HOMOLOGY, ANALOGY, AND CREATIVE COMPONENTS IN PLANTS

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Evolutionary theory assumes that biological likeness necessarily implies kinship. Yet brothers sometimes differ more from each other than from unrelated men. Some particular cases of similarity do indeed indicate relatedness such as the blue-eyed children found in a human family from blue-eye parents. These limited illustrations, however, give us no reason to assume that similarities between the kinds of plants and animals must point toward organic descent. Although likeness *may* derive from kinship, it can likewise stem from the activity of a common originator or creator. Various models of automobiles produced by the same firm resemble each other. Similarity here indicates a common creator rather than a common ancestry. Likewise, parallelism between models of Chrysler, General Motors, and Ford indicates that all three manufacturers respond to customer needs by use of the same designs and materials.

Evolutionary biologists have decided that some similarities are meaningful and indicate close relationship (homology), while others do not (analogy). For example, the underlying bony similarities between man's fingers and a bat's wing bones are thought to demonstrate a very close relationship. But the superficial similarity between an insect wing and a bat wing is assumed to illustrate evolutionary convergence (analogy) between widely different groups. Such an arbitrary choice between the "true" similarities and "apparent" ones is open to question since it rests partially on the subjective bias of the investigator. If evolutionists are so certain that analogy is a "false teacher" when it comes to demonstrating phylogeny, perhaps much of what is called homology is really analogical (consult 1, p. 109). Some of the so-called analogous similarities are just as striking and as close as others that are classed as homologies.

Biblical Creation of distinct and non-related "kinds" is a scientific model in which the artificial distinction between homology and analogy disappears. All homologous and analogous resemblances are accordingly attributable to what could be called "creative interchange of components." In the field of automobile manufacturing such widespread interchangeability is clear evidence for design. Distribution of similar tissues, organs, and organ systems throughout widely diverse plant forms likewise speaks for the creation of distinct kinds. There is no need then to postulate great evolutionary divergences followed by incredible convergence. Only one postulate is essential to the creation system — the originating God. He worked by obvious outline (homology) but integrated various patterns in the distinct kinds as He chose (analogy) . A catalog of analogous similarities in plants will demonstrate the great faith required to attribute all such parallelism to chance evolutionary convergence.

Parallelisms in Bacteria:

Bacteria of the order Myxobacterales have a life cycle that is plainly similar to that of the slime molds (Myxomycophyta — members of an entirely different botanical division). In both groups there is a swarming amoeboid stage followed by formation of a fruiting body which produces spore-like reproductive cells.

Other bacteria (such as Streptomycetaceae and the Actinoplanaceae) have a tubular shape (hypha) that resembles the hyphal strands of true molds. Likewise the reproductive spores and spore cases (sporangia) formed by these bacteria are similar to those of the fungi.

The "trichome" or thread-like colony of the Caryophanales bacteria clearly parallels the pattern of the blue-green algae (e.g. *Oscillatoria* sp.). The Beggiatoales (a sulfur metabolizing bacterial group) closely resemble the blue-green algae in their colony structure also.

Parallelisms in Fungi:

The common bread mold reproduces across a tube that unites two parent strands. This process emulates the conjugation between cells of *Spirogym* (green alga) although exact nuclear details vary.

The large egg enclosed in the oögonium (egg sac) and the male nuclei enclosed in a smaller tubular antheridium (sperm sac) in the Peronosporales order of the Phycomycetes fungi closely approximates the reproduction by oögonium and antheridium in the golden-brown alga *Vaucheria* sp.

Some fungi (mycorrhizae) invade the roots of other plants and thereby enhance their nutrient absorption and growth. At the same time the fungus supposedly receives food and shelter from the root. Many distant groups show such a mutualistic union between fungus and green plant. It occurs in the gametophytes of certain lycopods, the root of the fern *Ophioglossum*, and in the roots of many woody seed plants. In fact, mycorrhizae are coming to be recognized as very important and extensive in the plant world.

Parallelisms in Algae:

It has been assumed that phloem sieve tubes (food conducting elements) are the evolutionary hallmark of the vascular plants. It is interesting to discover that there is a phloem-like tissue in the stipes of brown algae and in certain mosses (2, p.

