

# S T E M *Savvy*

CHEMISTRY

V. IV

SPRING 2022

## INTERVIEW

Career insights from a Chemist!

## MEET OUR ROBOT

Learn about Pearadox and meet  
SkyScraPEAR, our 2020-2021 robot!

## ACTIVITIES & GAMES

Play the Periodic Table Game!



Brought to you by:

Gearbox Girls &

FRC Team 5414

Pearadox

CREATIVE • CONFIDENT • CAPABLE

# *Girls in STEM*

Science, Technology, Engineering, Math

EDITOR'S NOTE

# VOLUME 4

## CHEMISTRY ISSUE

MEET THE

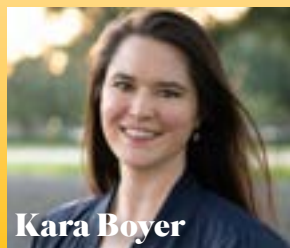


GEARBOX GIRLS

### *Mentors*



**Mayra Castorina**



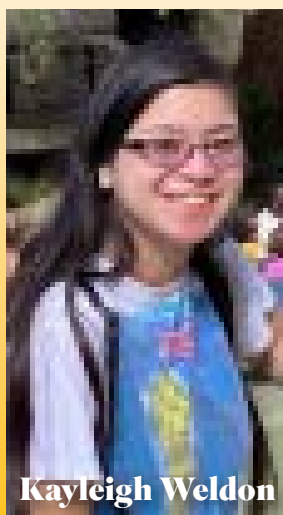
**Kara Boyer**

### *Editor*



**Julia Rieger**

### *Photos By*



**Kayleigh Weldon**

### *Content By*



**Isabella Theroff**



**Abigail Lopez**

This magazine seeks to fill a niche role being neglected by most media. We want to give girls access to a magazine that not only encourages, but sustains their interest in STEM.

Cheers,

*Gearbox Girls & Pearadox*

# Table of Contents



Interview

04



Tool Introduction

06



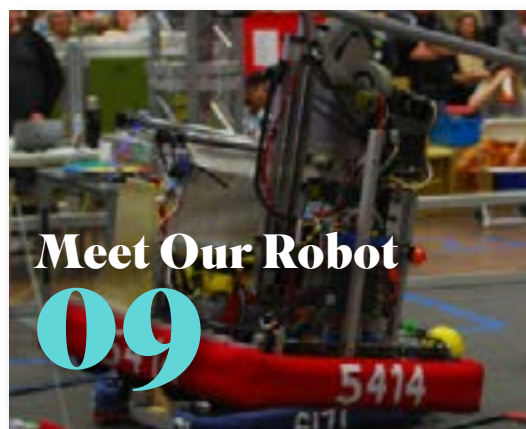
Career Introduction

07



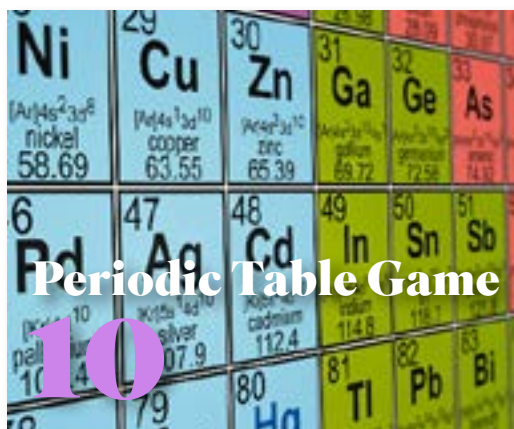
Pearadox Spotlight

08



Meet Our Robot

09



Periodic Table Game

10

Keep an eye out for the Pearys hiding in this issue!  
Play more "Where's Peary" on our Instagram @pearadox5414



# Emilia Di Francesco



*Ph. D. Chemist*  
*Years in the field: 25*



By: Abigail Lopez & Isabella Theroff

## How did you get into science?

Most of my education since I graduated high school has been in science, I had very classic general studies in high school and then I switched completely to a scientific background. My later education was similar to one for a math, engineering, or physics student. Basically, the first two years of college were math, math, and math. I wouldn't say I studied engineering, but I did learn the mathematical foundations of it.



