

5th Annual University of Pittsburgh Cancer Institute (UPCI) Summer Academy Final Report 2013



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University of Pittsburgh Cancer Institute (UPCI) Summer Academy Final Report 2013

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Our Logo-The World and the Crab: The etymology of the word "cancer" is crab, just like the zodiac sign. It's from the Latin, originally meaning "a crab," and later, "malignant tumor." The Greek physician Galen, among others, noted the similarity of crabs to some tumors with swollen veins. Our logo, showing the world, given the international nature of our Academy, and the underlying crab is meant to demonstrate that we are engaging the best and brightest from around the world to deal with Cancer in our programs.

I. INTRODUCTION



The 5th Annual University of Pittsburgh Cancer Institute (UPCI) Summer Academy was successfully completed following eight weeks (June 17 to August 9, 2013) of experiential and didactic activities designed specifically for rising high school seniors. After the pilot program in 2009, the academy was federally funded by the National Cancer Institute to continue in the summer of 2010 as a supplement to our Cancer Center's P30 Support Grant. The UPCI Summer Academy received support again in 2011 and 2012 from

the University of Pittsburgh Cancer Institute, Bayer Material Sciences, the Queen's Hospital of Honolulu, the UPCI Volunteer Office, and the National Cancer Institute. In 2012 and 2013 we were also funded for ten additional scholars under-represented in the Biomedical Sciences (UB's) by the Doris Duke Charitable Foundation to launch the DDF Academy for Clinical Research which was fully integrated into the UPCI Academy in 2013. By 2013, the UPCI Summer Academy had grown to become an internationally recognized STEM program that provided 56 high school seniors with unique and complex science research learning experiences.

Scholars spent eight weeks over the summer participating in intensive studies in an individual mentor's research laboratory; clinical and basic science cameo appearances from cancer professionals; field trips to local scientific activities and to the National Cancer Institute; and weekly didactic sessions led by qualified graduate students, medical students, postdoctoral fellows, and faculty.

II. OBJECTIVES

The UPCI Summer Academy has designed specialized curricula to help prepare high school rising seniors to further their studies in science, technology, engineering, and mathematics (STEM) subjects and to consider careers in cancer care and research. Through immersion in our dedicated laboratories with qualified faculty mentors (**see Appendix A**), by the end of the eight weeks scholars showed an increased knowledge of (1) STEM careers in cancer care and research, (2) education in cancer biology and therapeutic strategies, and (3) development of research and communication skills, what we call 'science as a performing art'.

The summer program operates from federal and foundation grants, institutional support, donations from grateful patients, in-kind support from local companies and organizations, and the commitment of University of Pittsburgh faculty and staff. We do not charge an application registration fee and we do not charge tuition for entrance into our program. Our program curricula is taught and supervised by faculty in expert areas of research, postdoctoral fellows, administrative and research staff, and medical students. Our main goal for scholars is to provide them with innovative ways in which to explore the exciting and complex fields of cancer and identify a career pathway in which they can contribute to their own future, placing them on a different trajectory for their science.

III. PROGRAM SITE OVERVIEWS

For the first time since its inception in 2009, the Academy expanded in 2013 to five distinct sites located throughout the University of Pittsburgh campuses:


- Hillman Cancer Center - Shadyside
- The Magee Women's Cancer Research Center (WCRC) - Oakland
- Computer Sciences, Biology and Biomedical Informatics (CoSBBi) - Shadyside
- Tumor Immunology - Oakland
- Drug Discovery, Systems and Computational Biology (DiSCoBio) - Oakland.

Each site was well-equipped with dedicated faculty, staff and facilities to provide our scholars with options to complete hands-on, experiential research in a variety of specialized areas of cancer, oncology and medicine. Below are detailed program descriptions for each site.

Hillman - Shadyside

Scholars at the Hillman spend eight weeks with assigned qualified faculty mentors, learning in-depth about cancer care and research, education in cancer biology, and therapeutic strategies, and development of research and communication skills. Focus on fundamental aspects of cancer biology including cell cycle progression, suppressor and dominant oncogenes, the role of metabolism and disordered mitochondrial mechanisms, cell signaling pathways, and immune mechanisms are highlighted and explored in depth. Along with time spent in the laboratory, scholars attended a comprehensive series of didactic cancer biology lectures presented by program academic staff, largely presented by graduate students and medical students, postdoctoral fellows, and mentors. They attended presentations from clinicians and researchers from across UPCI disciplines focusing on clinical care, career options, and career preparation.

Scholars were led on tours of a variety of clinical (operating room, radiation therapy suite, etc) and research facilities at UPCI, UPMC Shadyside, and the Biomedical Science Tower III.



Science as a Performing Art
*First Annual UPCI
Summer Academy Talent Show*

Be dazzled by the amazing skills of these young scholars! Summer Academy students are not only intelligent but also gifted musicians, dancers and comedians! Tonight prepare to be fascinated by the performances of our young talents.

Program:

1. Vega Gopalakrishnan - Cartwheel
2. Tumour Immunology Group (Anne Kennedy, Robert Kancans, Taseen Haque, Zach Iezzi, Chandra Muthiah, Pranav Murthy, Essence Criswell, Idee Olugbade) - Human Knot
3. Amy McMillen and Mara Staines - "When I'm Gone"
4. Sophia Cheng - "Violin Concerto in G Major, 2nd Movement" by Joseph Haydn
5. Meghana Ganapathiraju - Classical Indian Dance
6. Kyle Yoshida - "Mele Ho'okipa"
piano - "Ua mau"
clarinet - "Can You Feel the Love Tonight"
and "Hawaii All State Music"
7. Adila Izgutdina, Amy McMillen - "Diamonds"
8. Phil Vernon, Han Zheng, Jenny Zeng, Kyle Yoshida, Reid Akana - Food Contest
9. Anne Kennedy - Jump Rope Routine "Cotton Eye Joe"
10. The Dorm Kids (Peter Baek, Diane Low, Divya Patel, Rebekah Madrid, David Chen, Robert Kancans, Jaime Lopez) - "A Day in the Life of Living in Pennsylvania Hall"
11. Amy McMillen and Reid Akana - "Two Better Than One"

CoSBBI - Shadyside

The Computer Sciences, Biology and Biomedical Informatics (CoSBBI) site was hosted by the Department of Biomedical Informatics and Pathology Informatics (Shadyside campus). The program was developed to introduce high school rising seniors to various aspects of biomedical informatics and their uses in cancer research. Biomedical Informatics research covers a broad spectrum of inquiry - from the analysis of genomic microarray datasets to the evaluation of hospital organizations during the adoption of new technology. Students spent the summer working with faculty mentors on projects with a focus on clinical informatics, pathology informatics, genomic and proteomic data or the development of data warehouses and data mining strategies, among other interests. Their research experience was supplemented with a four week daily classroom component. By the end of the eight weeks, students understood the various aspects of biomedical informatics and their uses in aspects of cancer detection, diagnosis, and treatment.

