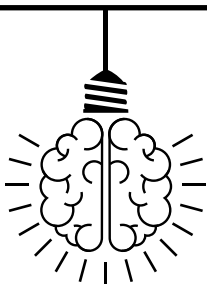




# Learning notes

- explore five of the key stories



Discover ideas, activities and opportunities to learn more about the science and technology covered in this edition of Catalyst magazine.

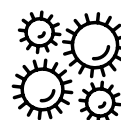
## Contents

Developing medicines



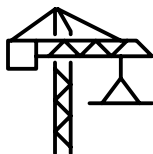
1

The future of radiotherapy: physics and careers



2

Understanding the different ways that we manufacture products: DT



3

Finding out more about polymers: science

Investigating the impact of natural pollutants

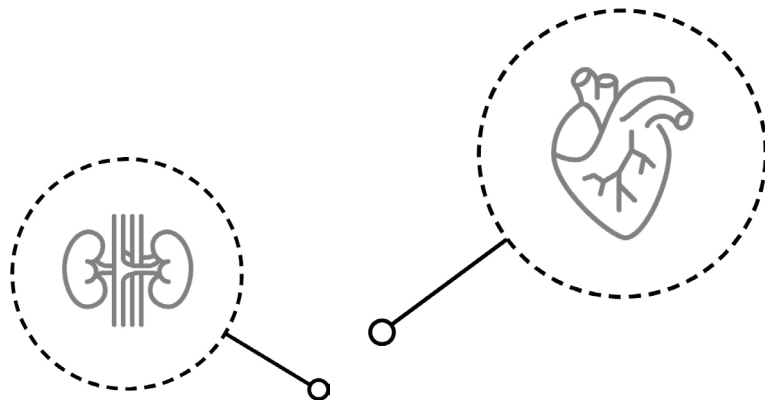


4

Discovering careers



5



## Teaching notes

1

### Developing medicines

Main Article: [The Harsh Reality: trauma can hit anyone](#)

This article links to several areas of the science curriculum and adds context to understanding of both the role of organs and blood. It also considers steps in the discovery and development of new medicines.

#### Suggested Activities:

The article could be used simply to focus on what the organs of the body do and why the functions of each is important. One approach to this is to hold a balloon debate where individual students or small groups are allocated an organ of the body to research and asked to present reasons why their allocated organ is the most important one in the body. The ABPI Schools 'Interactive Body Builder,' provides an interactive guide to body parts and what they do, which could be used as a starting point leading to more in depth research. This type of activity can serve as a useful way to draw together, consolidate and revise ideas about how the body works.

For those using the context of blood loss and trauma as part of their teaching on blood and the circulatory system a useful way to support student understanding is to set out a room or an outdoor space as a giant circulatory system and ask students to walk the route taking on the role of red blood cells or blood plasma.

Those looking to explore and discuss issues surrounding animal research in drug development, triggered by reading this article, will find a PowerPoint and worksheet to help students explore their own thinking and attitudes to animal research, alongside support to run a debate in the SATIS resources. Up to date background information and ideas for discussion can also be found in the Understanding Animal Research resources, such as the informational leaflet, 'Where do medicines come from?'

#### ✦ Related resources:

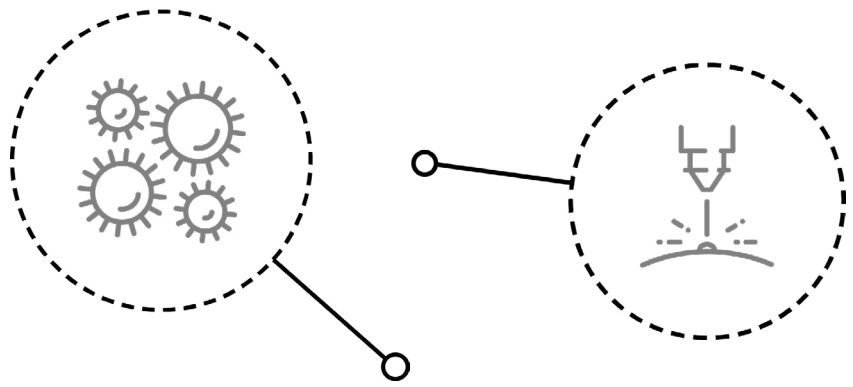
A useful suite of resources to support 14-16 year old and older students' understanding of blood and the circulatory system [www.stem.org.uk/lx6e3x](http://www.stem.org.uk/lx6e3x)