## What is your job?

My job is in synthetical chemistry. Our education helped us in assembling molecules which is a little bit like an architect or engineer. We make a project and plan it out, and then



we know the right technologies to build that project. We start from smaller elements like carbon, hydrogen, oxygen, and put them into molecules and watch how they react together to become a different entity. This is just one of the areas I work in. From there it goes into medicinal chemistry where people decide which are the really perfect molecules to build. How the molecules react with specific enzymes and protein targets that have a specific biological role in our bodies, which is important so we can inhibit bad proteins that cause cancer. In other words- we are looking for the perfect interaction between our molecule and a target protein so that we can block the dangerous actions. Once we block the function of that target protein, we have achieved the first step of our optimization. The rest of the job, which can sometimes take years, is taking this very optimized molecule and transforming it into a

real prescription that can be given to patients safely. This entire process takes a good number of years to get to the point where you, and the FDA (who are in charge of regulation), are confident enough to say that the prescription is safe and offers benefits after testing.

### What helped influence your decision of pursuing this job?

I knew that I wanted to be a scientist because I really enjoyed my science in school. To be honest, I entered chemistry knowing I loved the subject but not quite sure which career paths I should take. I went to a lecture about chemistry in medicine and I was absolutely fascinated with pharmacology, which is basically what small molecules can do to proteins and enzymes, and how they react with our body. A lot of what our body does is chemistry, so there are small molecules that interact within our body, which is fascinating. The fact that we can actually use chemistry to restore, cure and prevent disease is amazing.

### What would you say to someone who thinks chemistry and science is boring?

In all my years, to be honest, I've never heard anybody tell me that my job sounds boring. The reason is that you are never doing the same thing twice. It is always a different problem. It is very intense and sometimes it can be tiring. You spend a lot of hours in the lab doing actual lab work and then typically you have to [spend] hours reading the data of all the work that you have done. The work can be tiring, but never boring. What I love is that it's different; I've been doing this for probably 25 years and I have never been in the same place twice. I love the challenge. Sometimes we have relatively challenging problems, like a potent molecule that

can't be administered to a patient. The challenge is to find ways to change the molecule to make it viable for patients, and I love finally solving problems and hearing feedback from patients that are benefitting.

### What would you say to someone afraid of entering science?

I think aspiring kids in science might be afraid of the hard work, especially the difficult math, because there's a long way to go in terms of your career. I think it's a lot of work; nothing comes easy in life, though this is very worth it. It's very rewarding on the other end of it when you are part of a team that you know can successfully say, 'we work together to get medicine on the market.' As you hear the story of patients that actually benefit from your teams' work, it's great. I like the team work, I like the possibility of really being factual on people's wellbeing, and so I think that is rewarding. If you are afraid of a challenge, remember, the possibility of being successful in that challenge is enough to stick around.

### What would you say to people interested in chemistry?

I am still very much in love with the topic I selected for my education. I think chemistry is like engineering with small molecules. It's a very challenging, very diverse job. You are never doing the same thing twice, which I love. You have to be passionate and resilient. It sometimes takes years to achieve a good result in a product. Sometimes you contribute to helping put together and develop molecules that succeed in helping people. Helping patients is something that is very very worth it. This is what has driven me to continue and pursue this particular area.

