

UNIVERSAL TIMES

2020 Annual Report / Vol. 62

The Summer Science Program online...

WHAT A RIDE!!



*participants and faculty of SSP '20 in Astrophysics
Univ. of Colorado Boulder virtual campus
photo collage by Lily Sensen '20*

INSIDE THIS UT ▶ ▶



Find us on your favorite
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Find us on the web at SSP.org

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Superheroes to the Rescue

Richard Bowdon '74, Executive Director



Alumni: think about your own Summer Science Program. Now imagine it being online. Hard to do? Or impossible??

By the beginning of March, 32 faculty had committed to teach SSP '20, and 1,400 teenagers had applied from 44 states and 42 countries. Then the realization hit: an in-person program was out of the question. Would 2020 be the first summer in 62 years with no SSP?

Not a chance. Our faculty would not let these young people down. They agreed to teach asteroid orbit determination and fungal enzyme inhibition online on short notice. They are all heroes!

A few weeks of intense planning later, 144 teens spent hundreds of hours on Zoom, Slack, Canvas, and Vimeo, having a life-changing research immersion without actually touching any equipment.

But don't take my word for it ... watch the videos on SSP's YouTube channel.

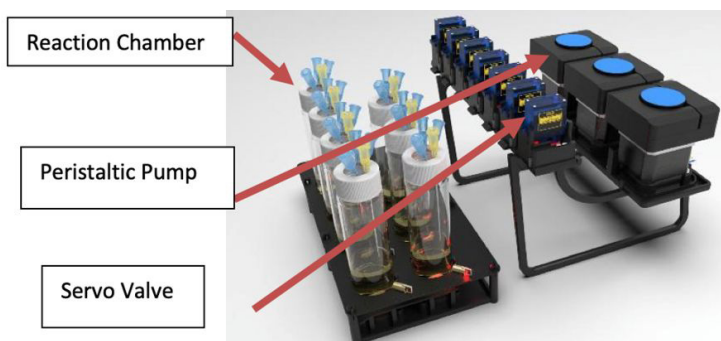


Genomics Project Update

Dr. Amy Barr Mlinar, Chief Academic Officer



Two years after a generous \$275,000 development grant from an anonymous alum, SSP's third research project is coming into focus. We have chosen an experiment in directed evolution, proposed by Dr. Fyodor Kondrashov and Catalin Rusnac at the Institute of Science and Technology in Vienna, Austria.



Teams will assemble, program, and test this Raspberry Pi-controlled "morbidostat" to maximize the rate of evolution of antibiotic resistance in E. coli.

Each team will 3D-print, assemble, program, and test a "morbidostat," an automated evolution accelerator, and use it to evolve antibiotic resistance in *E. coli*. They will hypothesize genetic changes, sequence the DNA using PCR, and analyze the results.

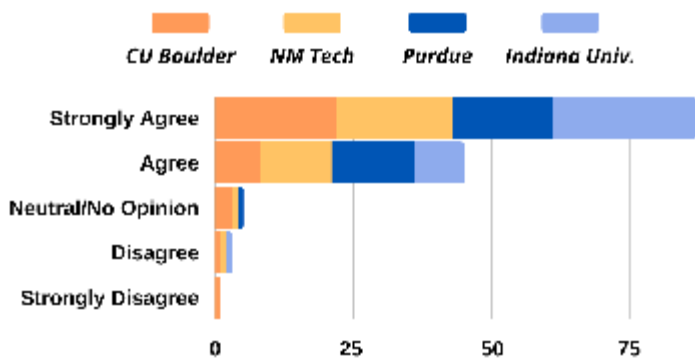
This project is highly interdisciplinary, including biomedical engineering, genetics, coding, statistics, and calculus, and plenty of opportunities for overcoming setbacks and frustrations – always integral to the SSP experience!

To refine and test the project, we've partnered with Prof. Tamara Kinzer-Ursem and her colleagues at Purdue's Weldon School of Biomedical Engineering. They plan to teach a pilot next summer, then the first SSP in Genomics in 2022. Strict sterile techniques and protocols will be followed, as required by Purdue's Institutional Biosafety Committee.

