Beiblatt zu den Botanischen Jahrbüchern.

Nr. 70.

Band XXXI. Ausgegeben am 29. August 1902. Heft 4/5.

A System of Nomenclature for Phytogeography*).

By

Frederic E. Clements,

University of Nebraska, Lincoln.

The extremely rapid development of phytogeography during the last decade has brought forth a host of new conceptions and new terms in this branch of botany. As is always the case in the unfolding of a new line of investigation and thought, first ideas are very general, if not crude, and the pioneers in such work approach it from different points of view. The result has necessarily been a great surplus of terms as well as much confusion and uncertainty in their application and meaning. Further than this, the use of the vernacular, especially in the elaboration of vegetative coverings entirely unknown to foreign botanists, has rendered unavoidable a confusing shifting of terms in the process of translation and interpretation. No botanist has attempted as yet to cover the whole field, and in consequence the contributions made, as they have been, by many workers, show an almost complete lack of comparison and coordination. In this respect, phytogeography stands today just where taxonomy did before Linnaeus picked up the chance binomials of Bauhin and the herbalists to make out of them an exact system. While the working out of a system of nomenclature for phytogeography comparable to the binomial system seems impossible at the present time, yet much can be done in the way

*) **Anmerkung der Redaction:** Die Ausführungen des Herrn Verf. habe ich unverkürzt zum Abdruck gebracht, muss aber von vorn herein erklären,

1) dass ich entschieden nicht billigen kann die Einführung der Priorität in die pflanzengeographische Nomenclatur,

2) dass ich als Aufgabe einer Commission nur die betrachte, eine möglichst vollständige Synonymie der bestehenden Formationsbezeichnungen zu stande zu bringen,

3) dass es sich nicht empfiehlt, die volkstümlichen Bezeichnungen von Pflanzenformationen aus der pflanzengeographischen Litteratur zu verbannen,

4) dass durch allzuweit getriebenen Schematismus ebenso viele tüchtige Botaniker von der Pflanzengeographie wie von der Systematik abgeschreckt werden würden.

A. Engler.

of reducing the existing confusion and in coordinating the different portions of the subject. Warburg and Flahault have been the first to point out the need of system in phytogeographical nomenclature and to propose a remedy in part. Flahault, in correspondence in 1899, had already seen the necessity for reform and was seeking the cooperation of other botanists. Warburg, before the International Geographical Congress at Berlin in September 1899, pointed out in a vigorous article [1]) the many inconsistencies of phytogeographers, and laid the foundation of a real system by maintaining that Greek must be the basis, and that a definite and consistent principle must be employed in the nomenclature of formations. Warburg's leading argument is for »understandability« for the sake of the layman, but it applies with almost equal force to the case of the specialist. He considers the present time especially favorable for the elaboration of a thorough system for the following reasons.

1. The nomenclature of formations is in a state of chaos.
2. There are as yet no antagonistic schools which would render an agreement more difficult.
3. The nomenclature of formations is constantly undergoing changes at the hands of phytogeographers, while the principles have nowhere been so firmly fixed as to make a common system difficult.
4. Topographical phytogeography has progressed so far as to comprise the entire extent of conceivable names, so that few principal formations will be added in the future, the increase being confined essentially to local types.
5. Biological phytogeography is now so well developed that one cannot go astray in the choice of principles and of names.

In accordance with Warburg's proposals, a commission, of which the phytogeographers, Drude, Engler, Gräbner and Höck are members, was appointed to work out a simple system for the nomenclature of plant formations, and to report to the next International Geographical Congress.

Warburg has concerned himself entirely with suggestions for the nomenclature of formations. Flahault [2]), in his Projet de Nomenclature Phytogéographique, read before the International Botanical Congress at Paris in 1900, has scarcely touched this phase of the question, but has confined himself to the nomenclature of geographical and vegetational divisions. With respect to a few essential features, Flahault's work, painstaking in the matter of priority and careful in execution, falls short of an international system. The terms are in the vernacular and many of

1) Warburg, O., Einführung einer gleichmäßigen Nomenclatur in der Pflanzengeographie. Engl. Bot. Jahrb. XXIX. 3/4. Heft, Beibl. 66, p. 23, 1900. Read before the Botanical Society of America at the Denver Meeting, 1901.

2) Flahault, Ch., Projet de Nomenclature Phytogéographique, 1900. English Translation in Bull. Torr. Bot. Club. XXVIII. p. 391, 1901.

them are long, such as groupe de régions, type de végétation, série écologique de groupes d'association, groupe d'association. Flahault would retain a long list of indigenous names of formations, tundra, taigamyrar, watten, llanos, carroscos, campos, pinhals, garigues, for the reason that they have no equivalents in French (or in any other language), forgetting evidently that these names merely designate particular types of principal formations found elsewhere. He has been consistent in the application of priority, though it seems that the reasons for making this rule retroactive hardly obtain in phytogeography as they did in taxonomy. The term formation, however, is supplanted by groupe d'association on the one hand and by association on the other, though the strict application of priority would necessitate its retention. Flahault's report was referred to a commission on nomenclature, which was given complete latitude in the matter, with instructions to report to the Vienna Botanical Congress in 1905.

In a later paper [1]), Flahault has made use of his terms for geographical divisions in sketching the vegetation of France, but he does not take up the vexed question of formational nomenclature. No fault can be found with the terms employed, région, domaine, district, sous-district, station, which are as good as any others, were they not in the vernacular.

In proposing the following system of nomenclature for phytogeography, two principles have served as a basis. The first is that the division of the vegetation into formations must be founded upon the concept of habitats (environments), since each habitat and its corresponding formation are merely the physical and biological expressions of the same forces. Such a method is not only consistent, but it is logical and natural as well. What is only an apparent inconsistency arises from the fact that language has sometimes chosen to name the biological fact, as in the word forest, and sometimes the physical fact, as in cliff or beach, while in some words, such as meadow, both facts are represented. The second principle is that a name is of value only when its application is clear, and its interpretation definite. For this reason, Greek and Latin can alone be made use of in a scientific system. Just as taxonomy, from the time and conditions in which it developed, found its natural expression in Greek and Latin, so phytogeography must turn to these universal languages. Greek is to be preferred because of the perfection to which the composition of words has been carried in it, but Latin has many terms which are already in use, and many others which may well be used. For these reasons, it seems best that both languages should be employed, Greek when a new word is to be coined, Latin when a short simple term is desired. These principles, with others arising out of them, are embodied in the following rules of nomenclature, which are suggested as the basis for a system.

