



Science Gurus

Empowering NEXTGEN Scientists

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**Annual Cell Science
Internship Report - 2016**

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INTRODUCTION

The Cell-Science Internship is a seven-week summer program organized by Science Gurus to expose high school students, to the process of drug discovery and development. The curriculum is centered around cancer therapies, and focuses on both small-molecule and biological drugs.

Interns gain a thorough understanding of the mechanisms of cancer and the many types of cancers that affect the body. Eminent guest speakers from various biotechnology companies and academic institutions such as Genentech and Stanford present to interns advanced research related to a type of cancer or cancer drug. This research is often their own, and provides interns with an opportunity to see the research and development stage from a primary source.

Moreover, interns undertake two projects. The first project is an in-depth study of one type of cancer. Using database research techniques, interns gather a wealth of information about their chosen cancer, including genetic aspects, physiological features, and current/developing treatments.

The second project is a study of a specific gene or gene pathway that has a connection to cancer, and this is a partner project. Interns must use bioinformatics tools and databases such as the National Center for Biotechnology Information and Uniprot, and are taught how to understand the data by two computational biologists from Genentech (Kiran Mukhyala and Dr. Suchit Jhunjunwala).

Finally, interns write a detailed research paper reporting their findings and present them in front of an audience of parents and other interns. The program concludes with a dinner and awards ceremony at a local Indian restaurant.

PARTICIPATING INTERNS

Name

Akansha Gupta
Allyssa Suarez
Amrita Nagasuri
Ananya Venkatesh
Anay Limaye
Bhargav Venkatraghavan
Hursh Desai
Jazmin Velazquez
Keshav Sharma
Medha Acharya
Medha Mangipudi
Nataya Phakoom
Pooja Devanaboyina
Prachi Kale
Saketh Gurram
Salil Uttarwar
Sally Nguyen
Sanghavi Srinivasan
Shail Trivedi
Shirly Ho
Venkat Krishnan

School

Gunn High School
San Leandro High School
Irvington High School
Cupertino High School
Bellarmine College Preparatory
University Preparatory Academy
Milpitas High School
Arroyo High School
San Ramon Valley High School
Irvington High School
Amador Valley High School
Arroyo High School
American High School
Gunn High School
The Harker School
Monta Vista High School
San Leandro High School
Archbishop Mitty High School
Monta Vista High School
American High School
American High School

CURRICULUM



Cell-Science Summer Internship Program

Date and Time: July 5 – August 21, 2016; Tuesday and Thursday, 5.30-8.15pm*
Location: 1531 Industrial Road, San Carlos, CA, 94070.

Day	Date	Instructor	Hours	Class	Class	Break	Class
Tue	7/5/16	Jagath Reddy Junutula	2.5	Meet and Greet; Goals of Internship	Introduction to Cancer Biology & Cancer Basics		Cancer Phenotypes & Signaling
Thu	7/7/16	Kiran Mukhyala/Suchit Jhunhunwala	2.5	Introduction to Bioinformatics	Introduction to Bioinformatics		Bioinformatics tools/applications
Tue	7/12/16	Kiran Mukhyala/Pradeep Fernandes	2.5	Bioinformatics tools/applications	Bioinformatics tools/applications		Cell Signaling/Systems Biology
Thu	7/14/16	Suchit Jhunhunwala/Chakk Ramesha	2.5	Bioinformatics tools/applications	Drug Discovery & Development - Overview		Drug Discovery & Development - Overview
Tue	7/19/16	Kiran Mukhyala/Pablo Garcia	2.5	Bioinformatics tools/applications	Bioinformatics tools/applications		Small Molecule- Drug Discovery Kinases
Thu	7/21/16	Student speakers/Jagath Reddy Junutula	2.5	Bioinformatics tools/applications	Group1: Brain/Thyroid/Cervical/Gastric		Antibody Therapeutics
Sun	7/24/16	Aparna Gandhari/Raji Pingali (11am-1pm)	2	Workshop: "Preparing Effective College Applications"			Workshop
Tue	7/26/16	Student speakers/Sanjeev Redkar	2.5	Bioinformatics tools/applications	Group2: Pancreas/Kidney/Colon		Small Molecule Manufacturing & Formulation
Thu	7/28/16	Ram Mandalam/Sreedhara Alavattam	2.5	Bioinformatics tools/applications	Cancer-Stem Cell Therapeutics		Large Molecule Manufacturing & Formulation
Tue	8/2/16	Heather Maecker/Student speakers	2.5	Bioinformatics tools/applications	Cancer Immunotherapy		Group3: Ovarian/Melanoma/Head&Neck/Liver/Lung
Thu	8/4/16	Student speakers/Ganesh Kolumam	2.5	Bioinformatics tools/applications	Group4: Prostate/Bladder/Endometrial/NHL		Interplay Cancer and Inflammation
Sat	8/6/16	Bob Figari (1.30-5.30pm)	3	Workshop: "Effective Content Development & Delivery"			Workshop
Tue	8/9/16	Zora Modrusan/Student speakers	2.5	Bioinformatics tools/applications	Cancer Diagnostics-NextGen Sequencing		Group5: Blood Cancers (Lymphoma/Leukemia/Myeloma)
Thu	8/11/16	Mahendra Shah	2.5	Bioinformatics tools/applications	Venture Funding		Project Work
Tue	8/16/16	Sukhmani Padda/Sreedhara Alavattam	2.5	Bioinformatics tools/applications	Overview to Clinical Trials		Cancer-Nanoparticle Therapeutics
Thu	8/18/16	John Storella/Elisa Brunnette	2.5	Bioinformatics tools/applications	Overview to Patents-IP		Regulatory Filings
Sat	8/20/16	Final Project Presentations	6	Final Project Presentations (10am-4pm)	Final Project Presentations		Final Project Presentations
Sun	8/21/16	Science Gurus Annual Day	3	Certificate presentations (6-9pm)	Certificate presentations		Certificate presentations

