Dear Science Teacher

The enclosed D Files are a result of collaboration between CLRC Daresbury Laboratory, science teachers and Local Authority Science Advisors. Their aim is to help teachers teach the science content of the National Curriculum and to make science fun for the students. Please complete and return the questionnaire to enable us to continue to improve our schools programme.

All the experiments contained in the Files can easily be carried out in school laboratories with the exception of those in Plastic Surprises. This file is intended as a ‘thought exercise’, however, the experiments are feasible but could prove expensive and possibly dangerous if carried out in school laboratories or at home.

The Laboratory acknowledges the assistance of Mr Stuart Webster, senior science advisor for Cheshire LEA and members of the team he assembled. Other members are: Ms Annette Drake, science advisor, Cheshire LEA, Ms Sue Wells, Frodsham High School, Mr Joe Burke, Holmes Chapel Comprehensive School, and Mr Chris Clements, Sutton High School.

Yours faithfully

Anne Humphreys
Schools Liaison Officer
Title: The Atom Smasher Enquiry

D File Number: WA44AD001

Date: 16.03.62

Time: 09.30

Who: Minister for Science, 5 Senior Civil Servants and a team of Research Scientists.

Place: Whitehall, London

Fact: Another atom smasher was urgently needed to complete vital research.

Problem: Convincing the ministers to fund the project was not a problem. Siting was.

Report:

What happens in an atom smasher?

An everyday tale of atomic attraction, repulsion and energy.

What happens if atoms collide?

All atoms consist of a nucleus which contains positively charged protons and neutrons which have no charge. Negatively charged electrons are in orbit around the nucleus. If atoms collide, more details about what's inside them are revealed.

continued...
What is an atom smasher used for?

They give scientists a better understanding of atomic structure based on the results of atom collisions.

Who was involved in the enquiry on where to site the structure?

Particle Research Scientist
Expert Geologist
Local conservation group members
Chairperson of Cheshire County Council
Chairperson of Glasgow City Council
Minister

The Enquiry

Each member has up to three minutes to give a short talk presenting their case to enable the minister and advisors to make a decision.

The outcome and what happened next.

Site agreed at Daresbury formal approval granted
22 September 1962.
Ivor Charge The Particle Research Scientist

Your job is to convince the enquiry of the need to have an appropriate site for the Atom Smasher.

It needs to have:
- Easy reach of the main research groups - Liverpool, Manchester, Glasgow, Edinburgh.
- Stable bedrock - not likely to subside.
- Cooling water supply to prevent machine from overheating.
- Good transport links.
- Position not too close to a main road to avoid vibration having an effect on the stability of the machine.
- Minimal effects on the environment
- Skilled operatives available.

continued...
Sandy Stone The Geologist

Your brief is to outline the strengths and weaknesses of the two sites.

Glasgow site

- close to river which can flood during heavy rain.
- Bedrock has unstable features due to previous mining for coal.
- Coal deposits revealed on survey of site with potential future use.
- Quarry close by.

Daresbury site

- Close to Bridgewater canal which has an effective overflow system.
- Bedrock mainly sandstone.
- Low water table.
- Foundations would need extra concrete raft to counteract porous effect of sandstone.

continued...
Emma McLean Member of local conservation group Glasgow

Your brief is to stop the Glasgow site being used.

- River in an area of outstanding natural beauty.
- Accept that the site will be screened and that offer of an Arboretum would attract visitors to the area to observe wildlife.
- Possible danger of pollution.
- Rare orchid growing close to river.
Joe Pike Member of local conservation group Daresbury

Your brief is to stop the Daresbury site being used.
- Possible fumes from central heating chimney damage vegetation?
- Warrington anglers claim fishing quality will deteriorate?
- Valuable agricultural land affected?
- Conservation support given to adjacent woodland?
Elly Shone Member of Glasgow District Council

Your brief is to encourage the Glasgow site to be used even though there are some drawbacks

- Reduce greenbelt.
- Want to attract high tech industry.
- Create job opportunities on site and in local hotels for visiting scientists.
- Council will invest in highways to improve communication with site.

continued...
Donna Vote Member of Cheshire County Council

Your brief is to encourage the Daresbury site to be used even though there are some drawbacks.

. County Council willing to grant outline planning permission for site.
. Will not spend to improve infrastructure.
. Area has already high tech industry.
. Create job opportunities but no current labour shortages.
Don Matter Minister for Science

Your brief is to make a decision using the following criteria. Your decision will be final.