---

1) Flahault, Ch., La Flore et La Végétation de la France, 1901.

Rules for Phytogeographical Nomenclature.

Priority.

I. Priority of term and of application is to be regarded as the fundamental principle of phytogeographical nomenclature.

Author.

II. A term to be valid must be proposed by a botanist.

Beginning.

III. The beginning of phytogeographical nomenclature shall date from the adoption of this code.

Publication.

IV. Terms are valid only when published together with a definition or application. Publication, or republication with definition or application, must be made in Engler's Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie.

Source of Terms.

V. Terms are to be formed or taken from classical Greek or Latin. The former is to be preferred when words are to be compounded, the latter when simple terms are desired.

Proper Construction[1]).

VI. All hybrids and all terms which violate the principles of word-formation in Greek and Latin are invalid. Terms which exceed seven syllables, or are improperly spelled or transliterated are likewise invalid. This rule is retroactive to the extent that words improperly formed, spelled or transliterated shall be made to conform to classical usage.

Vernacular Terms.

VII. All vernacular terms are invalid, except as common or appositive terms in the language in which they are used.

Similar Terms.

VIII. Similar terms are valid only when they show a difference in stem, prefix, or suffix: mere differences of inflection or spelling are insufficient.

Stability of Terms.

IX. In the analysis of a process, structure, phenomenon, formation, factor, group or division, the original term is to be retained for the first, major, or general portion.

---

1) Miller, Walter, Scientific Names of Latin and Greek Derivation. Pro. Cal. Acad. Sci. III. 1, p. 115, 1897.

Formational Names.

X. The names of formations shall be based upon the principle of habitats. They shall be formed from Greek and shall terminate uniformly in -εῖον, -ium. Types are to be indicated by the use of the generic names of the facies or principal species followed by the name of the formation. Patches are to be named by the addition of the suffix -etum to the generic name of the characteristic or controlling species.

Committee on Nomenclature.

XI. An international committee of ten phytogeographers shall constitute a standing committee on phytogeographical nomenclature. It shall be the duty of this committee to pass annually upon the validity of proposed terms, names, formations etc., under the provisions of this code. The decisions of the committee shall be final. An annual report of the findings of the committee shall be published in Engler's Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie.

I. Names of Formations (Habitats).

Formed by adding the suffix -εῖον, -ium, pl. -εῖα, -ia, place, to denominative stems.)

Hydrophytia (ὕδωρ, water, φυτόν, plant, -εῖον, -εῖα, place), Water plant formations.

1. ocean (oceanus) — ὠκεανός, ὁ, ocean: ὠκεανεῖον, τό, oceanium, a particular ocean formation; ὠκεανεῖα, τά, oceania, a group or series of ocean formations, i. e., a principal formation: hence, oceanophyta, ocean plants; oceanophilus, ocean-loving, -dwelling[1]).
2. sea (mare) — θάλασσα, ἡ, sea: θαλασσεῖον, τό, thalassium, a particular sea formation; thalassia, a group of sea formations: thalassophyta, sea plants: thalassophilus, sea-loving.

   surface (pelagus) — πέλαγος, εος, τό: πελαγεῖον, τό, pelagium, a surface sea formation; pelagia, a group of such formations: pelagophyta, surface sea plants; pelagophilus, living at the surface of the sea.

   deep sea (pontus) — πόντος, ὁ: ποντεῖον, τό, pontium, a deep sea formation; pontia, a group of deep sea formations: pontophyta, deep sea plants; pontophilus, dwelling in the deep sea.

   Cfr. ἅλς, ἁλός, ἡ, the sea (as salt).

---

1) The forms, oceaniophyta, oceaniophilus (oceanio-) are preferable, but the shorter term is used for the sake of brevity. Another series of adjectives in -phyticus, as oceanophyticus etc., may also be formed.

3. lake (lacus) — λίμνη, ἡ, a large pool of standing water, lake, mere: λιμνεῖον, τό, limnium, a lake formation; limnia, a group of lake formations: limnophyta, lake plants; limnophilus, lake-loving.
4. pond, pool (piscina) — τῖφος, εος, τό, pool: τιφεῖον, τό, tiphium, a pond formation; tiphia, a group of pond formations: tiphophyta, pond plants; tiphophilus, pond-loving.
5. stagnant water (stagnum) — στάσις, εως, ἡ, a standing, stopping: στασεῖον, τό, stasium, a stagnant water formation; stasia, a group of such formations: stasophyta, stagnant water plants; stasophilus, dwelling in stagnant water.
6. salt marsh (palus salsa) — λιμνῶδες, τό, marshy ground: λιμνωδεῖον, τό, limnodium, a marsh formation; limnodia, a group of marsh formations: limnodophyta, marsh plants; limnodophilus, marsh-loving.
7. fresh marsh (palus) — ἕλος, εος, τό, low ground by rivers, marsh: ἑλεῖον, τό, helium, a marsh formation; helia, a group of marsh formations: helophyta, marsh plants; helophilus, marsh-loving.
8. wet meadow (pratum irriguum) — τέλμα, ατος, τό, low land subject to inundation, water meads: τελματεῖον, τό, telmatium, a wet meadow formation; telmatia, a group of wet meadow formations: telmatophyta, wet meadow plants; telmatophilus, dwelling in wet meadows.

