CONTENTS

New Series 1925/26

Vol. I

Papers: Page

PROCEEDINGS OF THE INTERNATIONAL SOCIETY
OF SOIL SCIENCE

N. S. Vol. 1, No. 2 — April-June, 1925.

Papers.

BROWN EARTH IN FINLAND.

B. Aarnio.

According to Ramann, the principal soil formation of Central Europe is composed of brown earths, which cover part of England, almost the whole of France, Germany, Austria, part of Denmark, South Sweden, Northern and Central Italy. According to Ramann brown earths form in temperate climates and are related to the growth of deciduous trees (1). Brown earths are characterised by a dull, dark-brown colour, caused by the presence of iron oxide and humus matter. Ramann assumes that the influence of the bed-rock is of special importance as regards brown earths.

According to Ramann, brown earths do not contain alkalis, the soluble salts, including carbonates and sulphates, having been washed out. On the other hand, iron and aluminium oxides and phosphoric acid are not washed out, or only to a slight extent.

Although it may be admitted that Ramann's theory as to the extension of brown earths is exaggerated, yet it is certain that brown earths play an important part in Central Europe from the point of view of soil science. And yet there is no exact description in the literature on the subject of this important soil type, especially as regards the central parts of the brown earth zone.

---

(1) E. Ramann, Bodenkunde, pp. 533 and 585.

The only exact explanation of the existence of brown earth is given by **Karl Lundblad** (1), who describes the brown earth of Helgö, Smålånd, Sweden. In this region are mostly beech forests with typical brown earth formation, as well as needle-leaf forests, rich in moss, with normal podsol. The soil section is as follows:

0-3 cm.	Forest litter, beech leaves;
3-15 "	Very loose soil of granular structure, containing many earthworms; the soil changes to a
15-55 "	Brown earth, of granular structure;
55- "	C- layer, moraine.

Table I. — *Moraine section, Helgö, Sweden* (2).

Brown earth.

Soil horizon	Weight percentage in air-dried soils			Weight percentage in mineral substances		
	A	B	C	A	B	C
Depth in cm. . .	3–13	15–32	100–115	3–13	15–32	100–115
SiO_2 . . .	65.42	79.99	72.90	76.18	74.69	75.18
TiO_2 . . .	0.53	0.59	0.55	0.61	0.63	0.57
Al_2O_3 . .	19.97	11.97	12.25	12.60	12.77	12.65
Fe_2O_3 . .	2.51	3.31	3.18	2.88	3.53	3.28
CaO . . .	1.98	1.41	1.84	1.82	1.51	1.90
MgO . . .	0.09	0.12	0.15	0.10	0.13	0.16
K_2O . . .	2.77	3.19	3.16	3.18	3.41	3.26
Na_2O . .	3.16	3.12	2.88	3.63	3.33	2.98
H_2O . . .	2.49	1.95	1.17	—	—	—
Humus . .	9.96	3.96	1.98	—	—	—
	99.21	99.62	99.18	100.00	100.00	100.00

The results of this analysis show that aluminium oxide and potash are similar in amount and silicic acid and sodium are increased in the A level, whereas iron oxide is washed out of the upper layer. The most important fact is that the humus is of a crumbly texture and is therefore very loose.

According to Dr. **Olaf Tamm**, who in the summer of 1923 demonstrated before some soil scientists the occurrence of brown earth,

---

(1) **Karl Lundblad**. Ett bidrag till kännedom om brunjords- eller mulljordstypens egenskaper och degeneration i Södra Sverge. *Medelanden från Statens Skogsförsöksanstalt*, Part 21, No. 1, 1924.

(2) **Karl Lundberg**. Op. cit.

this brown earth changes very quickly if beech forest is replaced by needle-leaf forest. It must therefore be assumed that the formation of brown earth originates from the large quantities of fallen beech leaves. Under the influence of the needle-leaf forest the brown earth quickly changes to podsol.

As is known, large deciduous trees are very seldom found in Finland. The only " tree " which yields an abundant fall of leaves is the hazel (*Corylus avellana*). It might be supposed that this is perhaps the cause of the soil formation of brown earth. Hazel-bushes however are seldom found in Finland in forest plantations. Nevertheless there is one such instance, the Parish of Laitila in South-West Finland, where hazels are grown over an area of some hectares. The soil type is moraine, which has originated from Rapakiwi granite. A correspondingly typical brown earth formation has taken place in this soil type.

Section :

0-7 cm. a dark-coloured loose layer of granular texture and rich in humus (A-layer)
7-17 " dirty-brown humus (B_1-layer) ;
17-40 " grey-brown, containing humus (B_2-layer) ;
40 " moraine (C-layer).

There is no light-coloured earth.

TABLE II. — *Moraine section, Laitila, S. W. Finland.*

Soil horizon	Weight percentage in air-dried soils				Weight percentage in mineral substances			
	A	B_1	B_2	C	A	B_1	B_2	C
Depth in cm.	0–7	7–13	20–30	50–60	0–7	7–13	20–30	50–60
SiO_2	57.25	66.55	70.70	70,95	72.52	74.54	74.62	75.53
Al_2O_3 . . .	9.76	15.50	11,82	11,93	12,36	11,83	12,48	12,36
Fe_2O_3. . . .	3.83	3.91	3.75	4.95	4.86	4.38	3.96	5.13
CaO	2,18	1,70	2,10	1,80	2,76	1,90	2,22	1,87
MgO	0,86	1,27	1,13	1,08	1,08	1,42	1,19	1,12
K_2O	2,68	2,46	2,15	3,02	3.39	2,76	2,97	3.13
Na_2O	1,96	2,65	2,80	2,50	2,49	2.97	2,96	2,63
P_2O_5	0,37	0,18	0,28	0,22	0,47	0,20	0,30	0,23
SO_3.	0,05	—	—	—	0,06	—	—	—
H_2O	10,35	5,02	2,35	2,75	—	—	—	—
Humus . . .	10,51	5.49	2,60	0,47	—	—	—	—
	99,80	99.79	99,68	99.71	100,00	100,00	100,00	100,00

From this analysis it is evident that thes oil formation differs from podsoil: the sesquioxides are not increased in the B-layer, Al_2O_3 is about the same in weight and Fe_2O_3 is washed out. Potash phophoric acid and especially lime are increased in the A-layer which contains humus. The high humus content in the B-layer causes the brown-grey colour.

As is known, the solubility of humus is an important factor in moist regions. The soluble humus matter protects the decomposed substances, which are in a colloidal state, and favours their displacement. The soluble humus matter predominates, especially in those moist regions where the soil type is poor in double bases, also in those where the granite bedrock is extensive (podsol district). On the other hand the humus matter, that occurring chernos for instance, is very slightly soluble in water, according to P. KASSOWITZ (1) about 0.02 to 0.05 %.

The solubility of humus matter in water. — 10 gm. of earth were shaken up with 100 cc. of water and the soluble humus matter contained therein was estimated by means of potassium permanganate solution:

TABLE III.

				% of humus content	% of humus soluble in water, out of total humus
Brown earth,	Helgö,	Sweden,	A layer,	9,69	0,85
»	Helgö.	»	B »	3.96	1,05
»	Laitila,	Finland,	A »	10,51	0,79
»	Laitila,	»	B »	5.49	0,78
Iron podsol,	Heinjärvi,	»	B »	7.28	1,55
»	Karjalohja,	»	A »	9,02	2,05
»	Karjalohja,	»	B »	2,18	0,94
Humus podsol.	Heinjärvi,	»	B »	3.17	7.03
»	Tikkurilla,	»	A »	41,87	1.47
»	Tikkurilla,	»	B »	2,41	6,83

From this table it is evident that humus matter, especially in the B-layer is least soluble in water in brown earths, and most soluble in water in humus podsols. The iron podsols come near the brown earths in this respect.

In the above table the soluble humus is expressed in % of total

---

(1) P. KASSOWITZ. Die Schwarzerde. *Int. Mitteilungen für Bodenkunde*, 1912, p. 323.

humus. But it is important in soil science to know the soil solution concentration as regards humus. In the following table the amounts of soil soluble humus per litre are shown :

TABLE IV.

				Humus dissolved per litre
				gm.
Brown earth,	Helgö,	Sweden,	A layer.	0,0824
»	Helgö,	»	B »	0,0412
»	Laitila,	Finland,	A »	0,0883
»	Laitila,	»	B »	0,0432
Iron podsol,	Heinjärvi,	»	B »	0,1130
»	Karjalohja,	»	A »	0,1853
»	Karjalohja,	»	B »	0,0205
Humus podsol,	Tikkurilla,	»	A »	0,6178
»	Tikkuriila,	»	B »	0,1647
»	Heinjärvi,	»	B »	0,2059

The humus matter occurring in brown earths especially, though also in iron podsols, is very slightly soluble in water and forms weak solutions. On the contrary that in humus podsol dissolves more easily.

These examples show the importance of humus matter in soil formation. In similar conditions, that is when climate and bedrock are similar, humus podsol with well-formed light-coloured earth layers, is found under the crude humus, because the humus matter dissolves easily in water, on the contrary iron podsols and brown earths form if the humus matter is less soluble in water.

The formation of brown earths is in these cases dependent on the vegetation, for the influence of climate and bedrock would cause a podsol formation. Through the abundant leaf-fall the lime content especially, is increased in the upper layer (cf. table II), and flocculates the humus matter, changing it into a very slightly soluble type. In this case the humus matter does not favour washing out and there is no layer of light coloured earth. Owing to the abundant formation of humus the upper soil levels are rich in humus matter, yet this exerts no protecting influence. Through the presence of humus the colour of the upper soil layers is a dirty-brown.

No observations have been taken as to the yearly leaf and needle-fall in northern countries. The variations in Bavaria, however, according to EBERMAYER, are not very great : in beech plantation

4100 kg., in spruce plantations 3500 kg. and in common pine plantations 3700 kg. per hectare. In young plantations, with the exception of pines, the total is generally somewhat higher.

TABLE V. — *Amount of air-dried leaf- and needle-fall per hectare per annum* (1).

No. of observation posts	Age (years)	Proportion of mixed timber	Average yield in kg. per ha.
In beech plantations 11	27–56	Beech only, and with oak, birch and aspen.	4182
» » 7	60–85	Beech only, and with oak, birch and pine	4094
» » 7	91–130	Beech only, and with oak, spruce and pine	4044
In spruce plantations 12	34–59	Spruce only, and with fir, maple and larch	3964
» » 9	60–86	Spruce only, and with fir, beech and maple.	3376
» » 10	94–125	Spruce only, and with fir, and maple	3273
In pine plantations 10	25–48	Pine only, and with spruce and larch	3397
» » 6	61–74	Pine with beech, spruce and oak	3491
» » 5	80–107	Pine with beech, spruce and oak	4229

The variations in the quantity of potash and lime are considerable.

TABLE VI. — *Total potash in forest litter.*

	1000 parts of dry matter contain (in gms.)				
	K_2O	CaO	MgO	P_2O_5	Total potash
Beech-leaf litter (1)	2.97	24.62	3.64	3.14	55.76
Spruce-needle litter (1).	1.61	20.27	2.32	2.14	5.27
Pine-needle litter (1).	1.52	3.95	1.51	1.16	14.65
Various forest mosses	7.61	5.47	2.51	4.78	30.98
Yellowed hazel-leaves (2). . . .	12.37	32.17	4.95	5.90	—
Yellowed beech-leaves (2) . . .	9.42	18.49	5.06	1.78	—
Decayed oak-leaves (2).	4.99	33.70	4.16	3.59	—
Decayed birch-leaves (2)	7.25	33.27	3.28	2.09	—

(1) EBERMAYER. Op. c., p. 108.

(2) E. RAMANN: Wanderung der Mineralstoffe beim herbstlichen Absterben der Blätter. *Vers. Stat.* 76, pp. 157-160, 1912.

---

(1) E. EBERMAYER. Lehre der Waldstreu, pp. 44-49. Berlin, 1876.

If, according to EBERMAYER, the potash content per year per hectare of the annual yield of completely dry litter be determined, the following mineral nutrient substance content of the upper soil layer, in kg. per ha, is obtained :

	Dry litter per year	Total potash	K_2O	CaO	MgO	P_2O_5
Beech-leaf litter	3331	185.54	9,89	82,01	12,12	10,46
Spruce-needle litter.	3007	135.92	4.84	60,95	6,98	6.43
Pine-needle litter.	3186	46,52	4.84	18,96	4.81	3.70

The lime content of the beech-leaf and spruce-needle litter is considerable in comparison with that of the pine-needle litter. If, in addition to this, it be borne in mind that the very resinous spruce and pine-needles take much longer to rot than the leaf-litter, it will become clear that leaf-litter favours the formation of the more coagulated humus.

This kind of humus is formed principally in dry places ; in areas where the water level is high, the lime is washed out, whereby the solubility of the humus matter is increased.

The brown earth formation occurs in Finland only in certain places and forms flats of small extent. It should also be observed that these soil formations, which lie outside the true brown-earth zone, differ to some extent from the brown earths of the central parts of the zone. For instance, according to STREMME (1), the German brown earths at the boundary of the subsoil are characterised by concretions of calcium carbonate ; this phenomenon does not take place at all in the brown earth formation of Finland. If the general character of these soils be taken into consideration however the last-named must be classed before the sesquioxide soils (2).

The brown earths in Finland, differ from the podsols by the absence of light-coloured earth and the fact that their humus matter is less soluble in water. A low sesquioxide content and slight difference as regards bedrock is common to both these soils.

---

(1) H. STREMME. Bodentypen in Deutschland. *Mémoires sur la nomenclature et la classification des sols*, p. 2. Helsingfors, 1924.

(2) B. AARNIO and H. STREMME. Zur Frage der Bodenbildung und Bodenklassifikation. *Mémoires sur la nomenclature* etc., p. 73.

Abstracts and Literature.

General.

The Bases of Petrography.

ERDMANNSDOERFFER, O. *Grundlagen der Petrographie*, pp. 321, illust. 119. Publ. by Ferd. Enke, Stuttgart, 1924.

The author shows the connection between the geological, physico-chemical and mechanical bases of the science of petrography. In this work the geologist is shown the direct application of general knowledge to the problems which specially interest him, and the mineralogist, whose attention is directed more towards the physical and chemical branches of science, the application of the results of his researches on the processes in the great laboratory of Nature.

After a general introduction, the separate chapters deal with: the lithosphere, the glacial rocks, magnetic conditions, the period of formation of the magma, the structure, texture and sectional formation of the glacial rocks, the causes of metamorphism and its products in their geological relations. The separate chapters are accompanied by detailed references to the literature on the subject.

This important work of ERDMANNSDOERFFER is in every respect one of the best from a scientific point of view. SCHUCHT.

A Manual of Mineralogy.

GOSSNER, Dr. B. with a portrait of G. AGRICOLA, *Lehrbuch der Mineralogie*. 4 Plates and 465 text illustrations. Publ. by Fr. Brandstaetter, Leipzig.

The present work is in a certain sense the successor of that by F. v. KOBELL, from which a number of the figures in the text are taken. It should serve as an instructive manual, condensed, but at the same time as complete as possible, in order to give a comprehensive view of the many branches of mineralogy and should be especially useful to students of chemistry, geology, natural science and mining.

This excellent work, of a high scientific type, is divided into two principal parts: I. General mineralogy; II. The system, formation and occurrence of minerals (special mineralogy). These two parts are subdivided as follows:

Part I.: Mineral physics (the form of crystals — formation and dissappearance of crystals — cohesion — crystals and their radiant-energy — structure — the crystallographic phenomena of certain minerals). The chemistry of minerals (the general composition of minerals — the chemical bases of mineral formation). Minerals from a geological point of view (general causes of the existence of mineral stratification — system of mineral stratification).

Part II.: Silicates — oxides (including hydroxides) and their compounds — mineral sulphides — mineral salt compounds of the common acids. Appendix: Rare or unclassified substances. L. G.

Soil Science for Farmers and Foresters.

MITSCHERLICH, Dr. EILH. ALFR. *Bodenkunde für Land- und Forstwirte.* 4th Edition (revised) with 37 text illust. Publ. P. Parey. Berlin, 1924.

The new edition treats of recent research and knowledge in the plant physiology branch of soil science.

MITSCHERLICH's "Soil Science" is so well known that any further recommendation is unnecessary. SCH.

A Manual on Geology.

KOBER, Prof. Dr. LEOP. *Lehrbuch der Geologie.* Illust. 325, maps 2, and 30 plates. Publ. by Hoelder, Pichler, Tempsky & Co., Vienna, 1924.

Contents: Biology as a Science — Review of the history of the formation of the earth — General structure of terrestrial bodies — Rocks of the earth's crust — Stratification of the rocks — Volcanic phenomena — Climatic zones of the earth and their geological importance — The action of water and air — The activity of organisms — Movement of the earth's crust — The geosynclinal zones and glacial continental masses — The most important groups of fossil plants and animals — Structure of the earth — General laws and theories — Treasures of the soil — Geological-palaeontological-atlas-index.

A book to be recommended. SCH.

A Petrographic "Vademecum".

WEINSCHENK. *Ein Hilfsbuch für Geologen, Geographen und Techniker* (An Aid to Geologists, Geographers and Technologists). Revised by JOSEF STINY. IV. Edition (revised) 256 pp., 1 Plate, 104 text illustrations. Publ. by Herder & Co., Ltd., Freiburg im Br., 1924.

WEINSCHENK's well-known book, which constitutes a "Petrography without a Microscope" has been further improved by its reviser in accordance with the progress of science, and can be strongly recommended to all soil scientists on their expeditions into the mountains. SCHUCHT.

