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In this issue:

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FROM THE EDITORS

This issue marks the first number of **Missouriensis** produced by the current editors. We would like to take this opportunity to express our appreciation to Paul Redfearn for his long and capable service as editor of **Missouriensis** from 1986 to 1992. Under Paul's stewardship, the journal continued to develop in its role as the primary outlet for information from our Society. We hope to extend the tradition, and will no doubt be calling frequently upon Paul's expertise in that regard.

Missouriensis is your journal. As members of the Missouri Native Plant Society, it should reflect the type of information you would consider most useful or would most like to read. Since the publication of the first issue in the summer of 1979, the pages of **Missouriensis** have contained a wide variety of material providing vast contributions to our understanding of plant life in the state. We would like to continue to expand the scope and variety of information published in the journal.

Your journal represents an opportunity to publish information about our flora that would not be available elsewhere. The Missouri Native Plant Society provides a public and academic service to readers both in the state and outside our borders by facilitating dissemination of information directly relevant to Missouri, even if this information would be considered too site specific or regional for publication in works with a broader focus. As contrasted with the solely scientific focus of most academic journals, or the primarily popular focus of most gardeneing publications, **Missouriensis** offers an opportunity to provide the reader with a broad spectrum of materials relating to Missouri's plant life. Material on our native and introduced flora, culture and propagation of native plants, flora and vegetation of specific areas, biographical essays on Missouri botanists, and a variety of other topics are ideal for publication.

This brings us to a request. If **Missouriensis** is to continue to grow and change to reflect the growth and changes within our Society, we need your help. We would like to have far more material for publication in the journal than has been received in the past. Many members of MONPS have knowledge or experience that would be of interest to others. We encourage any of you to write articles, even brief, simple ones, and send these to us. We are committed to maintaining a mixture of technical and popular levels in the journal, but can only do this with your support. As editors, we are merely the final assemblers of a product generated by the Society, and the success of **Missouriensis** will be due entirely to the efforts and interest level of the membership.

To that end, we always want to hear from you regarding your thoughts about the journal, including comments, suggestions, and complaints. It is only through this type of feedback that we can continue to develop **Missouriensis**, and hopefully to live up to the traditions established by our previous editors. Again, on behalf of the Missouri Native Plant Society, our appreciation to all of the previous editors: Paul Redfearn, Nancy Morin, Erna Eisendrath, Joanna Turner, and Rebecca Haefner.

Best wishes and don't forget to write,

George and Doug

COMMON PLANT FAMILIES OF MISSOURI, I. INTRODUCTION TO FRUITS

Edgar Denison
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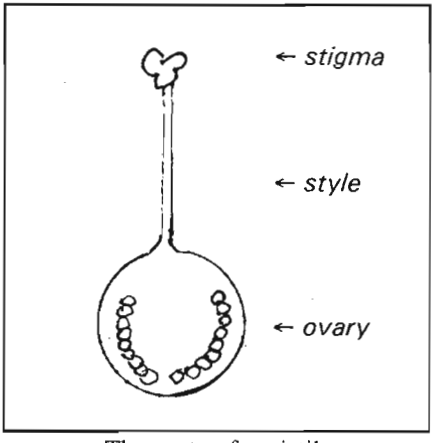
Editor's Note: We were all saddened by the sudeen passing away of Edgar Denison on August 14, 1993. A fuller tribute to this extraordinary man will appear in the next issue of the journal. The following article is the first of what was to have been a series of contributions by this respected wildflower authority with the aim of introducing families of wildflowers to readers. Those familiar with Mr. Denison's popular field guide, ***Missouri Wildflowers****, will recall the tables of features characterizing common wildflower families that appeared in the fourth edition of the book. This series was intended to complement those useful tables, which are based upon the observation that the majority of Missouri species fall into relatively few, large families of plants. The present, first installment, however, deals more generally with the variety of common fruit types. A second article, dealing with monocot families was completed shortly before the author's death, and will appear in the next issue.*

Many botanists focus their attention on the flowers of the wildflowers, but these beautiful plants also produce interesting and diverse kinds of fruits. The observation of plants in fruit can be an enjoyable experience in its own right, and can extend the field season far beyond the time when most species bloom. Familiarity with fruiting plants will also allow identification of species desirable for the garden at the time of year when seed may be harvested for cultivation.

For a better understanding of the fruit it is worthwhile to take a good look at the "female" (pistillate) part of the flower. After all, the fruit is by and large the mature ovary, the basal part of the floral female organization, although there are certain exceptions

(see below). The female component of the angiosperm flower consists of one or more **carpels**. In theory, carpels are specialized leaves that have become modified to surround and enclose the ovules. Each carpel potentially consists of the following parts, the first two of which are sometimes reduced or poorly developed:

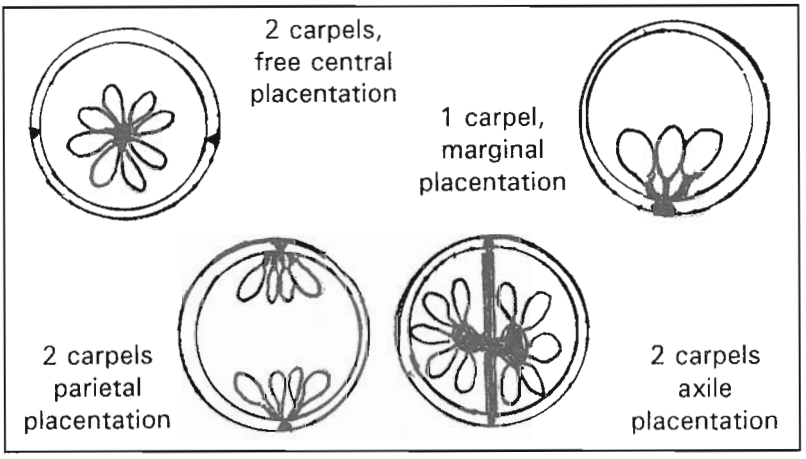
a) the **stigma**, with its stigmatic surface, which accepts the "male" pollen; b) the **style**, a connective tissue or tube usually of some length, between the stigma and the ovary; the pollen must germinate and grow through the style to arrive at the ovary, in order to fertilize an ovum (egg); c) the **ovary**, a bulging container of the ovule(s), which become the seeds(s).



The parts of a pistil.

The number and arrangement of the ovaries and the placement of the seeds varies greatly between species. This variation in structure affects the shape and design of the fruit, which are further modified by the configuration of the **placenta(e)**, the tissue to which the seed or seeds are attached, and from which they receive nourishment.

The collection of one or more carpels in the center of a flower may be free from one another or may be fused partially or entirely into a compound structure. The collective term for the carpel or carpels in a flower is **pistil**. In a compound pistil, the dividing wall between the two or more fused carpels is known as a **septum** (septae in plural); these dividers may be present, reduced, or totally absent. In cases where the septae are reduced or absent, the number of carpels may still be inferred from lines (sutures) on the outside of the pistil or from the position and grouping of the ovules.



Variations in the position of ovules and placentation.

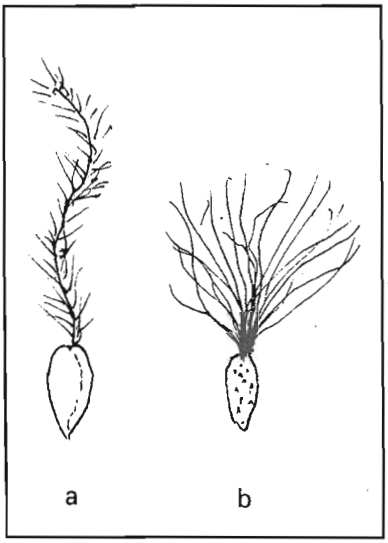
Many people mistakenly to think of a **seed** as a **fruit**. The two have much to do with each other, but they are not the same. The **fruit** is the container of the seed or seeds, and the **seed** contains the embryo that grows into a new plant when the seed sprouts.

Determination of families and genera is overwhelmingly based upon floral organization in most floras, field guides, and taxonomic monographs, but there are exceptions. In some cases, different forms of fruit occur in the same family and are thus not necessarily a diagnostic feature. For example, if you see a "hip", it places the plant necessarily in the rose family, Rosaceae. On the other hand, the bean family, also known as the Leguminosae or Fabaceae, is held together by its fruit, the legume, which is a type of dry fruit splitting along two sides when mature. However, the fruits of some legumes, such as those of peanuts and *Lespedeza* are modified and do not split open, and others, such as those found in *Desmodium*, break apart between the seeds instead of splitting open lengthwise.

The terminology for fruits used by botanists and the broader public is sometimes at odds. Most people would certainly refer to a strawberry as a "berry", but botanists, who see this fruit as a

collection of separate, small achenes on an expanded, fleshy receptacle, refer to the it as a "false berry" or "compound fruit".

There is a great variety of fruit types represented in the Missouri flora. The following list includes fifteen of the major types, but some of the specialized subtypes are not discussed. For a more complete listing of fruit types, please refer to any textbook on plant morphology or plant taxonomy (one inexpensive guide is *How to Identify Plants,* by H.D. Harrington and L.W. Durrell, 1957, Swallow Press).

