THE SUMMER SCIENCE PROGRAM

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INSIDE

LINKS

▶ Attend the Annual Dinner on Oct. 29 at La Canada Flintridge Country Club: ssp.org/dinner

▶ Update your profile and find other SSPers: ssp.org/alumni

▶ Donate securely to the 2017 Annual Fund: ssp.org/support

▶ Join the Facebook group facebook.com/groups/sspalum

Becoming The Summer *Science* Program

We've always *taught* astronomy at SSP, but SSP has always been about more than *just* astronomy. For 58 summers it has focused on meeting the developmental needs of highly gifted teenagers. Until now, astronomy has been our only means to that end.

Now the stage is set for the Summer Science Program *in Biochemistry*, following a successful pilot at Purdue. This student research, and a second project in Marine Metagenomics, were carefully designed to share many important design elements of the asteroid OD: teams of three, student "ownership" from start to finish, computational aspects, and more. Life science projects are timely, given the ongoing revolutions in biochemistry, molecular biology, genetics, and genomics.

Pending a final hard look at the projected costs and resources available, we hope to open applications in December for three campuses. The Board of Trustees will remain guided by the principle of "do no harm" to the highly successful SSP-Astro campuses in New Mexico and Colorado.

In the Long Run

SSP's $335,000 grant from the Gordon and Betty Moore Foundation funded more than development of two new student projects (in Protein Biochemistry and in Metagenomics) and a redesigned website. It also mandated our first-ever Strategic Plan, to which dozens of members have contributed over the past year.

In the process, we came to realize that by growing beyond the comfortable status quo, we could both mitigate a known risk - overtaxing our dedicated volunteers - and create new opportunities to widen SSP's influence on high-quality STEM education.

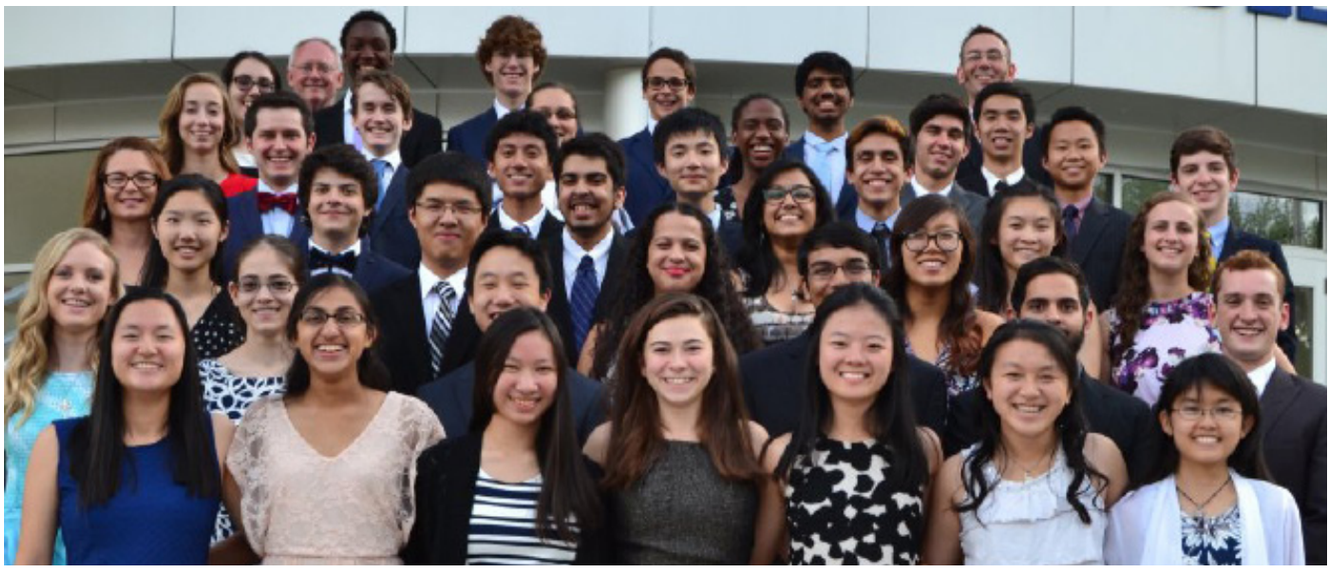
Imagine, 5-10 years from now, the profound SSP experience benefitting over 200 gifted teens per year, including those interested in life sciences. Imagine a nonprofit that can support a professional staff instead of relying on volunteers for routine administrative tasks. Most importantly, imagine SSP emulated as a model of how to expose high school students to authentic, hands-on research within a collaborative, supportive culture.

