Phycological Trailblazer No. 38 Camille Sauvageau

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The illustrious career of Camille Sauvageau (Fig. 1), who made some landmark discoveries on the life histories of brown algae and achieved remarkable success for his times, deserves to be included in this series. His studies of algae were only a part of the full range of his botanical, mycological, and physiological interests. Camille-François Sauvageau was born on 12 May, 1861 in Angers, Maire-et-Loire, France. He earned the Bachelor of Sciences degree from the University of Rennes in 1879, the licentiate's degrees in physical sciences (1882) and natural sciences (1884) from the University of Montpellier, and finally the doctorate degree in natural sciences from the University of Paris in 1891. Career-wise, at first he had low-level jobs such as preparator for the botany course in the Faculty of Sciences in Montpellier, as a teacher at a secondary school in Bordeaux, and as an adjunct professor of the Faculty of Sciences in Lyon. In 1898 he became in charge of the botany course of the Faculty of Sciences at Dijon, then later professor there. In 1901 he was initially again in charge of the botany course in the Faculty of Sciences at the University of Bordeaux, and later he became professor there. It was at Bordeaux where he spent the greater part of his professional career.

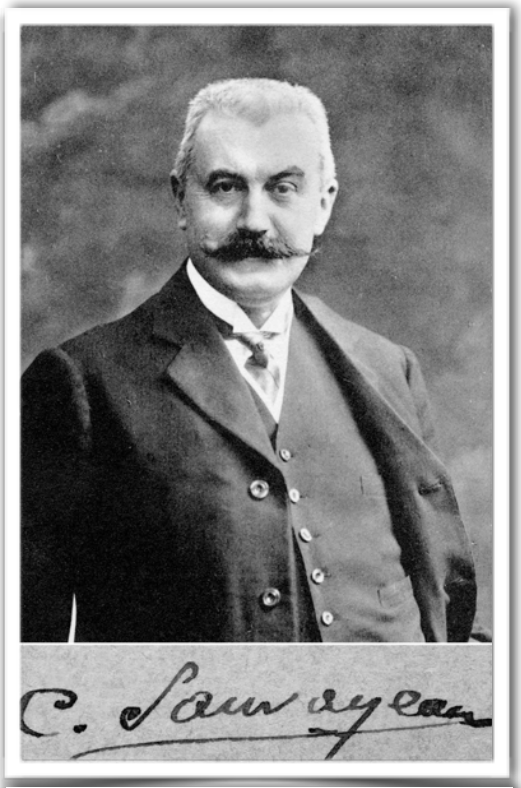
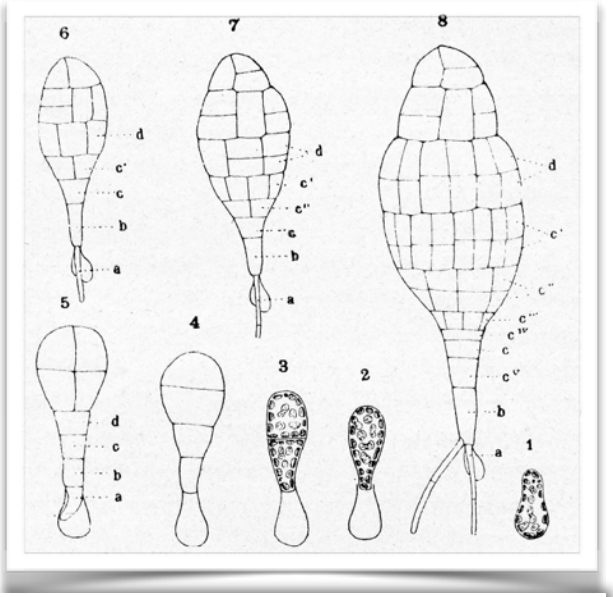


Fig. 1. Camille Sauvageau [from Dangeard, 1936] and his signature.

