

# EXPEDITION CLOTHING: THEN AND NOW

## GUIDING QUESTION

**Do today's fabrics and materials keep a climber warmer than those that Mallory and Irvine wore in 1924?**

**Students conduct an experiment to determine differences in fabrics worn in extreme environments in 1924 and present day.**



### Materials

- three pieces of clothing or samples of the following fabrics:
  - wool
  - flannel
  - tweed
  - gabardine
- three pieces of clothing or samples of the following fabrics:
  - fleece
  - goose down
  - synthetic down
- two plastic containers of the same size with tops (e.g., large yogurt containers)
- water
- freezer
- thermometers
- two 500-ml graduated cylinders
- rubber bands

## DIRECTIONS

### 1. Focus students on the role of clothing in their daily life and for an Everest climber.

Have students think about clothing they wear to keep warm when needed. Ask: *What do you wear for athletic activities in cool or cold temperatures? Do you wear fabrics that are natural, such as cotton or wool, or synthetic, such as nylon or polyester? Do you layer clothing to keep warm or adjust to changing temperatures?* Everest climbers rely on the types of clothing they wear to protect them from freezing temperatures. They also need gear to protect from sun and wind. Explain that in this activity students will test how well different fabrics insulate or protect from cold.

### 2. Have students imagine an Everest climb.

Have students look through the [Wildest Dream photo gallery](#) for photos that show clothing and gear from the past and present. Show the [film trailer](#) and the film clip "Replicating 20's Gear." Students can write their comparisons of clothing and other gear past and present on [Handout 1: Everest Gear Past and Present](#).

### 3. Test how well different fabrics insulate from the cold.

Explain to students that our bodies are 60-70% water. Water maintains its temperature well, but in extreme conditions, such as on Mount Everest, water freezes. This experiment will test the temperature of water that is insulated by the clothing of 1924 and that of today.

This experiment can be a demonstration for the whole class, or students can work in groups to conduct the activity. Distribute [Handout 2: Experiment: Clothing Past and Present](#). Follow the steps to set up the two insulated containers, then place in a freezer, checking and recording the temperatures every two hours.

Student groups share results and discuss. Ask: *How do you think clothing impacts the success of a climb? How might wind, snow, or ice affect the climber's ability to keep going?*



# EXPEDITION CLOTHING: THEN AND NOW

## Handouts

- Everest Gear Past and Present
- Experiment: Clothing Past and Present

## Film Clips

- “Replicating 20’s Gear”
- Movie Trailer:  
<http://video.nationalgeographic.com/video/player/movies/wildestdream/wildest-dream-trailer.html>

## VOCABULARY

- gabardine
- goose down
- insulate
- synthetic clothing

## EXTENDING THE ACTIVITY

- Read the rest of *How We Climbed Everest*. List and describe further improvements you can think of for the comfort and safety of the climbers.
- Have students test to what extent certain fabrics hold water. Since the body’s perspiration works hard at altitude, most clothes will get wet. Clothes made from certain materials that do not dry quickly will chill the body, and in extreme cases lead to hypothermia and a very bad situation, especially at high altitudes. For example, cotton-based clothing that gets wet takes a long time to dry, whereas synthetics such as nylon and fleece dry quickly when exposed to air and body heat.
- Have students research some of the injuries and discomforts climbers experience, such as frostbite, dehydration, sunburn, windburn, snowblindness, etc. Research additional equipment available to help climbers protect themselves from the elements.

## SUGGESTED RESOURCES

The Wildest Dream photo gallery:

[http://movies.nationalgeographic.com/movies/the-wildest-dream/photos#01-wildest-dream-climb-mallory-irvine\\_19160\\_600x450.jpg](http://movies.nationalgeographic.com/movies/the-wildest-dream/photos#01-wildest-dream-climb-mallory-irvine_19160_600x450.jpg)

NOVA Everest Resources:

<http://www.pbs.org/wgbh/nova/everest/exposure/gear.html>

*How We Climbed Everest*:

<http://ngm.nationalgeographic.com/2003/05/everest/bishop-text/11>

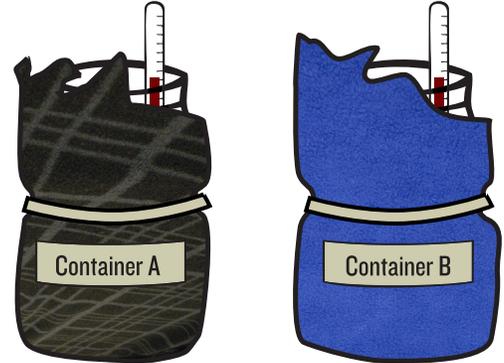




# EXPERIMENT: CLOTHING PAST AND PRESENT

### Materials needed:

- three pieces of clothing or samples of the following fabrics: wool, flannel, tweed, gabardine (worn in 1924)
- three pieces of clothing or samples of the following fabrics: fleece, goose down, synthetic down (worn today)
- two plastic containers of the same size with tops (e.g., large yogurt containers)
- water
- rubber bands
- freezer
- sticky notes
- thermometers
- two 500-ml graduated cylinders



### PROCEDURE:

1. Fill one large graduated cylinder with 500 ml water.
2. Use a thermometer to measure temperature. Record starting time and temperature in the Data Table.
3. Pour 250 ml water from first graduated cylinder into the other graduated cylinder. Use the water dropper to get an exact measure.
4. Transfer water from cylinders to plastic containers. Label containers A and B. Close securely.
5. Wrap Container A in one layer of a fabric Mallory and Irvine would have worn in 1924: flannel, wool, tweed, or gabardine. Repeat with two more layers. Label the outside Container A with a sticky note.
6. Wrap Container B in three layers of fabric worn by Everest climbers today: fleece, goose down, or synthetic down. Secure each layer with a rubber band. Label the outside Container B with a sticky note.
7. Place wrapped containers in a freezer. Check temperatures with a thermometer every 1 to 3 hours, following your teacher's instructions.

DATA TABLE	
	<b>Container A Temperature</b>
Starting time: _____	
Time 2: _____	
Time 3: _____	
Time 4: _____	
Time 5: _____	
	<b>Container B Temperature</b>
Starting time: _____	
Time 2: _____	
Time 3: _____	
Time 4: _____	
Time 5: _____	

**Conclusion:** Describe temperature patterns for Containers A and B. Which fabrics were better insulators?

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