There is a lot of work still ahead, but step-by-step expansion could make all of that possible. As member-governed nonprofit, SSP welcomes your support and feedback. Just email execdir@ssp.org.

Report from New Mexico Tech

Work, Fun, Dome Calls, and Down Time

BY DR. ADAM RENGSTORF, ACADEMIC DIRECTOR



This summer's weather in New Mexico was so good that all six teams collected all their data locally – no remote imaging necessary. NM Tech's Dan Klinglesmith again reserved a C-14 telescope, SBIG camera, and the main control room at Etscorn Observatory for our exclusive use. Typically for Dan, he encouraged TAs to call him at any time of night for help with any equipment problems: "I'm a doctor, I make dome calls."

In Socorro I was honored to work with Associate AD Bill Andersen, Site Director Joni Mauldin, and TAs Mathis Habich, Reilly Raab '10, Lindsey Whitesides '12, and Rebecca Sellers. Aaron Bauer '06 returned again to teach the programming. Together we led a wonderful group of students through the challenges and joys of real astrophysical field work.

The Summer Science Program is known for jam-packed days – and nights. All-nighters may be a treasured memory for some alumni, but in recent years sleep deprivation reached a dismaying, unhealthy extreme. So this year, the Board agreed to an experiment: "down time" at 3 am, in recognition that students really do need a minimum amount of sleep to function! In addition, Dr. Andersen and I decided to make problem sets due at midnight instead of 9 am. These policies seemed to work well, to our relief.

> *At SSP, you come in a student and come out a thinker, a learner, and a researcher. You come in with a love of learning science and come out with a burning desire to actually do science. You come in hopeful of your abilities and come out sure of your potential.*
> - ALEX MOSER '16

Students clocked more than 100 hours with Bill, Aaron, and me in the classroom, learning how to obtain and analyze astronomical images, perform astrometry and photometry, determine their asteroids' orbital elements with differential correction, and prepare their results for publication. And that's not all. Collaborating with students in Boulder and the Yale Summer Program in Astrophysics, they took simultaneous observations of asteroid 2002 KL6, then used trigonometric parallax to calculate its distance to within 0.5% of the JPL value! In the last week, they even found time to take some wonderful color "pretty pictures."

Southwest Research Institute scientists capped it all off by teaching non-linear numerical methods for estimating asteroid positions thousands of years into the future.

We welcomed six guest speakers including perennial favorite "mad scientist" Larry Sverdrup. We found time for field trips to Apache Point, the National Solar Observatory, White Sands National Monument (no one got lost this year), the Very Large Array, and Magdalena Ridge Observatory. We also soaked up some local culture in Santa Fe and Magdalena, including the amazing astronomical museum of John Briggs '76. Special thanks to Bernice Anaya, our wonderful bus driver. Bernice, Larry, and Dan Klinglesmith are the only people who have helped at every SSP @ NM Tech since the very first in 2003!

From "dome calls" to reading homeworks to driving the bus, everyone on our team in Socorro worked extremely hard to make this SSP an outstanding experience for our students.

Report from CU Boulder

We Can See Clearly Now

BY DR. MICHAEL DUBSON, ACADEMIC DIRECTOR

For more insight into SSP 2016 directly from the students, check out the campus blogs:

SSP2016NMT.wordpress.com
SSP2016CUB.wordpress.com

I love this program. The students and the curriculum are getting better every year. As we always expect, some students arrived less prepared academically … but as always, by working hard and enthusiastically, and collaborating with their peers, everyone thrived, excelled, and benefited greatly from SSP.

