# Crime Busters: Heartless in Harvard. Crime Scene

## THE CRIME:

Harvard University's Biology Department has been burglarized several times during the past several months. The culprit has been stealing sheep and cow organs from research labs. Rolled-up notes, held in place by metallic bands and printed in black ink, were discovered at each crime scene. These notes read:

The first one came from the Wizard of Oz,
But now I take to support my cause.
You might think that my chest is hollow,
But it's my conscience I must follow!

## THE EVIDENCE:

Campus police have identified several suspects and have requested your assistance in solving these crimes. Evidence gathered at the various scenes include:

1. Wide bands of a variety of metals, unique to each crime scene, coiled around the notes left behind
2. Ink from handwritten notes
3. Penmanship samples on the notes
4. Hairs, fibers and polymers found at the crime scenes
5. Shoeprints, several of which include small amounts of dried loam and silt trapped within the soles
6. Human hair from which DNA may be extracted
7. Polymer samples taken from various containers found at the scene

## THE SUSPECTS:

**JUDY GARLAND**, an animal rights activist, who has taken numerous classes at Harvard. She wears solely cotton clothing to assure that no animals were harmed in their manufacture. Judy works for Ruby's Bagels in Harvard Square. She lives with her cat, Gale, her dog, Toto, three birds and six gerbils. To supplement her income, Margaret moonlights as a night custodian at the General Mills Gelatin Factory in Woburn. Environmentally aware, Judy carries used plastic grocery bags to gather droppings while walking her dog along the loam and silt covered trails near her apartment.

**RAY BOLGER** studies anatomy at Harvard and especially enjoys dissecting lab specimens. His father is a fisherman and owner of a struggling fish cannery. Ray often travels home on weekends to work with his father. Although Ray prefers Styrofoam cups when on land, he drinks his coffee out of ceramic cups while at sea.

**JACK H. NAMNIT** works as a lab instructor for the Biology Department at Harvard. He wears cotton lab coats issued by the university. He frequently complains about low wages and supplements his income by baking Munchkins at Fresh'n Tasty Donuts. To save on bus fares, he often rides to work on his bike. For relaxation and exercise he walks his dog, Brick, along the silt-laden trails adjacent to his quiet neighborhood. He carries disposable plastic bags to pick up after his dog.

**BERT LAHR**, an anatomy professor, is disheartened that he was not chosen to chair the Biology Department. He has become visibly upset on several occasions over what he regards as 'nepotism' or 'favoritism'. He often refers to Dr. L. Frank Baum, Dean of the College of Science, as a "heartless" bum. To quell his frustrations, Bert listens to classic Elvis Presley songs on his cell phone.

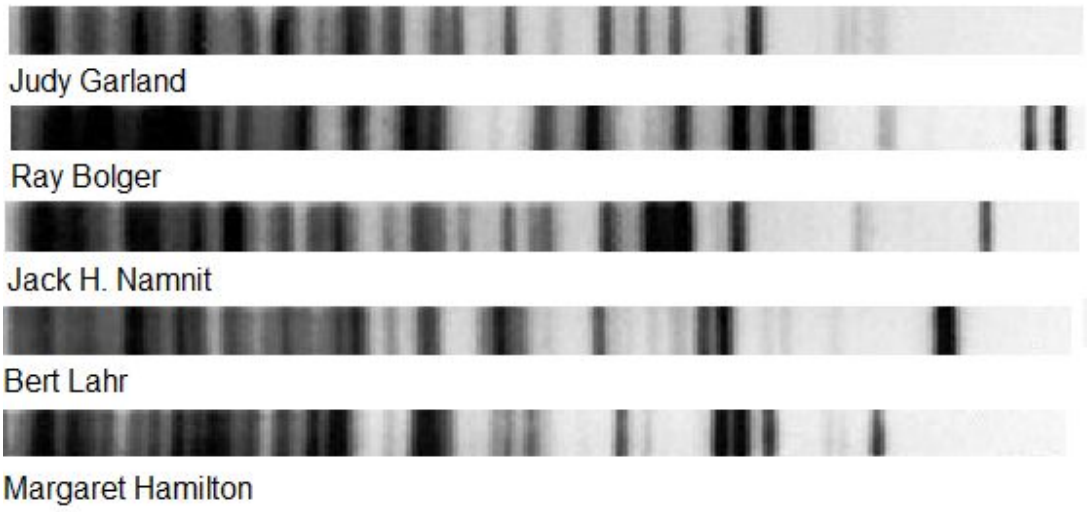
**MARGARET HAMILTON**, a lab custodian for the biology department at Harvard, detests the smell of the preservatives used to maintain lab specimens and frequently threatens to resign her position. The University provides her blue-colored, cotton uniforms. She frequently fills empty yogurt containers with her favorite flavor of Jell-O for late night snacks.

