

LXV. *Some Observations upon the Sleep of Plants; and an Account of that Faculty, which Linnæus calls Vigilæ Florum; with an Enumeration of several Plants, which are subject to that Law. Communicated to Wm. Watson, M. D. F. R. S. by Mr. Richard Pultney of Leicester.*

Read Jan. 26.
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A Costa and Prosper Alpinus, who both wrote near the conclusion of the XVIth century, are, I believe, the first, who recorded that nocturnal change in the leaves of plants, which has since been called *somnus*. It is an observation indeed as old as Pliny's time, that the leaves of trefoil assume an erect situation (1) upon the coming of storms. The same is observable of our wood-sorrel; and Linnæus adds, of almost all plants with declinated stamina (2). In the *Trifolium pratense album* C. B. or common white-flowered meadow trefoil, it is so obvious, that the common people in Sweden remark, and prognosticate the coming of tempests and rain from it.

The examples of sleeping plants instanced by Alpinus are but few. That author says, it was common to several Egyptian species (3); but specifies only the *Acaciæ*, *Abrus*, *Abfus*, *Sesban*, and the *Tamarind-*

(1) *Trifolium quoque inhorrescere et folia contra tempestatem subrigere certum est.* Hist. Nat. lib. xviii. cap. 35.

(2) Flor. Lapon. p. 222.

(3) Prosp. Alpin. de plantis Ægypti, cap. 10.

tree.

tree. Cornutus some time afterwards remarked this property in the *Pseudo-acacia Americana*. From that time it has remained almost unnoticed, till Linnæus, ever attentive to nature's works, discovered that the same affair was transacted in many other plants; and his observations have furnished us with numerous and obvious examples thereof. Mr. Miller mentions it in the *Medicago arborea* Lin. Sp. Pl. 778. and we may add to the list two other common plants not mentioned by Linnæus: these are the *Phaseolus vulgaris*, common kidney-bean; and the *Trifolium pratense purpureum majus*, or clover-grass: in both which this nocturnal change is remarkably displayed. Doubtless the same property exists in numberless other species; and future observation will very probably confirm Dr. Hill's sentiment, that no "plant or tree" "is wholly unaffected by it."

It is now more than twenty years since Linnæus first attended to this quality in plants. In his *Flora Lapponica*, when speaking of the *Trifolium pratense album*, as above-mentioned, he remarks, that the leaves of the *Mimosa*, *Cassia*, *Bauhinia*, *Parkinsonia*, *Guilandina*, and others in affinity with them, were subject to this change in the night time: and he had then carried his observations so far, as to find, that heat and cold were not the cause of this quality; since they were alike influenced by it when placed in stoves, where the temperature of the air was always the same.

The merit of reviving this subject is therefore due to the illustrious Swede; and the naturalist is greatly indebted to him for so far extending his observations thereon.

The subject of the *somnus plantarum* cannot but be highly entertaining to the lovers of natural knowledge: and such, I apprehend, cannot be less entertained with that faculty, which Linnæus calls *vigiliae florum*; of which we shall give a brief account.

Previous to our explanation of this affair it is proper to observe, that the flowers of most plants, after they are once opened, continue so night and day, until they drop off, or die away. Several others, which shut in the night-time, open in the morning either sooner or later, according to their respective situation in the sun or shade, or as they are influenced by the manifest changes of the atmosphere. There are however another class of flowers, which make the subject of these observations, which observe a more constant and uniform law in this particular. These open and shut duly and constantly at certain and determinate hours, exclusive of any manifest changes in the atmosphere; and this with so little variation in point of time, as to render the phenomenon well worth the observation of all, whose taste leads them this way.

This faculty in the flowers of plants is not altogether a new discovery; but we are indebted to the same hand for additional observations upon this head likewise. It is so manifest in one of our common English plants, the *Tragopogon luteum*, that our country people long since called it *John-go-to-bed-at-noon*. Linnæus's observations have extended to near fifty species, which are subject to this law. What we find principally upon this subject is in the *Philosophia Botanica*, p. 273. We will enumerate these plants, and mention the time when the flowers open and shut,

shut, that those, who have opportunity and inclination, may gratify themselves, and probably at the same time extend this branch of botanic knowledge still farther.

It is proper to observe, that as these observations were made by Linnæus in the academical garden at Upsal, whoever repeats them in this country will very probably find, that the difference of climate will occasion a variation in point of time: at least this will obtain in some species, as our own observations have taught us; in others the time has corresponded very exactly with the account he has given us.

Whether this faculty hath any connexion with the great article of fecundation in the oeconomy of flowers, I cannot determine: in the mean time it is not improbable. Future and repeated observations, and well-adapted experiments, will tend to illustrate this matter, and it may be lead the way to a full explanation of the cause.

