History SJ Science Camp Laboratory Research - Summer 2020

Schmahl Science Workshops' EXPLODES the myth that science is dull. Our instructors are talented scientists and engineers who engage students' curiosity, imagination and creativity using a fun, hands-on approach. Students learn to apply the scientific process as well as core scientific principles, all the while making exciting new discoveries.

In the Bay Area, thousands of students participate in science fairs each year. Students struggle in project selection, lab techniques, instrumentation, model development, and project design. Our camp topics help students in sharpening skills and learning about project design while working with our experienced mentors. Students should be interested in science, inquisitive and willing to work hard!

We are offering three weeks of camp. Students will be able to choose the following sessions:

Week 1 Sessions (June 15 – June 19)

Drop-off Discussion (8:15 – 9:00am)	Schmahl Talk
Morning Session (9:00 -11:30am)	Microbiology – Antibiotic Sensitivity
Mid-Day Session (12:00 pm – 2:30pm)	Molecular Biology
Afternoon Session (3:00 – 5:30 pm)	Comparative Anatomy

Week 2 Sessions (July 27 – July 31)

Drop-off Discussion (8:15 – 9:00am)	Schmahl Talk
Morning Session (9:00 -11:30am)	Model Organisms
Mid-Day Session (12:00 pm – 2:30pm)	Human Body
Afternoon Session (3:00 – 5:30 pm)	Neurophysiology

Week 3 Sessions (Aug 3 – Aug 7)

Drop-off Discussion (8:15 – 9:00am)	Schmahl Talk
Morning Session (9:00 -11:30am)	Molecules of Life
Mid-Day Session (12:00 pm – 2:30pm)	Microbiology - Antibiotic Sensitivity
Afternoon Session (3:00 – 5:30 pm)	Microbiomes

SIGN-UP NOW for Summer Camp!

Days: Monday thru Friday – 5 day course

Grades: 6 - 10

10 Students maximum per camp

Fees: $330 per weeklong session
Register for three sessions in the same week and receive a $100 discount

Location: History San Jose Park at Kelley Park
651 Phelan Ave San Jose, CA 95112
Room : Schmahl Science Lab

Registration Opens: February 1, 2020

HOW TO REGISTER:

Complete Registration Form: Use the attached form or print one out: at www.schmahlscience.org. Select the "Camps" tab and click on "Active Programs" to find the brochure & registration form for this series.

Payment Options:

1) Mail form and check to Schmahl Science Workshops, 1650 Senter Road San Jose, CA 95112 **OR**
2) Credit card payment: scan completed form and email to customerservice@schmahlscience.org. Include CC info on form or provide CC info over the phone. **OR**
3) Quickbooks online: scan completed form and email to customerservice@schmahlscience.org. You will receive an email with a link to pay via Quickbooks.

SESSION DESCRIPTIONS:

Comparative Anatomy

At the end of this camp, students will have a better understanding of the anatomical design of animals in general, and how that design is related to each organ system's mechanical or physiological functions. Students will develop a "mental map" of animal design. In addition, students will acquire an understanding of current scientific ideas about the evolutionary relationships amongst these vertebrates, and will appreciate the amazing diversity of vertebrates, both living and in the fossil record. Laboratory includes systematic and topical dissection of representative organisms and demonstrations of living animal functions.

Molecules of Life

Do you examine "Nutrition Facts" labels for the food you eat? If so, and if you had a look at the food's protein, carbohydrate, or fat content, you may already be familiar with several types of large biological molecules we'll discuss in this camp. If you're wondering what something as weird-sounding as a "large biological molecule" is doing in your food, the answer is that it's providing you with the building blocks you need to maintain your body – because your body is also made of large biological molecules!

Just as you can be thought of as an assortment of atoms or a walking, talking bag of water, you can also be viewed as a collection of four major types of large biological molecules: carbohydrates (such as sugars), lipids (such as fats), proteins, and nucleic acids (such as DNA and RNA). That's not to say that these are the only molecules in your body, but rather, that the most important large molecules can be divided into these groups. Together, the four groups of large biological molecules make up the majority of the dry weight of a cell. (Water, a small molecule, makes up the majority of the wet weight).

In this Camp, students will gain hands-on experience with these biological molecules, experimenting with them in a way that will give them a feel for how to work with proteins, nucleic acids, carbohydrates, and lipids and how they behave and interact with each other.