## Crime Busters: Heartless in Harvard. Suspect Data File

### Suspects' Fingerprints

Garland | Bolger | Namnit | Lahr | Hamilton

### Suspects' DNA Fingerprints



Judy Garland

Ray Bolger

Jack H. Namnit

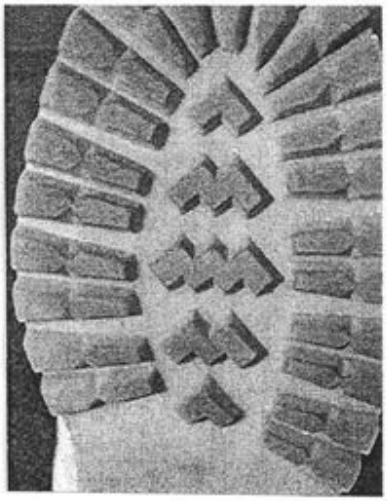
Bert Lahr

Margaret Hamilton

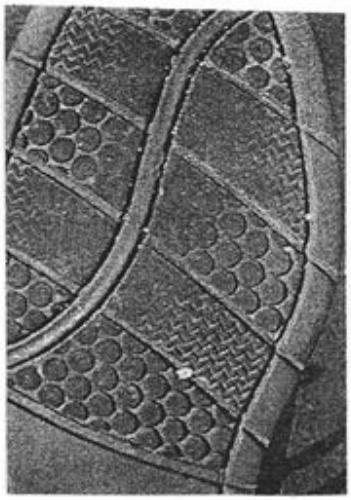
## Crime Busters: Heartless in Harvard. Suspect Data File

### Soles of Suspects' Shoes

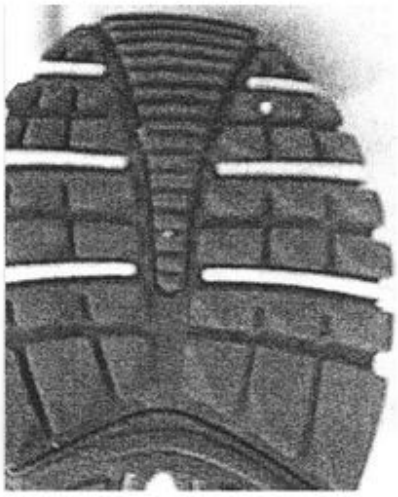
**Judy Garland**



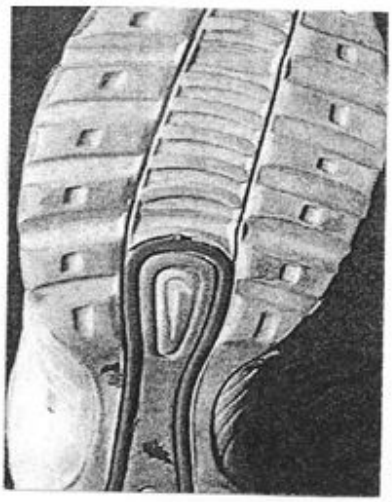
**Ray Bolger**



**Jack H. Namnit**



**Bert Lahr**



**Margaret Hamilton**

## Crime Busters: Heartless in Harvard

## Evidence Found at the Scene

### III. Shoeprints

### IV. Suspect's Fingerprint

### V. Suspect's DNA Fingerprints

# Crime Busters: Heartless in Harvard. Lab Sheet

NAMES:_____ SCORE: _____

**I. UNKNOWN SUBSTANCE ANALYSIS:** Identify the substances.

UNKNOWN 1 _____ & _____ UNKNOWN 6 _____

UNKNOWN 2 _____ UNKNOWN 7 _____

UNKNOWN 3 _____ UNKNOWN 8 _____

UNKNOWN 4 _____ UNKNOWN 9 _____

UNKNOWN 5 _____ UNKNOWN 10 _____

**NOTE**: UNKNOWN 1 is a mixture of two ingredients

**II. FIBER ANALYSIS**: **Identify the types of hair and fibers found at the crime scene.**

Possible hair samples: human, dog, cat Possible fiber samples: wool, cotton, linen, artificial

Slide A: _____ Slide C: _____

Slide B: _____ Slide D: _____

**III. SHOEPRINT ANALYSIS:**

Whose shoeprints were found at the crime scene? _____

Which type of soil was discovered within the deep grooves of the shoe soles? _____

**IV. FINGERPRINT ANALYSIS:**

Whose fingerprints were identified on the notes? _____

Which pattern did these fingerprints display? _____

**V. DNA ANALYSIS:** Whose DNA was discovered at the crime scene? _____

**VI. POLYMER ANALYSIS**

Polymer A and B: No reaction to heat; no reaction to acetone; turned to orange in flame. (These test results have been provided for participants without their having to perform actual laboratory tests.)
Polymers are classified as **PETE**, **HDPE**, **PVC**, **LDPE**, **PP**, **PS**, **PMMA**

