THE JAMES DYSON FOUNDATION

WHAT IS ENGINEERING?

Learn about the variety of engineering careers

ENGINEER PROFILE

Engineering is vital to our everyday lives – from essentials like running water and transport to cell phones, household appliances and the Internet.

There are many different types of engineers, from acoustic to design to electrical. Their skill sets can be very diverse, but they all have one thing in common: they love problem solving.

Ann-Marie
Design engineer at Dyson
Aged 26

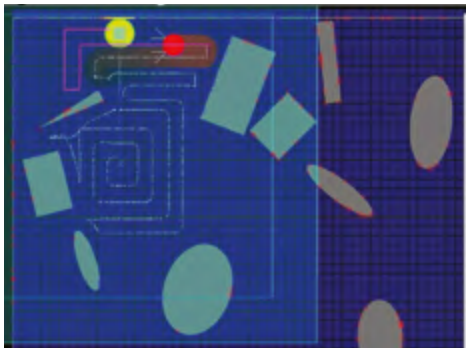
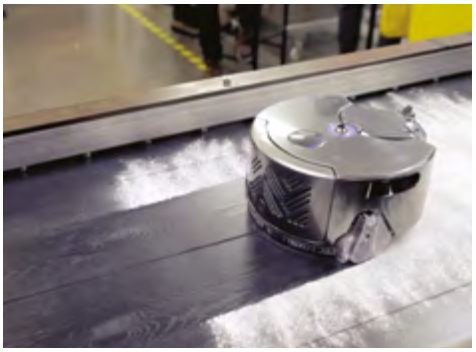
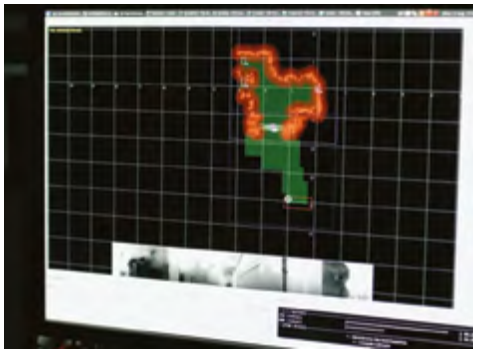
"As a young girl, it never occurred to me that I would grow up to be an engineer. My real passion was art and design, and I thought I might go into the jewelry or the fashion industry. But when I started researching degrees, I came across Product Design – and knew straight away that was the path for me. The thought of creating objects that could make people's lives a little bit better was exciting!
I studied Product Design and Innovation at Strathclyde University, and spent a year at Mars Chocolate before joining Dyson as a design engineer. I work in the New Product Innovation (NPI) team, where I conceptualize and create new ideas.

On a day to day basis, I'm typically sketching out new product ideas and concepts, or solutions to existing problems. I'm constantly thinking about how things work, and how they could be better. There's no right or wrong way to approach a problem, and that's really liberating. The most exciting part of working in NPI is turning 2D sketches into reality by creating visual – and working – prototypes. Using these prototypes to communicate how an idea might work or feel to use is satisfying – especially when I get to review the concepts with James Dyson.

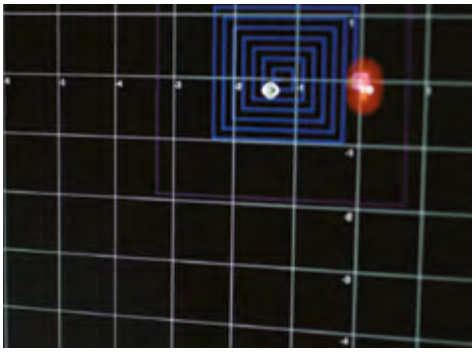
There can be a perception that engineering is all about Math and Physics – that it's a cold, unfriendly, calculation-centered career.

It's enough to put anyone off! But really, engineering is a wonderfully holistic blend of the technical and the creative. It's all about putting theory into practice; a perfect job for anyone who likes making things."

THE DYSON 360 EYE™ ROBOT



While the initial concept for a machine is developed by design engineers working in Dyson's New Product Innovation department, it takes the combined work of a variety of engineers – with different skills and specialties – to make it a commercial reality.

The Dyson 360 Eye™ robot vacuum cleaner is a complicated piece of technology. An intelligent mix of hardware and software, it took a lot of different engineering brains – and 16 years – to make it a success.

The Dyson 360 Eye™ robot was Dyson's first foray into artificial intelligence, and it required new types of engineer: robotics engineers, to design the plans needed to build the robot, and the processes necessary for it to run correctly. And software engineers, to apply mathematical analysis and computer science principles in order to design and develop software.

WHAT DID THEY DO?

Robotics and software engineers

worked together to develop the vision system that allows the Dyson 360 Eye™ robot to know where it's been, and where it's yet to clean. A unique algorithm enables the robot to take calculated decisions about its next course of action, based on time, area covered and complexity. But the Dyson 360 Eye™ robot is a vacuum first, and a robot second. It has to be able to clean properly – and this required input from many different engineers.

