AN INTRODUCTION TO THE EVOLUTION OF PLANTS

This is a thematic exhibit about Plamt Evolution. It examines the fossil record of plants, shows the relationships between different plant families and finally gives examples of co-evolution and convergent evolution.

Diagram below is a cladogram. Shows schematically how existing plants are related. Time advances from left to right. Complexity or evolved status increases from top to bottom. Items at top of chart are older and less complex than ones at bottom. Charts with more detail appear throughout the exhibit.



The exhibit follows the chronological appearance of plants from one-cell origins through multicellular organisms, which emerged in different geological eras documented by the fossil record. Text follows sequence of orders in cladograms. The story is how much diversity has developed over time by telling the numbers of genera and species in a family and how widespread their distribution. Philatelic items show examples of different genera. Many families are small and have no philatelic representation.

In section on flowering plants, the most ancestral are treated first (ANITA Grade), followed by related groups considered more derived. Position is based on age determined by fossils, or more recently by DNA analysis. All diagrammed relationships are based on the best available data and subject to revision when more information becomes available.

Important items are Double Boxed with **Arial 11 point bold**. Philatelic information is **Arial 10 point italic**. Botanical names are **Blue italics**. Scientific notes are **Blue**. **Bold type** correlates text with philatelic elements. **Subheadings:** are color co-ordinated with cladograms.

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- 3. The Flowering Plants: Angiosperms 3.1 Early Angiosperms 3.1.1 ANA grade 3.1.2 Magnoliids 3.2 Monocots 3.3 Eudicots 3.3.1 Basal Eudicots 3.3.2 Core Eudicots Rosids Fabids Malvids Asterids Lamiids Campanulids 4. Co-Evolution and Convergent Evolution 5. Conclusion

1. Introduction

1.1 Nomenclature:

Swedish botanist Carl Linnaeus in "Species Plantarum" (1753) first described a comprehensive naming system still in use today, but modified from his original method. All organisms have a binomial like Linnaeus suggested: genus and species. Genera (plural of "genus") with similar characteristics grouped into Familiies. Similar families grouped into Orders. Large familiies divided into sub-families or tribes. Related Orders form Divisions.



Double rate foreign mail; opened by British censor

Synopsis: An Introduction to the Evolution of Plants - MN Expo 2025

Purpose: This thematic exhibit explores the rise of plants and examines their evolution over the millennia.

Treatment: The exhibit starts with formation of the Earth, the beginnings of unicellular life in the oceans, and moves chronologically through the emergence of plants on land with the development of vascular tissue, and other adaptations that made this possible. Time lines are used as headers on some pages.

At first only fossils could tell the story. Now new data using DNA and molecular biology techniques have made botanists re-think the classification of many plants. Scientific advances have not been able to definitively prove all relationships, so there is still controversy about some of the classifications. Since 1985 there have been major revisions in plant taxonomy, the naming of plants.

The exhibit shows fossil plants depicted on stamps and evolutionary relationships between plants. All of the stamps depicting fossil plants are included in this exhibit, except one from British Antarctic Territory. Other gaps are the most primitive land plants, like Hornworts, which have never appeared on any stamps. Likewise, there are not many stamps showing cell structure such as chloroplasts, which make plants different from animals. In 2022 Switzerland produced a stamp with ink made with chlorophyll, the pigment that is involved in the photosynthetic process. The mitochondrion, a subcellular organelle that produces energy for all types of cell, found on a Japanese stamp, is unusual.

Once the fossil record on stamps has been exhausted, flowering plant evolution is described. Cladograms depict the best-deduced relationships between families (their phylogeny). Oldest groups (clades) appear at the top of the cladograms. The text takes the clades in order, from top to bottom. Colors used in cladograms are used as subheadings to make the flow easier to follow.

The examples shown attempt to be as comprehensive as possible, showing representative families and the diversity of genera within them. Completeness is not possible. Not all plants have been equally represented on philatelic items. Indigenous flora and garden plants are common design topics, as are endemic (those restricted to small areas) and endangered species. Some sections have greater coverage than others because they cover large families. Those of economic importance, like the Grass family, which in addition to being one of the larger families and giving us most of our food grains, are given more space.