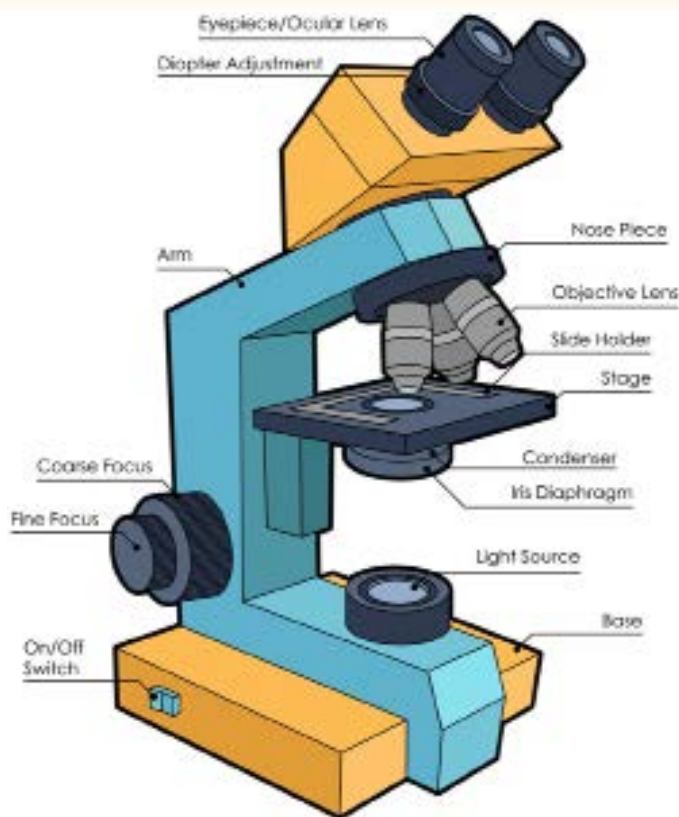
# Chemistry Lab Tools

By: Julia Rieger

## Microscope

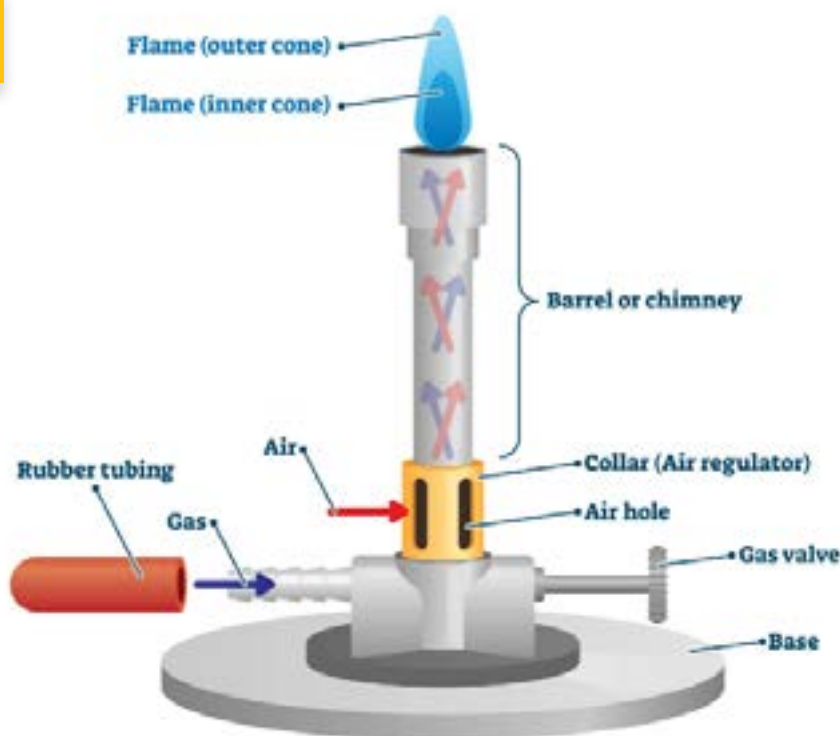
What does it mean to be microscopic? Objects are said to be microscopic when they are too small to be seen with the unaided eye—they need to be magnified (enlarged) for the human eye to be able to see them.

Microscopes are instruments designed to produce magnified visual or photographic images of objects too small to be seen with the naked eye. The microscope must accomplish three tasks: produce a magnified image of the specimen, separate the details in the image, and render the details visible to the human eye or camera.