Classify polymer A. _____ Classify polymer B. _____ Classify polymer C. _____

Describe the density of Polymer A as compared to water using the symbols < or >. _____

Describe the density of Polymer B as compared to water using the symbols < or >. _____

Describe the density of Polymer C as compared to water using the symbols < or >. _____

Which suspects are associated with polymer A? _____ / _____

Which suspect is associated with polymer B? _____

Which suspect is associated with polymer C? _____

# Crime Busters: Heartless in Harvard. Lab Sheet. Page 2

**VII. CHROMOTOGRAPHY**

Whose pen was used to compose the note? _____

TAPE YOUR CHROMATOGRAM STRIPS IN THE SPACE BELOW.

**VIII. WRITTEN ANALYSIS:** Based on the evidence gathered, identify which suspect committed the crime and explain how you came to that conclusion.

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**IX. CLEAN UP & SAFE LAB PRACTICE.** Supervisor's initials _____

# Crime Busters: Heartless in Harvard. Answer Key

**I. UNKNOWN SUBSTANCE ANALYSIS: (10)**

UNKNOWN 1 **flour / baking soda**

UNKNOWN 2 **copper**

UNKNOWN 3 **silt**

UNKNOWN 4 **loam**

UNKNOWN 5 **yeast**

UNKNOWN 6 **gelatin**

UNKNOWN 7 **aluminum**

UNKNOWN 8 **tin**

UNKNOWN 9 **sand**

UNKNOWN 10 **sugar**

**NOTE**: UNKNOWN 1 is a mixture of two ingredients

**II. HAIR AND FIBER ANALYSIS**: **(4)**

Slide A: **cotton**

Slide B: **dog**

Slide C: **human**

Slide D: **cat**

**III. SHOEPRINT ANALYSIS: (2)**

Whose shoeprints were found at the crime scene? **Garland**

Which type of soil was discovered within the deep grooves of the shoe soles? **Garland**

**IV. FINGERPRINT ANALYSIS: (2)**

Whose fingerprints were found? **Garland**

What pattern do these fingerprints display? **Loop**

**V. DNA ANALYSIS: (1)** Whose DNA matches that of the hair samples? **Garland**

**VI. POLYMER ANALYSIS (9)**

Classify polymer A. **LDPE** Classify polymer B. **PP** Classify polymer C. **PS**

Describe the density of Polymer A as compared to water using the symbols < or >. $\leq$

Describe the density of Polymer B as compared to water using the symbols < or >. $\leq$

Describe the density of Polymer C as compared to water using the symbols < or >. $\geq$

Which suspects are associated with polymer A? **Judy Garland** and **Jack H. Namnit**

Which suspect is associated with polymer B? **Margaret Hamilton**

Which suspect is associated with polymer C? **Judy Garland**

**VII. CHROMOTOGRAPHY (1)** Whose pen was used to compose the note? **Garland**

**VIII. WRITTEN ANALYSIS: (7)**

**Judy Garland** has motive and all evidence points to her. She works at Ruby's Bagels where she is exposed to flour, sugar, yeast and baking soda. She often moonlights at a gelatin factory. Garland has both a dog and a cat. She wears cotton clothing. The ink in her pen matches the ink used in composing the note. Her shoeprints – including loam and silt embedded within them, fingerprints, DNA, and grocery bags made of **HDPE** were found at the crime scene. **Jack H. Namnit** works at a donut shop where he is exposed to a variety of baking ingredients. He has a pet dog. Silt is a common type of soil within his area, but may have been 'picked' up elsewhere. Jack carries grocery bags composed of **HDPD** when he walks his dog. Since there were no footprints, fingerprints or DNA matching his at the scene, it's highly unlikely that he is guilty. **Margaret Hamilton** wears cotton uniforms and her yogurt containers, made of **PP**, were not found at the scene. Little or no evidence points to either **Ray Bolger** or **Bert Lahr**.

**IX. CLEAN UP & SAFE LAB PRACTICE:** Supervisor's initials

MATERIALS REQUIRED FOR THE **HEARTLESS IN HARVARD** LAB

Loam

Silt

Cotton

Sugar

Flour

Salt

Yeast

Cat hair slide

Dog hair slide

Human hair slide

Gelatin

Ink pen

**HDPE** Plastic grocery bag

**PS** Styrofoam cup

**PP** Yogurt container

* Chromatogram supplies

* Suggestion: Prepare, photograph, print and laminate five chromatograms of various inks to be used with all scenarios.Participants must prepare their own chromatogram for the pen included at this station.