   Cfr. εἰαμενή, ἡ, riverside pasture, meadow.
9. river (flumen) — ποταμός, ὁ, river: ποταμεῖον, τό, potamium, a river formation; potamia, a series of river formations: potamophyta, river plants; potamophilus, river-loving.
10. creek (amnis) — ῥόος, ὁ, a flowing stream: ῥοεῖον, τό, rhoium, a creek formation; rhoia, a series of creek formations: rhoophyta, creek plants; rhoophilus, creek-dwelling.
11. brook (rivus) — νᾶμα, ατος, τό, anything flowing, running water: ναματεῖον, τό, namatium, a brook formation; namatia, a series of brook formations: namatophyta, brook plants; namatophilus, brook-loving.

    Cfr. λιβάς, άδος, ἡ, a spring, fount or stream.
12. torrent (torrens) — ῥύαξ, ακος, ὁ, a stream that bursts forth, a mountain torrent: ῥυακεῖον, τό, rhyacium, a torrent formation; rhyacia, a series of torrent formations: rhyacophyta, torrent plants; rhyacophilus, torrent-loving.
13. spring (fons) — κρήνη, ἡ, well, spring, source, fountainhead: κρηνεῖον, τό, crenium, a spring formation: crenia, a series of spring formations: crenophyta, spring plants; crenophilus, spring-loving.

    Cfr. κρουνός, ὁ, a spring, well-head; πηγή, ἡ, a spring, well.

14. warm spring (thermae) — θέρμη, ἡ, heat, pl. hot springs; θερμεῖον, τό, thermium, a warm spring formation; thermia, a series of such formations: thermophyta, warm spring plants; thermophilus, dwelling in warm springs.

15. ditch (fossa) — τάφρος, ἡ, a ditch, trench: ταφρεῖον, τό, taphrium, a ditch formation; taphria, a series of ditch formations: taphrophyta, ditch plants; taphrophilus, ditch-dwelling.

Cfr. ὄρυγμα, ατος, τό, a place dug out, pit, ditch; κάπετος, ἡ, ditch, trench.

16. sewer (cloaca) — λαύρα, ἡ, an alley, lane, narrow passage, sewer, drain: λαυρεῖον, τό, laurium, a sewer formation; lauria, a series of sewer formations: laurophyta, sewer plants; laurophilus, sewer-dwelling.

Cfr. ἀμάρα, ἡ, trench, conduit, water-course; ὀχετός, ὁ, conduit, ditch, canal, aqueduct, drain.

17. swamp forest (silva paludosa) — ἕλος, τό, marsh, ὕλη, ἡ, forest: ἑλουλεῖον, τό, helohylium, a swamp forest formation; helohylia, a series of such formations: helohylophyta, wet forest plants; helohylophilus, dwelling in wet forests.

18. swamp open woodland (nemus paludosum) — ἕλος, τό, marsh, ὀργάς, άδος, ἡ, land partially wooded: ἑλοργαδεῖον, τό, helorgadium, a swampy open woodland formation; helorgadia, a series of such formations: helorgadophyta, plants of swampy open woodland; helorgadophilus, dwelling in swampy woodlands.

19. meadow thicket (virgulta paludosa) — ἕλος, τό, marsh, λόχμη, ἡ, thicket, coppice: ἑλολοχμεῖον, τό, helolochmium, a meadow thicket formation; helolochmia, a series of meadow thicket formations: helolochmophyta, meadow thicket plants; helolochmophilus, dwelling in meadow thickets.

20. bank (ripa) — ὄχθη, ἡ, any rising ground, bank, dike: ὀχθεῖον, τό, ochthium, a bank formation; ochthia, a series of bank formations: ochthophyta, bank plants; ochthophilus, bank-loving.

rock bank (ripa saxosa) — πέτρα, ἡ, rock, ὄχθη, ἡ, bank: πετροχθεῖον, τό, petrochthium, a rock bank formation; petrochthia: petrochthophyta; petrochthophilus.

sand bank (ripa arenosa) — ἄμμος, ἡ, sand, ὄχθη, ἡ, bank: ἀμμοχθεῖον, τό, ammochthium, a sand bank formation; ammochthia: ammochthophyta; ammochthophilus.

mud bank (ripa limosa) — πηλός, ὁ, mud, ὄχθη, ἡ, bank: πηλοχθεῖον, τό, pelochthium, a mud bank formation; pelochthia: pelochthophyta; pelochthophilus.

Cfr. χῶμα, ατος, τό, earth thrown up, bank, mound, dam.

21. rocky seashore (promunturium) — ἀκτή, ἡ, rocky coast against which the waves break: ἀκτεῖον, τό, actium, a rocky seashore for-

mation; actia, a series of such formations: actophyta, rocky seashore plants; actophilus, dwelling on the rocky seashore.

22. sandy seashore (litus) — αἰγιαλός, ὁ, that over which the sea rushes, seashore, beach, strand: αἰγιαλεῖον, τό, aigialium, a beach formation; aigialia, a series of beach formations: aigialophyta, beach plants; aigialophilus, beach-loving.

Cfr. κυματογή, ἡ, a place where the waves break, beach, strand.

23. sandbar (agger arenae) — χέραδος, τό, silt, mud, sand and gravel brought down by torrents and rivers: χεραδεῖον, τό, cheradium, a sandbar formation; cheradia, a series of sandbar formations: cheradophyta, sandbar plants; cheradophilus, dwelling on sandbars.

24. tank (piscina lignea) — φρέαρ, φρέατος, φρητός, τό, an artificial well, water tank, reservoir: φρητεῖον, τό, phretium, a tank formation; phretia, a series of tank formations; phretophyta, tank plants; phretophilus, dwelling in tanks.

25. sap, tissue (succus) — ὀπός, ὁ, juice, especially of trees, or other plants: ὀπεῖον, τό, opium, a parasitic formation; opia, a series of such formations: opophyta, sap plants, parasites; opophilus, sap-loving.

Cfr. ἱστός, ὁ, web: ἱστεῖον, τό, histium; histia: histophilus; histophyta.