1. Least cost
2. Most favourably received
3. Minimal impact on the environment
4. Easily accessible.
Activity

- What is the difference between the 1962 average wage and the 1996 average wage?
- Calculate the usage of water charge of 10 litres at Daresbury using Fact File Two.
- What would be the TOTAL average monthly cost?
1962

The PM was Harold Macmillan, the US President was J.F.Kennedy

<table>
<thead>
<tr>
<th>Main News Stories</th>
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<tbody>
<tr>
<td>Maiden flight of the de Havilland Trident Jet</td>
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<td>A6 (James Hanratty) murder trial began in February</td>
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<td>US Rocket Ranger III misses the Moon by 20,000 miles.</td>
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<td>Two climbers complete the first successful winter ascent of the north face of the Matterhorn</td>
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<td>An Essex schoolboy claims the world record for doing the Twist for 33 hours non-stop</td>
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<td>The first push button Panda crossings in London</td>
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<td>James Hanratty hanged, at the beginning of May, for the A6 murder</td>
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<td>Britain’s first satellite launched</td>
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<td>Ranger IV crashes on the dark side of the Moon.</td>
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<td>Last trolley buses taken out of service</td>
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<td>Eichmann hanged for World War 2 crimes</td>
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<td>Coventry Cathedral consecrated</td>
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<td>200 million Europeans view US live TV for the first time via the satellite Telstar</td>
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<td>First Hovercraft service (between Rhyl and Wallasey)</td>
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<td>Brazil wins the World Cup</td>
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<td>Night of the Long Knives (sacking of seven Government Ministers by PM)</td>
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<td>Jamaica gains independence from the UK</td>
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<td>Marilyn Monroe dies.</td>
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<td>World population estimated at more then three billion (mid 1990 est. at 5.3 billion)</td>
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<td>Riots in Mississippi as first black student enrolls at the University</td>
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<td>First female judge (Elizabeth Lane) sat in the High Court</td>
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<td>Agreement to build Concorde signed by France and UK</td>
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<td>BBC2 first proposed</td>
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<td>Mariner II sends back first close-up pictures of Venus</td>
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<td>60 die in London from smog</td>
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<td>Nelson Mandela jailed for five years</td>
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<td>Four British scientists win Nobel prizes. (Max Perutz and John Kendrew for protein research and Francis Crick and Maurice Wilkins for DNA research)</td>
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<td>USA agrees to provide Polaris to UK and France</td>
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<td>Decca rejects the Beatles</td>
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<td>First successful kidney transplant from a dead to live person (Leeds General)</td>
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<td>Bay of Pigs (Confrontation between USSR and USA over Cuba, generally thought to be incident which came closest to causing WW3)</td>
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<td>First Beatles hit</td>
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<th>Number One in Hit Parade</th>
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<tr>
<td>Stranger on the Shore</td>
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<tr>
<td>I Remember You</td>
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<tr>
<td>Rock a Hula Baby</td>
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| National average wage | £15.1s.4d (£15.07) now £237.94 |
• Canal water is used as primary cooling for four independent cooling circuits on the site.

• The temperature of the canal water can range from 0°C in winter up to 28°C in summer.

• The internal circuits are operated at a nominal temperature of 20°C but when the canal temperature rises above this the internal circuits are kept within 3 to 4°C above the canal temperature.

• Because of the temperatures, up to four pumps can be operating during the summer reducing to one in winter.

• Great care must be taken in balancing the reduced electricity costs of operating one pump against the danger of too low a flow creating a blockage as sand etc. settles in the heat exchangers.

• The return main is cast iron and 21 inches in diameter.

• The water is returned approximately 2 miles downstream. The pressure of the water at the beginning of the return pipe is around 7psi (483 millibar).

• The Bridgewater Canal is owned by the Manchester Ship Canal Company. It is operated as a trust with the local councils whose areas the canal passes through. The money generated is used to maintain and improve it.

• The Laboratory is licensed to extract up to 23 megalitres in any 24 hour period.

• The temperature of the returned water must not exceed the incoming water temperature by more than 5°C.

• The total usage charge for 1996 was 320,456 x 10^9 litres.

• The annual charge for 1996, paid to the Manchester Ship Canal Company was £49,366.36.

• This charge is made up of a fixed or standing charge, of £34,141.74 plus the usage charge.

• The Environment Agency issues the licenses to abstract and discharge. This costs £3,000 per annum.