DiSCOVER

4-H CRIME & SPY SCIENCE CLUBS
Description
The Discover 4-H Clubs series guides new 4-H volunteer leaders through the process of starting a 4-H club or provides a guideline for seasoned volunteer leaders to try a new project area. Each guide outlines everything needed to organize a club and hold the first six club meetings related to a specific project area.

Purpose
The purpose is to create an environment for families to come together and participate in learning activities that can engage the whole family, while spending time together as a multi-family club. Members will experiment with new 4-H project areas.

What is 4-H?
4-H is one of the largest youth development organizations in the United States. 4-H is found in almost every county across the nation and enjoys a partnership between the U. S. Department of Agriculture (USDA), the state land-grant universities (e.g., Utah State University), and local county governments.

4-H is about youth and adults working together as partners in designing and implementing club and individual plans for activities and events. Positive youth development is the primary goal of 4-H. The project area serves as the vehicle for members to learn and master project-specific skills while developing basic life skills. All projects support the ultimate goal for the 4-H member to develop positive personal assets needed to live successfully in a diverse and changing world.

Participation in 4-H has shown many positive outcomes for youth. Specifically, 4-H participants have higher participation in civic contribution, higher grades, increased healthy habits, and higher participation in science than other youth (Learner et al., 2005).
Utah 4-H
4-H is the youth development program of Utah State University Extension and has more than 90,000 youth participants and 8,600 adult volunteers. Each county (Daggett is covered by Uintah County) has a Utah State University Extension office that administers the 4-H program.

The 4-H Motto
"To Make the Best Better!"

The 4-H Pledge
I pledge: My HEAD to clearer thinking, My HEART to greater loyalty, My HANDS to larger service and My HEALTH to better living, For my Club, my Community, my Country, and my world.

4-H Clubs
What is a 4-H Club? The club is the basic unit and foundation of 4-H. An organized club meets regularly (once a month, twice a month, weekly, etc.) under the guidance of one or more volunteer leaders, elects its own officers, plans its own program, and participates in a variety of activities. Clubs may choose to meet during the school year, only for the summer, or both.

Club Enrollment
Enroll your club with your local Extension office. Each member will need to complete a Club/member Enrollment form, Medical History form, and a Code of Conduct/Photo Release form (print these from the www.utah4h.org website or get them from the county Extension office).

Elect Club Officers
Elect club officers during one of your first club meetings. Depending on how many youth you have in your club, you can decide how many officers you would like. Typical officers will include a president, vice president, pledge leader, and secretary. Other possible officers or committees are: song leader, activity facilitator, clean-up supervisor, recreation chair, scrapbook coordinator, contact committee (email, phone, etc.), field trip committee, club photographer, etc. Pairing older members with younger members as Sr. and Jr. officers may be an effective strategy to involve a greater number of youth in leadership roles and reinforce the leadership experience for both ages. Your club may decide the duration of officers—six months, one year, etc.
A Typical Club Meeting

Follow this outline for each club meeting:

☐ Call to order—President
☐ Pledge of Allegiance and 4-H Pledge—Pledge Leader (arranges for club members to give pledges)
☐ Song—Song Leader (leads or arranges for club member to lead)
☐ Roll call—Secretary (may use an icebreaker or get acquainted type of roll call to get the meeting started)
☐ Minutes of the last meeting—Secretary
☐ Business/Announcements—Vice President
☐ Club Activity—arranged by Activity Facilitator and includes project, lesson, service, etc. These are outlined by project area in the following pages.
☐ Refreshments—arranged by Refreshment Coordinator
☐ Clean Up—led by Clean-up Supervisor

Essential Elements of 4-H Youth Development

The essential elements are about healthy environments. Regardless of the project area, youth need to be in environments where the following elements are present in order to foster youth development.

1. **Belonging**: a positive relationship with a caring adult; an inclusive and safe environment.
2. **Mastery**: engagement in learning; opportunity for mastery.
3. **Independence**: opportunity to see oneself as an active participant in the future; opportunity to make choices.
4. **Generosity**: opportunity to value and practice service to others.

(Information retrieved from: http://www.4-h.org/resource-library/professional-development-learning/4-h-youth-development/youth-development/essential-elements/)
4-H “Learning by Doing” Learning Approach

The Do, Reflect, Apply learning approach allows youth to experience the learning process with minimal guidance from adults. This allows for discovery by youth that may not take place with exact instructions.

4-H Mission Mandates

The mission of 4-H is to provide meaningful opportunities for youth and adults to work together to create sustainable community change. This is accomplished within three primary content areas, or mission mandates: - citizenship, healthy living, and science. These mandates reiterate the founding purposes of Extension (e.g., community leadership, quality of life, and technology transfer) in the context of 21st century challenges and opportunities. (Information retrieved from: http://www.csrees.usda.gov/nea/family/res/pdfs/Mission_Mandates.pdf)

1. Citizenship: connecting youth to their community, community leaders, and their role in civic affairs. This may include: civic engagement, service, civic education, and leadership.
2. Healthy Living: promoting healthy living to youth and their families. This includes: nutrition, fitness, social-emotional health, injury prevention, and prevention of tobacco, alcohol, and other drug use.
3. Science: preparing youth for science, engineering, and technology education. The core areas include: animal science and agriculture, applied mathematics, consumer science, engineering, environmental science and natural resources, life science, and technology.
Getting Started

1. Recruit one to three other families to form a club with you.
   a. Send 4-H registration form and medical/photo release form to each family (available at utah4h.org)
   b. Distribute the Discover 4-H Clubs curriculum to each family
   c. Decide on a club name
   d. Choose how often your club will meet (e.g., monthly, bi-monthly, etc.)
2. Enroll as a 4-H volunteer at the local county Extension office (invite other parents to do the same)
3. Enroll your club at the local county Extension office
   a. Sign up to receive the county 4-H newsletter from your county Extension office to stay informed about 4-H-related opportunities.
4. Identify which family/adult leader will be in charge of the first club meeting.
   a. Set a date for your first club meeting and invite the other participants.
5. Hold the first club meeting (if this is a newly formed club).
   a. See A Typical Club Meeting section above for a general outline.
      i. Your activity for this first club meeting will be to elect club officers and to schedule the six project area club meetings outlined in the remainder of this guide. You may also complete a-d under #1 above.
   b. At the end of the first club meeting, make a calendar outlining the adult leader in charge (in partnership with the club president) of each club meeting along with the dates, locations, and times of the remaining club meetings.
6. Hold the six project-specific club meetings outlined in this guide.
7. Continue with the same project area with the 4-H curriculum of your choice (can be obtained from the County Extension Office) OR try another Discover 4-H Club project area.

