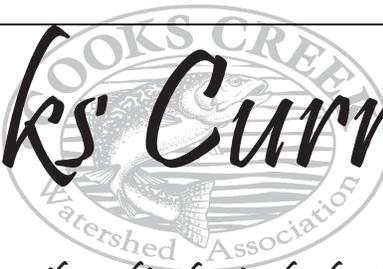


# Cooks Current



*"To protect, preserve and improve the quality of water, land and life in the Cooks Creek Watershed"*

Volume 16, Issue 4

Newsletter of the Cooks Creek Watershed

Fall 2019

## 2019 Events

### Regular Board Meetings:

Springtown Fire House- 7:30PM

4<sup>th</sup> Thursday of the month except Nov. and Dec. which is the 3<sup>rd</sup> Thursday;

All are welcome! We appreciate your involvement

### Special Events

Exciting new year coming!



See back for details!

**We're on the web!**  
[www.cooks creekpa.org](http://www.cooks creekpa.org)

Cooks Current is a publication of the Cooks Creek Watershed Association.

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### **Additional Members:**

Sarah Snider, Stephen Smith, MD,

## From Across the Board...

Fall is for celebrations and reflections. We at CCWA certainly can celebrate another year living in the heart of the nicest part of Bucks County. We can reflect on those we've lost, friends we've made, commitments fulfilled and dreams of things to come. I hope that many of you will do what you can to support conservation, either here at home, in our region, country or even the world. Every act matters, whether it's picking up a piece of trash, helping teach people about the environment, contributing money to a good cause, or voting for those who support conservation. Each of you has something to contribute.

Our fall dinner was the usual cast of characters and good food at the Springtown Rod and Gun Club. We enjoyed conversation, fantastic edibles and a very interesting presentation on mushrooms from one of my favorite local celebrities Dr. Marti Kyde. That same weekend we hosted the third Walk in Penn's Woods, leading folks on a



*Volunteers planting the Durham tailrace*

*Photo by Lois Oleksa*

fascinating walk from the top of Frya's Run to the bottom. Along the way Sarah Snider told us how much the land has changed since her youth and how to read the forest for clues about historical land use. Where Frya's run crosses under Funks Mill Rd, I showed the group what even small changes can do to the ecosystem by looking at the invertebrates that live in the Creek. The walk ended at Siegfried's where the riparian forest hosts an important Great Blue Heron rookery (one

of two in the Watershed).

Earlier this quarter Jim Nielsen, Stephen Willey and I placed Hans' memorial stone in front of the bench at Peppermint Park under the Tulip tree. Later, Lois planted some native sedges and violets around the stone. We hope that you all get a chance to go up to the park and pay your respects to Hans and remember all he did for CCWA and Springfield Township. While you're up there, enjoy the spec-

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tacular view and remember that you have Hans to thank that the land is public. Remember to say hi; I swear he's up there.

The Growing Greener project is moving forward. We now have new equipment in the stream gaging stations in Durham and Springtown, and we have completed our first year of water quality sampling. All indications point to the same high quality of water we've always enjoyed. I'm not sure why the PADEP was convinced otherwise, but all five stations attained the standards in chemistry and biology that one would expect from an Exceptional Value Watershed. We will be wrapping up this program over the next year, with some more sampling and writing up the results. Hopefully our friends at Princeton Hydro will be our guests at next year's Annual Dinner to present them to you. We will, of course, make the results available on the website, [www.cooks creekpa.org](http://www.cooks creekpa.org).

Finally, Lois Oleksa reported that the second phase of work on the Durham tailrace is complete, with new native vegetation replacing the invasives that were there. The floor of the race was graded to ensure proper drainage as well. Thanks to everyone who helped out and to the Lower Delaware Wild & Scenic River for providing the funds. With luck, the area will be not only an interesting part of the historical site but also provide erosion control and water quality filtration of stormwater from the Township complex.

Yours in conservation

W. Scott Douglas, President



**Botanical Focus: Black Walnut (*Juglans nigra*)**

*By: David Oleksa*

*This is the 13<sup>th</sup> installment in a series of articles on the flora of the Cooks Creek Watershed.*



The black walnut tree is one of North America's most beautiful native trees. It is also one of the most valuable, both from an economic sense and from the multitude of uses that it provides. Black walnut trees grow in mixed forests from the east coast of the United States to the Great Plains and from northern Florida well into Canada. The trees can take several shapes. When growing amongst other trees in the forest they tend to grow straight and tall with few lower branches, but when growing in the open, the trees tend to branch out closer to the ground and adopt a more spreading shape.

The tree grows best in well-drained soil preferably near streams and especially on the lower portion of slopes that are facing the northeast. It is a wonderful shade tree for large properties since it usually grows to a height of 50 feet (although there are some instances that double that height have been reached). There is one major drawback to having them in your lawn, however, and that will be discussed shortly. The black walnut tree produces both male and female flowers on the same tree and although self-pollination is not usual, occasionally the trees will prove that they are not self-sterile. The walnuts are wind pollinated. The anthers and stigmas hang out of the flowers so the wind can carry the pollen from the male single-stemmed catkins to the yellow-green female flowers which are located on short spikes near the twig ends. Flowering and leafing occur simultaneously from mid-April to the beginning of June. The large nuts ripen in September and October and drop to the ground after the fall of the tree's leaves.