Power systems engineers

designed the battery, working out how to get sufficient run time and support other processes at the same time.

Motor engineers

designed the motor that draws in the air – and dust – while analysis engineers validated the motor design and made sure it would survive the forces deployed in operation.

Mechanical engineers

worked out how to transfer power to the brush bar and tank tracks: making sure that the correct gear ratio was chosen to magnify the torque correctly.

Electrical engineers

looked at how to transfer power from the battery, to where it was needed – incorporating elements like proximity sensors, to help guide the robot around the room.

Aerodynamics engineers

mapped the flow of air around the machine, spotting blockages – making sure the air flowed as efficiently as possible.

Separations systems engineers

looked at the cyclonic separation system and the filters. They worked out how to get rid of pollutants from the air – and advised the design team on how to improve filtration performance.

Materials engineers

researched and advised on which materials should be used for which aspect of the machine. For example, the bin needed to be clear, but also hard wearing – so it could survive bumps and bangs.

Acoustic engineers

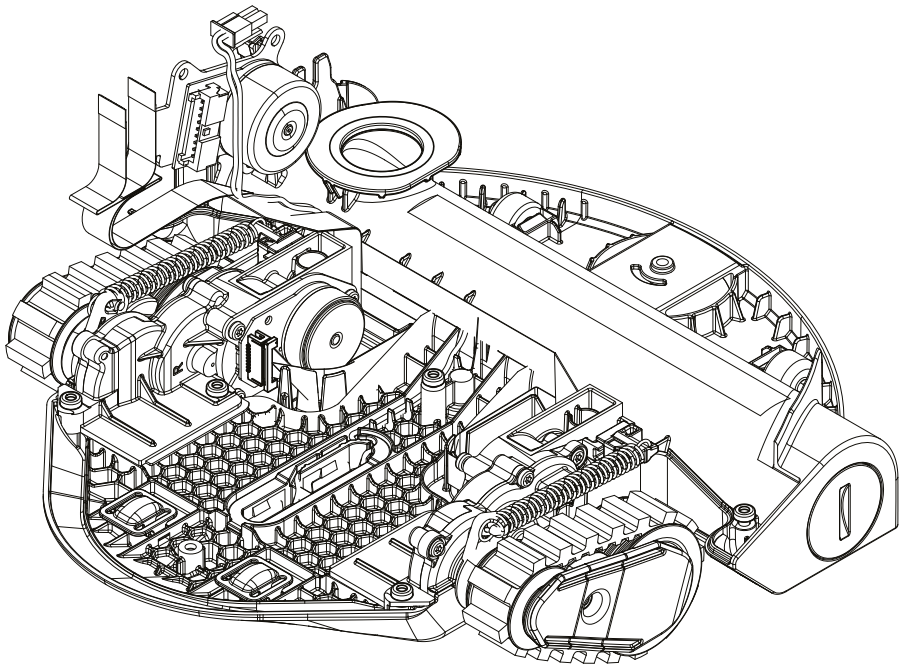
looked at the noise of the machine, employing insulation and other tricks to make it quieter.

Test engineers

put the Dyson 360 Eye™ robot through its paces and found the failures.

