How do flowers know when to bloom? How do dogs know when to start shedding their winter coats? Phenology, the study of timings in nature, helps us understand why spring is full of beautiful flowers, why birds migrate when they do, and why allergens are so high in spring and early summer. Plant and animal life cycle events are influenced by seasonal variations in temperature and precipitation driven by weather and climate. Learn more about phenology and record the timings of nature near you!

MATERIALS
- Phenology Bingo sheet (included)
- Colored pencils
- Science notebook or paper
- Something to write with

PROCEDURE

OBSERVE NATURAL PHENOMENA
- What season is it right now? Aside from the calendar, how do you know? Practice your observation skills of natural phenomena by playing Phenology Bingo.
- Print out or write out a copy of the Phenology BINGO sheet (included on next page). Go for a walk in your neighborhood and cross off as many of the items you are able to complete.
- Could you get a bingo? Were you able to find everything on your bingo sheet? Why or why not? Did you notice a pattern with the items that you were able to find and the items you weren’t able to find? What time of the year would it be easiest to find each item on the bingo sheet?
- Keep your bingo sheet and continue playing throughout the following months. How long did it take before you were able to complete the bingo sheet?

Experiment continued on next page...
**Phenology Bingo**

<table>
<thead>
<tr>
<th>Smell fresh cut grass.</th>
<th>Find a red leaf on a tree.</th>
<th>Find a blooming flower.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find a butterfly or moth cocoon.</td>
<td>Watch bats emerge for an evening feeding session.</td>
<td>Scratch a mosquito bite.</td>
</tr>
<tr>
<td>Collect ripe berries.</td>
<td>See a flock of birds fly overhead.</td>
<td>Play with maple “helicopters” (seeds).</td>
</tr>
<tr>
<td>Find a flower or tree with buds that have not bloomed.</td>
<td>Smell cedar trees after a rainstorm.</td>
<td>Observe a baby animal (do NOT approach).</td>
</tr>
<tr>
<td>Find snow on the ground</td>
<td>Drink a glass of apple cider.</td>
<td>Find a hummingbird near flowers or a feeder.</td>
</tr>
</tbody>
</table>

*Experiment continued on next page...*
PROCEDURE continued...

MAKE YOUR OWN PHENOLOGY CALENDAR

- Find an outdoor space that you visit regularly where you would like to make your observations.
- Brainstorm 3 natural things in the outdoor space that you want to record over time. Consider some of the items from the bingo sheet, or come up with your own things to observe.
  - Ideas for observations might be to observe the color of leaves on a tree, the number of bird calls you hear, the shape of a flower, the height of some grass, inches of snow, or what kinds of animals you see.
  - You could also measure things like temperature, moon cycles or tides by using a tool like a thermometer or tide book.
- Decide how often you will record your observations. Once a day? Once a week? Once a month? Create a calendar in your journal to record your phenological data. Think about formatting and how much size you want allotted for each observation day. Be sure to leave space for other interesting observations you might make.
- Make your observations! Every time you visit your outdoor space make your observations of the 3 natural things you picked to observe and record your observations in your calendar. You can also note any other observations from that visit.
- Good observations are key! Some observations, like temperature, should be measured and written clearly. Other observations, like plants that are blooming, require thinking like a naturalist. Here are some considerations that naturalists need when making observations:
  - Observations can be made using all your senses—consider what you hear, smell and feel in addition to what you see with your eyes.
  - If observing a moving target, such as a bird or insect, try studying one body part at a time.
  - If observing something stationary, like a flower or leaf, start with the big picture and then fill in details. Try drawing 2–3 pictures of the same item, drawn from a farther away perspective and close up perspective.

Experiment continued on next page...
WHAT SEASON IS IT?

PROCEDURE continued...

- What did you observe in your study area?
  - What did you notice today? Did you observe anything surprising or interesting in your study area?
  - Does anything you are observing remind you of something else? Perhaps something you’ve seen before? Or something you’ve read about or seen in a movie?
  - What are you wondering about in your study area? Record a list of questions you have about the things you are observing.

TRY THIS

Find another location where you can make a second observation area. What similarities and differences did you observe between your two study areas?

Can you continue phenology observations for a whole year? Make a phenology booklet with twelve pages, one for each month. During each month, draw pictures or write phrases of what natural occurrences you observe that month. What patterns do you notice throughout the year? If you did this for a second year, do you think there would be changes from year to year?

DID YOU KNOW

Phenology is the study of biological events that change in response to their environment. For example, bird migration is a phenomenon associated with climate and season. Likewise, the appearance of flowers is a response to the local weather and climate.

Understanding these patterns affects our everyday life. Phenology affects the growing season of all the plants we eat. Understanding the seasons is important for farmers and gardeners; it helps them know when to plant and when to harvest. Phenology also helps us understand the effects of climate change. As the climate changes, the timing of plant blooms, bird migrations and animal life cycles will also change in response.

Show us how you’re being curious! Share your results with us.
Bird migration is another area of study in phenology. In order to study a single bird’s migration, scientists will catch birds and band their legs with unique colors. On the next page we have data collected over many years about the migration habits of the Swainson’s Thrush.

On a map of the western hemisphere, place dots at each location a bird was spotted using the table on the next page. Use a different color depending on what season the bird was seen in: spring, summer, fall and winter.

What patterns do you see on the map? A bird’s range is a shape on the map of where a certain animal lives. Draw your best estimate of the Swainson’s Thrush’s range.

Look up the range of the Swainson’s Thrush at the Cornell Lab of Ornithology: allaboutbirds.org/guide/Swainsons_Thrush. How does your data compare with the map on the website? Does your range match theirs?

Experiment continued on next page...
The below data is from 1989 to 1995. Is that enough data to be sure of our conclusions? How much data should we have before we are sure? How often should scientists update the range of a species?

<table>
<thead>
<tr>
<th>Swainson’s Thrush Location Data</th>
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Data provided by Environment for the Americas and World Migration Day.