

OZARK ADVENTURE

SPONSORED BY FANTASTIC CAVERNS SCIENCE RESEARCH PROGRAM

CSI: Fantastic Caverns Pollen Investigation

By Shirley Gilmore

Did you know that plants sometime help solve crimes? Plant parts, such as seeds and pollen, are sometimes gathered as evidence when a crime has been committed. Those tiny traces of where a suspect has been are often overlooked when criminals try to clean up themselves or the scene of the crime. In fact, even washing their clothes several times might not remove the pollen.

Students visiting Fantastic Caverns from January through March 2010 have the opportunity to participate in CSI: Fantastic Caverns, our special 90-minute tour which includes activities at the Underground Classroom. In this educational program a *simulated* crime scene awaits the students and they must use their investigative skills to analyze and evaluate the evidence to narrow down the list of suspects who might have vandalized the cave.

The evidence to be examined by the students includes fingerprints, hair samples, blood samples, clothing fibers, and footprints. However, one piece of evidence that might have helped in investigating the case was overlooked.

Those responsible for the vandalism (it appears that there might have been two or more people involved) appear to have tracked through some shrubs near the entrance to the cave. A partial footprint matching one found inside the cave and some broken and flattened leaves were noted by investigators. If the vandals did walk through the shrubs, it is possible that pollen

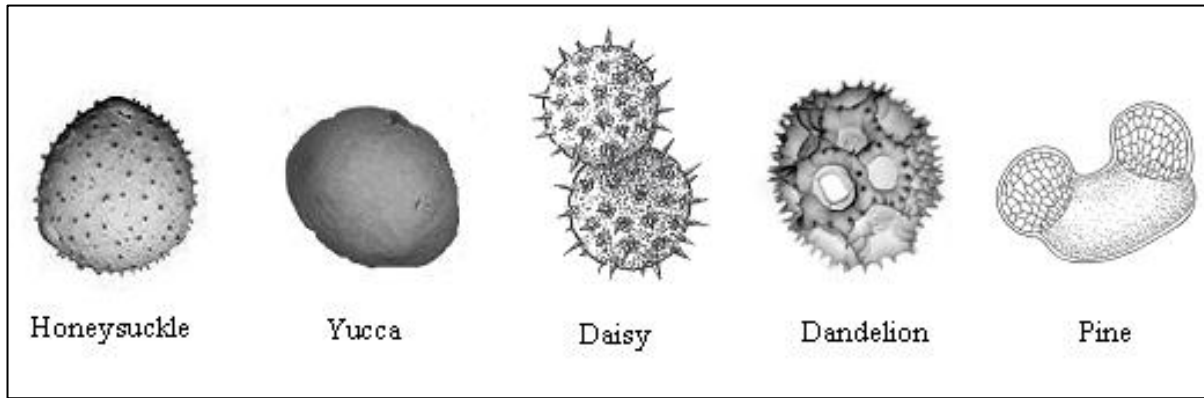


from the flowers on the bushes might have brushed off on the suspects' clothing. If that occurred, then it would have left a "pollen fingerprint" on the persons' clothing that could link them to the crime scene.

Palynology (pal-ih-nol-o-jee) is the study of pollen, a microscopic, powdery substance produced by flowering plants. The term "forensic palynology" refers to the use of pollen evidence in legal cases. The first task of the forensic palynologist is to try to find a match between the pollen in a known geographical region with the pollen in a forensic sample. Knowledge (Continued) of pollen dispersal and productivity often plays a major role in solving such problems.

Pollen grains from five types of plants found in the area around Fantastic Caverns . The grains have been magnified from 400 to 1,000 times.

At any time when these plants are flowering, anyone who walked through them could have some of their pollen on their clothes. In fact, anyone who had visited the cave on the day the crime was committed might have pine pollen on their clothes because it is (Continued)



dispersed or spread by the wind. The pollen from the other four plants is spread by insects, so the only way it could get on a person's clothes is if the person brushed up against that plant.

Look at the picture on page one which shows the entrance to the cave. On the left of the picture you can see the plants that the perpetrators of the vandalism are suspected of having walked through the night the crime occurred.