26. dead matter (corpus putre) — σαπρός, ά, όν, rotten, putrid, decaying (of wood, etc.): σαπρεῖον, τό, saprium, a saprophytic formation; sapria, a series of such formations: saprophyta, dead matter plants; saprophilus, dwelling on dead matter.

Cfr. σαθρός, putrid.

Mesophytia (μέσος, middle, φυτόν, plant, -εῖον, place), middle plant formations.

1. forest (silva) — ὕλη, ἡ, wood, a wood, forest, woodland including underbrush, thickets; ὑλεῖον, τό, hylium, a forest formation; hylia, a series of forest formations; hylophyta, forest plants; hylophilus, forest-loving.

broad-leaved evergreen forest (silva sempervirens) — ἀειφύλλος, ον, evergreen: ἀειφυλλεῖον, τό, aiphyllium, a broad leaved evergreen forest formation; aiphyllia, a series of such formations: aiphyllophyta, broad-leaved evergreen forest plants; aiphyllophilus, dwelling in evergreen forests.

coniferous forest (silva conifera) — κωνοφόρος, ον, cone-bearing: κωνοφορεῖον, τό, conophorium, a coniferous forest formation; conophoria, a series of coniferous forests: conophorophyta, coniferous forest plants; conophorophilus, dwelling in coniferous forests.

deciduous forest (silva decidua) — πτηνόφυλλος, ον, with deciduous leaves: πτηνοφυλλεῖον, τό, ptenophyllium, a deciduous forest formation; ptenophyllia, a series of deciduous forests: ptenophyllophyta, deciduous forest plants; ptenophyllophilus, dwelling in deciduous forests.

2. grove, park (lucus) — ἄλσος, εος, τό, a place grown with trees and grass, a grove: ἀλσεῖον, τό, alsium, a grove formation: alsia, a series of grove formations: alsophyta, grove plants; alsophilus, grove-loving.

   Cfr. τέμενος, εος, τό, a piece of land marked off, grove, park.

3. orchard (pomarium) — δένδρον, δένδρα, τά, fruit trees: δενδρεῖον, τό, dendrium, an orchard formation; dendria, a series of orchard formations: dendrophyta, orchard plants; dendrophilus, orchard-loving.

4. cañon (vallis cava) — ἄγκος, εος, τό, a bend or hollow, hence a mountain glen, dell: ἀγκεῖον, τό, ancium, a cañon forest formation; ancia, a series of such formations: ancophyta, cañon plants; ancophilus, cañon-lowing.

   Cfr. βῆσσα, ἡ, wooded glen, mountain glen.

5. open woodland (nemus) — ὀργάς, άδος, ἡ, meadow land partially wooded: ὀργαδεῖον, τό, orgadium, an open woodland formation; orgadia, a series of open woodland formations: orgadophyta, open woodland plants; orgadophilus, dwelling in open woodland.

   Cfr. νέμος, εος, τό, a wooded pasture, grove.

6. thicket (virgulta) — λόχμη, ἡ, thicket, coppice, a place for lying in wait: λοχμεῖον, τό, lochmium, a thicket formation; lochmia, a series of thicket formations: lochmophyta, thicket plants; lochmophilus, thicket-loving.

   Cfr. ξύλοχος, ἡ, thicket, copse; ὕλημα, ατος, τό, anything of woody kind, shrubs, or bushes; δρυμός, ὁ, an oak coppice, coppice.

   evergreen thicket (virgulta sempervirentia) — ἀειθαλής, ές, evergreen: ἀειθαλεῖον, τό, aithalium, an evergreen thicket formation: aithalia, a series of such formations: aithalophyta, evergreen thicket plants; aithalophilus, dwelling in evergreen thickets.

   deciduous thicket (virgulta decidua) — πτηνοθαλής, ές, deciduous: πτηνοθαλεῖον, τό, ptenothalium, a deciduous thicket formation; ptenothalia, a series of such formations: ptenothalophyta, deciduous thicket plants; ptenothalophilus, dwelling in deciduous thickets.

7. meadow (pratum) — πόα, ἡ, grass, grassy place, meadow: ποεῖον, τό, poium, a meadow formation; poia, a series of meadow formations: poophyta, meadow plants; poophilus, meadow-loving.

Cfr. λειμών, ῶνος, ὁ, grassy place, meadow; πίσος, τό, πίσεα, τά, moist lands, meadows.

8. pasture (pascuum) — νομός, ὁ, νομή, ἡ, a pasture (not wooded), place for cattle to graze: νομεῖον, τό, nomium, a pasture formation; nomia, a series of pasture formations: nomophyta, pasture plants; nomophilus, dwelling in pastures.

Cfr. βοτάνη, ἡ, grass, fodder, pasture; φορβή, ἡ, pasture, food, forage.

9. culture, grain field (arvum) — ἀγρός, ὁ, a field, land: ἀγρεῖον, τό, agrium, a culture formation; agria, a series of culture formations: agrophyta, culture plants; agrophilus, dwelling in grain fields.

Cfr. γουνός, ὁ, cornland, fruitful land.

10. waste places (loca ruderata) — χλῆδος, ὁ, slime, mud, the dirt and rubbish carried down by a flood, rubbish swept out of a house: χληδεῖον, τό, chledium, a waste formation; chledia, a series of waste formations: chledophyta, waste plants; chledophilus, dwelling in waste places.

Xerophytia (ξηρός, ά, όν, dry, parched, φυτόν, τό, plant, -εῖον, place), dry plant formations.