The early phase of his career was spent in studying aquatic flowering plants (*Potamageton*, *Zostera*, *Cymodocea*, *Halodule*, and *Phyllospadix*) as well as bacteriology, fungi and fungal diseases. It was not until 1892 when he published his first paper on brown algae. In the same year he also published on *Nostoc* and on freshwater algae collected in Algeria. So from 1892 onward, his attention was directed toward the brown algae. He received guidance from the eminent Édouard Bornet in his first efforts at studying small epiphytic brown algae. He was especially drawn toward making observations on reproduction and life histories in brown algae. In meticulous detail, Sauvageau (1898a, 1929) described his attempts, both his successes and his failures, in making "expeditions" and in establishing cultures. He spent time in the mid-1890s on the north coast of Spain, collecting at Gijón, Ribadeo, San Vicente de la Barquera, and La Coruña, a very picturesque coastline but then difficult to traverse because of the lack of a road parallel to the coast (Dangeard, 1937). He also ventured out to Tenerife in the Canary Islands and to Algeria to carry out his studies. Back in France he frequented coastal sites such as Cherbourg, Guéthary, and Roscoff. He would



Figs 2. *Saccorhiza bulbosa*. Development of young sporophytes from female gametophytes. [From Sauvageau, 1915b.]

ask for a hotel room with windows facing north, to avoid full sunlight. He would set out Petri dishes with his cultures on the outside windowsill. On occasion a gust of wind would send a Petri dish to the ground, destroying the culture. He would take his cultures to the laboratory at Banyuls or at Roscoff and continue to make observations.

Sauvageau's early use of culture techniques opened that avenue of research for several other investigators, such as Kathleen Drew-Baker, Jean Feldmann and Peter Kornmann, who followed his lead in using cultures to unravel life histories of not only brown algae but red and green algae. The scope of Sauvageau's interest in brown algae ran the gamut, from the very small epiphytes to those of intermediate stature up to *Desmarestia*, fucoids (*Cystoseira* and *Fucus*) and the kelps.

Papenfuss (1955) characterized Sauvageau's description of the heteromorphic life history in the Laminariales as an "epoch-making discovery", and indeed it was, that the dominant sporophytic phase alternated with microscopic oogamous gametophytes, analogous to the life cycle of ferns. Sauvageau (1915a, b, c) made this discovery in the kelp *Saccorhiza bulbosa* from material that he obtained from the shore at Guéthary (Basse-Pyrénées) in the south-western corner of France, and from material obtained from near the Biological Station at Roscoff. He observed heterogamous [oogamous] sexual reproduction involving an alternation of heteromorphic generations. The large plant known under this name is the sporophyte, and it bears uniform sporangia. He saw that each sporangium forms identical zoospores, and after their germination, they become either independent female (Fig. 2) or male (Fig. 3) gametophytes of microscopic size. The "oosphere" [egg] extruded from the female gametophyte, after fertilization, immediately germinates and develops the plantule that grows into the familiar kelp. Sauvageau speculated (correctly) that this life history is probably true for all the laminarioids.

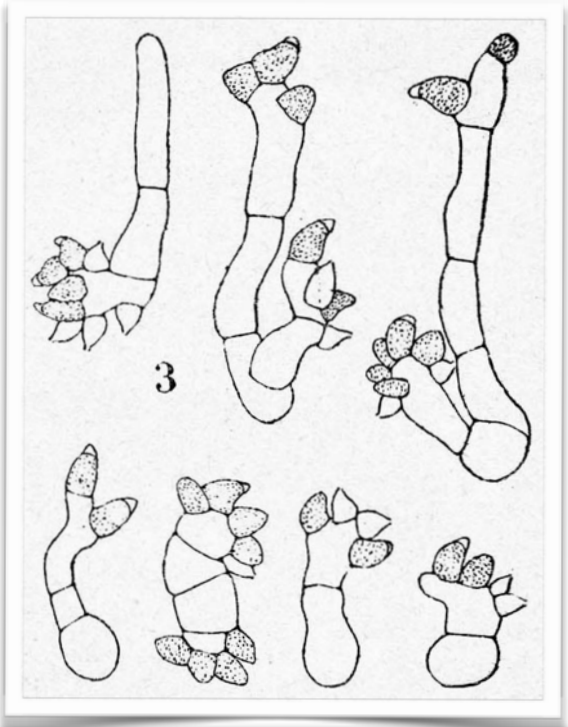


Fig. 3. *Saccorhiza bulbosa*. Male gametophytes with antheridia. [From Sauvageau, 1915c.]

