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**Botany.** — “*Contribution N<sup>o</sup>. 1 to the knowledge of the Flora of Java.*” By Dr. S. H. KOORDERS. (Continuation <sup>1</sup>).

(Communicated in the meeting of March 28, 1908).

§ 3. On the geographical distribution, oecological conditions and means of dissemination of the Aceraceae, growing wild in the highest mountain regions of Java.

§§ 1. Synonyms and geographical distribution.

This order, which in BENTHAM and HOOKER'S *Genera Plantarum* and in BOERLAGE *Handleid. Flora N. I.* forms part of the *Supindaceae*, consists of two genera; only one of these (*Acer*, LINN.) occurs wild in Java. Of the genus *Acer* about 50 species are known; only one of these (*Acer niveum* BL.) belongs to the flora of Java, and has frequently been found there, growing wild in the higher mountain regions (up to 2550 m. above sealevel).

Some authors, e. g. PAX l. c., distinguish two varieties in Java, which were regarded by BLUME as species *Acer niveum* BL. *genuinum* PAX and *A. niveum* var. *cassiaefolia* (BL.) PAX. According to PAX l. c. the former of these has broad elliptical or ovate leaves with rounded base and a snowy white under surface, the latter oblong leaves with an acute base and a blue-grey under surface. The type is represented at Buitenzorg in Herb. Kds. by specimens from the G. Gedé (Herb. Kds. 12645 β) and the variety by specimens from Takóka (Herb. Kds. 7251 β). By far the greater number of specimens (e. g. many from the Gedé), however belong to neither of these two forms, as they combine various properties in a number of ways. We therefore consider the two varieties to be merely the extreme forms of one and the same, more or less varying <sup>2</sup>) type. Some specimens in Herb. Kds., should further be noted, in which the under surface of the leaf (in the dried state) appears to be green, e. g. Kds. 7265 β from the G. Slammat; by this character and also by the incipient serration of the leaf margin, these specimens approach to *A. laevigata* WALL. Kds. 7267 β from Pringombo should also be considered; the leaves, which, in the living state are pale blue-grey cannot be distinguished from those of *A. oblongum*. The colour of

<sup>1</sup>) Continued from *These Proc.*, Febr. 29<sup>th</sup> 1908 p. 687.

<sup>2</sup>) In his last monograph of the *Aceraceae* PAX l. c. (1902) 31 also, however, already says, that the variety *cassiaefolium* (BL.) PAX, which he formerly separated off, scarcely differs from the type.

dried specimens in general, and of this species in particular, depends according to KOORDERS and VALETON Bijdr. Booms. Java IX (1903) p. 256), very largely on the manner and rate of drying of the herbarium.

*Acer niveum* BL. Rumphia III (1847) 193 t. 167 B. f. 1; HUERN in Hook. Fl. Br. Ind. I, 693; PAX Monogr. d. Gattung Acer in ENGL. Botani. Jahrb. VII, 207; PAX in ENGLER Pflanzenreich Heft 8 IV, 163 (1902) 31; KOORD. et VALETON l.c. 254; — *A. laurinum* HASSK. in Tijdschr. v. Nat. Gesch. en Physiol. X (1843) 138 (nomen tantum); MIQ. Fl. Ind. Bat. I, 2 (1859) 582; — *A. javanicum* JUNGH. in Tijdschr. Nat. Gesch. en Physiol. VIII (1841) 391 (nomen tantum); — *A. cassiaefolium* BL. l. c. f. 2.

Geographical distribution outside Java: India or.: "Assam, hills of Martaban and Tenasserim" (BRANDIS, Indian Trees, 181). "Assam and Burma" (according to PAX l.c.) Malay Archipelago: Sumatra (JUNGH. in Herb. Lugd. Bat.); in N. E. Celebes in the Minalasa on the Lolomboelang mountains (Herb. Kds in Mus. H. Hort. Bogor; comp. KOORD. Verslag botan. reis N. O. Celebes (1898) p. 409). Has also been collected in Celebes by WARBURG (comp. PAX l.c. 31).