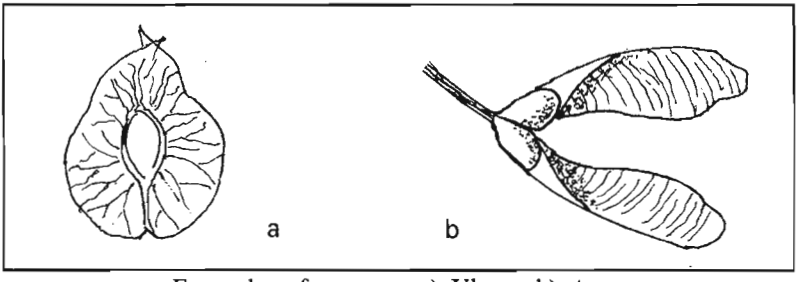


Examples of achenes.
a) *Clematis*, b) *Aster*

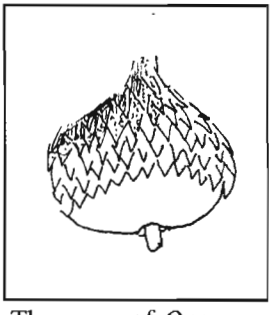
ACHENE - Achenes are dry, one-seeded fruits that do not split open at maturity (indehiscent). This fruit type is widely distributed among plant families. Species in the sunflower family (Compositae or Asteraceae) all produce achenes (these sometimes distinguished as cypselas), and the sunflower seed in its shell is an example of this fruit type. Other examples include the fruits of virgin's bower (*Clematis,* Ranunculaceae) and pondweeds (*Potamogeton,* Potamogetonaceae). The caryopsis (grain) of the grass family is a specialized kind of achene in which the contents are fused to the outer shell.

SAMARA - Samaras are similar to achenes in being single-seeded, dry fruits that do not dehisce. However, samaras have a prominent wing, which can take on many different shapes. The wing aids in the dispersal of the fruits by wind, acting as a sail to help the fruit remain airborne. Examples of this fruit type include the elms

(*Ulmus,* Ulmaceae), maples (*Acer,* Aceraceae), ash species (*Fraxinus,* Oleaceae), and the introduced tree of heaven (*Ailanthus,* Simaroubaceae).



Examples of samaras. a) *Ulmus*, b) *Acer*.

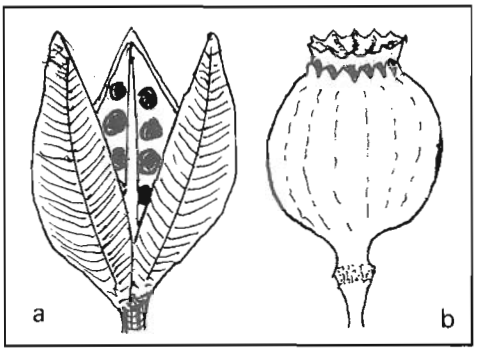


The acorn of *Quercus*, an example of a nut.

NUT - Nuts are also similar to achenes in being single-seeded, dry druits that do not dehisce. However, in the nut the outer wall of the fruit is thickened, hard and "woody". Familiar examples of this fruit type occur in the walnuts and hickories (*Juglans, Carya,* Juglandaceae). In oaks (*Quercus*), the acorn consists of a nut that is partially covered by a cuplike basal structure. Other nuts with various sizes, shapes and coverings include hazelnuts (*Corylus*) and other Betulaceae, as well as beech and chestnut (*Fagus, Castanea,* Fagaceae).

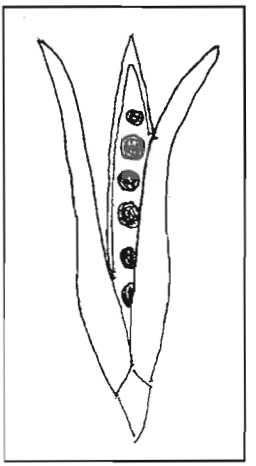
CAPSULE - Capsules are also dry fruits, but unlike achenes these fruits are usually formed from compound pistils (composed of two or more carpels) and thus contain more than one seed. Also, capsules split open at maturity along the septae between the carpels. Examples of species producing capsules are quite common in the Missouri flora, including such diverse species as violets (*Viola,* Violaceae), celandine poppy (*Stylophorum,* Papaveraceae), wahoo (*Euonymus,* Celastraceae), morning glories (*Ipomoea,*

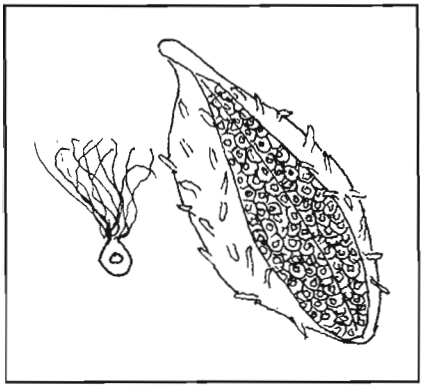
Convolvulaceae), and iris (*Iris,* Iridaceae). Some plants, such as purslane (*Portulaca,* Portulacaceae) have a modified capsule that has circumscissile dehiscence, that is the fruit has a lid or cap that pops off at maturity. Genera, such as the Venus looking glass (*Triodanis,* Campanulaceae) have specialized capsules with openings toward the top resembling, slits, windows, or the holes in a salt shaker, which are sometimes protected from raindrops by an outgrowth or rim of tissue that acts as a shield.



Capsules of a) *Iris*, b) *Papaver*

SILIQUE/SILICLE - Siliques and silicles are modified capsules. In these fruits, there are two carpels. At maturity the two faces of the fruit split from each other and fall away, leaving the seeds attached to the partition between the carpels, which is flat and papery, and is known as a replum. The seeds are then shaken free by the wind. This type of fruit is restricted to members of the mustard family (Cruciferae or Brassicaceae), some of whose members also have indehiscent fruits. The two names actually describe different shapes of the same fruit type (silique, in the broad sense). Siliques (in the strict sense) are usually much more than four times as long as wide, as in the mustards and cabbages (*Brassica*), rock cresses (*Arabis*) and Virginia whitlow wort (*Sibara*). Silicles are one to four times as long as wide, as in shepherd's purse (*Capsella*), the peppergrasses (*Lepidium*), and pennycresses (*Thlaspi*).

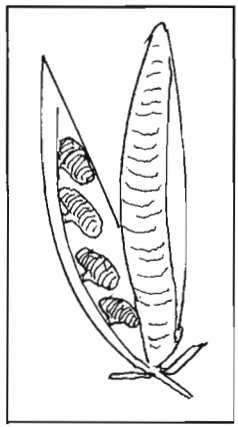

Brassica, an example of a silique



A follicle of *Asclepias*

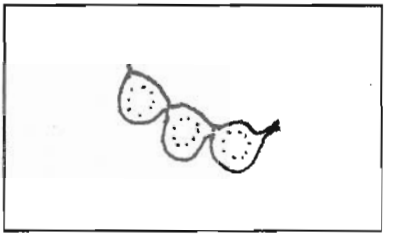
FOLLICLE - Follicles are dry, many-seeded fruits formed from flowers that have ovaries that are not fused together. In such flowers, each carpel forms a follicle that dehisces along only one side. Many species produce more than one follicle from a single flower, such as the milkweeds (*Asclepias*, Asclepiadaceae), dogbanes (*Apocynum*, Apocynaceae), larkspurs (*Delphinium*, Ranunculaceae), and garden paeonies (*Paeonia*, Paeoniaceae). In dogbane and some other plants, the carpels are actually fused at the stigmas during development and flowering (the developing fruits cause this connection to tear apart), although the ovaries are free from one another from the start.

LEGUME - Legumes are dry fruits formed from one carpel that dehisce along both sides. This type of fruit is restricted to the large family of legumes (Leguminosae or Fabaceae, sometimes split into three related families). Familiar examples include beans (*Phaseolus*), vetches (*Vicia*), partridge peas (*Chamaecrista*), and bundle flower (*Desmanthus*). However, not all genera of legumes have typical legume fruits. A few genera, such as peanuts (*Arachis*), sweet clovers (*Melilotus*), and bush clovers (*Lespedeza*) have indehiscent, one or few seeded fruits. Others have a specialized fruit known as a loment that is described below.

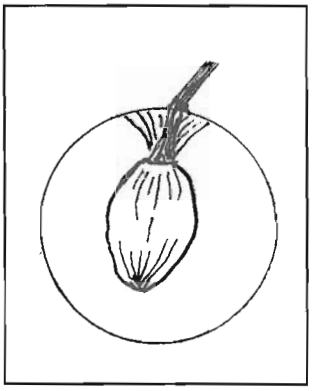


Phaseolus, an example of a legume.

LOMENT - Loments are not restricted to the legume family, but all of the common examples found in Missouri are in this group. Loments are also dry fruits derived from single carpels, but instead of splitting lengthwise, they are usually constricted or flattened crosswise between the seeds and break apart at maturity into one-seeded segments. The genus *Desmodium* (beggar ticks, beggar lice) is the largest and most common genus of Missouri legumes that has loments. In this case the hooked hairs on the fruits facilitate dispersal by animals or clothing. In the latter case the seeds are most often dispersed into a washing machine.



