), University of California, San Francisco (imaging facilities), and Stanford University (Synchrotron Light Source and Linear Accelerator Center). On each field trip the students are afforded an additional opportunity to interact with practicing nuclear and radiochemistry professionals.

The weekend excursions continued to be an important part of the Summer Schools program. The excursions allow the student participants to socialize and have informal discussions with program leaders outside the classroom setting. The students got to appreciate the diverse

backgrounds of their peers, and these excursions provide valuable low-stress times to balance the intensive nature of the course and laboratory work over the six-week duration of the program. The excursions afforded students a unique opportunity to experience some of the outstanding cultural centers in New York (for BNL site attendees) or San Francisco (for SJSU site attendees).

Annually, two "Outstanding Students", one from each site location, were selected based on their performance during the six-week program. These students (listed in Table 5) were invited to attend the National Meeting of the American Chemical Society Spring Meeting as guests of the ACS Division of Nuclear Chemistry and Technology and this program.

Table 5. Outstanding student awardees, 2007-2011.

Outstanding Students	2007	2008	2009	2010	2011
BNL	Farah (Northwestern)	Spector (Brown)	Allen (UNC)	McCarthy (Providence)	Sonnenberger (IWU)
SJSU	Long (TTU)	Sharp (Missouri)	Gilman (Valparasio)	Cisneros (Rice)	Kwarsick (MSU)

Budget Summary

The funding model for the Summer Schools was changed with the 2007 grant renewal to simplify financial operations of the program. Individual grant awards were made to the following: SJSU, BNL, and Michigan State University (MSU). Some of the activities on the MSU portion of the grant were subcontracted to the American Chemical Society's Division of Nuclear Chemistry and Technology. Table 6 provides the budget summary for the 2007-2013 Summer Schools, which included a one-year no-cost extension for the MSU and SJSU grants.

Request for funding of the BNL Summer Schools program was made annually through the laboratory's Field Work Proposal, while the annual funds authorization for the MSU and SJSU grants covered by this final report were processed through the DOE's Chicago Office. The Summer Schools, in the end, received funding authorization for the full amount of the initial proposal request, which allowed for the realization of the entire scope of the proposed Summer Schools programs.

Some of the requested funds for participant support were unspent over the grant period due to last-minute program withdraws by two students, and in another instance a student was unable to accept the program stipend. These unspent funds were repurposed to purchase two gamma-ray counting stations for the SJSU site. This new (non-capital) equipment replaced aging equipment and will ensure that the photon counting experiments included in the laboratory portion of the SJSU curriculum can be carried out in a reliable and efficient manner for years to come.

A total of $525 in unspent funds remained as of February 28, 2013, the conclusion of the No-Cost Extension period of the grants. There will be no further encumbrances or expenses on this award.

Table 6. Summer Schools initial budget request summary for 2007-2013.

Performance Location	Request	Allocation	Expenditures
San Jose State University Foundation Student housing and participation, course materials and supplies, guest lecture travel, and student activities (symposia, field trips, professional development)	$523,845	$523,845	$523,845
Brookhaven National Laboratory Staff salaries, student housing and participation, course materials and supplies, BNL space and support charges.	$933,370	$933,370	$933,370
Michigan State University *MSU* (direct spending) Student stipends, student and TA travel, support for National Director	$666,014	$666,014	$694,626
American Chemical Society (MSU subcontract) Lecturer salaries, guest lecture travel (BNL), student activities (BNL), SJSU salaries, student's DNCT membership	$541,472	$541,472	$512,335
Total Summer Schools Budget	$2,664,701	$2,664,701	$2,664,176
Unspent Funds			**$525**

Outcomes

One of the objectives of the Summer Schools is to educate the next-generation of nuclear scientists and technologists and established strong pipelines with employers meeting critical national needs in the broad areas of nuclear and radiochemistry. A listing of all Summer Schools student participants for the period 2007-2011 covered by this final technical report is provided in Appendices E-I.

Of the 118 student participants in the program during the years 2007-2011, it was possible to track the current employment/education status of all but 3 of the students. All 115 of the tracked students received either a Bachelor of Arts/Bachelor of Science degree from their undergraduate institution. As depicted in Figure 2, 85% of those students moved on to an advanced degree program. A high-level breakdown of the current career paths of the student participants is presented in Figure 3. The majority of the participating students have continued in the science/engineering disciplines. More than one-third of the students are one a path that includes a significant nuclear science/engineering/technology component. Nearly all the

students entering the Summer Schools programs had little prior knowledge of nuclear chemistry. Therefore, the Summer Schools are having a direct impact on students electing to pursue careers in nuclear science/engineering/technology.

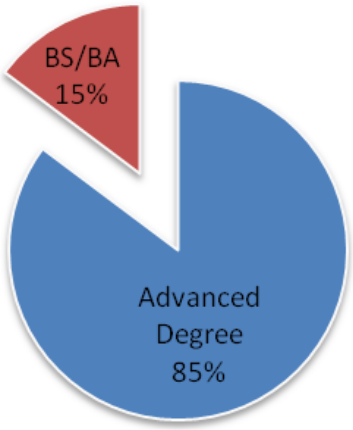

Figure 2. Education status of student participants in the 2007-2011 Summer Schools.