96). Since most evolutionists regard brown algae, mosses, and vascular plants as distant branches of the evolutionary tree, it must be assumed that phloem tubes arose independently at least three times. To attribute such an amazing amount of parallel structure to evolutionary convergence demands a stretching of the scientific imagination.

Algae of the diatom group and unicellular Radiolarian animal types independently show complex silicon cell wall formation. Certain separate groups of multicellular vascular plants also incorporate silicon into walls of the outer cells — ***Equisetum,*** ferns, grasses, Cyperaceae, palms, and some dicot flowering plants (3, p. 31) (4). Has the ability to build glass cell walls been the product of chance evolution in more than three different instances?

Parallel Life Cycle Patterns:

Some plants have two distinct generations that alternate with each other. One generation (gametophyte) has haploid cells and bears gametes that unite forming a diploid zygote. The other generation which results from the growth of the zygote (sporophyte) is diploid and eventually produces reproductive spores. It is sometimes argued that an alternation of two equal generations in one life cycle is a "primitive" evolutionary characteristic in plants. It is also argued that the dominance of the spore-bearing generation over the gametophyte is a more "advanced" status. This assumption is made because the sporophyte generally is larger in "higher plants." There is likewise a decreasing size of the gametophyte generations in ascending representatives of the supposed evolutionary series (algae — mosses — ferns — pines — etc.) Within the same group (green algae) however, there is a full spectrum or typical life cycles with no indication of which type is most "primitive." Some have a gamete-forming generation only— *Spirogyra* sp. Other green algae have only one generation but it is the diploid sporophyte — *Cladophora* sp. Still others exist with a complete alternation of independent sporophyte and gametophyte generations — ***Cladophora*** sp. (8, p. 363). In the brown alga ***Fucus*** the gametophytic generation is greatly reduced. Haploid spores are retained in the parent sporophyte and directly produce gametes. Such reduction and retention of the gametophyte generation clearly resembles the life cycle of the flowering seed plants. Such a scramble of supposedly primitive and advanced life cycle patterns within the algae themselves is further evidence in support of creation with interchangeable systems.

Evolutionary Problems with Bryophytes:

(mosses, liverworts, hornworts)

It is frequently assumed that the delicate leafy-liverworts arose from a leafless flat thalloid liverwort like ***Marchantia.*** But it is also assumed that the most advanced sporophyte among bryophytes is the type found in the hornworts. This complex cylindrical stalk has growing tissue which continually produces new spores from below. In the hornworts the most advanced sporophyte grows out of a typically primitive thalloid gametophyte — this of course presents a great problem to any theory of evolution.

Parallelism in Vascular Plants:

All plants which have water conducting tissues (xylem) and food conducting tissues (phloem) can be classed as "vascular plants." Some authorities however believe that the category is artificial and that there are several distinct groups of vascular plants that have arisen independently from the algae by parallel evolution. Within paragraphs that follow, convergence and parallelisms between the different kinds of vessel-bearing plants will be considered.

Most vascular plants grow in length as the rapidly-dividing regions at the tips of stems and roots form new cells. Some vascular plants can also grow wider as cambial growth layers produce whole new sheets of cells around the entire girth of the stem. Such growth in width is called "secondary growth." The following lists demonstrate the widespread distribution of secondary growth in a few groups that are otherwise quite distinct:

Groups Showing Secondary or Woody Stem Tissues:

1. Anomalous fossil Pentoxylaceae (6, p. 50)
2. Fossil Lycophyta (Lepidodendrales and Sigillaricaceae) (7, pp. 187, 220)
3. Some living Lycophyta (Isaetaceae—quillworts)
4. Some fossil Sphenophyta (Calamites) (7, p.. 248)
5. Some fossil ferns (Zygopteridaceae) (7, p. 275)
6. Some fossil Gymnospermae (Cordaitales, Voltziaceae) (8, p. 151)
7. Living Gymnospermae (Coniferales)
8. Living Angiospermae (Dicotyledonae)

Groups Showing Secondary Bark:

1. Fossil Lycophyta (Lepidodendrales, Pleuromeiaceae of Isoetales) (7, pp. 213, 222)
2. Fossil Sphenophyta (Sphenophyllales and Calamites) **(7,** pp. 243, 249)
3. Fossil Gymnospermae (Cordaitales) (8, p. 151)
4. Living Gymnospermae (Coniferales generally)
5. Living Angiospermae (Dicotyledonae generally)