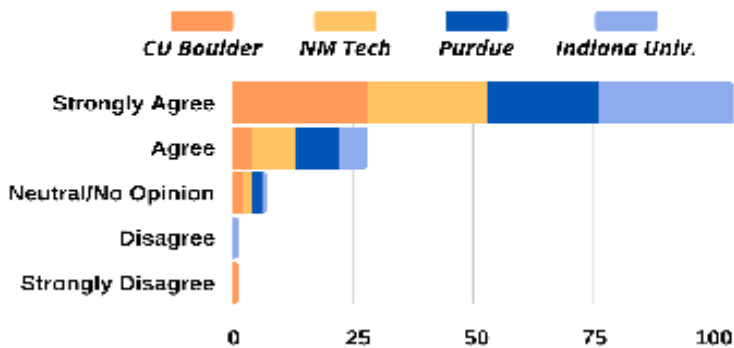
We're excited about this progress! Look for continuing updates in the Universal Times e-letter.

Participant Exit Surveys

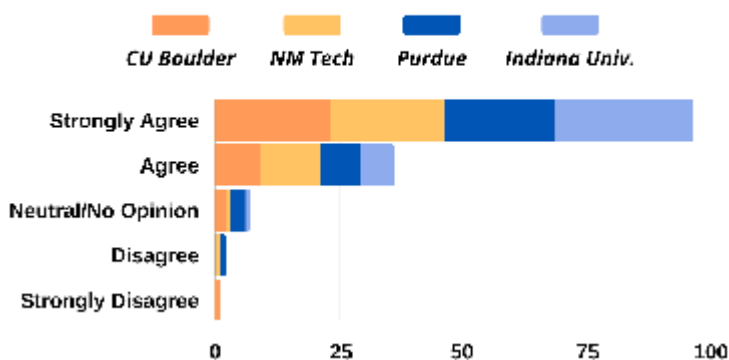
Increased my interest in math and science



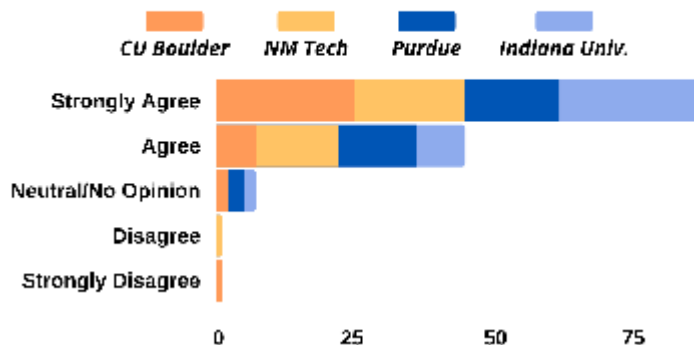
Helped me understand the nature & value of collaboration



Helped me grow as a person



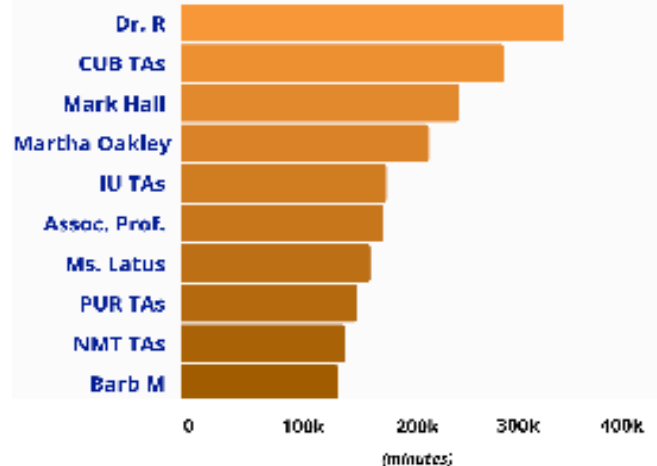
SSP will, in the long run, have a significant impact on my life



Technologies Used



Zoom Minutes



SSP Connect

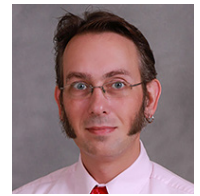
The new mentorship program, SSP Connect, is underway. Over a hundred new alumni are each paired with a twenty-something alum to talk about college admissions, college life, and beyond. The pairs will meet through the fall. Contact Katherine Hougland at khougland@ssp.org to volunteer for 2021.

