

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/331430118>

# Introduction to Botany Module 1

Chapter · March 2019

---

CITATIONS

0

READS

14,373

1 author:



[Edelyn Echapare](#)

Samar State University

9 PUBLICATIONS 2 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Antibacterial Activity of *Christella* sp against some Human Pathogens [View project](#)



Wound Healing Ointment [View project](#)

# Transformative Learning Module in **Botany**



*Edelyn O. Echapare*

# INTRODUCTION TO BOTANY

*"A man doesn't plant a tree for himself. He plants it for prosperity."*

*~ Alexander Smith*



The world you live in is rapidly changing, growing and advancing. New discoveries and high technologies are making our lives easier, comfortable and sustainable. DNA sequencing, genetic engineering, molecular cloning, atomic force microscopy, multimode imaging are only few of new technologies that urges Synthetic Biology, Precision Agriculture, and Millennial Farmers to exist. In this module you will investigate Botany as a science. You will also study how study of plants is significant to you and how plants affect your life.

The picture above shows a developing and growing plant. Plants are one of the most fascinating and important groups of organisms living on Earth. They serve as the conduit of energy into the biosphere, provide food, and shape our environment. If we want to make headway in understanding how these essential organisms function and build the foundation for a more sustainable future, then we need to apply the most advanced technologies available to the study of plant life. That's the biggest challenge of humanity and Botany. As, part of the society, what can you do to get involved in this endeavor?

## ***Read and Find Out:***

- ⇒ What is botany?
- ⇒ What are the different disciplines of botany and its focus of study?
- ⇒ What are the modern advancements in plant science?
- ⇒ Who did great contributions in the development of Botany?

**Module Objectives:**

1. Describe the field of Botany.
2. Interrelate other fields and sub-discipline of botany.
3. Trace the timeline of developments in botany.
4. Appreciate the achievements of some Filipino and foreign scientists in the development of botany and related technology.

**1.1 What is Botany?**

**Botany** is the branch of **biology** concerned with the scientific study of plants including their physiology, structure, genetics, ecology, distribution, classification, and economic importance.

Almost everything we eat is derived from plants, either directly or indirectly. Obviously, we must better understand how plants operate, in order to grow the best and most nutritious crops in less-than-ideal soils, and to reduce our dependence on inorganic fertilizers and pesticides. As the population of the world is expanding while the climate continues to change, agricultural science could help save millions of lives. In this lesson, we will explore the science of plants, Botany.

Botany is one of the natural sciences. Natural sciences can be organized under two broad categories of physical sciences and biological sciences. (Figure 1.1). Physical science is concerned with the materials in or world and in the entire universe and how energy affects these materials. Biological sciences involve the study of life forms.