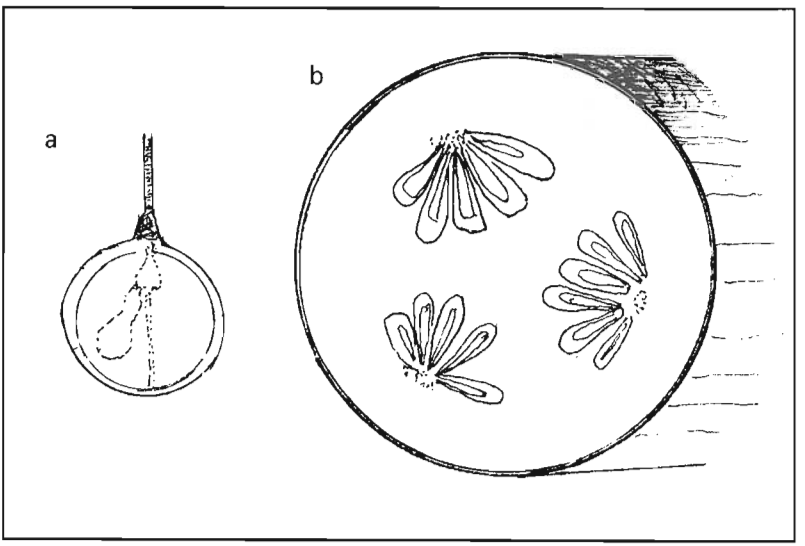
Desmodium, a loment.



Prunus, a kind of drupe.

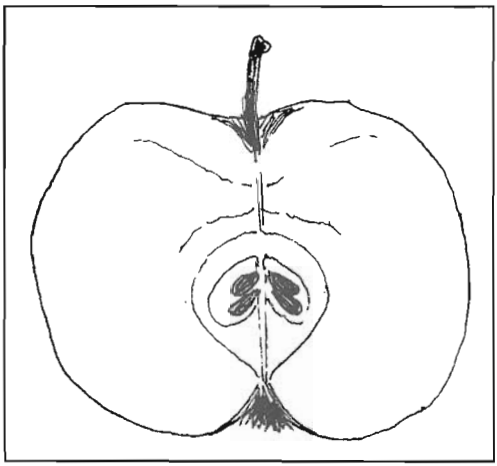
DRUPE - Drupes are also commonly known as "stone fruits". The wall of the ovary develops into three layers: a hard, "stony", inner layer sometimes called a "pit" covers and protects the usually single seed; this is surrounded by a fleshy middle layer that is edible to animals and sometimes humans; and the whole thing is covered by an outer skin or rind. Drupes are common in one subfamily of the rose family (Rosaceae) that contains some of our most prized edible fruits: the cherries, peaches, plums, apricots, and almonds (all *Prunus* species). Unlike most drupes, in which the fleshy middle layer is eaten, the outer layers of the almond fruit are removed and the inner layer is sold (the seed is eaten); thus almonds are not nuts. Genera in other Missouri families that produce drupes include the dogwoods (*Cornus*, Cornaceae) and sassafras (*Sassafras*, Lauraceae).

BERRY - Berries are fleshy fruits developed from one or more fused ovaries and usually contain more than one seed. The juicy layer is formed from specialized, enlarged cells in the ovary wall or from the placenta by which the ovules are attached to the ovary. Familiar examples from the produce counter include grapes, tomatoes, and eggplants. There are also numerous examples from the native flora, including elderberry (*Sambucus*, Caprifoliaceae), pokeweed (*Phytolacca*, Phytolaccaceae), and the nightshades (*Solanum*, Solanaceae). Some specialized berries are distinguished with separate names. Citrus fruits and some other members of the Rutaceae have a specialized berry with a rind known as a hesperidium. Some members of the cucumber family (Cucurbitaceae), including the wild gourd, buffalo gourd, and pumpkin (*Cucurbita*), the cucumber (*Cucumis*), and watermelon (*Citrullus*) also have berrylike fruits with a leathery or hardened rind, which are known as pepos.

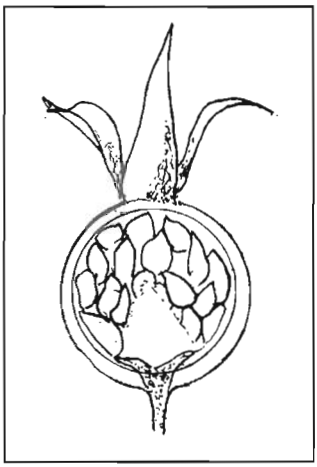


Examples of berries: a) *Vitis*, b) *Cucumis* (a pepo)

POME - The name of this fruit is derived from the Latin *pomum*, referring to any kind of fruit (Pomona was the goddess of fruit and fruit trees). Pomes are specialized, fleshy fruits in which the fleshy part is derived from an expanded receptacle that grows to surround the carpels. The receptacle is the modified end of the stem to which the flower parts are attached. This unusual fruit type is restricted to the subfamily Maloideae of the rose family (Rosaceae), which includes the apples (*Malus*), pears (*Pyrus*), and their relatives. In apples and pears it is this receptacle that is eaten, and the rest of the fruit, including the ovary and seeds is usually discarded.



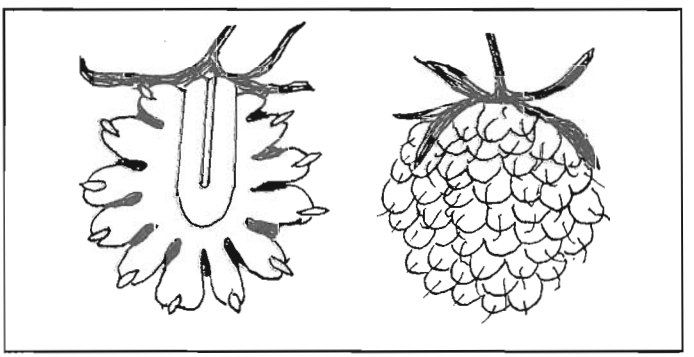
Malus, an example of a pome.



The hip of *Rosa*.

HIP - In hips the receptacle of the flower also enlarges to surround the seeds, but unlike pomes, in hips there are several free carpels, each developing into an achene, and the receptacle does not actually fuse to the ovary walls. This fruit is restricted to the roses (*Rosa*, Rosaceae), but only in some species does the receptacle become enlarged and juicy. The larger-hipped species are sometimes used to make marmelades. Rose hips are also dried and used to make herbal teas, and are a commercial source of vitamin C.

AGGREGATE AND COMPOUND FRUITS - In some plant groups clusters of fruits become grouped together into larger, complex fruiting structures. If these structures are formed by fusion of many individual flowers, as in pineapples (*Ananas*, Bromeliaceae), then they are known as compound fruits. The large connonball-like fruits of hedge apple (*Maclura*, Moraceae) are actually composed of numerous flowers that become fused into the receptacle. If instead, they contain several to many separate fruits from a single flower (as in rose hips), they are known as aggregate fruits. There are several other common examples of aggregate fruits in the Missouri flora, with different types of component fruit types. Strawberries (*Fragaria*, Rosaceae) consist of many individual achenes on an enlarged, fleshy receptacle. Buttercups (*Ranunculus*, Ranunculaceae) have a similar structure, except the enlarged receptacle does not become fleshy. Raspberries and blackberries (*Rubus*, Rosaceae) are clusters of berries on an elongated receptacle, that may or may not be separable from the rest of the "fruit" at maturity, depending upon the group of species. Tulip poplar (*Liriodendron*, Magnoliaceae) produces a tight cluster of samaras that gradually disperse from the outer edge inward.



The aggregate fruit of *Rubus*.

ARE THERE LICHENS IN THE SUBURBS?

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Lisle, Ill. 60532[1]

Most people who have spent time outdoors in Missouri, particularly in the Ozark region, are aware that lichens are a nearly ubiquitous component of the natural landscape. Although almost no one attempts to pursue lichens with the same zeal as birdwatchers pursue birds, most people have a casual familiarity with lichens as grayish or greenish splotches on tree trunks, or the occasional red-topped British Soldiers on a rotting log, or mats of reindeer "moss" in rocky open woodlands.

A popularly held notion about lichens is that they are universally intolerant of air pollution. The sensitivity of certain types of lichens to air pollution has been well documented. This is frequently used to buttress accounts regarding the lack of lichens in and around major urban areas. How true is this for the St. Louis area?

A census of the lichen flora of a small residential yard at 400 Linum Lane in suburban Webster Groves revealed a surprising lichen diversity. After residing at the site for more than four years and having casually dismissed the few easily visible lichens as weeds not worthy of note, I finally decided to undertake an objective survey of the yard's lichen flora.

This yard encompasses 11,600 square feet, or about one quarter of an acre. Suitable lichen substrates are extremely limited: there are six trees over 2" DBH (diameter at breast height) in the yard, as well as several shrubs. These exist in a well-spaced array

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in a turfgrass lawn. Most of the trees have been growing on the site since the early 1950's, providing 40 years of relatively stable land use conditions.

Nineteen species of lichens occur in the yard; this represents about 4% of the total known lichen flora of the state. Five of these lichens have never been formally reported from Missouri, although all are known from collections elsewhere in the state. The lichens are equally divided between crustose and foliose taxa. Most of the lichens grow on trees and shrubs; only seven species occur on non-corticolous substrates: one each on limestone, old brick edging, and old treated timbers, and four on weathered concrete - one of which also occurs on sandstone. Twelve of the lichens here each grow on only a single substrate, and none occur on both corticolous and non-corticolous substrates. Table I provides a summary of lichen substrate affinities. All of the individual lichen plants noted were small, typically 10 mm or less along their longest axis.

