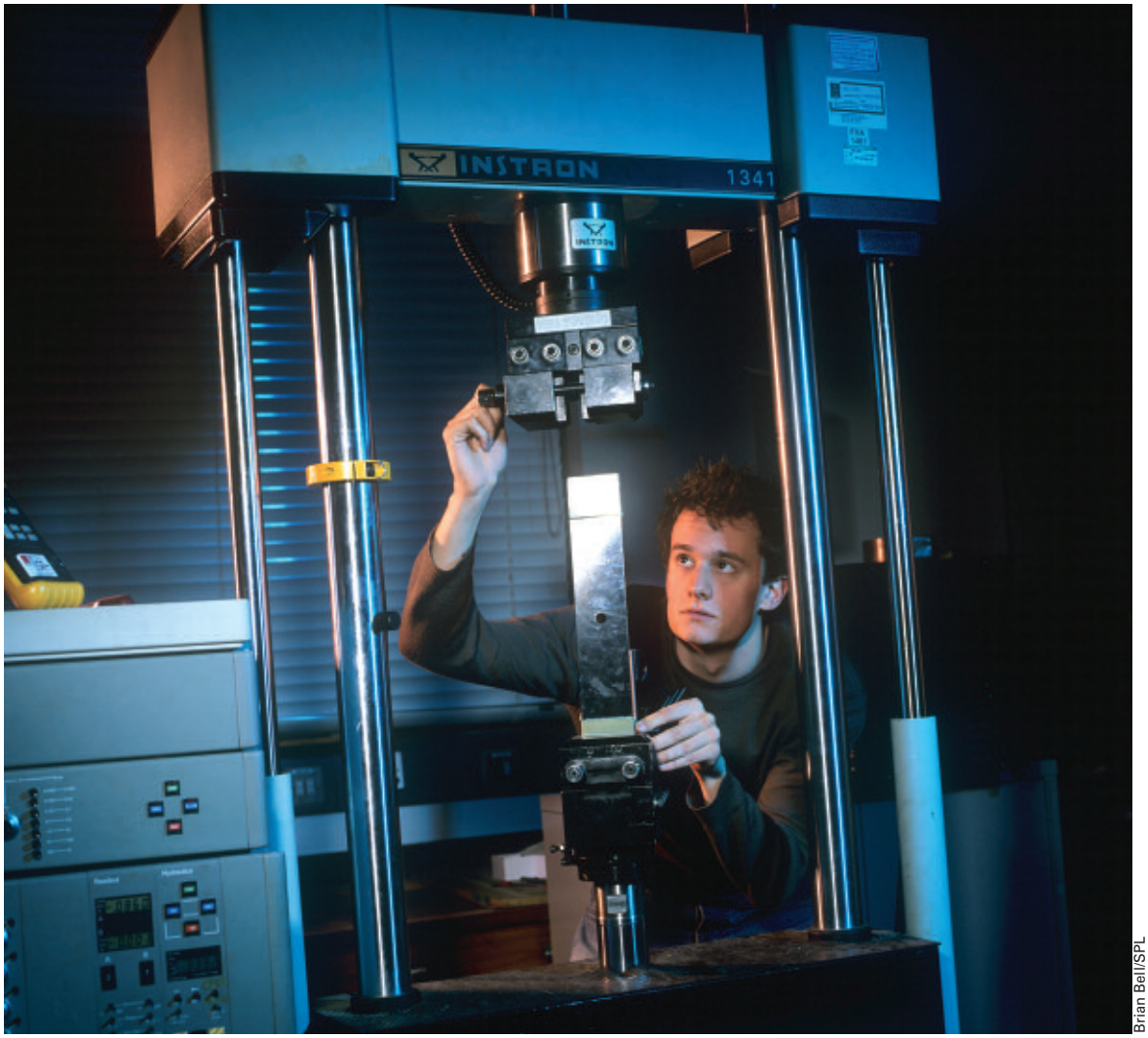


Brian Bell/SPL

Right: *Researcher working with a composite material intended for use in the aerospace industry*

It's a material world

What do the latest iPod, a dual fuel car and an artificial hip have in common? The answer is easy — they are all made of something. Materials scientists decide which material is best for each application.

You're probably familiar with the periodic table. This is a wonderful tool that tells materials scientists about the elements that they have to choose from. Some of these elements can't be used because they are dangerous, or they have only existed for a few nanoseconds in a laboratory somewhere. However, many of them are not only useful, but vital to the society in which we live. In some cases we use elements, such as gold, silver and carbon, in their pure state, but most of the time we use compounds and mixtures of the elements.

Understanding materials

The structure of materials

As a materials scientist or engineer the first thing you need to understand is the **structure** of a material — how the atoms arrange themselves into crystals or molecules and how those crystals or molecules arrange themselves with regards to each other. This structure has an important influence on the properties of the material. It will affect how strong or tough it is, whether it conducts electricity or whether it is transparent. But it's no use having a fabulous material with great properties if it can't be made into the right shape.

Processing materials

A materials scientist also needs to understand how materials can be processed. **Processing** covers the whole life cycle of the material, from obtaining raw materials from the Earth's crust, to extracting the useful part and forming this into everyday objects,

● **Visit the *Challenge of Materials* gallery at the Science Museum in London to see some modern, exotic materials, their structures and uses.**

right through to investigating the best ways to reuse, recycle or dispose of the material.

Materials scientists need to know all this, for many different materials, so that they can make sure that the right ones are used.

Working as a materials expert

Materials science and engineering is a broad discipline. Materials experts have played a role in everything you see and use. Some work on the fundamental science behind the materials, investigating structures and properties in a laboratory at a university or company. Others work in design and manufacturing, turning ideas into reality.