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When the early American colonists discovered the black walnut they were amazed by its versatility. The nuts contain the highest protein of any tree nut and can be used in both sweet and savory recipes. The dark wood is used for fine furniture because of the closeness of its grain and won special attention from gunsmiths who used it for rifle stocks. The wood is also water resistant and can be used for fence posts and window sills as well as foundation logs for early log cabins. The husks (the fibrous covering over the nuts' shells) are used to make dyes and the shells (the hardest of any tree nut in the world) are used in industrial applications.

As a food item, the black walnut has a distinctive taste, completely different from the English walnut that is sold commercially. English walnuts are grown in groves while the black walnut is a wild tree. The black walnut adds a rich texture and taste to baked goods like cakes and cookies but they can also be added to stews and can be served as a healthy snack as well. As a matter of fact, honey-black walnut bread was on the menu for the Lewis and Clark expedition in the 19<sup>th</sup> century.

Some of the more uncommon uses of the black walnut include the U.S. Navy using the shells to clean their ships and submarines; the shells were also used to clean the Statue of Liberty. Not many people know that black walnut shells are a major component as a filler in dynamite.

The hard shells of black walnuts are a perfect storage vessel for the nut inside. After the fruit falls from the tree the fibrous husk can be removed. (Wear gloves when doing this since your hands will become stained a deep dark brown if you don't.) The nut can be dried and then will store for over a year if the shell is not cracked. The best way to remove the nut from the shell is to strike a blow with a hammer at 90 degrees to the side of the shell. You can then use a pliers and nut pick to pry out the nutritious nut inside.

It was mentioned before that the tree can be a beautiful addition to a landscape, but here is one caveat. The black walnut tree's roots may extend as far as fifty feet from the trunk and these roots emit a natural herbicide called juglone which also exudes from the tree's leaves and fruit husks. Landscape plants like azaleas and rhododendrons and food plants such as apples, pears, berries, tomatoes and potatoes will be killed or at least stunted if planted too close to a black walnut tree. In addition, when the fruit falls from the tree, it is about the size of a baseball and is lime green in color. The husk soon deteriorates, turns brown and serves as an uncomfortable stumbling nuisance on the lawn. But despite these drawbacks, the black walnut tree cuts a magnificent figure in both forest and landscape, provides a wealth of nourishment to humans and wild life, and supports the wood working industry with valuable wood and veneer. These pluses certainly outweigh the few downsides that the tree has.



Black Walnut trees and their nuts.



## Children's Backyard: Traditional Medicine/Folk Medicine

By: Lois Oleksa

Traditional Medicine/Folk Medicine is the medicine that came from people of long ago. An **herbologist** or herbalist is a person who studies how plants can be used to help heal and treat ailments and health issues. Herbs and plants had been used thousands of years ago by ancient people and recently people have once again become interested in using them for helping the body to heal itself. Folk medicine has longstanding remedies passed on and practiced by common folk. With modern medicine, it is formally learned, science based and institutionalized systems of medical practice where we rely on the doctor to care for us. Both conventional/modern medicine and folk medicine can coexist. Plants around the world have been used by people and cultures before modern medicine with its chemistry identifying the helpful ingredients in the plants. Today, with chemistry, we are able to determine the active ingredient in the plants that were used ages ago. With the invention of the microscope we have discovered bacteria and microbes. When the Native Americans or Colonial Americans used herbs and plants for healing they knew nothing about the phytochemicals in plants. Phytochemicals are chemicals produced by plants to keep away competing plants and to keep predators or pathogens (diseases) away. Some phytochemicals are poisonous but others have been used in traditional medicines. Some of their health effects have not been proven but others, with work by phytochemists, have proven the plant compounds responsible for their health benefits. The best way to get these good phytochemicals into your body is to eat a great real food diet. Eat blueberries, red, blue and purple colored berries to get the phytochemical called anthocyanins. Carotenoids, another phytochemical, are yellow, orange, and red organic pigments produced by pumpkins, carrots, corn, tomatoes and even in flamingos and daffodils.

Home remedies/granny cures are treatments to cure a disease or ailment. Using plants, spices, herbs and vegetables may not cure but these remedies may ease pain or aid the conventional treatments. Any other benefits? People not having access to modern medicine use traditional medicines as they are affordable. Natural healing through plants can strengthen the immune system. And, it has fewer side effects.

Perhaps you've heard of using aloe on burns? Using native growing jewel weed for your itching poison ivy? Drinking 100% cranberry juice for urinary tract infections?

When grandma said eat your chicken soup the benefits range from being anti-inflammatory, full of vitamins and helping the immune system. Plants do the same thing. In the fire cider you can make, you'll find garlic, onions, ginger, horseradish, hot peppers and vinegar among a few of the ingredients that can be added.

What benefit does each ingredient give you that's in the fire cider?

First, apple-cider vinegar is a great digestive aid.

Horseradish is the number-one herb for combating sinus congestion and headaches. It clears your sinuses better than anything. Even when you're just grating it, by the time you're done, your sinuses are wide open.

Ginger is a warming circulatory herb that's wonderful for digestion. It also helps fight infection and is good for nausea.