INTERN CANCER PRESENTATIONS

Group 1:

Akansha (GBM/Brain)
Saketh (Thyroid)
Medha A. (Cervical)
Ananya (Gastric)

Group 2:

Venkat (Pancreatic)
Anay (Kidney)
Hursh (Colon)

Group 3:

Nataya (Ovarian)
Salil (Melanoma)
Sanghavi (Head & Neck)
Prachi (Liver)
Sally (Lung)

Group 4:

Shail (Prostate)
Medha M. (Bladder)
Jazmin (Endometrial)
Pooja (NHL)

Group 5:

Keshav (HL)
Bhargav (CML/CLL)
Amrita (AML)
Allyssa (ALL)
Shirley (MM)

GROUP PHOTOS



Interns with
Dr. Jagath
Reddy Junutula

Interns with
Dr. Suchit
Jhunhunwala
and Kiran
Mukhyala



Interns with Dr.
Ram Mandalam
and Dr.
Sreedhara
Alavattam



Interns with
Dr. Sanjeev
Redkar

Interns with
Mr. Pradeep
Fernandes



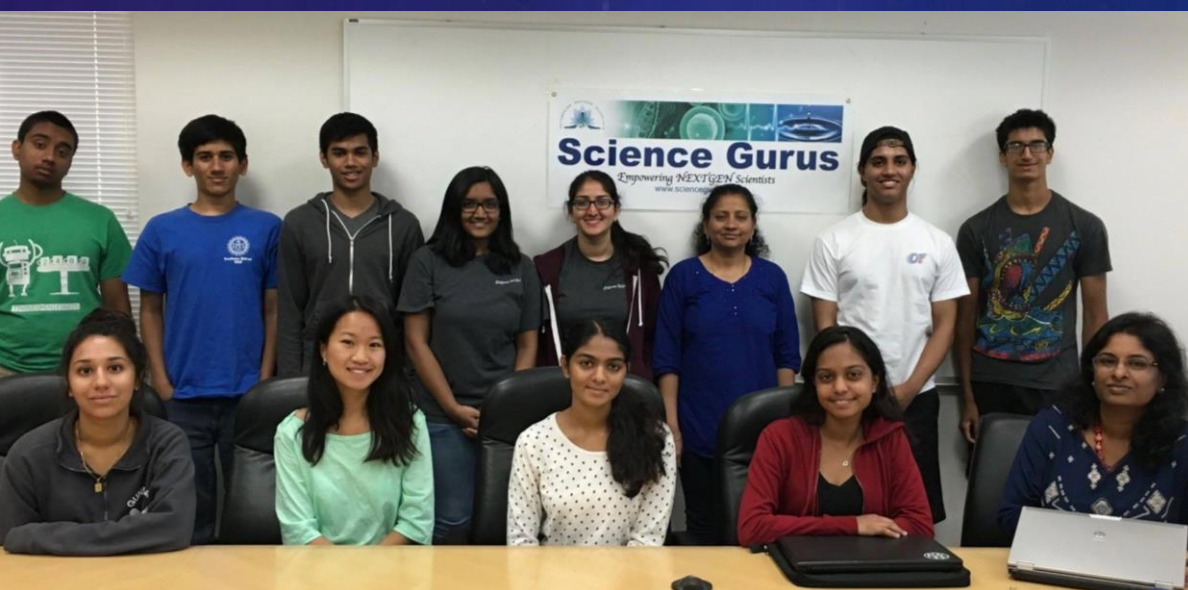
Interns with
Dr. Heather
Maecker and
Dr. Ganesh
Kolumam