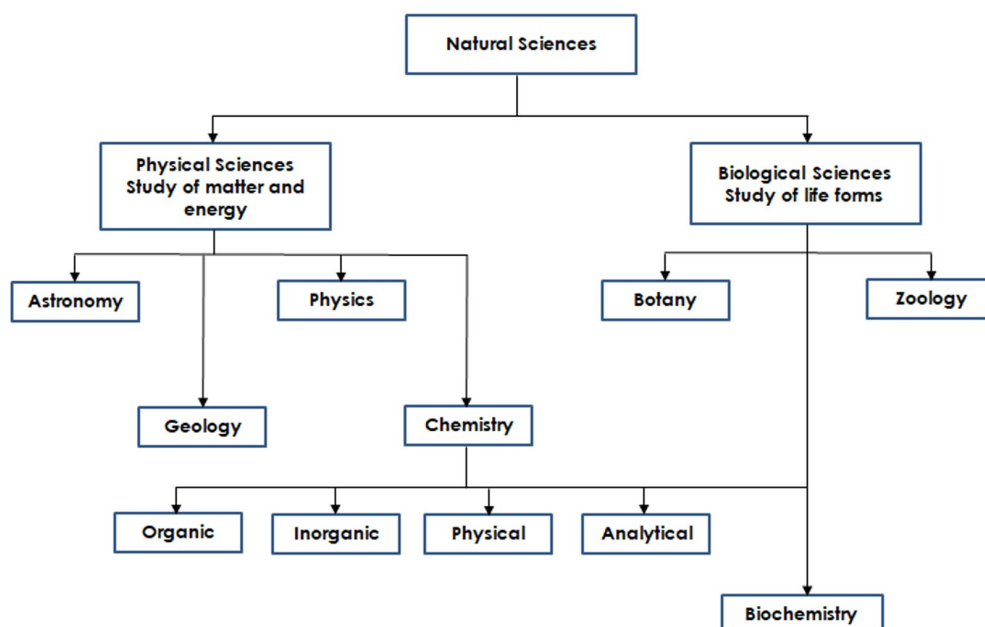


Figure 1.1 Divisions of Natural Sciences

# Module 1: Botany as Science

## 1.2 Brief History of Botany

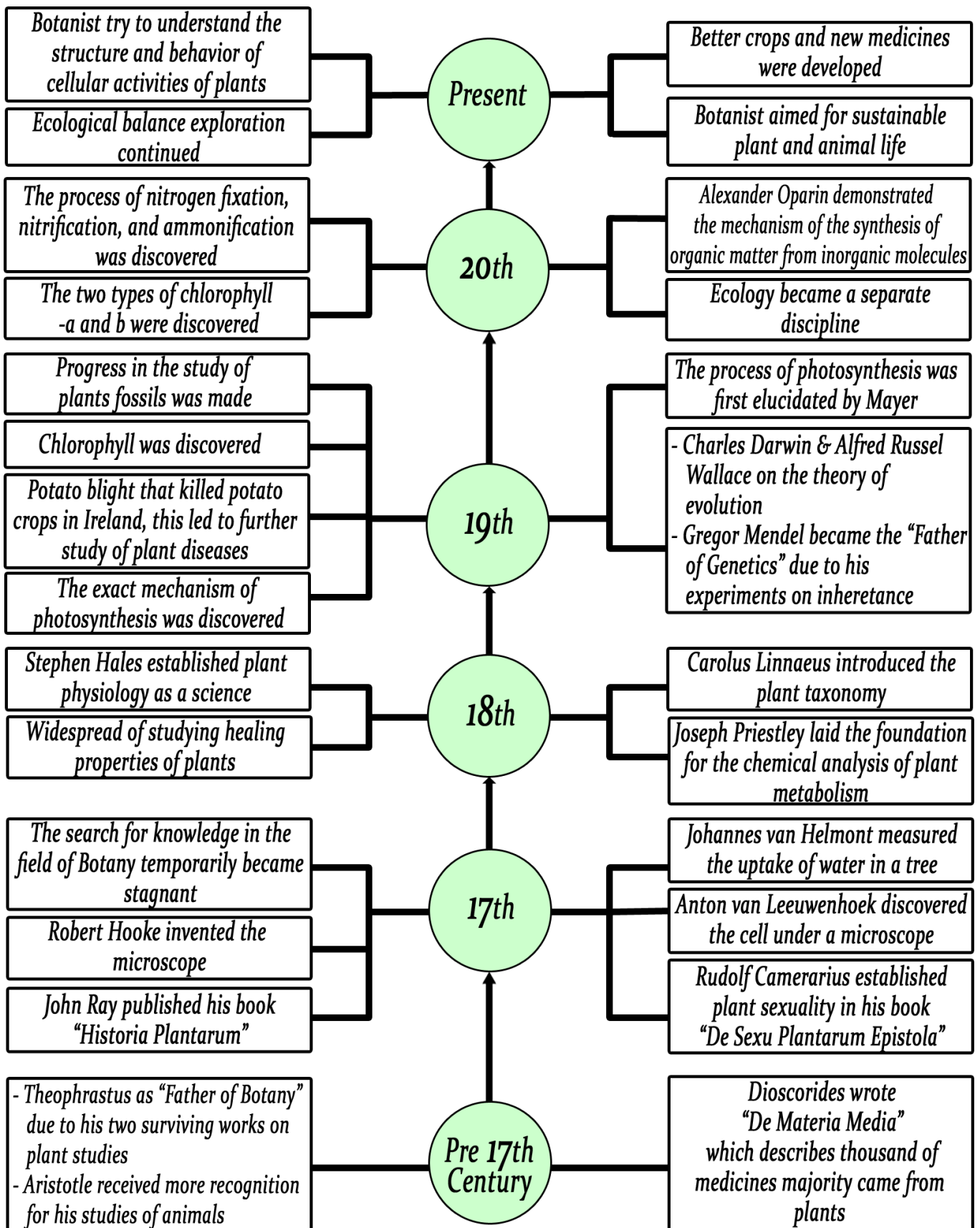


Figure 1.2 History of Botany - A Timeline

### 1.3 Sub-disciplines of Botany

Because botany is such a broad field of study, it has been divided into a number of smaller fields. The main divisions of botany are shown in the Table 1. There is a significant overlap of these divisions, as well as overlap with other sciences, and they should not be viewed as separate and distinct.

**Table 1. Sub disciplines of Botany**

<b>Fields in Botany</b>	<b>Focus of study</b>
» Agronomy	Application of plant science to crop production
» Bryology	Mosses, liverworts, and hornworts
» Economic botany	Study of plants of economic use or value
» Ethnobotany	Relationship between humans and plants
» Forestry	Forest management and related studies
» Horticulture	Cultivated plants
» Lichenology	The study of lichens
» Paleobotany	Fossil plants
» Palynology	Pollen and spores
» Phycology	Algae
» Phytochemistry	Plant secondary chemistry and chemical processes
» Phytopathology	Plant diseases
» Plant anatomy	Cell and tissue structure
» Plant biotechnology	Present technology used in different sub disciplines in plant science
» Plant breeding	Hybridization in plants
» Plant ecology	Role of plants in the environment
» Plant morphology	Structure and life cycles
» Plant physiology	Life functions of plants
» Plant systematics	Classification and naming of plants

## 1.4 Botany News

Modern botanists aim for sustainable plant and animal life. Latest discovery in the field of plant science is about applications of nano technology to plants. Nano particles (NPs) are utilized in producing nanoparticle -mediated materials in plants. It has a unique physicochemical properties, i.e., high surface area, high reactivity, tunable pore size, and particle morphology, because of it, NPs has numerous applications to plants. NPs can serve as “magic bullets” that can be introduced to plants containing herbicides, nano-pesticide fertilizers or genes, which target specific cellular organelles in plant to release their content and make the plant protected from pest invaders, genetically modified, all for a better yield. Figure 1.4 shows the process of how silver NPs are synthesized using plants. The silver NPs has been proven to be effective as antimicrobial material which led to its applications in biomedical purposes. Joginder, S., Duhan, R. K., Naresh, K., Pawan, K., Kiran, N., and Surekha,2017; Shakeel Ahmed and Saiqa Ikram, 2015)