## Bunsen Burner

The Bunsen burner is a common laboratory instrument that produces a hot, sootless, non-luminous flame. The Bunsen Burner allows for precise regulation of the mixing of gas and oxygen in its central barrel before combustion, which ignites the flame. The hottest part of the Bunsen flame which is heated just above the tip of the primary flame reaches about  $1500^{\circ}\text{C}$  or  $2700^{\circ}\text{F}$ . Having this type of high temperature and requiring less space, it is also called a micro incineration plant that is why also included in sterilization as a physical method.





# Careers in Chemistry

By: Julia Rieger

## Biochemistry

Develop new medicines to fight diseases, study the chemical and physical principles of living things and of biological processes, such as cell development, growth, heredity, and disease.

## Food Chemistry

Use scientific knowledge to breakdown the content of food to determine its chemical makeup, then create flavor blends for food and beverage products in order to enhance or mask the natural flavors.

## Forensic Chemistry

Search for and analyze forensic materials found at crime scenes and present this evidence for use in legal investigations and courts of law.

## Chemical Engineer

Involved in the design and development of new products from raw materials, using their knowledge of chemical properties and reactions to transform materials from one state to another.

## Self Care Challenge #3

### HOBBIES & JOURNALING

Feeling bored or stressed? Try out a new hobby! Learning something new helps break the monotony of routine. Exercising, drawing, journaling, painting, or cooking a new meal are several hobbies you can try at home, and there are plenty more to explore. Journaling specifically helps express emotions or thoughts that may be difficult to convey. It can be simple as jotting down a few bullet points in a notebook about how you feel, or creating a beautiful, artful spread.

**Starter Prompts:**  
How are you feeling today?  
What is something that you are proud of?  
What is a goal you have for yourself?  
What is something you want to do more?

**Spread Ideas:**  
To-do, opportunity, or favorites lists  
Calendars, planners, and date tracking  
Water, exercise, feeling tracking  
Grateful reflections

By: Kayleigh Weldon



## SPOTLIGHT

*By: Julia Rieger*

Pearadox 5414 is a high school robotics team that builds 125 pound robots, participates in global competitions, and learns invaluable knowledge. Students on Pearadox are mentored by professional engineers while we work together to overcome unique challenges. Pearadox is not only about building robots—chairmans, marketing, and business are extremely important subsystems on our team. These subsystems handle sponsor relations, branding Pearadox, and making sure our team reaches out to the community and the world. Pearadox has many initiatives to introduce girls into STEAM (Science, Technology, Engineering, Art, and Math), like the Girls Get Together, an event we created to help girls network with engineers, and this magazine, which we made to fill the gap of we see in STEM and robotics areas.

## STUDENT INTERVIEWS

**How has stem impacted your career path and who you want to be in your future?**

Pearadox has led me to discover my love for combining STEM and community outreach/business. It has solidified my passion for science and introduced business as an appealing career choice as well.



Natalie Yee

**How did Pearadox help you find your passion?**

Surprisingly, Pearadox helped me find my place in management and marketing. I have always been a speaker and creator, and joining Pearadox allowed me to practice soft skills that I never knew I'd learn on a robotics team!



Isabella Theroff

Pearadox 5414 knows that our goal may be to build a robot, but our mission is so much more than that. We strive to reach out and make a lasting impact on the students, parents, and teachers in our community. We do this to educate and enable not only the hundreds of students that pass through our program, but also for the thousands of people who may not feel motivated, confident, or capable enough to follow their dreams. Pearadox has reached a total of 30,000 people and counting during various events, competitions, and demonstrations. This gives people the opportunity we have to experience and, if they choose, immerse themselves in robotics. Everything we do, everything we are, is truly for more than the robots.



## MEET OUR ROBOT



# SKYSCRAPEAR

By: Julia Rieger

## CAD



## MACHINED



**CAD**, or Computer Aided Design, is how we make 2D drawings and 3D models digitally to plan our our robot before we build the physical, real robot. This way we don't waste materials and know what we're building before we build it!