The term "stele" is applied to the total mass of xylem and phloem tissue in a plant stem. The pattern and arrangement of xylem in relation to phloem varies and several stele patterns exist. In a "protostele" a central solid mass of xylem tissue is surrounded in some fashion by the phloem regions (see Diagram 1). If, however, the center of the stem is composed of soft-wailed non-xylem ceils (pith) with the xylem and phloem arranged around this central region, the stele is classed as a "siphonostele." Various subcategories of siphonosteles exist. If the xylem and phloem tissue are-arranged in discreet parallel bundles in a peripheral ring (with the phloem cells outside the xylem) or in a cylinder with phloem outside, the stem is called an "ectophloic siphonostele." If the phloem of each vascular bundle lines both the inside and the outside of the xylem regions of the bundle or cylinder, the stele is classed as an "amphiphloic siphonostele." If there is more than one ring of vascular bundles (many sets of bundle rings or cylinders) the stem is a polycyclic siphonostele. Since protosteles are frequently encountered in the simpler fossil vascular plants and since various siphonostelic types are common in gymnosperms and dicot angiosperm flowering plant stems, it is generally postulated that steles with a pith probably evolved from the solid protostelic stem type. This theory leads to the preposterous conclusion that carrot stems (which are siphonostelic) may be more "advanced" than carrot roots (which are protostelic). It also makes the improbable assertion that various siphonosteles evolved from protosteles not once, but several times in different parallel plant lines.

Some plant groups previously judged to be "primitive" in the light of evolution theory show wide and diverse stele arrangements. In the Selaginella family (little club mosses) for example, several stele patterns are known: protosteles, siphonosteles, and polycyclic siphonosteles. The polycyclic siphonosteles of the Selaginellaceae are quite complex. There may be as many as 16 different stele cylinders in one particular cross sectional region of the stem (7, p. 197).

A study of different vascular plant groups shows that the various stele types are present throughout most of the categories with no indication of which arrangement is actually "ancestral." The following documented lists will illustrate the wide distribution of stele types regardless of supposed "phylogenetic" or evolutionary family trees.

Groups with Protostelic Members:

1. Fossil Psilophyta *(Rhynia)* (7, p. 161)
2. Living Psilophyta *(Psilotum)* (7, p. 170)
3. Living Lycophyta *(Lycopodium phlegmaria* "ground pine" in which the stele resembles that of flowering plant root) *(7,* p. 187)
4. Fossil tree-like Lycophyta (Bothrodendraceae-smaller stems protostelic, larger siphonostelic) (7, p. 2218)
5. Fossil Sphenophyta (Calamites — roots protostelic, but stem siphonostelic) (7, p. 249)
6. Living Sphenophyta *(Equisetum*— roots protostelic, stem siphonostelic) (7, p. 256)
7. Fossil Filicinae (ferns) (Protopteridales and Coenopteridales) (7, pp. 272, 275)
8. Living Filicinae (many fern groups—Marattiales, Osmundaceae, Matoniaceae, Dipteridaceae, Cyatheaceae, and *Ophioglossum* roots and lower stem—upper stem siphonostelic) (7, p. 285 ff)
9. Fossil Gymnospermae (Cordaitales-roots protostelic, stem siphonostelic) (8, p. 152)
10. Living Gymnospermae (roots generally, while stems are siphonostelic)
11. Fossil and living Angiospermae (Dicotyledonae) (roots, while stems are generally siphonosteles)

Likewise the wide distribution of siphonosteles in nearly all the vascular plant categories means that there is no basis for the statement that siphonosteles are necessarily more "advanced."

Groups with Siphonostelic Members:

1. Living Psilophyta *(Tmesipteris tannensis) (7,* p. 170)
2. Fossil Lycophyta (Bothrodendraceae — larger stems siphonostelic, smaller ones protostelic) (7, p. 218)
3. Fossil Sphenophyta (Calamites--stems siphonostelic, roots protostelic—Calamophyton) (7, pp. 241, 248)
4. Living Sphenophyta *(Equisetum* or horsetail) —stems siphonostelic, roots protostelic) (7, pp. 254, 255)
5. Living Filicinae (ferns—stems frequently siphonostelic, roots or lower stems protostelic—*Ophioglossum,* Marattiales, Osmundaceae, Cyatheaceae, Polypodiaceae, etc.) (7, p. 285 ff)
6. Fossil Gymnospermae (Cordaitales, Voltziaceae) (8, p. 152)
7. Living Gymnospermae (stems generally)
8. Living Angiospermae (Dicotyledonae — stems generally)