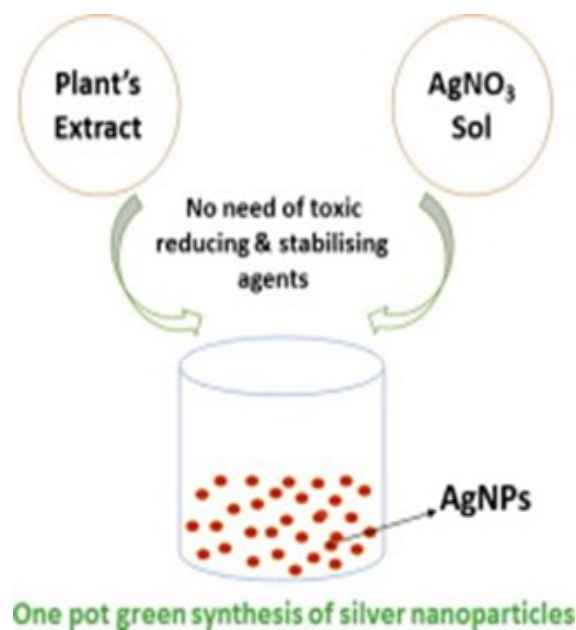
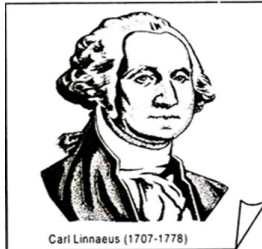


Figure 1.3

Biofuel production from plants is also an advancement in the field of botany . Biofuels are environmental friendly because it emits less carbon to the environment. Unlike fossil fuels, biofuels are a renewable energy source. Because they are derived from crops that can be harvested annually, or in the case of algae monthly, biofuels are theoretically unlimited. First off, biofuels are biological molecules and this means they are biodegradable. Bacteria and other organisms that live naturally in the soil and water are able to use biofuel molecules as energy sources and break them down into harmless byproducts. This means that even though concentrated biofuel spills can kill things like plants and smaller animals, they will not persist in the environment and cause damage or make an area uninhabitable for long periods of time. This discovery is timely because we cannot deny the fact that our environment is depleting due to pollution.

## 1.5 Some Botanists and their contributions

The field of Botany would not be as advanced as it is now without the contributions of great minds. Many scientists contributed to the development of botany. The following are the top five famous botanist in the world.



Carl Linnaeus (1707-1778)

### Carl Linnaeus (1707-1778)

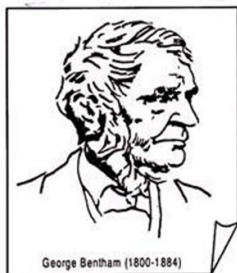
Carl Linnaeus, also known as Carl von Linné or Carolus Linnaeus, is also called the Father of Taxonomy. He developed a system for naming, ranking, and classifying organisms.



John Ray (1628-1705)

### John Ray (1628-1705)

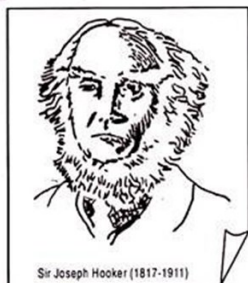
John Ray (1628-1705): He was the first person to prove that the wood of a living tree conducts water and this work won him a place in the newly formed Royal Society of London, one of the world's first scientific societies, in 1667.



George Bentham (1800-1884)

### George Bentham (1800-1884) and Joseph Hooker (1817-1911)

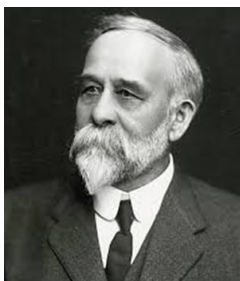
George Bentham, a self-trained British Botanist and Sir Joseph Dalton Hooker, Director of the Royal Botanic Gardens, Kew (England), proposed a natural system of classification in their book *Genera Plantarum* which includes the generic descriptions of 92,205 species belonging to 7,569 genera of 200 families of flowering plants.



Sir Joseph Hooker (1817-1911)

### Charles Edwin Bessey (1845-1915)

C.E. Bessey who trained under Asa Gray and then became a Professor of Botany at the University of Nebraska, proposed a phylogenetic system of classification which is called "Bessey's Cactus", which reflected the evolutionary ideas of Darwin which had greatly impressed him.