A General Chart of the occurrence of Potassic Salts and Petroleum in Germany.

Übersichtskarte der Deutschen Kalisalz- und Erdölvorkommen. Scale 1 : 450 000. Published by the "Preuss. Geolog. Landesanstalt"(Prussian National Geological Institute) compiled by ERNST FULDA, Member of the Mining Council ("Bergrat"), Gea-Booksellers, Ltd., Berlin W. 35.

The new potash chart includes those parts of the Provinces of Hanover, Saxony, Hesse-Nassau and the territories lying between them from which potassic salts are extracted. It includes not only geological data, but also data connected with mining, such as potash mines, potash works, salt mines, the mining-district boundaries, etc. and is completed by explanatory notes. The chart is excellent, both on account of the clear colouring and comprehensive contents, and can therefore be highly recommended.

SCH.

Physical Properties of Soils.

Influence of Water on Soil Granulation.

BOUYOUCOS, G. J. (Michigan Agricultural Experiment Station). *Soil Science*, Vol. XVIII, No. 2, pp. 103-110, 1 table. Baltimore, Md., 1924.

One of the most interesting physical phenomena in the soil is its persistent tendancy to assume a granular form when exposed to certain processes connected with the weather, such as the alternation of moisture and dryness. The natural soils of the fine texture type have almost always this granular type, which is so necessary for plant growth. Also when the soil is liable to caking, becoming dense and hard, it begins to crumble if subjected to alternate moisture and dryness. It is generally agreed that the granulation is due to the force of contraction of the pellicles of water in the soil. When the soil moisture begins to diminish by evaporation, the power of contraction of the pellicles of water increases, the pellicles becoming finer and finer, causing the soil particles to become attracted one to another, the soil thus becoming flocculated. This theory however is not correct, for otherwise the soil would tend to contract more and more into a dense mass, and there would no longer be any granular structure. Soil granulation on the contrary means not only the flocculation of the particles into larger ones, but also the crumbling of dense masses into others of loose structure.

Water participates in the process by detaching the particles from one another, being enabled to do this through the swelling of the colloids and by decreasing the cohesive power of the particles. Thus the clods acquire a granular structure. The force of contraction on the other hand is due not to the water pellicles, but to the cohesive power of the soil itself.

A. F.

The Effect of Movement of Soil Salts on the Standardization Values of Electrodes used in Soil Moisture Determinations.

DEIGHTON, T. *Journal of Agricultural Science* 13, 440, 1923.

Aims at determining to what extent the movement of soil salts affects electrode standardization values in a method for determination of soil moisture previously described. Fairly light soil packed in a large box, with constant water table, is presumed to have moisture content dependant on temperature and relative humidity of air at surface only. Units of 3 electrodes were sunk at 3 ", 4 " and 6 " depths ; 3 resistance thermometers were used at the same levels. Fluctuations of resistance were measured (i) while the system was coming to an equilibrium ; (ii) after application of varying quantities of "Artificial rain" applied at surface. Conclusions were reached to the effect that at 3", or at a lower depth relative humidity exerts no effect, nor did 1 mm. of rain affect these levels.

Several of the results were erratic, but the evidence available seemed to show that on normal soils small rainfalls would not materially affect standardization values. T. E.

The Soil Point Method for directly Estimating the Water Supplying Power of a Soil in the Field.

Hardy, F. *Journal of Agricultural Science*, 13, 355, 1923.

Develops under field conditions Mason's laboratory investigation on the same subject *i. e.*, the use of the conical surface of sharpened high grade graphite writing pencils for the absorption of moisture in the soil. Fifty pencils in lots of ten constitute one trial. The depth of absorbing surface below ground is 5"; time 3 hours. The probable errors quoted are insignificantly small. The following figures refer to the water supplying capacity of the soil at drying point in terms of hundredths of a gram of water absorbed by one soil-point in the specified time : Mason $1.41 = 0.031$, Hardy $1.71 = 0.066$. T. E.

The Maximum Water Retaining Capacity of Colloidal Soils, etc.

Hardy, F. *Journ. of Agricultural Science*, 13, 340, 1923.

The soils dealt with are representative of the diverse geological types of the British West Indies. Investigations were made chiefly with respect to their behaviour in the light of (i) The Briggs-Shantz formula for Maxinum Water Retaining Capacity, $M = 4.3\,H + 21$; (ii) a formula $M = P + 23.5$ ($P = \%$ moisture when in a plastic state) derived from Wilsdon's theoretical considerations. Data are given showing that the Briggs-Shantz formula holds for soils without highly marked colloidal properties but the experimental values are in excess of those calculated for soils of high siliceous colloid content. Such soils swell during imbibition and the soil mass is loosened with consequent increase of pore space.

Red laterite soils show the opposite effect, as their colloidal material is mainly alumina and ferric oxide hydrogel ; their volume expansion is low. Humus soils have a high volume expansion and resemble siliceous colloidal soils in the nature of their deviation from the Briggs-Shantz formula.

Wilsdon's "Vesicular coefficient" $\frac{P}{H}$; theoretically estimated as 4.3, varies from 4.9 to 3.3 for the first class of soils and from 3.5-2.4 only for the second. This is believed to account for low experimental values for the Briggs-Shantz formula in the laterite soils. The second formula is approximately correct for laterite soils but is not suitable for the other types. The reliability of the drying coefficient and critical moisture content formulae is examined in the light of the data and conclusions given. T. E.

Soil Moisture Investigations in Canada.

HOPKINS, E. S. (Central Experimental Farm, Ottawa). *Scientific Agriculture,* Vol. V, No. 3, pp. 79-83. Ottawa, 1924.

An outstanding fact of Canadian agriculture is the wide variations which occur from year to year in the yield of wheat grown in the Prairies Provinces. In Alberta the yield has ranged from 6.0 bushels per acre in 1918 to 32.7 in 1915 ; in Saskatchewan from 8.5 to 28.5, whereas in Ontario the extremes have only been from 12.5 to 23.2 bushels.

The average yields per acre for the past 23 years for wheat exporting countries (Russia 15 years) are as follows : Canada 17.8 bushels, United States 14.1, India 11.3. Australia 10.6 Russia, 9.4.

Poor yields are due partly to rust, but the most important cause is drought.

The Dominion Experiment Farms have shown that timothy, red clover and alsike do not succeed on the prairie ; western rye and brome grass are more drought resistant. The summer fallow may be replaced by maize, which in addition to giving a crop leaves the land in good condition for wheat and the stubble prevents the dry soil from blowing away.

At the Swift Current Station it has been shown that for the years 1921-1922 it has taken 1221 lb. of water (including transpiration and evaporation) to produce 1 lb. of wheat grain, on which basis 6.5 inches of water would be required to produce a 20 bushel crop. Rainfall appears to have the most beneficial effect about the time of heading. It has been proved that the soil mulch is not sufficient to conserve soil moisture. Weeds are the great enemy, not only as regards soil nutriment but also of moisture.

A study of statistics indicates that the hay crop varies the most, oats the next and maize and silage the least. Experiments are being carried out to ascertain which rotation is most economical in its use of soil moisture, as by the inclusion of different types of crops a certain amount of safety may be obtained in years when the rainfall is deficient. W. S. G.

The Moisture Equivalent of Heavy Soils.

JOSEPH, A. F., and MARTIN, F. J. *Journ. of Agricult. Science,* 13, 49, 1923.

Moisture equivalent is defined as the percentage of moisture retained by the soil after draining centrifugally for 40 minutes by a force of 1000 times that of gravity. Results showed that increased thicknesses of soils in the perforated boxes decreased the moisture equivalent by increasing the density of the lower layers and reducing pore space. With certain heavy soils, closely compressed, impermeability causes accumulation of water in surface layers and consequent increase in moisture equivalent. Clay content is not the only factor ; the water logged soils were those of higher P_H value. Salt content caused variations of the moisture equivalent which was increased by deflocculating agents such as sodium carbonate, and decreased by flocculating. salts.

Sodium carbonate gave a distinctive curve for the moisture equivalent — Na_2CO_3 concentration relationship. Moisture equivalent reaches maximum value at a concentration of 2% and then falls off. Variations in the content of colloidal clay produced variations in moisture equivalent, but of small degree. No such effect was noticed with other colloids such as kaolin.
T. E.

The Form of Mechanical Composition Curves of Soils, Clays and other Granular Substances.

ROBINSON, G. W. (University College of North Wales). *Journal of Agricultural Science*, Vol. XIV, Part. 4, pp. 627-633, figs. 2, bibliography. London, 1924.

The article describes the results obtained of the mechanical analysis of a large number of soils, clays and other granular materials, carried out by the author's method. The results are set out in the form of curves showing the relationship between summation percentages and logarithm of settling velocity. The curves are smooth, which indicates that a comparatively small number of determinations are sufficient to characterise the mechanical composition of a soil or clay.

The curves for ordinary soils and clays are found to show one general type and two subtypes, illustrated in Fig. 87.

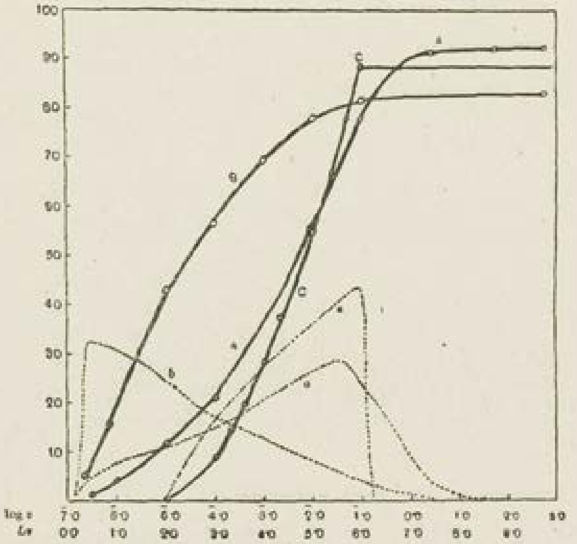

FIG. 87. —Principal types of curves illustrating the mechanical composition of soils.

The most common type of curve, to which the great majority of soils belong, is the sigmoid, as exemplified by curve A. The steepest portion represents the fraction present in greatest frequency, this being termed by the author the *modal fraction*. Two variants of the main type of curve were encountered, one in the case of very heavy clays, as shown by curves B and *b*, in which the lower portion of the sigmoid appears to be supressed, so that the modal fraction falls to the lower limit.

In the case of certain materials which have been reduced to powder by grinding, as for example slate powder, represented by curves C and *c*, the modal fraction appears to be at the upper limit.

The lower limit of particle size appears to be represented by log. $v = \bar{7}.0000$ in the case of normal soils and clays.

In the case of kaolin and certain finely divided but non-plastic materials, the lower limit appears to be in the region of $\bar{5}.0000$. The author suggests that the properties of soils would be better shown by taking the limit for clay at this point instead of at log. $v = \bar{4}.0000$; if this were adopted then the difference would be more clearly shown between plastic substances and materials which, although in a fine state of division, have not the characteristic properties of clay.

The use of the logarithm of settling velocity as a measure of particle size is discussed and it is suggested that the use of negative logarithms might be avoided by using $\log(v + 10^7)$, for which the symbol L v is proposed. W. S. G.

Chemical Properties of Soils.

The Determination of Ammonia in Soil.

BENGTSSON N. (Central Agricultural Experiment Station, Stockholm). *Soil Science*, Vol. XVIII, No. 4, pp. 225-268, bibliography. Baltimore, Md., 1924.

The author has revised the methods hitherto employed for the determination of ammonia in soil and has found that with none of them can the whole of the added ammonia be recovered.

The test showed that it is impossible to carry off all the ammonia in a soil extract. It is therefore necessary to adopt the method of successive extracts proposed by the author. For this purpose 25 grams of soil are extracted successively with 7 portions of 100 cc. of a solution of 4 % chloride of potassium. For peaty soils, on the other hand, portions of 50 cc. are be used. The method is not suitable for clay subsoils taken at a depth of 25-35 cm. A. F.

Secular and Seasonal Changes in the Soil Solution.

BURD J. S. and MARTIN J. C. (University of California Experiment Station). *Soil Science*, Vol. XVIII, No. 2, pp. 151-167, bibl. Baltimore Md., 1924.

Crops continued for a long period constantly diminish the concentration of soil solutions, which are obtained by the displacement of water. By leaving the soil fallow, on the other hand, the concentration of such solutions is increased, except in soils in a state of high fertility.

In soils cultivated continually for some years the seasonal decreases of concentration are only temporary, while such concentrations tend to increase in the season following that in which there was a decrease. There are also characteristic fluctuations of certain constituents, and the phosphates essentially depend on the reaction of the solutions.

It is evident that the qualitative composition of the soil undergoes continual changes. It follows that the solutions for water cultures, made to reproduce the conditions of the soil at the beginning of the season, no longer represent the conditions found in the succeeding stages of plant growth. A. F.

The Influence of Hydrogen-ion Concentration and Different Salts on the Electrical Charge of Clay Colloids.

DAYHUFF, W. C. & HOAGLAND, D. R. (College of Agriculture, University of California). *Soil Science*, Vol. XVIII, No. 5, pp. 140-408, bibl. Baltimore, Md., 1924.

It is known that the physical conditions of a soil depend to a great extent on the colloidal state of the clay fraction, and it would be interesting to know how the reaction and electrolyte content of the soil solution might modify the state of the clay dispersion. In such systems, one of the must influential factors is the electric charge of the colloidal particles.

Some years ago ARRHENIUS had advanced the theory that the clay could act as an ampholyte and therefore behave similarly to protein, in accordance with LOEB's idea. The authors' investigations on the contrary have shown that, at least as regards the clay type examined, the colloids possess no definite isoelectric point (unlike protein) in the series of hydrogen-ion concentrations examined (from P 2.1 to 12.7). The colloids continue to remain charged negatively.

On the stability of the colloidal clay suspension, the nature and concentration of the cations, on the contrary, have the greatest influence. It may be that in the soil conditions are somewhat different ; there may be certain organic colloids present, which may behave differently.

The question is important also from the practical point of view. As is known, an alkaline reaction of the soil is not unfavourable to plant growth. This may be due not only to the direct influence on root growth, but also to the influence on the physical state of the soil itself, whereby an unfavourable state for root growth and for the activity of microorganisms is created. The alkaline reaction in fact may cause deflocculation, decreasing the solubility of the di- and tri-valent cations, instead of influencing the hydroxylion concentration. A. F.

The Science of Soil Solutions: Methods for Obtaining and Testing Soil Solutions.

DOJARENKO, A. G. Prof. *Journal für landwirtschaftliche Wissenschaft*. 9-10. State Technical Publishers, Moscow, 1924.

This essay describes the principles and methods for the testing of soil solutions, which are important in agriculture. The author, in collaboration with his colleague A. A. SCHNIWCK, proposes a method for obtaining a solution without diluting with water, for which purpose use is made of the " Petroleum Emulsion method ". The freshly-obtained soil samples of which the water content must be more than double the hygroscopic water capacity, are well mixed with a certain quantity of a completely neutral and chemically inactive oil (vaseline oil), so that the oil forms an emulsion with the soil solution; from this, by slight pressure and subquent centrifuging, the soil solution, free of oil, is obtained. The following means for testing the soil solution are adopted: osmotic pressure, measurement of conductivity, degree of solubility of the electrolyte, colloid content, refraction exponent, rotatory power, chemical-calorimetric determination, titration of the oxidising compounds with permanganate.

GOERNER.

A Comparison of Qualitative Tests for Soil Acidity.

HARPER, H. J. & JACOBSON, H. G. M. (Iowa Agricultural Experiment Station). *Soil Science*, Vol. XVIII, No. 2, pp. 75-85, bibl. Baltimore, Md., 1924.

The different methods of testing enable very acid soils to be distinguished from medium and slightly acid soils. The Soiltex method also distinguishes neutral and basic soils, and has the additional advantage of requiring but few appliances; but with peat and clay soils the solutions obtained are not sufficiently clear. TRUOG's test requires more appliances and a longer time than the others; this method and COMBER's potassium salicilate test give accurate results with moist soils. The Iowa method gives good results with soils containing 20 % moisture, and RICHOPOOR's only with dry soils. A. F.

On the Determination of the Influence of Soil "Buffer-Action".

JENSEN TOVBORG, S. (Statens Forsogsvirksomhed i Plantenkultur). Om Bestemmelse af Jordens Stodpudevirkning. *Tidskrift for Planteavl*, Vol. 30, No. 4, pp. 565-585, figs. 21, bibliography. Copenhagen, 1924.

The author has determined the P_H variations in a soil suspension (10 gm.) in a constant volume of liquid (100 cc.), by adding thereto increasing quantities of hydrochloric acid and calcium hydrate in decinormal solutions. In order to investigate the influence of carbonate of lime on soil reaction, the calcium hydrate added was transformed into carbonate of lime by the addition of carbon dioxide at atmospheric pressure. According to N. BJERRUM and J. K. GIALDBOEK, in a liquid saturated with carbonate of lime, the P_H value may be expressed by the following equation:

$$P_H = 5.02 + \frac{1}{2} \log. C_{Ca}++ + \frac{1}{2} \log. pCO_2$$

in which $C_{Ca}++$ is the molecular concentration of the calcium ions and pCO_2 is the pressure of the carbon dioxide in the liquid.

