## CHEMICAL ENGINEERING

Online Challenge Team 5164B: Lilou Hashemi, Samara Gottlieb and Jonathan Gomperts.



#### **Chemical Engineers**

The job title "chemical engineer" is little known. However, chemical engineers are fascinating. One of the reasons that chemical engineering isn't very popular is because you have to do a lot of complex and technical studying. Chemical engineers work with chemicals to make products such as drugs, fuel, and even food. They also deal with problems in the world, and use chemistry to solve them. A chemical engineer could be dealing with problems from an inexpensive way to purify water, or even a new, and less time consuming fingerprinting method using sweat pores!



#### Skills Needed To Have This Job

There are many skills needed to be a chemical engineer. Some of the skills included are: biology, chemistry, physics and math. Also there are certain qualities chemical engineers need to become successful. For example, understanding written and spoken information, being able to read and interpret work-related materials, speaking clearly, and having good handwriting so that others can understand. Many of these attributes are needed for robotics as well.









#### Why Did We Choose Chemical Engineering?

We chose chemical engineering because we found that it sounded more interesting than any other job we were comparing it to. We also thought that chemical engineering might be able to impact the world in a good way, and that we would not be able to live our everyday lives without chemical engineers. For example, if there was no such thing as chemical engineering we would not have toothpaste or even medicines.

From the beginning, our whole team was leaning towards the engineering side over the medical side. On top of that, we had two chemical engineers that we could interview, instead of one person to interview. We felt that this was better because we would get two opinions and they have different positions in the field of chemical engineering.





### How Does Competitive Robotics Prepare Us For This Field?

Chemical engineering relates to robotics in many ways. There are many problems that need to be solved and many modifications to be made which is similar to making and controlling a robot. Everything needs to work as one, in a perfect balance, or what you are doing might not come out as you hoped. So when doing robotics you are exercising skills needed for chemical engineering.







## Types Of Chemical Engineers

There are three different types of chemical engineers. One type of chemical engineer works in a lab developing new products or solutions to a problem. Another type works in industrial plants. While on site, they direct and/or monitor all operations and solve any on-site problems. The third type work on computers to solve problems and send information to the people in the lab and those on industrial plants.





### How Will This Field Evolve Over The Next 10 Years?

We think that computers will be used more to do harder problems that you have to do manually now. Also, many chemical engineers that have been working on an industrial plant or in a lab will have to learn about computer data and system analytics.



#### To Become A Chemical Engineer You Have To...

To become a chemical engineer you have to go through several tests over four years. In these tests you will practice all of the skills needed to become a chemical engineer. You would do lots of problems and projects that are similar to what you would do when you have the actual job. To get the job you have to get a bachelor's degree.



The tests to get a bachelor's degree are very hard and take a lot of effort and time.



Getting a bachelor's degree.

# Current Projects In Chemical Engineering (Project 1)

A chemical engineer is currently trying to make a way to purify water with prickly pear cactuses! Here's how it works: the chemical engineer has discovered that the gummy substance in prickly pear cactuses can take metals, dirt, and even bacteria from water. This could be a huge discovery for everyone, as having clean water is extremely important, as we could not live without it.



# Current Chemical Engineering Projects (Project 2)

Chemical engineers have discovered that using sweat pores is a way more reliable fingerprinting method. The new method takes images of the sweat pores on your hands and uses a polymer that glows fluorescent and changes color when it touches tiny droplets of water. According to the new study, only a fraction of a fingerprint is needed to identify the person.



#### **Current Chemical Engineering Projects** (Project 3)

A chemical engineer is currently trying to use crystals to change the color of cars and clothing on demand. They are thinking of using light and chemistry and doing something like how chameleons can instantly morph their skin color to match their surroundings. Crystals will be a big part of the project because they are how chemical engineers plan to be able to control the light.





#### Project 3 (continued)

The method involves using latex particles (the crystals) submerged in a liquid. They then shine a laser on the particles to assume a 3D shape or pattern. For example, this could make an object assume a shape of a letter. Using crystals in this way could have a great future in chemical engineering, as this could become part of our everyday lives. 21.



A picture of the crystals used to change colors and shape.

#### Chemical Engineers' Salary

Chemical engineering is a fairly well-paid job. Chemical engineers are paid from \$53,493 to \$144,016 a year, depending on their years of experience and schooling. They are usually paid around \$40 an hour and \$1,601 a week.



#### Working hours of a chemical engineer

To be a chemical engineer you need to be flexible about the time you work. You have to be flexible because there are many things that could go wrong. For example, if you are doing a project where you are in the lab and you make a mistake with the chemicals or you need to finish a project or a problem by a deadline then you could be working very late. However usually it is normal hours from about 8:00 a.m. - 5:00 or 6:00 p.m. and about 40 hours or more per week.



### The Hardest Part Of Being A Chemical Engineer

Chemical Engineering can be very challenging and difficult. A very hard thing to deal with when doing chemical engineering is patience. It can take a long time to figure out difficult problems and a lot of times it can be frustrating. Sometimes if you are doing a project by a deadline and you have to work late. You can miss time with family and friends.





#### Hamid Afsarmanesh (Interview)

Hamid is a retired chemical engineer who used to make all different kinds of items from shopping bags to medicine. He said, "A chemist makes a product in a lab. You want to make tons and tons of this product. You need to have a design and know how to package it. All these things need to work perfectly together to create the product." He told us that to become a 27. chemical engineer you have to study a lot of advanced math.



<sup>(.</sup> This is a screenshot of the interview.