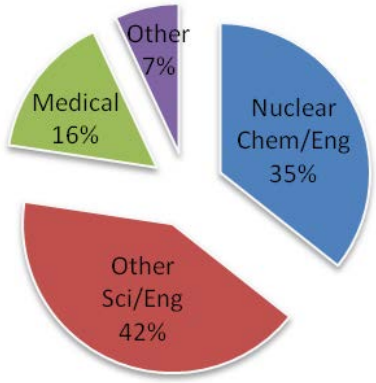

Figure 3. Career trajectory for student participants in the 2007-2011 Summer Schools.

One of the challenges in assessing the impact of the Summer Schools programs is the long time interval between student participation as an undergraduate and starting their first full-time employment. Students typically are accepted into the Summer Schools as rising juniors, and as presented in Figure 2, most go on to obtain an advanced degree. Those who matriculate through a Ph.D. program may also elect to take a post-doctoral research position. Hence, 8 to 10 years may pass before participating students enter the workforce. This challenge assessing the Summer Schools impact on workforce development is easily demonstrated based on the current employment/education information for the student participants in the programs from 2007-2011. Two of the students, Dr. Andrew Klose (MSU) and Dr. Mark McLauglin (Missouri) recently completed their Ph.D. theses in nuclear and radiochemistry, respectively; the first members of this cohort to do so. Both Andrew and Mark will move on to post-doctoral positions, meaning that they have at least 1 to 2 years to go before entering the nuclear workforce.

An important final point to make is that at least 40 students who participated in the Summer Schools programs during the period (2007-2011) covered by this final technical report are actively pursuing a career pathway that has a significant nuclear component. If a majority of these students are successful in matriculating through their advanced degree programs, it will represent a marked increase in the nuclear science Ph.D. output over previous decades, where the average Ph.D. production rate was less than 4 students per year.

Appendix A. 2011 course syllabus for BNL.

Week One – BNL				
Sat	11-Jun		Pena/TAs	Student arrival, pick up at airport
Mon	13-Jun	9:00	Peña	Program Orientation
		10:30		Lab Tour
		13:30	Folden	Chapter 1: Historical Perspective, Basic Concepts
		16:30		Building 801 Orientation
Tue	14-Jun	9:00		Radiation Safety Training
		13:30	Folden	Chapter 2: Nuclear Properties
Wed	15-Jun	9:00	Folden	Chapter 7: Alpha Decay
		16:00	Dodge	Laboratory Check-In
Thu	16-Jun	8:30	Folden	Chapter 8: Beta Decay Chapter 9: Gamma Decay
		13:00	Dodge	Expt. 1: GM Counting Lab
Fri	17-Jun	8:30	Folden	Review
		9:30	Folden	Exam 1
		14:00	Harbottle	"Applications of ^{14}C dating: The Vinland Map Controversy"
		15:30	Peña	Term paper discussion
Week Two – BNL				
Mon	20-Jun	9:00	Robertson	Chapter 3: Decay Kinetics
	Lab 1 due	13:00	Dodge	Expt. 2: Isotope Dilution Analysis
Tue	21-Jun	8:30	Robertson	Chapter 17: Charged Particles and Gammas with Matter
		13:30	Field Trip	Stony Brook University
Wed	22-Jun	8:30	Robertson	Chapter 17: Neutrons with Matter
		13:00	Dodge	Expt. 3: Interactions of Radiation with Matter
Thu	23-Jun	8:30	Robertson	Chapter 18: Radiation Detectors
		14:00	Nelson	"Space Radiation Environment and Accelerator-based Simulation"
Fri	24-Jun	8:30	Robertson	Review
		9:30	Robertson	Exam 2
	Lab 2 due	13:00	Dodge	Expt. 4: Pulse Height Analysis and NaI Scintillation
Week Three – BNL				
Mon	27-Jun	8:30	Mantica	Chapter 5: Nuclear Forces
	Lab 3 due	13:00	Dodge	Expt. 5: Gamma Spectroscopy with HPGe Detectors
Tue	28-Jun	8:30	Mantica	Chapter 6: Nuclear Structure
Wed	29-Jun	8:30	Mantica	Chapter 6: Nuclear Symmetries
	Lab 4 due	13:00	Dodge	Expt. 6: Secular Equilibrium in Decay Kinetics
Thu	30-Jun	8:30	Mantica	Chapter 6: Collective Models
		14:00	Field Trip	RHIC Tour
Fri	01-Jul	8:30	Mantica	Review
	Lab 5 due	9:30	Mantica	Exam 3
		14:00	Lacey	"Research at RHIC"