With all the flower stamps issued, one might think that an exhibit like this should be more than 6 frames. However, the exhibit does not try to show all the botany stamps, but representatives of as many different orders of plants as possible. Some orders are well represented by philatelic elements, while for many obscure orders there are none at all.

Philatelic & General Knowledge, Study and Research: Several stamps are mis-labeled. Most often the problem is a spelling mistake or capitalization. In the case of Mozambique, the wrong names have been printed on the stamps. This is a discovery of the exhibitor. The exhibitor has edited the most recent ATA Handbook, **Plants on Stamps, Volume V**, and has been the associate editor for Botany in the journal **Biophilately** for over 25 years.

Most of this information comes from the scientific literature. Several web sites have been valuable resources. They are:

Cole, T.C.H., Hiilger, H.H., Stevens, P.F. 2017. Angiosperm Phylogeny Poster – Flowering Plant Systematics <u>http://www2.biologie.fu-berlin.de/sysbot/poster/poster1.pdf</u>

Dimech, A. 2005. Plant Evolution: a 2.1 billion year story http://www.adonline.id.au/plantevol/

McCourt, Richard M., R. L. Chapman, Mark Buchheim, and Brent D. Mishler. 1996. Green plants. Version 01 January 1996. <u>http://tolweb.org/Green_plants/2382/1996.01.01</u> *in* The Tree of Life Web Project, <u>http://tolweb.org/</u>

Stevens, P. F. (2001 onwards). Angiosperm Phylogeny Website. Version 9, June 2008 [and more or less continuously updated since]

Wikipedia <u>http://en.wikipedia.org/wiki/Flowering_plant</u>

Klesius, M. <u>http://science.nationalgeographic.com/science/prehistoric-world/big-bloom/#page=1</u>

Rarity and Condition: The philatelic material used to illustrate the variety of plants is easily acquired. Important items are labeled with a double border. Nineteenth and early 20th century floral representations on stamps were generally heraldic in nature and seldom have realistic images of the plants. Also they appear in multiples on stamps rather than single plants, so they are not used.

Unusual, uncommon, and items of interest include:

1). Stamp printed with ink made from chlorophyll, the pigment that makes photosynthesis work (F1 p10)

2). Discovery copy, Mozambique design error, wrong plants identified (F1 p12)

3). Parcel tag with 10-shilling *Welwitschia* stamp from South West Africa, used in 1944 along with overprinted South Africa wartime miniature (F2 p9). Only 10/- SWA on cover seen by exhibitor in 30 years.

4). Progressive color proofs from Burundi (F3 p2), Belize (F3 p5), United Nations (F5 p16; 1 of 50 produced) and DDR (F6 p9)

5). Samoa palm tree bisect on cover, 1895 (F3 p8)

6). Imperforate proof, House of Questa (F4 p7)

7). Original artwork of *Bauhinia* (F4 p9): unique

8). Color omitted error on Sturt's Desert Pea (Australia) (F4 p11)

9. Fancy cancels of clover (F3 p14; F4 p11) and unidentified flower (F6 p11)

10). Boer War censored cover from Orange Free State with mis-identified image of an orange tree. It is an African olive with oranges added by the printer (F6 p1)

11). Edelweiss hand stamped cachet on Zeppelin postcard dropped during flight over Germany (F6 p7).

12). Various EFOs, mis-perforations (F5 p8), printing on unusual surfaces such as veneer (F1 p11) and bamboo (F3 p12), and color shifts (F3 p10).

Presentation: There are a lot of Cladograms shown. These convey the relationships between different kinds of plants.



In this example of a cladogram, A and B are more closely related than either is to C. C diverged at an earlier time point than A and B from an unknown common ancestor.

Text is in 12-point Times Roman. *Philatelic information is relayed in 10-point Bold Arial Italic.* Scientific **inormation is in blue bold Times Roman** *with scientific names in italics.* Subheadings appear in text-boxes that are color-coded to correspond to the cladograms. **Important items are described in 12-point bold Arial**.