We had a slow start at the telescopes due to equipment problems, clouds, and smoke from nearby wildfires. But soon enough the amazing manager of the CU campus observatory, Fabio Mezzalira, made repairs, and the clouds and smoke cleared away.

Site Director Barb Martinez and our four hardworking TAs – Ioana Plesca '10, Isabella Sanders '11, Sam Holo '11, and Andrew Bundas – diligently enforced the new policy of "down time" beginning at 3 am. This contributed significantly to student health, the quality of their work and the overall success of the program. In exit surveys students praised the policy unanimously, somewhat to our surprise. Each night they could "rest assured" they would not miss out on any fun. Even tardiness to morning lecture was rare! To discourage procrastination on problem sets, we required well-defined milestones each night, and put up a poster for students to mark their progress.

I taught the math and physics while Dr. Cassandra Fallscheer taught the astronomy, plus a really great lecture on scientific writing. She also was responsible for asteroid selection, all activities on the observing deck, and submission of student observations to the Minor Planet Center. Martin Mason flew in from L.A. to teach Introductory Python. I sat in on his excellent lectures, very much enjoying re-learning Python syntax and doing the homework. Like many (but not all) SSP students, I really love coding and find it very soothing.

> *This program made me appreciate how much I can learn from others by simply swallowing my pride, admitting I have no idea what's happening, and asking for help.*
> - SARA BRANHAM '16

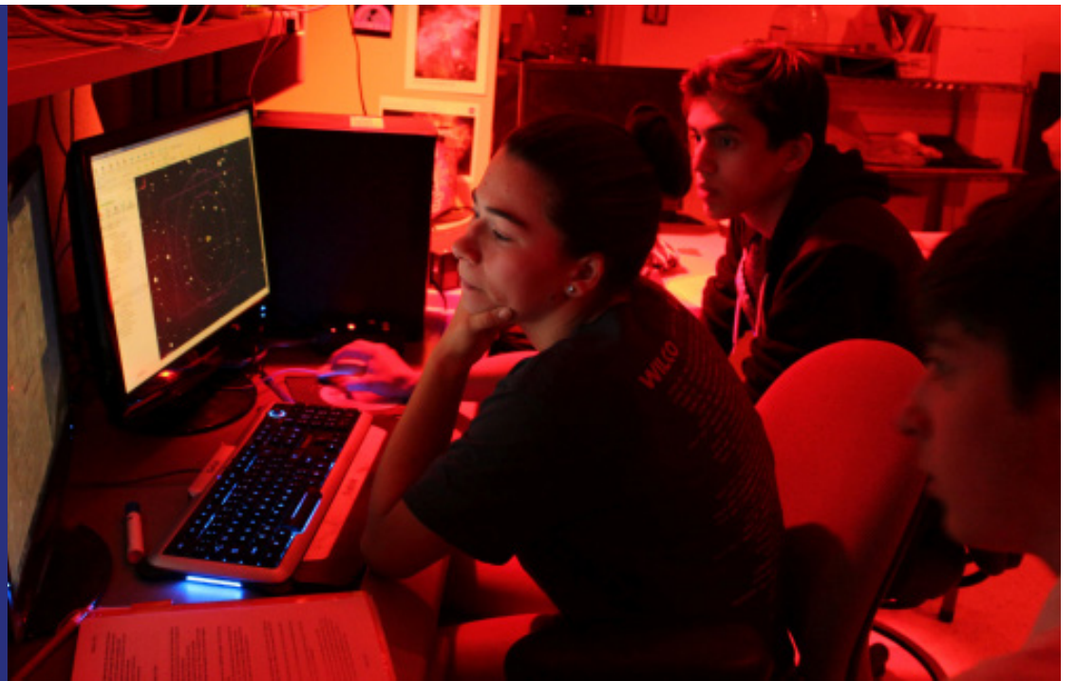
> *SSP is an unforgettable research experience made by scientists, for scientists. Its long, venerated history attests to its rigorously inspiring curriculum and academic environment, virtually perfected by years and years of repetition. The people I've met - my friends and mentors – have molded my passions, my values, and my unconditional love for a program that is truly life-changing. I've never felt closer and more engaged with the friends (or should I say, family) I found at SSP.*
> - STANLEY YU '16

Dr. Fallscheer is a superb teacher and colleague: competent, calm, level-headed and wise in her advice, great with the students and TAs. She and I agree on the high priority of making lectures interactive. Alas, she may not be available to us next year, as she has a new grant to set up a spectrometer at her home institution.

