PUPIL RESEARCHER INITIATIVE

Shooting stars

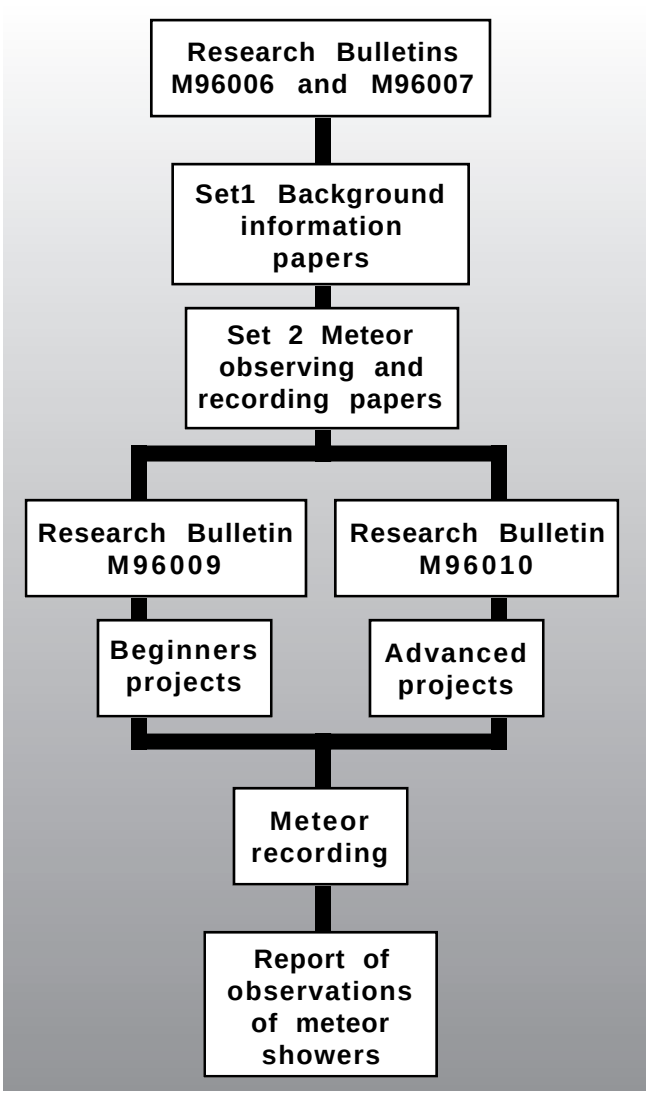
Pupil Research Brief

Teachers' Notes

Syllabus Coverage *Subject Knowledge and Understanding*

- ❒ the stars in the night sky stay in fixed patterns called constellations
- ❑ comets have orbits which are far from circular
- ❑ comets are very much closer to the Sun at some times than at others - this is why they can be seen

Route through the Brief



Introduction

In this Brief pupils are invited to carry out real research into meteor showers. Eight projects are outlined, the first four of which can be carried out by pupils with no previous experience of astronomical observations. The remaining four are for pupils who can recognise some constellations and the brighter stars. Although research on meteors is carried out by professional astronomers, amateurs can still make valuable contributions to the acquisition of data on the frequency and activity of meteor showers. The work done by teachers and pupils on meteor watching can be sent to the STAR Centre at Sheffield Hallam University for collation and analysis.

Experimental and investigative skills

- planning an investigation
- obtaining evidence
- analysing evidence and drawing conclusions
- evaluating evidence

Prior knowledge

Before attempting this Brief pupils should know about the Solar System, the Sun and the nine planets. They should have some knowledge of asteroids and comets and it would be useful if they know that meteors are lumps of rock from outer space, most probably debris from comets and asteroids.

Pupil Research Brief

Teachers' Notes continued

Running the Brief

Pupil grouping

For observing meteor showers pupils need to be at a site that is away from urban light pollution (direct glare from house lights and street lamps). So, for safety they should be in groups of at least three and accompanied by a responsible adult. Reading and planning tasks could be undertaken individually or in pairs or threes.