Garlic is the poor person's penicillin. It has broad-spectrum antimicrobial and antibacterial properties and is an excellent aid for fighting infection. It also produces a heat that helps lower cholesterol.

Onions have similar properties to garlic and are also good for colds and flus. Cayenne pepper is one of the best cardiovascular herbs. It helps your immune system mobilize and moves blood through the system.

And, honey is very soothing for inflamed tissues and organs, but its primary purpose is as a harmonizer or buffer. It helps blend all the flavors in fire cider and makes it palatable not just to your taste buds, but to your whole digestive system.

### Children's Backyard Activity: Make Fire Cider

Fire cider is mostly used for sinus congestion and warding off colds and flus.

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Sip one or two tablespoons each day this winter. When you're just starting you may want to dilute the fire cider with a little warm water or orange juice. If you feel a cold coming on, take smaller amounts more often.

It's great using it to make a salad dressing. Use the fire cider instead of the vinegar in your recipe.

The recipe gives rough amounts. You can substitute some of the herbs if you'd like, but the most important ingredients are horseradish, garlic, onion, and the apple cider vinegar. Of course organic ingredients are best.

### Homemade Fire Cider

#### Ingredients:

- ½ cup grated fresh horseradish
- ½ cup grated fresh ginger
- 1 onion, peeled and chopped
- 1 bulb of garlic, peeled and chopped
- 1 jalapeno, sliced
- 2-3 cups unfiltered apple cider vinegar
- ¼ cup raw honey, or more to taste

#### Optional:

- 1 lemon, sliced
- 1 orange, sliced
- ¼ cup chopped fresh parsley
- 1 tablespoon fresh rosemary
- 1 tablespoon cracked black peppercorn
- Turmeric and Echinacea can also be added

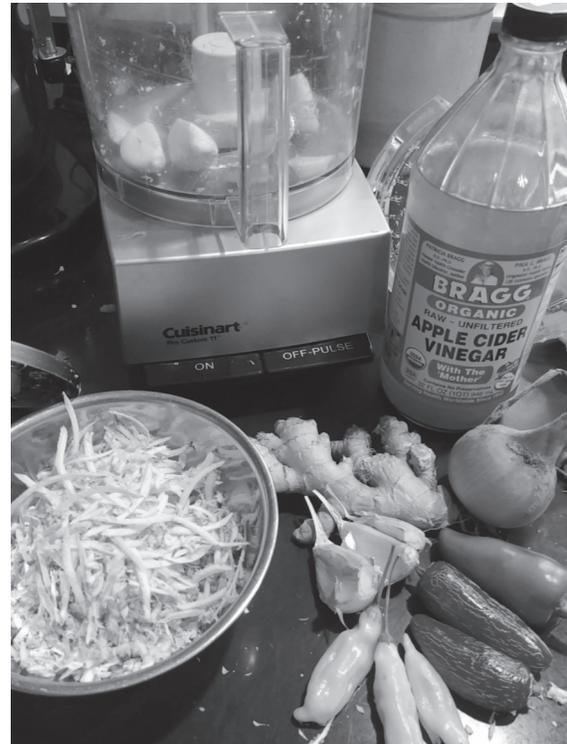
#### Directions:

Place all the grated and chopped ingredients into a quart sized jar. Add optional ingredients if desired.

Fill the jar with apple cider vinegar. Screw a lid on top. If it's a metal lid, place a piece of parchment paper between the jar and lid to keep rust from forming on the lid. Shake well.

Put the jar in a cool, dark place for 4-6 weeks. Shake the jar every day.

After the 4-6 weeks has ended, strain the infused vinegar into another jar and add honey to taste. Store in the refrigerator. The chopped veggies can be sautéed and added to other veggies or composted.



Grate Ingredients



Put in jar for 4 to 6 weeks

## **Update on the PennEast Pipeline and the Adelpia Gateway Pipeline** *By: Arianne Elinnich*

In early October, the NJ Department of Environmental Protection, citing the US Court of Appeals for the Third Circuit, decision to vacate the orders of condemnation for forty-nine properties where the state of NJ has property ownership interests, denied and closed PennEast's "incomplete" application. In addition to this significant blow to the project, PennEast has also failed to acquire the NJ DEP permits necessary to move forward. As a result, their application cannot be resubmitted without the legal authority to condemn these properties. PennEast then filed to overturn the Third Circuit Court's decision.

Then, in early November, the Third Circuit decided **NOT** to grant PennEast's application to rehear or reconsider its prior decision in favor of the State of New Jersey. Thus, PennEast does not have the right to condemn the land on which New Jersey has an ownership interest. This halts another PennEast legal attempt to gain traction on its proposed pipeline. Another closed door.

PennEast may, or may not, petition the Supreme Court to hear its case. We will keep you posted. In the meantime, enjoy this favorable decision from the Third Circuit!