WCRC - Magee

The UPCI Scholars placed at the Magee Women's Cancer Research Center (WCRC) were exposed to various aspects of research in women's cancers. Research projects and presentation centered on critical research projects in breast and ovarian cancer utilizing patient samples and animal models. The scholars were exposed to class-based didactic courses, to extensive research program in individual mentors' laboratories, and to a number of visits to clinical and core support components of the Magee Hospital. The cancer-focused coursework was designed to provide the scholars a rigorous introduction to the complexity of cancer, but at the same time helped them to better understand the lab projects they were working on under the direction of the Faculty mentors.

Scholars' knowledge of the fields relating to cancer related to women's health increased significantly in depth throughout the summer as they participated in (1) a daily didactic component taught by medical students from the University of Pittsburgh Medical School centered on Robert Weinberg's **The Biology of Cancer** textbook, (2) a laboratory experience with a dedicated MWRI faculty mentor, and (3) cameo experiences which included tours, guest

lectures, and clinical shadowing of physicians at Magee Women's Hospital. These components of the Magee Academy helped scholars to gain a greater appreciation for the breadth of the field of Oncology and how it translates to innovations and progress in women's health.

Tumor Immunology - Oakland

The Tumor Immunology site introduces rising high school juniors and seniors to basic concepts in immunology and the dynamic interaction between the immune system and cancer. Scholars are introduced to research in areas of cancer immunology and spearhead projects exploring basic mechanisms underlying initiation of tumor immunity, defining key components of an immune response to cancer (T-cells, NK cells, B-cells, antibodies, dendritic cells) and elucidating aspects of novel immunotherapies for cancer. Scholars are assigned to work with a mentor in a laboratory to develop a hypothesis driven research project which includes experimental design and data analysis. Scholars are exposed to cutting edge technologies in flow cytometry, microscopy, protein biochemistry, immunological assays and animal models of cancer, among others. Laboratory research is complemented with didactic sessions and other scholarly activities. The aim is to prepare scholars for career opportunities in Cancer Immunology. At the end of the program, scholars are expected to understand major concepts in immunology and cancer, and have a firm grasp of current efforts to develop successful cutting edge immunotherapies of cancer.

DiSCoBio - Oakland

The Drug Discovery, Systems and Computational Biology (DiSCoBio) site on the Oakland Campus introduces rising high school juniors and seniors to the emerging fields of research that use both computational and experimental approaches to answer fundamental questions in Cancer Biology and related disciplines: Computational Structural Biology (studying how proteins move and interact with each other), Drug Discovery (theoretical and experimental designing and testing of candidate drug compounds), Genomics/Bioinformatics (analyzing large data sets of sequencing and other data), Image Analysis/Informatics (training a computer how to "see" and analyze biological image data), and Systems Biology (tackling biological questions using an integrated, holistic approach). In addition to having a primary research experience in one of these fields, scholars will learn about the fundamental concepts in each of these "New Biologies", and gain hands-on training in the tools and techniques central to these disciplines. Professional development activities will complement the research and didactic training to help prepare scholars for careers in science and/or medicine. Scholars should expect an immersive, challenging, and fulfilling research and training experience in a fast-growing area of cutting-edge, biomedical research.

IV. RECRUITMENT

The UPCI Summer Academy faculty and staff have created a large network of contacts, locally, nationally and internationally, who work with us to identify and recruit high-achieving, diverse high school students. And as a central part of the goals of our program, we continue to recruit and retain academically successful students who are underrepresented in the Biomedical Sciences. In 2013, students were accepted from local high schools in Pittsburgh and surrounding communities, as well as Hawaii, New Jersey, Virginia, Minnesota, Texas, Vermont, New York, North Carolina, Maryland, and even as far as Kazakhstan.

Local. We have established a strong relationship with the Pittsburgh Public School (PPS) District, recruiting eleventh-grade [rising seniors] students from 4 major high schools grades 9-12 and 5 schools grades 6-12. PPS is the largest of 43 school districts in Allegheny County and the second largest in Pennsylvania. In the secondary schools alone (grades 9-12), 6,912

students are enrolled. According to the most recent demographic district data, 55% of those students are African-American (37% white, 2% Asian, 1% Hispanic). Approximately 70% of the graduates go on to enroll in higher education. Seventy-one percent of Pittsburgh Public School students (K-12) are eligible for free or reduced price lunch. Our program has seen many PPS students participate and successfully complete our summer high school program and we will continue to actively recruit from these local high schools.

The Pittsburgh Science & Technology Academy, located on the Oakland campus, is part of the Pittsburgh Public School District (one of the 5 schools grades 6-12). We have recruited widely within this school, accepting several students each summer from SciTech. The curriculum at SciTech is designed specifically for students with an interest in science, technology, engineering, or math. Recent school highlights show that over 75% of students scored proficient or advanced in reading and math. Additionally, racial disparity in both math and reading achievement has declined at SciTech in previous years.

We have also reached out to and connected with a number of urban schools immediately surrounding the University of Pittsburgh Shadyside and Oakland campuses, expanding our applicant pool to include high-achieving, academically prepared students who may come from low-income households or are ethnic minorities. And we continue to reach out to the many private schools in the immediate Pittsburgh region such as Winchester Thurston, Ellis School, Shadyside Academy, Oakland Catholic, Central Catholic and Sewickley Academy. We have many applicants and participating scholars who are enrolled in these private academies, and a number of them who maintain a scholarship for enrollment based on academic excellence.

Regional. We have established a number of relationships with regional (suburban) school districts who have been committed to spreading the word about our program to their students and where we have visited to speak directly with students about the opportunities our program provides. School districts outside of the City of Pittsburgh, including Hampton, Fox Chapel, North Allegheny and Upper St. Clair are all schools which have a high number of students interested in pursuing fields in cancer research, medicine and science.

National. National interest grew in 2013 with applicants from Vermont, Texas, New York, Minnesota, Maryland, Virginia, Hawaii and New Jersey. A special effort was made through connections of the Director to recruit native Hawaiians and two students matriculated from the Kamehameha School and one from Punahou this year. We have also continued our unique partnership with the Jack Kent Cooke Foundation, a private, independent foundation established to help exceptionally promising scholars with modest family means reach their full potential through education. The Foundation's scholarship and direct service programs support the education of approximately 650 remarkable scholars each year. This past summer, our program hosted four out-of-state scholars under the JKCF's Young Scholars Program to spend the summer in Pittsburgh. We plan to expand the number of Jack Kent Cooke Foundation student participants next summer to five or more scholars. We will work with the JKCF Education Director, Rebecca Cullen, as well as JKCF educational advisors to help identify qualified students and facilitate their attendance and residence in Pittsburgh for the duration of the eight week program.

International. The UPCI Summer Academy has recently focused efforts on recruiting selected international scholars into the program, reflecting strategic partnerships of the UPCI. In 2013, three students from Kazakhstan and one from Germany participated in the program and we expect to expand our international recruitment efforts in 2014. Our standards for recruiting quality, high-achieving students and developing relationships with educational and community

organizations worldwide, as well as nationwide, remain the same. These relationships will ensure that culturally/ethnically diverse students have the opportunity to succeed within our program. We anticipate that approximately 10% of our positions will be filled by individuals from outside of the US.