For example, some are involved in transportation, developing cars, trains, aircraft and the associated infrastructure such as roads and rails. Others are concerned with the manufacture of sports equipment which will maximise the performance of athletes, whether they are amateurs or world-class professionals. Materials experts also work alongside surgeons and clinicians, developing a wide range of replacement body parts, including hip and knee joints, artificial arteries and even replacement lenses for our eyes.

A great deal of research is being done at the moment looking at the next generation of materials, such as those on the nanoscale, and semiconducting and superconducting materials, which could change our lives over the next few decades.

If you think this sounds interesting, you might consider becoming a materials expert yourself. Here's something that may surprise you — you are already on the way to being one! You have been studying materials in science and technology since you started school — remember sorting and grouping materials and looking at reversible and irreversible reactions at primary school? And you make choices about materials in your everyday life — for example, choosing to go out in a coat made from a waterproof material when it's raining.

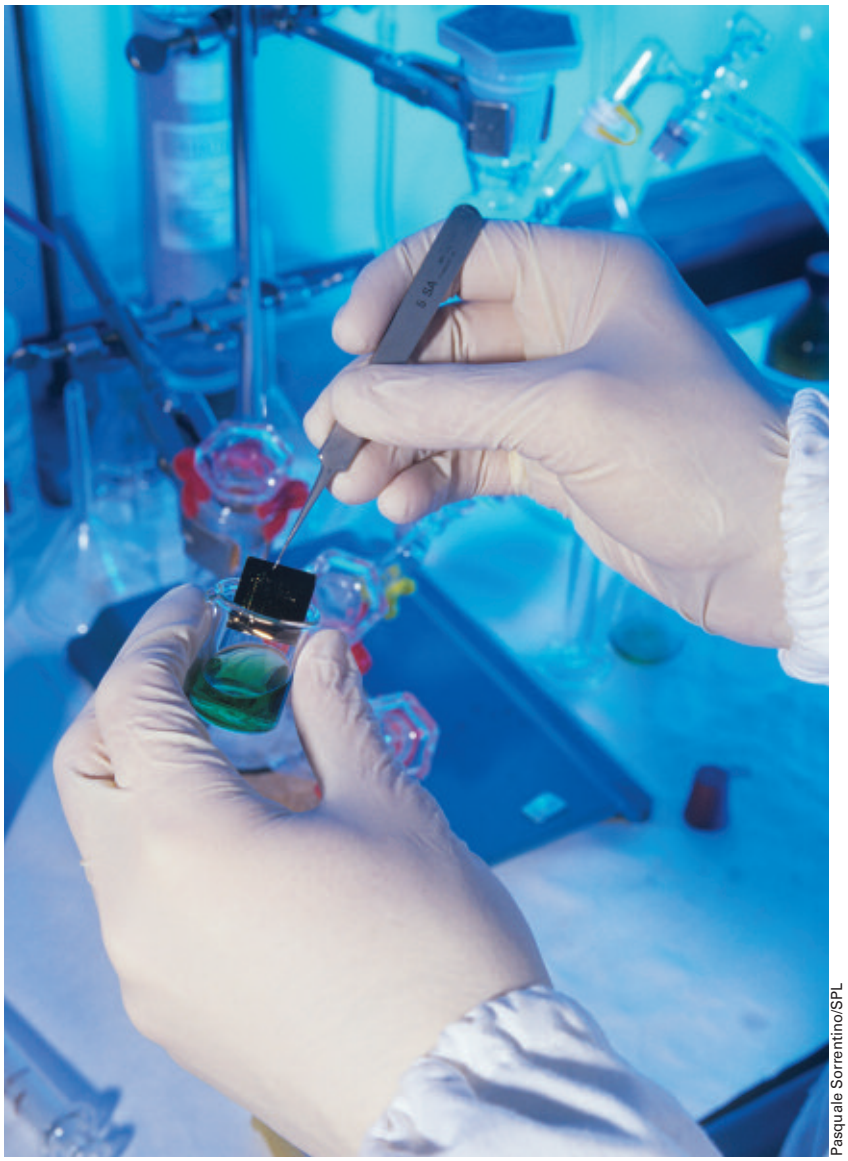
Box 1 Materials degree courses

Titles of university materials courses include:

- biomedical materials
- sports science and materials technology
- metallurgy and materials
- automotive engineering
- polymer technology
- aerospace engineering with materials
- dental materials

Most courses include a broad introduction to materials, with the opportunity to specialise later.

You need three A-levels (or two A-levels and an AS) for admission to an undergraduate course in materials. Choose at least two from maths, physics, chemistry, and design and technology.



Pasquale Sorrentino/SPL

Above: *Researcher using forceps to place a semiconductor sample in a chemical*

How to become a materials scientist or engineer

You can begin a career in materials at many levels. If you want to get a job when you've finished your GCSEs or A-levels, many companies employ technicians at 16 or 18 and will provide training on the job and through college courses. Alternatively, you might want to study materials at university, in which case there are many interesting courses to choose from (see Box 1).

Whether you decide to enter the materials world after GCSEs, A-levels or a degree, you can be sure that you will have an exciting, rewarding and challenging career and the chance to change and improve the world around you. If you would like more information on careers in materials, minerals and mining engineering go to **www.materials-careers.org.uk** or contact **education@iom3.org**.

Dr Diane Aston *is Education Coordinator at the Institute of Materials, Minerals and Mining.*

- **Check out which universities offer materials courses on the UCAS website (www.ucas.ac.uk).**

Materials science is sometimes broken down into metallurgy, ceramics and polymer science.