With the possibility of further long, drawn-out legal battles ahead, most recently PennEast also filed a comment appealing to the Federal Energy Regulatory Commission to request that the FERC issue a declaratory order (with no proposal for public input on such a decision) to interpret the Natural Gas Act's eminent domain authority in Section 7(h), to conclude that:

- (1) Under NGA Section 7(h), a certificate holder's authority to condemn "the necessary right-of-way to construct, operate, and maintain a [natural gas] pipeline" and the "necessary land or other property, in addition to right-of-way, for the location of compressor stations [and other associated equipment]," applies to property in which a state holds an interest;
- (2) In NGA Section 7(h), Congress delegated the federal government's eminent domain authority to certificate holders; and
- (3) In delegating the federal government's eminent domain authority in NGA Section 7(h), Congress necessarily delegated to certificate holders the federal government's exemption from claims of state sovereign immunity.

Meanwhile, in another part of Bucks County, the Adelpia Gateway Pipeline Project also remains heavily contested and will continue to face significant legal challenges. The FERC has still not made a determination on the project and the PA Environmental Hearing Board's recent dismissal of both West Rockhill Township's appeal and the appeal by the Concerned Citizens for Clean Air (against the PA DEP's Air Quality approvals for the proposed Quakertown Compressor Station), will be challenged and escalated to the Commonwealth Court for their consideration.

If you would like to support the Concerned Citizens for Clean Air in their fight to #ProtectTheAirWeAllShare, tax-deductible donations can be made on their behalf to Clean Air Council

<https://freedommerchants.com/cleanairadelphia.html>.

Certainly, New Jersey Resources, who maintains interests in both PennEast and Adelpia Gateway, is feeling the financial implications of the enduring opposition that continues to unite the communities affected by these proposed pipeline projects, and that opposition is an ever-growing movement that is not going away any time soon.

## Green Tip #48: Carpeting

**EarthTalk®** From the Editors of *E - The Environmental Magazine*.

**Dear EarthTalk:** I need to replace the wall-to-wall carpeting in my basement. Any tips for finding something new that won't aggravate my allergies or otherwise pollute my indoor air -- *Jasper Manheim, Los Angeles, CA*

Carpeting is an oft-overlooked culprit when it comes to compromised indoor air quality, but the chemicals used to produce it are typically far from natural. According to the non-profit Environmental Working Group (EWG), most carpeting is made from synthetic fibers derived from non-renewable petroleum-based sources and emits harmful volatile organic compounds (VOCs) into the air.

Meanwhile, carpet backing is typically made from synthetic rubber derived from styrene and butadiene, also respiratory irritants. And that new carpet smell we know so well comes from the off-gassing of 4-PCH, a potent VOC byproduct of the synthetic rubber manufacturing process known to cause respiratory problems, eye irritation and rashes. EWG adds that it can also react with other chemicals to produce formaldehyde, a known human carcinogen.

Likewise, the glues and sealants used to install most wall-to-wall carpeting come chock full of more VOCs and in some cases, toxic petroleum-based solvents. To add insult to injury, the waterproofing and anti-microbial treatments now common in everyday carpeting have been linked to cancer, birth defects and hormone disruption. Last but not least, carpet padding is typically made from scraps of polyurethane recycled from older furniture and mattresses—and as such likely contains carcinogenic chemical flame retardants now banned in new furniture.

Well that's all well and good, but what choices do we have? Actually, lots. Carpeting labeled with the Carpet & Rug Institute's "Green Label Plus" or UL Environment's "Greenguard" emit low amounts of VOCs and as such are safer for you and your family. Wool is the most common eco-friendly choice, but jute and cotton varieties are coming on strong. Stay away from stain fighting, waterproofing or antimicrobial treatments. For carpet padding, go with felt rather than synthetic rubber. And make sure to use low-emitting, non-solvent adhesives and/or fasteners during installation.

No matter what kind of carpeting you end up with, make sure to vacuum it regularly—the American Lung Association recommends at least 3x/week with a HEPA filter-equipped vacuum—to remove dust, allergens and pollutants that you (or your pets) might track in. "Carpets are ... the perfect environment to harbor dust mites, mold and mildew, which are all common allergens," reports EWG.

One way to avoid all of these issues entirely is to forego carpeting altogether and go with tile, wood, cork or natural linoleum flooring with low-VOC sealant. They don't off-gas VOCs or harbor allergens and pollutants, and they're easy to clean while lasting decades longer than carpeting anyway. Throw down a few wool area rugs (easily cleaned outside) and you'll be good—and green—to go.

Now what to do with the old carpeting is another question entirely. Carpeting is difficult to recycle as it's made from multiple components with different chemical makeups, so your local curbside recycling hauler is unlikely to take it away for you. The non-profit Carpet America Recovery Effort (CARE) is working to develop the infrastructure needed to recycle carpet efficiently across the U.S. In the meantime, you can search on Earth911 for a carpet recycler near you.

**CONTACTS:** EWG, [www.ewg.org](http://www.ewg.org); Green Label Plus, [carpet-rug.org/testing/green-label-plus](http://carpet-rug.org/testing/green-label-plus); Greenguard, [greenguard.org](http://greenguard.org); CARE, [carpetrecovery.org](http://carpetrecovery.org); Earth911, [search.earth911.com](http://search.earth911.com).