## AUTONOMOUS MODE (INDEPENDENT)

- Score 3 starting balls into the outer port and move off of initiation line

## TELE-OP MODE (REMOTE OPERATION)

- Can score into the outer goal from anywhere between the scoring zone to the far trench
- Can climb and traverse the bar to balance with a team mate
- Can collect balls anywhere

## SKYSCRAPEAR'S SPECS

- ~115 lbs
- 8 pneumatic wheel drive, high traction
- Max speed of 13.4 ft/s



Group →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period ↓	1 1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	* 71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	* 103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
			* 57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb		
			* 89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No		

## The Periodic Table

*The Periodic Table of elements is a collection of all the solids, liquids, and gasses that make up everything in our known universe. The table is organized using Periods and Groups.*

*By: Abigail Lopez*

8

O

**Atomic Number:** *Number of Proton and Electrons*

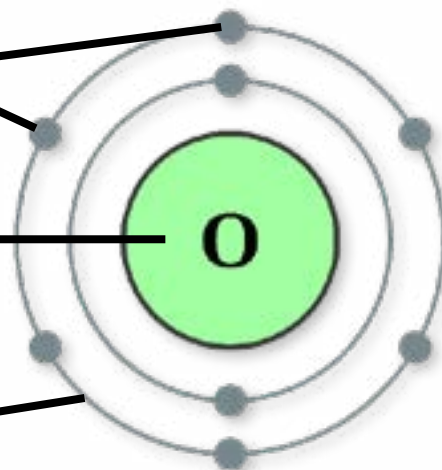
**Symbol of Element:** *Element Name Abbreviation*

*Period: 2 (row 2)  
Group: 6 (row 16)*

**Electrons (8)**

**Nucleus contains Protons  
(8) and Neutrons (8)**

**2 Rings/Shells (Period Number)**



# PERIODIC TABLE GAME

Find out what a chemist's favorite snack is by solving the math problems using the key below, then matching your answers with element symbols using the periodic table!

1.  $(\text{Red} + \text{Yellow}) - (\text{Cyan} + \text{Purple}) =$

50 20 10 5 2 1

2.  $\text{Red} + \text{Cyan} =$

3.  $\text{Orange} - \text{Purple} =$

4.  $(\text{Red} + \text{Orange}) - (\text{Cyan} + \text{Purple}) =$

5.  $\text{Green} + \text{Purple} =$

6.  $\text{Cyan} - \text{Purple} =$

7.  $(\text{Orange}) - (\text{Cyan} + \text{Purple}) =$

8.  $\text{Yellow} + \text{Green} =$

9.  $(\text{Red} \times \text{Cyan}) - \text{Purple} =$

10.  $(\text{Red} + \text{Green}) - \text{Cyan} =$

11.  $\text{Yellow} - \text{Cyan} =$

**What is a Chemist's Favorite Snack?**

8 3 9 1 2 8 4 6 5 9 11 7 6 10





***FIND ALL  
MAGAZINE ISSUES AT:***

[www.gearboxgirls.com](http://www.gearboxgirls.com)

***REACH US AT:***

[gearboxgirls@gmail.com](mailto:gearboxgirls@gmail.com)

[pearlandfrc@gmail.com](mailto:pearlandfrc@gmail.com)

***OR SCAN THE QR CODE:***



***FOLLOW US!***

Instagram: [@gearboxgirls5414](https://www.instagram.com/gearboxgirls5414)

***STEM Savvy is brought to you by Pearadox 5414  
Robotics Team, The Gearbox Girls, and our Sponsors!***



The Gearbox Girls Program  
Pearland, TX  
[Gearboxgirls@gmail.com](mailto:Gearboxgirls@gmail.com)



Team Pearadox 5414:  
Pearland, TX  
[Pearlandfrc@gmail.com](mailto:Pearlandfrc@gmail.com)



Dow Chemical Plant:  
1499 FM 523  
Freeport, TX 77541