For a liquid saturated with carbonate of lime at the normal pressure of carbon anhydride $P_H = 8.38$. It follows that the extreme limit of P_H in a soil suspension, to which is added increasing quantities of carbonate of lime, is 8.4, provided the soil in question does not contain large quantities of alkaline, or other strong carbonates. When the transformation mentioned does not take place, the carbon dioxide of the atmosphere will cause a partial transformation of calcium hydrate to carbonate and the P_H will diminish in relation with the pressure of carbon dioxide in the atmosphere.

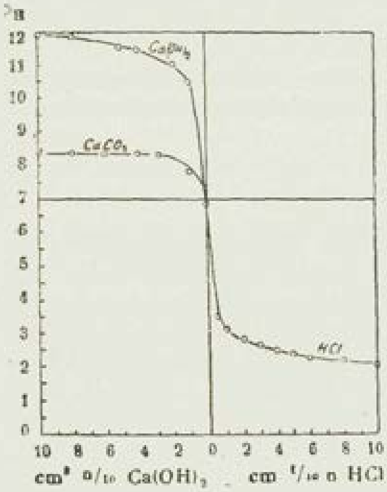

FIG. 88. — Standard curve showing buffer action in quartz sand.

The P_H determination was made in a soil deprived of " buffer action ", formed of pure quartz sand (Fig. 88). The results were expressed in graphs in which the quantities of calcium hydrate and hydrochloric acid added in decinormal solutions are in the ordinates, and the ascertained P_H values in the abscissae. The results obtained with the soils examined were expressed in a similar manner. In the diagram then, if the soils in question have no " buffer action " influence, the lines will coincide, whereas on the other hand, the greater such influence, the greater will be the deviation.

The exact value of the soil " buffer action " influence on the acid in a determined P_H interval, is expressed by the difference in length between distances at which the type curve and that of the soil examined intersect the horizontal lines which represent the same P_H intervals (Figs. 89 and 90). Such

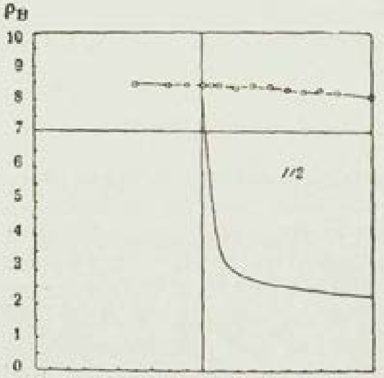

FIG. 89. — Curve showing buffer action of garden soil.

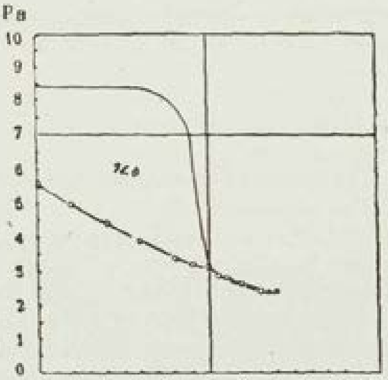

FIG. 90. — Curve showing buffer action of soil from a dry pond.

difference in length shows how many cc. of decinormal hydrochloric acid can be held by 10 gm. of soil, when the P_H values diminish within the limits shown by the interval. A. F.

Alkali Soil Investigation. Chemical and Biological Effects of Treatments.

JOFFE, S. S. and MACLEAN, H. C. (New Jersey Agricultural Experiment Station). Alkali soil investigations : chemical effects of treatment. *Soil Science*, Vol. XVIII, No. 2, pp. 133-149, bibliography.

Id. IV. Chemical and Biological Effects of Treatments. *Ibidem*, No. 3, pp. 237-254, 1 table, bibliography. Baltimore, Md., 1924.

The results of the first series of tests show that treatment with 2000 lb. of sulphur per acre is not sufficient to completely transform the soil alkalis. The total of hydrogen ions from 2000 lbs. of sulphur is not sufficient to substitute the zeolitic cations and neutralise the existing and potential soda. Alum, especially in combination with sulphur, may exert some influence.

It should be borne in mind that the soils examined contain soda and sodium in their zeolitic portion. Now when the colloids are coagulated, the carbonates begin to disappear ; some are changed into bicarbonates, others disappear, as is the case with carbonic anhydride, of which a part is utilised by the microflora. The first reactions take place with the carbonates in so far as they are solution reactions, and these are then followed by replacement reactions.

From the nature of the cations, it will be expected that the first to disappear must be the sodium, followed by calcium. By frequent determinations it is possible to ascertain the moment in which the whole of the sodium has been substituted ; only then is leaching resorted to. The oxidation of the sulphur that follows the leaching, supplies the hydrogen ions for replacement of the calcium which forms gypsum. When all the sulphur has been oxidised and all the hydrogen ions have been exhausted, the reverse reaction takes place, as shown in the following equation, which is reversible :

$$\mathrm{Ca\,Al_2\,Si_x\,O_y\,.\,nH_2O + H_2SO_4 \rightleftarrows H_2\,Al_2Si_x\,O_y\,.\,nH_2O + CaSO_4\,.\,H_2O}$$

The quantity of sulphur necessary is probably 4000-6000 lbs per acre.

The combined effects of the sulphur and alum resulting in improvements of alkali soils lead one to conclude that it is possible to use both these products for that purpose. The advantage would be that the alum would immediately coagulate the colloids, and the hydrogen ions of the sulphuric acid would then be utilised for replacement of the sodium. Further investigation is necessary however before defining the practical application of these two agents.

The use of organic substances, such as peat or large quantities of stable manure is effective in so far as they serve as a buffer ; they do not, however, contain cations capable of reacting on the zeolitic portion of the soil. In any case their effectiveness is only temporary, and is perhaps due to the introduction of some substance which serves in plant nutrition.

The authors have also investigated the biological effects of treatment, but the data obtained do not up to the present allow any conclusions to be drawn. In general, the authors' investigations would afford a theoretic basis for the views of GEDROIZ. The practical conclusions might lead to modifications in some particulars, but on the whole it is probable that from the results of these investigations one might proceed to their application. A. F.

Adsorption and Absorption of Bases by Soils.

JONES, C. P. (Massachusetts Agricultural Experiment Station). *Soil Science*, Vol. XVIII, No. 3, pp. 255-273, 1 fig., tables 8. Baltimore, Md., 1924.

The colloids of the soil may be divided into two great classes: inorganic and organic. Silicic acid, silicates, aluminium hydroxide and its silicic acid and ferric hydroxide compounds belong to the former. Among the organic colloids are the humus compounds and the various species of micro-organisms such as soil bacteria and fungi as well as the mucous matter secreted by such micro-organisms.

The colloids are capable of adsorption and absorption. The former is a surface phenomenon and is not considered to be of great importance, whereas absorption is important. The latter, which might also be called decomposition-adsorption, is a chemico-physical reaction and depends on the chemical nature of the colloids which enter into reaction.

The absorption of the bases by the soil is directly dependent on the degree of hydrolysis of the salt in solution. Hence the laws which govern hydrolysis, *i. e.*, chemical composition of the salt, concentration, and temperature, apply also to absorption.

The absorption of the bases of the compounds, which contain a strongly ionised base and an acid, is small. With the decrease of the ionisation of the base and of the acid there is an increase in the degree of hydrolysis and consequently an increase in the absorption of the base. This, in but slightly soluble substances, follows WENZEL's law: the speed of reaction of the solids with the liquids is proportionate to the air in contact with them.

The absorption of the bases by the soil is due to the chemical reactions between the constituents of the soil and the dissolved salts. Adsorption, or surface attraction, is merely accessory. A. F.

Drying of the Soil and Maintenance of Fertility.

LEEBEDJANTZEV, A. N. (Shatiloff Agricultural Experiment Station). Drying of the Soil as one of the Natural Factors in Maintaining Soil Fertility. *Soil Science*, Vol. XVIII, No. 6, pp. 419-447, tables 24. Baltimore, Md., 1924.

The drying of soil to an air-dried condition in the open air at ordinary temperature, produces a large increase in the yielding capacity in the case of pot experiments.

Especially responsive to drying appear to be uncultivated soils and those under grass for a number of years ; soils under continuous mechanical cultivation respond less readily. Soils fertilised with farmyard manure or phosphates are more responsive than unfertilised soils. Meadow grasses show the best results with soil drying.

A positive influence of drying is evident only with cultivated soils reaching a 6 per cent content moisture, and with uncultivated soils reaching 14 per cent. With a less amount of drying, fertility is not increased and may even be lowered. Repeated drying of the same sample of soil, with intermediate moistenings, is accompanied by a further increase in the yielding capacity and the maximum fertility is attained with triple drying.

The maximum effect of drying for deep black soil seems to be in the layers 20 to 40 and 40 to 60 cm. For surface soils (0 to 20 cm.) as well as for the layers lower than 60 cm., it is markedly less.

During the process of drying, important chemical changes take place in the soil which tend to increase the solubility of organic substances and to enrich the soil in nitrogen and phosphorus, and to bring about a large increase of ammoniacal nitrogen, a considerable increase of amide nitrogen and a diminution in micro-organisms. These changes are very similar to those taking place in the soil under the influence of low temperatures and antiseptics, so that the drying of a soil may be considered as partial sterilisation. The factors most important for ensuring these effects are dehydration and temperature, while oxygen and light cause a decrease in fertility.

An indirect proof of the favourable action of the drying on fertility is given by the fact that the upper 5 cm. layer is the most fertile and also increases its fertility most rapidly. A. F.

The Influence of Various Salts on Acid Soils.

MIYAKE, K., TAMACHI, I. and KONNO, J. (Institute of Agricultural Chemistry, University of Hokkaido, Sapporo, Japan). The Influence of Phosphate, Biphosphate, Carbonate, Silicate and Sulphate of Calcium, Sodium and Potassium on Plant Growth in Acid Mineral Soils. *Soil Science*, Vol. XVIII, No. 4, pp. 279-310, tables 7, bibl., Baltimore, Md. 1924.

The study of acid mineral soils and the improvements to be made in them is very important for Japan, where such soils are very extensive. The low fertility of these soils is especially due to the presence of large quantities of aluminium, which seem to have a toxic effect on plants.

The authors' experiments have shown that soil acidity may be reduced by the addition of carbonate, phosphate, biphosphate and silicate of lime, soda and potassium, whereas sulphate has no effect. By the addition of such salts, the hydrogen-ion concentration is also reduced, but not to the same extent as the acidity.

The quantity of aluminium which passes into solution with potassium chloride, after the addition of the said salts, corresponds with the acidity, which latter therefore seems due to the quantity of dissolved aluminium.

The salts, arranged in the order of their power to render aluminium insoluble, are the following: carbonates, phosphates, biphosphates and silicates. The sulphates, on the contrary, increase the quantity of soluble aluminium.

In the tests made with barley, the order of beneficial influence is as follows: phosphates, biphosphates, carbonates and silicates, while the unfavourable influence of the sulphates is confirmed. The order is therefore the same as that in which aluminium is rendered insoluble, except that the phosphates and carbonates have exchanged positions. It is deduced therefore that the presence of large quantities of aluminium in acid soils is a very important factor in connection with the low fertility. The greater influence of the phosphates seems to be due to the deficiency of phosphoric anhydride in such soils.

Although hydrogen-ion concentration is also reduced by the addition of the said salts, it was impossible to prove that there was any connection between it and plant growth.

It is therefore concluded that "the inferior quality of an acid soil as regards plant growth is due, at least to a certain extent, to the presence of soluble aluminium, which is decidedly toxic to plants, and to the deficiency of phosphoric anhydride." These chemical products which can give the necessary quantity of phosphoric anhydride and cause the elimination of soluble aluminium are therefore most suitable for such soils. A. F.

Determination of the Hydrogen-ion Concentration of Soils by the Colorimetric Method.

Niklas, H. and Hock, A. *Zeitschrift für angewandte Chemie*, v. 38, p. 150. Leipzig, 1919.

The authors describe the principles of the colorimetrical determination of the hydrogen-ion concentration in soils by Clark and Lubs' test, also by that of Michaelis, and show the comparative determinations of the P_H in the soil by these two methods, which agree very well. The authors further compare the colorimetrical P_H determination with the electrometric, in which the slight deviations from the maximum ± 0.1 P_H show that the use of the colorimetric methods, both according to Michaelis and to Clark and Lubs, fulfil the requirements of scientific exactitude. Niklas.

Soil Nitrogen.

Rippel, A. Versuche aus dem Nachlass von Alfred Koch. *Journal für Landwirtschaft*, No. 1, pp. 17-52. Berlin, 1924.

The fundamental conception of Koch may be summarised as follows: generally speaking, whereas on fallow land it is possible to adopt practical measures in order to increase the fixation of nitrogen by bacteria, it is necessary at the outset to find fallow land which can supply the required amount of energy to the bacteria to enable them to fix the nitrogen, by the utilisation of the organic matter of the soil, although assisted by adequate soil cultivation.

The author is decidedly against this opinion of KOCH's, and considers that the problem of fallow land is only a part of the larger problem, of the nitrogen cycle and its renewal in cultivated soil.

The author has never found that on fallow land nitrogen is assimilated in appreciable quantities.

The author then gives the results of KOCH's experiments on the cultivation in the open field of wheat, rye and meadow-grass. Parallel tests were made on fallow and on cultivated soil, the plots being 3 metres apart. The fertilisers used were potash salts, Chile nitrate and ammonium sulphate. The resulting wheat crop was larger than that of the rye. The yield of grain was proportionately larger than that of straw.

The proportional decrease in quantity of straw was probably due to the gradual production of nutritive elements by the soil, and especially of nitrogen.

In the case of meadow-grass the variations in yield for the different years of the test are larger than in the case of wheat and rye, which is due to the fact that the hay crop depends more than wheat and rye on the year's precipitations.

The average results of the tests for the four years, however, show that the total hay crop is about the same as that of wheat and rye.

Other tests were made by KOCH in metal cylinders with open bottoms. Here it was observed that in the case of wheat the proportion of grain to straw is about the converse of that observed in the yield from the open field. The fertilisers used in this case were potassium nitrate and potassium phosphate.

Other tests were made regarding the action of nitrogen at different depths of the soil, the object of which was to compare soil weathered during the winter and cultivated during the summer with similar, but unweathered soil. The tests were made in pots, with potash salts and superphosphate. The results show how easily the nitrogenous substances in the upper strata of the soil may be made available.

Other tests by KOCH relate to the effect of sugar, cellulose and straw on the nitrogen content of the soil.

The addition of dextrose and cane sugar, continued for a period of 9 years, caused an increase in yield, which increase then stopped at the end of the period mentioned. As regards the addition of cellulose to the soil (in the form of paper), either alone or mixed with manure, KOCH found that cellulose alone tends to decrease the quantity of nitrogen fixed, but when mixed with manure there is no decrease, whereas the quantity is increased by the administration of manure alone. G. B.

The Effect of Fertilizer Salts Treatments on the Composition of Soil Extracts.

SPURWAY, C. H. *Michigan Sta. Tech. Bul.* 45, pp. 18, 1919.

Four sandy loam soils, two acid and two alkaline to litmus paper, were treated with fertilizer salts in the proportion of 1 gm. of fertilizer salt to 1 kg. of soil, placed in a percolation apparatus and leached twice with distilled water, after two days and also after fifteen days standing, with three litres of distilled water at each leaching. Salts used : KCl, commercial acid phosphate, commercial slaked lime, $CaSO_4$, NaCl, $NaNO_3$, $Ca_3 (PO_4)_2$, $CaH_4 (PO_4)_2$ and $CaCO_3$. The leachings were analyzed for SiO_2 P_2O_5, SO_3, Cl, Ca, Mg, Na, K, Fe_2O_3, Al_2O_3 and combined CO_2. Chemical analyses of the soils are given.

The treatments had certain well defined effects on the soils. Application of soluble chemical compounds to soils change markedly the chemical composition of the soil extracts, and when these soluble constituents are removed the soil is left in a permanently changed condition. The SiO_2 of alkaline soils was found to be more soluble than that of the acid soils. Non-phosphate salt treatments generally increased the amount of phosphorus in the soil extracts. The basic radicals of the salts, KCl, $CaSO_4$, NaCl and $NaNO_3$ occurred in the second leachings in greater quantities than the acid radicals, showing that a transformation had taken place and that these basic radicals were combined with other acids, mainly as carbonates. Comparatively large quantities of iron and aluminium were found in the second leaching from the $CaCO_3$, $NaNO_3$, $CaSO_4$, and phosphate treatments. All treatments except those of slaked lime and $CaCO_3$ left the soils acid to litmus paper. C. H. S.

Studies on the Reactions Between Soils and Various Chemical Compounds.

SPURWAY, C. H. *Michigan Sta. Techn. Bul.* 51, p. 29, 1921.

This work was designed primarily to study reactions between alkaline and acid soils of various classes and neutral salts, bases and hydrolyzing salts.

100 gms. of air-dried soil and 500 cc. of solution containing, usually, one hundredth part of the formula weight of the chemical used, were brought into contact, in glass containers, at laboratory temperature for one hour, and the solution separated from the soil mass by decantation. Soils used: acid and alkaline (litmus paper test) soils of each of the following classes: medium sand, sandy loam, silt loam and clay loam. Chemicals used — KCl, K_2SO_4, KNO_3, $(NH_4)_2SO_4$, $Ca(NO_3)_2$, $CaSO_4$,$CaCl_2$, $MgCl_2$, KOH, $Ca(OH)_2$, K_3PO_4 $CaH_4 (PO_4)_2$, $Ca(C_2H_3O_2)_2$, $KC_2H_3O_2$, $K_2C_2O_4$, $FeCl_3$.