Our guest lecture series included CU physicist and Nobel laureate Eric Cornell and six others; we took multiple field trips around greater Denver, with Lockheed Martin the runaway student favorite.
When SSP moved to CU-Boulder last year, one might have said that the future was cloudy. Could we maintain the "family feel" on such a large campus? After two great summers in Boulder, the clouds have cleared (metaphorically, at least!) We have a well-tuned operation, with great support and facilities, on a beautiful campus. I look forward to next summer!

Sarah had a remarkable experience at SSP. She learned a tremendous amount, not only about math, physics, and astronomy, but also about perseverance and the depth of her inner strength. While Sarah has participated in academic programs each summer since 7th grade, SSP was unique in its extreme intensity, which forced her to grapple with grit and determination as she hadn't before.

- CAROL LIPSTONE,
parent of Sarah Lipstone '16



COLLEGE DESTINATIONS OF '15ERS

Caltech	Philip Carr, Adrianna Crowell, Kathryne Lamkin
Carnegie-Mellon	Jaejoon Kim, Megan Yu, Yifan Zhao
Columbia	Isaac Ruble
Cornell	Mahiro Abe
Dartmouth	Onaleece Colegrove
Georgia Tech	Abhraneel Dutta
Harvard	Abhishek Anand, Claire Burch '14, Maya Burhanpurkar, Julia Edsparr, Miro Furtado, Vaughan McDonald, Mauranda Men, Megan Zhao
Harvey Mudd	Rachel Cohen '14
Johns Hopkins	Xiaoqiang Meng
McGill Univ	Daoud Piracha
MIT	Rishabh Chandra '14, Hannah Chang, Eleanor Graham, Petra-Juliahn Hernandez, Luis Herrera, Agni Kumar, Grace Lam, Mia LaRocca, Nanxi Liu, Charlotte Minsky, Simran Pabla, Tiffany Pan, Collin Potts, Sunayana Rane, Elina Sendonaris, Steven Truong, Rachel Wei, Michelle Xu '14
Notre Dame	Phuoc Tran
Pennsylvania	Aditya Yo Inada Somasundaram, Alejandro Rodriguez
Princeton	Udit Basu, Ariel Chen, Hector Afonso Cruz, Emma Louden, Zhao Zhang
Stanford	Ruohan Miao, Vibha Puri, Canyon Robins, Antonio Rodriguez, Dane Stocks, Xuechun Yao, Dushyant Singh
Tufts University	Molly Lie
UC Berkeley	Joseph Romagnoli, Sukrit Tripathi
Univ. of Minnesota	Crystal Luo
Univ. of Virginia	Yifei Jiao
Yale	Helen Cai, Jason Chen, Gaole Dai

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PRESIDENT'S LETTER

by Scott Pace '75, Board President

Yes, summer is the time for SSP students at each campus to experience the exhilaration, camaraderie, and exhaustion that comes from working on a challenging scientific problem with new friends. However, the work of SSP the nonprofit goes on year-round as dozens of volunteers and hundreds of donors plan and fund the next SSP for the next cohort of highly talented teenagers. For example, several dozen volunteers carry out our admissions process – a daunting task as we admit about 10% of applicants.

For the past several years, your Board has explored ways to benefit more students, while preserving the distinct SSP culture. And we seek new ways to prove that SSP's unique design can work just as well in fields of science besides Astrophysics, and deserves to be widely emulated.

In July I had the opportunity of time-traveling to SSP's future. Six '15 alumni took part in a pilot run of the new SSP in Biochemistry at Purdue, where they designed molecules to block harmful crop fungi pathogens. This was just a pilot and more refinements are needed, but in my observation the experience was true to the SSP culture. We continue to work towards opening a regular campus at Purdue next summer. If we succeed, Biochemistry will soon join Astrophysics as part of a broader definition of the "science" done each summer at the Summer Science Program.