Interns with
Dr. Pablo
Garcia



Interns with
Dr. Chakk
Ramesha

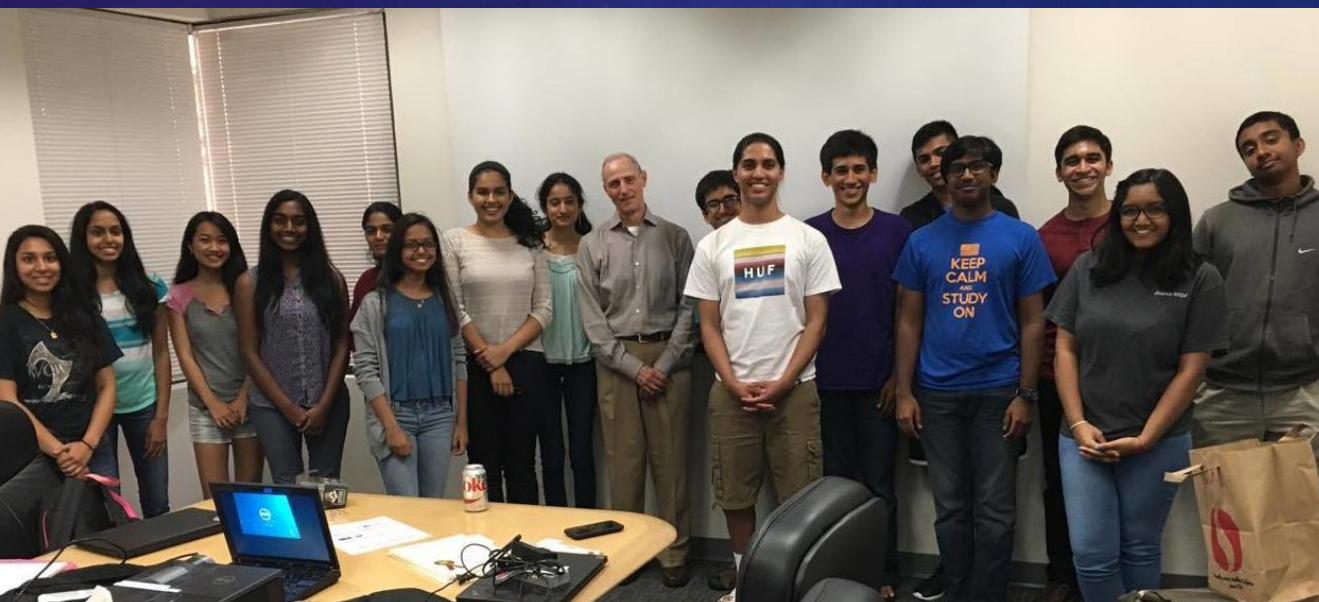


Interns at
College
Application
Workshop with
Dr. Raji Pingali
and Ms.
Aparna
Gandhari



Interns with
Ms. Elisa
Brunnette

Interns with
Dr. Mahendra
Shah



Interns
with Mr.
John
Storella



FINAL REPORT ABSTRACTS

Amrita Nagasuri and Prachi Kale

CD20 Gene

CD20: B-Cell Leukemia/Lymphoma

Amrita Nagasuri^{1,2} and **Prachi Kale**^{1,3}

¹Cell-Science Internship, Science Gurus, San Carlos, CA; ²Irvington High School, 41800 Blacow Rd, Fremont, CA 94538; ³Henry M. Gunn High School, 780 Arastradero Rd, Palo Alto, CA 94306

Abstract

CD20 is an antigen that is expressed on the surface of B-cells. Mutations of this protein can be caused by point mutations of certain bases, which can cause the alteration of many amino acids in its peptide sequence. These mutations can be targeted by various antibodies as well as radioimmunotherapy. Through the use of gene profiling, this report will discuss the various aspects of the function of CD20 and the mutations as well as their effects on the body.

Ananya Venkatesh and Akansha Gupta

VEGF Gene

VEGF in Cancer

Ananya Venkatesh^{1,2} and Akansha Gupta^{1,3}

¹Cell-Science Internship, Science Gurus, San Carlos, CA; ²Cupertino High School, 10100 Finch Avenue, Cupertino CA 95014; ³Gunn High School, 780 Arastradero Road, Palo Alto CA 94306

Abstract:

VEGF and the VEGF pathways are a crucial part of tumor growth and metastasis. They trigger angiogenesis, which creates new blood vessels connected to the tumor so it can grow properly by receiving enough nutrients. This is even more significant because this gene is amplified in many, many kinds of cancer, so it is applied as a target for cancer drugs very often. It is a druggable target, and there are several drugs already approved today that target VEGF.