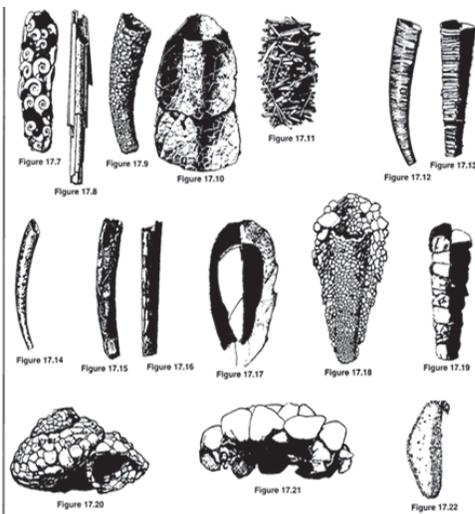
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## Creature Feature: Caddisfly Cases *By: W. Scott Douglas*

This is 50<sup>th</sup> installment in a series of articles on the fauna of Cooks Creek Watershed.

Caddisflies were the subject of one of the very first Creature Features over a decade ago. Working on samples of invertebrates as part of our current water quality program inspired me to come back to this fascinating and diverse group of insects. Rather than talk about the insects though, I'd like to talk about their homes. Caddisflies are the only group of insects that construct their own homes. Many build cases, made from just about anything and everything the stream provides from diatoms and algae to leaves, twigs and pebbles. Some build silken retreats, using the silk netting to trap food particles as they are carried downstream. Some predatory caddisflies do not build cases at all. Some cases are only a few millimeters long, others several centimeters, depending on the species and age. The diagram below shows a few common case types. I've seen many similar to these in PA rivers, many in our Watershed or nearby.

The tiny engineers that do build cases do this to both protect and hide them from their predators. Some of the cases are even designed to bring food within reach of the hungry larva inside. While many cases are carried by the caddisfly larva as it moves around the stream bottom, others cement theirs firmly to rocks and logs so that they will not be tossed about during high flow events (unless, of course, what they've attached their house to moves). One group of caddisflies, the Helicopsychidae, make a spiral shell that looks like a snail shell. Scientists believe that they are not snail mimics though, rather the shape is designed to make the case sturdier since the larva tends to burrow deeply in the bottom gravel making it more likely to be crushed in storms. Some affix large stones or sticks to the sides of the case to stabilize it in the rapids where they live.



All of the larvae spin a silk shroud about themselves first, often within hours of hatching from their eggs. They then attach items to the case to strengthen and camouflage it. Sometimes the materials are collected, sometimes they are carefully cut from leaves or plant stems. Cases made from mineral materials are more for protection, those made from plant materials are more for camouflage. Despite this, some fish and a few birds have learned to separate the caddis from its case and eat the tender morsel within. This has led to an

arms race between the caddisfly and its predators where increased predation tends to favor mineral based cases.

The style and composition of the case is so specific that it can be used to identify the larva within to the family level at least, sometimes even to genus. The larva often has bumps or hooks on its body to help it stay firmly in the case. For some caddisflies, the case not only protects the larva, it serves to help it breathe too. The larva orients itself head upstream and then undulates its body within the case, moving water rapidly over its abdomen where they often sport gills.

Partly because of this remarkable adaptation, caddisflies are found the world over from springs and seeps to raging rivers to the bottom of lakes. With practice, they are not hard to find, and you can even build a collection of these miniature works of art. The larva is constantly growing from the time it hatches until it pupates, therefore it must periodically either add on to its house or abandon it and make a new, larger one. Consequently, many cases are actually empty and can

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easily be collected by the careful observer. Simply pick up a rock and look at the underside to find some for yourself. Often abandoned mineral cases can be found affixed to rocks that have been left high and dry on the edge of the water. Or sit quietly beside a clear pool and watch the sticks and leaves on the bottom. If you are patient, you'll start to see that some of those twigs and leaves are moving! You can then reach in and pluck them out. Put your specimen in a small tray or cup with water and after a bit it will poke its head and legs out and move about. Once you know what the case looks like, you will likely be able to spot others that are empty in the same pile of debris. Take your treasures home and dry them on a windowsill. If you want, a little varnish applied with an artist's brush will strengthen and preserve them. Some people even make jewelry out of them!



# Current Matters



Marty Kyde at Fall 2019 Dinner



Scott Douglas' Class



Brook trout from Frya Run



Elderberries newly planted in the Durham Mill tail-race.

**Check us out on the web for more information and articles from past brochures!**

**[www.cookscreekpa](http://www.cookscreekpa)**

## Protein *By: Stephen H. Smith, M.D.*

It's been a long day at work so you decide to stop at the tavern by the roadside you know so well. This will be nice, no prep, no dishes to do, reasonably good food. Having overindulged a bit a lunch you opt for the salad. Your server asks, "Protein?" Hmm...protein? "Oh, yes...no, I'll just have the salad without the chicken or beef". You figure that this will save you about five dollars and the two teaspoons of avian or bovine muscle isn't worth it. "But", you say, "I would like the other three classes of organic molecules that are common to all forms of life. Please add nucleic acids (anchovies), carbohydrate (croutons) and lipid (olive oil)". Your server disappears, never to be seen again and you go home hungry.