#### Narimon Honarpour (Interview)

Narimon Honarpour is a chemical engineer who works with medicines. Narimon told us that computers will play a bigger role in chemical engineering. He felt that using computers will enable chemical engineers to do more complex problems. He thinks that robotics would prepare us well for chemical engineering because of the teamwork.



#### Famous chemical engineer : George E. Davis

George E. Davis is considered the founding father of chemical engineering. At the age of 16 he decided to pursue his interest in chemistry after being a bookseller and a bookbinder. Davis wrote A Hand-Book of Chemical Engineering and published a famous lecture series that was given in 1888 at the Manchester Technical School (which in 1966 became the University of Manchester Institute of Science and Technology). It was these lectures that made chemical engineering a discipline!



#### Famous chemical engineer: Frances Arnold

Frances Arnold is a famous chemical engineer. She studied at the University of California, Berkeley. It was there that she got her Ph.D. in chemical engineering. Frances is currently the director of the Donna and Benjamin Rosen Bioengineering Center, and is inspired by her students' interest in science. She is most famous for doing work with enzymes which won her the Nobel Prize two years ago in 2018.



We had so much fun and learned a lot working on this project! We hope you enjoyed it. By Lilou Hashemi, Samara Gottlieb and Jonathan Gomperts.

#### Chemical Engineering Team 5164B



#### Works Cited

- Interview with chemical engineer Narimon Honarpour
- Interview with chemical engineer Hamid Afsarmanesh
- <u>Article from wikipedia.org : Article on Chemical Engineers.</u>
- Article from mendeley.com : Article on Chemical Engineering
- Information from payscale.com : Average salary of a Chemical Engineer.
- Article from livescience.com: What is Chemical Engineering?
- Article from livescience.com: New way to fingerprint
- Article from livescience.com: Using prickly pear cacti to purify water.
- <u>Article from wikipedia.org : George E. Davis</u>
- <u>Article from wikipedia.org : Frances Arnold</u>
- <u>Article from livescience.com : Crystals to change color of cars and clothing on demand.</u>

# Picture Credits (There is a number at the bottom left corner of every photo. Each number corresponds to the link in the following picture credits)

- 1. https://www.flickr.com/photos/30478819@N08/49590484092
- 2.<u>https://i.ytimg.com/vi/0itSS6ATWvM/hqdefault.jpg</u>
- 3.<u>https://www.aiche.org/sites/default/files/styles/aiche\_content/public/images/pageset/lead/biomedicine.jpg?itok=Kp0iVezF</u>
- 4.<u>https://www.bestcolleges.com/careers/science-and-engineering/mechanical-engineering/</u>
- 5.<u>https://i.ytimg.com/vi/LeBm1LRAcvk/maxresdefault.jp</u>
- 6.https://scx2.b-cdn.net/gfx/news/hires/2019/howtoovercom.jpg
- 7.<u>http://www.chemeng.uct.ac.za/sites/default/files/image\_tool/images/82/why-icons-02.png</u>
- 8. https://careerinstem.com/wp-content/uploads/2017/07/chemical-engineer-official-600x600-600x430.jpg
- 9.https://www.pinterest.com/pin/8514686772582865/

#### Picture Credits (continued)

10. https://blog.frontiersin.org/2019/09/27/zero-emissions-and-zero-incidents-too-good-to-be-true/

11.<u>https://www.pinterest.com/pin/184577284713036079/</u>

12.<u>https://static7.depositphotos.com/1010683/702/i/450/depositphotos\_7025209-stock-photo-cement-factory-at-night.jpg</u>

13.<u>https://www.engin.umich.edu/wp-content/uploads/2017/08/Research\_feature-1-1394x784.jpg</u>

14.<u>https://www.123rf.com/photo\_66248203\_chemical-engineer-working-with-analysis-software-on-laptop-in-the-re</u> <u>hsearch-laboratory-research-scien.html</u>

15.<u>ttps://cdn.careeronestop.org/OccVids/OccupationVideos/17-2041.00.jpg</u>

16.<u>https://images.wisegeek.com/african-american-male-with-diploma.jpg</u>

17.<u>https://www.intelligentliving.co/amp/non-toxic-compostable-plastic-cactus-juice</u>

18.<u>https://scx2.b-cdn.net/gfx/news/hires/2018/thehiddendat.jpg</u>

#### Picture Credits (continued)

- 19. https://www.mentalfloss.com/article/581233/hypercolor-clothing-fad
- 20.https://automotive.basf.com/news/read/basf\_color\_shifting\_coating\_ford\_mustang
- 21. https://www.livescience.com/45058-chameleon-crystals-could-camouflage-clothing-cars.html
- 22.<u>https://reconciledsolutions.net/wp-content/uploads/2018/10/getting-paid.jpg</u>
- 23.<u>https://www.cafepress.com/+chemical-engineer+clocks</u>
- 24.<u>https://s3.amazonaws.com/commercio/goldbio-2018/pages/Scientist%20Frustrated%20-%20bot%20istock%2011-29-1</u> 8.jpg
- 25.<u>https://thumbor.forbes.com/thumbor/711x473/https://specials-images.forbesimg.com/dam/imageserve/596174516/960x</u> 0.jpg?fit=scale

#### Picture Credits(continued)

26. https://theartofbeingsensuous.files.wordpress.com/2015/02/researcher.jpg

- 27. Screenshot of an interview with chemical engineer Hamid Afsarmanesh
- 28. <u>https://www.casapacifica.org/images/uploads/news/Narimon\_Honarpour.jpg</u>
- 29. https://www.thechemicalengineer.com/features/cewctw-george-e-davis-meet-the-daddy/

30. https://www.nytimes.com/2018/10/03/science/frances-arnold-nobel-prize-chemistry.html