In fact, Sauvageau was responsible for critical observations on the life histories in a number of brown algae. In the Cutleriales (1898b, 1899b, 1905, 1907d, 1908e), thanks to maintaining cultures for long periods, he was able to work out that *Cutleria adspersa* and *Aglaozonia melanoidea*, which were common at Guéthary, represented the sexual and asexual dimorphic phases of the same species.

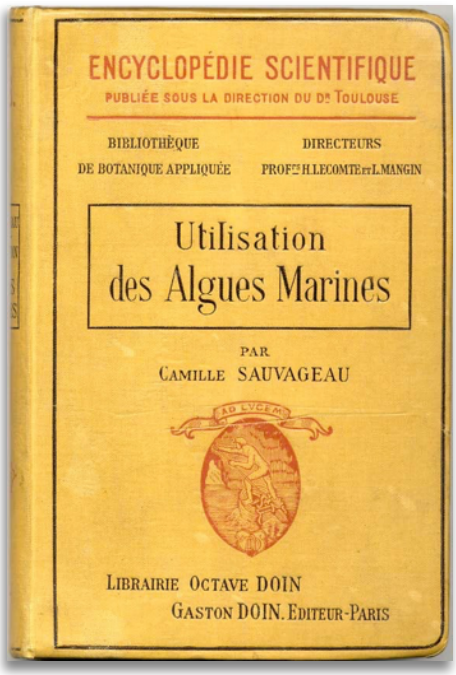


Fig. 4. *Utilisation des algues marines* by Sauvageau (1920a).

In the Sporochnales he reported an alternation of heteromorphic generations in *Carpomitra* (1926b) and the gametophyte generation for *Nereia* (1927a). For *Tilopteris mertensii* (1928c, d) he observed that the monospores behaved as propagules, recycling the plants. He was the first (1927d) to notice and describe var. *peregrina* of *Colpomenia sinuosa*, which was an immigrant to the Basque coastline. The life histories of many brown algal genera (*Stictyosiphon*, *Litopsiphon*, *Chordaria*, *Liebmannia*, *Punctaria*, *Asperococcus*, *Dictyosiphon*, *Sporochnus*, *Arthrocladia*, *Nemacystis*, and others) were investigated by Sauvageau (1928b, 1929, 1931a). Asexual cycles were noted for some of them. He (1900-1914) also was strongly drawn to the family Sphacelariaceae and had many papers on its members.

From years of his experience in observing how brown algae behave in culture, Sauvageau (1924a, b) was the first to describe the phenomenon of "heteroblasty", in which zoospores, from the same origin, show two developmental pathways, different both morphologically and physiologically. Sauvageau (1932a) also proposed the term "plethysmothallus". He was well aware that many brown algae, such as *Myriotrichia*, were apparent in nature for only a limited time in nature, be it a few months or even just a few weeks, and then they would disappear for the rest of the year. Their conspicuous state was their "delophycean" stage, and he referred to them being in their eclipsophycean stage during the time they disappeared. Plethysmothalli were not prothalli, a term reserved for gametophytes, nor were they protonema, which was part of the sporophyte, nor were they plantules, which are the start of the young individuals that take on the form known in the adult plant. The plethysmothalli are microscopic thalli that produce zoospores, forming more of this "adelophycean" stage, and at the right time the zoospores give rise to the conspicuous phase of the life history.