The list at the end of this note provides a complete account of the lichen flora of the yard. The only tree with a well-developed lichen flora was a 19" DBH silver maple (*Acer saccharinum*), which was inhabited by eleven species of lichens. An adjacent 22" DBH Siberian elm (*Ulmus pumila*) had five species of lichens, although only one was common. Although the silver maple and Siberian elm were adjacent, their lichen floras were different - only four lichens occurred on both trees, as contrasted with eight that occurred on only one tree or the other. A 4" DBH redbud (*Cercis canadensis*) appeared at first glance totally devoid of lichens, but upon close examination was found to have numerous minute yellow thalli of *Candelaria concolor* scattered along the lower trunk, and a single fragment each of *Arthonia caesia* and *Physcia millegrana*. All of these individual thalli were less than 4 mm in diameter. A multi-coppiced ornamental magnolia (*magnolia denudata*) harbored *Arthonia caesia* and a small fragment of *Physcia stellaris*. Although several old lilac (*Syringa vulgaris*)

bushes occur on the site, they were devoid of lichens except for a few small thalli of *Arthonia caesia* on one stem of one bush. A 10" DBH Colorado spruce (*Picea pungens*) was sparsely colonized by *Arthonia caesia*, *Lecanora strobilina*, and *Physcia stellaris*. Three other conifers on the property, including red cedar (*Juniperus virginiana*), Mugho pine (*Pinus mugo*), and a large, open-grown 20" DBH white pine (*Pinus strobus*), did not have any lichens.

On trees, most lichens except *Physcia stellaris* were located at the base or on the lower meter of the trunk. Only *Candelaria concolor* was common on a few trees for any distance up the trunk, and it was largely restricted to the north sides of these trees. *Physcia stellaris* was the only lichen to occur regularly on branches, but was never abundant. Lichens characteristic of upper trunks of trees in undeveloped landscapes are restricted to basal zones at this site. This pattern of corticolous lichen colonization differs from locations elsewhere in Missouri, particularly in the Ozarks, where lichens typically are abundant and diverse on all parts of trees.

In addition to the effects of air pollution, this pattern of lichen growth may reflect the decrease in ambient humidity brought about by urban development. Brodo (1968) has speculated on the effects of "urban drought" on lichens in the New York City environs. The fact that virtually all of the lichen biomass at the Webster Groves site occurred close to ground level seems to support Brodo's thesis. Air quality at various levels in the yard should be equivalent, yet there is a pronounced difference in the abundance and composition of the lichen vegetation at various levels. LeBlanc and Rao (1973) have discussed air pollution and urban drought in relation to lichens. They contend that restriction of lichens to basal areas of trees is due to increased transport velocities above the ground, and hence more air pollutants. If this were the sole factor, one would expect sheltered locations, with their reduced transport velocities, to have better developed lichen floras than unsheltered

areas of similar ambient light intensities. That is not true in this location. Brodo (1966) has postulated that air pollution and urban drought both affect urban lichen floras, with pollution the more pervasive and wide ranging of the two effects, and urban drought impacting the pollution tolerant lichens surviving in an urban zone.

Just as for the fauna, vascular flora, and other aspects of the biota, the lichen flora of this microcosm of a suburban landscape has been radically altered by the impacts of development. Nonetheless, a surprisingly rich lichen flora lives in this small area with limited opportunities for lichen establishment and growth. While the more conservative lichens, including virtually all of the larger forms, do not occur at the site, the area is not by any measure devoid of lichens.

The degree to which various factors influence the composition of the lichen flora is difficult to determine. To simply ascribe the site's relatively poor lichen diversity as compared to natural areas solely to the effects of air pollution seems insupportable. There has been an equal or greater incremental impoverishment in the fauna and vascular flora at the site, yet these declines are never attributed solely to the effects of air pollution. A more reasonable approach might be to view the current condition of the lichen flora of the site as the end product of a myriad of environmental influences and site perturbations, of which air quality changes are a contributing factor. Perhaps the pollution-sensitive elements of the St. Louis area lichen flora are in a recovery phase; our air today is far cleaner than in the days of smokestack industry, inefficient vehicles burning leaded fuel, coal heating, and largely unregulated emissions.

As this example indicates, the suburban environment in the St. Louis metropolitan area is characterized by a cohort of small and relatively non-conservative crustose and foliose lichens. These lichens are widely distributed, and lichens appear to be a nearly

ubiquitous, if inconspicuous, component of the local suburban landscape.

LICHEN FLORA OF 400 LINUM LANE WEBSTER GROVES, MISSOURI

In the following alphabetical list, nomenclature for lichens follows Egan (1987). Hale (1979) provides good nontechnical descriptions and illustrations of the foliose lichens. Nearing (1962) provides nontechnical descriptions and illustrations of many of the crustose forms and definitions of technical terms. Apothecia are the disk-like fruiting structures of the fungal component of the lichen. Numbers in brackets refer to the author's collection number for voucher specimens. Appreciation is extended to Richard Harris of the New York Botanical Garden and Gerould Wilhelm of The Morton Arboretum for their assistance with determinations.

Arthonia caesia Occasional on silver maple, rare on lilac, magnolia, redbud, and spruce. This lichen is frequently sterile at the site, appearing as zones of powdery greenish granules on bark. It occurs on more trees than any other lichen in the yard, although nowhere abundantly. [15790]

Bacidia sp. #1 (fide Harris 1977) Known only from old bricks forming an edging along ornamental plantings. This is the first report for Missouri. This is an inconspicuous greenish gray crust with black apothecia. It is similar to B. inundata, but the epithecium is greenish at the edges, the hypothecium is brown, and the hymenium is greenish. [12625]

Caloplaca feracissima Common but inconspicuous on partially exposed, flat, weathered concrete on retaining walls, driveways, and stoops. This lichen consists of tiny yolk-yellow apothecia less than a quarter of a millimeter in diameter, with lighter colored borders, scattered among the rock granules in the concrete. This is the first report for

Missouri, although the species is common on old concrete throughout much of the state. [17302]

Caloplaca flavovirescens Rare; two small thalli occur in the yard on shaded concrete and mortar. This lichen consists of small, orange apothecia in a thin, yellow, crustose thallus. [17305]

Caloplaca pollinii Locally frequent on the lower trunk of silver maple. This lichen is a drab, dark gray crust with small black apothecia. [15795]

Candelaria concolor Common on silver maple and especially Siberian elm; uncommon on Red Bud. This small, lemon-yellow foliose lichen is the most common lichen in the yard. [15798]

Endocarpon pusillum Rare on partially sheltered concrete stoop. This lichen consists of tiny brown squamules that turn green when wet. [17303]

Lecanora dispersa Rare on sandstone near mortar joints; occasional on weathered concrete, often associated with *Caloplaca feracissima*. The tiny, white-rimmed, light to dark brown apothecia are distinctive. This is the first report for Missouri. [17304]

Lecanora saligna Occasional on weathered railroad ties bordering a garden bed, in partial shade. This appears to be a consistent substrate for the plant in the St. Louis area. The small, brown apothecia with scant thallus development blend perfectly with the ties and are easily overlooked. This is the first report from Missouri. [16829]

Lecanora strobilina Rare at the base of silver maple and a single plant on a spruce branch; the greenish yellow crust with pale

tan apothecia bordered by thick, powdery, greenish yellow rims is distinctive. [15792]

Phaeophyscia cernohorskyi Rare at the base of Siberian elm and silver maple. This small, gray foliose lichen has fine whitish hairs along the tips and edges of the lobes. [15786]

Phaeophyscia pusilloides Uncommon on the lower trunk and base of silver maple, as well as a few small thalli on the base of Siberian elm. This is a dark greenish gray foliose lichen with small round soredia (powdery zones). [15791]

Physcia millegrana Occasional on silver maple and Siberian elm, rare on redbud. After *Candelaria concolor*, this small light gray foliose lichen with a white underside is the most common lichen in the yard. On mid and upper trunks, the two are sometimes the only lichens present. Both seem to thrive throughout the suburban region. [15797]

Physcia stellaris Occasional on silver maple; also uncommon on spruce branches, and a single, tiny fragment on an ornamental magnolia branch. This small, gray, foliose lichen lacks the granular particles (soredia) along the lobe edges that characterize the similar but more delicate *P. millegrana*. It is probably found on the upper branches of the larger trees (Siberian elm and white pine), since previous experience in the area has shown it to be locally common on upper branches of a variety of tree species in suburban settings. [15796]

Punctelia rudecta Known only from a small, stunted fragment on the base of silver maple; typically this is a large, grayish green foliose lichen with numerous white pores on the upper surface. [15789]

Pyrrhospora varians Occasional on lower trunk of silver maple, usually associated with *Caloplaca pollinii*. The aggregated

clusters of slightly irregular, brown apothecia on a pale whitish gray crust are distinctive. This is the first report for Missouri. [15794]

Pyxine subcinerea Known only from a few small (ca. 6 mm dia.) fragments just above the base of the silver maple. This small, medium-gray, foliose lichen has a pale yellow medulla (inner tissue). [15788]

Verrucaria muralis Known only on a chunk of limestone in a sheltered nook along a north-facing foundation wall. This is a very inconspicuous greenish crust with dark perithecia partially sunken in minute pits in the rock. [15821]

Xanthoria candelaria Rare on the base of Siberian elm. This orange-yellow lichen was associated with the morphologically similar *Candelaria concolor*, which is lemon yellow. [15785]

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Table 1. Lichen substrate profile, 400 Linum Lane.