While all four classes have a beautiful story of their own we'll focus on protein in a limited way as many volumes have been published on this class of organic molecules alone. There are an estimated eighty million different protein structures present in the plant and animal kingdoms and all of these fall into several functional groups, including: signaling, structural, transport, enzymes, storage, regulatory, and immune response. All of these fall into two basic shapes, fibrous and globular. 14,110 different proteins are found in the human liver alone. Enzyme proteins are essential to life as they drive the biochemical reactions necessary for metabolism at a rate one billion times faster than would occur without them.

How are proteins made? The story, as you may have guessed, begins with DNA, a remarkable molecule if there ever was one. The function of DNA is to serve as a massive recipe book for protein synthesis. The information encoded in DNA is over a trillion times more dense than in any computer hard drive! (And Cooks Illustrated wants to make you pay for their recipes! Really?). The three billion nucleotides of DNA form a strand that if enlarged to the width of human hair, would be about six miles long (my calculation and so may be subject to error). A triplet of "codons" transcribed onto messenger RNA from the DNA carries the recipe for a specific amino acid to a little kitchen known as a ribosome. Ribosomes dot the endoplasmic reticulum in the cell giving it the name "rough ER". The little ribosomal kitchen is better than any Three Star Michelin restaurant at turning out molecular cuisine. The chef, tRNA (transfer RNA) starts stringing amino acids together, via peptide bonds, to form a polypeptide chain known as the "primary form" or "random coil", which then exits from a tunnel in the ribosome. There are twenty amino acids, nine of which are essential, meaning that they must be consumed in the diet, while the other eleven are synthesized in the body.

Polypeptide chains are generally between one hundred and thousands of amino acids long. By convention the head of the chain is formed by an amino group ( $\text{NH}_3$ ), the tail by a carboxyl ( $\text{COOH}$ ) group. As the polypeptide chain exits the ribosome it begins to form secondary structures known as alpha helices and beta strands or sheets. The alpha helix may form transiently as the tiny thread of random coil protein hits intracellular water perceived by it as very viscous. A more stable alpha helix forms as every fourth amino acid in the chain forms a hydrogen bond causing it to spiral. The beta sheet also forms by hydrogen bonds between the side chains of parallel strands of amino acids. Spider web is stretched and dehydrated beta sheet protein.

The alpha helices and beta strands/sheets then fold to form the tertiary, "native" or active form of protein. Until this stage is reached most protein molecules, such as enzymes, are not biologically active. Here is where the story becomes very interesting. Christian Anfinsen, working at the NIH, showed that the sequence of amino acids in the polypeptide chain was alone sufficient to determine the final, active tertiary form. He demonstrated this with a series of very elegant experiments in which a protein, ribonuclease A, was denatured with two denaturants, 8 molar urea, and B-mercaptoethanol. Once denatured to an unfolded random coil, he found that the initial active, native

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form *would re-fold spontaneously* if the surrounding medium were returned to physiologic conditions. For this, he and his two coworkers received the 1972 Nobel Prize in chemistry.

But wait! There's more! Cyrus Levinthal, a researcher at MIT, was troubled by something. At a conference in 1969 Levinthal calculated, on the back of an envelope, that if a relatively small strand of only 100 amino acid residues were to fold into an active tertiary form with *one "search" for the proper linkage every ten trillionth of a second*, it would take  $10^{81}$  years for the protein to reach the proper conformation, in other words into the "native", tertiary form. Yet this process, on average, takes only a tiny fraction of a second! Clearly something was amiss. This realization led to the famous "Levinthal's Paradox" and countless scientific papers have tried to describe how this knot might be untangled...for the most part unsuccessfully.

Any spontaneous reaction, whether in inorganic or organic chemistry involves a simple equation known as Gibb's Free Energy. For a reaction to be spontaneous, the Gibb's Free Energy must be negative. This equation incorporates the Second Law of Thermodynamics, in particular, the concept of entropy. To make it simple think of a kid's messy bedroom, as being in a state of chaos, disorder, dispersion, or uncertainty, in other words a state of *high entropy*; (Mom! Where's my iPhone?). It happens all by itself, it's spontaneous, and the reason it only gets worse is because, most kids being inherently lazy, won't do the *work* to tidy it up.

Researchers have assumed that the random coil, or primary polypeptide chain represents a state of high entropy. And it would seem so at first glance given the astronomical number of possible conformations available to it in the folding process. (Erwin Schroedinger, famous for his Schroedinger equation used to determine how a quantum wave form evolves over time, used the term "negentropy" to mean negative entropy, in his popular book, What is Life? but this is a digression).

Putting "free energy" and "entropy" together, researchers came up with a scheme called the "energy landscape funnel" in which the protein falls over the high energy, high entropy rim into a downward slide of progressively lower entropy and energy, with the lost entropy moving into the surrounding water. Each protein would have its own specific funnel shape.