Getting the Word Out. We will continue partnerships with local organizations and programs such as Bayer Material Sciences and the University Of Pittsburgh Office Of Diversity (Director, Paula K. Davis). Our contacts in the Office of Diversity provide our scholars with unique opportunities to participate in shared activities, namely diversity training, with the University of Pittsburgh School of Medicine Summer Premedical Academic Enrichment Program (SPAEP). Two open houses were offered during the winter of 2013 to prepare applicants, parents and teachers for the Academy – the open houses gave applicants a chance to better understand the application process and learn more about program site curricula, activities, academic goals and program expectations. We reached out to local urban and suburban schools, guidance counselors and teachers to advertise the open houses and encourage potential candidates to apply. Faculty from each program site attended to speak in person with students and parents. Informational open houses will be conducted in early 2014 as well.

Working closely with our advisory committee members, we will collaborate with the Pittsburgh Public Schools Science Curricula Department to advertise our program to rising seniors in local high schools. As we have done in the past, we plan to visit various science classes within PPS high schools to talk about our program and identify eligible and high-achieving scholars for 2014. Laurie Heinreicher from Hampton School District has served as our liaison for recruitment and advertising among suburban school districts, and we have made additional contacts through Allegheny County to raise awareness about STEM education and how our programs are uniquely designed for rising seniors who desire an immersive and intensive hands-on experience in basic science and translational research.

Local and Community Support. As has been the case for the past five years, we could not have completed such a successful program without the continued support of our local communities and leaders. We receive current support from Bayer Material Sciences, the University of Pittsburgh Cancer Institute, the Office of Science Education Outreach – University of Pittsburgh, Pittsburgh Public Schools, SciTech Academy, the Fund for Advancement of Minorities through Education (FAME), Family House – Neville, the University of Pittsburgh Medical Center and Ayoob Woodworks.

V. PROGRAM LEADERSHIP

Program leadership consists of University of Pittsburgh faculty and staff, many of whom have been active in the program for the last several years. New faculty mentors and labs are identified and added each year as our program needs grow. Key personnel are listed below and the full list of faculty mentors can be found in Appendix A. Additionally, we recruit many graduate, undergraduate and medical students to serve as teaching mentors who provide weekly mentoring and tutoring sessions to the scholars, so that all scholars have the opportunity to manage assigned coursework in an appropriate and timely manner. Offering a one-on-one experience with scholars consistently leads to overall better understanding of the material and more interactive didactic sessions and experiences in the laboratory. Staff mentors and block leaders for each site are also listed below.

PERSONNEL (see Appendix A for full list of program faculty)

Name	Title	Role	Site
Michael Lotze, MD	Program Director and Instructor	Provided overall logistics and support for the program; developed funding requests and interactions with outside agencies and promoted the expansion of the current program.	Hillman
Jessica Poli	Program Administrator	Recruited scholars and provided student support. Coordinated guest speakers, tours, application and recruitment development, advisory meetings, and overall program management. She also conducted the NCI trip.	Hillman
Philip Vernon, BS	Hillman Academic Administrator	Developed curriculum for the Hillman and Magee sites, oversaw didactic sessions, served as assessment consultant and instructor. Worked daily with scholars on developing research projects and laboratory experiments.	Hillman
Steffi Oesterreich, PhD	WCRC Site Director	She took an active role in the education of the scholars in the biology of women's cancer. She was also involved in the organization of the social activities of the program, as well as a team-building exercise for the scholars, and attended the day long trip to the NCI.	Magee
Rebecca Watters, PhD	WCRC Academic Administrator	Developed curriculum for the Magee site, oversaw didactic sessions, served as assessment consultant and instructor. Worked with scholars on developing research projects and laboratory experiments.	Magee
Joseph Ayoob, PhD	DiSCoBio Site Director and Instructor	Recruited scholars, provided student support, prepared schedule, tours, advisory meetings, and program management.	DiSCoBio
Vanathi Gopalakrishnan, PhD	CoSBBI Site Program Director	Oversaw the CoSBBI curriculum and research projects.	CoSBBI
Joyeeta Dutta-Moscato, MS	CoSBBI Site Instructor	Developed curriculum and co-ordinated the didactic sessions for CoSBBI	CoSBBI
Robert Binder, PhD	Tumor Immunology Site Director	Designed and implemented the Tumor Immunology program, including all didactic and research activities,	Tumor Immunology
Michelle Messmer, BS	Tumor Immunology Academic Administrator	Led most didactic sessions, served as assessment consultant and instructor. Worked daily with scholars on developing research projects and laboratory experiments.	Tumor Immunology

BLOCK LEADERS (See Appendix C for full list of teachers)

Hillman: Philip Vernon, BS; Sarah Michelson, BS; Adriana Forero, BS; and Guanqiao Li, BS

CoSBBI: Michael Becich, MD, PhD, Joyeeta Dutta-Moscato, MS Vanathi Gopalakrishnan, PhD, Nancy Whelan, MS, Albert Geskin, BS

DiSCoBio: Joseph Ayoob, PhD, Timothy Lezon, PhD, David Koes, PhD, Mark Schurdak, PhD, Kelly Gentile, BS, and Leah Russell, BS

Tumor Immunology: Robert Binder, PhD, and Michelle Messmer, BS, Prerana Thapar, BS

Resident Advisors for scholars who resided in the University of Pittsburgh dorms

- Nicholas Moores
- Jianxin Zeng (Jenny)
- Adila Izgutdina
- Han Zheng
- Eileen Bauer, PhD (Activities Director)

VI. CURRICULUM

HILLMAN GOALS

Specific Aim 1: Awareness of Science, Technology, Engineering, and Mathematics (STEM) Careers in Cancer Care and Research. The primary aim was to motivate high school scholars to continue their study of STEM subjects by introducing them to the many STEM disciplines that are employed by professionals working in a Comprehensive Cancer Center. This was pursued through presentations by professionals recruited to represent the diversity of opportunities in the cancer field, focusing on the roles, skills, and educational backgrounds of cancer team members.

Specific Aim 2: Education in Cancer Biology and Therapeutic Strategies. Our secondary aim was to educate scholars in the biology of cancer and the strategies in use and under development for its prevention, diagnosis, and treatment. This was pursued through a variety of lectures, textbook readings, and guest presentations.

Specific Aim 3: Development of Research and Communication Skills. Our tertiary aim was to educate scholars in the process of scientific research. This was pursued through participation in a project under the supervision of a cancer researcher and by preparing an oral/visual presentation to their peers and mentors describing their research goals, methods, and results.

Specific Aim 4: Participation of Underrepresented Minorities and Disadvantaged Students. The Office of Diversity, Health Sciences (ODHS) and the School of Medicine's Office of Student Affairs/Diversity Programs have played a major role over the past year in helping us to identify and reach out to local talented, disadvantaged youth. These programs and leaders are experienced in supporting scholars who come from economic, social or educational disadvantaged background, and those who are underrepresented in Medicine and Science. The director of these programs (Paula Davis) have been instrumental in working with us during the application and recruitment process to create avenues by which scholars can be appropriately paired with a science and/or medicine internship. Additional collaborations with Brian Corr, Director of Pittsburgh Public Schools Science and Dr. Edwina Kinchington, teacher at the Pittsburgh & Science Technology School have been an important resource as we expand our outreach and look to recruit more disadvantaged and minority scholars.