Week Four – BNL				
Mon	04-Jul			Holiday
Tue	05-Jul	9:00	de Souza	Chapter 10: Nuclear Reactions
	Lab 6 due	14:00	de Souza	Chapter 11: Fission Processes
Wed	06-Jul	9:00	Ferrieri	Radiochemistry of ^{18}F
		10:00	Dodge	Expt. 9: PET Radiotracers and ^{18}F
		14:00	de Souza	Chapter 12: Nuclear Reactions in Nature
Thu	07-Jul	8:30	de Souza	Chapter 14: Reactors and Accelerators
		14:00	Field Trip	NSLS Environmental Beam Lines
Fri	08-Jul	8:30	de Souza	Review
		9:30	de Souza	Exam 4
		13:30	Greenlaw	"National Urban Security Technology Laboratory"
		14:30	Fishbone	"Nuclear Material Control, Protection, and Accounting"
		15:30	Musolino	"Early Response to the Fukushima Disaster"
Week Five – BNL				
Mon	11-Jul	7:30	Field Trip	Indian Point Nuclear Power Plant
	Lab 9 due			
Tue	12-Jul	8:30	Button	"Health Physics"
		9:30	Peña	"Radiobiology
		13:00	Dodge	Expt. 7: Principles of Liquid Scintillation Counting
Wed	13-Jul	9:00	Mausner	"Accelerator Production of Radioisotopes"
		10:00	Schlyer	"Cyclotron Production of Radioisotopes"
		11:00	Cutler	"Reactor Production of Radioisotopes"
		14:00	Field Trip	Tour of BLIP Facility
Thu	14-Jul	8:30	Jurisson	"Radiochemistry using Radiometals"
		10:00	Hooker	"Development of new chemical strategies for using ^{11}C in biological applications"
		11:00	Medvedev	"Labeling of Nanoparticles"
	Papers due	13:00	Dodge	Expt. 8: Solvent Extraction Techniques
Fri	15-Jul	8:30	Field Trip	Sloan Kettering Cancer Center
	Lab 8 due			
Week Six – BNL				
Mon	18-Jul	8:30	Czerwinski	Chapter 16: Reactor Chemistry
	Lab 8 due	14:00	Grubbs	"Applying to Graduate School in STEM"
Tue	19-Jul	8:30	Czerwinski	Chapter 15: Actinide and Transuranium Chemistry
Wed	20-Jul	8:30	Czerwinski	Open Topics
Thu	21-Jul	8:30	Peña	Student Presentations
Fri	22-Jul	8:30	Francesconi	"IGERT Radiochemistry Graduate Program at Hunter College"
		9:00	Czerwinski	"Nuclear Chemistry at UNLV"
		9:30	Inn	"Radiation Metrology at NIST"
		10:00	Pereira	"Chemical Engineering at ANL"
		10:30	Gatley	"Radiopharmacy at Northeastern University"
		11:00	Sianian	"PET Medical Radioisotopes at Siemens"
		11:30	Boland	"SPECT Medical Radioisotopes at Nuclear Diagnostics"
Sat	23-Jul		Peña /TAs	Student Departure

Appendix B. 2011 course syllabus for SJSU.

WEEK ONE – SJSU				
Sat	11-Jun		Silber/TA's	Student arrival, pick up at airport, get together dinner.
Sun	12-Jun		Silber/TA's	Student arrival, pick up at airport, get together dinner.
Mon	13-Jun	8:30	Silber	Welcome; explanation of course curriculum, presentations, etc.
		9:00	Benny	Chapter 1: History of Nuclear Science
		11:00	Benny	Chapter 2: Nuclei, Isotopes and Isotope Separation
		13:00	Staff	Tour of campus, ID cards
		14:30	Maraschin	Radiation safety, radiation survey meters
		16:00	Benny	Lab: Word/Office tutorial, Excel spread sheets, other software
Tue	14-Jun	08:30	Maraschin	Lec: Radiation safety, radiation survey meters
		13:30	Benny	Chapter 10: Radiation Detection and Measurement Techniques
		14:00	Benny	Expt-I-1: Working Characteristics of a Geiger-Mueller Counter
		14:30	Benny	Expt-I-2: Counting Statistics
		15:30	Benny	Expt-I-3: Shelf Ratios - Radiation Flux as a Function of Distance
		16:00	Benny	Expt-I-4: Determination of the Resolving Time of a G-M Tube
		16:30	Benny	Expt-I-5: Determination of GM counting Efficiency
		17:00	Benny	Expt-I-6: Minimum Detectable Activity of a G-M System
Wed	15-Jun	08:30	Benny	Chapter 3: Nuclear Mass and Stability
	Quiz 1	13:30	Benny	Chapter 10: Radiation Detection and Measurement Techniques
		14:00	Benny	Expt-II-1: Half-Life of ^{137m}Ba Using the “Mini-Generator”
		14:30	Benny	Expt-II-2: Separation of ^{137m}Ba from ^{137}Cs by Sulfate Precipitation
		15:30	Benny	Expt-II-3: Separation of ^{234m}Pa from a Uranium Solution by Adsorption on a MnO_2 Precipitate
		16:30	Benny	Expt-II-4: Determination of the Half-lives for Two Components
Thu	16-Jun	08:30	Benny	Chapter 3: Nuclear Mass and Stability
		10:30	Benny	Chapter 4: Radioactive Decay
		13:30	Benny	Chapter 10: Radiation Detection and Measurement Techniques
	Lab I due	14:00	Benny	Expt-III-1: Liquid Scintillation Exp. 1: Comparison of Counting Vials
		14:30	Benny	Expt-III-2: Liquid Scintillation Exp. 2: Efficiency Determination
		15:00	Benny	Expt-III-3: Liquid Scintillation Exp. 3: Double Isotope Counting
Fri	17-Jun	08:30	Benny	Chapter 4: Radioactive Decay
		13:30	Benny	Expt-III-4:Cerenkov Counting of ^{40}K (finish Expt III - all sections)
		16:00	Sudowe	"Radiochemical analysis in the aftermath of the reactor accident in Fukushima"
		17:00	Karol	"High-energy nuclear reactions: From the nuclear surface to beyond the galaxy’s edge”