Other Resources

Utah 4-H website: www.Utah4h.org
National 4-H website: www.4h.org
4-H volunteer training:
   To set up login: http://utah4h.org/htm/volunteers/get-involved/new-volunteer-training
   To start modules: http://4h.wsu.edu/volunteertraining/course.html
   (password = volunteer)

References

Information was taken from the Utah 4-H website (utah4h.org), the National 4-H Website (4h.org), the Utah Volunteer Handbook, or as otherwise noted.


We would love feedback or suggestions on this guide; please go to the following link to take a short survey:
http://tinyurl.com/lb9tnad
4-H CRIME & SPY SCIENCE CLUB Meetings

Club Meeting 1
Spy Kits/Opening Letters .................................................. 2

Club Meeting 2
Hidden Messages .................................................................. 5

Club Meeting 3
Fingerprinting .................................................................... 8

Club Meeting 4
Mystery Powder Analysis ..................................................... 11

Club Meeting 5
DNA Extraction .................................................................... 14

Club Meeting 6
A House Divided ................................................................... 17

Libby Porter | Dave Francis | Stacey MacArthur
Utah State University Extension
In this club we will investigate crime scenes and learn the skills necessary to become top detectives and solve mysteries. Today we will make top secret spy kits and learn how to open and reseal letters without a trace!

WHAT TO DO
First, everyone should write down on a piece of paper their predictions about what will happen during the experiments. This will be the spy notebook.

ACTIVITY 1: SPY KIT DIRECTIONS
Time: 10 minutes

1. Each person should get a pencil box for a spy kit container and use a permanent marker to put his or her name on it. Each person should receive a magnifying glass, dark sunglasses, a few small Ziploc bags, a small paintbrush, small flashlight, pencil, and a note pad to put in the spy kit.
2. These kits will be used throughout the club to help youth solve crimes.
ACTIVITY 2: OPENING LETTERS DIRECTIONS

Time: 20 minutes

1. Put the tea kettle on the stove, heat until water boils, and then reduce heat to medium.
2. Write a message on a sheet of paper, put it in an envelope, and then seal it.
3. Wearing an oven mitt, use the tongs to hold the envelope. Carefully place the sealed flap of the envelope in front of the steam coming from the spout of the kettle. Hold it there for 30 seconds.
4. After 30 seconds remove the envelope and try to open the flap. If you cannot open it, return the envelope to the steam for another 30 seconds.
5. Continue the process until you are able to open the envelope.
6. After you read the letter you can put it back in the envelope, reseal it, and send it on its way!

At the end of the experiments, everyone should write down their observations and the results of the experiment and then discuss them as a group.

Reflect

- What do you think real spies have in their kits?
- What are the most important things to have in your kit?
- How can spies and investigators use this method of opening letters?
- Were you able to open the envelope without any signs of struggle?
- How do you think this works?
- How can you seal your envelopes to avoid anybody from opening them?

Apply

- All spies and detectives need to have a few necessities in a kit that is always with them while investigating. In this spy kit the magnifying glass is used to search for clues and fingerprints. The dark sunglasses are specifically designed for undercover purposes. The small Ziploc bags are evidence bags used for collecting any small bits of evidence to examine. The paintbrush is used to dust for fingerprints, while the flashlight is used for finding the way around in the dark on a secret mission or on a crime scene. Lastly, the pencil and note pad are necessary for making special notes to leave for others or to write down notes for you to remember.
Apply Continued

- The glue on the flap of the envelope is made of a chemical that is water soluble, meaning it dissolves, or it becomes liquid in water. When you lick the envelope flap, the glue dissolves, forming a sticky liquid. After sealing the envelope, the water evaporates (changing from a liquid to gas), causing the liquid to change from a sticky liquid back into a gas. The glue hardens, sealing the flap of the envelope, and the letter remains closed. When you boil water, it changes rapidly from a liquid to a gas. Water’s gas form is called water vapor and it is invisible. However, the water vapor condenses (changing from a gas to a liquid) as it cools, changing into tiny droplets of water called steam. When the envelope is put in the steam, the steam causes the glue to dissolve again and become sticky. After reading the letter, put it back in the envelope, reseal it, and send it on its way. There are no signs that the letter has been opened. Transparent tape is the best known protection against opening letters. The glue on transparent tape is not water soluble. So far, no way has been found to remove the tape from an envelope and replace it without leaving telltale marks.

Belonging

Working together as a group of detectives will create a sense of unity as youth work through failure and success to solve the crime.

Science

Youth will explore the science behind investigating crime scenes and identifying evidence. They will also learn about solubility and physical changes of state.

Mastery

Youth will focus on paying attention to details and using critical thinking to make conclusions and find answers.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

References

In this club we will investigate crime scenes and learn the skills necessary to become top detectives and solve mysteries. Today we will discover the secrets behind writing invisible messages!

WHAT TO DO
First, everyone should write their predictions about what will happen during the experiments in their spy notebook.