My son has never been more engaged and felt more at home than he does with his SSP family. For the program to add a mentorship program is simply more than we could have ever expected. The college admission process is murky in the best of times and, in the COVID 19 era, having someone who recently went through it has been a godsend.

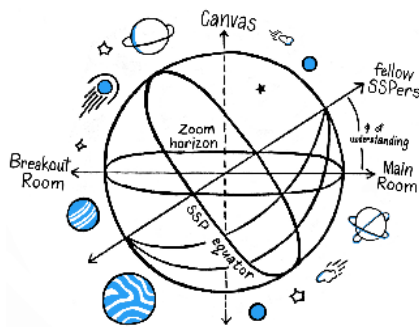
- John D., Parent

New Mexico Tech

Dr. Adam Rengstorf, Academic Director



Starting SSP not knowing what to expect ... that's normal. Despite what they've read online or heard from alumni, they don't really know what SSP is like until they arrive.



But this summer, we faculty didn't know what to expect either!

Fortunately, we had plenty of continuity and experience. This was my 7th summer as AD, working side-by-side with colleagues Dr. William Andersen (AAD) and Barb Martinez (SD). Dr. Aaron Bauer again taught Python and Dr. Gillian Andersen put on a technical writing workshop. With TAs Luke Kiernan, Zhanpei Fang, Joseph Tran, and

Amy Zhao, we had over 40 programs' combined experience when we began this summer. They made my summer enjoyable.

I missed New Mexico and trips to the VLA and White Sands. But I very much enjoyed the unique opportunity for Dr. Andersen and me to work closely with our counterparts Drs. Agnes Kim and Cassandra Fallscheer in teaching SSP.

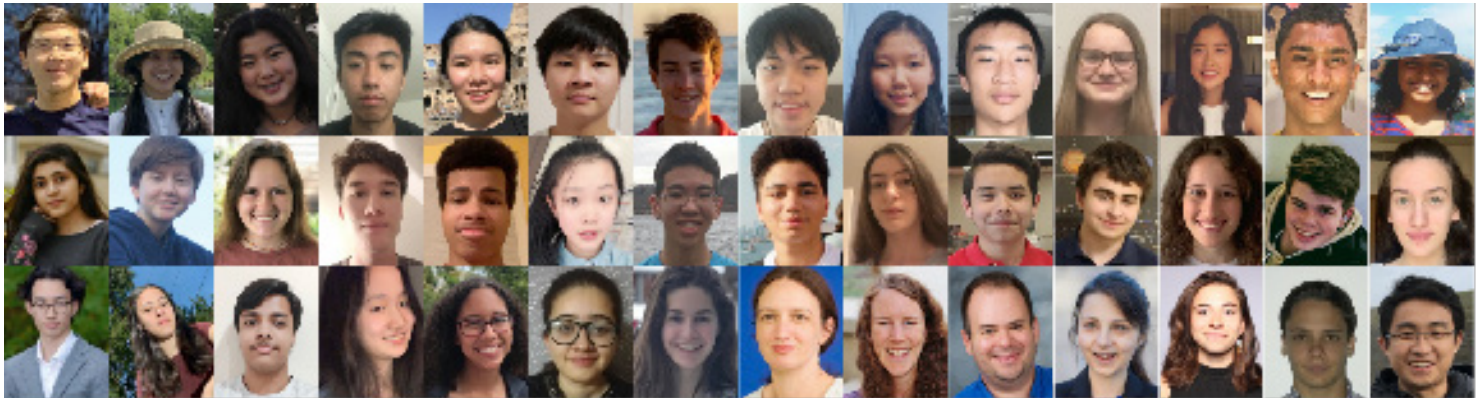
Each team of three participants collected its asteroid images from multiple observatories: the Skynet and iTelescope international networks, and friends-of-SSP Sommers-Bausch in Boulder, FOAH in New Mexico, and Central Washington University. Special thanks to Fabio Mezzalira at SBO, John Briggs '76 at FOAH, and Dr. Fallscheer at CWU! Teams downloaded observations, coded the Method of Gauss orbit determinations, and submitted their astrometry to the Minor Planet Center.