Over the full extent of his study of algae, Sauvageau was also interested in their physiology and their potential for utilization. Sauvageau (1907c) had a lengthy paper on the phenomenon of the "greening" of oysters (their gills) by their filter-feeding on the diatom *Haslea* [formerly *Navicula*] *ostrearia* (Gaillon) Simonsen, the only organism known to accumulate this blue-green pigment in its vacuoles (Davidovich et al., 2009). This pigment in oysters was first described by Gaillon (1820), and it was first given the name "marennin" by Lankester (1895), now spelled "marennine" (Pouvreau et al., 2006).

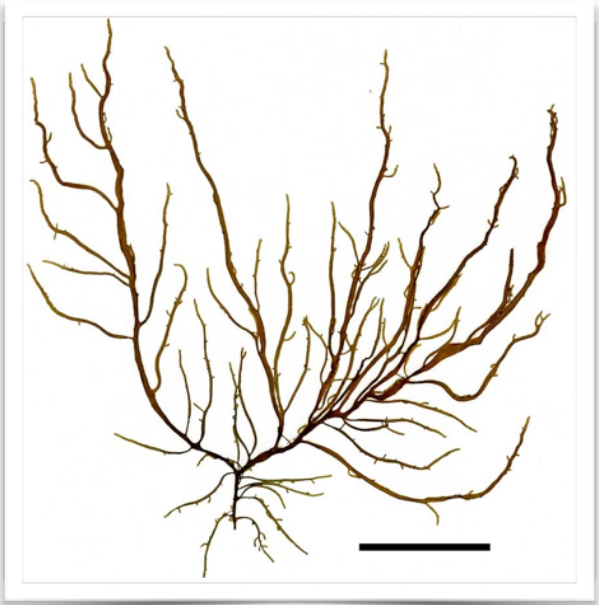


Fig. 5. *Sauvageaugloia divaricata*. [Playa de Muxia, La Coruña, Spain, leg. J. Cremades, Exsicc. Algae Ibericae No. 99, in MICH]

These green oysters were known in Paris as "huîtres de Marennes", Marennes on the Normandy coast being a primary source of their growth, or mariculture. Going back to the early 19th century oyster merchants along certain stretches of the coastline of northern France would place 500,000 to 600,000 oysters in "parks" or tanks, about 200 feet in length by 50 feet in width and 4 feet in depth and at certain season during the year (especially April to June and also in September), the water in these reservoirs acquire a bluish-green tint, due to the growth of the *H. ostrearia* (Lankester, 1895).

Sauvageau always maintained a sense of the practical, and as the French authority on seaweeds he was a consultant during the World War on possible industrial utilization of seaweeds. In 1920 he published the book *Utilisation des algues marines* (Fig. 4), summarizing the state of the art for the application of seaweeds and seaweed products commercially and in agriculture. Later, he (1921b, 1922) published on the "gelose", or agar, produced and stored in seaweeds, their phycocolloids (carrageenan and agar), recognizing the important red algae *Chondrus crispus*, *Mastocarpus stellatus*, and members of the Gelidiaceae. He thought that iodine was accumulated in special cells called "ioduques" (1925a) and bromine in other special cells ("bromuques") (1926a), but this was later questioned by Kylin (1930).

Sauvageau was responsible for the description of several new genera, most of which are of brown algae: *Chilionema* (1898a), *Hecatonema* (1898a), *Climacosorus* (1933c), and *Gontrania* (1936). But some of his generic names (*Alethocladus*, *Disphacella*, *Phaeocaulon*, *Protasperococcus*, and *Strepsithalia*) have subsequently been regarded as congeneric with older names. He also described a few Cyanobacterial genera: *Radaisia*, *Synechocystis* and *Tapinothrix*.

Sauvageau was the recipient of numerous academic prizes (Prix Desmazières, Prix Gay, Prix Montagne). The genus *Sauvageaugloia* was named in his honor by Kylin (1940), the current name of the type species being *S. divaricata* (Clem.) Cremades (Fig. 5). He even has a street in Bordeaux named after him (Fig. 6). A list of his publications up through 1931 was published (Sauvageau,

Fig. 6. Street marker in Bordeaux [from the internet].