The alkaline soils generally fixed greater quantities of the cations of the neutral salts than the acid soils of the same class, but the degree of fixation depends upon certain soil elements, chiefly calcium and magnesium, with smaller quantities of sodium and potassium, in chemical combinations that react with the neutral salts, and not on the reaction of the soil. Extracting the eight soils with HCl. and washing, greatly reduced the quantities of potassium fixed from KCl by the soils. These soils did not fix equivalent quantities of calcium, potassium and magnesium from neutral salts of these elements. The fixation of potassium was correlated with the exchange of calcium and magnesium from the soils, and the fixation of calcium with the exchange of magnesium, and the fixation of magnesium with the exchange of calcium. The fixation of potassium from KCl by carbonate and non-carbonate soils, was closely correlated with the quantities of calcium and SiO_2 found soluble in 0.2 N HCl. When the acid and alkaline sandy loam soils were saturated with certain cations at equal solution concentrations, then the fixation of the other cations used at the same concentration was closely equivalent. The reactions betweensoils and neutral salts were reversible in all cases studied. Much greater quantities of calcium were fixed by the soils from $CaCl_2$ after these soils were treated with $MgCl_2$, than before this treatment. These observations contain strong evidence that the reactions involved are of a chemical nature, and that the chief cause of fixation from neutral salts by soils, is the presence of chemical elements in combinations that react with the neutral salts, forming an insoluble compound with the salt cation and some soil acid ; and the degree of fixation is considered to be dependent upon both kind and quantity of the reacting ions present.

Potassium and calcium were fixed from hydroxides in large quantities by all the soils used without equivalent exchange of soil elements ; but a portion, at least, of the potassium and calcium fixed from hydroxides is held by the soils in an exchangeable condition.

In general, the alkaline soils fixed greater quantities of the basic ions of hydrolyzing salts used than the acid soils, but a greater degree of fixation was observed from the hydrolyzing salts than from the neutral salts. The fixation of one ion of an alkaline hydrolyzing salt was apparently independent of the fixation or combination of the other ions of the same salt. In the case of $FeCl_3$, the iron fixed by the soils was nearly proportional to the calcium found in the soil extracts, showing that this reaction is mainly neutralization of the HCl produced and precipitation of iron as $Fe(OH)_3$.

Anions or acid radicals of the salts used that form insoluble compounds with calcium and magnesium were fixed by the soils, but anions of salts that form soluble compounds with calcium and magnesium are not fixed by soils, at least not to any great extent.

Coarse particles of limestone may be present in soils where the fine material may be acid.

Fixation of basic ions or elements from salts, is not a distinguishing characteristic of acid soils.

The reaction between soils and chemical compounds, especially with reference to products found and soil fixation, depends chiefly upon the manner of dissociation of the compounds used for the treatments and the solubilities of the possible combinations. The magnitude of the reaction depends upon the quantity relationship between the reacting compounds.

C. H. S.

Studies on Active Bases and Excess Acids in Mineral Soils.

SPURWAY, G. H. *Michigan Sta. Tech. Bul.* 57, pp. 27, 1922.

The object of this research was to determine the neutralizing value of soils for acids and alkalis, using the hydrogen electrode as the end-point indicator. In the titration work, 10 gms. of soil were placed into each of several beakers, the number depending upon the range to be covered; 0.1 N equivalents of the different reagents used were added in quantities of one to 10 cc. and sufficient neutral, distilled water was added to each beaker to raise the liquid volume to 50 cc. Soils used :— medium sand, sandy loam, silt loam, clay loam and a miscellaneous series of soils. Reagents used : $Ca(OH)_2$, Al_2Cl_6 and HCl.

The neutralizing value of soils for acids and alkalis may be quite accurately determined and methods are given for this purpose. When soils are treated with $Ca(OH)_2$ the reaction proceeds slowly and comes to an equilibrium on P_H 7.00 with the quantity of $Ca(OH)_2$ required in at least 24 hours, but in the presence of an excess of $Ca(OH)_2$ an equilibrium was not obtained in three to eight days, indicating that this further reaction continues for a long period of time. $Ca(OH)_2$ forms salts with soil acids. A soil acid equilibrium may be obtained in about three hours in the presence of an excess of the acid, and this equilibrium is quite constant over a period of several days, showing that a rather sharp distinction may be made between reactive and inactive soil bases. Weak soil acids are split off when soils are heated with strong acids. There is a direct correlation between the base-acid ratio of soils and P_H. This base-acid ratio in soils is believed to be of great scientific and practical importance.

C. H. S.

The Decomposition of Organic Matter in Soils.

STARKEY, R. L. (New Jersey Agricultural Experiment Station). *Soil Science,* Vol. XVII, No. 4, pp. 293-314, 7 tables, figs. 5, bibliography. Baltimore, Md., 1924.

The author has investigated the decomposition of cellulose, dextrose, rice straw, alfalfa, dried blood, and a mixture of mycelium and fungus spores, in one and the same soil and in different soils, measuring the intensity of decomposition by the formation of carbonic anhydride. It was found that, in spite of what has been said to the contrary, this method is a good index of decomposition.

In the same soil, decomposition varies according to the various substances contained therein, and is very rapid in fertile soils. After two days, the following were eliminated as carbonic anhydride : 35 % of the dextrose carbon, 26 % of the alfalfa, 19 % of the mixture of fungi, 16 % of the rice straw, 7 % of the dried blood and 0.5 % of the cellulose. Decomposition attains its maximum during the first few days.

The speed of decomposition varies according to the substances ; the slowest is cellulose ; then follow rice straw, alfalfa, fungus mixture, and dried blood ; glucose is the most rapid of all.

Nitrates accelerate the decomposition of rice straw and cellulose, but have no effect on alfalfa. Rice straw tends to diminish the soluble nitrogen of the soil, whereas alfalfa and dried blood increase it.

Fertile, and almost neutral soils in general, decompose the organic matter more quickly than the less productive and the acid soils. The differences in the power of decomposition among the various soils, however, are not very great. A. F.

Methods of Studying Soil Acidity.

Tidmore J. W. and Parker F. W. (Alabama Polytechnic Institute). Methods of Studying the Strength of Soils Acids. *Soil Science*, Vol. XVIII, No. 4, pp. 331-338. Baltimore, Md., 1924.

The three methods : Truog's acidity, sugar inversion, and hydrogen-ion concentration, give similar results, which proves that the hydrogen-ion concentration in soil solutions is to a great extent caused by the acidity of acid silicates.

By maintaining a constant specific resistence and hydrogen-ion concentration, the presence of acid soils greatly increases the sugar hydrolysis, without the influence of the solid phase being observed. Probably it is a question of a hydrogen-ion concentration greater at the surface of the soil particle than in the solution. A. F.

Investigations on the Changes in Soil Solutions during the Plant-Growth Period on various Ploughed Fallow Soils.

Trofimoff, A. W. *Journal für landwirtschaftliche Wissenschaft*, No. 9-10. State Technical Publishers, Moscow, 1924.

The author has obtained soil solutions from various parts of the experimental field of the Moscow Agricultural Academy during a dry and a moist period of plant growth, by Prof. A. G. Dojarenko's "petroleum-emulsion method", and subjected them to a careful chemico-physical test by the same experimental method. The chief results may be summarised as follows :

(1) The concentration of the soil solution increases until the middle of the growth period, and decreases again towards the end. On absolutely fallow land the concentration is three times stronger than on recently ploughed land.

(2) The osmotic pressure, which is likewise 4-5 times greater on purely fallow land than on that recently ploughed, also attains its maximum during the growth period.

(3) The nitrogen content of the nitrate is likewise at its highest in the middle of the summer, and greater in purely fallow land than in recently ploughed land.

(4) The relative K, Mg and Ca content is equalised and causes a "buffering" of the soil.

(5) Anions are in excess of cations.

(6) The hydrogen-ion concentration was in all cases nearly neutral and was only occasionally inclined towards acidification, but always within the optimum limits for plant life. Goerner.

Soil Colloids, their Action on Lime and Bicarbonate of Lime.

Vincent, V. (Quimper). Emploi rationnel de la chaux et du calcaire dans les sols argileux ou acides. *Association française pour l'Avancement des Sciences.* Congrès de Bordeaux, 1923, pp. 1023-1025, published at Paris, 1924.

The combination of lime (CaO) with alumina (Al_2O_3) forms an insoluble tricalcic aluminate ; with gelatinous silica (SiO_2) an insoluble tricalcic silicate ; and with ferric hydrate there is no combination, but adsorption.

As regards the organic matter of the soil, there is a formation of humate with the acid part and a calcic combination with the nitrogenous hydrocarbon remaining, which may fix at the most 10 % of its weight of CaO.

In some soils, the proportion of CaO fixed per kg. of soil is 20 grams, whereas if calcium bicarbonate be applied the soil only retains 3 grams of CaO.

In the Brittany granite soils, the acidity determined by calcium bicarbonate is due almost entirely to the organic matter and not to alumina.

In practice, VINCENT advises the following applications : lime, to precipitate the colloids of a clay soil and thus make it easy to till and permeable to water ; limestone (carbonate of lime) to neutralise the acidity of a humous soil.

Soils are alkaline when the ratio : lime soluble in acetic acid : 1 % organic matter is about 9 %.

To Brittany soils of average richness in organic matter (30-40 grams per kg. of soil), 1200 kgs. of pure carbonate of lime, or its equivalent of 570 kgs. of lime, should be applied annually.

DR. PIERRE LARUE.

Effects of Lime on Decomposition of Soil Organic Matter.

WHITE J. W. and HOLDEN F. J. (Department of Agronomy, Pennsylvania State College). *Soil Science*, Vol. XVIII, No. 3, pp. 201-218, 1 bibliography Baltimore, Md., 1924.

The experience of forty years shows that there are no fundamental differences between the action of quicklime and that of crushed limestone on soil organic matter. Both substances, applied in quantities eight times greater than that used for calcareous soils, gave a considerable increase in nitrogen over that in soils not treated. There is no sign whatever of any destruction of organic matter by the quicklime, as might have been feared. Indeed there is a greater preservation of nitrogen and organic matter with lime (in the form of quicklime or limestone) than in soil not treated. A. F.

Method for Testing Artificial Fertilisers.

Methode zur Untersuchung der Kunstdüngemittel. Compiled and published by the German Fertiliser Manufacturers' Association (" Verein Deutscher Düngerfabrikanten "). VI. Edition. Publ. by F. Vieweg, Son & Co., Brunswick, 1925.

A laboratory book for chemists engaged in testing fertilisers.

SCH.

Biological Properties of Soils.

The Protozoan Fauna of the Soils of the United States.

Allison, R. V. (Rothamsted Experiment Station). *Soil Science*, Vol. XVIII No. 5, pp. 339-352, 1 fig. bibl. Baltimore, M., 1924.

The examination of a series of soil samples taken in various parts of the United States shows considerable uniformity in the distribution of the more important flagellates, ciliates and rhizopods. *Heteromia* sp., *Cercomonas* dop. and *Cicomonas* sp. were found in all of them; *Dimastigamoeba gruberi* in 95 %; and *Sainouron* in 65%. In general, the types of genera were similar to those met with in England.

As regards the quantity of protozoa present, on the contrary, the author obtained rather low figures as compared with those obtained in England; the ciliates especially were scarce or absent. The maximum number of flagellates was 10,314 and the minimum 15; and the amoebae varied from 3,114 to 22. In some cases, all, or almost all the protozoa were found in the cyst stage.

The following conclusions may be drawn: It is considered that the protozoa cannot act as a limiting factor, especially in conditions of partial sterilisation. Now, following on the author's investigations, the query may arise as to whether this depends, not on the lack of the capacity of the protozoa themselves to act as a limiting factor, but rather on their limited numbers, owing to which they can exert no decisive influence.

A. F.

The Density of Unicellular Organisms.

Allison, R. V. *Annals of Applied Biology*, XI, pp. 153-168, 1924.

When it is desirable to calculate the total mass of the micro-organic population of soil or other media, a knowledge of the density of cells, calculated from numbers and dimensions, is important. The author measures the rate of fall of unicellular green Algae (*Scenedesmus* sp.) in water and calculates the density therefrom by the formula of Stokes. The mean density of that organism was found to range between 1.07 and 1.15. The density of certain unicellular animals is also reported. By applying the formula of Hehner and Richmond to the values for density, the percentage of dry matter has been calculated.

P. H. H. Gray.

The Action of Protozoa on Bacteria when Inoculated into Sterile Soil.

Cutler, D. W. *Annals of Applied Biology*, X, pp. 137-141, 1923.

Proof that Protozoa are normal agents that keep down bacterial numbers in field soil is adduced in an experiment lasting 21 days wherein soil sterilised by intermittent steam is inoculated with:

(*a*) Bacteria alone;
(*b*) Bacteria and a species of Amoeba;

(*c*) Bacteria and a species of Flagellate, with the following results:

(*a*) Bacteria alone rose to 214 millions per gramme on the 6th day and maintained a level of 160-135 millions from 8-21 days.

(*b*) Bacteria with amoebae present rose to 177 millions at the 3rd day and fell to 66 millions on the 8th day, fluctuating between 70 and 30 millions up to the 21st day.

(*c*) Bacteria with flagellates present rose to 100 millions on the 7th day, fell to 50 millions on the 16th day, and fluctuated between 40 and 70 millions up to the 21st day.

Protozoa were in the active (trophic) form during the 15th-21st days of the experiment; the normal relationship between them and the bacteria thus appears to have been maintained.

P. H. H. GRAY.

A Quantitative Investigation of the Bacterial and Protozoan Population of the Soil, with an Account of the Protozoan Fauna.

CUTLER, D.W., Lettice M. CRUMP, and H. SANDON. *Phil. Trans. Roy. Soc. Lond.*, Ser. B., Vol. 211, pp. 317-349, 1922.

The results are given of 365 consecutive counts made daily, from July 5th 1920 to July 4th 1921 of the numbers of bacteria and of six species of protozoa in a normal field soil. The soil samples, consisting of a mixture of six cores 9'' deep, were taken from an experimental plot that annually receives 14 tons of dung per acre, two feet, separating adjacent cores so that variations in numbers of micro-organisms due to unequal distribution might be avoided. The bacteria and protozoa were counted by dilution methods, which are described, using THORNTON's count medium for the former, and CUTLER's technique for the protozoa. A summary of the complete data obtained is given in tabular form.

Both the bacteria and the protozoa were found to fluctuate greatly from day to day; these fluctuations could not be correlated with meteorological or soils conditions. Seasonal changes in the soil micro-organic population are found to exist in addition to daily variations in numbers. Both bacteria and protozoa were at their maximum at the end of November, and at a minimum during February. Temperature and rainfall were not found directly to influence these seasonal changes. A comparison is made between these seasonal fluctuations in field soil and similar changes occuring in aquatic organisms.

An inverse relationship was found to exist between the numbers of bacteria and active (trophic) amoebae in 86 % of the total observations. A two-day periodicity, more marked in March than in July 1921, was shown for the active forms of one species of soil flagellate, *Oicomonas termo*. Auto-intoxication is suggested as a possible cause for this periodicity at certain times of the year, but not for the whole period under observation.

P. H. H. GRAY.

On the Partial Sterilisation of Peat.

DEMOLON, A. (Laon) Association française pour l'Avancement des Sciences. Congrès de Bordeaux, 1923. Published in Paris, 1924, pp. 1025-1026.

Peat, after being heated for a quarter of an hour at 100°C, instead of a partial sterilisation of its microbic reactions, shows a super-activity in the form of an increased discharge of carbonic anhydride.

Why is peat passive in its natural state (before heating)?

The following are the results of M. DOLOMON's experiments:

1. The liquid with which the peat is impregnated contains no substances which obstruct microbial development.
2. Chemical antiseptics such as carbon disulphide, toluene and naphthaline remain inactive.
3. After boiling a culture, the microbial phenomena are intensified.
4. The acid reaction of peat in chalky soil is $P_H = 6.4$ to 6.8. No neutralisation takes place.

It is concluded that the poorness of the mass in nutrient elements prevents reaction in peat.

The results of heating are:

(*a*) The formation of ammonia in the cores of soil;

(*b*) the increased solubility of the mineral substances (0.30 gms. to 1.20 gms.), among which phosphoric anhydride (P_2O_5) and potash (K_2O) become soluble.

The addition of mineral fertilisers is therefore a primary condition for rendering peat soils productive. PIERRE LARUE.

The Influence of Nitrifying Bacteria on the Growth of Barley.

FRED, E. B. (University of Wisconsin). *Soil Science*, Vol. XVIII, No. 4, pp. 323-330, figs. 2. Baltimore, Md., 1924.

Growth tests on SHIVE solution, in which calcium nitrate was substituted by ammonium sulphate. In some of the pots a culture of nitrifying bacteria was added. The yield of barley in the pots to which the nitrifying bacteria were added was almost double that of the check. The beneficial influence of such bacteria is therefore proved. A. F.

Nitrification in South African Soils.

HALL, T. D. (School of Agriculture and Experiment Station, Potschefstroom). *Soil Science*, Vol. XVIII, No. 3, pp. 219-235, bibl. Baltimore, Md., 1924.

The author continues his investigations on the nitrifying power of 30 soils in the Transvaal, the partial results of which were published in this *Review* (Vol. XII, No. 4), and has now been enabled to draw the following general conclusions:

The factors which influence nitrification in the climatic conditions observed by the author, more than the temperature, are moisture and aeration. The seasonal changes show that there is a production of nitrate which would be sufficient for the majority of the crops in such types of soil, and this explains the small effects obtained with nitrate fertilisers.