1. If these plants had been flowering at the time, investigators might have found which of the pollen pictured above on the suspect's clothes? _____
2. If they did find that pollen on the suspect's clothes, would that mean he was guilty of the vandalism inside the cave? _____
3. What other explanation might the suspect offer as to how the pollen got on his clothes?

Pollen is not only used in forensic investigations. Scientists study it primarily as part of botany, but it is also a valuable tool in archaeology and geology. Scientists who study caves also look at the pollen in the cave deposits. For something so tiny, it plays a major role in several different sciences.

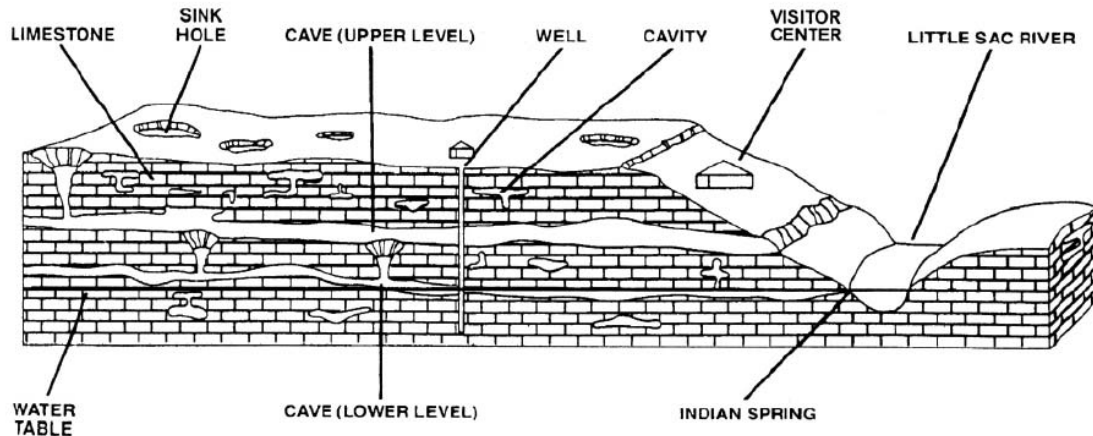
If you are interested in learning more about pollen and its use in forensic investigations here is a website you might want to visit (with your teacher's/parents' permission):
<http://askabiologist.asu.edu/research/pollen>

Going To the Source

With springs as common as they are in the Ozarks, do you ever wonder where the water comes from? At Fantastic Caverns, this is a question we ask for a number of reasons. Knowing where the spring "source" is gives you an idea of the pollutants that may be in the water when it comes out at the spring. For example, we know that the water coming out of the spring at Fantastic Caverns (Indian Spring) begins as surface rainwater runoff in our watershed. This watershed, or recharge area, is located to the south and west of the cave. The area is about 15-square miles and includes the Springfield-Branson National Airport, an industrial development area and family farms. We learned this by using a special dye to trace the ground water. This is important information about our water and spring system. We know that if there is a big storm near the airport we can expect the flow of the spring to increase. If there is an accidental fuel or chemical spill in our watershed, we can expect that some of those materials may make their way into the cave and spring system.

To put this all in focus, let's take a look at the limestone that is present in the Ozarks. This limestone isn't "solid" rock, but rock that is filled with cracks, cavities and passages that allow water to move through it. This type of landform is called karst. Karst is a German word for the limestone region of Krs, Slovenia. When it rains, water from the surface drains into the karst through openings called sinkholes. Some sinkholes are funnel-shaped (Continued)

WATER MOVEMENT AT FANTASTIC CAVERNS



openings that are easy to see. Some are hidden low spots in fields that fill with water when it rains. As the water moves through these sinkholes into the groundwater system, it travels through the caves in the area. In fact, Fantastic Caverns was once an underground river and was entirely filled with water. Even today, the cave's lower passageways will fill with water and overflow into the upper, toured part of the cave. The place where this water drains from the cave is called a spring.

Protecting the quality of this water is very important. Fantastic Caverns is home to three species of rare and threatened animals that depend on clean groundwater to survive. The watershed that supplies water to Fantastic Caverns, Indian Spring and these animals is also the water supply for over 1,000 neighborhood water wells. As you can see, clean water is important to all life.

In 1990, Fantastic Caverns established its Science Research Program. This program is designed to help with the collection of good information about the cave's ecosystem. The information is then shared with students, teachers and government officials that will help with planning the region's future growth. History has taught us that good people will make good decisions if they are given good and accurate information.