1931c). Dangeard's (1937) tribute to Sauvageau includes a very thorough and helpful analysis of Sauvageau's body of work along with a complete list of his papers.

Dangeard, P. 1937. Notice sur la vie et les travaux de Camille Sauvageau (1861-1936). Bull. Stat. Biol. Arcachon 34: 5-57, portr.

Davidovich, N. A., J.-L. Mouget & P. Gaudin. 2009. Heterothallism in the pennate diatom *Haslea ostrearia* (Bacillariophyta). Eur. J. Phycol. 44: 251-261.

Gaillon, B. 1820. Des huîtes vertes, et des causes de cette colororation. Annales Generales des Sciences Physiques 7: 89-94.

Kylin, H. 1930. Über die Blasenzellen bei *Bonnemaisonia*, *Trailliella* und *Antithamnion.* Zeitsch. Botanik 23: 217226.

_____. 1940. Die Phaeophyceenordnung Chordariales. Lunds Univ. Årsskr., N.F., Avd. 2, 36(9). 67 pp., 8 pls.

Lankester, E. R. 1886. On green oysters. Quart. J. Microsc. Sci., N.S., 26: 71-94, pl. VII.

Papenfuss, G. F. 1955. Classification of the algae. In*: A century of progress in the natural sciences 1853-1953*. Pp. 115-224. California Acad. Sci., San Francisco.

Pouvreau, J.-B., M. Morançais, F. Fleury, P. Rosa, L. Thion, B. Cahingt, F. Zal, J. Fleurence & P. Pondaven. 2006. Preliminary characterisation of the blue-green pigment "marennine" from the thycopelagic diatom *H. ostrearia* (Gaillon/Bory) Simonsen. J. Appl. Phycol. 18 757-767.

Sauvageau, C. 1892a. Sur quelques algues phéosporées parasites. J. de Bot. 6: 1-10; 36-44, 55-59; 76-80; 90-96; 97-106; 124-131, pls. 1-4.

_____. 1892b. Sur l'état coccoïde d'un *Nostoc*. Compt. Rend. Acad. Sci. [Paris] 115: 322-325.

_____. 1895a. Note sur l'*Ectocarpus tomentosus* Lyngb. J. de Bot. 9: 153-167.

_____. 1895b. Note sur l'*Ectocarpus pusillus* Griffiths. J. de Bot. 9: 274-291; 307-318.

_____. 1895c. Note sur l'*Ectocarpus Battersii* Bornet. J. de Bot. 9: 351-364.

_____. 1896a. Sur la conjugaison des zoospores de l'*Ectocarpus siliculosus*. Compt. Rend. Acad. Sci. [Paris] 123: 431-433.

_____. 1896b. Remarques sur la reproduction des phéosporées et en particulier des *Ectocarpus*. Ann. Sci. Nat., Bot., sér. 8, 2: 223-274.

_____. 1896c. Sur le *Strepsithalia*, nouveau genre de phéosporée. J. de Bot. 10: 53-65.

_____. 1896d. Sur l'*Ectocarpus virescens* Thuret et ses deux sortes de sporanges pluriloculaires. J. de Bot. 10: 98-107; 113-126.

_____. 1897. Note préliminaire sur les algues marines du golfe de Gascogne. J. de Bot. 11: 166-179; 202-214; 252-257; 263-288; 301-311.