1. desert (eremus) — ἐρημία, ἡ (ἔρημος), a solitude, desert, wilderness: ἐρημεῖον, τό, eremium, a desert formation; eremia, a series of desert formations: eremophyta, desert plants; eremophilus, desert-loving.
2. sandhills, sandy plain (campus sabulosus) — ἄμαθος, ἡ, sandy soil, sand of the plain: ἀμαθεῖον, τό, amathium, a sandhill or plain formation; amathia, a series of such formations: amathophyta, sand plain plants; amathophilus, dwelling on sandy plains or in sandhills.
3. prairie, plains (campus graminosus) — ψιλά, τά (ψιλός, ή, όν), bare, naked (of land), without trees: ψιλεῖον, τό, psilium, a prairie formation; psilia, a series of prairie formations; psilophyta, prairie plants; psilophilus, prairie-loving.
4. dry open woodland (nemus siccum) — ὑλώδης, ες, woody, wooded: ὑλωδεῖον, hylodium, a dry open woodland formation; hylodia, a series of such formations: hylodophyta, dry open woodland plants; hylodophilus, dwelling in dry open woodlands.
5. dry thicket (virgulta sicca) — λοχμώδης, ες, overgrown with copse, bushy: λοχμωδεῖον, τό, lochmodium, a dry thicket formation; lochmodia, a series of such formations: lochmodophyta, dry thicket plants; lochmodophilus, dwelling in dry thickets.
6. dry (upland) forest (silva sicca) — ξηρός, ά, όν, dry, parched, ὕλη, ἡ, forest; ξηρουλεῖον, τό, xerohylium, a dry forest formation;

xerohylia, a series of such formations: xerohylophyta, dry forest plants; xerohylophilus, dwelling in dry forests.

7. gravel slide (clivus glareosus) — χαλικώδης, ες, gravelly: χαλικωδεῖον, τό, chalicodium, a gravel slide formation; chalicodia, a series of such formations: chalicodophyta, gravel slide plants; chalicodophilus, dwelling in gravel slides.
8. sandbar (syrtis) — σύρτις, ιδος, ἡ, anything swept down by a river, hence a sandbar: συρτιδεῖον, τό, syrtidium, a dry sandbar formation; syrtidia, a series of such formations: syrtidophyta, dry sandbar plants; syrtidophilus, dwelling on dry sandbars.
9. sanddraw (alveus arenosus siccus) — ἔναυλος, ὁ, a hollow channel, water-course, torrent: ἐναυλεῖον, τό, enaulium, a sanddraw formation; enaulia, a series of sanddraw formations: enaulophyta, sanddraw plants; enaulophilus, dwelling in sanddraws.
10. blowout (puteus ventosus) — ἀνεμώδης, ες, windy: ἀνεμωδεῖον, τό, anemodium, a blowout formation; anemodia, a series of blowout formations; anemodophyta, blowout plants; anemodophilus, dwelling in blowouts.
11. strand (litus siccum) — ψάμαθος, ἡ, sand of the seashore: ψαμαθεῖον, τό, psamathium, a strand formation; psamathia, a series of strand formations: psamathophyta, strand plants; psamathophilus, strand-loving.
12. dune (tumulus litoralis arenosus) — θίς, θινός, ἡ (ὁ), a heap of sand on the beach, down, dune: θινεῖον, τό, thinium, a dune formation; thinia, a series of dune formations: thinophyta, dune plants; thinophilus, dune-loving.
13. bad lands (terra attrita) — ὕδωρ, ὕδατος, τό, ὑδρο-, water, especially rainwater, rain: τριβή, ἡ, grinding down, wearing away: ὑδροτριβεῖον, τό, hydrotribium, a bad land formation; hydrotribia, a series of bad land formations: hydrotribophyta, bad land plants; hydrotribophilus, dwelling in bad lands.
14. hill, ridge (collis) — λόφος, ὁ, neck, ridge, hill: λοφεῖον, τό, lophium, a hill (crest) formation; lophia, a series of hill formations: lophophyta, hill plants; lophophilus, hill-dwelling.

    Cfr. δειράς, άδος, ἡ, the ridge of a chain of hills.
15. cliff (scopulus) — κρημνός, ὁ, overhanging steep, bristling crag, cliff: κρημνεῖον, τό, cremnium, a cliff formation; cremnia, a series of cliff formations: cremnophyta, cliff plants; cremnophilus, cliff-dwelling.
16. rock field (campus saxosus) — φελλεύς, έως, ὁ, stony ground: φελλεῖον, τό, phellium, a rock field formation; phellia, a series of rock field formations: phellophyta, rock field plants; phellophilus, dwelling in rock fields.

17. boulder field (campus saxorum teretum) — πετρώδης, ες, abounding in boulders: πετρωδεῖον, τό, petrodium, a boulder field or ravine formation; petrodia, a series of such formations: petrodophyta, boulder field plants; petrodophilus, dwelling in boulder fields.
18. rock, stone (saxum) — πέτρος, ὁ, piece of rock, stone, boulder: πετρεῖον, τό, petrium, a rock formation; petria, a series of rock formations: petrophyta, rock plants; petrophilus, rock-dwelling.
19. wood (lignum) — ξύλον, τό, wood, firewood, timber: ξυλεῖον, τό, xylium, a wood formation (saprophytic, epiphytic); xylia, a series of such formations: xylophyta, wood plants; xylophilus, wood-loving.
20. salt marsh: cfr. Hydrophytia 6.
21. humus marsh (palus acida) — ὀξύς, sour, ἰλύς, ἡ, mud, slime: ὀξιλεῖον, τό, oxylium, a humus marsh formation; oxylia, a series of such marshes: oxylyphyta, humus plants; oxylyphilus, humus-loving.
22. alkali plain (campus alcalinus) — δριμύς, piercing, biting, pungent: δριμεῖον, drimium, an alkali plain or salt basin formation; drimia, a series of such formations: drimyphyta, salt plants; drimyphilus, salt-loving.
23. heath, dry meadow (campus ericaeus) — ξηρός, dry, πόα, ἡ, grass, herb: ξηροποεῖον, τό, xeropoium, a heath formation; xeropoia, a series of heath formations: xeropoophyta, heath plants; xeropoophilus, heath-loving.
24. moor (locus patens) — στερρός, (of countries) hard, stony, barren: στερρεῖον, τό, sterrhium, a moor formation; sterrhia, a series of moor formations: sterrhophyta, moor plants; sterrhophilus, moor-loving.
25. alpine stretches (campus alpinus) — κορυφή, ἡ, top, summit, peak of a mountain: κορυφεῖον, τό, coryphium, an alpine stretch formation; coryphia, a series of such formations: coryphophyta, alpine plants; coryphophilus, dwelling in alpine stretches.
26. polar barrens (campus arcticus) — κρυμός, ὁ, icy-cold, frost: κρυμεῖον, τό, crymium, a polar barrens formation; crymia, a series of such formations: crymophyta, polar barren plants; crymophilus, dwelling in polar barrens.
27. snow (nix) — χιών, όνος, ἡ, fallen snow: χιονεῖον, τό, chionium, a snow formation; chionia, a series of snow formations: chionophyta, snow plants; chionophilus, snow-loving.
28. wastes (ager vastus) — χέρσος, ἡ, dry land, dry barren waste, χέρσα, τά, waste places: χερσεῖον, τό, chersium, a dry waste