Groups with Ectophloic Siphonostelic Members:

1. Living Filicinae (such ferns as *Schizaeae molocceana* and *Ophioglossum* sp.) *(7,* pp. 314, 282-285)
2. Living Gymnospermae (stems generally)
3. Living Angiospermae (Dicotyledonae — stems generally)

Groups with Amphiphloic Siphonostelic Members:

1. Living Filicinae (ferns-species of *Marsilea, Matonia, Dipteria, Cibotium, Pteris, Lindsaya, Polypodium, Gleichenia, Jamesonia, and Loxsonia) (7,* pp. 328-329, 302, 345) (9, p. 312)
2. Living Angiospermae (Dicotyledonae—Curcurbitaceae or Cucumber family)

Groups with Polycyclic Siphonostelic Members:

1. Living Lycophyta (Selaginellaceae) (7, p. 197)
2. Fossil Pteridospermales (seed ferns—Medullosaceae) (6, p. 26)
3. Anomalous fossil group Pentoxylales (8, p. 143)
4. Fossil Filicinae (Cladoxylaceae) (7, p. 273)
5. Living Filicinae (ferns — Matoniaceae and Polypodiaceae) (7)

Within ferns, lycopods, sphenophytes, gymnosperms, and angiosperms are protosteles and all sorts of siphonosteles. How much convergence will be permitted before neo-Darwinianism is considered inadequate as a working model in origin studies? Far from being guides to evolutionary family trees, the stele types appear to be components which the Creator used in various scattered segments of His creative outline.

Origin of Vascular Elements:

Much evolutionary discussion has centered upon the supposed origin of the various water conducting elements in the xylem. Briefly, there are two distinct water conducting units in the xylem—the tracheid, and the vessel member. Tracheids are cells that elongate and become spindle shaped. During their differentiation, tracheid cell walls are thickened excepting in small patches (pits) which do not become covered with cellulose and lignin (the thickening chemicals). Usually a number of such pits connect one tracheid to each neighboring tracheid. When the cell matures, it usually dies and thus a hollow water-containing element results. Sometimes tracheids have a scalariform (ladder-shaped), spiral, or ringed pattern of wall thickening rather than the pitted pattern. Vessel members, on the other hand, elongate but eventually lose the top and bottom end walls. This means that a vertical column of vessel member cells will eventually lose the end walls that separate them (or else the end walls become extensively perforated) and a hollow-conducting vessel many cells in length results because the protoplasm of each cell dies. Such multi-cellular vessels may have cell walls thickened in a pitted, scalariform, spiral, or ringed pattern. Katherine Esau (3, p. 232) and others express the belief that the tracheid is the most primitive xylem element and that xylem vessels have evolved from tracheids of ancestors. Such a decision, however, is not necessarily confirmed by comparative plant anatomy. Vessels occur independently in five separate plant groups as Katherine Esau points out: (1) gymnosperm Gnetales *(Ephedra), (2)* most dicot angiosperm, (3) monocot angiosperm, (4) in certain ferns *(Pteridium aquilinum,* and roots of *Nephrodium felix-mas)* (7, p. 141) (10) and (5) in the genus *Selaginella* of the Lycophyta. She interprets these results as follows: "Vessels arose independently, through parallel evolution, in the five groups of plants named above . . ." (3, p. 232). It would tax the idea of natural selection to produce vessels from tracheids in just one evolutionary line during the supposed ages. To suggest that vessels arose five times by chance is not a scientific deduction from data but an evolutionary afterthought. Evidently God used whichever types of steles or xylem were most likely to fill the needs of the particular plant He was creating.

Frost, Bailey, Cheadle, and others have performed extensive statistical examinations of the xylem in various stems (2, p. 106) . They believe that the anatomical correlations of wood overwhelmingly support the evolution hypothesis. A compelling alternative view would suggest that the formation of various xylem and phloem elements is controlled by physiological laws within genetic limits originally established by the Creator.