Animal Research, SATIS revisited introductory power point and student opinion sheets, linked to developing medicines [www.stem.org.uk/rxtvs](http://www.stem.org.uk/rxtvs)

Understanding Animal Research, informational leaflet, 'Where do medicines come from?' and other resources [www.stem.org.uk/enrichment/stem-directory/activity/understanding-animal-research-exploring-ethics-and-science](http://www.stem.org.uk/enrichment/stem-directory/activity/understanding-animal-research-exploring-ethics-and-science)



**External link:** ABPI Schools Interactive Body Builder provides an interactive guide to body parts and what they do. Note that the STEM learning site hosts additional paper resources from ABPI schools readily found using your search engine. [www.abpischools.org.uk/topic/bodybuilder](http://www.abpischools.org.uk/topic/bodybuilder)



## Learning notes

### The future of radiotherapy: physics and careers

Main Article: [New innovations in radiotherapy treatment](#)

With the number of people being diagnosed with cancer on the rise it is important we are able to treat it, and have people understand the technology used to treat cancer so we can improve that treatment.

#### Learning Task:

Do you know what cutting edge science is going on at the moment, and how this can help cancer patients? One new way of tackling cancer is proton beam therapy, and a video produced by the NHS can be viewed here:

[www.england.nhs.uk/commissioning/spec-services/highly-spec-services/pbt/](http://www.england.nhs.uk/commissioning/spec-services/highly-spec-services/pbt/)

How is this different to current radiotherapy?

If it is so successful, why is it only offered to certain patients?

#### Take your learning further:

You hear people saying they want a career in medicine, but are you aware of how many different careers are out there? Watch the video to see some careers that you can go into using physics in medicine.

[www.stem.org.uk/resources/elibrary/resource/35290/making-difference-physics-careers-medicine](http://www.stem.org.uk/resources/elibrary/resource/35290/making-difference-physics-careers-medicine)

Do you notice any common skills that you need in these careers?

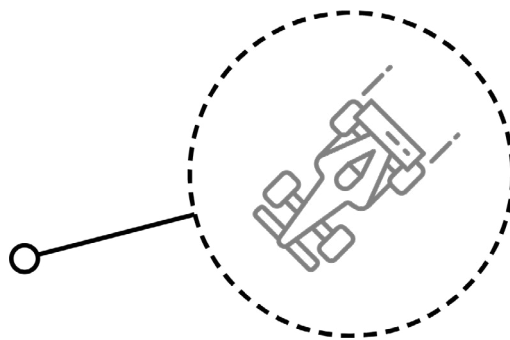
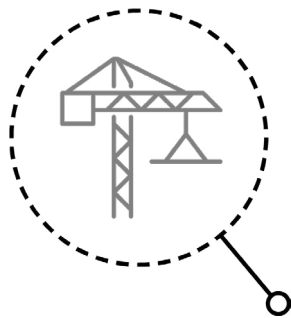
What skills do you feel you have that could help you develop a career in one of these fields?

#### Take your learning further still:

Imagine you are planning to apply for a place at college or university to begin a career in radiotherapy physics. Write a personal statement about what skills and interests you have that would make you suitable for this role. This will give you practice in writing these statements for when it comes to applying for courses or jobs in the future. Use the link below to see what is looked for in this role.



To find out more about radiotherapy physics visit this link: [www.healthcareers.nhs.uk/explore-roles/healthcare-science/roles-healthcare-science/physical-sciences-and-biomedical-engineering/radiotherapy-physics/entry-requirements-skills#With%20A%20levels](http://www.healthcareers.nhs.uk/explore-roles/healthcare-science/roles-healthcare-science/physical-sciences-and-biomedical-engineering/radiotherapy-physics/entry-requirements-skills#With%20A%20levels)



## Learning notes

3

Main Article: [Layer by Layer: The wonderful world of Additive Manufacturing](#)

### Understanding the different ways that we manufacture products: D and T

In the article, Suryanarayanan uses the term additive manufacturing to describe the process of building a part, layer by layer.