1. *Anagallis flore phœniceo* C. B. pin. 252. Raii Syn. p. 282. *Anagallis arvensis* Lin. Spec. plant. p. 148. *The Male Pimpernel*. The flowers of this plant open about eight o'clock in the morning, and never close till past noon. This plant is common in kitchen-gardens and in corn-fields, and flowers in June, and continues in flower three months.

2. The *Anagallis cœrulea foliis binis ternisve ex adverso nascentibus* C. B. pin. p. 252. Raii Hist. Plant. p. 1024. *Anagallis Monelli* Sp. plant. 148. *Blue-flowered Pimpernel with narrow leaves*. The flowers of this plant observe nearly the same time in opening and shutting as the foregoing.

3. Con-

3. *Convolvulus peregrinus cæruleus folio oblongo* C. B. pin. 295. *Convolvulus tricolor* Sp. plant. 158. *Little blue Convolvulus, or Bindweed.* This opens its flowers between the hours of five and six in the morning, and shuts them in the afternoon.

4. *Phalangium parvo flore ramosum* C. B. pin. 29. Raii Hist. Pl. 1193. *Branched Spiderwort with a small flower.* These open about seven in the morning, and close between the hours of three and four in the afternoon.

5. *Lilium rubrum Asphodeli radice* C. B. pin. 80. *Hemerocallis fulvus* Sp. pl. 324. *The Day Lily.* The flowers open about five in the morning, and shut at seven or eight in the evening.

6. *Plantago aquatica minor.* Park. 1245. Raii Syn. 257. *Alisma ranunculoides* Sp. pl. 343. Fl. Suec. 2. N^o. 325. *The lesser Water-Plantain,* during its flowering-time, only opens its flowers each day about noon.

7. *Caryophyllus sylvestris prolifer* C. B. pin. 209. Raii Syn. 337. *Dianthus prolifer* Sp. pl. 410. *Proliferous Pink.* The flowers expand about eight in the morning, and close again about one in the afternoon.

8. *Spergula purpurea* J. B. III. 722. Raii Syn. p. 351. *Arenaria rubra.* Sp. pl. 423. *Purple Spurrey.* These expand between nine and ten in the morning, and close between two and three in the afternoon. This little plant is common among the corn in sandy soils, and flowers in June.

9. *Portulaca latifolia fativa* C. B. pin. 288. *Portulaca oleracea* Sp. pl. p. 445. *Common Purslain,* opens its flowers about nine or ten in the morning, and closes them again in about an hour's time.

10. *Ficoides Africana*, folio *plantaginis undulato micis argenteis adperso* Boerh. Ludg. I. p. 291. *Mesembryanthemum chrySTALLINUM* Sp. pl. 480. *Diamond Ficoides*. The flowers of this plant open at nine or ten, and close at three or four in the afternoon.

11. *Ficoides Africana folio tereti in villos radiatos abeunte*. Tourn. *Mesembryanthemum barbatum* Sp. pl. 482. The flowers of this species expand at seven or eight in the morning, and close about two in the afternoon.

12. *Ficoides folio tereti Neapolitana flore candido* Herm. Ludg. 252. *Kali Crassulæ minoris foliis* C. B. pin. 289. *Mesembryanthemum nodiflorum* Sp. pl. 480. The flowers of this plant open at ten or eleven in the morning, and close at three in the afternoon.

13. *Mesembryanthemum folio linguiformi latiore* Dillen. Hort. Elth. *Mesembryanthemum linguiforme* Sp. pl. 488. *Ficoides with a tongue-shaped leaf*. These open at seven or eight in the morning, and are closed about three in the afternoon.

14. *Nymphæa alba* J. B. III. 770. Raii Syn. 368. *Nymphæa alba* Sp. pl. 510. Fl. Suec. 2. N^o. 470. *White Water Lily*. This plant grows in rivers, ponds, and ditches, and the flowers lie upon the surface of the water. At their time of expansion, which is about seven in the morning, the stalk is erected, and the flower more elevated above the surface. In this situation it continues till about four in the afternoon, when the flower sinks to the surface of the water, and closes again.

15. *Papaver erraticum nudicaule flore flavo odorato* Dillen. Hort. Elth. 302. *Papaver nudicaule* Sp. pl.

pl. p. 507. *Wild Poppy with a naked stalk and a yellow sweet-smelling flower.* The flower of this plant opens at five in the morning, and closes at seven in the evening.

16. *Alyssoides incanum, foliis sinuatis* Tourn. Inst. 213. *Alyssum sinuatum* Sp. pl. 651. *Hoary Madwort with sinuated leaves.* The flowers of this plant expand between the hours of six and eight in the morning, and close at four in the afternoon.

17. *Abutilon repens alceæ foliis, flore helvolo* Dillen. Hort. Elth. 5. *Malva Caroliniana* Sp. pl. 688. *Creeping Indian Mallow with leaves like Vervain Mallow, and a flesh-coloured flower.* These open at nine or ten in the morning, and close at one in the afternoon.