formation; chersia, a series of such formations: chersophyta, dry waste plants; chersophilus, dwelling in dry wastes.

II. Names of Groups of Formations, based upon physical factors.

1. Medium or stratum.

Geophytia (γῆ, ἡ, land; φυτεῖον, εἶα, τό, τά, plant formation), land plant formations; geophyta, land plants; geophilus, land-loving, terrestrial.

Hydrophytia (ὑδρο-, water-; φυτεῖον, plant formation), water plant formations; hydrophyta, water plants; hydrophilus, water-loving, aquatic.

2. Temperature.

Macrothermophytia (μακρός, great; θέρμη, heat; φυτεῖον, τό, formation), tropical plant formations; macrothermophyta, tropical plants; macrothermophilus, dwelling in the tropics.

Mesothermophytia (μέσος, middle), temperate plant formations; mesothermophyta, temperate plants; mesothermophilus, dwelling in the temperate zone.

Microthermophytia (μικρός, small, little, short), boreal plant formations; microthermophyta, boreal plants; microthermophilus, dwelling in boreal regions.

3. Water content.

Mesophytia, moist land plant formations; mesophyta, moist land plants; mesophilus, dwelling in moist land.

Xerophytia, dry land plant formations; xerophyta, dry land plants; xerophilus, dwelling in dry land.

Hydrophytia, wet land or water plant formations; hydrophyta, wet land or water plants; hydrophilus, dwelling in wet land or water.

4. Light.

Heliophytia (ἥλιος, ὁ, the sun), sun plant formations; heliophyta, sun plants; heliophilus, dwelling in the sunshine.

Sciophytia (σκιά, ἡ, shade), shade plant formations; sciophyta, shade plants; sciophilus, dwelling in the shade.

Scotophytia (σκότος, ὁ, darkness), darkness plant formations; scotophyta, darkness plants; scotophilus, dwelling in darkness.

5. Soil.

Eurotophytia (εὐρώς, ῶτος, ὁ, mould, dank decay), leafmould plant formations; eurotophyta, leafmould plants; eurotophilus, dwelling in leafmould.

Oxygeophytia (ὀξύς, sour), humus plant formations; oxygeophyta, humus plants; oxygeophilus, dwelling in humus.

Melangeophytia (μελαγγῆ, ἡ, black earth), loam or alluvium plant formations; melangeophyta, loam plants; melangeophilus, dwelling in loam.

Spiladophytia (σπιλάς, άδος, ἡ, clay), clay plant formations; spiladophyta, clay plants; spiladophilus, dwelling in clay.

Psammophytia (ψάμμος, ἡ, sand), sand (sandstone) plant formations; psammophyta, sand plants; psammophilus, sand-loving.

Chalicophytia (χάλιξ, ικος, ὁ, ἡ, pebble, gravel), gravel plant formations; chalicophyta, gravel plants; chalicophilus, dwelling in gravel.

Lithophytia (λίθος, ὁ, stone), rock plant formations; lithophyta, rock plants; lithophilus, rock-dwelling.

Gypsophytia (γύψος, ἡ, chalk), limestone plant formations; gypsophyta, limestone plants; gypsophilus, dwelling on limestone.

Halophytia (ἅλς, ἁλός, ἡ, salt), salt plant formations; halophyta, salt plants; halophilus, salt-loving.

Hydrophytia, water plant formations, etc.

Histophytia (ἱστός, ὁ, tissue, web), parasitic formations; histophyta, parasites; histophilus, parasitic.

Sathrophytia (σαθρός, putrid), saprophytic formations; sathrophyta, plants of putrid matter; sathrophilus, saprophytic.

6. Physiography (elevation).

Bathyphytia (βαθύς, deep, low), lowland plant formations; bathyphyta, lowland plants; bathyphilus, dwelling in lowlands.

Mesochthonophytia (χθών, ονός, ἡ, earth, land), midland plant formations; mesochthonophyta, midland plants; mesochthonophilus, dwelling in midlands.

Pediophytia (πεδίον, τό, plain), upland plant formations; pediophyta, upland plants; pediophilus, dwelling in uplands.

Pagophytia (πάγος, ὁ, rocky hill), foothill plant formations; pagophyta, foothils plants; pagophilus, dwelling in foothills.

Orophytia (ὄρος, τό, mountain), subalpine plant formations; orophyta, subalpine plants; orophilus, dwelling in the subalpine region.

Acrophytia (ἄκρον, τό, highest point, peak), alpine plant formations; acrophyta, alpine plants; acrophilus, dwelling in the alpine region.

Chionophytia (χιών, όνος, ἡ, snow), niveal plant formations; chionophyta, niveal plants; chionophilus, snow-loving.

7. Biological character.

Hylophytia, hylophyta, poophytia, eremophytia, etc., under Names of Formations.

8. Association.
   Pycnophytia (πυκνός, thick, close), closed formations.
   Sporadophytia (σποράς, άδος, ὁ, ἡ, scattered), open formations.
9. Development.
   Proodophytia (πρόοδος, ἡ, advance, pioneer), initial formations.
   Ptenophytia (πτηνός, winged, passing), intermediate formations.
   Aiphytia (ἀεί, ever, permanent), stable (ultimate) formations.