One major obstacle to this much touted solution to Levinthal's Paradox is that the average energy difference from the top to the bottom of the funnel is small, approximately that of a single hydrogen bond, and there may be hundreds of hydrogen bonds in the fully folded native, tertiary form. Another problem with the "funnel" scenario, which I recently presented at a conference on how electric charges affect biology, is that the unfolded primary form, or random coil may not in fact be in a high entropy state! If, as Anfinsen demonstrated, the random coil will fold spontaneously into the native state *it must possess within it, the end and means to do so, hardly a state of uncertainty!*

It remains unknown precisely how proteins fold into the biologically active forms necessary for life. Much is known about the electrostatics of amino acid side chains forming van der Waals interactions, hydrogen bonds, ionic bonds, peptide bonds, and covalent bonds as well as the interactions of hydrophobic amino acids with water, but the interplay of all these forces is so complex that researches continue to hunt for a theory that supplies conclusive answers. Physicists, such as Ian J. Thomson, may be on to something with the idea that the constants of nature, in particular the "fine structure constant," may change very briefly, and in a miniscule way, permitting the "end in view" to take shape via "back propagation". "Ends" or "goals", as such, may have been considered unscientific since the time of Francis Bacon (*Novum Organum* published 1620), however, physics and neuroscience, especially in the realm of consciousness, may be considering "ends" as necessary in the mix, and this would seem to be especially the case in the story of protein folding.

## Back to the Past: Flax and its Culture

*A column highlighting the natural history of the Watershed. By Grier Scheetz, Perkasie, PA.*

(Doylestown Meeting, May 28, 1907.) From *A collection of Papers Read Before The Bucks County Historical Society*, Volume III. Published For The Society By B.F. Fackenthall, Jr., Riegelsville, PA., 1909

Flax was grown in our Watershed and this article began in the summer of 2019 issue and concludes here in the Fall 2019 newsletter.

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### FLAX AND ITS CULTURE

We now have the curing of the flax before it can be broken which consists of spreading the flax on the grass for a number of days, and at various times turning it. This is called "dew rotting." I have seen the curing of flax in all its stages, have pulled large quantities, and hammered or crushed the bolls to extract the seeds for days at a time when a boy. The labor connected with it is both laborious and tedious, and only men and women of strong constitutions and muscle, were able to do this difficult and hard work, as the curing of flax up to the time it enters the cloth requires at least twenty-two different operations.

In the early fall of the year all the old stumps on the farm were gathered, and split up to be used for the drying of flax previous to its "breaking," for it had to be dried very brittle. The stumps and old roots would give but very little flame if any, as you can not dry flax with an ordinary wood fire on account of the flame it produces.

Each farm in the olden time had a flax-kiln constructed (many of which are still in existence in the upper end of Bucks county). The flax-kiln consisted of a wall about five feet high, six feet long with wings of about four feet forming the letter E and generally facing the midday sun. Across this wall were thrown two or more green poles upon which a thin layer of flax was spread while the pieces of roots and stumps were burning the flax was turned again and again so as to thoroughly heat and dry it by the heat and smoke of the stump fire. To these flax-kilns came the orioles for supplies with which to build their nests.

Great care had to be exercised in curing and drying flax, for sad was the man all day who burned a "bed of flax, as it was called, and his comrades would berate him for his carelessness. Many of the best men of our land have worshiped at the shrine of the flax god, and at break of day were kindling their fires, and preparing their flax for the day's labor. One hundred handfuls was considered a full day's work, which lasted from dawn to dusk. the price being regulated for a day's labor by the market price of a bushel of wheat, which sold for from 40 to 50 cents per bushel. In the earlier days this hard work was often

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performed by women. After the flax had been broken then followed the "scoutching" or "swingling" as it was oftentimes called.

The machinery consisted of an upright board nailed to a block of wood, and a wooden knife known as a "scoutching knife." This was used to beat upon the flax with the sharp edge to extract the rotten particles contained inside the fibre, or flax, which the breaking had not loosened. Later a wheel as large as a wagon wheel with four or five knives of wood fixed into the edge, and worked by treadle, was used instead of the hand work.

The flax after being thoroughly beaten was placed on piles from whence it went to the "hatchels." The first, for coarse tow from which wagon covers and bags were made; the second, for a finer grade of tow from which trousers and skirts for field work, and bed ticking were made; the third, for men and women's suiting, towels and shirtings; fourth, for thread and fine linen from which fine shirts were also made.

In the earlier days buttons were very scarce and pieces of leather were made to do service instead; they were shaped at one end like an arrow with a slit, and a knob at the other end. This made the best kind of a shirt button.

The "hatchels" were made about fifteen inches long by four inches wide, in which sharp pointed nails were driven, over and through this the handfuls of scoutched and beaten flax were pulled to remove the tow, and to divide the flax into beautiful silky strands.

I have seen trousers made of tow that when new were so closely woven as to stand upright without a man in them. This material was also made into ladies' skirts for the field workers who invariably helped their husbands with the crops in upper Bucks county as late as 1870, following the reapers and binding the sheaves of grain. For the growing boy trousers were made with tucks of about one inch wide and every year one of these tucks was left out, the trousers oftentimes lasting from five to ten years. Young girls also had tucks sewed in their skirts and as they grew taller the same were left out.

In colonial days spinning was one of the accomplishments.

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## FLAX AND ITS CULTURE

Nowhere was it done so perfectly as it was done by the Pennsylvania German women of upper Bucks county, and to this day we have quite a number who still are expert at spinning, and as many will testify, arising at 4 a. m., and spinning by candlelight until 9 p. m.