18. *Tragopogon luteum* Ger. 595. Raii Syn. 171. *Tragopogon pratense* Sp. pl. 789. *Yellow Goats Beard, or Go-to-bed-at-noon.* The latter of these names was given to this plant long since, on account of this remarkable property. The flowers open in general about three or four o'clock, and close again about nine or ten, in the morning. These flowers will perform their *vigiliæ*, if set in a phial of water, within doors for several mornings successively; and I have sometimes observed them to be quite closed, from their utmost state of expansion, in less than a quarter of an hour. It flowers in June.

19. *Tragopogon gramineis foliis, hirsutis.* C. B. pin. 275. Raii. Hist. Plant. 253. *Rose-coloured Goats Beard.* These open between five and six in the morning, and close about eleven. *Tragopog. hybridum* Sp. plant. 789.

20. *Tragopogon, calycibus corolla brevioribus inermibus,*

ermibus, foliis lyrato-sinuatis. Hort. Upf. 244. Sp. pl. 790. Hall. Hort. Gotting. 2. p. 419. The flowers of this plant open at six or seven in the morning, and shut between the hours of twelve and four in the afternoon.

21. *Sonchus Tingitanus papaveris folio*. Tourn. Raii Suppl. 137. *Scorzonera Tingitana* Sp. pl. 791. *African Sowthistle with a poppy leaf*. This plant opens its flowers between four and six in the morning, and closes them in about three hours.

22. *Sonchus repens, multis hieracium majus* J. B. II. 1017. Raii Syn. 163. *Sonchus arvensis* Sp. pl. 793. *Tree Sowthistle*. These flowers expand about six or seven, and close between eleven and twelve in the forenoon. This is common in corn-fields, and flowers in June, July, and August.

23. *Sonchus lævis* Ger. Raii Syn. 162. *Sonchus oleraceus* Sp. pl. 794. *Smooth or unprickly Sowthistle, Hares Lettuce*. These open about five in the morning, and close again at eleven or twelve.

24. *Sonchus lævis laciniatus cæruleus* C. B. pin. 124. Raii Hist. pl. 225. *Sonchus alpinus* Sp. pl. 794. *Blue-flowered Mountain Sowthistle*. These open about seven, and close about noon.

25. *Sonchus tricubitalis, folio cuspidato* Merr. pin. Raii Syn. 163. *Sonchus asper arborefcens* C. B. pin. 124. *Sonchus palustris* Sp. pl. 793. *The greatest Marsh-tree Sowthistle*. It expands its flowers about six or seven, and closes them about two in the afternoon.

26. *Lactuca fativa* C. B. pin. 122. Sp. pl. 795. *Garden Lettuce*, opens its flowers about seven, and closes them about ten, in the forenoon.

27. *Dens leonis* Ger. 228. Raii Syn. 170. *Leontodon Taraxacum* Sp. pl. 798. *Dandelion*. It expands at five or six, and closes at eight or nine, in the forenoon. This flowers early in the spring, and again in the autumn.

28. *Dens leonis hirsutus leptocaulos*, *Hieracium dictus*. Raii Syn. 171. *Leontodon hispidum* Sp. pl. 799. *Rough Dandelion*, or *Dandelion Hawkweed*. This plant opens its flower about four in the morning, and keeps it expanded till three in the afternoon. In May.

29. *Hieracium minus præmorfa radice*. Park. 794. Raii Syn. 164. *Leontodon autumnale*. Sp. pl. 799. *Hawkweed with bitten roots*, or *Yellow Devil's-bit*. The flowers open about seven, and keep in an expanded state till about three in the afternoon. It flowers in July and August.

30. *Pilosella repens* Ger. 573. Raii Syn. 170. *Hieracium Pilosella* Sp. pl. 800. *Common creeping Mouse-ear*. It opens about eight in the morning, and closes about two in the afternoon. Very common on dry pastures, flowering in June and July.

31. *Hieracium murorum folio pilosissimo* C. B. pin. 129. Raii Syn. 168. *Hieracium murorum* Sp. pl. 802. The flowers of this plant expand about six or seven, and close about two in the afternoon. Upon old walls, flowering in June and July. This is called in English, *French* or *Golden Lungwort*.

32. *Hieracium fruticosum angustifolium majus*. C. B. pin. 129. *Hieracium umbellatum* Sp. pl. 804. *Narrow-leaved bushy Hawkweed*. The flowers of this species expand about six in the morning, and remain open till five in the afternoon.

33. *Hiera-*

33. *Hieracium fruticosum latifolium hirsutum* C. B. pin. 129. Raii Syn. p. 167. *Hieracium fabaudum* Sp. pl. 804. *Bushy Hawkweed with broad rough leaves.* These flowers are in their expanded state from about seven in the morning till one or two in the afternoon. In woods, flowering in June and July.