Parallelism in Guard Cells:

Certain paired cylindrical cells in the epidermis of various plants (guard cells) change shape by swelling and thus create a pore (stomate) between them. Gases can readily diffuse through this open portal. Since guard cell pairs are found in such divergent groups as moss sporophytes, hornwort sporophytes, fossil Psilophytes, *Psilotum, Tmesipteris, Lycopodium, Selaginella, Equisetum,* ferns, gymnosperms, and flowering plants, evolutionists must again plead that such mechanisms arose by chance several times.

The upper surface of a *Marchantia* (flat or "thalloid" liverwort) thallus is composed of polygonal air chambers whose walls and ceiling are composed of green cells. In the top of each chamber there is a pore surrounded by several cells in concentric rings. (7, pp. 47-48). The pore bears a striking superficial resemblance to the guard cell complex found in other plants. In some liverwort genera the pore has been found to open and close due to imbibitional changes in walls of nearby cells (7, pp. 47-78). Such parallelism fits the Biblical creation view.

Two different kinds of guard cells have a scattered distribution in vascular plants. In some plants, a single mother cell divides yielding two guard cells. Certain nearby epidermal cells then become the subsidiary cells. (Subsidiary cells are oriented epidermal cells surrounding the guard cell apparatus.) Such a stomatal type is called "haplocheilic." Haplocheilic stomates occur in these groups: Nilssoniales (Cycads), Cycadales, Pteridospermales, Coniferales, *Ginkgo, Ephedra,* and some angiosperms. In other plants, however, one mother cell divides twice yielding three cells. The middle cell then divides forming two guard cells and the outer cells then form the subsidiary cells-the whole unit having come from just one mother cell. Such stomates are called "syndetocheilic" and are found in the Bennettitales, Pentoxylales, Cycadeoidales, ***Gnetum,*** *Welwitschia,* and some angiosperms (8, p. 136). It appears that the stomatal apparatus is likewise a widely distributed creation component. Stomates in *Lycopodium phlegmaria* "have been shown to be identical in structure with those of certain angiosperms." (7, p. 186)

The Problem of Pentoxylales:

If there ever existed a vascular plant group that strained the theory of evolutionary convergence, it is the Pentoxylales. Delevoryas states that their stems are like coniferous gymnosperms, yet they are polystelic like the seed ferns. They have leaves like cycads but their stems resemble those of *Ginkgo.* Their microspore structures are unlike any others (8, p. 145).

Other Anatomical Parallelisms:

Endodermis: Since an endodermis is characteristically present in many of the simpler vascular plants and in angiosperm roots but not in angiosperm stems generally, some investigators have suggested that the presence of an endodermis is a "primitive" condition. However, some Psilophyta such as *Rhynia* (7, p. 161) and *Tmesipteris tannensis* (which evolutionists call "primitive") must then be classed as "advanced" because they too lack an endodermis in their aerial branches. Some herbaceous dicotyledonous angiosperms have an endodermis in the stem *(Trophaeolum majus-* nasturtium) and are thus "primitive" despite their complex and otherwise advanced floral anatomy.

Latex vessels: Another fascinating situation that challenges evolutionary theories is the distribution of latex vessels (lactifers) in various flowering plants. Latex tubes form in two or three distinct and different modes. Sometimes longitudinal chains of cells lose their end walls yielding so-called "lactiferous vessels." In other plant forms single cells grow and develop into much-branched tubes. The single cell thus keeps pace with the growing seedling and the latex tube thus formed is actually a "lactiferous cell." These and other latex vessel types occur scattered in widely different plant families (3, p. 307).

Stem succulence: Some plants manifest greatly thickened stems which contain much water. It would be difficult to suggest the steps by which just one plant family might evolve succulent members. Then when it is seen that several different families such as the Cactaceae, Euphorbiaceae, and the Asclepiadaceae have parallel or convergent types with succulent stems, one is tempted to postulate that there has been definite planning and proportioning. There is just such a direct convergence between the cactus *Astrophytum asterias* and the euphorbiaceous plant *Euphorbia obeasa* (both having a ribbed, balloon-shaped succulent stem). An outside observer would be tempted to entertain the idea that God decided to create such succulent types along entirely different family lines. Accordingly He created various plants according to their kinds and formed succulent members in various segments of the creation outline.

Parallelisms in External Shape or Function:

"Leaves": Some plants that have no leaves as such have either petioles *(Acacia melanoxylon)* or whole side shoots (cladophylls of *Ruscus* spp.) that are flat and act as "leaves." Thus leaflike structures are produced in several distinct anatomical patterns.