ACTIVITY 1: INVISIBLE INK MESSAGES DIRECTIONS
Time: 15 minutes
1. Write a message on a piece of paper with lemon juice using a cotton swab.
2. Allow the lemon juice to dry so there is no visible message on the paper.
3. Use a hair dryer on the paper and watch the message slowly appear.
4. Now you can write secret messages to your friends using invisible ink!
ACTIVITY 2: MILKY MESSAGES DIRECTIONS

Time: 20 minutes
1. Put the milk into a bowl.
2. Dip the cotton swab into the milk and write a message on the paper.
3. Allow the message to dry completely. Do not blot the message. You should not be able to see the message after it has dried.
4. When the message has dried, hold the pencil over the paper. Use the sandpaper to scrape the lead so that black powder covers the message.
5. Gently rub the powder over the message area on the paper.

At the end of the experiments, everyone should write down their observations and the results of the experiment and then discuss them as a group.

Reflect
- What happened when you heated the paper with the hair dryer?
- How did this experiment work with each of the different juices?
- Which juice worked the best?
- Why do you think the ink shows up when you heat the paper?
- What happened when you spread the black powder over the paper?
- What other liquids do you think would work?

Apply
- Lemon juice is very light colored and is difficult to see after it has dried. However, when you use the hair dryer, the heat turns the lemon juice brown and the hidden message appears. Fruit juices, including lemon juice, and other liquids such as milk and soda, contain carbon atoms, which in lemon juice are bonded to other atoms to form carbon-containing molecules. These carbon-containing molecules have almost no color when dissolved in liquid. However, when these liquids are heated, a chemical reaction occurs. The carbon-containing molecules break apart and produce the element carbon. An element is a substance that cannot be broken down further chemically.
- Milk contains many chemicals mixed with water. One of these chemicals is fat, a food nutrient. The milk used in this activity is homogenized, which means that the fat has been made very fine and spread evenly throughout the milk. The fat is nearly invisible when it dries on white paper. However, when you scrape the pencil lead, the fat becomes visible. Pencil lead is made of graphite, which is a form of the element carbon. The graphite scrapings stick to the fat in the dried milk, but not to the rest of the paper, thus allowing the hidden message to appear. Because there is less fat in 1% and 2% milk than in whole milk, the experiment does not work as well for those kinds of milk.
Belonging
Working together as a group to conduct and explore these science experiments will create a sense of unity as youth work through failure and success.

Science
Youth will explore the chemical reactions that are used in the process of identifying and examining evidence.

Mastery
Youth will focus on paying attention to details and using critical thinking to make conclusions and find answers.

Independence
The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

References
In this club we will investigate crime scenes and learn the skills necessary to become top detectives and solve mysteries. Today we will examine our fingerprints as well as dust the crime scene for fingerprints in order to identify the culprit!

WHAT TO DO
First, everyone should write their predictions about what will happen during the experiments in their spy notebook.

ACTIVITY 1: FINGERPRINTING DIRECTIONS

Supplies
- Paper
- Pens/pencils

Fingerprinting
- White paper
- Pencils (non-mechanical)
- Clear tape

Dusting for Fingerprints
- Cocoa powder
- Glass container/glass object
- Small paintbrushes
- Clear tape
- Black paper

Time: 15 minutes
1. Give each person a piece of white paper and a pencil. Rub the pencil on the paper in the same spot until it is dark with lead.
2. Rub a finger over the spot until the end of the finger is covered with lead.
3. Then press the finger with lead down on the sticky side of a piece of tape.
4. Turn the tape over and stick it onto a black spot on the white paper.
5. The fingerprint should now appear on the white paper.
6. Find out what kind of fingerprint the youth have by comparing it to the example pictures.
Dusting for Fingerprints

ACTIVITY 2: DUSTING FOR FINGERPRINTS DIRECTIONS

Time: 15 minutes

1. Give each person a glass container or any glass object.
2. Wipe your finger alongside your nose so that it is oily and then make a fingerprint on the glass.
3. Sprinkle cocoa powder onto the fingerprint. Lightly dust off the excess powder using a paintbrush.
4. Place a piece of tape on the fingerprint, then lift it back off and stick the tape to a piece of black paper.
5. The fingerprint should then be visible.

At the end of the experiments, everyone should write down their observations and the results of the experiment and then discuss them as a group.

Reflect

• How are fingerprints important when you are studying a crime scene?
• Why do you think we fingerprint babies when they are born?
• What kind of fingerprint do you have?
• How can fingerprints be classified?
• How would classification make it easier to match one print against a database of many?
• Where would you want to look for fingerprints at a crime scene?
• Why is it important to dust for fingerprints?

Apply

• Fingerprints must be removed and transported to the crime lab. They are often compared to the database of fingerprints on file. One way detectives collect fingerprints is by dusting for them. Fingerprints are coated with powder and then removed and taken to the lab for identification.
• The patterns of ridges on our finger pads are unique; no two individuals (even identical twins) have fingerprints that are exactly alike. We leave impressions, or prints, on everything we touch with even the smallest amount of pressure. The prints can be visible, as when our fingers are dirty or oily, or they can be latent, as when they are made only by the sweat that is always present on our finger ridges. Injuries such as burns or scrapes will not change the ridge structure; when new skin grows in, the same pattern will come back.
Belonging
Working together as a group of detectives will create a sense of unity as youth work through failure and success to solve the crime.

Science
Youth will learn about fingerprints and how they are used to identify people.

Mastery
Youth will focus on paying attention to details and using critical thinking to make conclusions and find answers.

Independence
The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

References
In this club we will investigate crime scenes and learn the skills necessary to become top detectives and solve mysteries. Today we will observe chemical reactions in order to identify the mystery substance found at the scene of the crime!

**WHAT TO DO**

First, everyone should write their predictions about what will happen during the experiments in their spy notebook.