Geographical distribution and oecological conditions in Java: Has been collected, according to Herb. Kds, in Western and Central Java, and also in Eastern Java, at an altitude of 700—2550 m. at the following points. Hitherto (according to Herb. Kds.) it has been found in the following places in Java: In the res. Bantën on the G. Karang at 1000 m. above Tjimanoeck, and on the G. Poelasari at 1050 m. near bivouac Kihoejian (both in the division Pandeglang). In the res. Preanger: 1) on the G. Gedé near and above Tjibodas at 1450 m., 1600 m., etc. and also at 2200 m. above sea level; 2) near Takoka at 1200 m. the Djampang; 3) near Pangentjongan in the Galoenggoeng (in the div. Limbangan at 1250 m., 1400 m., and at 1800 m. above sea level); 4) near Tjigenteng in the Kendeng-Patoeha mountains at 1450 m. and 1600 m. above sea level. In the res. Tegal-Pökalongan on the G. Slammat above Simpar at 1400 m. and above Soerdjã on the N.-W. Prahoe at 1400 m. In the res. Këdoe at 2200 m. on the G. Këmbang above Bëdaka and at 2500 m. on the highest summit of the Prahoe-Diëng mountains. In the res. Banjoemas on the Midangan mountains near Pringãmbã 800 m. above sea level In the res. Sëmarang on

the G. Oengaran and the G. Telmājā at about 1400 m., e.g. above Sēpa-koeng In the res. Madioen on the Wilis-mountains above Ngèbèl between 1400 m. and 2000 m. (not collected there at a greater height). In the res. Prābālingā-Pasaroehan on the Tēngger-mountains at 2000 m. near Ngadisari. In de res. Bēsoeki on the Idjenplateau near bivouac Oengoe-p-oengoe-p at 1700 m. Up to the present this species is therefore known from the res. Bantěn (in Western-Java) to the res. Bēsoeki (in Eastern-Java) from 700 m. to 2550 m. above sealevel. — Occurrence: Does not grow socially in Java, but occurs fairly plentifully in some mountain forests e.g. in Western-Java on the G. Gédé. Oecological conditions: This species has not yet been observed by me in Java on soils, where there is a great, permanent dearth of water nor where there is physiological drought resulting from a large saline content, nor on soils rich in lime and common salt; neither does the species grow on soils which are periodically liable to strong desiccation. It grows almost exclusively on permanently damp, fertile, volcanic soils, rich in humus, in close shady mountain forests of high trees and consisting of a great number of species. In the hot plain, even in permanently humid districts, the species does not occur. The lowest station is in a ravine in Eastern-Java at about 700 m., the highest is at nearly 2550 m. above sealevel in Central-Java. I feel obliged to consider the possibility of the occasional, be it very exceptional, occurrence of *Acer niveum* in physiologically dry, saline soils, in consequence of a herbarium note of JUNGHUHN, found by me in 's Rijks Herbarium, and referring to a specimen, collected by this naturalist on the Diēng-plateau at about 2000 m. near the Kawah-Tjondro-dimoeko. I have here as yet no other data at my disposal, which would show with certainty, whether this species does not only occur in Java "near", but also "on" such soils. — Leaf-fall: At the same moment there stood in the same locality (in the same forest, in close proximity to each other) two individuals of apparently the same age. On the 2<sup>nd</sup> of June 1898 one of these was in full (old) leaf, while the adjoining specimen was practically without leaves, except one branch which bore young foliage. On March 23<sup>d</sup> 1893, near Takóka, one of the trees (of this species), which had been numbered for the purpose of the investigation, was completely without leaves, although it stood in the midst of tree species, which were then nearly all in full foliage. — Time of flowering and fruiting: Flowers were collected in June and in July, August, Sept. and Nov. — Habitus: A forest giant, which immediately reveals its presence, even in the thickest virgin forest,

by its fallen leaves on the ground, and sometimes by its characteristic winged fruits; the leaves are noticeable on account of the colour of their lower surface, which remains greyish white for a fairly long time. This greyish white or bluish grey colour is also rather striking in the living plant. In the flowering period this giant of the forest further attracts attention by its almost leafless condition in the midst of evergreen trees. In alpine regions, at 2000 m. above sealevel, in Western and Central-Java, (e.g. Preanger, Bagèlen), this species stands out by its dimensions, which are rather considerable for a high altitude; so, for instance, at 2200 m. sealevel, on the G. Kembang near Bédaka, a specimen was 20 m. high, with a trunk  $\frac{1}{2}$  m. in diam. The above data about Java, relating to oecological conditions and geographical distribution, have been taken from observations, made by me in Java 1888—1903, and mostly published in KOORDERS and VALETON l.c. 257—258. — In the National Herbaria at Leiden and at Utrecht I found with the specimens, collected in Java by JUNGHUHN, BLUME, REINWARDT, etc., and now examined by me, no special data about oecological conditions: in most cases there was only written on the labels "Java" without further indications.