On-Line Cave Information

To learn more about caves and educational programs from our Science Research Program, visit our website at:

www.fantasticcaverns.com/educate.htm

This site contains photos, study guides and other information about cave animals and history. You will even find back issues of the *Ozark Adventure* classroom magazine. Looking for more? Try these great cave information websites:

Ozark Highlands Grotto – www.theohg.com

National Speleological Society – www.caves.org

Missouri Speleological Society – www.mospeleo.org

National Caves Association – www.cavern.com

Missouri Caves Association – www.missouricaves.com

American Cave Conservation Association – www.cavern.org

Bat conservation International – www.batcon.org



ALL
NEW
FOR
2010!



An exciting **NEW** program awaits visiting students at Fantastic Caverns in 2010. **CSI: FANTASTIC CAVERNS** takes full advantage of the cave's Underground Classroom with a very special. Visiting students will learn about some very discreet ways we can harm a cave system without even knowing it...skin oils, lint, hairs and even pollution making its way into the groundwater system.

They will also come upon a cave crime scene. Vandals have struck, and in their wake, left behind evidence that students will process, analyze and evaluate to narrow down the suspects. Vandalized cave formations, scattered evidence, evidence markers, crime-scene tape and investigators will give this very special program an authentic feel. Plus, it all takes place in the cave's Underground Classroom where it's always a warm 60° regardless of the weather outside.

CSI:FANTASTIC CAVERNS includes the all-riding tour of the caverns.

CSI:FANTASTIC CAVERNS is a special, 90-minute, "touchable" educational experience designed especially for school groups.



Fantastic Caverns supports science because today's students are tomorrow's community education leaders.

Fall 2009

CAVE INVESTIGATOR WORD SEARCH

Find the following words. Expect them to read in any direction!

P	N	J	E	Z	E	C	N	E	I	C	S	M	C	T	Z	F	K	E
R	M	O	F	M	C	Z	Q	L	W	S	U	S	P	E	C	T	S	C
F	E	L	F	R	Y	V	P	T	L	T	D	G	U	A	N	O	V	N
T	J	C	I	B	A	T	E	E	R	C	S	I	D	R	Q	X	L	E
Q	A	M	H	N	L	C	Y	R	O	T	S	I	H	R	F	I	S	D
K	E	S	D	A	A	I	R	E	H	T	A	E	W	Q	O	U	G	I
C	K	A	T	F	R	K	N	B	O	Z	A	R	K	S	G	C	R	V
R	L	M	R	Y	T	G	G	D	M	T	E	R	N	N	W	K	G	E
S	O	U	G	I	U	R	E	H	P	N	Z	S	U	I	H	Q	N	T
R	S	T	L	R	L	R	A	Q	Z	I	Y	F	T	P	K	H	I	H
E	K	T	A	J	O	R	Y	M	O	L	L	T	B	M	L	S	R	R
S	G	C	O	G	M	U	P	Q	J	E	A	C	N	A	F	F	P	E
E	B	N	K	U	I	T	N	N	R	G	N	P	M	F	L	T	S	A
A	Z	R	I	W	C	T	C	D	B	K	A	I	T	Q	P	S	C	T
R	C	B	F	L	Y	H	S	L	W	E	N	L	R	D	C	K	A	E
C	E	H	Z	D	L	K	A	E	D	A	L	K	H	E	N	P	V	N
H	M	A	B	A	T	E	D	B	V	N	T	I	N	D	F	K	E	E
C	H	I	V	J	L	K	W	Y	L	N	B	E	D	G	M	W	N	D
D	B	R	R	D	T	L	J	D	Y	E	I	Z	R	M	H	T	W	N

ANALYZE

CAVE

EVIDENCE

HAIR

LINT

RESEARCH

SPRING

THREATENED

ANIMAL

CRIME

FUNGUS

HARM

OIL

SCENE

SURFACE

TOUCHABLE

BAT

DISCREET

GUANO

HISTORY

OZARKS

SCIENCE

SUSPECTS

VANDALS

BLIND

DWELLING

GROUNDWATER

INVESTIGATOR

RECHARGE

SKIN

TASTY

WEATHER