### Mystery Powder Analysis

**ACTIVITY 1: MYSTERY POWDER ANALYSIS DIRECTIONS**

**Time: 30 minutes**

1. Start off by telling the group that there was a mystery substance discovered at the scene of the crime and it is their job to identify the powder in order to link it to the criminal!
2. Use the sticky notes to create labels for each of the three powders and three liquids. Arrange them in a grid, just as the diagram shows.
3. Put 1 teaspoon of baking powder into three different cups. Repeat this for the baking soda and the flour. You should have nine cups total. Line them up under their labels (see illustration).
4. Use the pipette to put 5-10 drops of grape juice into the baking powder. Record observations in the spy notebook. Look for a chemical reaction. Some signs may include foaming, fizzing, or a change in color. In some cases no reaction will occur.
5. Now try the grape juice on the other two powders and continue to record observations.
6. Repeat the last two steps for both the vinegar and the iodine, so each powder is mixed with each of the three different liquids.

**Supplies**

- Paper
- Pens/pencils
- Grape juice
- Vinegar
- Iodine
- Baking powder
- Flour
- Measuring spoons
- 12 small cups
- 3 pipettes/eye droppers
- Paper towels
- Sticky notes
- Baking soda
- Measuring spoons
- Paper towels
- Sticky notes

---

In this club we will investigate crime scenes and learn the skills necessary to become top detectives and solve mysteries. Today we will observe chemical reactions in order to identify the mystery substance found at the scene of the crime!

**WHAT TO DO**

First, everyone should write their predictions about what will happen during the experiments in their spy notebook.

### Mystery Powder Analysis

**ACTIVITY 1: MYSTERY POWDER ANALYSIS DIRECTIONS**

**Time: 30 minutes**

1. Start off by telling the group that there was a mystery substance discovered at the scene of the crime and it is their job to identify the powder in order to link it to the criminal!
2. Use the sticky notes to create labels for each of the three powders and three liquids. Arrange them in a grid, just as the diagram shows.
3. Put 1 teaspoon of baking powder into three different cups. Repeat this for the baking soda and the flour. You should have nine cups total. Line them up under their labels (see illustration).
4. Use the pipette to put 5-10 drops of grape juice into the baking powder. Record observations in the spy notebook. Look for a chemical reaction. Some signs may include foaming, fizzing, or a change in color. In some cases no reaction will occur.
5. Now try the grape juice on the other two powders and continue to record observations.
6. Repeat the last two steps for both the vinegar and the iodine, so each powder is mixed with each of the three different liquids.

**Supplies**

- Paper
- Pens/pencils
- Grape juice
- Vinegar
- Iodine
- Baking powder
- Flour
- Measuring spoons
- 12 small cups
- 3 pipettes/eye droppers
- Baking soda
- Measuring spoons
- Paper towels
- Sticky notes

---
ACTIVITY 1: MYSTERY POWDER ANALYSIS CONTINUED

7. Now it is time for the mystery substance. Select one person to choose a mystery substance from one of the three different powders (baking soda, baking powder, flour) and put 1 teaspoon of it into each of the three cups. Make sure to keep the identity of the substance a secret so that the mystery doesn’t get revealed!

8. Line each of the three mystery powder cups up to each liquid. Test and record observations.

9. Compare data and draw conclusions.

At the end of the experiments, everyone should write down their observations and the results of the experiment and then discuss them as a group.

Reflect

- What was the mystery substance?
- Were you surprised by any of the chemical reactions?
- Which mixture made the biggest reaction?
- How can detectives use this technique to solve mysteries?
- Why is it important to write down your observations as you go?

Apply

- In this activity you performed an experiment and analyzed data just like a scientist does. A chemical will react in the same way every time, as long as the conditions are the same. You set up the experiment so that each powder was tested in exactly the same way and then you observed the reactions and recorded your data. As you drew conclusions about what the mystery substance was, your conclusions were supported by scientific evidence.
Belonging
Working together as a group of detectives will create a sense of unity as youth work through failure and success to solve the crime.

Science
Youth will explore chemical reactions and use the scientific method to make observations and draw conclusions.

Mastery
Youth will focus on paying attention to details and using critical thinking to make conclusions and find answers.

Independence
The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

References
In this club we will investigate crime scenes and learn the skills necessary to become top detectives and solve mysteries. Today we will learn about DNA and how it can be extracted from fruit!

WHAT TO DO
First, everyone should write their predictions about what will happen during the experiments in their spy notebook.

ACTIVITY 1: DNA EXTRACTION DIRECTIONS
Time: 30 minutes
1. Measure 2 teaspoons of shampoo into a small cup.
2. Add 2-3 pinches of salt (NaCl) to the shampoo.
3. Add 4 teaspoons of tap water. Mix with a spoon, but try to avoid creating bubbles in the solution. DNA is soluble in water.
4. Add 1 pinch or shake of meat tenderizer. Mix until dissolved.
5. Use fruit for this step. Some suggested fruits are: 3-4 strawberries, ½ pint blueberries, ½ a nectarine, or ½ a banana.
6. Place the fruit in a blender. Add 1 cup of water.
7. Place the lid on the blender and blend for 20 seconds until the mixture is the consistency of a smoothie. Add fruit or water as needed.
ACTIVITY 1: DNA EXTRACTION CONTINUED

8. Add 4 teaspoons of the fruit puree to the cup with the shampoo solution. Gently mix with a spoon for 5 minutes. Try not to create too much foaming. This will interfere with the filtration step and may damage the long, fragile DNA molecules. Save the remaining fruit puree in the blender container. This can be used to make a smoothie.

9. Place the coffee filter into a cup. The bottom of the filter must not touch the bottom of the cup. Fold the edge of the filter over the cup.

10. After the fruit-shampoo mixture has been mixed for 5 minutes, pour it into the coffee filter. Filter the mixture for approximately 5 minutes (or until there are at least 4 teaspoons of liquid in the cup).