#### §§ 2. Means of dissemination.

The only means of dissemination is the fruit, known as *samara*, which is primarily intended for distribution by wind, but which seems, in addition, to have a certain capacity for being transported by water, according to an experiment of mine. At least, if the fruits are quite dry, they remain floating for some days on a  $3\frac{1}{2}$  % solution of common salt. In this species the fruits are produced in Java, as far as is known, only once a year, but then mostly in great numbers. Although the winged fruits are fairly heavy (when dry they weigh about 100 milligrams, the wings, which are often 5 cm. long and 2 cm. broad, being included), and although I never found in Java any indication, that the fruits are distributed by animals, distribution must nevertheless take place easily, as is proved by the large number of localities, cited above, where the tree is found. As the occurrence of the species is limited to the higher regions of several active volcanoes, at places which are more than 40 kilometres apart, and which are separated by hot plains, in which the species has never been found wild in Java at the present time, it would appear, that the force of the wind on the higher mountains of Java is sufficient for transport over a distance of 40 kilometres, even of such large samarae as those of *Acer niveum*.

I think it however more probable, that in the case of this species, as in that of the next one, (*Dodonaea viscosa*) such large winged fruits have been and are still, only transported in stages. It may have been, that in former times other climatological conditions enabled these two species to grow wild in the 30—40 kilometres of intervening low lands, in such places where growth can no longer take place at the present time. It may also be that even under the present conditions of climate, isolated specimens have escaped notice and might be found between the two places so far apart. Finally we may suggest, that transport by wind does not primarily take place through the air direct, but chiefly in stages, in such a way, that the fruits remain for a longer or shorter time on the ground, or floating on the surface of water; in the latter case of course, till they are washed ashore and are then carried further by the wind.

The original occurrence across the sea of this *Acer* growing wild in Java and provided with fruits, which are apparently only adapted for wind transport, may, it seems to me, be readily explained by a combination of wind transport in stages with transport by water, but not exclusively by so called direct wind transport. This explanation possibly also applies to other species, growing in Java and belonging to other genera or orders, with physiologically similar fruits or seeds, which have hitherto only been regarded as anemophilous.

It should further be noted, that this species only bears fruit at an advanced age, when the crown has already attained a considerable height. This character is perhaps useful, since the tree generally occurs scattered in dense ever-green heterogeneous mountain forests, composed of high trees. For this species, which is obviously in the main dependent on wind distribution, the above-mentioned character is probably connected with the oecological conditions determining the original occurrence of the tree, and the character referred to, has arisen through natural selection. For in the damp Javanese mountain forests, which are generally very dense, only those species have a good chance of being disseminated by the wind, whose fruiting branches protrude above the dense leaf covering, formed by the crowns of the surrounding trees.

In connexion with the obvious relation between the conditions of growth, the fruiting period and the means of dissemination of *Acer niveum*, we may quote what has been said by VÖGLER<sup>1)</sup> on a similar

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1) VÖGLER, P., Ueber die Verbreitungsmittel der Schweizerischen Alpenpflanzen in Flora oder allg. botan. Zeitung 89 (1901) p. 2.

relation in the case of other species likewise having large winged fruits, such as those of *Acer*.

“... Derartige Arbeiten erhielten einen viel grösseren Werth, wenn sie einem Zusammenhang oder auch nur Parallellismus zwischen den ähnlichen Verbreitungsmitteln und anderen durchgehenden biologischen Verhältnissen der betreffenden Arten nachgingen. Eine ganz kleine Untersuchung dieser Art bietet LUBBOCK<sup>1)</sup> in dem er nachweist, dass von 30 Gattungen, ““figured as having seeds or fruits with a long wing, known as a *Samara*””, alle zu den Bäumen oder Klettersträuchern gehören, keine einzige zu den niedrigen Kräutern” (VOGLER l.c.).