HILLMAN SYLLABUS – HILLMAN AND MAGEE SITE (FIRST HALF IDENTICAL)

The syllabus and lecture design was based on Weinberg and Hanahan's revised hallmarks of Cancer. In order of presentation, the following lectures were conducted by the Hillman site block leaders:

- Introduction/evolution of cancer
- Basic biology review
- Overview of cancer
- Tumor viruses
- Oncogenes
- Growth factors
- Cytoplasmic signaling
- Tumor suppressors
- Cell cycle/pRb
- Apoptosis/p53
- Immortality/senescence
- Women's malignancies
- Tumorigenesis
- Genomic integrity/mutagens
- Inherited defects
- Heterotypic interactions/TME
- Angiogenesis
- Metastasis
- Immunology overview
- Tumor Immunology
- Mitochondria/metabolism
- Cancer vaccines/immunotherapies
- Current chemotherapeutics
- Surgical oncology
- Drug development and clinical trials

(Note: The Magee Site spent the last half of their curricula on breast and ovarian cancer using scholarly articles and reviews from the recent literature to guide the teaching.)

The 18 Hillman scholars participated in a wide variety of learning activities, including lectures, textbook readings, guest speaker presentations, tours of clinical and research facilities, laboratory research, lab meetings, research seminars, discussions, and their own presentations. The scholars found the majority of these categories of learning activities beneficial.

- Pathology and Genomics Facility Tour - Dr. Sheldon Bastacky
- Molecular and Cellular Biology Lecture - Dr. Richard Steinman
- Flow and Imaging Cytometry Tour – Michael Meyer
- Animal Facility Tour – Dr. Joe Newsome Lyn Robertson - Community health education and screening
- Genetic counseling and familial centers – Beth Dudley
- Bioinformatics Lecture – Dr. Michael Becich
- Medical Oncology Career Lecture and Zebrafish Facility Tour – Dr. Nathan Bahary
- Shadyside Hospital Operating Room Observations
- College admissions counseling sessions from Carnegie Mellon University and the University of Pittsburgh

CoSBBI GOALS

Specific Aim 1: Awareness of Careers in Biomedical Informatics: The CoSBBI program introduces the scholars to the many career options available in these fields, and makes them aware of the incredible rewards available in a career dedicated to health care research in a computational environment. Scholars have opportunities to learn about these careers through a series of visits by those actively working in these areas.

Specific Aim 2: Education in Selected Topics in Biomedical Informatics: Another goal of this site was to introduce the scholars to concepts such as genomic and proteomic research, statistical and computational modeling of disease, bioinformatics, cognitive and translational informatics. Although these represent only a few of the research tracks available in both fields, they are very important in a cancer research context, because understanding of disease biology and complex interactions, as well as clinical applications, is crucial for early diagnosis and successful treatment.

Specific Aim 3: Development of Research and Communication Skills: CoSBBI also focused on the development of research skills through one-on-one interactions with faculty mentors in the development of individual projects, as well as in the development of communication skills needed to carry out such projects and to present them to the entire group at the end of the eight weeks.

CoSBBI SYLLABUS

- | | |
|-----------------------------|--------------------------------------|
| • Molecular Biology | • Protein-protein Interactions |
| • Programming | • Genome wide association studies |
| • Statistics | • Cancer genome analysis |
| • Information Visualization | • Medication Safety |
| • Data Mining | • Pathology Informatics |
| • Predictive Modeling | • Biosurveillance |
| • Pharmacogenomics | • Usability and User-centered design |

Textbook: Translational Bioinformatics (PLOS Computational Biology Collection)

The CoSBBI scholars participated in a number of learning activities with the overall goal of experiencing research in Biomedical Informatics and its role in cancer research. Students were paired with faculty mentors who guided them through independent research projects. Four weeks of daily didactic sessions covered fundamental concepts and activities on information

technology applied to biomedicine and health care. Each didactic session was comprised of one instructional hour, led by doctoral, postdoctoral and medical students, followed by one hour of research presentation and discussion, led by faculty and industry guests. Lectures in the early weeks covered basics of molecular biology, bioinformatics tools, computational thinking, statistics and data mining. Later lectures were devoted to specific areas of research.

In the absence of a standard undergraduate level textbook for our field, we selected the recently released compilation, Translational Bioinformatics (PLOS Computational Biology Collection). This online, open-access collection provided chapters crafted by leading experts in topics such as genomics, proteomics, Bayesian inference and decision modeling, and pharmacogenomics. These were complemented with lectures on human computer interaction and issues in technology incorporation for laboratory workflow, medication safety, and biosurveillance. The classroom sessions were focused on concepts and application, with students encouraged to pursue deeper the skills relevant to their individual research project. Periodic sessions were held to discuss research progress, presenting a paper, writing an abstract. During the course of the summer, students went on guided tours of other clinical and research facilities, and participated in group activities and social events. At the end of the program, all students gave conference-style presentations of their research and participated in a poster symposium as well.

WCRC GOALS

In its second year, the UPCI Summer Academy-WCRC Program tailored the curriculum to cover basic cancer biology in the first half of the program followed by an intense focus on women's cancers in the second half. This was achieved using WCRC site-specific instructional staff; site-specific research mentors; and a combination of site-specific and joint content-deepening experiences with the other two sites. An ancillary aim was to establish the administrative mechanisms to permit these activities within MWRI, while not interfering with the long-running Magee Womens Hospital summer internship program, which also places high school students within select MWRI research laboratories.

Specific Aim 1: Education in Cancer Biology and Therapeutic Strategies. Our foremost aim was to educate scholars in the biology of women's cancer; and in the strategies currently employed or under development for its prevention, diagnosis, and treatment. This was achieved through a variety of lectures, textbook readings, guest presentations, physician shadowing, visits to research core facilities and operating rooms, and most importantly direct mentoring in laboratory research (see Aim 2). An ancillary aim was to provide nuanced understanding of gynecological and breast oncology in the greater context of women's reproductive health.

Specific Aim 2: Development of Research and Scientific Communication Skills. Our second aim, which supported the first, was to provide scholars with hands-on experience in laboratory scientific women's cancer research. This was achieved through participation in a project under the supervision of a cancer researcher (faculty, post-doctoral or other dedicated laboratory staff) including: literature research and reading on a specific topic; extensive practicum in laboratory bench methods; experiment design and performance; analysis of results; and communication of findings through oral and poster presentations.

Specific Aim 3: Establishing Awareness of STEM disciplines; Fostering Significant Connection to Post-secondary Education or Employment in STEM. Our third aim - which emerged from pursuit of the first two aims - was fostering awareness of (and lasting connection to) the many science, technology, engineering, and mathematics (STEM) disciplines which are involved in performing cancer research at a collaborative research institutes such as UPCI and MWRI.