III. Phytogeographical Divisions of North America.

Hemisphaera septentrionalis — Northern hemisphere.
  Zona polari-nivalis — Polar-niveal zone.
  Zona arctico-alpina — Arctic-alpine zone.
    Provincia arctica — Arctic province.
    Provincia alpina — Alpine province.
  Zona boreali-subalpina — Boreal-subalpine zone.
    Provincia alaskana — Alaska province.
    Provincia cordillerana — Cordilleran or Mountain province.
    Provincia ontariensis — Ontario province.
  Zona temperata — Temperate zone.
    Provincia atlantica — Atlantic province.
    Provincia appalachiana — Appalachian province.
    Provincia nebraskensis — Nebraska province.
      Regio missouriensis — Missouri or Prairie region.
        Districtus elkhornensis — Elkhorn district.
        Districtus plattensis — Platte district.
        Districtus nemahaensis — Nemaha district.
      Regio arikareensis — Arikaree or Sandhill region.
        Districtus niobrarensis — Niobrara district.
        Districtus loupensis — Loup district.
        Districtus republicanus — Republican district.
    Provincia utahensis — Utah province.
      Regio nevadana — Nevada region.
      Regio mohavensis — Mohave region.
    Provincia litoralis — Coast province.
      Regio columbiana — Columbia region.
      Regio californica — California region.
    Provincia pacifica — Pacific province.
  Zona subtropicalis — Subtropical zone.
    Provincia floridana — Florida province.
    Provincia mexicana — Mexico province.
  Zona tropicalis — Tropical zone.
    Provincia antilleana — Antilles province.
    Provincia andeana — Andean province.

IV. Names of Particular Formations (Types), illustrating the construction of formational polynomials.

Phragmites-Scirpus-Typha-helium — The reedgrass-rush swamp formation.
Phragmitetum, scirpetum, typhetum, the area or patch characterised or controlled by Phragmites, Scirpus, or Typha.

Primula-Polemonium-Oxyria-phellium — The primrose rock cleft formation.
Primuletum, polemonietum, oxyrietum.

Betula-Salix-helolochmium — The birch-willow meadow thicket formation.
Betuletum, salicetum.

Paronychia-Silene-chalicodium — The mat gravel slide formation.
Paronychietum, silenetum, arenarietum.

Carex-Sieversia-Polygonum-coryphium — The sedge-smartweed alpine meadow formation.
Caricetum, sieversietum, polygonetum.

Quercus-Ulmus-Juglans-hylium — The buroak-elm-walnut forest formation.

Populus tremuloides-hylium — The aspen forest formation.

Sporobolus-Koeleria-Festuca-Andropogon-psilium — The prairiegrass prairie formation.

Potamogeton-Sparganium-Utricularia-limnium — The alpine lake formation.

Deschampsia-Poa-Agrostis-poium — The bluegrass-redtop meadow formation.

V. Names of Vegetation Forms and Habitat Forms.

Vegetation forms[1]).

I. Lignosae (sc. plantae) — Woody plants.
- Arbores — Trees.
- Frutices — Shrubs.
- Suffrutices — Undershrubs.
  - Dumi — Bushes.
  - Subdumi — Dwarf shrubs.
- Scandentes — Climbers and Twiners.

II. Fruticuli — Half Shrubs.

III. Herbae — Herbs.
- Pleiocyclicae (sc. herbae) — Pleiocyclic Herbs.
- Hapaxanthae — Hapaxanthous Herbs.
  - Rosulae — Rosettes.
  - Mattae — Mats.
  - Succulentes — Succulents.
  - Serpentes et Scandentes — Creepers and Climbers.

1) Pound and Clements, Phytogeography of Nebraska I. 2. ed. 9, 95, 1900

Caespites — Turf-builders.
Gramina caesposa — Sod-formers.
Gramina fasciata — Bunch grasses.
Rhizomata — Rhizome plants.
Rhizomaticae (sc. plantae) — Rootstalk Plants.
Tuberoides — Bulb and Tuber Plants.
Dicyclicae (sc. plantae) — Dicyclic Herbs.
Monocyclicae — Monocyclic Herbs.
V. Aquaticae (sc. plantae) — Aquatic Plants.
Fluitantes — Floating Plants.
Submersae — Submerged Plants.
Amphibiae — Amphibious Plants.
VI. Hysterophyta — Hysterophytes.
Saprophyta — Saprophytes.
Parasiticae (sc. plantae) — Parasitic Plants.
VII. Thallophyta — Thallophytes.
Musci — Mosses.
Hepaticae — Liverworts.
Lichenes — Lichens.
Foliacei (sc. lichenes); Fruticulosi; Crustacei.
Fungi — Fungi.
Geophili (sc. fungi); Xylophili; Biophili; Sathrophili; Hydrophili; Entomophili.
Algae — Algae.
Filamentosae (sc. algae); Coenobioideae.

Habitat forms.

(Formed by adding the suffix -κόλος, (-κολέω), dweller, dwelling in (cfr. L. -cola) to the Greek name of the habitat[1]).

A habitat form is the modified form of a species common to two or more formations produced by a particular formation, i. e., habitat, such as the alpine meadow habitat form of *Campanula rotundifolia*, the forest habitat form of *Galium boreale*, the gravel slide habitat form of *Dasyphora fruticosa*, etc.

Habitat forms are then to be indicated by trinomials, as *Campanula rotundifolia coryphocolus*, *Galium boreale hylocolum*, *Dasyphora fruticosa chalicodocolus*, *Aster levis lochmocolus*, *Synthyris plantaginea phellocolus*, etc.

Hylocolus (ὕλη, forest, -κόλος, dweller, dwelling in), alsocolus, dendrocolus, ancocolus, orgadocolus, lochmocolus, poocolus, nomocolus, agrocolus, chledocolus; eremocolus, amathocolus, psilocolus, etc. etc. Construed as adjectives of two terminations, *-us*, m. and f., *-um* n.