#### Learning Task:

Watch this video from the University of Cambridge: [www.stem.org.uk/resources/elibrary/resource/425005/what-3d-printing](http://www.stem.org.uk/resources/elibrary/resource/425005/what-3d-printing)

- Describe the 4 different manufacturing methods that the video explores.
- For each manufacturing method, think of 3 products and consider why they are manufactured in this way.

Hint: Consider sale price, length of use, volume of manufacture, shape, materials...

### Finding out more about polymers: science

3D printing is a fascinating way of constructing items in a different way, here we look at one of the materials we could use to do this, in more detail.

#### Learning Task:

What is a polymer and how are they formed? Watch this video from Twig world: [www.stem.org.uk/resources/elibrary/resource/35141/plastics-and-polymers-suitable-home-teaching](http://www.stem.org.uk/resources/elibrary/resource/35141/plastics-and-polymers-suitable-home-teaching)

Organise your thoughts from this into:

- ways of making a polymer properties stronger and more rigid
- ways of making the polymer lighter and more flexible. Can you add an example polymer for each of these types?

#### Take your learning further:

Imagine cooked spaghetti strands as a model for the polymer chains. How could you model a plasticiser being added? What food material would make the chains more likely to slide over each other? Then think about how you could also model cross-linking to reduce the chains being able to freely move. You may be able to draw and explain your ideas with real polymer examples to show the difference in properties.

#### Take your learning further still:

Read about the issues facing the plastics industry. How do you think 3D printing and additives manufacture can contribute to a more sustainable future for the industry?

[www.stem.org.uk/elibrary/resource/31079](http://www.stem.org.uk/elibrary/resource/31079)



Perhaps you want to find more about being a materials scientist using polymers?

[www.stem.org.uk/resources/elibrary/resource/34072/faces-chemistry-helen-neville](http://www.stem.org.uk/resources/elibrary/resource/34072/faces-chemistry-helen-neville)



## Learning notes

### Investigating the impact of natural pollutants

Main Article: [My life and work in the UK](#)

In the article the author explains different aspects of air quality that she and the company are involved in. These include microclimates, acoustics, noise and vibrations and the quality of air itself. Air pollution takes many forms that we may not have previously considered.

#### Learning Task:

We are familiar with air pollution that is created from human activities, such as industrial pollution, car exhausts, agricultural spraying and aircraft. We often overlook pollutants that originate from a natural basis, forest fires, volcanoes, plants and even bacteria. Each generates pollution that affects the quality of our air.

Using the information sheet available from the link, we can compare natural versus man-made pollutants.

[www.stem.org.uk/system/files/elibrary-resources/legacy\\_files\\_migrated/4735-AQ%20ISair%20pollution.pdf](http://www.stem.org.uk/system/files/elibrary-resources/legacy_files_migrated/4735-AQ%20ISair%20pollution.pdf)

- a) create charts to show the different gases from natural sources and man-made ones.
- b) compare the two charts; what comparisons can you make based on the data available?
- c) research a natural pollutant, such as termites, volcano, plant, oceanic bacteria etc. and determine the environmental impact they may have on air quality.