- This was achieved by incorporating many diverse researchers, clinicians and professional staff in oral presentations, laboratory tours, physician shadowing and OR observation experiences for Summer Academy students, as described above.
- Connection to STEM careers was supported by arranging permission to attend twice-weekly lunchtime presentations at MWRI by clinicians and researchers, who are encouraged to speak informally about their own paths through higher education and professional career development.
- This was also supported by the use of near-peer mentors (undergraduates, graduate students, postdoctoral fellows and early medical students) as course instructors, who could contribute guidance on transitioning to undergraduate STEM education and thereafter to medical school.
- This was also supported by shadowing in the Womens clinic

Specific Aim 4: Service to Underrepresented Minorities and Disadvantaged Students. An aim of the entire UPCI Summer Academy is to extend their unique scientific experience to minority and disadvantaged students in the Pittsburgh city and region.

- This has previously been supported through UPCI Summer Academy consulting The Office of Diversity, Health Sciences (ODHS) and the School of Medicine's Office of Student Affairs/Diversity Programs on how best to identify and reach out to local talented, disadvantaged youth.
- The UPCI-MWRI Pilot has supported this aim
 - by hosting two underrepresented and disadvantaged scholars, and arranging an extracurricular experience in engineering for this student (see above)
 - by consulting University of Pittsburgh Health Sciences Associate Vice Chancellor for Science Education Outreach (Joan Lakoski)
 - by arranging a special presentation of a newly modified version of the University of Pittsburgh School of Medicine Diversity Workshop, for secondary students considering Health Sciences professions.



Hospital and Research Institute.

WCRC SYLLABUS

Cameo experiences included guided tours of MWRI facilities such as the Histology Core Facility and Mass Spectrometry platform, as well as visit to other University of Pittsburgh core facilities such the Genomics and Proteomics Core Facility. To provide further insight into the biomedical research community, the UPCI Summer Academy Scholars were afforded a special presentation from the School of Medicine Office of Diversity Programs, as well as numerous informal career guidance lectures from clinicians and researchers in the Magee Womens

The scholars' understanding of women's health with a focus on cancer and oncology was evaluated based on pretests, post-tests, and interim exams. The scholars were also expected to discuss their lab's current research by participating in a weekly journal club in which they presented relevant scientific articles. The scholars not only improved significantly throughout the

summer in their knowledge of the basic science behind cancer, but also improved in their ability to analyze, share and present their knowledge to others.

DiSCoBio GOALS

The major motivation for the DiSCoBio Academy is our duty as educators and scientists to help train the next generation of researchers, physicians, and others interested in pursuing careers in STEM fields. As such, the primary goals for our Academy are to:

1. Educate our scholars in the fundamentals theories and practices in drug discovery and computational and systems biology through a series of lectures, seminars, demos, and workshops.
2. Provide an immersive research experience by facilitating individualized research projects for each of our scholars.
3. Prepare and Support our scholars for the next step of their careers and beyond by providing them with professional development and career preparatory opportunities that will arm them with the necessary tools to succeed in STEM careers or in whatever fields they choose.

DiSCoBio SYLLABUS

We provide a comprehensive curriculum modeled after a typical graduate school program. Our scholars attend specially-designed class sessions to introduce them to the major topics related to our program: Genomics, Computational Structural Biology, Systems Biology, Drug Discovery, Programming, and Bioimaging. Class sessions are a mix of lecture and hands-on activities that teach the students fundamental concepts and provide them with opportunities for practical experience with the research tools used in each discipline. A number of enrichment activities also supplement the didactic activities. Scholars participate in a journal club, attend a seminar series designed specifically for summer students, tour local research facilities and labs, and present their work at weekly roundtable meetings, as well as at two final symposia at the conclusion of the Academy.

TUMOR IMMUNOLOGY GOALS

Specific Aim 1: Understand the basic concepts in Immunology with a special focus on the interaction of the immune system and cancer. In this regard, the scholars were simultaneously educated in cancer biology and to understand cancer as a disease. The complexity and dynamism of this interaction were on full display. The goals were to explore how the immune system recognizes cancer cells and shapes the developing cancer. The 3 E's (elimination, equilibrium, and escape) of cancer immunology were entrenched. This was pursued through a variety of lectures, textbook readings, and guest presentations.

Specific Aim 2: The concept of immunotherapy was presented. Current and past efforts at using the immune system to eradicate cancer were discussed in depth. The scholars were highly encouraged to bring their most creative ideas for novel approaches for immunotherapy of cancer.

Specific Aim 3: Development of Research and Communication Skills. To educate scholars in the process of scientific research. This was pursued through participation in a project under the supervision of a cancer researcher and by preparing an oral/visual presentation to their peers and mentors describing their research hypothesis, goals, methods, results and conclusions.

TUMOR IMMUNOLOGY SYLLABUS

Key texts and chapters were used from the latest editions of Weinberg and Hanahan's *Biology of Cancer*, and Janeway's *Immunobiology*. In order of presentation, the following lectures were conducted at the BST.

- Overview to Laboratory Introduction, Fundamental biology- macromolecules
- Basic anatomy & physiology, Cell biology, Molecular biology, Experimental Model organisms
- Introduction to Cancer
- Hallmarks of Cancer
- Immunology- Innate; cells, systems, receptors, effector mechanisms
- Immunology- Adaptive; cells, systems, receptors, effector mechanisms
- Tumors, T cells and the Immune system
- Immunosurveillance; history and current paradigms
- Tumor antigens; definition, history, types, rejection antigens, T & B cell antigens
- Immune cells & cancer – T regs, MDSCs, DCs, NK, Macrophages, Neutrophils
- Immune Evasion
- Immunotherapy; T cell based approaches, antibodies and other strategies
- Factors limiting effectiveness of immunotherapy

Besides the laboratory research and didactic sessions, the Tumor Immunology scholars participated in other scholarly activities including attendance at guest speaker seminars, tours of clinical and research facilities, lab meetings, and their own presentations at the end of the Academy. The scholars also toured the flow cytometry and microscopy centers, and the zebrafish facility.

With a total of 8 scholars in the Tumor Immunology site, our first year was a complete success and we met majority, if not all, the goals we put forth.

PROGRAM-WIDE CURRICULA AND ACTIVITIES

While each site modified its curricula and syllabus to relevant topics and activities, there were a number of shared events that all scholars from every site participated in.