34. *Hieracium montanum cichorii folio.* Raii. Syn. p. 166. *Hieracium paludosum* Sp. pl. 638. Fl. Succ. 2. N^o. 702. *Succory-leaved Mountain Hawkweed.* The flowers expand about six in the morning, and close about five in the afternoon.

35. *Hieracium hortense floribus atro-purpurascen-
tibus* C. B. pin. 128. *Hieracium aurantiacum* Sp. pl. 801. *Garden Hawkweed with deep purple flowers, or Sweet Indian Mouse-ear.* The flowers are in their expanded state from six or seven in the morning till three or four in the afternoon.

36. *Hieracium luteum glabrum, five minus hir-
sutum.* J. B. Raii Syn. 165. *Crepis tectorum* Sp. pl. 807. *Smooth Succory Hawkweed.* The flowers of this plant expand about four in the morning, and close about noon.

37. *Hieracium Alpinum Scorzonerae folio* Tourn. Inst. 472. *Crepis Alpina* Sp. pl. 806. *Mountain Hawkweed with a vipers-grass leaf.* These open about five or six, and close at eleven in the forenoon.

38. *Hieracium dentis leonis folio, flore suave-ru-
bente,* C. B. pin. 127. Raii hist. pl. 231. *Crepis ru-
bra* Sp. pl. 806. *Hawkweed of Apulia with a flesh-
coloured flower.* The flowers remain in their ex-
panded state from six or seven in the morning till
one or two in the afternoon.

39. *Hieracium echioides*, capitulis cardui benedicti C. B. pin. 128. Raii Syn. 166. *Picris echioides* Sp. pl. 792. *Lang de bæuf*. On banks about hedges, and about the borders of fields, flowering in August. These expand about four or five in the morning, and never close before noon: sometimes they remain open till nine at night.

40. *Hieracium Alpinum latifolium hirsutie incanum flore magno*. C. B. pin. 128. Raii Syn. p. 167. *Hypochæris maculata* Sp. pl. 810. *Broad-leaved Hungarian Hawkweed*. These flowers are in their vigilating state from six in the morning till four in the afternoon.

41. *Hieracium ramosum*, floribus amplis, calycibus valde hirsutis, foliis oblongis obtusis: dentibus majoribus inæqualibus incisif Raii Suppl. 144. 76. *Hypochæris Achyrophorus* Sp. pl. 810. This plant opens its flowers about seven or eight in the morning, and closes them about two in the afternoon.

42. *Hieracium minus dentis leonis folio*, oblongo glabro C. B. pin. 127. *Hypochæris glabra* Sp. pl. 811. These expand about nine in the morning, and close about twelve or one o' clock.

43. *Hieracium falcatum alterum* Raii Hist. 256. *Lapsana calycibus fructus undique patentibus, radiis subulatis, foliis lyratis* Hort. Upf. 245. Sp. pl. 812. The flowers open at five or six, and close between the hours of ten and one.

44. *Hedypnois annua* Tourn. Inf. 478. *Hyoseris hedypnois* Sp. pl. 809. The flowers open at seven or eight, and close again at two in the afternoon.

45. *Hieracium montanum alterum leptomacraulon* Col. Raii Hist. 234. *Lapsana chondrilloides* Sp.

Sp. pl. 812. *Mountain Hawkweed with long slender stalks and small flowers.* The flowers are in their expanded or vigilating state from five or six in the morning till about ten.

46. *Cichoreum fylvestre* Ger. em. 284. Raii Syn. 172. *Cichorium Intybus* Sp. pl. 813. *Wild Succory.* On the borders of fields, flowering in August and September. The flowers open about eight in the forenoon, and keep expanded till about four in the afternoon.

47. *Calendula arvensis* C. B. pin. 275. Raii Hist. 338. *Calendula officinalis* Sp. pl. 921. *Wild Marigold.* The flowers expand from nine in the morning till three in the afternoon.

48. *Calendula foliis dentatis* Roy. Ludg. 177. Miller, p. 50. Tab. 75. f. 1. *Calendula pluvialis* Sp. pl. 921. *Marigold with indented leaves.* The flowers expand from seven in the morning till three or four in the afternoon. Linnæus observes of this plant, that if its flowers do not expand about their usual time in the morning, it will almost assuredly rain that day; with this restriction indeed, that the plant is not affected by thunder showers. Phil. Bot. 275.

49. *Sonchus pedunculis squamatis, foliis lanceolatis indivisis sessilibus.* Hort. Upsal. 244. Flor. Suec. 2. N°. 690. *Lactuca Salicis folio, flore cæruleo.* Amman. ruth. 211. Of this plant it is remarked, that whenever the flowers are in the expanded state in the night-time, the following day generally proves rainy.