§ 4. On the geographical distribution, oecological conditions and means of dissemination of the Sapindaceae, growing wild in the highest mountain regions of Java.

The *Sapindaceae*, as defined by RADLKOFER in ENGLER and PRANTL's, *Natürliche Pflanzenfamilien*, consist of about 73 genera with over 600 species. Of these only a single species occurs in Java, growing wild in the highest mountain regions, namely *Dodonaea viscosa* (LINN) JACQ.

#### §§ 1. Synonyms.

*Dodonaea viscosa* (LINN.) JACQ. Enum. Pl. Carib. 19, non SIEBER, non Mart.; HIERN. in Hook. Fl. Br. Ind. I, 697; KURZ For. Flora I, 287; BRANDIS Indian trees (1906) 186; HASSK. Pl. Jav. var. 292; KOORD. en VALETON Bijdr. Booms. Java IX (1903) 226; — *D. angustifolia* BLANCO Fl. Filip. ed. I, 312; — *D. angustifolia* LINN. f. Suppl. 218; — *D. Burmanniana* DC. Prod. I, 616; — *D. Candollei* BL. ! msc. in Herb. Lugd. Bat. = *D. Candoleana* BLUME ! Rumphia III, 190; — *D. dioica* ROXB. Hort. Beng. (28); Fl. Ind. II, 256; — *D. Dombeyana* BL. ! in Rumphia III, 189; — *D. ferrea* JUNGH. ! msc. forma 1, 2 et 3 in Herb. Lugd. Bat.; — *D. jamaicensis* DC. Rod. I, 616; — *D. Kingii* G. DON, Syst. I, 674; — *D. latifolia* SALIB. Prod. 276; — *D. microcarpu* DC. Prod. I, 617; — *D. montana et littoralis* JUNGH. in Java I, ed. II 267; — *D. nerifolia* A. CUNN. ex A. GRAY Bot. U. St. Expl. Exped. I. 262; — *D. oblongifolia* LINK. Enum. Hort. Berol. I, 381; et in Bot. Reg. t. 1051; — *D. ovata* DUM.-COURS. Bot. Cult. ed. II, 7, p. 327; — *D. pallida* MIQ. ! Anal. Bot. Ind. III, 7; — *D. pen-*

<sup>1)</sup> LUBBOCK, Flowers, fruits and leaves London (1886) p. 79 (quoted by VOGLER l.c.).

*tandra* GRIFF. Notul. IV, 548; — *D. salicifolia* DC. Prod. I, 617; — *D. Schiedeana* SCHLECHT. in Linnaea XVIII (1844) 33 (err. typ. 49); — *D. senegalensis* BLUME<sup>1</sup> nosc. in Herb. Lugd. Bat.; — *D. spatulata* SM. in REES Cycl. XII n. z.; — *D. triquetra* JUNGH. in Natuurk. en Geneesk. Arch. Neêrl. Indië II (1845) 36; non ANDR.; — *D. viscosa* ROYEN ex BLUME<sup>1</sup>, Rumphia III, 191, — *D. Wightiana* BLUME in Rumphia III, 189; — *D. Waitziana* BLUME<sup>1</sup> l. i.; — *D. Zollingeri* TURCZ in Bull. Soc. Nat. Mosc. XXXVI (1863) I, p. 587; — *Caryophyllanthus littoreus* RUMPHIUS Herb. Amb. IV, t. 50; — *Ptelea viscosa* LINN. Spec. ed. I, 108.

For the very numerous synonyms of this polymorphic species, which has extremely wide vertical and horizontal distribution, I have chiefly relied on the most recent literature as regards these species, which occur outside the Dutch East Indies, but have checked them as far as possible by the very rich material in the National Herbaria at Leiden and at Utrecht. The Dutch East-Indian synonyms are chiefly based on my own examination of the above collections, and on KOORDERS and VALETON Bijdr. Booms. IX l. c. From various facts it appears that this tree (at least the littoral form) was already known to RUMPHIUS, and that it has been described as separate species by a large number of authors under more than 25 different specific names.