This was the fourth year that our program has visited the National Institutes of Health and National Cancer Institute in Bethesda, MD. Each scholar was individually paired with a laboratory on the NIH campus that was working on similar research and was a personal collaborator with the scholar's faculty mentor at the University of Pittsburgh. We designed this interactive and one-on-one approach to give the scholars a chance to see how the same type of research is conducted nationally and on a larger scale. Some of the laboratories that our scholars spent the day in included:

Additionally, each scholar was required to participate in the following activities so that they could be best prepared and equipped to perform quality research inside of the laboratory and in a professional setting among colleagues:

- Health Sciences Diversity Awareness Workshop
- Chemical Hygiene training
- Bloodborne Pathogen training
- Responsible Conduct of Research Training
- Opening and closing receptions and poster presentations

EXTRACURRICULAR ACTIVITIES



To create a close-knit community among the scholars, teachers, staff and faculty we created a weekend activities schedule where scholars would sign up on a weekly basis to attend social outings. Originally, social events were planned to give out-of-state scholars who resided in the dorms activities to do during their free time. These activities included weekday and weekend events. Now, all scholars in the program are invited to attend a number of recreational activities such as Pirates games, Fallingwater tours, trips to Sandcastle Waterpark, group dinners and lunches, free movies at Flagstaff

park, among other local outings. This past summer, Dr. Eileen Bauer oversaw the social activities including organization of purchasing tickets and coordinating transportation for the scholars. Events in 2013 included cook outs, visits to local sights such as Phipps Conservatory, Ohio Pyle, trips to local museums and tours of historical sites in Pittsburgh (**See Appendix D**). Activities were supported by local establishments such as Kennywood, Giant Eagle, Brady's Restaurant, Eat 'n Park, The Pittsburgh Riverhounds, and Ayoob Woodworks. We also conducted the first **Fun Run** to raise funds for the UPCI Academy and the **First Talent Show – Science as a Performing Art**.

VII. CLOSING RECEPTION AND POSTER PRESENTATIONS

The closing receptions and poster presentations took place on Friday, August 9, 2013. Each site, Hillman, CoSBBI, DiSCoBio, Tumor Immunology and WCRC, conducted their own, distinct oral presentations and ceremonies in the morning, where scholars presented their projects and faculty had an opportunity to speak about their scholars' work and their time in the laboratories and facilities. Following the oral presentations and closing ceremonies, all five sites came



together at the Hillman Cancer Center atrium to participate in an open house poster session. The entire UPCI community of faculty and staff were invited to see the scholars' posters and talk with them about their individual projects, research findings and work completed throughout the summer (**see Appendix B**).

We formed a poster review committee consisting of faculty from the UPCI and across the University of Pittsburgh campus and various departments. The judges viewed their assigned posters and ranked them according to experimental methods, scientific thought, analytic approach, and oral presentation.

VIII. ASSESSMENT AND FEEDBACK

In order to measure behavioral outcomes, scholars at each site were evaluated at regular intervals by their research mentors and teachers throughout the program using a short survey form. Mentors then reported back to the program director and administrator feedback on scholars' enthusiasm, interest, punctuality, understanding of topics, attention to detail in conducting research, ability to follow instructions, compliance with safety standards, grasp of scientific content, and discipline in completing assigned readings. Scholars were also surveyed to assess their overall satisfaction with the program and to identify its strengths and weaknesses so that we may continue to improve upon program design for future years. Assessment of program performance was conducted using two methodologies: weekly feedback surveys and cumulative surveys, as well as specialized pre- and post-tests given by all sites. Results from both methods are summarized below.

Laboratory Experiences

Scholars believed their laboratory projects gave them hands-on, intensive experience that they had rarely had the opportunity to participate in before. Scholars found success in their projects and their ability to collect, analyze and communicate data greatly increased over the course of the summer. For future years, we think that it would be helpful to the scholars, faculty members and post docs in the lab to have training sessions and early communication about: 1) what is expected in the lab; and 2) goals of the program, and then formulate the best, most efficient way to accomplish these goals in eight weeks. One way to achieve this is to personally introduce the scholar and assigned faculty mentor weeks prior to the start of the program in June so that they have an opportunity to establish a strong dialogue and share research materials and questions. For scholars who cannot meet in person, they will have access to communicate with their faculty mentor via Skype and email. We also plan to incorporate training sessions (in April and May) for the faculty and post docs so they are best prepared for spending two months as a mentor.

Didactic Sessions

Scholars have indicated that lectures could be streamlined into a lesser number of topics covered over the course of the eight weeks. Additionally, scholars would like the lectures to be shorter, but more interactive between scholars and block leaders/teachers.

Specific feedback from WCRC and proposed didactic changes for the WCRC site in 2014

The Magee WCRC site proposes to revise their class schedule to two times a week from weeks 2 through 7. The 12 classes will be broken down into 3 blocks: 4 classes of general cancer biology, 4 classes of breast cancer biology, and 4 classes of ovarian cancer biology. Within those classes, instructors will utilize facilitated learning in order to actively engage scholars by having them research topics and make slides on their own in small groups. This will encourage even greater interaction between the scholars. A new textbook will be chosen to supplement the WCRC's course work.

Specific feedback from DiSCoBio: The DiSCoBio Site performed a pre- and post-evaluation aimed at a general assessment of career-oriented and professional development gains obtained on account of the program. This analysis revealed that our scholars made significant gains in

the following categories: understanding the role played by computational approaches in science, understanding what it takes to correctly perform an experiment, ability to understand and discuss scientific concepts, and feeling like a scientist.

Reading Materials

Scholars should be provided with reading materials even before the program begins in the summer so that they are best prepared to get the most out of their eight week research project. Scholars found roundtable discussions and journal clubs useful and helped to provide support in learning new topics. While some scholars found certain reading assignments to be challenging or intimidating, overall they thought that the advanced reading and coursework directly benefitted their positive outcome in the program. The same textbooks have been successfully used for the past five years of the program.

Professional Development Opportunities and Tours

Scholars particularly enjoy the career cameos and would like to expand these fields to include even more professions in science and medicine. Meeting with faculty and hearing “real life” stories about how they got into their current professional roles was considered to be inspiring and relevant. Two suggestions that will be considered for 2014 are having more clinicians meet with scholars in an “open question” format as well as creating panels led by medical students who can talk personally with the scholars about their application process experience. Each year, we have undergraduate admissions counselors meet with the scholars and talk about what to expect academically in college. This has proven to be a great benefit and scholars have requested that in the future we provide more insight into graduate and medical school admissions and academics. Additional clinical shadowing opportunities (such as tours to the operating room which the Hillman scholars participate in each year) were requested by many scholars.

After evaluating the clinical rotations in 2013, the Magee WCRC site plans to incorporate cameos and Q&A sessions with clinical professionals (i.e. pathologist, radiologist, surgeon, and oncologist) in future years. The WCRC expects that this plan will maintain a balance between expanding scholars’ knowledge about applying research in the medical field while providing the necessary time in the laboratory for scholars to complete their research projects.

Field Trips and Social Activities

Scholars were very pleased with the variety and number of the different enrichment activities that were made available to them. The social activities were well attended and effectively organized to include as many scholars who chose to participate.

Follow-Up Evaluation

Both scholars and faculty mentors who participated in the 2013 UPCI Summer Academy have been asked to provide feedback via an electronic survey to determine their overall satisfaction and learning experience from the program. These surveys have been designed to gauge the increased knowledge of the scholars, their increased interest in cancer careers, the faculty’s perception of the scholars’ success, and ways in which we can further improve and build upon our program. Scholars are also contacted after their graduation from our program to update us on their academic achievements, plans for which colleges/universities they plan to attend, updates on ongoing projects, and other relevant activities. We track scholars for up to five years to determine the long-term impact that our program has on their academic and career paths.