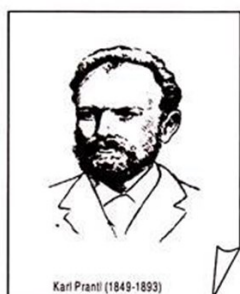


### Adolf Engler (1844-1930) and Karl Pranti (1849-1893)

Proposed the system of plants classification .

Engler's system is that, the families of higher vascular plants are arranged according to the increasing complexity of the flower.

Pranti provided keys and description for all the then known genera of algae, fungi, bryophytes and higher vascular plants.



*The highest honor of the Philippine government gives outstanding Filipino scientists is to bestow on them the rank of National Scientist. Seven of the more than 20 National Scientist are presented here.*

### Pedro B. Escuro

Pedro B. Escuro has achieved fame as a plant breeder. He developed high-yield varieties of C4 rice that was hardy against disease and pests. His varieties are high quality rice and have good



### Bienvenido O. Juliano

Bienvenido O. Juliano has spent much of his life improving the grain quality of rice. He made the rice more economical and more nutritious. He developed a method of evaluating grain quality and is a senior consultant for the Philippine Rice Research Institute.



### Evelyn Mae T. Mendoza

Evelyn Mae T. Mendoza has performed research in plant biochemistry, particularly in the makapuno phenotype of coconut and the nutritional worth of certain legumes indigenous to the Philippines, cassava, and sweet potatoes. She also studied the resistance of certain plants to pests or disease.





### **Eduardo Quisumbing**

Eduardo Quisumbing is an authority of Philippine plants. He has published numerous papers, many concerning medicinal plants, like orchids. He has received many awards, like the Distinguished Service Star (botany) and the Diploma of Merit (Orchidology).



### **Asuncion Raymundo**

Asuncion Raymundo is a researcher into the chemistry of natural products. She applied biotechnology and microbial genetics to agriculture of the Philippines. She is an Academician of NAST, the National Academy of Science and Technology, and is on the advisory group of science and technology to the Office of the President.



### **Benito S. Vergara**

Benito S. Vergara is an expert on the flowering response of rice to photoperiodism and physiology. His research has led to improvement of deep water rice, rice that is tolerant to floods and cold temperatures, and increased production.



### **Prescillano M. Zamora**

Prescillano M. Zamora has done work on the xylem elements of vascular plants. His research on ferns has led to the discovery of additional species. He has also contributed to the conservation of natural resources and environment policy research.

### KEY CONCEPTS / SUMMARY

1. Botany is a branch of biology which studies about plants. Since studies about plants are broad, it has been subdivided into specific disciplines, such as agronomy, bryology, ethnobotany, forestry, horticulture, ecology, morphology, and physiology.
2. The study of botany started even ancient time. Theophrastus, Aristotle and Dioscorides were the primary contributor in this field. Their works are mostly on the medicinal properties of plants. The invention of microscope in the 17th century by Robert Hooke leads to the advancement of discoveries in botany. Anton Van Leeuwenhoek was able to see the plant cell. From then on, cell organelles such as chlorophyll a and b have been discovered. The discovery of chlorophyll leads to the elucidation of photosynthesis by Julius Robert Mayer. Ecology became the separate discipline and up to the present, ecological balance exploration continued which is the primary focus of study of this field.
5. Botany at present time has been commercialized. Several specialized commercial fields have developed NPs for plant application to increase crop yields. Discovery of biofuel will minimize environmental issues on pollution.
6. Botany evolved from ancient to modern time because of botanists' great minds. Contributions of Carl Linnaeus, George Betham, Joseph Dalton Hooker, and Charles Edwin Bessey offers systematic grouping and classification of plants which are useful even up to this time. Filipino botanists generally contribute to agronomy, such as improvement of rice plants, coconut, cassava, sweet potatoes, legumes and some medicinal plants