11. Pour 4 teaspoons of ICE COLD 91% Isopropyl rubbing alcohol into the clear film canister. It should be approximately half full.

12. Add 2 teaspoons of the filtered fruit solution to the small container of cold alcohol. There will be two layers in your container. Do not mix these layers! After a few minutes a white “glob” will start to form in the solution. This is DNA! You can try to spool out the DNA using a toothpick.

13. To save the DNA, remove it from the container and store it in a different container containing only alcohol.

14. When you are finished with the DNA you can make a smoothie with your leftover fruit puree!

At the end of the experiments, everyone should write down their observations and the results of the experiment and then discuss them as a group.

Reflect

• What is DNA?
• Why did you have to shake the strawberry solution?
• Why do you think you needed to add the soap?
• What was the purpose of the ice cold alcohol?
• Why do you need to store the DNA in alcohol?

Apply

• The lipid bilayer of the cell membrane and nuclear membrane is broken down by soaps, such as lauryl or laureth sulfate found in shampoo and dish soap. Shampoo also contains EDTA (ethylene diamine tetraacetic acid), which binds to cations such as Mg2+. Cations are sometimes used as cofactors that help enzymes work properly. Without the cofactor the enzyme can’t function. One enzyme that is detrimental to DNA is nuclease, which breaks down the DNA. EDTA binds to Mg2+ and prevents it from assisting nucleases in their destruction of DNA.
• The positively charged sodium ions (Na+) are attracted to the negative charge of the DNA. This creates a “shield” around the DNA molecules and causes them to stick together. This enables the DNA to precipitate out of the solution when added to the alcohol in a later step. Salt also causes proteins in the fruit mixture to denature and precipitate out of the solution.
Apply Continued

- Meat tenderizer contains the molecule papain, which breaks down certain proteins including other enzymes. The meat tenderizer helps to protect the DNA by breaking down nucleases.
- Blending the fruit with water causes some of the cells in the fruit to break open. Because DNA has a negative charge it is able to dissolve in the water. Many other cell parts are not soluble in water.
- Filtering the soapy fruit solution through a coffee filter removes extra cell debris (cell membranes, precipitated proteins, and excess fruit pieces that didn’t get pureed in the blender).
- DNA molecules are soluble in water, but not in an alcohol solution. When the fruit DNA solution comes in contact with alcohol, the long, stringy DNA molecules precipitate into the alcohol. The long, stringy precipitated DNA is thousands of DNA molecules that are stuck together.
- Pure DNA is a colorless molecule. Any visible color is caused by fruit pigment molecules that got trapped in the string DNA.

Belonging

Working together as a group of detectives will create a sense of unity as youth work through failure and success to solve the crime.

Science

Youth will explore DNA and how it can be extracted from fruit. They will also discuss enzyme activity and how it all relates to the human body.

Mastery

Youth will focus on paying attention to details and using critical thinking to make conclusions and find answers.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

References

Zanta, Carolyn A. UIUC-Hughes Biotechnology Education and Outreach Program. (www.life.uiuc.edu/hughes/foot-locker) Activity modified from Iowa State University Biotechnology Center.
In this club we will investigate crime scenes and learn the skills necessary to become top detectives and solve mysteries. Today we will have to piece together the evidence to find out which suspect has been stealing money from the mortgage company!

**WHAT TO DO**
First, everyone should write their predictions about what will happen during the experiments in their spy notebook.

**Background Information**
A large mortgage company suspects that one of its loan officers is preparing fraudulent loan applications and pocketing the money. They are not sure which officer is involved although they believe they have it narrowed down to three individuals: Cameron Robinson, Luis Rothstein, and Amanda Remillard. However, the culprit learned of the company's suspicions and shredded the evidence! Your lab has been asked to assist in reconstructing the evidence to determine which of the three suspects is guilty of this fraud.

**Prior to the Activity**
The following pages (pages 20-25) are documents that have been recovered from the offices of the mortgage company. They include: four shredded loan applications, an email describing the purchase of several stolen identities, and a partial list of the stolen identities. These documents need to be photocopied, and then individually shredded (either by hand or with an electric paper shredder). Do not use a cross cut paper shredder. Place the remains of each individual document in separate plastic bags.

**ACTIVITY 1: A HOUSE DIVIDED DIRECTIONS**
Time: 30 minutes
1. Divide into groups and give each group a plastic bag containing a shredded document. Reassemble the document and use the tape to hold it together.
ACTIVITY 1: A HOUSE DIVIDED CONTINUED

2. Once all the documents have been pieced together, examine the documents and discuss the allegations.
3. No one document is enough to incriminate any of the suspects. However, after reviewing all six documents, youth should be able to reconstruct the crime and identify the culprit.

At the end of the experiments, everyone should write down their observations and the results of the experiment and then discuss them as a group.

Reflect

- Who was the culprit?
- What was the evidence that incriminated the suspect?
- What was difficult about this activity?
- Were your initial allegations correct?
- Why was it important to read all of the documents before accusing any one suspect?

Apply

- This is a good activity to emphasize attention to detail, patience, and the accuracy that are required by many forensic careers. Things don’t happen nearly as quickly in real life as they do on television. In this instance, this is a real case from a document examiner. IMPORTANT: ALL IDENTITIES ON THESE DOCUMENTS ARE FICTITIOUS!
Belonging
Working together as a group of detectives will create a sense of unity as youth work through failure and success to solve the crime.

Science
Youth will explore the science behind identifying and examining evidence. They will use the scientific method to make observations and draw conclusions based on evidence.

Mastery
Youth will focus on attention to detail, patience, and accuracy, which are all required by many forensic careers.