We have a dedicated advisory committee made up of local and national advisers who meet annually to discuss the past year’s events and plan for the next year’s activities. Together, curriculum design, structure of the programs, integration of the activities, and streamlining the most effective method of teaching is a process that is worked on throughout the year.

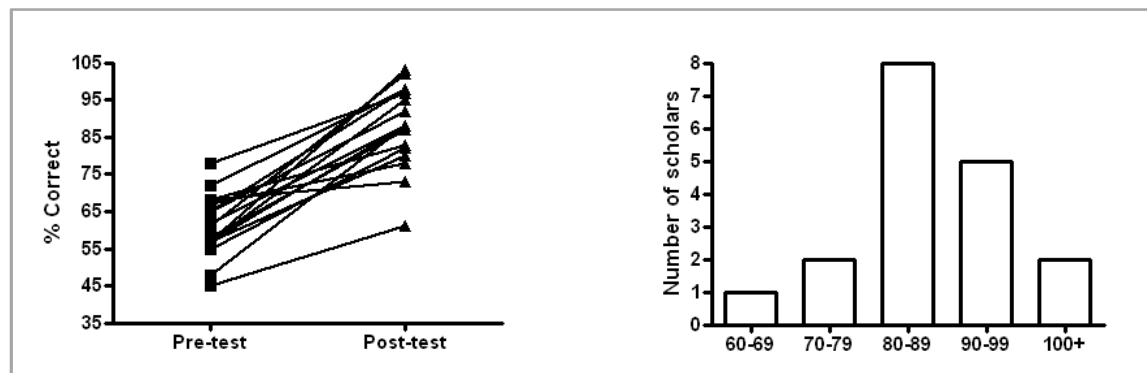
Advisory Committee:

Name	Organization/Company
Ted Frick	Bayer
Rebecca Cullen	Jack Kent Cooke Foundation
Kevin Ashley	LRDC, Pitt
Paula Davis	Office of Diversity, Pitt
Edwina Kinchington	SciTech Academy
Holly O'Donnell	Pittsburgh Public Schools
Brian Corr	Pittsburgh Public Schools
Candi Castleberry-Singleton	UPMC
Laurie Heinreicher	Hampton School District

Examination Results and Improvement

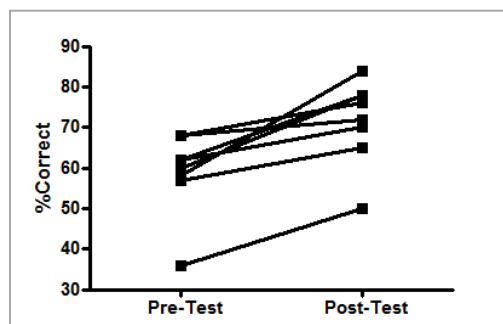
A standard, comprehensive pre-test was given at the beginning of the program, and at the end of the didactic lectures each site conducted their own individual post-test. None of the test material was given to the scholars; some required an extension of the information provided in class. The final scores ranged from 49-100% correct, with the majority of scholars vastly improving their performance on the final exam, which was considerably more difficult. Below, grades of the tests are displayed as scatter plots.

Hillman Test Scores



With the largest number of scholars in our history, 18 at the Hillman site, we found that our ability to provide individualized attention was more limited. Still, each of the scholars remarkably improved their scores on the post-test. We found the Weinberg text useful – actually invaluable for our scholars, keeping them focused and providing an external source in addition to the presented material. This almost certainly has to do with the singular focus on Cancer Biology which suffused all presentations. Next year we plan on decreasing the number of scholars to about twelve.

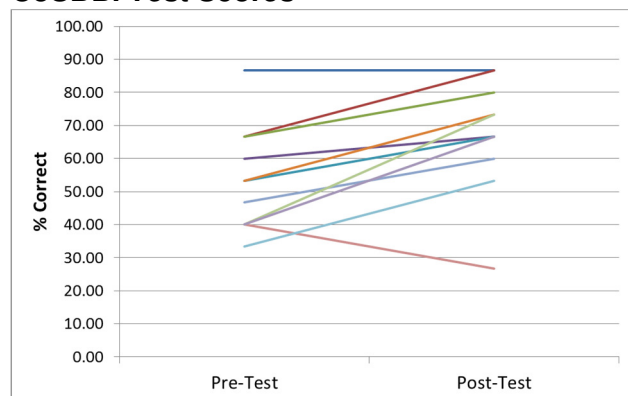
Magee Test Scores



The WCRC exam had an assortment of 50 multiple choice, essay, and matching questions, in order to test the understanding of the science behind cancer development and treatment, especially as it relates to women’s malignancies. In particular, students were tested on the pathogenesis and the endocrine control of both breast and ovarian cancer. According to our end of course survey, our students reported their understanding of women’s cancers at an average of 4.56/5, compared to the average 1.89/5

at the beginning of the course, (scale: 1=not much knowledge and 5=much knowledge on the topic). This improved understanding of women’s cancers is clearly demonstrated by the increased scores from pre- to post-test.

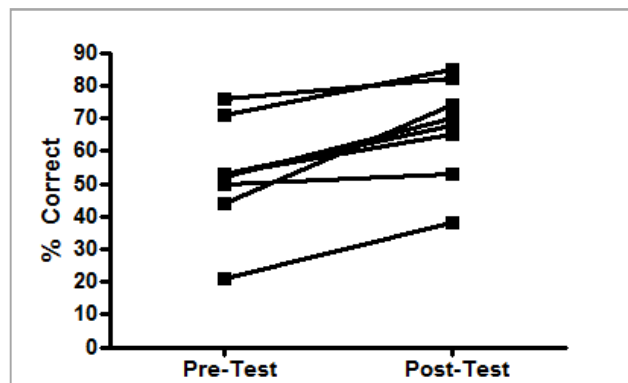
CoSBBI Test Scores



Students in the CoSBBI program came with a background in advanced high school biology, but they varied in their mathematics and computer background, ranging from no programming experience to proficient in developing simple standalone applications. The students were administered a pre-test on the first day of class, consisting of multiple choice questions covering fundamentals from biology, genetics, protein interactions, computer science, bioinformatics and biomedical informatics. The same test was

again administered after the last day of class. 9 out of 11 students showed improvement in their scores, with a highest individual improvement of 83%. Average student performance increased by 26%.