	SUBSTRATE										
LICHEN	maple	elm	redbud	spruce	magnolia	lilac	RR Ties	concrete	limestone	brick	sandstone
Arthonia caesia	x		x	x	x	x					
Bacidia sp.#1										x	
Caloplaca feracissima								x			
Caloplaca flavovirescens								x			
Caloplaca pollinii	x										
Candelaria concolor	x	x	x								
Endocarpon pusillum								x			
Lecanora dispersa								x			x
Lecanora saligna							x				
Lecanora strobilina	x			x							
Phaeophyscia cernohorskyi	x	x									
Phaeophyscia pusilloides	x	x									
Physcia millegrana	x	x	x								
Physcia stellaris	x			x	x						
Punctelia rudecta	x										
Pyrrhospora varians	x										
Pyxine subcinerea	x										
Verrucaria muralis									x		
Xanthoria candelaria		x									
Taxa/substrate	11	5	3	3	2	1	1	4	1	1	1

PANICUM YADKINENSE ASHE (POACEAE) NEW TO MISSOURI

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In May 1992, a small population of *Panicum yadkinense* Ashe was found growing in an open, sandy flat along the East Fork of the Black River in Reynolds County, Missouri. This is the first station for this panic grass in Missouri. A voucher specimen was collected on 30 May 1992 from Johnson's Shut-Ins Natural Area in Johnson's Shut-Ins State Park (*Heumann 21*, MO). The grass is a perennial to 1 meter tall, closely resembling *P. dichotomum* L. According to Hitchcock (1950), *P. yadkinense* ranges from Pennsylvania to southern Illinois and south along the coastal plain to Georgia and Texas where it grows in moist woods and thickets. It was named for the Yadkin River, in North Carolina.

Approximately 15 stems of "Yadkin panic grass" were observed growing in an open sand flat at the base of a rhyolitic cliff in a rich stand of deer tongue grass (*P. clandestinum*), switch grass (*P. virgatum*), purple coneflower (*Echinacea purpurea*), Ozark witch hazel (*Hamamelis vernalis*), and ninebark (*Physocarpus opulifolius*). A second population of 5 stems was observed growing in a shaded, sandy, oak-pine bottom with elm-leaved goldenrod (*Solidago ulmifolia*), smooth false foxglove (*Gerardia flava*), flowering spurge (*Euphorbia corollata*), pale Indian plantain (*Cacalia atriplicifolia*), Bosc's panic grass (*Panicum boscii*), and winterberry (*Ilex verticillata*). Although the two sites are physically similar floodplain terraces, they are floristically dissimilar. As shown in table 1, only seven of a total 41 associated vascular plants are common to both sites.

Panicum yadkinense resembles *P. dichotomum* var. *dichotomum*, with a ligule less than 1 mm and glabrous spikelets, leaves, sheaths, and culms. However, *P. yadkinense* is distinguished by its larger, acutely pointed spikelets (2.3–2.5 mm), taller culms, and distinctive pale glandular spots on the leaf sheaths. It appears to be restricted to richly vegetated, low, sandy oak-pine woods at this station. Typical *P. dichotomum* is most frequently found in dry upland woods in acid soils in the Ozarks, and Steyermark (1963) stated that it is found, "Less frequently in low rich woodlands."

Yadkin panic grass appears to be a conservative native component of this habitat type. Searches along a one-mile stretch of the river revealed only the two described sites, both on sand flats just higher than the banks of the river. Future searches will likely find this plant in similar sites in the St. Francois Mountains area of southeastern Missouri.

The taxonomy of the genus *Panicum* L. has been a subject of taxonomic debate. In Illinois, Mohlenbrock (1985) placed the grass in the genus *Dichanthelium*, as *D. yadkinense* (Ashe) Mohlenbr. Other authors have subsumed the grass under *P. dichotomum* (Smith, 1988, Correll and Johnston, 1970) or treated it as *P. dichotomum* var. *yadkinense* (Ashe) Lelong (Lelong 1986). It is not known whether this taxon will remain at the species level, be reduced to a variety of *P. dichotomum*, or be subsumed under that species. Whatever the outcome, these Missouri populations have distinctive field characters and are a handsome grass.

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Table 1. Vascular plants associated with *Panicum yadkinense* Ashe. Nomenclature follows Steyermark (1963).

SITE 1 - Open sand flat below an igneous cliff.
SITE 2 - Shaded oak-pine sand flat near the base of an igneous talus slope

SCIENTIFIC NAME	COMMON NAME	SITE NUMBER 1	SITE NUMBER 2
Acalypha gracilens	slender mercury	X	
Ambrosia artemisiifolia	common ragweed	X	
Andropogon gerardii	big bluestem	X	
Andropogon scoparius	little bluestem	X	
Antennaria plantaginifolia	pussy toes	X	X
Aster patens	spreading aster		X
Cacalia atriplicifolia	pale Indian plantain		X
Carpinus caroliniana	blue beech		X

Table 1, continued.

SCIENTIFIC NAME	COMMON NAME	SITE NUMBER 1	SITE NUMBER 2
Cassia nictitans	wild sensitive plant	X	X
Chrysopsis villosa	golden aster	X	
Coreopsis tripteris	tall coreopsis		X
Echinacea purpurea	purple coneflower	X	
Elymus virginicus	Virginia wild rye	X	
Euphorbia corollata	flowering spurge		X
Gerardia flava	smooth false foxglove		X
Hamamelis vernalis	Ozark witch hazel	X	X
Houstonia longifolia	long-leaved bluet	X	
Ilex verticillata	winterberry		X
Juniperus virginiana	red cedar	X	X
Lespedeza procumbens	trailing bush clover	X	
Lysimachia lanceolata	lanceleaf loosestrife	X	
Panicum boscii	Bosc's panic grass		X
Panicum clandestinum	deer tongue grass	X	
Panicum sphaerocarpon	round-fruited panic grass	X	
Panicum virgatum	switch grass	X	
Physocarpus opulifolius	ninebark	X	
Physostegia virginiana	false dragonhead	X	
Pinus echinata	shortleaf pine	X	X
Potentilla simplex	common cinquefoil	X	
Pycnanthemum tenuifolium	slender mountain mint	X	
Quercus alba	white oak		X
Ratibida pinnata	gray-headed coneflower	X	
Rosa carolina	pasture rose	X	
Rudbeckia hirta	black-eyed Susan		X
Solidago nemoralis	old field goldenrod	X	
Solidago ulmifolia	elm-leaved goldenrod	X	X
Thaspium trifoliatum	purple meadow-parsnip	X	X
Ulmus alata	winged elm	X	
Uniola latifolia	spike grass		X
Vernonia baldwinii	western ironweed	X	
Vernonia crinita	great ironweed	X	

STUDIES IN THE FLORA OF MISSOURI, IV

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The register of Missouri's flora continues to grow as field and herbarium studies reveal the presence of additional taxa not previously recognized as growing in the state. Ongoing work is refining our knowledge of various families and genera, a process that seemingly will never find conclusion.

The purpose of the present paper is to relate several new state records based on field and herbarium studies by a variety of individuals: 14 new species are reported; 5 of these native and the other 9 introduced. The authors acknowledge information and assistance provided by Nina Bicknese, Sherry Holmes, Don Kurz, Doug Ladd, Paul Nelson, Tim Nigh, John Oliver, Richard Rabeler, Anton Reznicek, James Solomon, James Trager, Ginny Wallace, and James Whitley.

ASTERACEAE

Aster tataricus L.f. (Asteraceae), Tatarian aster, is native to Siberia, but is commonly grown in gardens in this country. It has escaped from cultivation at a number of sites in the eastern half of the United States, and has now been confirmed as an escape in Missouri. A collection made by James Solomon of the Missouri Botanical Garden on 9 October 1976 along a stream ca. 4 miles northwest of Pevely (table 1) was discovered recently in a pile of undetermined specimens.

Aster tataricus is a distinctive, perennial aster with relatively large, blue-rayed heads in flat-topped inflorescences

and large oblanceolate leaves long-tapered to sessile, but not clasping bases. Plants do not key well in Steyermark's (1963) key to aster species, due to conflicting characters.

CARYOPHYLLACEAE

Missouri botanists know the forked chickweed genus *Paronychia* (Caryophyllaceae) from two, delicate, annual species (*P. canadensis* (L.) Alph. Wood and *P. fastigiata* (Raf.) Fern.). A third native species has recently been discovered in Missouri. *Paronychia virginica* Sprengel, sometimes known as Virginia or Appalachian whitlow-wort, was discovered by Nina Bicknese on 29 August 1988 during her Natural Features Inventory of McDonald County (Bicknese, 1988). Subsequent searches have documented this species' occurrence at a series of localities in McDonald County in and around the town of Powell (table 1). At the Missouri sites plants grow in exposed areas on limestone ledges, bluff faces, and small glades, often in vertical to near-vertical situations.

This remarkable species is so distinctive in appearance that it is not likely to be confused with any other member of the Missouri flora. *Paronychia virginica* has the scarious stipules typical of the two annual Missouri members of the genus, but is a multi-stemmed perennial. The leaves are needle-like and opposite. Flowers are numerous in dense cymes at the tips of the stems. The flowers and capsules are yellow when fresh. The identity of Missouri materials was verified by Richard Rabeler of the University of Michigan, a specialist on the family Caryophyllaceae.