It appears that the drying of the soil in the winter season, and the frosts also, increase the nitrifying power when conditions become favourable again for nitrification. Nitrification is scarce in samples taken at a depth of about 30 cm. and is almost nil at a depth of 1.80 m.

In acid soils also nitrification is good and not improved by the addition of lime. It was also satisfactory, except in two cases, in soils under tobacco, in which the subsoil nitrifies better than the surface soil.

A. F.

Investigations on Azotobacter.

NIEMEYER L. Azotobacter Studien. *Botanisches Archiv*, Vol. VII, Parts 5-6. Königsberg, 1924.

The author's investigations are divided into two parts. In the first the problem is considered from the ecological and the botanical-geographical point of view. The subject of these preliminary investigations is the diffusion of *Azotobacter* in the various soils and the conditions necessary for its development. In the second part the problem is considered from the morphological point of view and its historical development.

The presence of *Azotobacter* in soil is mostly influenced by the aeration and chemical reaction of the soil. *Azotobacter* was found in 54 % of the soils analysed, the acidity of which was determined by the WHERRY method.

The limit of soil acidity concomitant with the presence of *Azotobacter* was found by the author to be P_H 5, whereas that of alkalinity could not be determined in the soils examined.

Azotobacter was found in 74 % of cultivated soils. Those in which it was impossible to detect the presence of *Azotobacter* all showed less than P_H 5.5 of acidity.

The difference in percentages as regards uncultivated and cultivated soils respectively, is due to the fact that among the first some showed clearly acid reactions, and others, though from a biochemical point of view fulfill the conditions necessary for the development of *Azotobacter*, were found to be insufficiently aerated. Tilled soils are aerated by ploughing and only in exceptional cases do they show acid reaction.

Azotobacter was also found in roads ; newly formed fields may therefore be easily infected. *Azotobacter* was likewise found in the Islands of Juist and Heligoland, as well as in the waters of the North Sea, some yards from the shore (Juist Island).

As regards morphology and the history of the development of *Azotobacter*, the experimental material was supplied by two species from Muenster and Juist ; they presented no appreciable morphological difference. The pigmentary formation was found to be more marked in the Juist than in the Muenster species. In neither case was it possible to establish any relation between the lime content of the soil and the formation of the pigment.

In the Muenster cultures, cells free from glycogen were observed, these cells having appendices of rod-like from, which, as regards colouring matter and reagents, behaved like the cells themselves. No further development of such formations was observed and their importance seems doubtful.

In the works of LÖHNIS and SMITH *Azotobacter* is studied under several forms, which may be classified in 3 distinct groups: (1) Developed forms; (2) Regenerated forms; (3) Symplastic and combined forms.

A. F.

Bacteria which fix Nitrogen in Vesuvian Soils.

RICCARDO, S. (Institute of Agricultural Bacteriology in the Royal Higher School of Agriculture, Portici). First contribution to the knowledge of bacteria which fix nitrogen in Vesuvian soils. *Annali della R. Scuola sup. di agricoltura in Portici*, Series II, Vol. XVIII, pp. 1-50, figs. 3, bibliography Portici, 1923.

The object of this work is to examine the result of a successive application of schizomycetic species in Vesuvian virgin and sterile soils before the growth of algae, lichens and mosses. From the results, on the completion of the investigation, it will be possible to determine whether or not there exists a succession of those pre-eminently agricultural processes (putrefaction, nitrification, denitrification, fixation of nitrogen) and also whether there are soils in which such process do not take place.

In the Vesuvian plain soils, besides *B. amylobacter*, there are many rounded forms which must in all probability be classed with the so-called nitro-bacteria; on the other hand the nitrogen fixers are absent or extremely rare at a height of 310 m. and also of 878 m.

Six species of nitrogen fixers were isolated; one of these, an anaerobe, corresponds to *B. amylobacter*, hence it may be concluded that the anaero-nitro-bacteria come within the group of such bacteria; investigations must be made however in order to discover whether the other types isolated at various heights are in every respect identical with the type isolated on the said plain and heights.

Among the other species having the common quality of fixing nitrogen and of being aerobic, three belong to the schizomycetes and two, most probably, to the *Mycoderma* genus. The systematic position of these species and the relations between them and those considered as belonging to the *Azotobacter* genus will form the object of further research.

A. F.

The Streptotriceae of Vesuvian Soils.

RICCARDO, S. (Institute of Agricultural Bacteriology, Royal Higher School of Agriculture, Portici). *Annali della R. Scuola sup. di Agricoltura in Portici*, Series II, Vol. XVIII, pp. 1-14. Portici, 1923.

In the Vesuvian soils which were most affected by the action of the cinders of the 1906 eruption, the streptotriceae are not numerically great.

The author has isolated a species which may be considered to be *Actinomyces chromogenes Gasparini albus* L.; e. N.

It has no pathogenical power but seems to have a certain capacity to fix nitrogen. A. F.

Some Protozoa from Soils Collected by the " Quest Expedition " (1921-1922).

SANDON, H. and CUTLER, D.W. *Journal Linnean Society Zoology* XXXVI, pp. 1-13, 1924.

Soils collected from widely distributed localities in the Atlantic Ocean, (St. Paul's Rocks, South Georgia, St. Vincent, Elephant Island, Tristan da Cunha, Gough Island, St. Helena and San Miguel, Azores) were found to contain types of Protozoa mostly identical with those found in English soil and soils from other parts of the world. The soils which had been cultivated for many years contained the richest protozoan fauna. A total of 92 species were identified. P. H. H. GRAY.

On the Development of a Standardised Agar Medium for counting Soil Bacteria.

THORNTON, H. E., *Annals of Applied Biology*, IX, pp. 241-247, 1922.

In order to make an accurate estimate of fluctuations in the numbers of soil bacteria, a medium is required which will give constant results, be reproducible at different times or by other workers, and allow in a single soil suspension the development of numbers differing only within the limits of random sampling variance. This constancy in results with a plating medium depends mainly upon the following factors:—

A. The composition of the medium must be constant.

B. There must be little interference between developing colonies; *e. g.* rapidly spreading colonies must be checked.

C. The growth of fungi must be kept down.

D. There should be only slight variation in hydrogen-ion concentration. Reproducibility has been obtained for the medium by the use of pure chemical compounds and such constituents as will not change appreciably the reaction in an agar substrate. The medium here developed also represses the rapid growth of *B. dendroides* over the surface of the agar by reducing its rate of multiplication, and the development of fungi is considerably checked.

The medium has the following composition:

K_2HPO_4	1.00 gm.	KNO_3	0.5 gm.
$MgSO_4 7H_2O$	0.20 »	Asparagine	0.5 »
$CaCl_2$	0.10 »	Mannitol	1.0 »
NaCl	0.10 »	Agar	12.0 »
$FeCl_3$	0.02 »	H_2O to	1000 cc.

The method of its preparation can be carefully standardised in order to produce comparative results. The following technique was finally adopted. The K_2HPO_4, KNO_3, and asparagine are dissolved in distilled water; the $MgSO_4$, $CaCl_2$. NaCl and $FeCl_3$ added from standard solutions in the order named. The agar is then added and dissolved in the steamer at 100°C.

At this temperature the medium is filtered by passing it twice through a layer of cotton wool. To the filtrate the mannitol is added: at 60°C. the reaction is adjusted to P_H 7.4 with Brom-Thymol Blue, and the tubed medium is sterilised for 15 minutes at 15 pounds pressure. The optimum temperature and time for incubation with this medium is found to be 20°C. for 10 or 12 days. P. H. H. GRAY.

Soils and Vegetation.

Deficiency in Nitrate caused by the Application of Wood Waste.

ARRHENIUS, O. Ett fall av nitratbrist åstadkommen genom inblandning av träavfall. Medd. 276 från Centralanstalten för jordbruksförsök.

The author describes an instance of a market garden which was completely ruined by a "compost" of wood shavings. Cucumbers, tomatoes, lettuce, strawberries, etc., showed evident signs of deficiency in nitrate and finally perished.

An application of nitrate fertiliser prevents this result. Frequent dressing with nitrate in solution is suggested. A.

Soil Reaction and Yield.

ARRHENIUS, O. Markreaktion och skördeutbyte. Medd. 278 från Centralanstalten för jordbruksförsök.

The author shows that the various cultivated crops have different requirements as regards soil reaction. Various growths of the same species of plant even may show differences. That the results of the pot-tests are also applicable to field crops is proved by field tests.

The author proposes the following methods for utilising to the utmost the results obtained:

(1) To cultivate those plants which respond to soil reaction;

(2) In special cases to adapt soil reaction to the plants it is desired to cultivate;

(3) As a third possibility it is proposed to use various kinds of plants on different types of acid soils. A.

Recent Investigations regarding the Utility of Stable Manure Nitrogen in Field Soils.

BARTHEL Chr. Nyare undersökningar rörande stallgödselkvävets utnyttjande i åkerjorden. *K. Lantbruks Akad. Handl. o. Tidskr.* 1925.

The author refers to earlier observations, and shows that the increase in the number of micro-organisms, which should result from stable manuring, probably has no influence on the microflora of the soil, for the proportion of the microflora is generally already established.

The author would therefore attribute to stable manure not a direct, but an indirect biological influence.

Tests made at the Swedish Central Agricultural Station show that the ammoniacal nitrogen in stable manure is nitrified during the first year. The organic nitrogen on the other hand dissolves very slowly, as was proved by tests with stable manure freed from ammonia. Stable manure therefore is a very important source of nitrification only during the first year.

For decomposing cellulose, ammoniacal nitrogen is of much greater importance, as was shown by BARTHEL and BENGTSSON. This therefore is another indirect influence of stable manure and not, as was formerly believed, an accelerated decomposition of cellulose through the importation of cellulose-fermenting organisms. A.

Soil Acidity and its Relation to Ammonification and Nitrification of Woodland Soils.

CLARKE, H. R. (*Oxford Forestry Memoir No.* 2). *The Indian Forester*, Vol. L, No. II, pp. 580-593. Dehra Dun, U. P., India, 1924.

The close relation between the plant and its habitat is well known and that the reaction of the soil is an important factor in plant distribution, the growth of each type of plant being most successful within a specific reaction.

The total acidity of a soil is a quantity factor, measured by the amount of the base required to combine with the whole amount of acid present. The active acidity of the soil, the concentration of hydrogen-ions, is, on the other hand, a measure of the intensity factor of soil acidity.

In correlation between soil types and forest types and plant associations, the activity of the microflora of the soil is a significant factor. The organisms which bring about ammonification and nitrification are of great importance, and a study of these bacteria with regard to hydrogen-ion concentration is of value.

The author in his studies employed GILLESPIE's method for estimations of hydrion concentration, and HUTCHINSON and MCLENNAN's to determine the lime requirement. The estimation of ammonia was made by MATTHEW's method, and the determination of nitrates by means of phenoldisulphonic acid.

A definite relationship was found between the lime requirement of a soil and its organic content. The *p*H value of a soil growing a forest is least acid when the forest is in full growth. The accumulation of ammonia is greater in very acid soils than in slightly acid or neutral soils. The ammonia of a very acid soil is liable to rapid fluctuation. Nitrate is present in measurable quantities in very acid soils and is apparently independent of reasonal changes, under the conditions of the author's investigations, in which the soils studied were taken from woodland.

W. S. G.

The Effect on Crop Yield of Mixing Light Sandy Soil with Meadow Marl, Low Moor and Clay Soils.

GERLACH. *Landw. Jahrbücher*, Vol. 61, p. 153. Berlin, 1925.

The author's investigation on this subject in Mocheln and Bromberg showed that in general the very beneficial influence of meadow marl, clay and low moor soil on unfertilised plots is greater than on fertilised. On the other hand the deleterious effect of an admixture frequently becomes very evident, especially on unfertilised plots. The advantage of such mixing, from results obtained in Mocheln, seems somewhat doubtful, but the results obtained in Bromberg were rather more favourable. By the use of clay and low moor soil the deposit seems to be improved, yet the result in this direction are not uniform. Meadow marl, clay and low moor soil should act directly as a fertiliser on the light sandy soil, poor in nutrient substances. It must also be considered that soil reaction is greatly influenced by these additions.

In any case, only after the question of the advantage of the process has been proved, can it be decided whether, and to what extent, the admixture of certain substances to a sandy soil is advisable.

NIKLAS.

Effect of Salts on the Intake of Inorganic Elements by the Plant.

HOAGLAND, D. R. and MARTIN, J. C. *University of California, College of Agriculture, Technical Paper No.* 8, pp. 26, tables 7, figs. 5, bibliography. Berkeley, Cal., 1924.

The authors carried out a series of experiments to study the effect of alkali soils or solutions on the chemical system of the plant, in order to obtain a better understanding of the relation of the plant to the medium in which it grows. The experiments were made on barley, beans, peas and pumpkins. Attention is drawn to the variation of the effects of salts on plants according to environment, temperature, humidity, etc.

Sodium chlorine and sodium sulphate tended to decrease the absorption of calcium, magnesium and potassium. When sodium chloride is used, sodium and chlorine may be absorbed and stored by the barley plant in relatively large quantities. In the case of sodium sulphate, the sulphate ion is removed less rapidly from solutiont han the chlorine ion ; this is true for barley, cucumber and melons.

Observations were made on the effect of salts on the reaction and buffer systems of barley, peas and pumpkins. Rapid and extreme changes in the reaction of the sap expressed from the roots were caused by the addition of sodium bicarbonate to the culture solution. Calcium chloride produced changes in the reaction and buffer effect of the plant juices. Barley and pumpkins were influenced in opposite directions. Neutral sodium salts caused slight changes in reaction and titration values. Sodium nitrate increased the alkalinity of the root sap, with accompanying injury similar to that induced by sodium bicarbonate.

A brief general discussion of certain phases of alkali injury to plants is given. W. S. G.

The Natural Increase of Metal Salts and other Inorganic Compounds in Plants.

Von LINSTOW, O. *Die natürliche Anreicherung von Metallsalzen und anderen anorganischen Verbindungen in den Pflanzen.* Verlag des Repertoriums, Berlin-Dahlem, Fabeckstrasse, 49, 150 pp., 1924.

This work reviews the plants which are associated more or less to a soil of a definite chemical composition, or at least prefer such a soil, and further indicates those plants which are enabled to draw from or to increase one or more of the constituents of such a soil. SCHUCHT.

The Effects of Additions of Nitrogen, Phosporus and Potassium on Nitrogen Economy.

MORRIS V. H. (Ohio Agricultural Experiment Station). *Soil Science,* Vol. XVIII, No. 2, pp. 87-97, bibl. Baltimore Md., 1924.

Nitrogen is one of the most important plant constituents, it is the most costly, and is also easily lost in leaching. Hence the great utility of investigations directed towards preserving the nitrogen left in the soil, and the most scientific method of its application.

Tests covering a period of 30 years in a fine sand and silt soil, with quinquennial rotations of maize, oats, wheat, clover and *Phleum pratense*, have shown an average loss of 22 % of the original supply of nitrogen. Plots treated with lime lost similar quantities of nitrogen to those which were not treated ; in the last 10 years the loss was greater even, in those treated.

The use of fertilisers (potassium chloride and acid phosphates) resulted in a preservation of nitrogen directly proportional to the increased yield due to the fertilisers themselves. In this case the lime increased the quantity of nitrogen preserved by applications of fertiliser. A. F.

A Critical Enquiry into the Alleged Fixation of Nitrogen by Green Algae.

BRISTOL MURIEL, B. and PAGE, H. J. *Annals of Applied Biology,* X, 378-408, 1923.

WANN's conclusions that Green Algae were capable of assimilating free nitrogen from the air in the presence of nitrates and glucose, were tested with pure cultures of four species of Green Algae under conditions almost identical with those used by WANN (*Amer. Journ. Bot.* VIII, 1-29, 1921). The method of chemical analysis used by WANN for media containing nitrates is shown to be faulty, and the probable source of error is indicated.

In this experiment the average percentage recovery of nitrogen was or the cultures 99.28 per cent., and for the controls 99.25 per cent.

P. H. H. GRAY.

Relation of Soil Moisture and Available Nitrogen to the Yield and Protein Content of Wheat.

NEIDIG A. E. and SNYDER R. S. (Idaho Agricultural Experiment Station). *Soil Science*, Vol. XVIII, No. 3, pp. 173-179. Baltimore, Md., 1924.

The results of the authors' previous investigations were that, moisture is the chief factor in wheat production and also as regards protein content, provided that sufficient nitrogen is available. The present investigations prove that a high percentage of moisture in a soil containing sufficient available nitrogen, gives an abundant wheat yield with a high protein content. If on the other hand, under the same conditions, the moisture is deficient, there is a lower yield, but with a still higher protein content. This last factor may be attributed to grain shrinkage.

If, with good moisture conditions, the nitrogen is insufficient during the period of heading and ripening, but high during the first periods, there is an abundant yield with a low protein content. If, on the other hand, while nitrogen remains the same, the moisture is deficient, the yield is low and the protein content varies with the amount of grain shrinkage.

Under natural conditions, abundant rains evenly distributed over the growth period, with an average soil, give a high yield with a low protein content ; in the same conditions, with a very fertile soil, there is a high protein content if the nitrogen was available throughout the life cycle of the plant. A soil in which wheat is continually grown produces a larger yield of grain when rains are plentiful, especially if these are scarce during the heading and ripening period. In general to obtain an abundant yield of good quality, suitable conditions as to soil moisture and high fertility are necessary

A. F.

The Importance to Plants of Nutritious Soil Substances with Interchangeable Bases and the Influence of Lime on Absorbent Soil Substances.

NOSTITZ, A. *Landw. Versuchsstationen*, 103, 159, 1925.