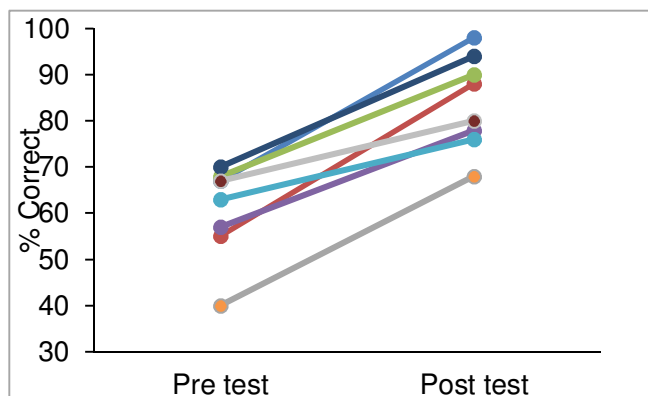
DiSCoBio Test Scores



An exam of 34 questions that covered the breadth of topics in the DiSCoBio Academy was given to our scholars at the beginning and end of the 8-week program to assess their learning gains. The exam included questions from each of the areas of study in our comprehensive curriculum – Drug Discovery, Computational Structural Biology, Genomics, Systems Biology, Bioimaging, and Computer Programming. Comparisons of the performances on the pre- and post-tests showed an improvement by each scholar in

the program (see figure). The pre-test data showed that our scholars were the most knowledgeable in Systems Biology and Bioimaging. The post-test data showed that the students improved the most in the categories of Computer Programming and Computational Structural Biology.

Tumor Immunology Test Scores



21 of the questions on the post-test were new, with an average of 85% correct; 29 of the questions on the post-test were repeats from the pretest, with an average of 84% correct. The average student improvement from pre-test to post-test was 23 points, +/- 7.6. One student who received the highest post-test grade and one who had the most improved score both increased their scores by an average of 32 points.

Scholar Testimonials

Scholars, their families, their research mentors, teachers and other professionals witnessing these scholars' presentation all had significant praise for the quality of the scholars' research and their articulation of it to audiences. Below are just some of the testimonials provided by the 2013 scholars:



Magee Testimonials:

"The people who are involved in this program are passionate and truly care about us and our experiments."

"The academy was a good experience for me overall. Instead of wasting my summer, I feel as though I was able to accomplish and learn something that is definitely beneficial to my educational career."

"I loved the lab work, the weekend activities were exciting, thank you!"

"The course greatly expanded my knowledge of cancer as a whole and was beneficial to my understanding of lab work."



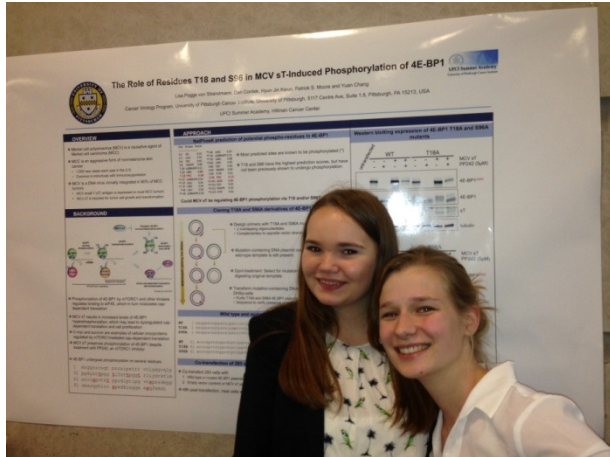
Hillman Testimonials:

"This was an interesting course allowing us to learn more about cancer and aspects of its initiation, development and management."

"I truly had an unforgettable summer, and was able to learn ideas and materials I would never imagine learning in high school."

"I can honestly say that this program was outstanding. I never expected to accomplish everything that I have."

"The pairing of projects was perfect because I was able to work on what interested me, and also able to continue my exploration in career paths relating to my interests."



CoSBBi Testimonials:

“Coming into this summer program, I expected to be intellectually stimulated and exposed to the research world. As I reflect on my experience at CoSSBI, it definitely met these expectations.”

“The CoSSBI Academy was a turning point in my life. I am definitely considering a career in either Biomedical informatics or Pathology after my experience. The other scholars I met will be some of my best friends forever. I strongly recommend this program for anyone who wants to spend their summer doing cutting-

edge research, learning a lot, and meeting amazing people.”

“I think the networking and real world experience were the best part of my time here this summer. I feel like I have accomplished so much in such a short amount of time ... Having a mentor as enthusiastic as Vanathi was amazing, and I'm so glad I've had the chance to meet so many innovators in this field. I am planning on majoring in bioinformatics, and I am so glad I have decided what I want to do with my career. It has truly been a life changing summer.”

“The one-on-one mentoring was great. Additionally, it was amazing that Dr. Becich was able to provide us with the opportunity to publish our extended abstracts.”



DiSCoBio Testimonials:

“DiSCoBio revealed a world to me that I had not known about before. It was a fun experience that taught me a lot about the daily lives of scientists.”

“Cutting-edge biology multiplied by research experience and divided by great fun.”

“It is an overall great program with a lot of opportunities. It is very well rounded and you discover yourself academically and personally. Plus, you network and meet a lot of great

people and friends.”

(In response to a question asking for their favorite part of the Academy): “Meeting new people and doing research in the real-life scientific world. Working with PhD researchers was an amazing opportunity considering that I am only in high school.”

Plans in Progress for 2014 UPCI Academy

Since 2009, the program has improved upon its curriculum, organization and activities, aiming to provide its scholars with the best educational opportunities and most diverse exposure to scientific and medical fields. Moving into its 6th annual year, and having grown from a program of five students, the UPCI Summer Academy has been newly termed, The UPCI International Academy. While maintaining its original goal as a community-centered program (recruiting the majority of our students from local urban and suburban schools), the UPCI Academy has also begun to recruit qualified students from all over the world. Bringing cultural, ethnic and social differences together in a program such as ours provides a uniquely enriching experience to every student in the program.

In 2013, for the first time, our program enrolled three students from Kazakhstan. Two of these students participated in our WCRC and Hillman program sites, completing research projects on DNA repair mechanisms in breast cancer cells and immune responses in melanoma patients. The third student from Kazakhstan served as a program resident advisor, overseeing out-of-state scholars residing in the dorms. A fourth student from Cologne joined us last summer as well. After the positive and seamless integration of international students in the Academy, we are excited to add a site in Cologne, Germany for the 2014 year. The Center for Integrated Oncology-Cologne/Bonn Academy (CIO) will host a new program this year focuses largely on leukemias and lymphomas. Under the direction of Dr. Michael Hallek and Dr. Cornelia von Levetzow, six laboratories will each host one to two scholars for a four-week program that mirrors the curriculum design at the United States UPCI Academy.

We are also excited to announce the (re)opening of another program site at the Center for Health Equity Research and Promotion (CHERP). To promote our commitment to our local communities' students, the CHERP Oakland campus site will be re-instated for 2014. CHERP faculty members and staff were valuable participants in our program two summers ago and have agreed to serve as a program site again in 2014. CHERP is now located in new quarters at the VA Hospital and will engage scholars in cutting edge studies designed to discern the origins and develop solutions for disparities in health care. Led by Michael J. Fine, MD, MSc, CHERP Director, this program site will be designed specifically for scholars who are interested in working with researchers on clinical research projects. Under the guidance and direction of Dr. Fine, scholars will work side-by-side with an assigned CHERP faculty mentor to complete research projects focused on areas such as health care disparities, delivery of health services, and quality and equity of care.

ATTACHMENTS

Appendix A. Faculty Mentors and Scholars

Appendix B. Program and Abstract Booklet

Appendix C. Course Teachers and Block Leaders

Appendix D. Activities Calendar