"Cones": An apparent parallelism exists between the flower clusters (catkins) of betulaceous trees (birch, alder) and the cones of Redwood trees. They are members of entirely different classes — Angiospermae and Gymnospermae respectively-yet they both bear their seeds in woody "cones." In *Sequoia* the seeds are borne nakedly on scales of a woody cone (Figure 1) . In *Alnus,* (alder) pistils are borne on a separate female stalk. Because the female flowers lack both sepals and true petals and because the catkins bear the nutlets between persistent woody scales (11, p. 159) the female catkin bears a resemblance to the female cone of *Sequoia* (Figure 1). There are certain differences, of course--the seeds of alder cones are housed in a pistil or ovary whereas those of *Sequoia* rest nakedly on the cone scales. But the apparent similarity that exists is striking and not easily explained by neo-Darwinianism.

"Fruit": The *Gingko* tree bears a reproductive organ which outwardly resembles the true drupe fruits of the cherry tree, but which is not really a fruit but simply a seed with one fleshy seed wall. The cherry fruit (Angiospermae) is an entire ripened ovary with the seed deeply encased in an outer fleshy fruit wall and an inner bony "pit." This is another example of two distinct groups with unbelievably similar organs.

Parallelism of Nuclear Disintegration in Female Gamete and/or Spore Formation:

In mammals three out of four sets of meiotic female chromosomes are shunted into various polar bodies, and only one functional egg is generally formed. In *Ascaris* worm, a similar production of an egg and polar bodies occurs. In flowering plants three out of four sets of meiotic chromosomes disintegrate in the reduction division of the megaspore mother cell, and only one functional megaspore eventually arises. By repeated nuclear division this functional spore gives rise to the egg inside an embryo sac. In the megasporangium (female spore case) of *Selaginella* (Lycophyta) many megaspore mother cells begin to develop, but all except one of these disintegrates. The one functional megaspore mother cell is nourished in part by the fluid resulting from the degeneration of the others (5, p. 469). In the Coniferales (e.g. pine) one megaspore mother cell forms in the young seed or ovule. This cell undergoes meiosis, yielding four megaspores. Here too, three out of the four chromosomal sets eventually disintegrate. Such amazing parallelism in the development of female gametes, spores, or spore mother cells suggests that there has been the creative repetition of a common feature throughout extremely different forms.

Parallelism Between Beefwood and Horsetail Plants:

A final and arresting morphological similarity concerns the genus of beefwood trees *(Casuarina).* By virtue of its reproductive structures, *Casuarina* is a dicotyledonous flowering plant genus. Female flowers are borne on short dense heads that eventually have the appearance of "cones." Male flowers are borne in slender spikes. *Casuarina stricta* Dry. is therefore a flowering tree of some 10-30 feet in height with drooping branches. Figures 2 and 3 further demonstrate that the branching pattern and the detailed external appearance of the young *Casuarina* stem bears an amazing resemblance to stems of *Equisetum telmateia* Ehrh. var *braunii* (Milde) Milde-giant horsetail. The stems of the species *Casuarina equisetifolia* bear an even closer resemblance to *Equisetum* stems in certain aspects (11, p. 141), Figure 4. Figures 5a and 5b show photomicrographs demonstrating that the two stems are not entirely similar internally. They both have sclerenchyma patches at the margin but the placement of vascular tissues and chlorenchyma (darker colored patches of green cells) is somewhat different. They also differ in that *Casuarina* alone is perennial and later forms layers of secondary wood. The main stems of *Equisetum* are hollow, while those of C. *stricta* are solid. The side branches or "verticils" of *E. talmateia* var. *braunii* are solid when very young like the branches of C. *stricta,* however.

Despite the internal differences, one would hardly expect a greater degree of *external* morphological similarity between two plants within the same genus. It is a staggering thought then to realize that these two plants must be placed in different phyla or plant divisions on the basis of reproduction— *Equisetum* sp. in the Sphenophyta (no seeds, only one kind of spore), *Casuarina* sp. in the dicotyledonous Angiospermae of the Pterophyta. Regarding *Casuarina,* Eames says that it *must* be classified as a dicot despite its affinities to *Ephedra* and the stems of *Equisetum* (12, pp. 610-611). Such similtude in appearance and structure of two obviously diverse plants fits very nicely with the idea of creative use of various patterns in different basic plant forms.