The author's investigations led to the conclusion that when an interchange of bases is impossible, the nutrient substances combined with bases can only assist the roots by attacking the absorption agents, whereby at the same time the absorptive power of the soil is weakened. This reaction proceeds rather quickly so long as zeolitic substances saturated with bases are present, but this easily attackable part is small. In field soils there are scarcely any aluminium silicates combined with bases available ; hence without an interchange of bases the available absorbent nutrient substances of the soil are not sufficient to ensure abundant nutrition. A corresponding carbonic acid-lime content of the soil acts as a buffer, in the sense that it prevents the decomposition of the zeolitic aluminium salts containing water, and thereby the soil's power of absorption is better ensured.

NIKLAS.

Injury caused to Plants by Mixing Sawdust with the Soil.

SOEDERBAUM, H. G., and BARTHEL, Chr. Inverkan på växtligheten av träavfall i jorden. *Medd.* 271 från Centralanstalten för försöksväsendet på jordbruksområdet.

During the war, sawdust was generally used as a stable-litter ; it is still so used to a great extent in the sawmill districts of Sweden.

The authors show that arrest in plant growth took place through applying sawdust to sandy soil, 2 % of cellulose completely stopping the nitrification of an otherwise normally nitrifying soil. This stoppage was of long duration. It is not caused by resins or similar substances, but is more probably due to the capacity of cellulose compounds to use up the nitrates.

If the cellulose in the soil is destroyed nitrification is resumed.

The arrested growth phenomena can be eliminated by the use of a nitrate fertiliser. A.

Nomenclature, Classification and Mapping.

The Importance of Soil Maps in Agriculture.

NIKLAS, H. *Illustrierte landw. Zeitung*, 45, 37, 1925.

After describing the development of soil-mapping in various countries, the author points to the importance in practical agriculture of representing the soil on a strictly scientific basis, especially as regards the estimation of soil and agricultural statistics, in which connection the author refers to his own extensive works on this subject. H. NIKLAS.

The Foundation of Soil Mapping.

TILL, ALFRED, Vienna. With 2 sketch-maps in the text. pp. 95, Publ. by L. W. Seidel u. Sohn, Vienna, 1923.

The author divides soil science into analytical, dynamic and geographical pedology, and in this booklet treats of the importance and utility of soil-mapping. The work should lay the foundations for the beginning of soil-mapping in Austria. Contents : The search for a Natural Soil System ; Classification of Soils ; Soil-Mapping. SCHUCHT.

Synoptic Agropedological Map of the Czechoslovakian Republic.

Drawn by Prof. J. KOPECKY and Eng. J. SPIRHANZL. Prague, 1924.

Dividing the soils of the Czecho-Slovakian Republic according to texture into 8 types, the authors have drawn up a clear soil map, 100 × 48 cm. (explanations in Czek and French). The soil types are :

(1) Heaviest clay soils ;
(2) Heavy clay silt soils ;
(3) Cohesive sand-clay soils ;
(4) Ordinary silts ;
(5) Friable sandy silts ;
(6) Silty and humous sands, easily disaggregated ;

(7) The lightest quicksands ;
(8) Shallow stony soils, covered with forests.

This map is very useful to persons tudyingthe Czechoslovakian soils.

L. SMOLÍK.

Regional Soil Science.

Investigation of Soil Strata in White Russia.

AFANASSIEW, A. *Zeitschrift des landwirtschaftlichen Instituts Gorky.* Vol. II, 1924 (*Journal of the Gorky Agricultural Institute*).

The author reviews the soil types which go to make up the soil of White Russia, and the history of their formation during the Diluvial and Alluvial Periods. The results are summarised in the following general review of the soil strata :

I. Upper layer : Gravelly sand and sand without gravel (1 m.) ; or loamy sand (1 m.) ; or loess loam (0.30-1 m.) ; or loess (10 m.) ; or loam without gravel (up to 0.05 m.).

II. Middle layer : Gravelly coarse sand (0.1-1 m.).

III. Subsoil : Moraines, the upper sections of which contain gravel, or, in the neighbourhood of loess, humus formations (0.5-1 m.). At Gorky there are two, and at Vitebsk three moraines, one over the other, which are divided by 12-15 m. of very coarse sand. HELLMERS.

The Composition of some Sudan Soils.

JOSEPH, Dr. A. F. (Wellcome Tropical Research Laboratories, Khartoum). *Journal of Agricultural Research*, Vol. XIV, Part 4, pp. 490-497, tables 5, bibliography. London, 1924.

The article records the mechanical and chemical composition of some typical soils of the Sudan, e. g. (*a*) river flood alluvium brought down from the Abyssinian hills by rapid rivers and deposited in certain parts of the eastern Sudan ; (*b*) " Badob ", loess or cotton soil, an important area of which is the " Gezira " lying between the Blue and White Niles ; (*c*) Khor Soils, deposited in the beds of streams running only in the rainy season ; (*d*) Goz soils, reddish in colour and with a high percentage of sand, and a clay content of 5 to 50 % ; (*e*) Blue clay soils, found in the upper reaches of the White Nile, and which may contain as much as 75 % clay.

None of the above types are common in temperate climates ; they appear to be associated with large uniform plains having only the gentlest slopes. They are all alkaline and the organic matter rarely exceeds 1 % ; nitrogen is usually less than 0.05 %, phosphoric oxide extracted by 20 %, boiling hydrochloric acid varies between 0.1 and 0.2 %, in samples from the first foot of soil.

The Gezira badob soil alone contains particles above 2 mm. in diameter and these consist mainly of calcium carbonate. The coarse sand fraction consists of silica, except in the Gezira soil, in which it consists of 80 % of calcium carbonate. The fine sand fraction is mainly silica with

A mechanical analysis of the above soils gave the following results:

Type	Flood alluvium	Badob	Khor soil	Goz soil	Blue clay soil
Locality	Kassala	Gezira Blue Nile	Um Ruaba Kordofan	Abu Haraz Kordofan	Nasser Upper Nile
Colour	light brown	dark brown	black	red	slate blue
Stones and gravel %	0.0	2.7	0.0	1.1	0.0
Coarse sand %	5.4	10.0	1.7	31.9	5.2
Fine sand %	15.7	19.2	15.2	34.8	13.4
Silt %	32.2	10.8	15.1	2.8	13.8
Clay %	46.7	57.2	68.1	29.5	67.6
Soluble salts %	0.028	0.100	0.035	0.005	0.029
*p*H	8.3	9.4	8.1	8.5	8.5

about 15 % basic oxides, except in the case of the Abu Haraz red soil where it is 98 % silica.

The clay fractions from Gezira, Um Ruaba and Nasser blue clay contain about 48 % silica and 38 % basic oxides. The clay from Kordofan red soil has 42 % silica and 45 % basic oxides.

It appears that a very important factor in determining the plasticity of a clay is its composition as shown by the molecular ratio of silica to alumina.

W. S. G.

Ukrainian Soil Investigations.

I. Prof. G. MAKROFF. (Origin and evolution of Ukrainian soils). *Vistaik Silsko-Gospodarskoi Naouk* (1) Vol. III, Nos. 3 and 4, pp. 6-22, map. Kharkov, 1924.

II. Prof. V. KROKOS. (Loess and fossil soils of South West Ukraine). *Ibid.*, pp. 22-31.

I. — The author refers to the work of Prof. DOKUTCHAEFF, whose researches on Russian soils and particularly on the origin of tchernozem, have become classic; he was the first to establish the method of natural zone classification, based on the conformation of the ground, and to seek the explanation of the origin of the soils in the influence of climatological, orographical and biological conditions. Prof. DOKUTCHAEFF's method has been largely followed in Russia and a series of valuable researches have since been made. Unfortunately these investigations have always been limited to a restricted area, and an extended survey over a region large enough to lead to wide general views, has not been possible until recently.

The author has succeeded in supplying this deficiency, thanks to the mission which was entrusted to him in 1921 by the Ukrainian Scientific

---

(1) *Journal of Agricultural Science*, published by the Scientific Agricultural Committee of Ukraine.

Agricultural Committee, and has been able to make a detailed examination of Ukrainian soils and to draw up a pedological chart. This investigation is not yet completed, but the author believes he has already obtained certain results which are not without interest and which are given in this article.

In the description of the Ukrainian soils, the author states that the country is divided into two climateric regions by the line of a barometric maximum which crosses the country from east to west, following a curve touching the towns of Kharkov, Poltava, Krementchoug, Kamenetz and Podolsk. To the north of this line the atmospheric precipitations are greater, and have an annual average of 500-600 mm. The summer is less warm and dry, the temperature more constant, with narrower deviations between maximum and minimum and the prevailing winds blow from the west; the climate of this region is termed a *cyclonic climate*. To the south of the barometric line the climate is dryer, with wider deviations between minimum and maximum temperature, and the prevailing winds come from the east. This is a *monsoon climate*.

From the orographical point of view, the author mentions the high land in the Provinces of Volhynia and Podolia which slope northward to the Pripet, eastward to the Dnieper and southward to the shore of the Black Sea. A second chain of high land forms the left bank of the Dnieper, a third, the Donetz chain (Kriaj), which joins the Berdiansk-Mariupol plain. The principal lowlands are those of the Pripet and Dnieper valleys, as well as the steppe, which forms the shore of the Black Sea, of which the lowest part is the North Tauride steppe.

The high lands are characterised by a moister and colder climate whereas the valleys have a warmer and much dryer climate.

The principal bed-rock on which the soil through the country has formed, is a loess of eolian origin, the upper layers of which afterwards become transformed into tchernozem, owing to the accumulation of plant residues which have supplied the humus.

The author distinguished three different kinds of loess: (1) sub-sand and sub-clayey loess of the northern region, which contains 82 % of SiO_2, 10 % of Al_2O_3 and 4 % of oxide of iron. This loess is very porous and of a very pale straw yellow. (2) The loess of the middle region is sub-clayey and contains 70 % of SiO_2 and 14 % of Al_2O_3. (3) The loess of the southern region is decidedly clayey and of a dark straw yellow, and contains 65 % of SiO_2 and more than 15 % of Al_2O_3.

In the regions of the north-west, towards the valley of the Pripet, at present covered with forests (called the Poliessia region), the upper layers of loess have become metamorphosed into podzol, marshy podzol and peat. In the whole of the remaining territory of Ukraine the upper soil layers are formed of tchernozem.

The northern zone, above the line of the barometric maximum, was at a certain epoch covered with forests, especially in the hilly region, whereas the steppes of the south supported only herbaceous vegetation. This is the cause of the difference observed in the qualities of tchernozem and in the thickness of the beds in these two regions. The author describes five tchernozem zones, characterised by different qualities and thicknesses of soil:

(1) The northern zone, of which the tchernozem contains 4-5 % humus, the soil being slightly clayey and the carbonates it contains being in the form of lublinite.

(2) The zone rich in tchernozem, of forest origin, and which extends southward as far as the line of the barometric maximum, the southern limit of the ancient forests. The tchernozem layer here has a depth of 150 cm., and contains from 5-6.5 % of humus; the soil is sub-clayey and the carbonates are also in the form of lublinite.

(3) The zone of the ordinary tchernozem, immediately to the south of the barometric line is characterised by a dryer climate. The soil is clayey and sub-clayey and contains 6.5-7.5 % of humus, but the depth is not more than 100 cm.; the carbonates are of two forms, lublinite and "biloglazka", the former being characteristic of a moister, and the latter of a drier climate. This zone extends in the direction of the Sea of Azov. But the area extending from the littoral for a distance of 100 kilometres from the coast, to the Donetze chain, shows a certain difference in the soil formation; the tchernozem is only 90 cm. in thickness and contains only 5 to 6 % of humus, and the carbonates, though present in both forms, contain more "biloglazka".

(4) The southern zone towards the west, the steppes of the Black Sea, is characterised by a soil 70-80 cm. in thickness containing 5-6.5 % of humus, with carbonates in the form of "biloglazka".

(5) The zone of the shore of the Black Sea, lower and dryer than the preceding one, has a layer of tchernozem from 40 to 50 cm. in thickness, which becomes more and more saline as it approaches the coast.

When discussing the question of origin, the author gives the different points of view respecting the causes of forest growth in the northern zone, whereas the steppes, to the south of the barometric line, had only herbaceous, though very abundant vegetation. Apart from the influence of a moister climate, certain scientists have tried to explain this fact by assuming the existence of an older plant evolution, the northern zone having emerged from the sea long before the southern steppes; others explain the fact by the excessive salinity of the southern soils, of which the saline solutions are more concentrated in consequence of the dryness of the climate. The author does not exclude the influence of these factors but considers the true explanation to be a combination of climateric, orographical and biological causes; in his opinion, *the northern zone has always been a region of more intense plant and animal life, owing to the conditions of conformity, climate and sub-soil there ruling.* This view is supported by the innumerable mole-hills with which the soil of this zone is covered, though the rodents which made them were afterwards driven southwards by the forest-growth. The latter has caused great humification of the upper layer of the soil, which in turn has given rise to the formation of soluble organic substances in the sub-soil, under the influence of which the breaking down of the silicious parts of the soil has taken place.

With regard to the degree of salinity of the soils of the southern zone and the plain regions, the author considers that the horizon of conglomeration of the soil at certain depth, may serve as a characteristic index for the degree of salinity. The conglomeration horizon is found at a depth of 10-30 cm. in the low plains, 40-60 cm. in the ancient forest zone, 40-50 cm. in the (ordinary) tchernozem and 80-90 cm. in the southern steppes.

In conclusion, the author again refers to the subject of Ukrainian loess and notes certain of its typical charactiristics. This soil is always intersected, at a certain depth, by sedimentary, beds, which divided the loess into several layers. The author considers that these layers are generally four in number; their number increases towards the south and diminishes towards the north, on approaching the ancient regions of glaciation. The beds which separate the superposed loess sections are generally of fossil soil; in the north, in the region of the ancient glacier of the Valley of the Dnieper, the layers of fossil soil are placed above the moraine. To the south of the glaciation region the fossil soils belong to the type of forest clays. In the southern steppe, the fossil soil has no trace of alluvial horizon.

II. — The article by Prof. V. KROKOS completes the above investigation by giving the result of the investigations made at a depth to investigate the stratification of the loess and the process of its formation. By means of borings to a depth of 18 metres, which however did not reach the tertiary rocks, the author observed that the loess layer is composed of at least four stages of which the deepest are separated by layers of fossil soil, while the last but one is separated from the last, by a layer of fossil soil and a deposit of moraine. The author explains the formation of these layers by the alternate advance and retreat of the Dnieper glacier. The four layers of loess would therefore correspond to four succesive periods of glaciation. In receding, the glacier formed torrents of melted snow which carried away numerous small rock debris; the moraines formed by these torrents afterwards disintegrated, and the wind, carrying away their dust, left deposits which by accumulation gave rise to the layers of loess. Indeed, the chemical analysis of the loess and the moraine below the first layer of loess, proved them to be of very similar chemical composition. The author explains the absence of moraines between the lower sections of loess by their complete disintegration and subsequent removal by wind. The moraine between the first (upper) and the second layer of loess remained intact, because at that period the great Dnieper glacier receded further, dividing into several small glaciers, and the light local winds which prevailed at that period could not entirely disintegrate the masses of rocks brought down by their torrents. The analysis of the loess revealed another interesting particular: the SiO_2 content decreases in all the layers of loess in proportion to their distance from the valley of the Dnieper; this indicates that, during the accumulation of the loess a coarser substance than the dust of the moraines intervened, transported by the winds coming from that valley.

An examination of the layers of fossil soil which separate the layers of loess reveals the fact that all three layers are composed of ancient black soils, analogous to the present tchernozem, but which have lost most of their humus. The upper layer still remains a dark coloration, and is found at a depth of 3.2 metres; the second layer, situated at a depth of 9.4 metres, is much lighter in colour, and the third layer, at a depth of 9.1 to 16.3 metres is light yellow and rich in carbonates. The humus content of these layers is very slight, varying from 0.5 to 0.7 % which decreases with their depth. The carboniferous layers contain much more CO_2 than humus.

The first layer is a little less than 100 cm. in thickness, whereas the other two are more than 100 cm. in thickness. These thick layers of ancient tchernozem show that formerly the steppe had a more humid climate than at present, and that it was always covered with luxuriant vegetation. G. Z.

Geological Observations on the ancient Soils of Mt. Pisano.

MASINI, R. *Bollettino della Società geologica italiana*, Vol. XLII, Part 1, pp. 68-108, figs. 4, 1 map. Rome, 1924.

Mount Pisano is of an elliptical shape divided into two parts by the Valley of S. Maria del Giudice ; the eastern part is formed of ancient soils, the western of more recent soils ; they are connected by the hill of S. Giuliano, whence runs the Lucca-Pisa pass.

The rocks of the ancient soils of Mt. Pisano may be divided into conglomerates and pudding-stones (some varieties with pebbles), gravel-stones more or less quartzitic, often laminated and schistose, and schists properly-so-called. A general characteristic of all these soils is the almost total absence of lime.

The decomposition of the schists and occasionally of the semiochreous gravel-stones gives rise to the red and white soils.

In some places (Fosso del Mulino, Rio Borello, Rio delle Macine) there is a graphitic anthracite, very fragile and heavy and difficult to burn.

The layer of the soil of Mt. Pisano is uniform, and is probably an instance of a long, continuous series, formed at the expense of an ancient excrescence of granite rocks, or something similar to granite. As regards age, it does not seem to be much below the carboniferous, nor is there so far. any reason for concluding that the deepest part is Silurian or Cambrian.