According to an unpublished note of REINWARDT, found by me with a herbarium specimen collected on the sandy beach of Ternate, this observer has the credit of having already realized, that the coast and the mountain forms of the specimens of *Dodonaea viscosa* from Malay Archipelago belong to one and the same species.

## §§ 2. Geographical distribution and oecological conditions of *Dodonaea viscosa* outside Java.

According to the literature (e. g. RADLKOFFER) and the herbaria consulted by me at Leiden and at Utrecht, *Dodonaea viscosa* is generally distributed in tropical and subtropical regions of the whole world, and is known outside Java from sandy sea shores as well as from inland localities up to an altitude of 1400 meters. BRANDIS [Indian Trees (1906) 187] states: "Trans Indus, Afghanistan and Beluchistan. Common locally, often covering extensive tracts in the drier regions of North-West and Central India as well in the Deccan. Also on the seacoast" (BRANDIS l. c.). In the National Herbarium at Leiden I saw an authentic herbarium specimen of *Dodonaea arabica*



HOCHST and STEUD. According to the attached label, this specimen was collected on Dec. 8<sup>th</sup>, 1835 by W. SCHIMPER (the father of the phytogeographer F. W. SCHIMPER) at 4000 feet (1330 meters) above sea level on the summit of the mountain Kara in Hedschas (Arabia). According to HOOKER Flora Brit. India l.c. this specimen is identical with the widely distributed *Dodonaea viscosa* (L.) JACQ. HOOKER'S view is undoubtedly correct. It seems to me that the occurrence of the littoral *D. viscosa* (L.) JACQ. on the above-mentioned mountain can easily be explained, by assuming that the locality, where SCHIMPER collected his *Dodonaea*, was extremely poor in water. In 's Rijks Herbarium at Leiden I also saw a specimen of *Dodonaea viscosa* L. (det. P. HENNINGS) from Herb. SCHLAGINTWEIT N<sup>o</sup>. 80846, which was collected in the Panjab in North-West India between November 15<sup>th</sup> to 28<sup>th</sup>, 1855 at 650—850 meters above sea-level, and finally a specimen from Herb. FIEBRIG N<sup>o</sup>. 2501, correctly named *Dodonaea viscosa*, which was collected in 1903—1904 in Eastern Bolivia (South America) at a height of 1400 meters. As proved by a herbarium specimen from British India, due to HOOKER and THOMSON, and seen by me in Rijks Herb. at Leiden, *Dodonaea Burmanniana* D. C. which is synonymous with *D. viscosa*, grows there at a height of 0—600 meters above the sea. In 's Rijks Herbarium at Leiden I further saw a herbarium specimen, which according to the label, had been collected in 1841 by FORSTEN "on extensive beds of lava" in Ternate (Spice Islands); this specimen had been determined by BLUME as *Dodonaea Candollei* Bl. var. *minor* BLUME. In my opinion there is no doubt, that this is merely a form (from an arid locality) of the ordinary *Dodonaea viscosa* (L.) JACQ.

§§ 3. Geographical distribution and oecological conditions of *Dodonaea viscosa* in Java.

The following data regarding the vertical and horizontal distribution, and the oecological condition, of *Dodonaea viscosa* (LINN.) JACQ. which, in part have already been published in KOORDERS and VALETON l. c., can now be communicated; they are based on observations made by myself in Java 1885—1906, and on herbarium specimens collected by me.

In Western and Central Java, as well as in Eastern Java on sandy sea-shores, further in Central and in Eastern Java at 1450 m. above sea-level and higher, especially above 1800 m. and still at 2600 m. According to Herb. Kds. it has been collected in Java in the following localities: In Western Java: near Tjemara in S. W.