Anay Limaye and Venkat Krishnan

Map Kinase Pathway & BRAF

Venkat Krishnan and Anay Limaye

Cell-Science Class

Final Report

Map Kinase Pathway and BRAF

Introduction

The Map Kinase Pathway also known as the Ras-Raf-Mek-Erk Pathway is a signaling pathway where a chain of proteins and receptors are used to control a series of cellular processes such as proliferation, differentiation, stress response, apoptosis (controlled death of the cell), and survival. BRAF is a gene that plays a key role in regulating the MAP kinase pathways and ERK signaling pathways. It controls and affects cell differentiation, cell division, and secretion. It is an oncogene that is druggable and therapeutic companies are currently working on creating BRAF inhibitors to prevent binding of proteins that can cause uncontrolled cell proliferation. The types of inhibitors and how they function will be further described in the drug section of this report. Statistical studies have shown that a significantly higher number of mutations on the BRAF gene are found in patients with melanoma.

Bhargav Venkatraghavan and Saketh Gurram

CD19 Gene

CD19: B-Cell Lymphoma

Bhargav Venkatraghavan^{1,2} and Saketh Gurram^{1,3}

¹Cell-Science Summer Internship, Science Gurus, San Carlos, CA; ²University Preparatory Academy, 2315 Canoas Garden Avenue, San Jose CA 95125; ³Harker High School, 500 Saratoga Ave, San Jose, CA 95128

1 ABSTRACT

CD19 is a molecule that has been constantly linked back to B-Cell Lymphoma. The reason for this is pretty simple. When dealing with cancer, there are really only two major things to consider; signaling pathways and mutations to the genes. Specific mutations can turn on oncogenes or turn off tumor suppressor genes. Similarly, a lot of our body's reactions come down to the specific signaling cascades that take place inside the cell. Cancer is caused by errors in either of these two. In our analysis of CD19, we found that CD19 is actually not an oncogene or a tumor suppressor. In fact, it is actually a biomarker in B-cell Lymphoma since the signaling pathways CD19 is involved in can tell us whether the patient has B-cell Lymphoma. In the following report, we will showcase our analysis of CD19 and the importance of CD19 in B-cell Lymphoma.

Jazmin Velazquez and Allyssa Suarez

PD-L1 Gene

Jazmin Velazquez
Allyssa Suarez
Cell Science Internship 2016

PD - L1 in bladder cancer

Abstract

The official Gene symbol for PD-L1 is CD274. The normal function and codes for Ligand expresses on B & T cells. In T cells, the ligand lines to the receptor and produces cytokine, which is a protein that degrades malnourished or malignant cells. In a tumor cell, it inhibits the receptor preventing the production of cytokines and preventing the program cell death of a malignant cell. Also, in cancer PD-L1 is over expressed in tumor cells and tumor-infiltrating immune cells such as macrophages and dendritic cells. Program death 1 and its ligand PD-L1 has a key role in a cancer evasion of apoptosis and the formation of a tumor microenvironment. In tumor microenvironment, the interaction of a ligand and PD-L1 receptor provides an immune escape for tumor cells through cytotoxic T-cell inactivation.

Medha Acharya

TP53 Gene

Determining the Druggability of Cellular Tumor Antigen P53 Using Bioinformatics Data Tools

Medha Acharya*

Abstract—TP53 is a tumor suppressor gene that codes for the p53 protein, which regulates the cell cycle to prevent uncontrollable proliferation. TP53 is closely involved with both extrinsic and intrinsic apoptotic cell death pathways. Due to this, it is frequently mutated in cancer cells, and this leads to loss of function changes or deletions. As will be discussed further in this paper, TP53 is a gene that is central to carcinogenesis, yet is a non-druggable target. This makes attacking cells with severe TP53 mutations very difficult. In this report, I examine information from bioinformatics databases to determine the possibilities for targeting the TP53 gene and its protein p53.



Medha Mangipudi and Pooja Devanaboyina

Hedgehog Pathway

Hedgehog Pathway in Basal Cell Carcinoma

Cell-Science Summer Internship, Science Gurus, California

Medha Mangipudi, California

Pooja Devanaboyina, California

Introduction

Embryogenesis is the formation and development of an unborn offspring. During this time, many developmental genes are active in order to regulate cell growth and cell differentiation. But some of these developmental genes continue to play an important role in regulation of cell growth and differentiation after embryogenesis. Therefore, mutations in these genes can result in cancer. One example of these genes is the Hedgehog gene (Hh gene).

The Hh pathway was first discovered through the studies of fruit flies. In fruit flies, Hh established anterior-posterior segment polarity, meaning it determines which part of the fly was the head and which part was the tail. If this gene is mutated, the flies body parts would be reversed. This is where the Hh gene got its name. Mutant fruit fly larvae had a cuticle with a spiky phenotype that resembled the spikes on a hedgehog.