1) As before, the Greek stem is preferred for brevity to the name of the formation, terminating in -εῖον

VI. Names of Accessory Biological Characters[1]).

Periodus anthesis — Period of flowering.

Aspectus — Aspect: Prevernalis, Vernalis, Aestivalis, Autumnalis.

Aianthae (sc. plantae), Hemeranthae, Nyctanthae, Ephemerales.

Fructificatio — Seed-production.

Polyanthae (sc. plantae), Polyspermatiae.

Disseminatio — Dissemination.

Anemosporae, Hydrosporae, Zoidiosporae, Chalicosporae.

Pollinatio — Pollination: See Knuth, Handbuch der Blütenbiologie. 33. The terms given here are uniformly from Greek and should end in *-ia*. To these should be added Allautogamia (Autallogamia), as one or the other method of pollination is normal, the other unusual, Nothogamia (νόθος, ὁ, hybrid), hybridisation, and Mychogamia (μυχός, ὁ, inmost part), opposed to Herkogamia. See also p. 76 and 82.

VII. General and Floristic Terms[2]).

Phytogeographia — Phytogeography.

Ecologia — Ecology.

Floristicia — Floristic.

Flora — Flora.

Statisticia — Statistics.

Elementum florae — Floral element.

Elementum endemicum, derivatum, adventicium.

Elementum vegetationis — Vegetation element.

Distributio geographica — Geographical distribution.

Area geographica — Geographical area.

Area transitionis — Transition area.

Limitatio regionalis — Regional limitation.

Diversitas floralis — Floral contrast.

Diversitas formationalis — Formational contrast.

Flora propria — Proper flora.

Flora exclusa — Excluded flora.

Frequentia — Frequence.

Index frequentiae; frequens, subfrequens, infrequens, rara.

Abundantia — Abundance.

Index abundantiae; quadratum; sociales exclusivae (plantae), sociales inclusivae, gregariae, subgregariae, vixgregariae, copiosae, subcopiosae, sparsae, solitariae, gregario-copiosae, etc.

1) Pound and Clements, Phytogeography of Nebraska I. 2 ed. 124, 1900.

2) —— ——, ibidem, 49.

Zona vegetationis — Vegetation zone.
Provincia — Province.
Regio — Region.
Districtus — District.
Statio — Station.
Vegetatio — Vegetation.
Tegmen vegetale — Vegetative covering, floral covering.
Dominium (regnum) — Domain (Hylophytic, Poophytic, Eremophytic).
Series — Series (Hydrophytic, Mesophytic, Xerophytic).
Formatio — Formation.
Typus — Type.
Facies — Facies.
Zonula — Formational zone.
Stratum — Layer.
Aspectus — Aspect.
Area — Patch (-etum).
Species principalis — Principal species.
Species secondaria — Secondary species.
Symmetria topographica — Topographical symmetry.
Radialis-bilateralis-unilateralis.
Asymmetria topographica — Topographical asymmetry.
Associatio — Association.
Coordinatio — Coordination.
Subordinatio — Subordination.
Zonatio — Zonation.
Zonatio radialis — Radial zonation.
Zonatio bilateralis — Bilateral zonation.
Zonatio unilateralis — Unilateral zonation.
Azonatio — Azonation.
Successio — Succession [1]).
Alternatio — Alternation [1]).
Stabilisatio — Stabilisation.
Migratio — Migration.
Invasio — Invasion.
Proximitas — Proximity.
Adaptabilitas — Adaptability.
Obstructio — Obstruction.
Obex — Barrier.
Conductio — Conduction.
Distributio — Distribution.
Pressus — Pressure (forward pressure, tension).

1) Thornber, J. J., The Prairiegrass Formation in Region I. Rep. Bot. Surv. Nebr. 5 : 55. 1901.

Centrum vegetationis — Vegetation centre.
Lineamentum — Line of stress.

VIII. Terms for Physical Factors and Instruments [1]).

Temperatura — Temperature: thermotropismus, thermotaxis, etc. [2]).
Maximum, minimum, optimum, pessimum, isophytotonus: thermometrum, thermometer.
Lux — Light: phototropismus, phototaxis, etc.
Intensitas, duratio, qualitas, directio: photometrum, photometer.
Aqua soli — Water content: hydrotropismus, hydrotaxis, etc.
Physica, physiologica: geotome — geotome.
Solum — Soil: chemotropismus, chemotaxis, etc.
Textura, pressura, porositas, capillaritas: rhoptometrum (ῥοπτόν, τό, what is absorbed), rhoptometer; atmometrum (ἀτμός, ὁ, vapor), atmometer.
Atmosphaera — Atmosphere.
Humiditas (psychrometrum), aura (anemometrum, index ventorum), pressura (barometrum), compositio, praecipitatio (ombrometrum).
Physiographia — Physiography.
Altitudo (barometrum), exposura, clivus (clinometrum), superficies: acus magnetica, compass.
Gravitas — gravity: geotropismus, geotaxis, etc.

Flahault has rightly insisted that his propositions with regard to nomenclature are to be regarded as suggestions only, and that for such a work the collaboration of botanists of all nationalities is necessary. This must be true of all proposed systems at present. We are merely on the threshold of the development of phytogeography. Some of its aspects, such as the phylogeny of vegetation, and experimental field ecology, have scarcely been touched, while its very foundation, the exact investigation of its physical basis, the habitat, is yet to be laid. Until the latter is done, the limitation of many formations will be uncertain, if not impossible, and the application of formational terms more or less inexact. Phytogeographers should hold themselves fortunate, however, that the nomenclature discussion has arisen so early, before hard and fast lines have been drawn, and before names and terms have become fixed in the minds of botanists. Warburg has well said that the time is especially favorable for this work — more favorable indeed than it ever can be again. The feeling for a thorough and scholarly system of nomenclature is growing. It is all important to take advantage of this fact before phytogeography becomes encumbered with a nomenclature that has »jest growed«.

1) Pound and Clements l. c. 161.
2) Davenport, C. B., Experimental Morphology, 1897.