WEEK TWO – SJSU				
Mon	20-Jun	08:30	Ensor	Chapter 5: Radioactive Decay Laws
	Lab II due	13:30	Ensor	Expt-IV-1: Self-Absorption of Weak Beta Radiation
		14:30	Ensor	Expt-IV-2: Absorption of Beta Radiation
		14:30	Ensor	Expt-IV-3: Absorption of Gamma Radiation
		15:30	Ensor	Expt-IV-4: Thickness Gauging by Radioactive Tracer Techniques
Tue	21-Jun	08:30	Maraschin	Review of Radiation Safety
		9:30	Ensor	“Solvent Extraction and Separations Chemistry”
		11:15	Ensor	“Separation Science”
		13:30	Ensor	Expt-XII: Solvent Extraction Determination of ^{155}Eu
	Quiz 2	15:30	Ensor	Expt-V: Introduction to NaI(Tl) Gamma Ray Spectroscopy
Wed	22-Jun	08:30	Ensor	Chapter 6: Environmental Radiochemistry
		13:30	Ensor	Expt-XIV: Separation of Cs and Eu Using an Extraction Column
Thu	23-Jun	09:00	Maraschin	Radiation Safety Quiz
	Lab III due	10:30	Ensor	Chapter 7: Radiometric Dating
		13:30	Ensor	Chapter 10: Radiation Detection and Measurement Techniques
		14:00	Ensor	Expt-VI: Gamma Ray Spectroscopy Using HPGe Detectors
		14:30	Ensor	Expt-VI-1: Analysis of ^{137}Cs and ^{60}Co
		15:00	Ensor	Expt-VI-2: Analysis of ^{133}Ba and ^{241}Am Gamma-Spectra
		15:30	Ensor	Expt-VI-3: Comparison of NaI Line-Widths with HPGe Line-Widths:
		16:00	Ensor	Expt-VI-4:^{133}Ba and ^{241}Am and X-Ray Fluorescence
		16:30	Ensor	Expt-VI-5: Decay Scheme for ^{133}Ba Gamma Spectroscopy
Fri	24-Jun	09:00	Ensor	Chapter 8: Radiation Interactions
	Lab IX due	13:30	Ensor	Chapter 9: Nuclear and Atomic Analytical Methods
		15:00	Powell	"Plutonium Environmental Chemistry and Subsurface Transport"
		16:00	Nitsche	“Actinide Chemistry”

WEEK THREE – SJSU				
Mon	27-Jul	09:00	Nitsche	Chapter 11: Radiochemical Tracer Methods
	Lab V due	13:30	Nitsche	Expt-VII: Introduction to Alpha Spectrometry with Silicon Detector
Tue	28-Jun	09:00	Nitsche	Chapter 12: Cosmic Radioation and Elementary Nuclear Particles
		10:30	Nitsche	Chapter 13: Nuclear Structure I
	Quiz 3	13:30	Maraschin	Radiation Safety Final Exam
		15:30	Nitsche	Expt-VIII: Radioisotopes as Traces, K_{sp} of lead iodide
Wed	29-Jun	09:00	Nitsche	Chapter 13: Nuclear Structure I
		11:00	Nitsche	Chapter 14: Nuclear Structure II
		13:30	Maraschin	Expt IX: Tritium Bioassay Experiment
		14:30	Nitsche	Review for Mid-Term Exam
		15:30	Nitsche	Mid-Term Examination
Thu	30-Jul	09:00	Field Trip	Lawrence Berkeley Laboratory
		10:45	Nitsche	Tour of Actinide Labs
		11:45	Nitsche	Lunch
		13:30	Nitsche	Laboratory Tour
Fri	01-Jul	9:00	Nitsche	Chapter 14: Nuclear Structure II
	Lab VI due	13:30	Nitsche	Expt-X: Actinide Environmental Chemistry: Measurement of a K_d
		17:00	Yates	"From Neutrons to Neutron Stars: What Do We Know About Nuclear Shapes"
WEEK FOUR – SJSU				
Mon	04-Jul			Holiday
Tue	05-Jul	9:00	Cutler	Lec: Introduction to radiopharmaceuticals and production
	Labs VIII, IX due	13:00	VanBrocklin	Lec: Introduction to radiopharmaceuticals and production
Wed	06-Jul	09:00	Cutler	Lec: Tc Chemistry / Tc Generators / Medical Isotopes
		13:00	VanBrocklin	Expt-XI: Preparation of a Radiopharmaceutical
Thu	07-Jul	09:00	Cutler	Lec: Radiotherapy / Drug Development
		13:00	VanBrocklin	Lec: Small Animal Imaging / Nuclear Medicine Applications
Fri	08-Jul	09:00	VanBrocklin	Finish lab reports, lab reports graded and discussed
	Labs VIII, X due	13:00	Vanderhayden	"Being a Nuclear Chemist/Physicist in Industry: Challenges and Opportunities"
	Quiz 4	14:15	Chen	"Developing Radiolabeled Probes for Non-invasive Imaging in Living Subjects"
		15:30	Boswell	"Molecular Probes for Quantitative and Mechanistic Studies of Drug Disposition"
		16:45	Schwarz	"Nuclear Pharmacy Career Opportunities"