Salil Uttarwar and Hursh Desai

BCR-Abl fusion Gene

The BCR-Abl fusion gene and its role in Chronic Myeloid Leukemia

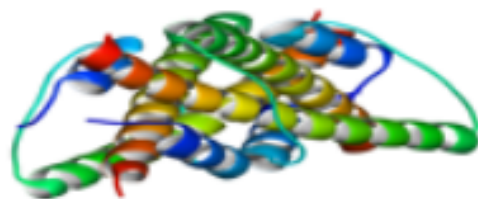
Salil Uttarwar^{1,2} and Hursh Desai^{1,3}

¹Cell-Science Internship, Science Gurus, San Carlos, CA; ²Monta Vista High School, 21840 McClellan Ave, Cupertino, CA 95014; ³1285 Escuela Pkwy, Milpitas, CA 95035

Abstract

BCR-Abl is a fusion gene that codes for the BCR-Abl protein, which is a constitutively active tyrosine kinase. The chromosomal translocation of Abl from chromosome 9 to BCR on chromosome 22 creates what is known as the Philadelphia chromosome. Because of its constitutively active state, the presence of the BCR-Abl protein leads to uncontrolled cell growth and proliferation. This mutation is found in 95% of all patients with CML and is also found in other leukemias. BCR and Abl by themselves have been found to not play a large role in cancers, but when joined through mutation, they are extremely oncogenic. To combat the mutation, tyrosine kinase inhibitors, most notably Gleevec, are administered to stop the uncontrolled growth.

Medical Research in 1960. Both of these facilities are located in Philadelphia, and so the chromosome was named after it. In 1973, Janet Rowley of the University of Chicago discovered that the Philadelphia chromosome was caused by a chromosomal translocation. The conjunction of BCR-Abl leads to the production of a tyrosine kinase signaling protein that is constitutively active. Because pathways that involve this kinase lead to cell growth and proliferation, the presence of the Philadelphia chromosome is almost always an indicator of cancer.



Sanghavi Srinivasan and Shirley Ho

HER2 Gene

HER2: Breast Cancer

Sanghavi Srinivasan^{1,2} and **Shirley Ho**^{1,3}

¹Cell-Science Summer Internship, Science Gurus, Fremont, CA; ²Archbishop Mitty High School, 5000 Mitty Way, San Jose, CA 95129; ³American High School, 36300 Fremont Blvd, Fremont, CA 94536

Abstract

Breast cancer is the second most common cancer in women, where more than 200,000 cases are diagnosed in the US annually. In order to understand breast cancer, one needs to learn about HER2, one of the most widely known genes linked to breast cancer. It is a human epidermal growth factor receptor that is overexpressed in some breast cancer cells. Many research studies show that patients that are HER2 positive, meaning that the gene is overexpressed, tend to have breast cancers that grow and spread more aggressively. Throughout this paper, the molecular mechanisms of HER2 will be discussed as well as treatment plans to control this HER2-positive breast cancer.

Shail Trivedi and Keshav Sharma

CD30 Gene

CD30: Hodgkin's Lymphoma

Shail Trivedi^{1,2} and Keshav Sharma^{1,3}

¹Cell-Science Internship, Science Gurus, San Carlos, CA; ²Monta Vista High School, 21840 McClellan Ave, Cupertino, CA 95014; ³San Ramon Valley High School, 511 Danville Blvd, Danville, CA 94526

ABSTRACT

CD30 is a cytokine receptor that serves as a tumor marker for Hodgkin's Lymphoma. The Tumor Necrosis Factor Receptor Superfamily includes 27 members that perform a variety of functions, including regulating apoptotic pathways, controlling cell proliferation, and producing co-stimulatory signals. This paper will discuss the relation of the CD30 gene with cancer, specifically Hodgkin's Lymphoma, along with the targeted therapies available to treat mutations in this gene.

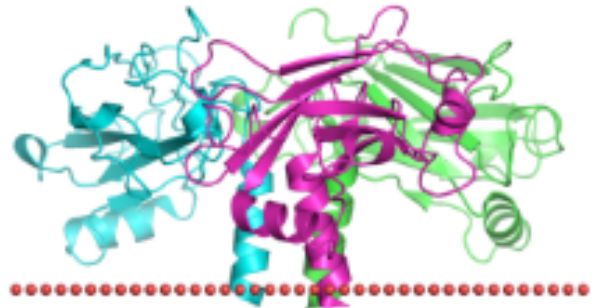


Figure 1. Image of the TNFRSF8 gene bound to TRAF2.