Independence
The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

References
Zanta, Carolyn A. UIUC-Hughes Biotechnology Education and Outreach Program. www.life.uiuc.edu Activity modified from Iowa State University Biotechnology Center.
Subject: RE: ID Auction Listing
From: <HaXrUs> anonymous@advicebox.com
Date: Saturday 26 May 2007 16:24:22 -0500
To: “MoneyMaster” mm@pookmail.com

Payment received!
These IDs are fresh, so no one should notice anything wrong for at least a couple of weeks. Use them wisely, and remember—if anyone ever comes asking about these, you never heard of me!

ATTACHMENTS:

--- Original Message ---
Subject: RE: ID Auction Listing
From: “MoneyMaster” mm@pookmail.com
Date: Friday 25 May 2007 16:24:22 -0500
To: <HaXrUs> anonymous@advicebox.com

HaXrUS,

Won your auction on IdentityAction.info. I need the list of stolen IDs delivered ASAP—big deals in the works.
<table>
<thead>
<tr>
<th>Name</th>
<th>City</th>
<th>State</th>
<th>ZipCode</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atkins</td>
<td>New York</td>
<td>NY</td>
<td>10005</td>
<td>2127 2828 Mount Tabor</td>
</tr>
<tr>
<td>Britts</td>
<td>S Boston</td>
<td>MA</td>
<td>02125</td>
<td>4050 Ferguson Street</td>
</tr>
<tr>
<td>Brown</td>
<td>Fayetteville</td>
<td>AR</td>
<td>72108</td>
<td>1234 Vineyard Drive</td>
</tr>
<tr>
<td>Carter</td>
<td>New Berlin</td>
<td>WI</td>
<td>53156</td>
<td>2100 2329 Forton Circle</td>
</tr>
<tr>
<td>Cha</td>
<td>New Berlin</td>
<td>WI</td>
<td>53156</td>
<td>2100 2329 Forton Circle</td>
</tr>
<tr>
<td>Conner</td>
<td>Taunton</td>
<td>MA</td>
<td>02125</td>
<td>3412 Kennedy Court</td>
</tr>
<tr>
<td>Corcoran</td>
<td>Hibbing</td>
<td>MN</td>
<td>56746</td>
<td>3412 Kennedy Court</td>
</tr>
<tr>
<td>Delong</td>
<td>Phoenix</td>
<td>AZ</td>
<td>85003</td>
<td>2100 2329 Forton Circle</td>
</tr>
<tr>
<td>Farrow</td>
<td>New York</td>
<td>NY</td>
<td>10010</td>
<td>2100 2329 Forton Circle</td>
</tr>
<tr>
<td>Gonzales</td>
<td>Middletown</td>
<td>CT</td>
<td>06256</td>
<td>3412 Kennedy Court</td>
</tr>
<tr>
<td>Gray</td>
<td>New York</td>
<td>NY</td>
<td>10010</td>
<td>2100 2329 Forton Circle</td>
</tr>
<tr>
<td>Hackett</td>
<td>New York</td>
<td>NY</td>
<td>10010</td>
<td>2100 2329 Forton Circle</td>
</tr>
<tr>
<td>Isaacs</td>
<td>Huntington</td>
<td>WV</td>
<td>25701</td>
<td>3412 Kennedy Court</td>
</tr>
<tr>
<td>Johnson</td>
<td>Huntington</td>
<td>WV</td>
<td>25701</td>
<td>3412 Kennedy Court</td>
</tr>
<tr>
<td>Kellerman</td>
<td></td>
<td></td>
<td></td>
<td>3412 Kennedy Court</td>
</tr>
</tbody>
</table>

Activity taken directly from: Carolyn A. Zanta, UIUC-Hughes Biotechnology Education and Outreach Program
www.life.uiuc.edu (activity modified from Iowa State University Biotechnology Center)
# Residence for Life, Ltd., Home Mortgage Application

This application is designed to be completed by the applicant(s) with the Lender's assistance. Applicants should complete this form as "Borrower" or "Co-Borrower" as applicable. Co-Borrower information must also be provided when either the income or assets of a person other than the Borrower (including the Borrower's spouse) will be used as a basis for loan qualification or the income or assets of the Borrower's spouse or other person who has community property rights pursuant to state law will not be used as a basis for loan qualification, but his or her liabilities must be considered because the spouse or other person has community property rights pursuant to applicable law and Borrower resides in a community property state, the security property is located in a community property state, or the Borrower is relying on other property located in a community property state as a basis for repayment of the loan.

## Loan Applicant

<table>
<thead>
<tr>
<th>Name</th>
<th>DOB</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maria D. Carter</td>
<td>10/5/53</td>
<td>F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
<th>City</th>
<th>State</th>
<th>ZIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>4988 Hart Street</td>
<td>Farmington</td>
<td>CT</td>
<td>6032</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSN</th>
<th>Home Phone #</th>
</tr>
</thead>
<tbody>
<tr>
<td>040-80-8147</td>
<td>860-284-0614</td>
</tr>
</tbody>
</table>

## Loan Co-Signer

<table>
<thead>
<tr>
<th>Name</th>
<th>DOB</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phillip Beers</td>
<td>10/13/42</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
<th>City</th>
<th>State</th>
<th>ZIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>629 Mount Tabor</td>
<td>New York</td>
<td>NY</td>
<td>10005</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSN</th>
<th>Home Phone #</th>
</tr>
</thead>
<tbody>
<tr>
<td>115-64-0860</td>
<td>914-509-2933</td>
</tr>
</tbody>
</table>

Each of the undersigned specifically represents to Lender and to Lender's actual or potential agents, brokers, processors, attorneys, insurers, servicers, successors and assigns and agrees and acknowledges that the information provided in this application is true and correct as of the date set forth opposite my signature and that any intentional or negligent misrepresentation of this information contained in this application may result in civil liability, including monetary damages, to any person who may suffer any loss due to reliance upon any misrepresentation that I have made on this application, and/or in criminal penalties including, but not limited to, fine or imprisonment or both under the provisions of Title 18, United States Code, Sec. 1001, et seq.