WEEK FIVE – SJSU				
Mon	11-Jul	09:00	Shuh	"Advanced X-Ray Techniques, Synchrotron Light Sources"
		13:00	Field Trip	Tour of SSLS at Stanford
Tue	12-Jul	09:00	Baisden	Chapter 14: Nuclear Structure II
		10:45	Baisden	"The National Ignition Facility"
		13:30	Maraschin	Expt XIII: Radioimmunoassay of Insulin
		15:30	Robertson	"From the Largest to the Smallest: Applications of Radiochemistry at the University of Missouri Research Reactor"
Wed	13-Jul	09:00	Mantica	"The Use of Accelerators in Nuclear Chemistry"
		14:00	Students	Web Presentations
Thu	14-Jul	09:00	Field Trip	LLNL: CAMS Accelerator, Seaborg Institute, and NIF
		10:45	Kersting	Tour of Actinide Labs – LBL
	Quiz 5	11:45	Stoyer	"Experiments at the National Ignition Facility"
Fri	15-Jul	09:00	Baisden	Chapter 15: Nuclear Power
		10:30	Baisden	Chapter 16: Nuclear Fuel Cycle
	Lab XIII due	13:30	Baisden	Expt-XV: Activation Analysis (NAA) of Silver and Some Metal Ores
		16:00	Hall	"Global Challenges in Nuclear Security: Countering Threats, Limiting Proliferation"
		17:00	Clark	"Environmental Radiochemistry: Actinide Sources, Signatures, and Geochemical Cycling"
WEEK SIX – SJSU				
Mon	18-Jul	09:30	Grant	"Nuclear Forensics"
		10:45	Moody	"Super Heavy Element Discoveries"
		14:00	Kinard	Expt-XVI: Homeland Security Exercise
Tue	19-Jul	09:00	Kinard	Chapter 17: Nuclear Waste
	Quiz 6	10:30	Kinard	Chapter 18: Nucleosynthesis
	Labs XIV, XV due	13:30	Kinard	Finish lab reports, review for Final Exam
Wed	20-Jul	09:00	Kinard	Chapter 18: Nucleosynthesis
		14:00	Silber	Get packing supplies, review for Final Exam
Thu	21-Jul	09:00	Maraschin	Lab Clean-up and Survey
		14:00	Kinard	Final examination
Fri	22-Jul	09:00	Kinard	Course evaluation / UPS Packing / Prepare for departure
		11:00	Kinard	Announcement of top student, grades, concluding remarks
Sat	23-Jul	06:00	Kinard/TA's	Student departure

Appendix C. BNL guest lecturer listing. The matrix on the right side of the table indicates the year(s) the lecturer attended and presented at the Summer Schools program.

Speaker	Institution	Topic	2007	2008	2009	2010	2011
Adam Hunter	Manhattan Environmental	Homeland Security Careers in Nuclear Science	X	X		X	
AJ Francis	BNL	Microbial Transformations of Radionuclides and Environmental Restoration Through Bioremediation	X	X	X		
Alice Mignerey	Maryland	Nuclear Science Graduate Studies at University of Maryland	X	X	X	X	
Bill Eckelman	UCSD	Overview of the Impact of Nuclear Science in Medicine	X	X			
Candido Pereria	ANL	Chemical Engineering					X
Cathy Cutler	Missouri	Reactor Production of Radioisotopes				X	X
Cleveland Dodge	BNL	Interactions of Radionuclides with Organic Ligands and the Implications of their Mobility in Nuclear Waste	X	X			
Cody Folden	TAMU	Heavy Element Research at TAMU			X		
Craig Woody	BNL	New Developments in Instrumentation for Medical Imaging	X				
Daeg Brenner	Clark University	What Can Atomic Mass Tell Us About Nuclear Structure?	X				
Dallas Reilly	UNLV	Student Alumni Symposium				X	
David Schlyer	BNL	Cyclotron Production of Radioisotopes	X	X	X	X	X
Dimitri Medvedev	BNL	Radiolabeling of Nanoparticles			X	X	X
Doug van Cleef	ORTEC	Career Opportunities in the Nuclear Industry		X			
Felicia Taw	LANL	Research Opportunities at LANL in Nuclear Science	X				
Gar Harbottle	BNL	Applications of ^{14}C Dating: The Vinland Map Controversy	X	X	X	X	X
Gerhardt Freidlander	BNL	Stories of the Manhattan Project	X	X	X		
Greg Choppin	FSU	Environmental Radiochemistry		X			
Greg Nelson	Loma Linda Medical School	Space Radiation Environment and Accelerator-base Simulation					X
Huan Feng	Montclair State	Natural radionuclides as tracers for estuarine and coastal environmental studies		X	X		
Jacob Hooker	Harvard Medical School (MGH)	Development of new chemical strategies for using ^{11}C in biological applications		X	X	X	X
Jeffrey Fitts	BNL	Synchrotron-based Investigations of Biogeological Transformations of Priority Contaminants in Soils at DOE Sites	X	X			
Jenifer Braley	WSU	Student Alumni Symposium				X	
Joanna Fowler	BNL	Addiction Research at BNL	X				
Joel Kempema	Ametek	Career Opportunities in the Nuclear Industry			X	X	
John Gatley	Northeastern	Radiopharmacy					X