_____. 1898a. Sur quelques Myrionemacées. Ann. Sci. Nat. Bot., sér. 8, 5: 161-288.

_____. 1898b. Sur l'origine du thalle des Cutlériacées. Compt. Rend. Acad. Sci. [Paris] 126: 1435-1438.

_____. 1898c. Sur la sexualité et les affinités des Shacélariacées. Compt. Rend. Acad. Sci. [Paris] 126: 1672-1675.

_____. 1899a. Les *Acinetospora* et la sexualité des Tiloptériacées. J. de Bot. 13: 108-127.

_____. 1899b. Les Cutlériacées et leur alternance de générations. Ann. Sci. Nat., Bot. sér. 8, 10: 265-362, pl. 9.

_____. 1900-1914. Remaques sur les Sphacélariacées. J. de Bot. 14: 213-234, 247-259, 304-322, 1900; 15: 22-36, 50-62, 94-116, 137-149, 222-255, 368-380, 401-418, 1901; 16: 325-349, 379-416, 1902; 17: 45-56, 69-95, 332-353, 378-422, 1903; 18: 88-104, 1904; independently publ. pp. 349-634, 1914. Reprinted and repaginated as Fasc. 1: 1-320, from J. de Bot. 141-7, 1903; Fasc. 2: 321-480, 17, 18, 1904; Fasc. 3, Independently publ. 481-634, 1914.

_____. 1905. Observations sur quelques Dictyotacées et sur un *Aglaozonia* nouveau. Bull. Stat. Biol. Arcachon 8: 66-81.

_____. 1907a. Le *Nemoderma tingitana* est une algue méditerranée. Compt. Rend. Soc. Biologie 62: 273-274.

_____. 1907b. Sur la sexualité de l'*Halopteris* (*Stypocaulon*) *scoparia*. Compt. Rend. Soc. Biologie 62: 506-507.

_____. 1907c. Le verdissement des huîtres par la Diatomée bleue. Bull. Stat. Biol. Arcachon 10: 1-128.

_____. 1907d. Sur une nouvelle complication dans l'alternance des générations de *Cutleria*. Compt. Rend. Acad. Sci. [Paris] 63: 139-141.

_____. 1908a. Sur deux *Fucus* récoltés a Arcachon (*Fucus platycarpus* et *F. lutarius*). Bull. Stat. Biol. Arcachon 11: 65-224.

_____. 1908b. Sur des Myxophycées roses et sur un procédé d'étude de la phycocyane. Compt. Rend. Soc. Biologie 64: 95-97.

_____. 1908c. A propos d'Oscillariés rouges observées dans un aquarium du laboratoire de Banyuls-sur-Mer. Compt. Rend. Soc. Biologie 64: 97-99.

_____. 1908d. Sur la coloration des Floridées. Compt. Rend. Soc. Biologie 64: 103-104.

_____. 1908e. Nouvelles observations sur la germination parthénogénétique de *Cutleria adspera*. Compt. Rend. Acad. Sci. [Paris] 65: 165-167.

_____. 1909. Une question de nomenclature botanique *Fucus platycarpus* ou *Fucus spiralis*. Bull. Stat. Biol. Arcachon 12: 201-205.

_____. 1911a. Sur la vie indépendante des noyaux explusés da l'oogone des Fucacées et la possibilité de leur fécondation. Compt. Rend. Soc. Biologie 71: 470-472.

_____. 191lb. Sur la végétation des *Cystoseira*. Compt. Rend. Soc. Biologie 71: 680- 682.

_____. 1911c. Sur l'iridescence des *Cystoseira*. Compt. Rend. Soc. Biologie 71: 684-685.

_____. 1912a. Sur l'apparition du *Colpomenia sinuosa* dans le Golfe de Gascogne. Compt. Rend. Soc. Biologie 72: 478-

_____. 1912b. A propos des *Cystoseira* de Banyuls et de Guéthary. Bull. Stat. Biol. Arcachon 14: 133-556.

_____. 1913. Sur les Fucacées du détroit de Gibraltar. Compt. Rend. Acad. Sci. [Paris] 157: 1539-1540.

_____. 1915a. Sur le développement et la biologie d'une Laminaire (*Saccorhiza bulbosa*). Compt. Rend. Acad. Sci. [Paris] 160: 445-448.

_____. 1915b. Sur les débuts du développement d'une Laminaire (*Saccorhiza bulbosa*). Compt. Rend. Acad. Sci. [Paris] 161: 740-742.

_____. 1915c. Sur la sexualité heterogamique d'une Laminaire (*Sacccorhiza bulbosa*). Compt. Rend. Acad. Sci. [Paris] 161: 796-799.