Structure

The CD30 gene displays a helical structure. The transmembrane helical domain consists of a hydrogen-bonded helix and is located between amino acids



INTERN REFLECTIONS

Amrita Nagasuri

Irvington High School, Fremont



The Cell-Science Internship was really insightful for me. Before the internship, I was certain that I wanted to be involved in the biological side of the world. However, I had no idea that there were so many different professions that I could choose to pursue. The guest speakers were really insightful and passionate about their work. They brought to the table a multitude of issues regarding cancer and other ailments that I had no idea existed or were major problems. Others brought to my attention that simply being a scientist working in a lab is not the only way to make a lasting impact on the biological field. For example, when a lawyer came to talk to us about his work, I did not understand how he could make any impact on the world of cancer treatment. But, he explained how, as a patent lawyer, he helps companies like Cellerant patent their treatments and formulas so that other companies cannot produce the same drugs legally without infringing on the patent borders. When Mahendra Shah, a venture capitalist, came to talk to us about what he does, he inspired me with his hard work in earning an MD, PhD, and an MBA. He studied pharmacy in undergrad and was employed part time so that he could get his masters, which his company kindly paid for. His life story and accomplishments really made a positive impact on me. It inspired me to strive for what I wanted in life just as he did. It is obvious that I got a lot out of this internship, but, best of all, I was able to figure out what I want to do. I plan to major in biomedical engineering, where I can design and work with medical devices. I am truly thankful for this amazing opportunity that opened so many more doors than I knew existed.

Ananya Venkatesh

Cupertino High School, Cupertino



The Cell-Science Internship was a great experience where I got to learn a lot about biotechnology, specifically drug discovery for cancer targeted therapy. Initially, I did not know much at all about this field, but this internship really showed me a whole other field that I'm not interested in. This internship was very educational because there were multiple guest speakers who lectured each week, and each one talked about a different aspect of the field of drug discovery. We were able to learn a huge amount of information in a very short amount of time. I really appreciate that the guest speakers took their time to talk with us about their work, especially Suchit and Kiran who helped us immensely on our final bioinformatics projects. I learned so much about the various tools available simply online that help with researching possible targeted therapies. Also, I really enjoyed the visit to Genentech. This was a great opportunity for me to visit a company that does work that I'm interested in as a career. We got to look inside the different labs they have, so we saw the hands-on work that they do. Overall, this internship truly allowed me to learn about cancer and drug discovery so in depth, and I'm grateful for Jagath and all the guest speakers for making this possible.

Hursh Desai

Milpitas High School, Milpitas



The Cell-Science Internship was absolutely perfect in all aspects, and, if you take into account the fact that it was supposed to be centered around only cancer, it is especially surprising the amount of information it gave me that I could use outside of only that subject. That point in particular is what I found most rewarding about the internship, as I came in thinking that I wouldn't really get that much information from it because I had already learned a lot about cancer from school. But, the amount of new information that I learned was not only amazing but also will be incredibly useful in my future studies. And, I can confidently say that this internship played a huge part in my decision for what I want to do in my higher education, and this is because as I learned more about all of these different biological processes, I grew more and more interested in what else there could possibly be out there to learn. After that spark of interest, it became very easy to see myself going into bio-engineering or bio-med.

Keshav Sharma

San Ramon Valley High School,
San Ramon



The Cell-Science Internship has allowed me to be in an atmosphere where I was surrounded by peers of my age who had similar interests, which I had not experienced before. Though I did feel pressure to complete assignments, I gained a much deeper and extensive knowledge on a field I would like to major in college and pursue a career. The various lectures gave me a newfound respect for those who work in this field, as I had not realized the amount of patience and low success rates scientists toiled to just to improve and save lives. The lectures, college application workshop, and workshop on giving effective presentations with Bob Figari gave me skills that I have been able to incorporate into my academic life and in my current college applications. Most of all, I would like to say how, even though at times I did get tired and want to bring down the level of work, the opportunity of being able to do this internship thanks to so many giving their time for free cannot be thanked simply with words, but I hope I have done my best to and I will do my best to repay all those who helped by going into this field.

Medha Acharya

Irvington High School, Fremont



Before I started the Cell-Science Internship, I had no idea what I wanted to do with my life. I knew that I was interested in biology and chemistry and the study of diseases in general, but I wasn't sure about medicine or engineering or any more specific fields. This internship really opened my eyes to the wonders of the drug industry which is so influential in medicine and technology in general. Because of this internship, I now have many great contacts and mentors whom I can keep in touch with for potential future opportunities and also have the experience necessary to understand what I want to pursue. I will be majoring in biomedical engineering in college, hoping to pursue pharmaceutical research as a career. I am really appreciative of this opportunity and would like to thank Jagath, Suchit, Kiran, and all of the other guest speakers who made this such a wonderful experience for me!