Microbiology – Antibiotic Sensitivity

You might be aware that antibiotics were once thought of as a "magic bullet;" a nearly perfect drug for combating bacteria. We should have known that things are never that simple. If we use the three domains model for classification (bacteria, archea, and eucarya), then there are more than a dozen different kingdoms of Bacteria. Thinking this way, we readily see that bacteria are too diverse for any one drug to kill them all. Some antibiotics come close, though. These are called "wide spectrum" antibiotics. Other kinds of antibiotics are fairly specific in the type of bacteria against which they are lethal.

To compare how effective one antibiotic is to another, or to measure the degree of antibiotic resistance in a bacterium, a procedure called the Kirby-Bauer test can be done. To do this, a pure strain of bacteria is isolated from an infected person. This pure strain is then spread over the surface of a special medium, called Mueller-Hinton agar, to create a lawn, or carpet, of bacteria. Small filter paper discs, impregnated with standardized amounts of antibiotic, are gently pressed on to the surface of the agar. While the plates are incubating overnight, the antibiotic diffuses from the disc and into the agar. This antibiotic diffusing into the agar will inhibit the growth of susceptible bacteria.

This camp session will challenge your student to think, research and conduct experiments in microbiology. The students will have the opportunity to explore the 5 i's of microbiology; inoculating, incubation, isolation, inspection, and identification. Students will become familiar with writing, recording, and tracking scientific data as they are introduced to common microbiology lab techniques such as the Kirby-Bauer Test, Minimum Inhibitory Concentration and Minimum Bactericidal Concentration Assays.

Microbiomes

Microbiome is defined as the entire habitat of microorganisms, their genomes, and their surrounding environmental conditions. The microorganisms include bacteria, viruses, archaea, lower and higher eukaryotes. There are many microbiomes, such as human microbiome, bee's microbiome, ant microbiome, plant microbiome, microbiome of the air, etc. Even within the human microbiome, there is microbiome of the skin which is different from microbiome of the gut. Therefore, when we study the microbiome, we need to be specific about which microbiome we are referring to.

Microbes behave differently in the lab compared to their natural habitats. The microorganisms are dependent on each other to survive because one organism's by-products could be used by other microorganism for other processes. In the lab, only certain microbes can be grown because many microbes require the right physiochemical environment to grow, and we do not have the knowledge to create the right living conditions for them.

Human microbiome has gained attention in the most recent few decades because scientists have found that the microbiome makes a difference in our health and disease. The NIH initiated a Human Microbiome Project in the 2000s, trying to understand how microbes play a role in human diseases. To date, there have been numerous research studies that correlates the gut microbes to human obesity, cancer, inflammatory disease, and more. Recently, a study showed that eating raw food can be bad for your gut microbiome because some food such as vegetables could have antibiotics that were made for self-defense. These natural antibiotics in return are bad for our gut microbes. Cooking vegetables can inactivate antibiotics and other harmful chemicals. The human microbiome can easily be altered with the change in the human living conditions such as: diet, sleep cycle, intake of antibiotics/antifungal/antiviral, hand sanitizer, etc.

The human microbiome can be influenced by extrinsic and intrinsic factors. The microbial components of other habitats such as the air, water, and soil can also change, but at a much slower rate. Each habitat has its own microbiome and all are different kinds of microbes which includes bacteria, fungi, and viruses. Over 90% of microbes in this world are good microbes and beneficial to their host or surrounding environments. It is important to know our surroundings in order for us have healthier lives and a better world.

This Seminar introduces students to the microbiome of the human skin, water, soil and air. They will learn the culturable diversity of the

microbes in these different environments and recognize some microorganisms by the way they grow on solid agar media.

Molecular Biology

Molecular Biology is a very exciting area of science to explore. Most students have heard of genetic engineering, and this camp will allow students to gain firsthand knowledge by doing actual experiments in this field. The abstract nature of molecular genetics can best be overcome by approaching the subject in the same manner as scientists - by asking questions and doing experiments. The camp will be comprised of lectures and laboratories in an intensive hands-on format that will allow ample time for discussions and analyses of experimental results and procedures. Students will gain an understanding for how scientists isolate genes away from the genome which is key to investigate a gene's function.

Neurophysiology

Your ability to perceive your surroundings – to see, hear, and smell what's around you – depends on your nervous system. So does your ability to recognize where you are and to remember if you've been there before. In fact, your very capacity to wonder how you know where you are depends on your nervous system!

