"Keeping warm"

Subject: Physics/Biology

Sensor: Temperature

Overview:
A human 'body' keeps warm in all sorts of ways using different materials. This experiment will compare every-day materials and see why some might be used for clothing. It is also designed to show that some materials are better thermal insulators than others.

Equipment required: LogIT Datalogger
2 or 3 Temperature sensors (HiTemps or ProTemps with extension cables)
2 or 3 small bottles or similar vessels
Different materials eg. bubble wrap, tin foil, cotton wool etc.

Hazards:
Make sure the water is not too hot for the ability of the pupils. Water temperature above 55° C will scold children.
Care must be taken if using kettles to heat the water. Allow the temperature to cool before use.
Place the bottles into a tray to catch any spilt water should the bottles be knocked over.
BE CAREFUL NOT TO HAVE REALLY HOT WATER AS THIS CAN CAUSE SERIOUS BURNS AND WILL ALSO SOFTEN THE PLASTIC OF THE BOTTLES BEING USED.

Setup:

1. Connect the Temperature sensors to the datalogger.
2. You can use a clamp stand to hold the sensors if required.
3. Wrap one of the bottles in the first test material.

Note: The picture shows the use of ProTemps. These have been passed through some modified syringes glued into the top of the bottles. This gives a good tight fit and also ensures that the sensor is in the same position in each bottle for accuracy. In this example, we are comparing an insulated 'body' covered in bubble wrap and an uninsulated 'body'.

Method:
1. Switch on your datalogger or setup your software ready to start taking readings.
2. Fill both bottles with the same amount of hot water (not hotter than 55°C)
3. Start logging.
4. After 20-25 minutes stop logging.
5. If you have been using a remote datalogger, download the results to your computer and display the graph.

Note: If using a few materials, you can use all three channels or if you are using the LogIT DataVision you might like to set up six. Remember you can use the 'Overlay' feature in some datalogging software to place all the results onto one graph for comparison.

Results:

Can you see any differences in the temperature of the bottles after 15 minutes?
Which material is acting as the best insulator?
Is this what you thought would happen?
What would make the hot water cool down more quickly?