There are many unbelievable parallelisms in the botanical world. A study of the work of Berg (13) and Short (14) will reveal numerous other examples of "convergence" in the animal world. It is presently postulated that the principle of creative interchange of components is a more adequate model in the explanation of these numerous parallelisms than is convergent evolution by neo-Darwinian mechanisms of chance mutation and natural selection.

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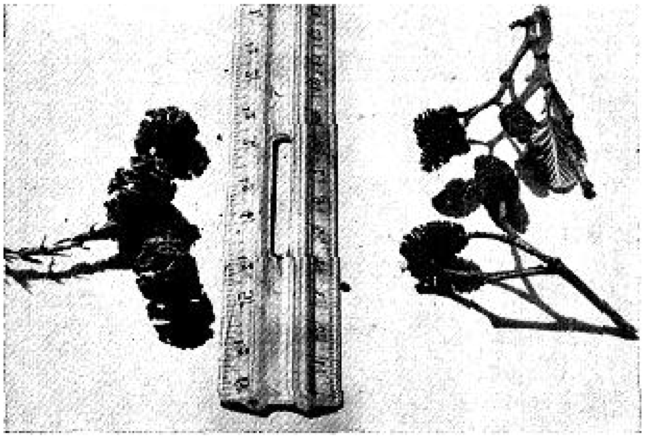

Figure 1. Right, *Alnus rhombifolia* Nutt, female catkin. Left, *Sequoia sempervirens* Endl. female cone. Note similarities.

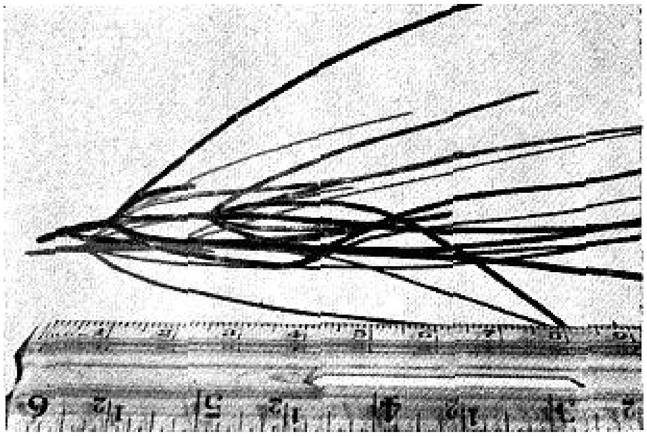

Figure 2. *Casuarina stricta* Dry. young stem. Compare with Figure 3.

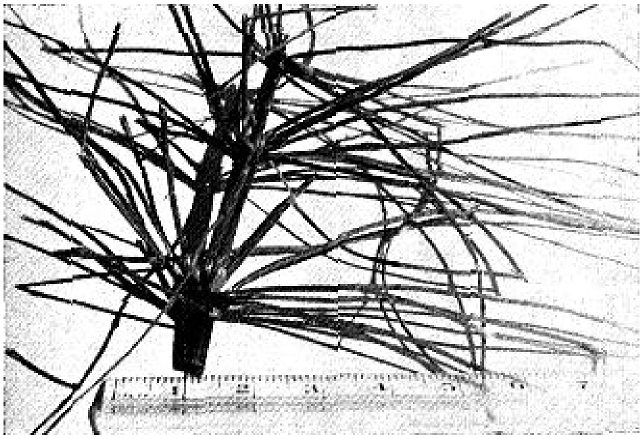

Figure 3. *Equisetum telmateia* Ehrh. var braunii (Milde). Milde. young shoot. Compare with Figure 2.