The conglomerates, pudding-stones and those varieties of gravelstone which are most adapted to stone-cutting, are known as " verrucano " (oil-mill stone) in the Province of Pisa, and as " pietra bigia " (grey-brown stone) in the Provincie of Lucca. Other local names are " pietra salina " for the more granular gravelstone and " lucciche " for the conglomerate.

A. F.

The Soils to the East of the Catria Range.

PRINCIPI, P. Studio del terreno ad est della catena del Catria. *Bollettino della Società geologica italiana*, Vol. XLII, Part. I, pp. 36-46, 1 table. Rome, 1924.

Pink limestone and pink schists give rise to the heights known as Monti Bambino, Campifobio, Mezzano, Morcia, Spicchio, Comunelle, Vincione, Croce della Serra, Calvello Venatura, Valdolmo di Stavellina, di Frontone, and Poggio Pantano. They also form those which extend from Castello di Sassoferrato, Mt. S. Croce, Mt. Orso and Mt. di Nebbiano to the North of Fabriano; these heights form an anticline to which the mesozoic excrescences of Mt. Rotondo, Poggio Roeta, Mt. Romano and those of Mt. Donico and Mt. Borea near Acqualagna also belong. Following this anticline there is another, which after having formed the secondary undulations of Mt. Paganuccio and Mt. Pietralata, continues to the East of Pergola, whence the above formations continue in a south-easterly direction, forming Mt. Pelato and the Arcevia heights.

The pink limestone and pink schists of the first group above-mentioned are followed by a series of strata formed by greenish-grey or red alternating scaly schists with intercalations of brown clay limestone, rich in nodules of pirites and patches of hydroxide of iron. This combination forms the so-called *ash layer*, which belongs to the lower Eocene. Near the station of Sassoferrato it appears as a greenish-grey strata, of which some very marly layers are used for making a quick-drying cement. Towards the Strega Mountain, the ash layer becomes more and more clayey and includes beds of " splintering " limestone, which also crop out on the other side of the syncline included between the above Mountain and the promontories of Sassoferrato.

Following the ash layer there is another formation of alternating grey schist limestone marls, which contain beds of compact whitish or ash-coloured marly limestone. The marls are known locally by the name of " genga " and the limestone by that of " bisciaro ".

The principal fossiliferous localities known to exist in the district under examination, are those of Colbacchione and Farneta to the West of Acqualagna, Pergola and Serra S. Abbondio. The combination of groups here met with is classed with the Langhiano and has a band of rather deep marine marls.

The beds of more or less marly limestone sometimes predominate over the schist marls, assuming the same aspect of flinty limestones intercalated in the ash layer. Both are locally known by the name of " bisciaro ", which is applied however to two levels, *i. e.*, to the Eocene (ash layer) and the Langhiano (scaly marls overlying the former). The " bisciaro " of the Urbinate has a band somewhat characteristic of the Langhiano marly limestone formation. Between the Eocene ash layer and the Langhiano compact scaly marls there may be a gap, though it is concealed by an apparent parallelism of the strata.

Following the Langhiano marly limestone zone there is a series of large beds of blue-grey gravelstone, sometimes lenticular in form (S. Savino, Mt. Vecchi, Mt. Torrino, Mt. Aiate). Towards Mt. Torrino the gravelstone, which contains 40 % of carbonate of lime, changes at various points into actual pudding-stone. Not far from Mt. Vecchietto there are volcanic rock or crystal-schist pebbles, which probably originated from the remains of tertiary layers in a state of disaggregation and sediments which were stratifying on the bottom of the sea. Fossils are very scarce throughout the formation.

From Mt. Aiate, towards the Cinisco torrent there are schisty gravel marls with tripolaceous layers and lenticular chalk, which must belong to the highest part of the Myocene, *i. e.* the Messinian. Near Canneto there is a considerable development of chalky bituminous marls, distinctly stratified, of a dark grey colour, called " ghioli ", in which there are some traces of sulphur. Sulphur is abundant at Cabenardi and Percozzone, where there are important sulphur mines. The sulphur series of strata is almost vertical, and the lime of which it is formed is dark grey or yellowish, marly, and of vacuolar structure, and is interspersed between the " ghioli ", chalky at the top and a bituminous limestone at the sides. In some point the more or less modified sulphur limestone (" magnone ") crops out.

The bottom of the valleys of the Cesano and Cinisco torrents is formed of quarternary gravels with discoidal elements, which may attain a thickness of 60 metres ; other alluvial deposits are found at various altitudes along the slopes of the heights bordering the two water-courses. Such gravels originate from rocks which form the framework of the Catria.

The leading contours of the region examined are three anticlines running north-west and south-east : (1) the Strega Mountain and Mt. Mura ; (2) Mounts Nebbiano, Sassoferrato, Madonna del Sasso and Acqualagna ; (3) Mounts Arcevia, Mezzanotte, Barbanti and Furlo. Between the two synclines thus formed are the two Messinian zones of Canneto and Percozzone-Cabernardi. A. F.

Literature.

General.

HISSINK, D. J. Rapport betreffende de scheikundige en de mechanische samenstelling van ennige grondmonsters, afkomstig uit den polder zuidveen, uitgebracht op verzoek van de commissie voor de partieele bemaling van het waterschap Vollenhove. Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstation, No. XXIX, 1924.

PANKOFF, A. Naturwissenschaftlich-Geschichtliche Gebiete des Gouvernements Woronesh.

SOULE ANDREW M. Stop the Losses in Farming. *Georgia State College of Agriculture*, Vol. VIII. No. 33, Bul. 211.

Soil Physics.

BLANCK, E. and ALTEN, F. Ein Beitrag zur Frage nach der Vorbehandlung der Böden mit Ammoniak für die Atterbergsche Schlämmanalyse. *Journal für Landwirtschaft*, pp. 153-162, 1924.

FISCHER, K. Der Sinn der Gleichung : Niederschlag : Abfluss-Verdunstung : Versickerung. *Meteorolog. Zeitschrift.* Part 8, 1924.

FISCHER, K. Die Verdunstung des Weserquellgebietes in methodischer Hinsicht betrachtet. *Meteorolog. Zeitschrift*, Part 7, 1924.

PANKOFF, A. Einige Angaben über die physikalischen Eigenschaften des Bodens nach ATTERBERG. Wladikawkas, 1922.

Soil Chemistry.

Arrhenius, O. Markreaktion och Skördeutbyte, O. L. Svanbäcks Boktryckeri. Stockholm, 1923.

Barnette, R. M., Gerretsen, F. C., Hissink, D. J., and Van der Spek, J. De calorimetrische bepalling van den zuurgrad van den grond. *Chemisch weekblad*, deel 21, No. 12, 1924.

Barnette, R. M., Hissink, D. J., Van der Spek, Jac. Some remarks on the determination of the hydrogen-ion concentration of the soil. *Recueil des travaux chimiques des Pays-Bas, publ. par la Soc. chim. néerl.* (Haarlem, Hollande, 33. Eindenhoutstraat (4) 5, No. 5, (15 May 1924).

Blanck, E. and Alten, F. Experimentelle Beiträge zur Entstehung der Mediterran-Roterde. *Die landwirtschaftlichen Versuchstationen* 90, 1924

Blanck, E. and Alten, F. Beiträge zur Kennzeichnung und Unterscheidung der Roterden. *Die landwirtschaftlichen Versuchstationen*, pp. 41-72, 1924.

Carter, L. M., Lowry, M. W., Collins, W. O., Soule, A. M. Analyses of Soils of Floyd County. *Georgia State College of Agriculture*, Vol. X, No. 15. Bulletin 277, 1923.

Carter, L. M., Lowry, M. W., Collins, W. O., Soule, A. M., Glenn, L. Fuller. Analyses of Soils of Burke County. *Bulletin Georgia State College of Agriculture*, Vol. XIII, No. 5, Bulletin 302, 1924.

Fain, Ino. R. Rock Phosphate, Georgia State College of Agriculture *Circ.* 20, 1916.

Gallay, René. Contribution à l'étude de la coagulation de l'argile. Thèse présentée à l'école polytechnique fédérale pour l'obtention du grade de docteur des sciences techniques. 1924.

Hissink, D. J. Studie van en Proefnemingen op Slempige Gronden door het Rijkslandbouwproefstation Groningen (Afdeeling voor Grondonderzoek) Voorloopig verslag, uitgebracht op verzoek van de betrokken Vereenigingen, 1924.

Hissink, D. J. De Natuurkundige en scheikundige veranderingen, die kweldergronden na de indijking ondergaan. *Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstations* No. XXIX, 1924.

Hissink, D. J. Base Exchange in Soils. *Reprinted from the Transactions of the Faraday Society*, No. 60, Vol. XX. Part 3, 1925.

Hissink, D. J. Der Sättigungszustand des Bodens. Sonderdruck aus der *Zeitschrift f. Pflanzenernährung und Düngung*. Verlag Chemie, Leipzig, Bosestrasse 2. Year 4, Part 3.

Linck, G., Blanck, E. Chemie der Erde. *Zeitschrift der chemischen Geologie, chemischen Mineralogie und Bodenkunde.* Verlag Gustav Fischer, Jena.

Luening, O. und Bebenroth, H. Das Verhältnis von Mg zu Ca in Harn und Jauche, sowie in Abwässern und Grundwässern. *Zeitschrift für angew. Chemie* 38 112, 1925.

Lyon, T. H., Bizzel, J. A. and Wilson, B. D. Depressive influence of certain higher plants on the accumulation of nitrate in soil. *Journal of the American Society of Agronomy*, Vol. 15. No. 11, Nov. 1923.

Lyon, T. L. and Buckman, H. C. Availability of the phosphorus of floats as influenced by incorporation of farm manure in the soil. *Journal of the American Society of Agronomy*, Vol. 16, No. 2, February 1924.

Nemec, A. and Kvapil, K. Sur la composition des sols forestiers. Chimie agricole, *Comptes Rendus des séances de l'Académie des Sciences*, Vol. 179, p. 537, Meeting of the 15 Sept. 1924.

Niklas, H. and Hock, A. Bestimmung der Reaktion und der Kalkbedürftigkeit von Böden der Pfalz (Blatt Speyer). *Geogn. Jahresh.*, Year 36, 1923, pp. 169-174.

Vilensky, D. (Kharkow, Ukraine). On the amelioration of alkaline soils and on the struggle against reiterated alkalizing by irrigation. (Russian).

Wilensky, D. C. (Tiflis). Das Entstehen der Alkali-Böden. (Russian).

Worsham, W. A. Jr., Long, David, D., Carter, L. M., Lowry, M. W., Collins, W. O. Analyses of Soils of Jasper County. *Georgia State College of Agriculture*, Vol. VII, No. 6, Bulletin 160, 1918.

Worsham, W. A. Jr., Long, David D., Carter, L. M., Lowry, M. W., Collins, M. W. Analyses of Soils of Wilkes County, *Georgia State College of Agriculture*, Vol. IX, No. 10, Bull. 225, 1920.

Worsham, W. A., Long, David D., Carter, L. M., Lowry, M. W., Collins, W. O. Analyses of Soils of Cresp County. *Georgia State College of Agriculture*, Vol. VIII, No. 3, Bull. 181.

Worsham, W. A. Jr., Long, D. D., Carter, L. M., Lowry, M. W. Analyses of Soils of Dougherty County. *Bull. of Georgia State College of Agriculture*, Vol. V, No. 17, Bull. 126, 1917.

Worsham, W. A. Jr., Long, D. D., Carter, L. M., Lowry, M. W., Collins, W. O. Analyses of Soils of Polk County. *Bull. Georgia State College of Agriculture*, Vol. V, No. 18, Bull. 127, 1917.

Worsham, W. A., Carter, L. M., Lowry, M. W., Collins, W. O. Analyse of Soils of Pierce County. *Georgia State College of Agriculture*, Vol. IX. No. 9, Bull. 248, 1921.

Worsham, W. A. Carter, L. M., Long, David, D., Lowry, M. W. Analyses of Soil Types of Troup County. *Georgia State College of Agriculture*, Vol. IV, No. 2, Bull. 92.

Worsham, W. A. Purchasing Ground Phosphate Rock. *Georgia State College of Agriculture*, Circ. 42, 1917.

Soil Biology.

Brenner, Widar. Azotobakter in Finnländischen Böden. Geol. Kommissionen I. Finnland. No. 20. Agrogeolog. Meddelanden, Helsingfors.

Pankoff, A. Die Tiere des Bodens und ihre Bedeutung für die Bodenbildung. Sonderabdruck aus den *"Versuchsberichten" des Gebietes Woronesch*. Tschernosiom, Nos. 5-6, 1921.

Soil and Vegetation.

Blanck, E. and Alten, F. Ein Vegetationsversuch mit "Asahi Bromoloid". *Journal für Landwirtschaft,* pp. 139-143, 1924.

Blanck, E. and Alten, F. Zur Wirkung des Zeotokols (Doleritmehl) auf die Pflanzenproduktion. *Journal. für Landwirtschaft,* pp. 145-152, 1924.

Engels. Die Bedeutung geologisch-agronomischer Bodenuntersuchungen für die Landwirtschaft. *Die Ernährung der Pflanze,* No. 22 1924. Herausgegeben vom Deutsche Kalisyndikat G. m. b. H.

Kinger, J. B. Climate of the Great Plains as a Factor in their utilization. *Annals of the American Geographers,* XIII, No. 2, June 1923.

Shantz, H. L. and Marbut, C. F. The vegetation and soils of Africa. With a section on the land classification of Agrica by the joint authors, and a note on a rainfall map of Africa by Kinger, J. B. Published jointly by the National Research Council and the American Geographical Society, Broadway at 156th street, New York, 1923.

Shantz, H. L. The Natural Vegetation of the Great Plains. *Annals of the Americ. Geographers,* XIII, No. 2, June 1923.

Suechting, H. Zur Kennzeichnung einiger abnormer forstlich genutzter Böden. Festschrift der forstlichen Hochschule Hann. Munich, 1924.

Wiedemann, Eilhard. Zuwachsrückgang und Wuchsstockungen der Fichte in den mittleren und unteren Höhenlagen der sächsischen Staatsforsten. 180 pages. Kommissionsverlag W. Laux. Tharandt, 1923.

Soil Nomenclature, Classification and Mapping.

Aarnio, B. (Helsingfors) u. Strechte, H. (Danzig). Zur Frage der Bodenbildung und Bodenklassifikation. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Andersen, Johannes, Copenhagen. Nomenclature et classification du sol de Danemark. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Bjoerlykke, K. O. Aas, Norwegen, Die Nomenklatur und Klassifikation der Bodentypen in Norwegen. Intern. Soc. of Soil Sc., IV Com. No. 13.

Bjoerlykke, K. O. Aas. Die Nomenklatur und classifikation der Bodentypen in Norwegen. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc. IV Com Helsingfors, 1924.

Brenner, W. (Helsingfors). Über die Reaktion finnländischer Böden. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of. Soil Sc., IV Com. Helsingfors, 1924.

Christensen, Harald R. Lyngby. Landwirtschaftliche Klassifizierung und Beschreibung der dänischen Böden. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Encoulesco, P. Bukarest. Le climat comme facteur de variation des types zonaux de sol. Mémoires sur la nomenclature et la classification des sols. Intern. Soc., of Soil Sc., IV Com. Helsingfors, 1924.

Frosterus, Benj. Helsingfors. Die Klassifikation der Böden und Bodenarten Finnlands. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Frosterus, Benj. Die Klassifikation der Böden und Bodenarten Finnlands. Geol. Kommissionen I. Finnland No. 18. Agrogeolog. Meddelanden. Helsingfors.

Glinka, C. D. Petrograd. Différents types d'après lesquels se forment les sols et la classification de ces derniers. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Hallisy, T. Dublin. Soil Research and the question of Nomenclature and Classification of Soils in Ireland. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Hissink, D. J. Groningen. Versuch einer Nomenklatur und Klassifikation der Niederländischen Böden, nebst Bemerkungen der Methodik. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Hume, W. E. Cairo. Character of the Soil of Egypt. Mémoires sur la nomenclature et la classifilation des sols. Intern. Soc. of Soil Sc. IV Com. Helsingfors, 1924.

Johansson, Simon, Stockholm. Classification and terminology of Swedish soils, especially mineral soils, used by the Geological Survey of Sweden. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingf., 1924.

Larue, Pierre, Gurgy. Sur la Classification des terres en France. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soils Sc., IV Com. Helsingfors, 1924.

Miklaszewski, Stawomir, Warsaw. Les sols comme individus. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Murgoci, G. Bukarest. Considerations concerning the Classification and Nomenclature of Soils. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingf., 1924.

— Nomenclature et classification des sols. (Mémoire rélatif à la Pologne). Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Novák, N. Brünn. Die bei der Bodenforschung in der Cechoslowakei benutzte Nomenklatur und Klassifikation. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

V. Post, L. Stockholm, Das genetysche System der organogenen Bildungen Schwedens. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Robinson, G. W. Bangor, Wales. Soil Types of North Wales. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Stremme, H. Die Verbreitung der Bodentypen in Deutschland. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Tesch, P. Haarlem. Versuch einer Nomenklatur und Klassifikation der Niederländischen Bodenarten (Sous-sols) nach rein petrographischen Gesichtspunkte und mit Benutzung der in den Niederländen üblichen Bezeichnungen. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Till, A. Wien. Zur Frage der Bodenkartierung und Klassifikation. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Treitz, P. Budapest. Die Bodenregionen im geschichtlichen Ungarn und die Stellung der Hauptbodentypen zu der allgemeinen Bodenklassifikation. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Wolff, W. Bemerkungen über die Klassifikation und Nomenklatur der Böden bei den Arbeiten der Preuss. Geol. Landesanstalt. Mémoires sur la nomenclature et la classification des sols. Intern. Soc. of Soil Sc., IV Com. Helsingfors, 1924.