### PRACTICE TEST

#### A. Choose the letter of the best answer.

1. Ethnobotany is a branch of botany that deals with \_\_\_\_\_
  - a. algae
  - b. terrestrial plants
  - c. primitive plants
  - d. relationship between the primitive people and the plants
2. The science of naming the plant is known as
  - a. Mycology
  - b. Taxonomy
  - c. Dendrology
  - d. Pedology
3. Who among the following Filipino scientist who applied biotechnology and microbial genetics to agriculture?
  - a. Benito Vergara
  - b. Asuncion Raymundo
  - c. Prescillano Zamora
  - d. Bienvenido Juliano
4. Carl Linnaeus was considered the father of taxonomy due to the following reasons
  - a. he studied phytochemicals in medicinal plants
  - b. he develop a system for grouping, classifying and ranking of organisms
  - c. he isolated flavonoids from herbal plants and tested for antibacterial activity.
  - d. he invented the "one pot green synthesis"
5. The following are advancement in botany EXEPT
  - a. DNA reprogramming in plant reproductive cycle
  - b. biofuel from sorghum
  - c. transgenic cow
  - d. silver NPs from plant

### B. Match column A with column B.

- | A                        | B                                  |
|--------------------------|------------------------------------|
| 1. Bryology              | a. high yield variety of C4 rice   |
| 2. John Ray              | b. algae                           |
| 3. Pedro B. Escuro       | c. mosses, liverworts, & hornworts |
| 4. Phytopathology        | d. Bessay's Cactus                 |
| 5. Phycology             | e. Makapuno phenotype              |
| 6. Evelyn Mae Mendoza    | f. father of taxonomy              |
| 7. Plant physiology      | g. fossil plants                   |
| 8. Carl Linneus          | h. wood conducts water             |
| 9. Paleobotany           | i. plant disease                   |
| 10. Charles Edwin Bessey | j. life functions of plants        |



### Transition Assessment Activity

**Direction:** As a learner, have some reflections by answering the following questions :

1. What are the most important insights you gained from reading the module?
2. What are the other things you did to understand the module fully?
3. What is your score in the post test? Does the score show that you learned well or not?



### REFERENCES

- Arber, Agnes. "THE EARLY HISTORY OF BOTANY." *Herbals: Their Origin and Evolution*, 2010: 1-2.
- Farabee, M. *Development of the Evolutionary Theory*. 2001. <https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookEVOLI.html> (accessed July 22, 2016).
- JRank Articles. e: Botany - History of botany - Plants, Plant, Study, and Century. 2016. <http://science.jrank.org/pages/996/Botany.html> (accessed July 24, 2016).
- kenyon.edu. *History of Genetics*. 2016. [http://biology.kenyon.edu/courses/biol114/Chap01/history\\_genetics.html](http://biology.kenyon.edu/courses/biol114/Chap01/history_genetics.html) (accessed July 22, 2016).
- Kumar, Punam. *Introduction to botany*. 2016. <http://www.peoi.org/Courses/Coursesen/bot/frame1.html> (accessed July 23, 2016).
- Mason, M.G. *Introduction to Botany*. 2016. <http://www.environmentalscience.org/botany> (accessed July 23, 2016).
- Rhoads, Dan. *History of Cell Biology*. 2007. <http://bitesizebio.com/166/history-of-cell-biology/> (accessed July 22, 2016).
- Richman, Vita. *History of botany*. 2016. <http://science.jrank.org/pages/996/Botany.html> (accessed July 23, 2016).
- ROOK A (ed.). 1964. *The Origins and Growth of Biology*. Harmondsworth, Middlesex: Penguin Books, Ltd. 403 p.
- "History of Botany," in *Bio Explorer* by Jack Kirsten, August 12, 2016, [https://www.bioexplorer.net/history\\_of\\_biology/botany/](https://www.bioexplorer.net/history_of_biology/botany/).
- "Top 12 Botany News For 2017," in *Bio Explorer* by Jack Kirsten, January 5, 2018, <https://www.bioexplorer.net/botany-news-2017.html/>.