

Proposal form

Please provide names, status and affiliations of people who will be running the workshop or presentation (max 3):

Miles Hudson. UK physics teacher and textbook author. Inventor of the Best Fit Line Ruler.

Please explain the content of your proposed workshop or presentation, in plain English and in plain Science, and describe any demonstration you are intending to run with or without the pupils:

Astronomy workshops.

I propose three workshops here. I think that these three combined could easily be made into a 3 hour workshop. I suspect though the best format would be two of the workshops with a break in between, totalling 3 hours. This could be split as:

younger pupils (14-16): 1) Telescopes then 2) Aliens

older pupils (16-18) 1) Telescopes then 2) Starlight

1) Telescopes

Studying space really interests young people, so workshops along those lines would be easy to make successful. At school, I do a great lesson where pupils learn about the power of lenses, and this then leads them on to make their own telescope. The physics involved can be taken to as simple or as difficult a level as appropriate, but they all love making the telescope (which is just two lenses sellotaped to the ends of a cardboard tube - the problem to be solved is how long to make the tube so the image is clear).

Activities:

- Discussion of the use of telescopes in astronomy
- Demonstration of focussing of light rays by convex lens
- Demonstration of normal adjustment refracting telescope, and explanation of the design.
- Pupil pairs focus the light from a window to measure focal lengths of many lenses.
- Pupil pairs choose a combination of two lenses and a cardboard tube to construct their own telescope and test it.

2) Aliens

Another one that is of great interest, but often missed out of school lessons, is about communicating with aliens. There's a variety of ideas about how to detect the presence of aliens which we can go through. Then there is a great radio message that was sent out by SETI which the pupils have to try and decode (it's a picture with various bits of information to decipher - older pupils can go into great depth, younger ones can just pick out the person and the map of our solar system and so on) and they can look at the plaques on the Voyager and Pioneer space probes. I'd finish this one with the pupils drawing/constructing their own plaque/message to be sent out.

Activities:

- Discussion of the possibility and implications of the existence of extra-terrestrial intelligence and the ethical and practical difficulties in making contact, including viewing Voyager and Pioneer plaques and explanation of the SETI project.
- Pupils try to decode Drake's radio message, followed by explanation of the solution.
- Pupils draw their own plaque for a new deep space probe

3) Starlight

Older pupils could do some stuff working out the distances to stars, and their speed from redshift of light spectra. An introductory session explaining the concept of a light spectrum, and absorption lines from stellar chemicals can then lead into Doppler shift and galactic red shift. This leads on to Hubble's Law and measurement of red shift, and hence speed of movement, directly from spectra.

Activities:

- Discussion of the information we have from stars, and how we obtain it.
- Pupils observe light spectra using individual diffraction gratings.
- Demonstration of measurement of light spectra in detail using spectrometer and gas discharge tubes.
- Demonstration and explanation of Doppler effect and application to starlight.
- Explanation of Hubble's plot of galactic speed vs distance, and Hubble's law, and implications for the age of the Universe.
- Pupils measure redshift from example spectra and create own Hubble's Law graph and estimate age of the Universe.

Please list and describe material required for the workshop or presentation, stating which you will not be able to bring with you:

All workshops require venue to have normal science teaching materials such as data projector and large work desks.

1) Telescopes

- Many cardboard tubes of varying lengths approx 50mm diameter – possibly able to bring with me (but would be easier if provided at workshop venue)
- Many rolls of sellotape – please provide at venue

2) Aliens

- Various laminated large size photos – I will bring with me
- paper, pencils, coloured pens – please provide at venue

3) Starlight

- Various laminated large size photos – I will bring with me
- graph paper – please provide at venue
- Galactic light spectra source pictures – I will bring with me

Please list and describe products required for the workshop or presentation, stating which you will not be able to bring with you:

1) Telescopes

A small astronomical telescope for demonstration – NOT able to bring with me
 School lab raybox and demonstration convex lens - able to bring with me
 Many round biconvex lenses of varying focal lengths - able to bring with me

2) Aliens

No equipment needed

3) Starlight

- Individual diffraction gratings – able to bring with me
- gas discharge tubes to provide light spectra – possibly able to bring with me (but would be easier if provided at workshop venue)
- bench spectrometer – possibly able to bring with me (but would be easier if provided at workshop venue – it's very heavy)
- electronic speakers on strings – able to bring with me
- Best Fit Line Rulers – I will bring with me