Manufacturing engineers

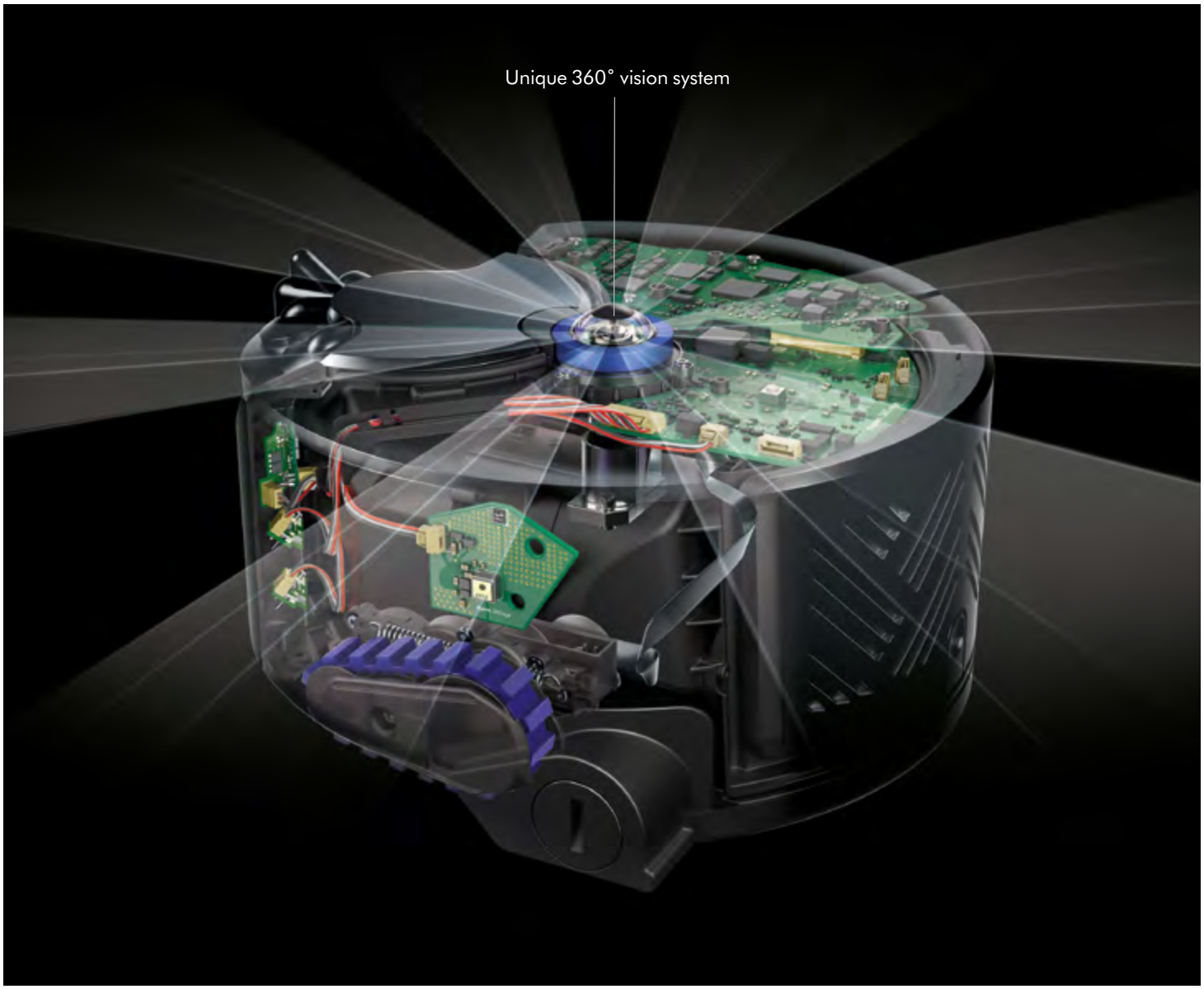
looked at how the final machine is made – defining the best way to manufacture every component, and making sure they were designed to fit together as easily as possible on the assembly line.



HOW DOES IT KNOW WHERE TO CLEAN?

Infrared sensors work alongside a lens on top of the machine which houses a 360° panoramic camera. The camera takes 30 frames every second, providing up-to-date information on its surroundings.

Before the Dyson 360 Eye™ robot begins cleaning, its vision system locates potential challenges and pinpoints landmarks. It translates these into coordinates, creating a virtual map. Having created this map, the robot vacuums the room systematically from edge to edge, never cleaning the same spot twice.



TODAY'S ENGINEERS

Duration: 1 hour 30 minutes

Learning objectives:

1. Understand that there are lots of different types of engineers.
2. Develop an in-depth understanding about different types of engineering careers, and how they each contribute to the development of technology.
3. Understand the similarities between different types of engineers, as well as the differences.

Activity outcomes:

– Class discussion about what engineers do
– Completed group research into an engineering career
– Completed group presentations about a type of engineer

Things you will need:

– The Meet an engineer videos online at www.jamesdysonfoundation.com
– Computer access for groups of students
– Pens and paper

Starter: 15 minutes

What do engineers do?

Learning objective	Activity
1	As a class, discuss what the students already know about engineers and what they do. Write down key points on the board.
2	As a class, watch the **Meet Annmarie: a Design engineer (new product innovation)** video. Talk about Annmarie and her job. Is there anything that surprised the students? Refer to Annmarie's profile on page 2 for extra information.

Main: 45 minutes

Get to know a real engineer

Learning objective	Activity
1	Explain that in this lesson, the students are going to learn about different types of engineers.
1, 2	Break the class into six groups. Give each group a different **Meet an engineer** video to watch. Explain that the engineers in the videos will all talk about how they contributed to the development of the DC39, a Dyson vacuum cleaner. If your class is large, break the students into smaller groups and duplicate the videos you are asking them to watch.
2	Ask the students to spend the next 30 minutes learning more about the engineering career that corresponds to their video. Explain that they will be asked to give a two minute presentation of their findings to the class. They may want to consider: – What this engineer does – Why this type of engineering is important – Key skills this engineer needs – Famous examples of this type of engineer – How you become this type of engineer

Wrap up: 30 minutes

Present your findings

Learning objective	Activity
1, 2	Ask the student groups to present their research to the class. Encourage the class to ask questions.
3	Once all of the presentations have been given, discuss as a class whether the different types of engineers have anything in common. If required, prompt them to think about: – Interests as children – Love of problem solving – Technical skills