_____. 1916a. Sur les gamétophytes de deux Laminaires (*L. flexicaulis* et *L. saccharina*). Compt. Rend. Acad. Sci. [Paris] 162: 601-604.

_____. 1916b. Sur la sexualité hétérogamique d'une Laminaire (*Alaria esculenta*). Compt. Rend. Acad. Sci. [Paris] 162: 840-842.

_____. 1916c. Sur les "glandes à mucilage" de certaines Laminaire (*Saccorhiza bulbosa*). Compt. Rend. Acad. Sci. [Paris] 162: 921-924.

_____. 1916d. Sur les variations biologiques d'une Laminaire (*Saccorhiza bulbosa*). Compt. Rend. Acad. Sci. [Paris] 163: 396-398.

_____. 1916e. Sur les plantules de quelques Laminaires. Compt. Rend. Acad. Sci. [Paris] 163: 522-524.

_____. 1916f. Sur une Laminaire nouvelles pour les cotes de France, *Laminaria Lejolisii* Sauv. Compt. Rend. Acad. Sci. [Paris] 163: 714-716.

_____. 1917. Sur un nouveau type d'alternance des générations chez les algues brunes (*Dictyosiphon foeniculaceus*). Compt. Rend. Acad. Sci. [Paris] 164: 829-831.

_____. 1918a. Sur les plantules d'une Laminaire à prothalle parasite (*Phyllaria reniformis* Rostaf.). Compt. Rend. Acad. Sci. [Paris] 166: 787-789.

_____. 1918b. Recherches sur les Laminaires ds côtes de France. Mém. Acad. Sci., Paris 56: 1-240.

_____. 1920a. *Utilisation des algues marines*. (1 volume of Encyclopédia scientifique). Libraire Octave Doin, Gaston Doin, Paris. 394 pp.

_____. 1920b. A propos des *Cystoseira* de Banyuls et de Guéthary. Bull. Stat. Biol. Arcachon 17: 3-52.

_____. 1920c. Nouvelles observations sur l'*Ectocarpus Padinae* Sauv. Compt. Rend. Acad. Sci. [Paris] 171: 1041-1044.

_____. 1921a. Observations biologiques sur le *Polysiphonia fastigiata* Grev. Recueil Trav. Bot. Néerland. 18: 213-234.

_____. 1921b. Sur la gélose de quelques algues Floridées. Bull. Stat. Biol Arcachon 18: 5-113.

_____. 1922. Remarques sur la gélose et sur diverses algues qui en produisent. Bull. Sci. Pharmacolog. 19: 637-640.

_____. 1923a. Sur l'état quiescent prolongé d'une algues phéosporée éphémère. Compt. Rend. Acad. Sci. [Paris] 176: 478-482.

_____. 1923b. A propos de quelques *Fucus* du bassin d'Arcachon. Bull. Stat. Biol. Arcachon 20: 19-136.

_____. 1924a. Sur le curieux développement d'une algue phéosporée, *Castagnea Zosterae* Thuret. Compt. Rend. Acad. Sci. [Paris] 179: 1381-1384.

_____ 1924b. Sur quelques exemples d'heteroblastie dans le développement des algues phéosporées. Compt. Rend. Acad. Sci. [Paris] 179: 1576-1579.

_____. 1925a. Sur quelques algues Floridées renferment de l'iode à l'état libre. Bull. Stat. Biol. Arcachon 22: 5-45.

_____. 1925b. Sur une développement d'une algue phéosporée, *Leathesia difformis* Areschoug. Compt. Rend. Acad. Sci. [Paris] 180: 1632-1635.

_____. 1925c. A propos de la rencontre du *Desmarestia Dudresnayi* Lamx. dans le golfe de Gascogne. Rev. Algol. 2: 1-13.

_____. 1926a. Sur quelques algues floridées renfermant du brome à l'état libre. II. Bull. Stat. Biol. Arcachon 23: 5-23.

_____. 1926b. Sur l'alternance des genérations chez le *Carpomitra cabrerae* Kütz. Bull. Stat. Biol. Arcachon 23: 141-192.