We managed to keep them busy with four hours of daily interactive sessions, covering everything an SSPer needs to know, followed by four more hours combining office hours, study group, discussion forum, games, and other typical computer lab shenanigans. A benefit of being online was the chance to hear twice as many guest speakers, all of whom were excellent.

By Closing Ceremony, the 36 participants had made it through a very challenging research program under unprecedented conditions, and bonded together just as much as in any other summer. It was a privilege to be part of that.

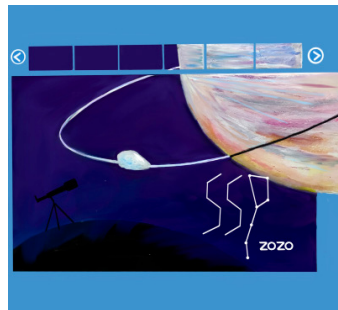
For someone coming from a small town with not much opportunity, SSP has made such a huge impact for the present and opened so many doors for the future.

- Daniel G.



If you ask faculty to name the key elements of SSP's design, they will list being present 24/7, interacting in a hands-on learning community. How then, could we do SSP online? We interacted for hours every day on Zoom, and did everything we could to preserve the hands-on aspects. For example, being "with" Dr. Cassandra Fallscheer late at night as she took observations in the dome at Central Washington University made memories for a lifetime.

Despite our misgivings about spending those daily hours online, after the first week it became natural. We even looked forward to it! With people spread over 16 (!) time zones, scheduling sessions when everyone



would be awake (more or less) was a game of three-dimensional chess – we did the best we could. After some experimentation the first week, participants figured out a system of napping that worked for them, and faculty figured out due times for assignments that worked for everyone.

During daily WorkPlay blocks, Zoom rooms became "zoom buildings," complete with work rooms, a faculty lounge, game rooms, and a Zen room featuring Site Director Mark Greenberg in his Japanese garden. Participants were free to roam about. At times, they would all congregate in a room with a TA for an impromptu lecture or game. At others, they worked together on code or

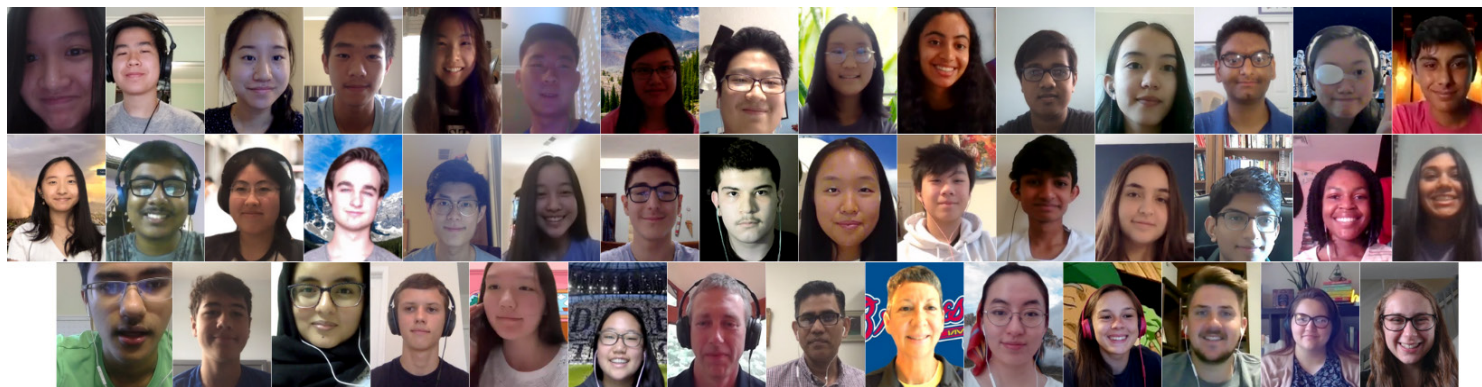
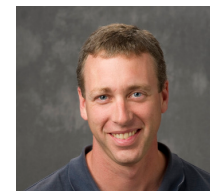
the OD. Our TA's expertly maintained the Zoom building, helped the participants through the academics, and made sure they took some time to have fun.