Missouri specimens are referrable to var. *scoparia* (Small) Cory, which grows primarily in the eastern half of Texas and Oklahoma (Core, 1941), with outlying populations in central and western Arkansas (Smith, 1988). These are some 180 km to the south of the Missouri sites. This variety is said to differ from

typical *P. virginica* of the Appalachians in its more strongly ascending inflorescence branches and generally more robust habit, but some workers have expressed doubts that these character states are anything more than environmental and age-related differences (Core, 1941). The western and eastern populations do appear separable from one another, based on a qualitative examination of specimens at the Missouri Botanical Garden Herbarium (MO), thus the varietal segregation recommended by Cory (1944) is adopted here.

CELASTRACEAE

Burning bush, or winged spindle-tree, *Euonymus alatus* (Thunb. ex Murray) Siebold (Celastraceae), is a native of eastern Asia that is widely cultivated as an ornamental in the United States. Although it does not appear to spread aggressively, it does escape and become established outside cultivation sporadically. This species was first recorded for Missouri on 3 September 1987 by Doug Ladd at a site in Jefferson County in a disturbed woodland (table 1). It was subsequently collected on 28 September 1989 by Charles Caverly during a floristic inventory of the Missouri Department of Conservation's Powder Valley Nature Center site, in St. Louis County, where it was growing in a ridgetop forest at the southwest end of the property (table 1).

Euonymus alatus is a much-branched shrub to 2.5 m tall with sharply serrulate, deciduous leaves that turn bright red in the fall. The flowers are 4-merous and green, and the fruits are smooth and often deeply two-lobed, with an orange aril covering the seeds. It can be distinguished from the four other species of *Euonymus* in Missouri by the 2–4 corky wings on its branches.

Another exotic member of the Celastraceae that has become established in Missouri is the Oriental bittersweet, *Celastrus orbiculatus* Thunb. ex Murray. A native of eastern Asia, it is

widely planted as an ornamental in the United States, and it escapes sporadically to colonize open woodlands and thickets as far north as Connecticut (Gleason and Cronquist, 1991). The species was first discovered outside of cultivation in Missouri by Paul Nelson in 1990 during field work at the University of Missouri's Thomas Baskett Wildlife Research Area, 3 miles east of Ashland in Boone County. There, this aggressive, woody climber festoons telephone poles, as well as oaks and junipers, in a large, open area of old fields and grassland that are reverting to upland forest. A voucher was subsequently collected on 18 June 1991 (table 1). A second population was discovered by Michael Arduser and Jane Stevens on 12 October 1992 at Castlewood State Park in St. Louis County, where it had probably escaped from an old homesite.

Celastrus orbiculatus tends to be more robust than the native *C. scandens* L. It also has broader, obovate to nearly orbicular leaves. Unlike the terminal panicles of flowers characteristic of *C. scandens*, those of *C. orbiculatus* are in short, axillary cymes of 2–3 flowers.

CYPERACEAE

South of Naylor, along the Arkansas state line in Ripley County, the Nature Conservancy's Nancy B. Altvater Pondberry Preserve and the Missouri Department of Conservation's adjacent Sand Ponds Natural History Area are home to several species of rare and endangered plants and animals. Many of these occur in the swampy forest covering a large part of the preserve. However, the low, sandy rises bordering this "sand ponds forest" also provide a special habitat and harbor unusual species. It was in this somewhat drier, forested habitat that *Carex abscondita* Mackenzie (Cyperaceae) was collected during field work on 24 May 1989 (table 1). This discovery was first mentioned in a description of the preserve (The Nature Conservancy, 1991), but has not been brought to the attention of

botanists in the state previously. Earlier, Mackenzie (1935) claimed to have examined specimens collected in Missouri, but this has not been verified by subsequent workers, and the species was not mentioned by Steyermark (1963).

Carex abscondita has long, branching rhizomes and forms extensive, clonal colonies. The spikes are on short peduncles and mostly obscured by the leaf bases. It belongs to the section *Laxiflorae*, which includes several common Missouri taxa. In Steyermark (1963), this species would key closest to *C. digitalis* Willd., from which it differs in its nearly sessile, rather than conspicuously pedunculate, staminate spikes and smaller growth form.

This interesting sedge grows primarily along the eastern seaboard from Massachusetts to Florida and disjunctly further inland in Louisiana and Indiana. Recently, it has been reported from southern Mississippi (Carter et al., 1990), as well as several counties in Arkansas and Texas (Naczi and Bryson, 1990). It should be sought for at other localities in Missouri's bootheel counties.

DRYOPTERIDACEAE

Yatskievych and Turner (1990) listed five native species of the wood fern genus *Dryopteris* for Missouri. A recent find from northeastern Missouri raises this number to six. On 26 June 1991 Missouri Department of Conservation biologists Don Kurz and Karen Kramer were botanizing a forested margin of Goose Pond, a marsh and spring complex located near the town of Wayland in Clark County. There they encountered a population of *D. cristata*, the crested shield fern, which is otherwise found to the north and east of the state.

Crested shield fern in some ways resembles a smaller version of the log fern, *D. celsa* (W. Palmer) Small, but does

not key well in Steyermark's (1963) key to *Dryopteris* species, because it has fewer lobes on the basal pinnae (leaflets) than either that species or Goldie's fern, *D. goldiana* (Hook.) A. Gray. An unusual feature of *D. cristata* is that the pinnae tend to orient themselves with the surfaces parallel to the ground, so that the leaf somewhat resembles a Venetian blind in terms of its leaflet position.

ERICACEAE

Vaccinium corymbosum L. (Ericaceae) is a highbush blueberry native to eastern North America that is cultivated for its edible fruit. A small orchard of plants of this species has persisted for many years at an old homesite along the southern edge of Pickle Springs Natural Area in Ste. Genevieve County. In recent years, scattered progeny of these cultivated plants have been noted as escapes in the main portion of the preserve. A voucher specimen (table 1) was collected on 13 April 1991 in rocky woods just west of Piney Glade along the nature trail.

Vaccinium corymbosum is a shrub to 3 or more m tall with ovate to narrowly elliptic, deciduous leaves, and with relatively large flowers with cylindrical or urn-shaped, whitish pink corollas. It would key to the lowbush blueberry, *V. pallidum* [= *V. vacillans*], based on flower and leaf characters in Steyermark's (1963) key to species of *Vaccinium*, but differs from that species in its taller, arborescent growth form and in its generally larger flowers and fruits. Also, the flowers of *V. corymobosum* appear in short racemes (often very short!), but those of *V. pallidum* are in axillary clusters. The closest native populations of *V. corymbosum* to the Ste. Genevieve County plants occur in northwestern Arkansas and western Kentucky (Vander Kloet, 1988).

FABACEAE/MIMOSOIDEAE

The honey mesquite, *Prosopis glandulosa* Torrey, occurs throughout the southwestern United states and the southern Great Plains. Recently a specimen was discovered at the Missouri Botanical Garden documenting this species' historical existence in Missouri. Steyermark (1963) made no mention of B.F. Bush's collection from waste ground near Sheffield, Missouri, on 25 September 1918, and it has not been recorded in other literature on the genus or the region. The Atlas of the Flora of the Great Plains (Great Plains Flora Association, 1977) shows the closest localities as occurring in Tulsa and Washington Counties, Oklahoma, ca. 450 km to the southwest of the Missouri station.

The genus *Prosopis* differs from other mimosoid legumes in the state by its arborescent growth form and its dense spikes of small yellow flowers, among other characters. The Missouri collection apparently falls into the more western var. *torreyana* (L. Benson) M.C. Johnston, which has fewer leaflets than the Great Plains var. *glandulosa*. It seems unlikely that the original station still exists, but this species might be reintroduced in the future, as its fruits are frequently eaten by cattle.

FAGACEAE

The oaks (*Quercus*, Fagaceae) contain numerous species prized for their value as ornamental trees and lumber. Yatskievych and Turner (1990) listed twenty species as growing in Missouri, all of them native. A number of these species are cultivated as street and garden trees, and collectively are among the most important tree groups in Midwestern horticulture. Sadly, in spite of the diversity of native oaks available, some Midwestern nurseries are beginning to import an exotic species.

Quercus acutissima Carruth. is an Asian oak whose leaves somewhat resemble those of the native shingle oak, *Q. imbricaria*, but usually have coarse, shallow teeth with bristle tips. The acorns have deep, shaggy cups. It is unclear why this particular oak, which is beginning to be sold in the eastern U.S. under the name sawtooth oak, should be more desirable to land owners than the native species, but perhaps any novelty will be purchased by a certain percentage of the public.

Sawtooth oak has been grown in a few of the larger botanical gardens and arboreta in this country as a specimen tree for a number of years. At the Missouri Botanical Garden's Shaw Arboretum at Gray Summit in Franklin County, this species has escaped and successfully become naturalized, forming a small grove of large, reproducing individuals in an unplanted portion of the property near Brush Creek. A voucher for this new record was collected on 1 Sep 1992 by James Trager of the Arboretum staff. This species can be expected to spread to additional sites as it becomes more commonly cultivated.

LAMIACEAE

A third species of *Lamium* has been recorded for Missouri. Steyermark's (1963) flora included two common introduced species, *L. amplexicaule* L., also known as henbit, and *L. purpureum* L., a dead nettle. On 2 April 1967, Victor Mühlenbach collected two small, immature specimens of an unusual *Lamium* growing with a colony of *L. purpureum* (table 1). These were subsequently determined to be *L. hybridum* Vill. by F. Markgraf (of the Botanical Institut in Zurich, Switzerland) and have been verified during our studies. Oddly, Mühlenbach never reported this find in his several papers on the "synanthropic railroad flora" of the St. Louis area (e.g., Mühlenbach, 1979).