Medha Mangipudi

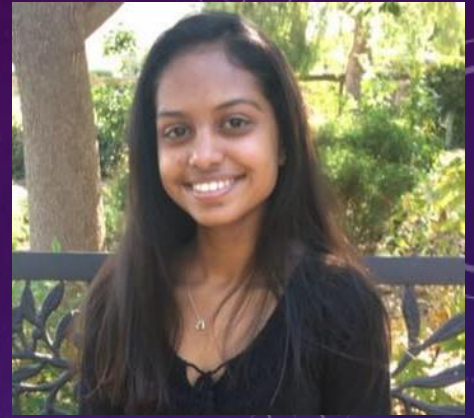
Amador Valley High School, Pleasanton



The Cell-Science Internship introduced me to the different fields of science I could go into with a biology degree. There are many professions that come into play when trying to conduct research, from biochemists to biophysicists to bioengineers. Companies even require lawyers and accountants to manage their business side. Furthermore, the research process is not a set in stone practice with a hypothesis that leads to experiments that leads to results. It is an interconnected web of constant trial and error that leads to only a few solutions out of all the attempts executed. It is the process of getting to that answer that helps bolster other research conducted and all comes together to improve our knowledge and understanding of how cells work. The internship gave me an in-depth understanding of the molecular workings behind cancerous cells. Overall, there are many different genes in our genome that control DNA replication. When these genes are mutated either through inheritance or outside factors, individuals become more likely to get cancer. You can't just change the genes in a cell because you would have to find all the cancerous cells in the body which in itself is a difficult task because they can metastasize. The same goes for killing off all the cancerous cells. I have gained a newfound appreciation for scientists trying to tackle this difficult problem. I also gained experience using different databases such as blast, which is an essential skill when conducting research. And, I had the opportunity to improve my public speaking skills by giving a presentation at the culmination of the internship. All in all, the Cell-Science Internship was a great experience; I met new people and gained great insight into how cancer works, and I am really glad I took part in this.

Pooja Devanaboyina

American High School, Fremont



Overall, the Cell-Science Internship was a great experience for me. It was amazing learn that there are several methods that scientists and doctors use in order to prevent or cure cancer. Receiving the various opinions from different guest speakers with different backgrounds kept the internship very interesting and engaging. However, I was hoping for some hands on experience as well. All the speakers were amazing and gave very in-depth information. The lectures were also very engaging, and all of the speakers were open to answer my questions, no matter how dumb the question might have been. Thank you for this opportunity, and I hope to be able to help future interns some day.

Salil Uttarwar

Monta Vista High School, Cupertino



Participating in the Cell-Science Internship made my summer both rewarding and enriching. Although I initially was not sure what the internship would entail, I knew that we would be exploring cancer research and drug discovery. Twice a week, we were given presentations by professionals in biotech from around the Bay Area. Before the internship, I had very little knowledge of cancer research and the drug discovery process, but I can now confidently say that I know a lot about these two fields. The reports we were assigned to write helped cement this understanding of cancer biology (far beyond anything we are normally taught in school), and our individual presentations allowed us to go in depth into one specific cancer. In addition, we learned how to use bioinformatic databases to research into cancer genes. I never knew of websites like CBioPortal and GTEX, but now know I can use them to find valuable information on any gene and find correlations between it and certain types of cancer. This part of the internship was especially rewarding for me, as it taught me how to research by myself and forced me to think below the surface to make connections. Although my partner and I were assigned to present on BCR-Abl, a fusion gene, we were still able to do the research on the individual genes. In addition to the focus on cancer research and drug discovery, the internship also included two helpful workshops. The first workshop described the college admission process and how to write the application essays. The second workshop, put on by Bob Figari, was especially beneficial. Mr. Figari taught us how to be better speakers and how to give better presentations through recording us give impromptu presentations and giving us outlines to make perfect presentations. Also, in August we were fortunate enough to visit the Genentech campus in South San Francisco. We had learned so much about bioinformatic research, drug development, and genome sequencing, so this visit allowed us to visualize the process. We visited labs that were culturing bacteria and labs that held tens of DNA and RNA sequencing machines of various shapes and sizes, among other places. This visit allowed us to see into the daily lives of biotech professionals and made me even more eager to join the industry in the future. The guidance, motivation, and personal touch given to us interns by Jagath and other organizers made this program particularly special. As I reflect over my experiences in the Cell-Science Internship, I realize just how much it has taught me and how much I have grown over the past 7 weeks. If anyone is considering pursuing a career in cancer research or biotechnology, I highly recommend participating in this internship.