Banten, growing on the flat sandy beach. In the Southern Preanger near Palaboehanratoc, also on the sandy beach. In Central Java: on the G. Prahoe at 2000 m. on the Prahoe-Diëng mountains along the path from Soerdjâ to the Diëng plateau in the res. Tegal-Pekalongan. Near Sepakoeng (res. Semarang) on the G. Telemâjâ at about 1700 m. and also in the res. Semarang on the G. Merbaboeh above Andongtjemoro at about 1600 m. In the res. Kedoe on the G. Sendârâ near Kledoeng at about 1600 m. In the res. Madioen on the G. Wilis above Ngëbël at 1450 m. and higher up the mountain to 2000 m. In the res. Pasoeroehan-Probolinggo on the G. Ardjoenâ above Malang at about 2100 m. and on the Tënggèr mountains above Tosari and Ngadisari still at 2600 m. above sea-level. In the res. Besoeki on the Idjen plateau near the bivouac Oengoepe-oengoepe at 1700 m. and on the Kendëng ridge above Pantjoer at 1700 m.; also on the sandy beach of Gradjagan and on the sandy beach of Poeger (on the South coast of the divisions Banjoewangi and Djember respectively). Completely absent from the regions between the above alpine stations and those in the beach. On the other hand where this *Dodonaea* (*D. viscosa*) appears, it generally either grows socially forming smaller or larger woods, or it occurs at least in very large numbers. — **Oecological conditions.** It is completely restricted (at least when growing wild) to physiologically dry localities, namely either to the dry alpine regions of Central and Eastern Java above 1400 m. or on to the sea-beach, which is physiologically dry in consequence of its richness in salts. On the beach this species has been observed by me in W., as well as in Eastern Java. (Compare also under "Means of dissemination", and further K. & V. l. c. 229.

§§ 4. Means of dissemination of  
*Dodonaea viscosa*.

The inflated, thin-walled, light, winged fruits are not only eminently adapted for wind distribution, but (as has already been mentioned by some authors, and has been confirmed by me experimentally), they are also extremely well suited for transport by water. Of some fruits, which I placed in a 3½% solution of common salt, 80% still floated after 25 days.

In Java the plant bears a large number of fruits at an early age, e. g. before it is 2 years old.

As I have observed in Central Java, this species occurs wild on two volcanoes which are more than 40 kilometres apart, in a straight line, and on these only above an altitude of 1400 m., whereas it

is completely wanting in the intervening plain, except on the sea-beach, 30 kilometres off. Since moreover no argument has been advanced in favour of dissemination by animals, it would appear, that the winds of Central Java are capable of transporting the fruits of *Dodonaea viscosa* over a distance of more than 30 kilometres although these fruits weigh 0,040 grams, and have a surface of 2½ square centimeters.

There is, however, scarcely need, to point out here, that great care is necessary <sup>1)</sup> in drawing conclusions as to transport by wind. I only refer to what has been said above, regarding the wind distribution of *Acer niveum*. Notwithstanding the apparent possibility of a direct transport by wind over large distances, I consider that also in the case of *Dodonaea* windtransport in stages is much more probable.

Its general occurrence on the tropical shores of the whole world is sufficient evidence of the extreme suitability for transport by water over very great distances, so that no more need be said on this point.

The extraordinary power of resistance, which I have repeatedly observed, against drought of the air and of the soil, against direct sunlight, against the saline contents of the soil and also against strong winds, together with the property of bearing numerous fruits at an early age, which fruits are well adapted to transport by wind and by water (also by sea water) — all these characteristics fully explain, why this tree appears in Java, as the pioneer of new vegetation not only in alpine regions, but also on sandy sea beaches.

According to what has been said above, the almost complete absence of the species from the broad belt between the beach and the mountains, is probably due, to the crowding out by other plants of such seedlings as may arise from fruits, which doubtless frequently fall in the intervening zone.

Summarising, it appears to me, that the apparently whimsical distribution of this characteristic Javanese Sapindacea can be readily deduced, with a large degree of probability, from the properties mentioned above, and especially from those properties, which are connected with the edaphic condition of the species.

§ 5. Note on some incompletely known species of *Quercus*, in 's Rijks Herbarium, at Leiden.

In KOORD. and VALETON Bijdr. Booms. Java X, 65 there are mentioned at the end of the description of 25 species of *Quercus*, growing

<sup>1)</sup> Compare also VOGLER in SCHROETER l. c. 740.

wild in Java, five further species as "doubtful and incompletely known"; the latter were included on the authority of BLUME Mus. Lugd. Bat. I, 294—304; we were unable at the time at Buitenzorg to refer to the authentic specimens of these.