Speaker	Institution	Topic	2007	2008	2009	2010	2011
Jolie Cizewski	Rutgers	Workshop on Applying to Graduate School	X	X	X	X	
Jon Schwantes	PNNL	Nuclear Chemistry at the National Laboratories				X	
Justin Roper	Duke	Student Alumni Symposium				X	
Ken Czerwinski	UNLV	Graduate Studies in Nuclear Chemistry	X	X	X	X	X
Ken Inn	NIST	Radiation Metrology					X
Ken Nash	WSU	Need for Trained Professionals in Nuclear Science	X	X			
Kirk Cochran	EPA	Uses of Naturally Occurring and Anthropogenic Radionuclides to Study Processes in the Environment	X				
Krista Meierbachtol	MSU	Student Alumni Symposium				X	
Laodong Guo	Southern Mississippi	Radio Geochemistry		X	X		
Len Mausner	BNL	Accelerator Production of Radioisotopes	X	X	X	X	X
Les Fishbone	BNL	International Safeguards and the IAEA			X		X
Lester Morss	DOE	Actinide Chemistry		X			
Louis Peña	BNL	Radiobiology					X
Lucian Wielopolski	BNL	Non-destructive Testing of the Environment using Nuclear Methodologies	X	X	X		
Lynn Francesconi	Hunter College	Approaching environmental remediation of 99Tc: strategies based on fundamental chemistry of the element			X	X	X
Michael Ketterer	N. Arizona State	Plutonium in the environment: forensic and geochemical studies with mass spectrometry			X		
Michael LaPrade	Dominion Nuclear Power	Careers in the Nuclear Power Industry				X	
Mike Kilbourn	Michigan	Challenges in radiosynthesis 18F			X		
Minfang Yeh	BNL	Nucleosynthesis	X	X	X		
Pamela Greenlaw	DHS	National Urban Security Technology Laboratory					X
Paul Benny	WSU	Challenges in radiosynthesis using radiometals			X		
Paul Kalb	BNL	Applications of Nuclear Science and Techology for Environmental Remediation	X	X			
Paul Karol	CMU	High-energy Nuclear Reactions: From the Nuclear Surface to Beyond the Galaxy's Edge	X			X	
Paul Mantica	MSU	Need for Trained Professionals in Nuclear Science		X			

Speaker	Institution	Topic	2007	2008	2009	2010	2011
Paul Northrup	BNL	Overview of Synchrotron Radiation Techniques for Studying Environmental Processes	X	X			
Paul Vaska	BNL	New Developments in Instrumentation for Medical Imaging		X	X		
Richard Ferrieri	BNL	Uses of Short-lived Radionuclides to Investigate Feedstock Optimization of Biofuel: Challenges in Understanding Plant Cell-wall Construction	X		X	X	X
Richard Hahn	BNL	Solar Neutrino Research	X	X	X		
Richard Reeder	Stony Brook	Studies on Actinide Interactions with Carbonates using Synchrotron Radiation	X				
Robert Grubbs	Stony Brook	Applying to Graduate School in STEM					X
Ron Finn	Memorial Sloan-Kettering Cancer Center	Research on Monoclonal Antibodies	X				
Ron Zeszut	ORTEC	Career Opportunities in the Nuclear Industry	X				
Roy Lacey	Stony Brook	Research at RHIC			X	X	X
Saed Mirzadeh	ORNL	Research Opportunities at ORNL in Nuclear Science	X				
Silvia Jurisson	Missouri	Radiochemistry using Radiometals	X	X		X	X
Stephan Vogt	New Brunswick Laboratory	Environmental Research Activities at the New Brunswick Lab		X			
Steve Dewey	BNL	Small Animal Imaging	X	X			
Steven Musolino	BNL	Emergency Response Guidance for the First 48 Hours After the Outdoors Detonation of an Explosive Radiological Dispersal Device	X	X	X	X	X
Steven Ziegler	Siemens PETNet	Pharmaceuticals in Nuclear Medicine	X				
Susan Lever	Missouri	Interdisciplinary Graduate Studies in Radiochemistry and Biology	X	X	X	X	
Susan Pepper	BNL	Opportunities for Working Abroad within the IAEA	X			X	
Terry Button	Stony Brook	Health Physics					X
Terry Sullivan	BNL	Risk Assessment as a Decision Tool	X				
Thomas Boland	Nuclear Diagnostics	SPECT Medical Isotopes					X
Tigran Sinanian	Siemens	PET Medical Isotopes					X
Wolfgang Runde	LANL	Research Opportunities at LANL in Nuclear Science		X			

Appendix D. SJSU guest lecturer listing. The matrix on the right side of the table indicates the year(s) the lecturer attended and presented at the Summer Schools program.

Speaker	Institution	Topic	2007	2008	2009	2010	2011
Andy Boswell	Genentech, LLC	Radioimmunotherapy – Imaging with Antibodies				X	X
Annie Kersting	LLNL	Radiochemistry, Isotope Geochemistry, and Environmental Radiochemistry		X	X	X	X
Arden Dougan	LLNL	New Challenges for Radiation Detection Equipment	X		X		
Bethany Lyles	UC Berkeley	Addressing Nuclear Data Needs for Advanced Nuclear Reactors				X	
Brian Powell	Clemson	Plutonium Environmental Chemistry and Subsurface Transport		X	X	X	X
Cathy Cutler	Missouri	Radiopharmaceuticals and Production		X	X	X	X
Dale Ensor	Tennessee Tech	Solvent Extraction and Separations Chemistry	X	X	X	X	X
Dao Pho	Cardinal Health	Radiopharmacy	X				
Dave Robertson	Missouri	When Electrons Aren't Enough: Applications of Radioanalytical Chemistry	X	X	X		X
David Shuh	LBNL	Advanced X-Ray Techniques, Synchrotron Light Sources	X	X	X	X	X
Fred Chen	Stanford	Developing Radio-labeled Probes for Non-invasive Imaging in Living Subjects					X
Greg Choppin	FSU	Pu, the Element of Surprise	X	X	X		
Heino Nitsche	UC Berkeley	Actinide Chemistry	X	X	X		X
Henry Van Brocklin	UCSF	PET radioisotopes and Production		X	X	X	X
Howard Hall	Tennessee	Global Challenges in Nuclear Security: Countering Threats, Limiting Proliferation					X
Jacob Hooker	BNL	New Approaches to 18F and 11C Labeled Radiopharmaceuticals			X		
Jean Luc Vanderhayden	GE	Being a Nuclear Chemist/Physicist in Industry…Challenges and Opportunities				X	X
Joe Peterson	Tennessee	Chemical and Physical Consequences of Radioactive Decay in the Solid State	X				
Julie Sutcliffe-Goulden	UC Davis	Molecular Imaging Probes Using PET	X	X			
Ken Moody	LLNL	Super Heavy Element Discoveries	X	X	X	X	X
Lester Morss	DOE	Chemistry of the Actinide Elements in Solids and Aqueous Solution			X		
Lynn Francesconi	Hunter College	Approaching environmental remediation of 99Tc: strategies based on fundamental chemistry of the element				X	
Marc Weichelt	Essential Isotopes	Aspects of Radiopharmacy			X		