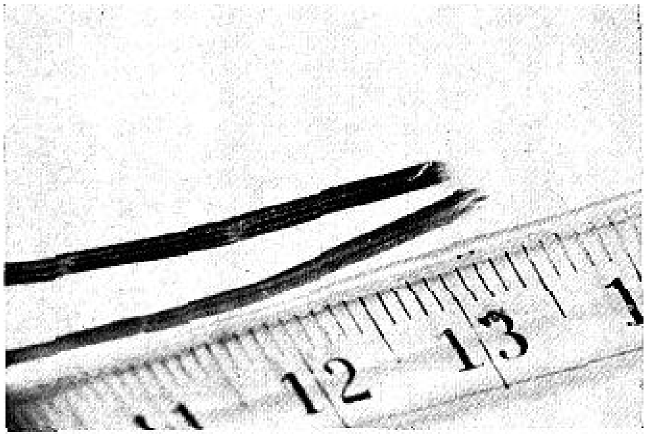

Figure 4. Bottom, *Equisetum telmateia* Ehrh. var braunii (milde) Milde. Closeup of young side shoot (verticil). Top, *Casuarina stricta* Dry. closeup of young stem. Note striking similarities.

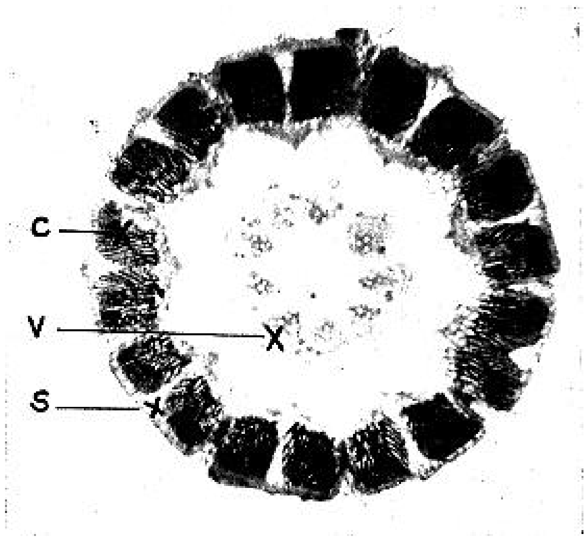

Figure 5a. Photomicrograph (about 80X) fresh cross section of Casuarina ***stricta*** Dry. young stem. C — chlorenchyma patch, “S”-sclerenchyma (thick walled) patch, “V”-vascular bundle.

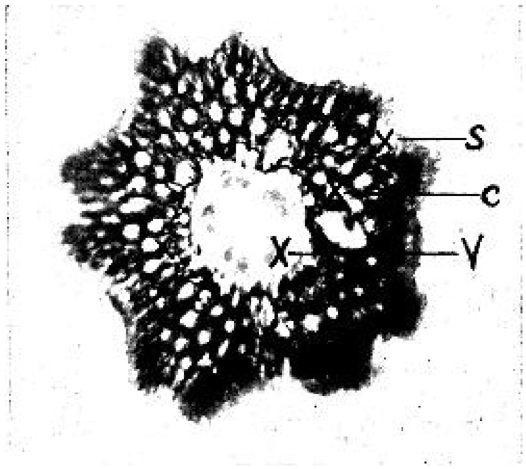

Figure 5b. Photomicrograph (about 80X) fresh cross section of ***Equisetum telmateia*** Ehrh. var ***braunii*** (milde) Milde young verticil. Note continuous chlorenchyma region “C,” other symbols as in Figure 5.

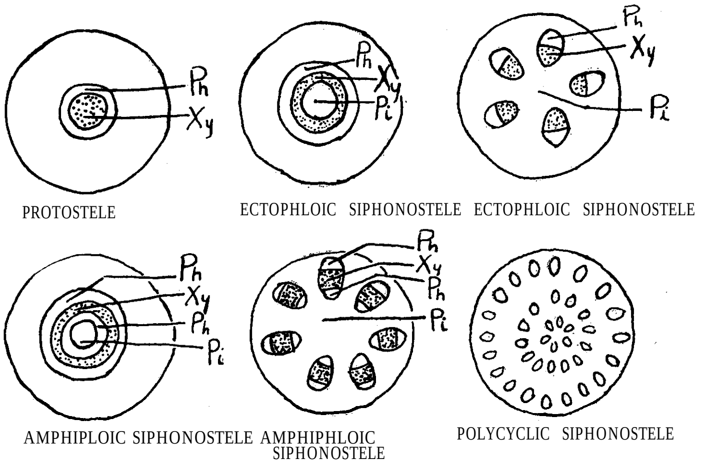

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DIAGRAM 1 CROSS SECTIONS OF REPRESENTATIVE STELE TYPES
(Ph--Phloem, Xy--xylem, Pi--Pith)