As I have now been able to examine the authentic specimens of BLUME in 's Rijks Herbarium at Leiden, I append my observations regarding these species.

1. *Quercus Pinanga* BLUME Mus. Lugd. Bat. I (1850) 303.

I completely agree with the view of KING, quoted in KOORD. and VALETON l. c. 65. The remark, published by BLUME l. c., that the above-mentioned species occurs "in Java in the mountain forest" must therefore be regarded as not wholly accurate because BLUME evidently prepared his diagnosis from a few leaves of *Quercus glabra* THUNB. (from Japan) an old tree of which was observed by me in a cultivated state in Hort. Bogor. as late as 1903.

*Q. Pinanga* BLUME should therefore be erased from the Flora of Java and be considered synonymous with *Q. glabra* THUNB.

2. *Quercus litoralis* BLUME l. c. 303.

On the authentic herbarium label there was written i. a.: "*Quercus littoralis* Bl., Java, leg. BLUME, Pasang-laut (Sund)".

Since the native name is Sundanese, this species cannot come from Eastern Java, as BLUME l. c. incorrectly remarks, but must come from Western Java, probably from the Preanger or Banten, where most of the specimens, collected by BLUME, were obtained.

The authentic specimen I regard as beyond doubt synonymous with *Quercus spicata* SM. var. *gracilipes* KING (comp. KOORD. and VALETON l. c. 42). This species of BLUME's must also therefore be deleted.

3. *Quercus glutinosa* BLUME l. c. 304.

According to the authentic herbarium label of REINWARDT this species was named by REINWARDT in manuscript *Quercus micans* REINW., and was afterwards renamed by BLUME *Quercus glutinosa* Bl. moreover, it was not collected "in the mountain forests of Western Java" but found by REINWARDT near Tondano in N.E. Celebes, in the year 1821. This species can therefore also be deleted from the flora of Java. It is not, as MIQUEL incorrectly thought, identical with *Quercus induta* Bl., to which it shows a superficial resemblance; the species is specifically distinct from *Q. induta* Bl., as was indeed already correctly surmised by DE CANDOLLE and by KING (comp. KOORD. and VALETON l. c. 65).

4. *Quercus sphacelata* BLUME l. c. 304.

The authentic specimen of this species consists of a branch with

leaves, but without flowers. I consider it a large leaved shoot (for instance, from a latent bud of the trunk) of *Quercus spicata* SM. var. *gracilipes* KING.

On the authentic label is written: "*Quercus sphaelata* Bl., Pasang, Java, in montanis Moerial, Herb. Waitz."

5. *Quercus nitida* Bl. l.c. 294.

The view, already expressed in KOORD. and VALLETON l.c. 65, that this species, which so far has only been recorded with certainty from Sumatra, does not yet belong to the flora of Java, is confirmed in my opinion, by the material in 's Rijks Herbarium at Leiden.

Leiden, March 1908.

(To be continued).

**Geophysics.** — "*The Starting Impulse of Magnetic Disturbances.*"

By Dr. W. VAN BEMMELÉN.

(Communicated in the Meeting of March 28, 1908).

Last year <sup>1)</sup> I communicated the compilation of a statistical list of the magnetic disturbances which the magnetograph at Batavia has recorded during the period 1880—1899. I drew the attention to the phenomenon of the starting impulse i. e. the suddenly appearing change of the magnetic elements, which very often accompanies the beginning of a magnetic storm.

This phenomenon appearing in like manner at Batavia and at other places, I ventured a supposition on the manner in which we can represent to ourselves the appearance of magnetic disturbances. To obtain a closer knowledge of this in my opinion very instructive phenomenon, I requested at the end of 1906 all Magnetic Observatories to give me their data for a number of cases selected by myself.

With great readiness those data were forwarded to me from several observatories and it is an agreeable duty for me to express at this place my thanks for it.

Besides this material received from many sides I have worked out all cases registered at Batavia and at Buitenzorg and have also been able to watch the nature of the electric earth-current during the phenomenon. I wish to communicate here of the results of this material what is most important, commencing with Batavia.

<sup>1)</sup> Proceedings 29 September 1906.

Also: Observations made at the R. Magn. and Met. Observatory of Batavia, Vol. XXVIII, App. III.