More recently, a second site for the hybrid dead nettle was discovered by the authors and P. McKenzie in Columbia, Boone County. A small population was located in a disturbed area along a parking lot, where it also was growing with *L. purpureum*. A voucher was collected on 30 May 1993 (table 1).

The scientific name notwithstanding, *L. hybridum* is apparently not a hybrid between henbit and dead nettle. Bernström (1955) studied the cytogenetics of these taxa and of artificially produced hybrids between them and determined that although diploid *L. purpureum* was involved in the formation of the tetraploid *L. hybridum*, the other parent was not *L. amplexicaule*. Plants of the hybrid dead nettle do resemble henbit superficially, particularly in the deeper and more rounded teeth along the leaf margins. They differ from this species however, in several important characters, including petiolate upper leaves that are not clasping or fused basally in the inflorescence, and in small bracts subtending the flowers. The inflorescences are relatively dense and apical, as in *L. purpureum*.

Plants of *L. hybridum* would key to *L. purpureum* in Steyermark (1963). They differ from that species in having more deeply and irregularly toothed leaves, corollas lacking a region of short hairs in the tube, and in their larger nutlets (2.2–3.0 mm, vs. 1.8--2.0 mm). The plants also tend to be a lighter green color and lack purplish coloration along the stems and upper leaves.

LYCOPODIACEAE

The ground cedar, *Lycopodium tristachyum* Pursh, is the best-known Missouri member of the *L. complanatum* complex, which has variously been referred to by taxonomists as *Lycopodium* section *Complanata* or the segregate genus *Diphasiastrum* (Øllgaard, 1987; Wagner and Beitel, 1992).

However, another member of this group has recently been discovered to grow in the state. *Lycopodium digitatum* Dill. ex A. Br., running ground cedar, was first collected in Missouri independently by Cecil Franklin and John Thurman, local land owners who had read an article in the *Missouri Conservationist* magazine featuring a photograph of *L. tristachyum*.

Mr. Franklin's site was under trees along an intermittent drainage near Oak Ridge, in Cape Girardeau County, and was observed on 8 August 1986. Mr. Thurman's site was in Carter County, on a wooded slope along a draw just below a man-made pond, under oaks and pines, about 6 miles N of Elsinore. The Carter County population was originally noted on 2 March 1987 and was subsequently revisited on 28 October 1987 by Tim Nigh during his Natural Features Inventory of Carter County (Nigh, 1988).

A third site was discovered on 7 May 1989 by John Oliver during a field trip to the Bell Mountain Wilderness, in Iron County, where a large colony grew along an earthen dam containing a small pond. A fourth station has since been discovered in Reynolds County, ca. 4 mi N of Ellington, in a wooded ravine. This site was documented on xxx 1993 by Conservation Department botanist Tim Smith and Reynolds County Conservation Agent xxx. Voucher specimens are cited in table 1.

In overall appearance, *L. tristachyum* and *L. digitatum* are quite similar. However, the horizontal stems of the former are underground (often 15–30 cm), with isolated clumps of aerial stems appearing at some distance from one another; those of the latter are at ground level or nearly so, with clonal colonies of dense, aerial stems often forming mats 3 m or more in diamter. The strobili of *L. tristachyum* are angled at the tip, whereas those of *L. digitatum* frequently have attenuated, sterile tips with reduced scales. In *L. tristachyum*, the leaves on the abaxial

surface of the flattened branches are similar in length to those along the margins, but in *L. digitatum* these are reduced to minute triangular flaps, much smaller than the marginal leaves.

Lycopodium digitatum is widespread in eastern North America and has been treated as *L. flabelliforme* (Fern.) Blanchard or *L. complanatum* L. var. *flabelliforme* Fern. in much of the older literature (Hickey and Beitel, 1979). Unpublished evidence indicates that this species is actively expanding its range in the Midwest. Peck and Peck (1988) recently published a first report for Arkansas and Mohlenbrock (1967, 1986) has indicated that it has become common in southern Illinois during the past few decades. Additional Missouri localities for this species are certain to be discovered in the future.

POACEAE

Most Missourians know the genus *Bromus* from the several species of weedy annuals that are abundant along roadsides and in other disturbed areas. However, the genus also contains a small group of native, woodland perennials, including *B. pubescens* Muhlenb. ex Willd. (Canada brome) and *B. latiglumis* (Shear) A. Hitchc. (no common name). To this may be added *Bromus ciliatus* L. (fringed brome), which may be distinguished by lemmas that are hairy only at and near the edges. This species was found growing in an upland, oak-hickory forest at Hilda Young State Forest near Pacific, where it was undoubtedly of native occurrence. Gleason and Cronquist (1991) contrasted this species with other *Bromus* species and included Missouri in their range, but the specimen collected at this site (table 1) represents the first confirmed occurrence for this brome grass. *Bromus ciliatus* has also been recorded from a number of adjacent counties in Illinois (Mohlenbrock and Ladd, 1978), so the discovery of a population in Missouri comes as no great surprise.

SCROPHULARIACEAE

Several members of the large Eurasian genus *Verbascum* are members of the weed flora in the United States. Steyermark (1963) included only two of these, moth mullein, *V. blattaria* L., and common mullein, *V. thapsus* L. Subsequently, Dension (1975) reported a population of white mullein, *V. lychnitis* L. from the Wentzville area. This species was overlooked by Yatskievych and Turner (1990), but is vouchered by a collection made by Arthur Christ on 10 June 1975 (table 1).

More recently a specimen of clasping mullein, *Verbascum phlomoides* L., was discovered during herbarium research at the Missouri Botanical Garden. This species was collect by B.F. Bush along a railroad in the Courtney area on 14 September 1915. It is a widely scattered weed in this country and may be encountered again in the future.

The four species of *Verbascum* known from Missouri thus far are relatively easily distinguished from one another. The following key is adapted from that of Gleason and Cronquist (1991):

1. Hairs unbranched, glandular . . . . . *V. blattaria*
1. Hairs branched, not glandular
   2. Corollas white; inflorescence usually several-branched, forming a panicle of spikes . . . . . *V. lychnitis*
   2. Corollas yellow; inflorescences unbranched or few-branched from near the base
      3. Leaves densely tomentose on both the upper and lower surfaces, the bases decurrent as flaps of tissue along the stems . . . . . *V. thapsus*
      3. Leaves less densely tomentose on the upper surface than on the lower surface, the bases rounded to clasping, but not decurrent . . . . . *V. phlomoides*

VERBENACEAE

The genus *Vitex* (Verbenaceae) contains about 250 species of mostly tropical shrubs and small trees (Mabberley, 1987), several of which have been cultivated as ornamentals. These are commonly known as chaste tree, hemp tree, or vitex. Recently, two populations of *V. negundo* L. were discovered: one in the city of St. Louis along the edge of a mesic woodland; the other in Scott County along a farm lane at the edge of a disturbed, sandy woodland. These represent the first records of naturalized plants of this genus in Missouri.

Gleason and Cronquist (1991) treated this species as a rare escape in the northeastern United States, but suggested that another species, *V. agnus-castus* L., was more commonly established outside cultivation in the region. *Vitex negundo* has apparently not been collected in any of the states surrounding Missouri. A voucher for the St. Louis site was collected on 2 August 1992 by Michael Grayum, who discovered this population. A specimen representing the Scott County site was collected on 1 October 1992 by Sherry Holmes of the Missouri Department of Conservation (table 1).

Vitex negundo is native to Asia. It is a shrub or small tree to 5 m tall (2.5 m in our population), with opposite, palmately compound leaves of 5 unevenly toothed leaflets that are dark green above and grayish with short, dense hairs below. Flowers are in loose clusters along the branches of panicles, and are zygomorphic. The corollas are mainly pale lavender with darker purple lower lips. Unlike other Missouri Verbenaceae, which have dry fruits (nutlets), this species has small drupes containing a four-celled, hard center. Plants would key to the horse-chestnut family, Hippocastanaceae, in Steyermark's (1963) key to families, because of superficial similarities in leaf position and morphology, and would not key at all in Steyermark's (1963) key to genera of Verbenaceae.

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Table 1. Summary of voucher specimens documenting new species records for the Missouri flora.

TAXON	COUNTY	COLLECTOR	HERB	MAP
Aster tataricus	Jefferson	*Solomon 2582*	MO	2188.09
Bromus ciliatus	Jefferson	*Yatskievych 92-210*	MO	107.09
Carex abscondita	Butler	*Yatskievych, Ladd, & Summers 89-131*	MO	496.09
Celastrus orbiculatus	Boone	*Yatskievych & Whitley 91-165*	MO	1480.09
	St. Louis	*Arduser & Stevens s.n.*	MO	
Dryopteris cristata	Clark	*Kurz & Kramer s.n.*	MO	61.09
Euonymus alatus	Jefferson	*Ladd 12278*	MO	1479.19
	St. Louis	*Caverly 89-187*	MO	
Lamium hybridum	Boone	*Yatskievych, Summers & McKenzie 93-120*	MO	1878.09
	St. Louis	*Mühlenbach 2771B*	MO	
Lycopodium digitatum	Cape Girardeau	*Franklin s.n.*	MO	4.09
	Carter	*Thurman s.n.*	MO	
	Carter	*Nigh 1186*	MO	
	Iron	*Oliver s.n.*	MO	
	Reynolds	*Smith* & MO		
Paronychia virginica var. *scoparia*	McDonald	*Bicknese 104*	MO	911.09
	McDonald	*Bicknese 104A*	MO	
	McDonald	*Yatskievych & Smith 90-201*	MO	
Prosopis glandulosa	Jackson	*Bush 8801*	MO	1268.09
Quercus acutissima	Franklin	*Trager s.n.*	MO	766.09
Vaccinium corymbosum	Ste. Genevieve	*Summers 4174*	MO	1696.09
Verbascum lychnitis	St. Charles	*Christ s.n.*	MO	1960.09
Verbascum phlomoides	Jackson	*Bush 7734*	MO	1960.19
Vitex negundo	St. Louis	*Grayum 10224*	MO	1849.09
	Scott	*Holmes 824*	MO	

ANNOUNCEMENTS

The Missouri Native Plant Society's archives are housed at the Missouri Botanical Garden's Library, in St. Louis. Records of events, correspondence on Society matters, and related items of interest are placed into these archives for posterity. The Society Archivist is Jim Bogler. Anyone with items of interest is encouraged to submit these to Jim by sending them to the MONPS mailbox (see back cover).