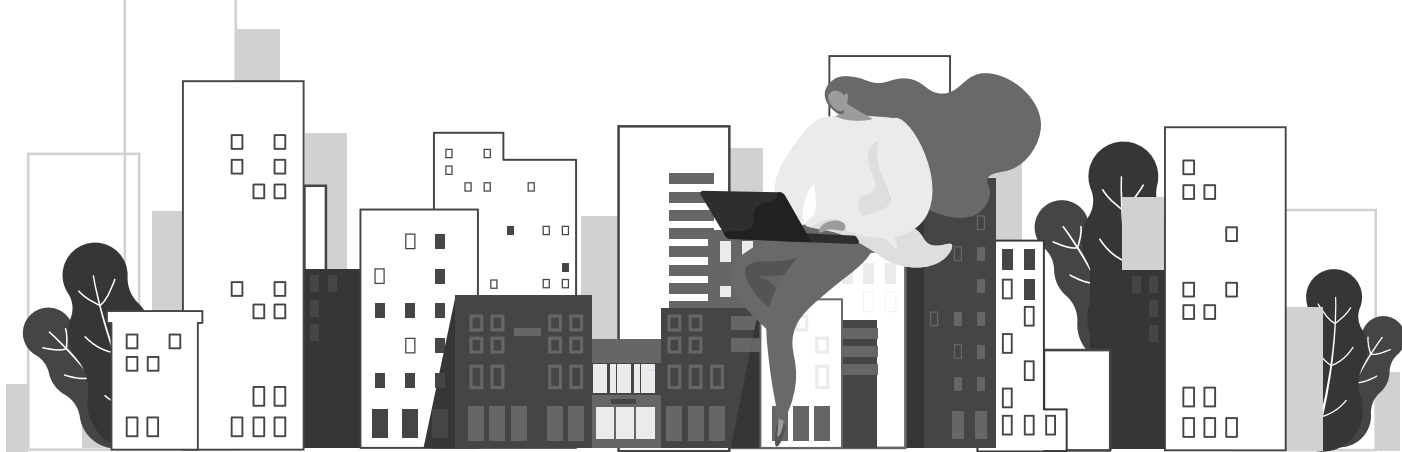
#### Take your learning further:

What is the air quality like in your area? You can track the main pollutants on a UK map at this website: [uk-air.defra.gov.uk](http://uk-air.defra.gov.uk)

Keep track of different pollutants over a number of weeks to look at the changes. Are there any surprises?

#### Take your learning further still:

Find out more about the environmental impact of both man-made and natural pollutants. Create an article or blog comparing the two and consider the actions we could take to improve air quality.



## Learning notes

### Discovering careers

Main Article: [Life as a software engineer](#) and [My life and work in the UK](#)

Each of the authors in this issue of Catalyst has a STEM related career. The articles showcase a variety of projects and roles that could inspire you to find the perfect role for you.

#### Learning Task:

Here are three questions to consider:

1. Which of the articles appealed to you the most?
2. What about it inspired you?
3. Could you see yourself in that role, working on a similar project?

Here are some suggestions:

- Look up the organisations the authors work for and explore the careers they offer.
- Find out how you could work for them.

- Consider the subjects you need to study, do you work towards a place at university or look for an apprenticeship? Is there another route you could take?
- Think about getting experience related to the role or project: summer placements or volunteer with similar organisations or projects. If you try it out you'll know if it's for you.

Take the opportunity to do research, ask around and seek advice. The more you find out, the easier it will be to choose the right path for you. And remember, it's ok to change your mind and try something different.

#### To find out more:

The website: [www.stem.org.uk/stem-careers](http://www.stem.org.uk/stem-careers) has useful information for you, your teachers and parents.



---

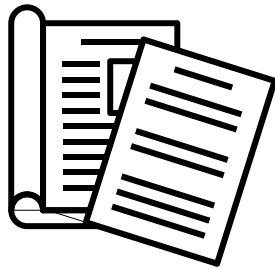
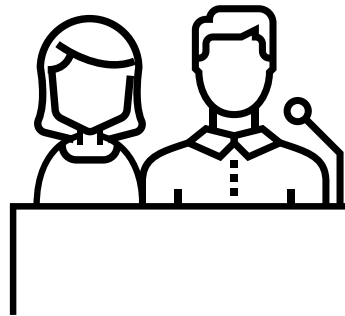
## Bring a STEM Ambassador into your classroom

We have a network of over 30,000 inspiring STEM Ambassadors who volunteer their time to inspire the next generation in STEM.



Find out more about how you could bring a STEM Ambassador into your school or college:

[www.stem.org.uk/stem-ambassadors](http://www.stem.org.uk/stem-ambassadors)



## Thank you

We hope you enjoyed Catalyst, and matching learning notes. If you have any feedback, or ideas for topics you'd like to see covered in future editions, please email:

[catalyst@stem.org.uk](mailto:catalyst@stem.org.uk)



Join us on Twitter [@STEMLearningUK](https://twitter.com/STEMLearningUK)



Visit our website [www.stem.org.uk/catalyst](http://www.stem.org.uk/catalyst)

---