**Maria D. Carter**  
Applicant's Signature

**Phillip Beers**  
Co-Signer's Signature

**Amanda Remillard**  
Mortgage Broker's Signature

**May 27, 2007**  
Date

---

Activity taken directly from: Carolyn A. Zanta UIUC-Hughes Biotechnology Education and Outreach Program  
www.life.uiuc.edu (activity modified from Iowa State University Biotechnology Center)
# Residence for Life, Ltd., Home Mortgage Application

This application is designed to be completed by the applicant(s) with the Lender's assistance. Applicants should complete this form as "Borrower" or "Co-Borrower", as applicable. Co-Borrower information must also be provided when either the income or assets of a person other than the Borrower (including the Borrower's spouse) will be used as a basis for loan qualification or the income or assets of the Borrower's spouse or other person who has community property rights pursuant to state law will not be used as a basis for loan qualification. The person's liabilities must be considered because the spouse or person has community property rights pursuant to applicable law and Borrower resides in a community property state. The security property is located in a community property state, or the Borrower is relying on other property located in a community property state as a basis for repayment of the loan.

## Loan Applicant

<table>
<thead>
<tr>
<th>Name</th>
<th>DOB</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sean Corcoran</td>
<td>3/6/59</td>
<td>M</td>
</tr>
<tr>
<td>Address</td>
<td></td>
<td></td>
</tr>
<tr>
<td>592 Joseph Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>State</td>
<td>ZIP</td>
</tr>
<tr>
<td>New Berlin</td>
<td>WI</td>
<td>53151</td>
</tr>
<tr>
<td>SSN</td>
<td>Home Phone #</td>
<td></td>
</tr>
<tr>
<td>389-05-2790</td>
<td>262-730-5905</td>
<td></td>
</tr>
</tbody>
</table>

## Loan Co-Signer

<table>
<thead>
<tr>
<th>Name</th>
<th>DOB</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosa Isaacson</td>
<td>1/29/43</td>
<td>F</td>
</tr>
<tr>
<td>Address</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3061 Rowes Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>State</td>
<td>ZIP</td>
</tr>
<tr>
<td>Paducah</td>
<td>KY</td>
<td>42001</td>
</tr>
<tr>
<td>SSN</td>
<td>Home Phone #</td>
<td></td>
</tr>
<tr>
<td>406-72-6327</td>
<td>270-587-1529</td>
<td></td>
</tr>
</tbody>
</table>

Each of the undersigned specifically represents to Lender and to Lender's actual or potential agents, brokers, processors, attorneys, insurers, servicers, successors and assigns and agrees and acknowledges that the information provided in this application is true and correct as of the date set forth opposite my signature and that any intentional or negligent misrepresentation of this information contained in this application may result in civil liability, including monetary damages, to any person who may suffer any loss due to reliance upon any misrepresentation that I have made on this application, and/or in criminal penalties including, but not limited to, fine or imprisonment or both under the provisions of Title 18, United States Code, Sec 1001, et seq.

---

**Sean Corcoran**
Applicant's Signature

**Rosa Isaacson**
Co-Signer's Signature

**Amanda Remillard**
Mortgage Broker's Signature

**June 4, 2007**
Date

Activity taken directly from: Carolyn A. Zanta, UIUC-Hughes Biotechnology Education and Outreach Program

www.life.uiuc.edu (activity modified from Iowa State University Biotechnology Center)
# Residence for Life, Ltd., Home Mortgage Application

This application is designed to be completed by the applicant(s) with the Lender's assistance. Applicants should complete this form as "Borrower" or "Co-Borrower," as applicable. Co-Borrower information must also be provided when either the income or assets of a person other than the Borrower (including the Borrower's spouse) will be used as a basis for loan qualification or the income or assets of the Borrower's spouse or other person who has community property rights pursuant to state law will not be used as a basis for loan qualification, but his or her liabilities must be considered because the spouse or other person has community property rights pursuant to applicable law and Borrower resides in a community property state, the security property is located in a community property state, or the Borrower is relying on other property located in a community property state as a basis for repayment of the loan.

## Loan Applicant

<table>
<thead>
<tr>
<th>Name</th>
<th>DOB</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joann S. Hatmaker</td>
<td>12/4/83</td>
<td>F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
<th>State</th>
<th>ZIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>3363 Settlers Lane</td>
<td>NY</td>
<td>10016</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSN</th>
<th>Home Phone #</th>
</tr>
</thead>
<tbody>
<tr>
<td>095-58-1575</td>
<td>917-795-7657</td>
</tr>
</tbody>
</table>

## Loan Co-Signer

<table>
<thead>
<tr>
<th>Name</th>
<th>DOB</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>James H. Morris</td>
<td>7/18/47</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
<th>State</th>
<th>ZIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>653 Harper Street</td>
<td>KY</td>
<td>42202</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSN</th>
<th>Home Phone #</th>
</tr>
</thead>
<tbody>
<tr>
<td>400-05-2514</td>
<td>270-539-5753</td>
</tr>
</tbody>
</table>

Each of the undersigned specifically represents to Lender and to Lender's actual or potential agents, brokers, processors, attorneys, insurers, servicers, successors and assigns and agrees and acknowledges that the information provided in this application is true and correct. I agree to submit to a background and credit check as part of the mortgage application process. I acknowledge that any intentional or negligent misrepresentation of this information contained in this application may result in civil liability, including monetary damages, to any person who may suffer any loss due to reliance upon any misrepresentation that I have made on this application, and/or in criminal penalties including, but not limited to, fine or imprisonment or both under the provisions of Title 18 United States Code, Sec 1001 et seq.