After spinning and filling a spool, the reel was used, which upon turning a certain number of times, or until the hickory strip located along the upright part of the reel gave the signal by a sharp rap which designated a hank or cut. The yarn upon the reel was then tied in several places, and removed from the reel, and the same method repeated. The spinning of eighteen cuts was considered a full day's labor, but Susan Fretz, of Hilltown township, daughter of Martin Fretz, oftentimes spun as many as twenty cuts per day. But with many other operators of the spinning wheel this was a rare occurrence.

After the spinning came the bleaching of the yarn. This required an exceptional amount of labor and experience. First the yarn was put into a large iron kettle and boiled, to make it soft and pliable. From thence it was taken to a stream of running water and thoroughly washed and rinsed; then hung upon the fence to dry, and bleached. After it had thoroughly dried it was taken through the flax brake so as to make it more soft and pliable. From there it went into the weavers' hands.

For half linen, or linsey for winter wear, one part wool and one part linen yarn were used. If a grey color was desired the wool of both white and black sheep was used, equal parts of each. For brown the wool was colored with a decoction made from black walnut hulls. All those old methods have passed away, and not many years hence no one will remember the old days of flax and its culture in Bucks county.

## Recycle! Local Recycling Information

### Durham Township Recycling Center

Location: Municipal Building, 215 Old Furnace Rd, Durham

1st Saturday of every month ( 2<sup>nd</sup> Saturday if 1<sup>st</sup> Saturday is on a holiday weekend)

Hours: 8:00AM – 12:00 noon, 1:00PM-4:00PM, (call ahead)

Accepting newspapers, magazines, junk mail, phone books, glass, tin, plastic, aluminum and cardboard, and CFL bulbs, rechargeable batteries (during office hours).

Please note that this facility is available to all, not just Durham Township residents!

Contact Dani McClanahan at the township building for more info. 610-346-8911

### Springfield Township

Location: Township Building, 2320 Township Road

Paper Recycling Bin Available at Township Building.

A Recycling bin was recently placed here and is available to anyone. Cut down on trash and help the township earn extra money. You can drop off: Magazines, Shopping Catalogs, Phone Books, Newspapers, Office and School Papers, Mail.

Please do NOT include: Plastic, glass, metal, trash

Hours: Anytime ; See website: [www.springfieldbucks.org](http://www.springfieldbucks.org) or call 610-346-6700.

### Blinderman & Son

Location: 1320 Whitaker St, Hellertown. 610-838-9221

Hours:  
7:30AM – 4:00 PM, Monday – Friday

7:30 AM – 11:30AM, Saturday

Accepting cardboard and most metals.

### City of Bethlehem Theis/Cornfeld Recycling Center

Web site: [www.bethlehem-pa.gov/recycle/services/theis\\_cornfeld.htm](http://www.bethlehem-pa.gov/recycle/services/theis_cornfeld.htm)

Location: 635 Illick's Mill Rd, Bethlehem

Phone: 610-865-7082 Hours: Weekdays: 9AM to 5 PM, Saturday 9 AM to 4 PM, Sunday 11AM to 4 PM

Accepting glass, cans, plastics, newspapers, all books, magazines, catalogs, cardboard, mixed office paper, metals, textiles (clothing, shoes, etc.), large appliances (certified freon-free). Call or go to the web site for specifics.

**Bonus!!** They provide FREE on site shredding services for businesses and private individuals. If you have 4 or more boxes, call 610-865-7082 to schedule an appointment.

## Schedules of Local Government Meetings

### Springfield Township:

[www.springfieldbucks.org](http://www.springfieldbucks.org)

610-346-6700

2320 Township Road

**Supervisors:** 2nd Tuesday @ 7:30 PM

**Planning Commission:** 1st Wed. @ 7 PM

**Supervisors/Planning Commission**

Work Session: 3rd Thurs. @ 7 PM

**Environmental Advisory Council:**

2nd Thurs. @ 7:30 PM

**Open Space Committee:**

1st Tuesday @ 7:30PM

**Historic Commission:**

3rd Tuesday @ 7:30 PM

### Durham Township:

[www.durhamtownship.org](http://www.durhamtownship.org)

610-346-8911

215 Old Furnace Road

**Supervisors:** 2nd Tuesday @ 7:30 PM

**Planning Commission:**

1st Tues. @ 7:30 PM

**EAC:** 3rd Tues. @ 7:30 PM

### Lower Saucon:

[www.lowersaucontownship.org](http://www.lowersaucontownship.org)

610-865-3291

3700 Old Philadelphia Pike

**Council:** 1st and 3rd Wed. @ 7 PM

**Planning Commission:**

3rd Thurs. @ 7 PM

**EAC:** 1st Tues. @ 7 PM

### Williams Township:

[www.williamstwp.org](http://www.williamstwp.org)

610-258-6060

655 Cider Press Road

**Supervisors:** 2nd Wed. @ 7 PM

**Planning Commission:** 3rd Wed. @ 7 PM

**Land Preservation Board:**

3rd Mon. @ 7 PM

### Richland Township:

[www.richlandtownship.org](http://www.richlandtownship.org)

215-536-4066

1328 California Road

**Supervisors:** 2nd and 4th Mon. @ 7 PM

**Planning Commission:** 3rd Tues. @ 7 PM

**Preservation Board:** 2nd Thurs. @ 7 PM