If your perceptions indicate danger ("Oh no, the house is on fire!"), your ability to act on that information also depends on your nervous system. In addition to letting you consciously process the threat, your nervous system triggers involuntary responses, like an increase in heart rate and blood flow to your muscles, intended to help you cope with danger.

All of these processes depend on the interconnected cells that make up your nervous system. Like the heart, lungs, and stomach, the nervous system is made up of specialized cells. These include nerve cells (or neurons) and glial cells (or glia). Neurons are the basic functional units of the nervous system, and they generate electrical signals called action potentials, which allow them to quickly transmit information over long distances. Glia cells are a supportive cell in the central nervous system. Unlike neurons, glial cells do not conduct electrical impulses. The glial cells surround neurons and provide support for and insulation between them. Glial cells are the most abundant cell types in the central nervous system.

The Neurobiology Seminar is an introduction to the structure and function of the nervous system, including neuroanatomy, neurophysiology, and systems neurobiology. Topics include the properties of neurons and the mechanisms and organization underlying higher functions.

Model Organisms

A human is a complicated organism, and it is considered unethical to do many kinds of experiments on human subjects. For these reasons, biologists often use simpler 'model' organisms that are easy to keep and manipulate in the laboratory. Despite obvious differences, model organisms share with humans many key biochemical and physiological functions that have been conserved (maintained) by evolution.

While mice, rats, and other small mammals are generally thought of as the typical model system used by researchers in biomedical studies, aquatic models including both freshwater and marine organism have long proved to be invaluable in the study of basic biological processes. Through the understanding gained in aquatic models of mechanisms of biology, scientists have elucidated their role in human health and disease. The value of aquatic models for disease research is rooted in the fact that across species numerous general cellular properties are common in all organisms. In addition to shared biological properties, many species exhibit unique features or disease syndromes that make them particularly suitable as animal models of specific disease processes. Research on aquatic animals occupies a broad variety of disciplines such as immunology, physiology, microbiology, molecular biology, pathology, toxicology, embryology, and genetics

Student(s) will learn about each specific organism and conduct several prescribed assay protocols. As part of this camp, student(s) will use microscopes to both observe and act on the tiny organisms.

Human Anatomy and Physiology

Egypt is famously known for its Nile and pyramids, yet not many people know that Egypt made possible the origin of the anatomical sciences. Several ancient papyri guide us through the Egyptians' exploration of the human body and how they applied anatomical knowledge to clinical medicine to the best of their knowledge. Papyri records from 3000 BC to 250 BC detail the work of the Egyptian embalmers, physicians, and Greek anatomists and help us understand the evolution of the anatomical sciences from 3000 B.C. to 250 B.C. It is through the Egyptian embalmer that we were able to learn of some of the first interactions with human organs and their detailed observation. The Egyptian physician's knowledge enabled future physicians to seek reference to common ailments for diagnosing and treating a variety of conditions ranging from head injuries to procedures, such as trans-sphenoidal surgery. During the same time period, the Greeks also made substantial contributions to the anatomical sciences by beginning the practice of human dissection.

Human anatomy is the scientific study of the body's structures. Some of these structures are very small and can only be observed and analyzed with the assistance of a microscope. Other larger structures can readily be seen, manipulated, measured, and weighed. The word "anatomy" means "to cut apart." When a body is dissected, its structures are cut apart in order to observe their physical attributes and their relationships to one another.

Whereas anatomy is about structure, physiology is about function. Human physiology is the scientific study of the chemistry and physics of the structures of the body and the ways in which they work together to support the functions of life. Much of the study of physiology centers on the body's tendency toward homeostasis. Homeostasis is the state of steady internal conditions maintained by living things. For instance, the concentration of various ions in the blood must be kept steady, along with pH and the concentration of glucose. If these values get too high or low, you can end up getting very sick.

It is difficult to study structure (anatomy) without knowledge of function (physiology). In this Seminar, the two disciplines are studied together because form and function are closely related in all living things. Imagine, for example, trying to appreciate the unique arrangement of the bones of the human hand if you had no conception of the function of the hand. Fortunately, your understanding of how the human hand manipulates tools—from hammer and chisel, pens to cell phones—helps you appreciate the unique alignment of the thumb in opposition to the four fingers, making your hand a structure that allows you to pinch and grasp objects and type text messages.