Timing

The Brief is likely to require 3 or 4 hours of classroom time, plus observation time out of school hours. This Brief can be used not only as part of an examination course, but also in the context of a science club or astronomy club. Meteor showers are predictable and so the work should be planned to coincide with the peak activity of a particular shower.

Activities

The teacher should issue the pupils with the **Study Guide** which provides them with a summary of what they should produce as they work through the Brief. It can also act as a checklist for pupils to monitor their own progress. Pupils are issued with the **Research Bulletins M96006** and **M96007**. They should be reminded that these projects will constitute real astronomical research and their reports can be sent to the **STAR Centre** at Sheffield Hallam University. The results will be collated there and an analysis of the results will appear in *PRISM*, the PRI pupil journal, and on the PRI Web site.

Before deciding which project to undertake, pupils should work through one or more of the background information worksheets : **Mechanism of meteor luminosity**, **Cosmic streakers** and **Ghosts of the Solar System**. These are simulated magazine articles that supply information about meteors, comets and asteroids. Pupils can make notes on these in preparation for their research work. Pupils need to decide between themselves and in consultation with the teacher, which project(s) to choose. **Research Bulletins M96009** and **M96010** should now be handed out. These contain details of the 8 projects pupils can work on.

Project 1 is a basic meteor watch which can be done on any meteor shower. The Perseids and Geminids are particularly suitable because of their numbers.

Projects 2, 3 and 4 apply the basic observation to particular showers of interest. If pupils can recognise bright stars and constellations and are capable of producing the analysis of results required, they may wish to work on **Projects 5** or **6**. **Projects 7** and **8** are best conducted with the help of a local astronomer or a research student on the **PRI Researchers in Residence scheme**.

Meteor Watching, **Meteor recording** (**1** and **2**) and **Map those meteors** are simulated magazine articles which give pupils information on how to plan and conduct their meteor watch and analyse the data they obtain. These need to be studied closely in the classroom before the observations are carried out. Pupils should be made aware that a cloudy night or bright moonlight can make observation very difficult, if not impossible, and that patience and perseverance are highly desirable qualities for astronomers (and all scientists) to possess. Meteor showers occur over several days as the sheet **Main meteor showers through the year** (Research Bulletin M96008) shows. So there will be several opportunities to make their observations. Pupils should plan their meteor watch carefully. **Meteor Watching** gives them a list of equipment they will need. The teacher should issue pupils with a copy of the **British Astronomical Association Meteor Section Visual Report** for recording their observations.

Once pupils have carried out their meteor watch, they should write a report that includes results, graphs, comments and a description of the meteor watch. The reports can be sent to the STAR Centre where they will form part of a bigger report that will be compiled and published as described earlier.

Technical details

see **Meteor Watching** article for a list of equipment.

Safety issues

PLEASE NOTE: It is also important that you prepare your own risk assessments for the practical work in this Brief in the usual way.

Observations at night in remote and/or otherwise empty premises - children should not work alone and should be supervised by an adult(s).

Pupil Research Brief

Teachers' Notes continued

Assessment issues for *Experimental and Investigative Science* (National Curriculum for England and Wales, Northern Ireland Curriculum)

P	Planning	O	Obtaining evidence
A	Analysing evidence	E	Evaluating evidence

The Brief requires pupils to follow set procedures in observing meteors and so it is unlikely that opportunities will arise for the assessment of **Skill Area P**.

The type of observation required by the activities on Research Bulletins M96009 and M96010 may restrict achievement to middle level marks for **Skill Area O**, although projects 5-8 could provide pupils with opportunities to achieve higher marks.

For **Skill Areas A and E**, data from observation would need to be collected for some time to enable higher level marks to be achieved. Using collated data from the STAR Centre could enable higher marks to be achieved.

Scottish syllabus coverage

Standard Grade Physics - *Space Physics*

Further pupil research opportunities

Projects 5 and 6 and particularly 7 and 8 offer ample opportunities for more extended project work. Pupils can be directed to read the article 'Meteors' in the first edition of PRISM, the PRI pupil journal. It briefly describes a fascinating and clever way of counting meteors devised by pupils at the King's School in Worcester. It may stimulate enthusiasm and further ideas.