Sanghavi Srinivasan

Archbishop Mitty High School,
San Jose



Going into this program, I wasn't really sure what to expect. I hadn't had much exposure to the field of bioinformatics and drug discovery—in fact, I didn't even know what bioinformatics is—and my understanding of cancer was limited. I honestly thought that with a biology degree, the only career options were to become a doctor or a researcher. I didn't fully appreciate how vast and diverse the field is. I quickly learned that there is so much more to cancer and drug discovery than what I had learned in the AP Biology classroom. Before, I knew that cancer cells have many mutations, but through the internship, I learned how these mutations are acquired, how they affect the cell, and how drug developers target the mutations. I learned how to use a variety of databases that show specific information about these mutations, such as what type of mutation is most prevalent in a certain type of cancer. In addition, the guest speakers provided me with invaluable insight into the many different types of therapy that are being explored in order to treat cancer patients more effectively. From them I also learned that there are so many different career options in the field of cancer research. My favorite part of this internship experience was the tour of Genentech's facilities in San Francisco. It was interesting to see what equipment they used, and I enjoyed seeing real-world applications of what I was learning from the guest speakers. Overall, the Cell-Science Internship was a wonderful experience, and I'm glad to have met so many amazing people along the way.

Shail Trivedi

Monta Vista High School, Cupertino



I had an extremely enriching experience learning about the breadth of the biotechnology industry this past summer as a part of the Cell Science Internship, hosted by Science Gurus. From the first day of the program, we interns were asked to begin gathering background information on the history of cancer, various cancer types, and available forms of therapy in order to prepare for an intensive cancer study for the duration of the program. Though this program was most directly focused on decoding the elements of this particular deadly disease and finding relationships between cancers of different types, the internship also taught each of us about different bioinformatics tools (NCBI database, GeneCards, UniProt, etc.), a little about patent law, and a large deal about basic biological processes in the body. These topics were covered in great depth and detail through guest lectures presented by distinguished scientists and industry leaders in the biotechnology field, as well as through an informative tour of Genentech Inc.'s development facilities. As a part of the two projects, each intern was able to present the nuances of a chosen cancer through a written report and oral presentation, with a follow up activity involving a group study of a given gene. Jagath and his team dedicated hours of their own time to help our group succeed in building our basic understanding of cancer and in opening our eyes to the numerous professional paths we may one day choose. I would like to thank him, Kiran, Suchit, and all of the guest lecturers for their time and for providing the interns the opportunity to interact with such a rich pool of knowledge; I truly appreciate the advice and insight you were able to impart upon us with regards to our future careers.

Venkat Krishnan

American High School, Fremont



The Cell-Science Internship has been a wonderful and eye-opening journey for me. When I first entered, I knew little about cancer and its mechanisms for proliferation. As I learned more about the disease through lectures and homework assignments, I was fascinated by the complex mechanisms that it uses to proliferate and by the great advancements that scientists have created to treat this disease. One of the most memorable moments during the internship for me was when I learned that one in two men and one in three women would most likely be diagnosed with cancer. Before this, I had always imagined cancer as a disease that affects only a small percent of people and never realized the danger it poses to the world. This statistic completely changed my perception of cancer as I began to realize that it is more than just a disease—it is a global challenge that requires intelligent scientists from all around the world to work on. This internship inspired me to further research cancer in my free time, and it gave me the basic knowledge required to take on a project of my own to find a better way to treat this disease. I would like to thank Dr. Jagath and all the amazing lecturers for their time and passion to arrange such an amazing experience!

HONORARY GUEST SPEAKERS & PRESENTERS

- ❖ Jagath Reddy Junutula, Ph.D. – Vice President, Cellerant Therapeutics
- ❖ Pradeep Fernandes, ME – Co-founder, CellWorks Group
- ❖ Heather Maecker, Ph.D. – Sr. Scientist, Gilead Sciences
- ❖ Ganesh Kolumam, Ph.D. – Scientist, Calico Labs
- ❖ Sanjeev Redkar, Ph.D., MBA – President & CEO, CBT Pharmaceuticals
- ❖ Sreedhara Alavattam, Ph.D. – Sr. Scientist, Genentech, Inc.
- ❖ Chakk Ramesha, Ph.D. – COO/CTO, Medhus Bio
- ❖ Ram Mandalam, Ph.D. – President & CEO, Cellerant Therapeutics
- ❖ Zora Modrusan, Ph.D. – Genentech, Inc.
- ❖ Pablo Garcia, Ph.D. – Director, Circle Pharma
- ❖ Sukhmani Kaur Padd, MD – Stanford University
- ❖ Elisa Brunette – Director, Cellerant Therapeutics
- ❖ John Storella, MS, JD – IP Attorney
- ❖ Kiran Mukhyala, MS – Genentech, Inc.
- ❖ Suchit Jhunhunwala, Ph.D. – Genentech, Inc.
- ❖ Bob Figari, MA – Founder & CEO, InnerTrek
- ❖ Raji Pingali, Ph.D. – Vice President, Science Gurus
- ❖ Mahendra Shah, Ph.D. – Managing Director, Vivo Capital
- ❖ Aparna Gandhari, MS – Arroyo High School Counselor

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