Schmahl Talk

Students may arrive any time between 8:15 and 9AM. During this time, Mrs Schmahl will discuss recent developments in the scientific community as well as the science behind topics in the news. Students may ask questions of their own and suggest topics for discussion.

About Schmahl Science Workshops

Schmahl Science Workshops is a non-profit partnership of students, parents, teachers, scientists and engineers who come together to foster the innate curiosity and love of science that exists among children. Founded in 1996 by a group of four children and their parents, Schmahl Science Workshops provides pre-K through 12th grade children an unmatched breadth of hands-on science workshops spanning biology, chemistry, earth science, forensics, math and physics. Our mission is to prepare children of all backgrounds for a future in which science and technology will drive every industry and vocation. We believe that children are motivated to learn when their ideas are cultivated through the joy of designing and carrying out an experiment. Through these authentic research experiences, our workshops enable students to explore and invent what inspires them, and to develop the skills needed to achieve success in all areas of their lives.

OFFICE USE
RECEIVED:
❑ CONF ❑ SRF ❑ RL ❑ ACCTNG

HSJ Science Camp Laboratory Research Summer 2020 Registration Form - 1

Submit Registration Forms directly to Schmahl Science Workshops.

Date: _____

Student's First and Last Name: _____ Grade 2019-20: _____

Any Medical issues for student: Check ❑ NONE or list issues: _____

Mother's First and Last Name: _____ Phone # : _____

Father's First and Last Name: _____ Phone # : _____

Email Address: _____ Home Phone #: _____

Home Address: _____ City: _____ Zip: _____

Emergency Contact First and Last Name: _____ Relationship To Child: _____

Emergency Phone: ❑ Cell: _____ ❑ Home: _____ ❑ Work : _____

Please refer to page 6 to specify workshops/dates and calculate total due. Please be sure to include pages 5 and 6 with your registration.

Payment is due with registration. No refunds. No substitutions.

ENROLLMENT OPTIONS:

- ❑ **Email registration to: customerservice@schmahlscience.org**
- ❑ **Mail registration to:** Schmahl Science Workshops, 1650 Senter Road, San Jose, 95112

PAYMENT OPTIONS:

- ❑ **Credit Card Payments**: ❑ MasterCard, ❑ Visa, ❑ American Express
  - Card # _____ Billing Zip _____
  - Sec Code (CVV) _____ Exp _____ Sign Date: _____
  - Signature: _____
  - Name printed on card: _____
- ❑ **Quickbooks Online** : SSW will send you an email with the link to use
- ❑ **Check or Money Order** made out to: Schmahl Science Workshops.
  - Ck#: _____ Amt $ _____

This is Important to Us!

Please Answer the Questions:

- How did you hear about us?
  _____
  _____
  _____
- Check here to be added to our mailing list of future workshops: ❑ YES ❑ NO
- Check here for information via email: ❑ YES ❑ NO
- SSW may take workshop photos for use in SSW's publicity. Names and locations will not be published. Do we have your permission to take photos of your children during our workshop(s): ❑ YES ❑ NO

HSJ Science Camp Laboratory Research Summer 2020 Registration Form - 2

Workshop Selections

Week	Sessions	Time	Session Cost	Amount Due
June 15 – June 19	Schmahl Talk	8:15am -9:00am	$0	
June 15 – June 19	Microbiology – Antibiotic Sensitivity	9:00am -11:30am	$330	
June 15 – June 19	Molecular Biology	12:00pm - 2:30pm	$330	
June 15 – June 19	Comparative Anatomy	3:00pm - 5:30pm	$330	
July 27 – July 31	Schmahl Talk	8:15am -9:00am	$0	
July 27 – July 31	Model Organisms	9:00am -11:30am	$330	
July 27 – July 31	Human Body	12:00pm - 2:30pm	$330	
July 27 – July 31	Neurophysiology	3:00pm - 5:30pm	$330	
Aug 3 – Aug 7	Schmahl Talk	8:15am -9:00am	$0	
Aug 3 – Aug 7	Molecules of Life	9:00am -11:30am	$330	
Aug 3 – Aug 7	Microbiology – Antibiotic Sensitivity	12:00pm - 2:30pm	$330	
Aug 3 – Aug 7	Microbiomes	3:00pm - 5:30pm	$330	
		*3 sessions	Discount *	<$100.00>
			Total Due	

Please be sure to include this page with page 5 when you submit your registration.