As the weeks went Zooming by, we all became Zoom experts. The participants treated faculty to a prank one morning: a TA's iPad appeared to take over the session, as a message played about a rebellion. It took us a minute to realize that the participants had all changed their Zoom names to "Lizhou's iPad."

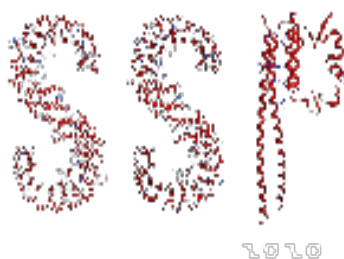
An important ingredient was not too difficult to reproduce: the challenges, leading to hours together working on tough problems and overcoming obstacles, leading to interpersonal (albeit remote) bonding. My third consecutive year as AD reaffirmed what the late Dave Pierce used to say, and I have long believed: great people make SSP the extended family it is.

I went into SSP excited most by the academic rigor. What I learned the most about, however, was just how collaborative and supportive an academic community could be.

- Ellie W.



A perennial favorite lecture topic at SSP Biochemistry is the molecular basis for evolution: environmental pressures leading to new species. That is this summer in a nutshell.



My anxiety level was high as the start date approached! Under pressure from the Covid-19 pandemic, we had to evolve a new online version of SSP Biochemistry ... no small feat, considering the usual heavy emphasis on hands-on work in the wet lab. Fortunately we succeeded, judging by participant enthusiasm and their gratitude on "departure day." I credit this to the talents, hard work, and preparation of our faculty.

Purdue's Dr. Chitta Das joined the team as a first-time AAD, bringing expertise in structural biology and enzyme biochemistry. He was impressed by participants' energy and passion. Dr. Nickey Ice, also new to us, served as Site Director. She navigated the intricate SSP culture, and the technol-

ogies and procedures for a virtual program, with a smile and upbeat attitude, putting her experience teaching and coaching high school students to good use.

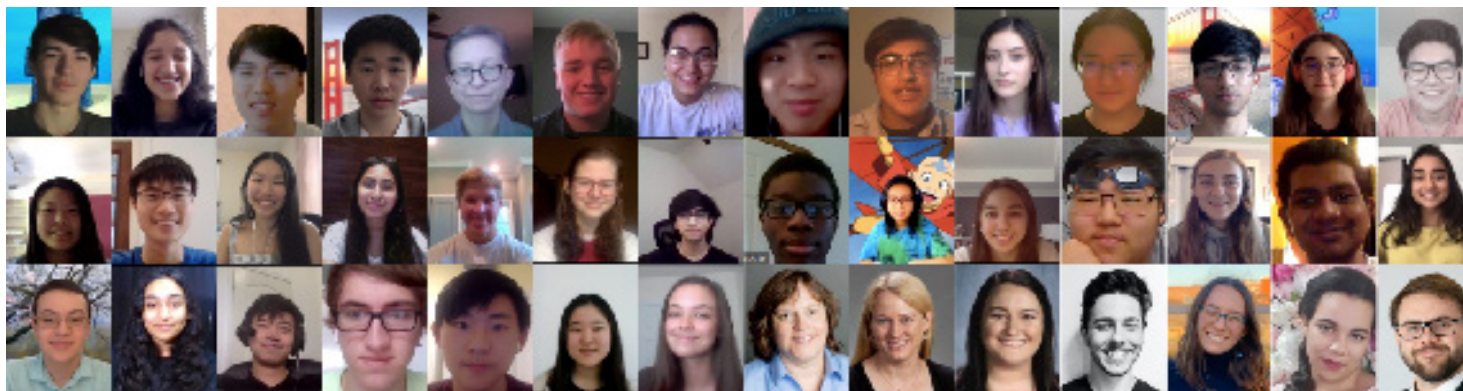
Our TAs were real heroes. Charged with devising ways to create the community atmosphere of SSP online, they did a remarkable job helping participants to bond and have fun despite never meeting in person. Helen Cai '15 went above and beyond by designing and teaching a new Python coding unit. Laney Flanagan '17 became the first Biochem alum to return as a TA, and did a wonderful job running the blog. Kathryn Wolfert, Tyler Huth, and Kaylen Meeks are all recent graduates of Purdue's Biochemistry undergraduate program and put their wet lab experience to good use. Collectively, they helped keep everyone's spirits high and ensured the best possible experience.