[Signature]

Applicant's Signature

[Signature]

Co-Signer's Signature

Mortgage Broker's Signature

May 28, 2007

Date

Activity taken directly from: Carolyn A. Zanta, UIUC-Hughes Biotechnology Education and Outreach Program

www.life.uiuc.edu (activity modified from Iowa State University Biotechnology Center)
Residence for Life, Ltd., Home Mortgage Application

This application is designed to be completed by the applicant(s) with the Lender's assistance. Applicants should complete this form as "Borrower" or "Co-Borrower," as applicable. Co-Borrower information must also be provided when either the income or assets of a person other than the Borrower (including the Borrower's spouse) will be used as a basis for loan qualification or the income or assets of the Borrower's spouse or other person who has community property rights pursuant to state law will not be used as a basis for loan qualification, but his or her liabilities must be considered because the spouse or other person has community property rights pursuant to applicable law and Borrower resides in a community property state. The security property is located in a community property state. or the Borrower is relying on other property located in a community property state as a basis for repayment of the loan.

### Loan Applicant

<table>
<thead>
<tr>
<th>Name</th>
<th>Matthew M. Davis</th>
<th>DOB:</th>
<th>4/28/58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>1861 Martha Ellen Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>Sparks</td>
<td>State</td>
<td>NV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZIP</td>
<td>89431</td>
</tr>
<tr>
<td>SSN</td>
<td>530-56-2914</td>
<td>Home Phone #</td>
<td>775-830-3195</td>
</tr>
</tbody>
</table>

### Loan Co-Signer

<table>
<thead>
<tr>
<th>Name</th>
<th>Patricia J. Shah</th>
<th>DOB:</th>
<th>3/2/75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>3892 Broad Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>Sparks</td>
<td>State</td>
<td>NV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZIP</td>
<td>89431</td>
</tr>
<tr>
<td>SSN</td>
<td>418-96-0939</td>
<td>Home Phone #</td>
<td>775-830-1366</td>
</tr>
</tbody>
</table>

Each of the undersigned specifically represents to Lender and to Lender's actual or potential agents, brokers, processors, attorneys, insurers, servicers, successors and assigns and agrees and acknowledges that the information provided in this application is true and correct as of the date set forth opposite my signature and that any intentional or negligent misrepresentation of this information contained in this application may result in civil liability, including monetary damages, to any person who may suffer any loss due to reliance upon any misrepresentation that I have made on this application, and/or in criminal penalties including, but not limited to, fine or imprisonment or both under the provisions of Title 18, United States Code, Sec 1001, et seq.

Applicant's Signature: Matthew Davis
Mortgage Broker's Signature: Cameron Robinson
Co-Signer's Signature: Patricia J. Shah
Date: May 27, 2007

Activity taken directly from: Carolyn A. Zanta, UIUC-Hughes Biotechnology Education and Outreach Program
www.life.uiuc.edu (activity modified from Iowa State University Biotechnology Center)
Congratulations on completing your Discover 4-H club meetings! Continue with additional curriculum in your current project area, or discover other 4-H project areas. Check out the following links for additional 4-H curriculum:

1. http://utah4h.org/htm/discover4hclubs
2. http://www.4-h.org/resource-library/curriculum/

Become a 4-H Member or Volunteer

To register your Utah club or individuals in your club visit:

http://www.utah-4.org/htm/staff-resources/4-h-online-support
http://utah4h.org/htm/about-4-h/newto4h/

Non-Utah residents please contact your local 4-H office:

http://www.4-h.org/get-involved/find-4-h-clubs-camps-programs/

Stay Connected

Visit Your County Extension Office

Stay connected with 4-H activities and news through your county Extension office. Ask about volunteer opportunities and don’t forget to register for your county newsletter. Find contact information for counties in Utah here:

http://extension.usu.edu/htm/counties

Enjoy the Fair!

Enter your project or create a new project for the county fair. Learn about your county fair and fair judging here:

http://utah4h.org/htm/events-registration/county-fairs
Participate in Local or State 4-H Activities, Programs, Contests or Camps

For Utah state events and programs visit:
- http://utah4h.org/htm/events-registration
- http://www.utah4h.org/htm/featured-programs

For local Utah 4-H events and programs, visit your county Extension office.
- http://extension.usu.edu/htm/counties

Non-Utah residents, please contact your local 4-H office.
- http://www.4-h.org/get-involved/find-4-h-clubs-camps-programs/

Discover Service

Become a 4-H Volunteer!

- http://www.youtube.com/watch?v=UBemO5VSyK0
- http://www.youtube.com/watch?v=U8n4o9gHvAA

To become a 4-H volunteer in Utah, visit us at:
- http://utah4h.org/htm/about-4-h/newto4h/

Serve Together as a 4-H Club or as an Individual 4-H Member

Use your skills, passions, and 4-H to better your community and world. You are needed! Look for opportunities to help in your area or participate in service programs that reach places throughout the world (religious groups, Red Cross, etc.).

Hold a Club Service Project

USU Collegiate 4-H Club hosted “The Gift of Giving” as a club activity. Club members assembled Christmas stockings filled with needed items for CAPSA (Community Abuse Prevention Services Agency).

- http://tinyurl.com/lu5n2nc
Donate 4-H Projects

Look for hospitals, nursing homes, or other nonprofit organizations that will benefit from 4-H projects. Such projects include making quilts for CAPSA or Primary Children’s Hospital, or making beanies for newborns. During Utah 4-H State Contests, 40 “smile bags” were sewn and donated to Operation Smile.

Partner with Local Businesses

92,000 pounds of processed lamb, beef, and pork were donated to the Utah Food Bank in 2013 by multiple companies.

Donate Money

Clubs or individuals can donate money gained from a 4-H project to a worthy cause. A nine-year-old 4-H member from Davis County donated her project money to help a three-year-old battle cancer.

Give Us Your Feedback

Help us improve Discover 4-H curriculum. We would love feedback or suggestions on this guide; please go to the following link to take a short survey:

http://tinyurl.com/lb9tnad