_____. 1926c. Sur un nouveau type d'alternance de générations chez les algues brunes: les Sporochnales. Compt. Rend. Acad. Sci. [Paris] 182: 361-364.

_____. 1926d. Sur le développement du *Colpomenia sinuosa* Derb. et Sol. Compt. Rend. Acad. Sci. [Paris] 185: 833-835.

_____. 1927a. Sur le gamétophyte d'une algue phéosporée (*Nereia filiformis* Zan.). Compt. Rend. Acad. Sci. [Paris] 184: 1223-1224.

_____. 1927b. Sur les problemes du *Giraudya*. Bull. Stat. Biol. Arcachon 24: 5-74.

_____. 1927c. Sur le *Fucus lutarius* et sur l'iode libre de certaines algues. Bull. Stat. Biol. Arcachon 24: 75-84.

_____. 1927d. Sur le *Colpomenia sinuosa* Derb. et Sol. Bull. Stat. Biol. Arcachon 24: 309-353.

_____. 1927e. Sur l'alternance des générations chez le *Nereia filiformis* Zan. Bull. Stat. Biol. Arcachon 24: 357-367.

_____. 1927f. Sur le *Castagnea Zosterae* Thur. Bull. Stat. Biol. Arcachon 24: 369-431.

_____. 1928a. Un dernier mot sur les ioduques et les bromuques Bull. Stat. Biol. Arcachon. 25: 3-24.

_____. 1928b. Sur le développement de deux *Asperococcus* Lamx. Compt. Rend. Acad. Sci. [Paris] 186: 612-615.

_____. 1928c. Sur la question du *Tilopteris Mertensii* Kütz. Compt. Rend. Acad. Sci. [Paris] 186: 1253-1256.

_____. 1928d. Sur la végétation et la sexualité des Tiloptériales. Bull. Stat. Biol. Arcachon 25: 51-95.

_____. 1928e. Seconde note sur l'*Ectocarpus tomentosus* Lyngbye. Bull. Stat. Biol. Arcachon 25: 121-135.

_____. 1928f. Sur les algues phéosporées à éclipse ou Éclipsiophycées. Recueil Travaux Bot. Néerlandais 25A: 262-270.

_____. 1929. Sur le développement de quelques phéosporées. Bull. Stat. Biol. Arcachon 26: 253-420.

_____. 1931a. Sur quelques algues phéosporées de la rade de Villefranche (Alpes-Maritimes). Bull. Stat. Biol. Arcachon 28: 7-168.

_____. 1931b. Sur trois nouveaux exemples de pléthysmothalle (*Myriotrichia* Harv. et *Protasperococcus* nov. gen). Compt. Rend. Acad. Sci. [Paris] 192: 1620-1621.

_____. 1931c. Titres et travaux scientifiques de M. Camille Sauvageau. Imprimerie de l'Université, Bordeaux. 20 pp.

_____. 1931d. Sur le rôle des *Aglaozonia* d'origine parthénogénétique. Compt. Rend. Acad. Sci. [Paris] 193: 133-134.

_____. 1932a. Le pléthysmothalle. Bull. Stat. Biol. Arcachon 29: 1-16.

_____. 1932b. Sur quatre *Ectocarpus*. Compt. Rend. Acad. Sci. [Paris] 194: 2260-2262.

_____. 1933a. Sur quelques algues phéosporées de Guéthary (Basses-Pyrénées). Bull. Stat. Biol. Arcachon 30: 1-128.

_____. 1933b. Un genre "*Symphoriococcus*" Rke est-il justifié? Bull. Stat. Biol. Arcachon 30: 179-188.

_____. 1933c. Sur le "*Climacosorus*" nouveau genre de Phéosporée. Bull. Stat. Biol. Arcachon 30: 189-196.

_____. 1936. Second mémoire sur les algues Phéosporées de Villefranche-sur-mer. Bull. Stat. Biol. Arcachon 33: 117-204.

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