An impressive roster of guest speakers included Nobel Laureate Dr. James Allison and his collaborator, Dr. Padmanee Sharma, discussing cancer immunotherapy. Dr. Tyrone Hayes, Dr. Minosca Alcantara, Dr. Briony Horgan, and Dr. KK Ojo covered a diverse array of fascinating topics. Drs. Susan Jerian '79 and David Essayan again conducted a two-day workshop on clinical trials in drug development.

In lieu of fieldtrips, online games like Fishbowl, Skribbl, Kahoot, and Sporcle provided opportunities to get to know each other and laugh together (a lot). It wasn't a typical SSP, but we proved SSP's design is adaptable. We will be prepared if the need to run SSP Biochemistry online arises again.

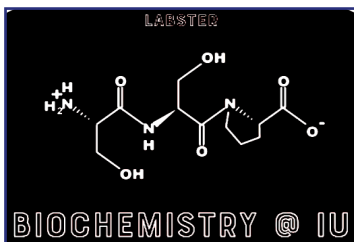
I will always remember SSP not only as my first exposure to advanced research, but as a dynamic and vibrant scientific community.

- Alexandra O.



It was a summer of firsts: our first year at Indiana University (though only virtually), a new Associate Academic Director, Dr. Jessica Hollenbeck, and a new Site Director, Christin Latus. Four-time (!) TA John Whitney was joined by three new TAs: Austin Meyer, Yvonne Thomason, and Kyra Raines.

In the huge challenge of converting to a virtual program then teaching it, Dr. Hollenbeck was enthusiastic, creative, and more experienced than I in online instruction. We worked closely with our Purdue counterparts, Mark Hall and Chitta Das, all of us dividing the lectures, assignments, and other tasks.



What would “residential life” activities be? Ms. Latus figured it out, organizing social hours, getting to know all 36 participants, and fostering interactions between the two subgroups. Within 24 hours, participants were saying that the best thing about SSP was getting to know their peers. That gave us confidence this virtual edition would be a success!

One might have guessed the TA workload would be reduced without the residential component, but that was not the case. Our TAs were spectacular: smart, flexible, insightful, kind, and patient. They hosted daily three-hour blocks, during which nine participants worked through experimental design, problem sets, and data interpretation. On Tuesdays, they carried out experiments on camera, some designed by participants.

John kept teams focusing on the big picture, and led in-lab video sessions. Kyra brought good humor, emphasis on teamwork, and tales of baby jellyfish. Austin applied his trouble-shooting skills – forged in organic chemistry labs – to this project, and was our resident expert on *Avatar the Last Airbender*. Yvonne taught that scientists can be stylish (though she unfortunately missed an opportunity to wear her cool lab coat).

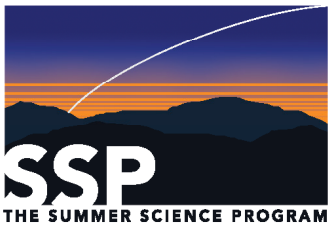
As always, guests added to the experience. Drs. Susan Jerian and David Essayan conducted their excellent workshop on the FDA approval process, and recruited Nobel Laureate Jim Allison and his collaborator Pam Sharma to speak to us. I’m grateful to them, and to all our other presenters.

In summary, this felt more like the in-person version than any of us could have hoped for. These teenagers experienced the same challenges, victories, collaboration, and community that makes SSP special. Thanks to everyone for a wonderful summer!

“
This experience has fundamentally changed the way I see science. I realize it is not just an academic endeavor but a way to benefit society by contributing to human knowledge and applying that knowledge to solve real-world issues.
 ”
 - David C.