Speaker	Institution	Topic	2007	2008	2009	2010	2011
Mike Zalutsky	Duke	Development of 211At Agents for Cancer Radiotherapy			X		
Pat Grant	LLNL	Nuclear Forensics	X	X	X	X	X
Patricia Baisden	LLNL	How NIF Works			X	X	X
Paul Karol	CMU	High-energy Nuclear Reactions: From the Nuclear Surface to Beyond the Galaxy's Edge	X	X	X	X	X
Paul Mantica	MSU	Use of Accelerators in Nuclear Chemistry	X	X	X	X	X
Peggy MacMahan	LBNL	Operation of the 88" Cyclotron at LBNL		X	X	X	
Raghu Pandurangi	Covidien, Inc.	Drug Development	X	X			
Ralf Sudowe	UNLV	Radiochemical analysis in the aftermath of a nuclear incident			X	X	X
Sally Schwarz	Washington University	Nuclear Pharmacy				X	X
Simon Williams	Genentech, LLC	Antibodies, Labels, and Imaging		X			
Steve Yates	Kentucky	Nuclear Shapes	X		X	X	X
Sue Clark	WSU	Environmental Radiochemistry	X	X	X	X	X
Sylvia Jurisson	Missouri	Metals in Diagnostic and Therapeutic Radiopharmaceuticals				X	

Appendix E. Summer Schools participants, 2011.

Student	**Undergraduate Institution**	**Current Status**
Ali Arico	Florida State University	Florida State University
Andrew (AJ) Swift	Huntingdon College	University of Nevada, Las Vegas
Andrew Sonnenberger	Illinois Wesleyan University	Illinois Wesleyan University
Ari Berlin	Rice University	Washington University, St. Louis
Corey Jones	University of Tennessee at Martin	University of Tennessee, Martin
Ivan Spector	St. Cloud State University	University of Minnesota-Twin Cities
Jacquelyn Dorhout	University of Massachusetts Amherst	University of Nevada, Las Vegas
Jason Jones	San Diego State University	San Diego State University
Jeffrey Berry	San Jose State University	Washington State University
Jeffrey Berryman	University of Notre Dame	Northwestern University
Jeffrey Kwarsick	Michigan State University	University of California, Berkeley
Jordan Hester	University of Florida	US Navy
Jordan L. Edberg	UC Santa Cruz	
Kalee Hammerton	Christopher Newport University	Michigan State University
Kari Izbicki	Gannon Univ.	Bay Valley Foods, QA Tech
Lauren McDougald	Mills College	
Logan Sutherlin	The University of Tulsa	University of Missouri, Columbia
Max Verkamp	Rose Hulman Institute of Technology	Rose Hulman Institute of Technology
Michael Polen	Widener University	Widener University
Nomi Sherwin	University of Central Florida	Medical School
Orion Wenrich	Butler University	University of Maryland, College Park
Stephen Ferguson	College of Charleston	Centers for Disease Control and Prevention
Travis Olds	Michigan Tech Univ.	University of Notre Dame

Appendix F. Summer Schools participants, 2010.

Student	**Undergraduate Institution**	**Current Status**
Andreas Wierschen	University of North Carolina	Quaker Chemical
Benjamin Sturtz	Clarion University of PA	Case Western Reserve University
Brandon Cisneros	Rice University	University of Texas, MD Anderson Cancer Center
Brekke Van Slyke	New Mexico State University	
Christopher Prokop	Minnesota State University, Mankato	Michigan State University
Daniel J. "Jed" Johnson	Auburn University	Target Pharmacy, NC
David Kuntz	LeTourneau University	Northern Illinois University
Emily Powell	Texas Tech University	Texas Tech University
Eva Uribe	Yale University	University of California, Berkeley
Jordan Ernst	Lake Superior State University	University of Michigan
Joseph McLaughlin	University of California, Berkeley	Bain & Co.
Kortney Cooper	Troy University	Michigan State University
Krystin Stiefel	Adrian College (MI)	Michigan State University
Kurt Wiebold	College of Idaho	Wiebold Ford, ID
Michael Crosley	Rutgers University	Johns Hopkins University
Philip Weiser	Moravian College	Lehigh University
Samuel Morrison	Northern Arizona University	Washington State University
Sean McCarthy	Providence College	Pennsylvania State University
Spencer Deese-Laurent	New York University	New York University
Stephen Schale	Seattle Pacific University	University of California, Irvine
Stephen von Kugelgen	Reed College	Kinestral Technologies
Sumer Brook Bottoms	Appalachian State University	Jordan High School
Travis Shaffer	Gannon University	Hunter College
Zachery Matesich	College of Wooster	University of Illinois, Champaign-Urbanna

Appendix G. Summer Schools participants, 2009.