Additionally, the Society is starting a file of plant lists of Missouri botanical areas. These will also be housed in the Garden's library, where they will be available for study by MONPS members. Anyone who has compiled plant lists during field trips, or who possesses lists of plants growing in areas of the state, is encouraged to send these to the Archivist as well.

BOOKS OF INTEREST

Flader, Susan, editor. 1992. Exploring Missouri's Legacy. University of Missouri Press. xiv, 352 pp. ISBN 0-8262-0834-7. $49.95. Hardbound.

Hawker, Jon L. 1992. Missouri Landscapes: A Tour Through Time. Missouri Department of Natural Resources (Educational Series, No. 7). x, 326 pp. No ISBN. $18.00. Paperbound.

Unkelsbay, A.G., and Jerry D. Vineyard. 1992. Missouri Geology. University of Missouri Press. xii, 191 pp. ISBN 0-8262-0836-3. $18.95. Paperbound.

BOOK REVIEWS

George Yatskievych

Wilson, Jim. 1992. Landscaping With Wildflowers. Houghton Mifflin Company. xi, 244 pp. $18.95. ISBN 0-395-56520-0. Paperbound.

That Victory Garden fellow is at it again! First released in hardback at the beginning of 1992, this attractive volume is now available in paperback form. Let me start by stating that I greatly enjoy Jim Wilson's style. The book's subtitle, *An Environmental Approach to Gardening*, sets the tone for all of the rest of the volume. Certainly there is a lot of good information on gardening with species from various habitats, and the lists of plants by sunny and shady sites for various regions provides lots of good suggestions for plants to use. However, beyond this, the book does a great deal to educate gardeners on other topics. For example, species are listed by scientific name first (followed by common name) and the author notes in the introduction that, "If you are going to get into wildflowers, you might as well bite the bullet and begin learning botanical names," followed by reasons why.

The text is also replete with messages about conservation of species and habitats. The invasive tendencies of *Lythrum salicaria* (purple loosestrife) and other species that degrade natural habitats is discussed. Wilson also explains why gardeners should select nursery-propagated stock and notes the misuse of the phrase "nursery grown" by some unscrupulous companies. Unfortunately, although he has the best of intentions, the author is a bit inconsistent with some specifics. Several orchid species, as well as some other wildflowers (such as *Arisaema* species) that are mostly wild-collected plants in the nursery trade are still on his lists of recommended plants. In general, however, the book presents quite a strong message about environmental issues involving plants.

In addition to an introduction and chapters dealing with plantings in a variety of habitats and regions, the book also discusses the composition of "wildflower meadow" seed mixes and how to help avoid a disappointment with this type of planting. There is a chapter on attracting birds and butterflies. Finally, there are useful lists of wildflower nurseries and of native plant and wildflower societies around the country. The text is quite readable, but contains more typos than should be expected from a major publisher. The numerous photographs complement the text nicely and are well-reproduced (although the *Trillium* pictured on page 170 is upside down). Overall, this is a useful reference that should appeal to anyone serious about wildflower gardening or naturescaping.

Kelly, M.A. 1992. A Child's Book of Wildflowers. Four Winds Press. 32 pp. ISBN 0-02-750142-6. $15.95. Hardbound.
This unusual book for children was written by four children of M.A. Kelly, a woman who obviously inspired a love of wildflowers in her offspring. The illustrations are the work of Joyce Powzyk, a mammologist and natural history illustrator with several other titles to her credit. There are few children's books that deal directly with plants, thus the title fills a large void in the book market. Although the book is apparently intended for about a third grade reading level, there is a note from the author(s) at the beginning directed at adults, as well as an illustrated summary of the techniques used by the artist to complete her watercolors. The body of the book discusses 24 common herbaceous species, each illustrated, described briefly, and with various discussions. The discussions lean heavily toward wildflower uses and folklore. For each plant there is an activity described, to extend the reader's experience with the plants beyond the printed pages.

Members of the Missouri Native Plant Society, who tend to be somewhat more purists in defining which species are wildflowers, may be a bit surprised at the broad sense of the

term used in this book. Among the 24 wildflowers treated, there are such exotics as mullein, dandelion, and butter-and-eggs. Apparently the authors decided to include some species for their ease of finding, and although the native origins of most of these plants are given, no mention is made of their weediness. Some parents may also be a bit concerned about the kinds of activities suggested for the plants, which may require supervision or may be indirectly hazardous. Most activities require picking or collecting plants or plant-parts, and some discuss eating fruits or leaves. As some of these species are roadside weeds or weeds growing next to cultivated fields with all of the spray and runoff from insecticides, herbicides, and fertilizers, both the collecting and eating may have serious consequences. It also seems inappropriate to convey the impression to children that wild plants should be collected or eaten, without a strong suggestion that parents should supervise the activity and verify the species identification; there is no mention that some wildflowers are poisonous in the text. Another activity to be avoided is the use of milkweed latex, which is poisonous, as a glue. Finally, although some of the activities are cute or imaginative, a few of the suggestions seem inappropriate in an educational book. Applying dandelion sap to a wart to see if it will disappear reinforces old-fashioned beliefs that are better avoided, and putting yarrow plants under one's pillow to see one's future spouse in a dream conveys a poor lesson to a child and will make a mess under the pillow.

The illustrations are nicely composed and have an ethereal quality to them. The colors may be a bit weak to hold some children's attention, but adults will enjoy the subtle use of color to convey depth and surface detail. The text is written with a good cadence for reading aloud and is clear and easily understood. As an attempt to communicate a sense of wonder about plants to young children, the book is admirable, and hopefully the title will be successful enough to prompt the

publishers of children's books to explore botanical topics more in the future.

Raven, Peter H., Linda Berg, and George B. Johnson. 1993. Environment. Saunders College Publishing. xxii, 569 pp. + 16 pp. glossary, 12 pp. appendices, 16 pp. index. ISBN 0-03-014329-2. $59.00. Hardcover.

There are several good college textbooks on the market about environmental biology that discuss the topic from a career standpoint and focus on techniques for analyzing various biotic parameters. These books should not be confused with Raven, Berg, and Johnson's new tome, which focuses on the environment, its components and the threats to it. This slick, well illustrated volume's utility goes beyond the realm of the textbook. It is also an encyclopedic reference guide for environmental issues ranging from local to global in stature. There is no effective way to summarize the broad scope of information presented in this slim, but densely packed book, except that it covers things better than any other text I have seen. The book is designed to capture a reader's attention and to hold it, and to make the problems, issues, and people who study them hold a personal importance to the student. Do not confuse this book's approach with the type of emotionally charged propaganda used by some environmental organizations to convert the American public to their memberships and support their causes. The authors instead create an immediacy to the topics by presenting lots of facts, showing the interrelationships between various aspects of the environment, and by mixing local and international issues with discussions of the agencies and organizations working on these, as well as interviews with well-known scientists and environmentalists.

The book is generally organized into seven parts covering the broad topics of: Humans in the Environment, The World We Live In, A Crowded World, The Search for Energy, Our Precious Resources, Environmental Concerns, and Tomorrow's

World. The 18 individual chapters range from The Pesticide Dilemna to Understanding Population Growth. The basic text is highly supplemented by numerous stunning photographs and figures and tables, but is also broken by numerous sidebars discussing specific examples of the principles under discussion. The entire presentation is very slick and modern, and should appeal to college students as well as general readers. For Native Plant Society members, many of the topics will be of special interest, such as a discussion of damming of the Missouri River and an explanation of the five major types of timber harvesting.

One of the fascinating aspects of the highly competitive market in college textbooks is the great incentives provided by publishers to instructors using a particular book. In this regard, the present volume is truly amazing. The textbook is part of a package that includes eight different regional supplements with discussions of specific regional issues, lists of environmental groups and agencies in the area, and suggestions for personal involvement. It also includes: two videos featuring Dr. Peter Raven discussing critical topics; an instructor's resource manual containing chapter outlines, chapter objectives, lecture summaries, suggestions for demonstrations and field trips, and a test bank of sample questions; a selection of overhead transparencies, a laboratory manual; and a set of computer programs that instructors can use with their personal computers to create modify, and print out tests and answer keys. With all of these supplements, one would imagine that the college course practically teaches itself!

More so than most textbooks, this volume has relevance outside the classroom and should be of interest to a very broad audience. The quality and quantity of information presented more than justify the fairly heavy price tag. Although some scientists may quibble with various details of the presentation, this book is certainly an indispensible guide to understanding the world we live in and the problems that are facing it today.