College Destinations of SSP '19

Brown Univ.	Hana B, Michael J, Raphael L
Cal. Poly San Luis Obispo	Madeline X
California Inst. of Tech.	Alice K, Cole A, James C, Jonah R, Rupa K
Carnegie Mellon	Grace X, Sanah I
Columbia Univ.	Avantika G, Lilah L, Sarah T, William F, Zoe C
Duke Univ.	Benjamin S, Ethan E, Liza L, Nicole E, Richard W
Georgia Tech.	Jiyuan D, Sivasai M, William B
Grinnell College	Hieu N
Harvard Univ.	Anicia M, Anne R, Arnun P, Austin M, Jaiden E, Mai H. '18, Mireya S, Ricardo L, Shang W. '18
Harvey Mudd College	Brandon B, Carter M, Kevin K, Lea T, Lucien T
Imperial College	Antonia Z
Johns Hopkins Univ.	Darrell F, Owen M, Smit V
Massachusetts Inst. of Tech.	Angela G, Anka H, April C, Ariel M, Bianca H, Blisse K, Catherine L, Cindy L, Daniel F, Emily J, Emily L, Emma H, Evelyn F. '18, Harry H, Isabel S, Jenny C, Jessica M, Jessica W, Joli D, Oswaldo M, Sarah W, Saul V, Siddharth M, Stanley C, Xinyi F '18
Nat. Univ. of Sci. & Tech.	Sahar A '18
New Jersey Inst. of Tech.	Maria G '18
Northwestern Univ.	Sia C
Occidental College	Olivia L
Princeton Univ.	Michelle H, Omar E, Ryan L
Purdue Univ.	Sveni T
Stanford Univ.	Boxin Z, Hope A, Janice T, Kaiden W, Marcus L, Patrick L, Priti R, Rohan S, Sasha R, Stephanie Z, William Z
Tech. Univ. of Munich	Beren G
Tufts Univ.	Alyssa D, Ezgi Z
Univ. of Alabama	Huan L
Univ. of Cal. Berkeley	Elizabeth C, Jason C, Jeff Z, Jonah H, Juhee H, Kenneth H, Nikhit K, Soumik C, Taifu L, Vighnesh N
Univ. of Cal. Los Angeles	Rupin M
Univ. of Chicago	Jeffrey H, Lena L, Stella K
Univ. College London	Márk M '18
Univ. of Colorado Boulder	Matthew J, Ryan C
Univ. of Michigan	Rutvik M
Univ. of N. Carolina Chapel Hill	Anonymous
Univ. of Notre Dame	Cecilia L
Univ. of Pennsylvania	Cameron W, Hyunjun A, Srikar G
Univ. of Southern Cal.	Brandon G, Emily R
Univ. of Tennessee	Melissa P
Univ. of Toronto	Ming Hong X
Univ. of Texas Austin	Callee C
Univ. of Texas Dallas	Evan Y
Washington Univ.	Benjamin M
Wellesley College	Naunet L
Williams College	Abby K
Yale Univ.	Alex D, Alex S, Allen W, Aurelia M, Bryan S. '18, Cathleen L, Charlene M, Ching Ying L, Christopher Y, Daniel D, David P, Irene X, Kelvin K, Sein L, Sophia B, Victoria L, Ziyue L



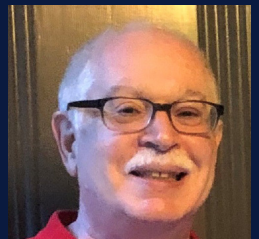
108 Whiteberry Dr
Cary, NC 27519

Address Service Requested

Letter from the Chair

The sad loss this past year of Dave Pierce, Catalin Mitescu, and Andy Friedman reminds me of how profoundly the SSP faculty has shaped our lives, heroically so this summer. Through their passion and creativity, coupled with the collaboration from afar of an eager cohort of participants, a rich and caring learning community emerged. SSP's success this summer fills me with confidence as we address the challenges ahead, such as the development of new curricula and their introduction at additional campuses, allowing us to make our unique experience available to yet more talented teens.

We have the responsibility to seek that talent everywhere, attracting applicants and shaping cohorts to reflect the multi-dimensional diversity of our country and the world. To do so requires time, money, imagination, and unwavering commitment. We're making progress. For instance, we achieved gender balance ten summers ago. But a long road remains, as we strive for diversity at all levels: participants, staff, guest speakers, and the Board of Trustees. I welcome your help as we make this journey.



Dr. Ron Irving '68,
Board Chair

from participant exit surveys