Student	**Undergraduate Institution**	**Current Status**
Alison Tasami	Florida Southern College	University of Missouri, Columbia
Anthony Schneider	Ohio Northern University	Ohio Luminex
Ben D. Williams	Southern Arkansas University	PPG Industries
Eric B. Rutledge	Rice University	Baylor College of Medicine
Hunter Fontenot	Loyola University (LA)	Eurofins Central Analytical Lab
Jeffrey N. Rolfes	Newman University (KS)	University of Nevada, Las Vegas
Jennifer Beveridge	Indiana University of Pennsylvania	Georgia Institute of Technology
Jennifer L. Erchinger	Texas A&M University	Texas A&M University
Jennifer Luther	Purdue University	Purdue University
Jennifer Shusterman	Tufts University	University of California, Berkeley
Jennifer Wong	University of California, Berkeley	Clemson University
John D. Auxier II	Adams State College	University of Tennessee
Joseph Jablonski	Fairleigh Dickinson University	Clemson University
Kyle Sutherlin	Washington University, St. Louis	Stanford University
Lauren A. Garofalo	Baylor University	University of California, Berkeley
Lauren A. Heilborn	Hillsdale College	Texas A&M University
Lauren R. Grabstanowicz	Lewis University (IL)	Northern Illinois University
Lindsey Gilman	Valparaiso University	Massachusetts Institute of Technology
Marc Fitzgerald	University of Maryland	University of Nevada, Las Vegas
Mathew S. Snow	BYU Idaho	Washington State University
Melissa Deri	New York University	Hunter College - CCNY
Phyllis Ko	Rutgers University	Pennsylvania State University
Scott A. Suchyta	The Ohio State University	Michigan State University
Thomas Allen	University of North Carolina	The University of Illinois, Urbana Champaign

Appendix H. Summer Schools participants, 2008.

Student	**Undergraduate Institution**	**Current Status**
Alexander Chao	Georgia Institute of Technology	Georgia Institute of Technology
Angie Mustain	Auburn University	Qualitest Pharmaceuticals
Anthony DeGraffenreid	Truman State University	University of Missouri
Don Bruss	Oregon State University	Texas A&M University
Emily Ebert	Brown University	Emory University
Erin Gantz	Carnegie Mellon University	University of California, Berkeley
Jason Dugger	University of New Mexico	University of Texas, Austin
Jeff Farrell	Washington and Jefferson College	University of California, San Francisco
Jeremy Mandia	United States Naval Academy	US Navy Medical Corps
John Depotopulus	University of Oregon	University of Nevada, Las Vegas
Julie Spector	Brown University	Stanford University
Karima Wagdy	Northwestern University	Independent Research Professional, NY
Mark McLaughlin	University of Notre Dame	University of Missouri - Columbia
McKenzie Clemens	Alfred University	Stony Brook School of Dental Medicine
Mikey Posch	Willamette College	Southwestern School of Medicine
Mitch Kim	University of Washington	New York University Medical School
Nathan Birhanu	University of Missouri - St. Louis	Peace Corps
Nathan Knapp	Oregon State University	Tactus Technology
Nick Sharp	University of Missouri - Columbia	University of Maryland
Robin Cumming	Mills College (CA)	University of California, Davis
Scotty Bobbitt	University of Arkansas	University of Texas, Austin
Tim Meyer	University of Arkansas	Whitmore Manufactoring
Tyler O'Dell	Lake Superior State University	Washington State University

Appendix I. Summer Schools participants, 2007.

Student	**Undergraduate Institution**	**Current Status**
Andrew Klose	Jamestown College (ND)	National Institutes for Standards and Technology
Benjamin Farah	Northwestern University	Duke-NUS Medical School
Brittany Gaydosh	Huntington College (AL)	Samford University McWhorter School of Pharmacy
Dallas Reilly	Carthage College (WI)	University of Nevada, Las Vegas
Eleanor M. Ott	University of Pittsburgh	Oxford University
Elizabeth A. Long	Tennessee Technological University	Newport News Shipbuilders
James Tocyloski	West Chester University (PA)	DuPont
John Degrave	Hillsdale College (MI)	University of Wisconsin, Madison
Jonathan D. Burns	MidAmerica Nazarene University	Texas A&M University
Joshua Henry	Austin Peay State University (TN)	University of Wisconsin, Madison
Kelly A. Daniel	Truman State University	Morningside College
Kristen N. Frommeyer	University of Kentucky	Private Dental Practice, IL
Kristina Knesting	St. Norbert College (WI)	University of Washington
Lukasz A. Koscielski	University of Illinois, Urbana-Champaign	Northwestern University
Mary E. Twist	Hillsdale College (MI)	Loyola University, Chicago
Monica Straatman	University of Missouri - Columbia	University of California, Irvine
Nicholas B. Swanson	University of Saint Francis (IN)	Environmental Protection Agency
Nicholas G. Horton	Rollins College (FL)	Cornell University
Paul A. Goodman	Truman State University	University of Nebraska, Lincoln
Richard A. Clark	Brigham Young University - Idaho	University of Missouri, Columbia
Robin L. Mizzell	Hollins University (VA)	Virginian Western Community College
Samantha Mroczynski	University of Alabama	University of Alabama
Tyler Litton	University of Missouri - Columbia	New York University School of Medicine
Zigfried Hampel-Arias	Rice University	University of Wisconsin, Madison