Regional Soil Science.

Bjoerlykke, K. O. Typical Soil Profiles in Norway. Com. IV. No. 25, 1924.

Davis, L. V. Use of Agricultural Lime in Georgia. *Georgia State College of Agriculture, Vol. XI. Bull.* 271. No. 11.

Jochems, S. C. J. *Mededeelingen van het Deli proefstation de Medan-Sumatra.* Tweede Serie No. XXIII. Verslag van de Selectioproeven over het jaar 1921.

Marbut, C. F. Soils of the Great Plains. *Annals of the Association of American Geographers,* XIII, No. 2, June 1923.

Maschhaupt, J. G. and Hissink, B. J. Onderzoek naar de gesteldheid van den bodem in den zuid-hollandschen beescbosch. *Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstation,* No. XXIX, 1924.

Pankoff, A. Ueber den Boden in Nord-Kaukasus. Aus den Bodenuntersuchungen von Kabard, 1924.

Reis, O. M. Ueber Böden aus dem Unterrotliegenden im Lautertal zwischen Olsbrücken und Wolfstein. *Geogr. Jahresh.,* 1923 Year 36, pp. 176-176. Munich, 1923.

General Notices.

Rules of the International Society of Soil Science. —

I. — NAME, OBJECTS AND HEADQUARTERS OF THE SOCIETY.

1. The Society shall be called the " International Society of Soil Science ".
(French : " Association Internationale de la Science du Sol ").
(German : " Internationale Bodenkundliche Gesellschaft ").
(Italian : " Società Internazionale della Scienza del suolo ").
(Spanish : " Sociedad internacional de la ciencia del suelo ").

2. The object of the Society is the study and promotion of soil science in general by means of :

(*a*) the organisation of Congresses and Conferences ;
(*b*) the formation of Sections and Commissions ;
(*c*) the publication of a Review ;
(*d*) the institution of a Central Office for Soil Science bibliography (documentation) at the International Institute of Agriculture at Rome.

3. The headquarters of the Society is the International Institute of Agriculture at Rome.

II. — MEMBERSHIP.

The International Society was founded by the Fourth International Conference and persons who took part in this Conference have the right to join the Society as foundation members.

Any individual or body corporate engaged in the study of soil science is eligible for ordinary membership of the Society. The names of new members must be proposed by two members and will be published in the review.

5. The Congress may appoint honorary members on a proposal made by the Executive Committee.

6. For particular countries sections may be formed within the Society either for the study of soil science in general or for the study of certain aspects of the subject.

Every section consisting of more than 15 members has the right to be represented on the General Committee by one member.

III. — CONSTITUTION OF THE SOCIETY.

7. The Society carries out its work through the following bodies :

(*a*) the Executive Committee (Bureau),
(*b*) the General Committee,
(*c*) the Commissions.

8. The Executive Committee is responsible for the general business of the Society. Its membership is as follows :

(i) the President,
(ii) the Acting-President,
(iii) two Vice Presidents,

(iv) a representative of the International Institute of Agriculture at Rome,
(v) the General Secretary,
(vi) the Editor of the Review,
(vii) the Librarian.

The four Presidents, General Secretary and Librarian are appointed on the first occasion by acclamation, afterwards by a majority ballot vote of the members of the Association A new election of the President, Acting-President, the Vice-Presidents, the General Secretary and the Librarian takes place at each Congress. All are eligible for re-election with the exception of the President, who must as a rule be a member of the Society belonging to the country in which the next Congress will be held.

The representative of the International Institute of Agriculture at Rome is appointed by that Institute.

The duties of the General Secretary may be discharged by one of the other members of the Executive Committee ; the necessary staff and funds will be found by the same body.

The editor of the Review is elected by the General Committee : he continues in office and can only be removed by a two-thirds majority of the General Committee.

9. The General Committee is composed of the Executive Committee and a certain number of members elected by the Congress by show of hands, and also representatives of the Sections (§ 6) and of the Commissions (§ 10).

Each State has the right to be represented on the General Committee by at least one member.

The General Committee drafts the agenda for the Congress and for the Commissions. It meets as required, and at least once in the interval between the meetings of the Congress.

The President of the Executive Committee is chairman of the General Committee.

10. The Commissions are appointed by the Congress or by the General Committee for the study of particular aspects of soil science. They determine their own constitution and have the right to add to their numbers directly. They are represented on the General Committee by one member.

IV. — The Congress.

11. The Congress is under the general patronage of the International Institute of Agriculture in Rome.

12. A Congress must be summoned at least every five years by the Executive Committee by arrangement with the International Institute of Agriculture in Rome. All members of the Association shall be invited as well as persons specially qualified in Soil Science who are not already members.

The Executive Committee will fix the place and date of the Congress after consultation with the International Institute of Agriculture in Rome. In this connection it is necessary as far as possible to consider the wishes expressed by the preceding Congress.

13. The scientific work of the Congress consists in the presentation of

reports, discussions, demonstrations and where desirable in the arrangement of exhibitions. In addition the Congress has the following administrative duties:

(*a*) The consideration of the Report of the Acting-President on the work of the Society since the preceding Congress;

(*b*) The consideration of the Report of the General Secretary on the financial situation and also the report of the auditors and final approval of the accounts; election of auditors for the next financial period;

(*c*) Election of the President, Acting-president, Vice-Presidents, the General Secretary, the Librarian, the three auditors as well the remaining members of the General Committee, in so far as the Congress has power to make such appointments.

V. — THE REVIEW.

14. The Review is published by the Executive Committee under the direction of the editor. The printing and publication is undertaken by the International Institute of Agriculture in Rome.

It will appear in separate numbers, forming an annual volume, beginning with January 1, 1925. It is primarily a scientific review for original work on general soil science.

It also serves the following purposes:

(*a*) The establishment of as full a conspectus as possible of the most recent publications concerning soil science as a whole and kindred subjects.

(*b*) Abstracts of the most important recent publications.

(*c*) Publication of information relating to the activities of the Society in English, French, German, Italian and Spanish.

15. The Executive Committee will supply the editor with the staff and means to carry out his work. The Sections and Commissions appoint their own assistants, whose business it is to collect the documentation and to publish information relating to the Society so far as it relates to the special work of the Section or Commissions.

16. The members of the Society are entitled to receive the Review gratuitously after payment of their annual subscription.

VI. — FINANCE OF THE SOCIETY.

17. The funds of the Society are provided as follows:

(*a*) by the annual subscription of members, the amount to be fixed each year by the Executive Committee;

(*b*) by the amount of the subscriptions to the Review and advertisement charges, as well as by the sale of reprints and special publications;

(*c*) by voluntary contributions.

18. The Executive Committee decides as to the application of the funds and the General Secretary is responsible for finance.

19. The annual accounts must be closed at the end of the calendar year, and forwarded to the auditors and returned by them to the Executive Committee within a month at latest. The accounts are wound up each year by the Executive Committee on the certificate of the auditors.

VII. — Other Regulations.

20. The Executive Committee has the right to settle all questions that are not covered by the regulations as it sees fit and also to give decisions in all doubtful cases as regards their interpretation.

21. Proposals as to alterations in the rules may be made by any member of the Society, but must be sent in writing to the Executive Committee at least three months before the Congress, and for their acceptance a two thirds majority of the votes given is required.

22. The Society can only be dissolved after a vote taken on a report recommending dissolution and published in the Review at least a year before the vote is taken.

The Society can only be dissolved if two-thirds of all the members are agreed.

In the case of the dissolution of the Society the Executive Committee shall decide in what way the funds of the Society shall be used for the furtherance of Soil Science work.

Passed at the final meeting of the Fourth International Conference in Rome on 19 May 1924.

Dr, D. J Hissink
Acting-President and General Secretary,
Groningen (Holland).

The Commissions of the International Society of Soil Science. —

I. Commission for the Study of Soil Physics and Mechanics :

Chairman : Dr. V. Novak, Brno, Czechoslovakia ;

Vice-Chairman : Dr. B. A. Keen, Rothamsted, Harpenden, England ; Dr. C. Davis, Washington, U. S. A. ; Prof. U. Pratolongo, Milan, Italy.

Secretaries : Dr. Krauss, Munich, Germany ; Dr. T. Mieczynski, Pulawy, Poland ; Ing. J. Spirhanzl, Prague, Czechoslovakia.

II. Commission for the Study of Soil Chemistry.

Chairman : Prof. Dr. A. J. Alexius de Sigmond, Budapest, Hungary.

Vice-Chariman : Dr. B. Arnio, Helsingfors (Finland) ; Prof. Dr. M. M. MacCool, East Lansing, Michigan, U. S. A. ; Prof. Dr. A. Vesterberg, Stockholm, Sweden ; Prof. Dr. G. Wiegner, Zurich, Switzerland.

Secretaries : Prof. Dr. Robert Ballenegger, Budapest, Hungary ; Prof. Dr. Norman M. Comber, Leeds, England ; Prof. Dr. Th. Saidel, Bucarest, Roumania ; Dr. E. Scherf, Budapest, Hungary.

III. Commission for the Study of Soil Bacteriology and Biochemistry.

Chairman : Prof. Dr. Ing. Julius Stoklasa, Prague, Czechoslovakia.

Vice-Chairman : Dr. Harold C. Christensen, Lyngby, Denmark ; Prof. Dr. H. Niklas, Weihenstephan., Germany ; Prof. Dr. Giacomo Rossi, Portici, Naples, Italy ; Dr. S. A. Waksman, New Brunswick, N. J., U. S. A.

Secretaries : Dr. D. W. Cutler, Rothamsted, Harpenden, England ; Dr. E. G. Doerell, Prague, Czechoslovakia ; Dr. Nemec, Prague, Czechoslovakia, Prof. Conn, New York ; Dr. Fred, Wisconsin U. S. A. ; Dr. Itano, Japan.

IV. Commission for the Study of Soil Fertility.

Chairman : Prof. Dr. Eilh. Alfred Mitscherlich, Königsberg, Prussia.

Vice-Chairmen : Dr. Harald C. Christensen, Lyngby, Denmark,; Dr. K. Zylstra, Groningen, Holland.

Secretaries : Dr. Olof Arrhenius, Stockholm, Sweden ; Prof. D. R. Hoagland, Berkeley, California, U. S. A. ; Prof. Aso, Komaba, Japan.

V. Commission for Soil Nomenclature, Classification and Soil Mapping.

Chairman : Prof. C. F. Marbut, Washington, U. S. A.

Vice-Chairmen : Dr. Benj. Frosterus, Helsingfors, Finland ; Prof. G. Murgoci, Bucarest, Rumania.

Secretaries : Prof. A. Till, Vienna, Austria ; Prof. W. Wolff, Berlin, Germany.

VI. Commissiou for the Production of the Pedological Map of Europe.

Director : Prof. G. Murgoci, Bucarest, Rumania.

Vice-Director : Prof. L. Cayeux, Paris.

General secretary : Prof. W. Wolff, Berlin, Germany.

VII. Commission for the Application of Soil Science to Scientific Agriculture.

Chairman : Oberst J. Girsberger, Kultur-Oberingenieur, Zurich, Switzerland.

Vice-Chairmen : Eng. E. Giovannoni, Rome, Italy ; Oberbaurat Otto Fauser, Stuttgart, Germany ; Prof. J. Zavadil, Brno, Czechoslovakia.

Secretary : Dr. Eng. Rud. Janota, Prague, Czechoslovakia.

Assessors : Prof. Dr. Zunker, Breslau, Germany ; Prof. Lzeslav Skotnicky, Warsaw, Poland.

Report of the Progress of the Activities of the Organizing Committee of the Fifth International Congress of Soil Science. — At its meeting in November the American Society of Agronomy appointed Dr. C. F. Marbut, Dr. A. G. Mac Call and Dr. J. G. Lipman as members of the Organizing Committee of the Fifth International Congress of Soil Science. The Commitee, of which Dr. Lipman is Chairman, has been given power to appoint sub-committees and to take such other steps as may be necessary toward establishing a satisfactory organization for the Firfth International Congress.

The Committee has planned a field excursion to enable the visiting delegates to become acquainted in the field with the soil formations and crop areas of the United States. It is expected that at least a month will be allowed for this excursion, which is to take place after the adjournment of the Fifth Congress. It is probable that the sessions will be held at Washington, D. C., late in May 1927, and that the field excursion will occupy nearly all of the month of June. If possible, the special train which will be made available for the delegates will travel as far as the Pacific Coast.

Efforts will be made by the American Committee to raise a fund sufficiently large to permit of reducing the expenses of the foreign delegates to a minimum. Steps have already been taken toward the organization of local committees in Washington, D. C. These will look after the comforts o fthe visiting delegates and the members of their families. Steps have also been taken toward the arranging for exhibits of soils, soil apparatus and general scientific apparatus that might be of interest to soil investigators. Considerable progress has been made with the enrolling of members of the International Society of Soil Science. Local committees on membership are being organized.

J. G. Lipman.

I. Commission for the Study of Soil Mechanics and Physics. — The Commission for the Study of Soil Mechanics and Physics was formed on the occasion of the Second International Conference for Agricultural Geology at Stockholm in 1910 as a Committee for the classification of the soil particles in connection with the mechanical analysis of soil. Its first chairman was Dr. Atterberg, late of Kalmar, Sweden. A general meeting of the Commission was held on 31 October, 1913 at Berlin and assumed the title of " Commission for the Study of Soil Mechanics and Physics ".

At this meeting proposals were brought forward by Dr. Atterberg to be placed by the Commission before the next Congress for agricultural geology for approval.

The following points were dealt with :

1. Classification of the Soil Particles.
2. Subdivisions of the different groups.
3. Preparation of the soil for mechanical analysis.
4. Viscosity apparatus.
5. Collections of the finest clay products.
6. Determination of humus.
7. International comparative analysis.

The Commission was agreed on the principles of the classification of the soil particles as proposed by Dr. Atterberg and on the adoption of the Atterberg apparatus as the standard apparatus ; the lines of work in regard to the remaining points of the programme were laid down. See the decisions of the Commission in the *Internationale Mitteilungen für Bodenkunde* IV, pp. 30 and 31.

As the International Conference on Soil Science in Petrograd in 1914 never took place, the approval of the decisions of the Commission had to be postponed. International relations were broken off on the outbreak of war and the work of the first international Commission was thereby interrupted. The work also suffered seriously from the death in 1916 of Dr. Atterberg who had filled the office of chairman with distinction.

It was not till the third International Congress on Soil Science in Prague 1922 that the Commission was once more re-established with J. Kopecky of Prague as chairman. On the proposal of Dr. Hissink the Commission carried out comparative analyses in seven European laboratories on prepared samples of soil for mechanical analysis. The report on these analyses was made to the Fourth International Congress on Soil Science in Rome in 1924 by the vice-chairman, Dr. Novak. At the final meeting of the First International Commission it was decided to continue the comparative analyses in regard to soil samples prepared for mechanical analysis on four more typical soil samples and to make arrangements for holding the next international soil science congress in America. The question of standard apparatus for mechanical analysis was taken out of the programme. Members of the Commission were recommended to make a study of the methods of ascertaining capacity for aeration and plasticity of the soil.

At the Fourth International Conference in Rome the following were elected from the Commission for the Study of Soil Mechanics and Physics :

Chairman Dr. V. Novak, Brünn, Czechoslovakia.

Vice-Chairmen : Dr. C. Davis, Washington, U. S. A. ; Dr. B. A. Keen, Rothamsted, Harpenden, England ; Prof. Dr. S. Oden, Stockholm, Sweden ; Prof. U. Pratolongo, Milan, Italy.

Members : Prof. N. Albert, Eberwalde, Germany ; Prof. J. Afanasjev, Gorki, Russia ; Prof. Ballenegger, Budapest, Hungary ; Dr. H. Burger, Zurich, Switzerland ; Prof. A. de Dominicis, Portici, Italy ; Prof. Ach. Gregoire, Gembloux, Belgium ; Dr. J. Hissink, Groningen, Netherlands ; Dr. S. Johansen, Stockholm, Sweden ; Prof. P. Koettgen, Lich. b. Giessen, Germany ; Dr. Liatsikas, Athens, Greece ; Prof. H. Loug, Berkeley, California, Prof. Dr. E. Ramann, Munich, Germany ; Dr. G. Robinson, Bangor, North Wales ; Prof. Dr. K. Roerdam, Copenhagen, Denmark ; Prof. Dr. A. J. de Sigmond, Budapest, Hungary ; Dr. L. Smolík, Brno, Czechoslovakia ; Prof. Sokolowski, Charkow, Russia ; Prof. P. Vinassa de Regny, Parma, Italy ; Prof. C. Viola, Parma, Italy ; Prof. T. Westermann, Copenhagen, Denmark ; Prof. Wiegner, Zurich, Switzerland ; Dr. J. P. van Zijl, Stellenbosch, South Africa ; Prof. Zunker, Breslau, Germany.

The programme outlined at the Conference at Rome is being gradually realised. The Executive Committee are organising further comparative experiments on the preparation of soil samples for mechanical analysis (see also the appeal to members of the first Committee) in conjunction with the second Committee, which makes use of the same soils for its comparative analyses. A questionnaire was also prepared on the subject of the classification of soil particles, thus carrying out the earlier programme of the Committee ; this classification will be introduced at an early date.

Dr. V. Novák,
Chairman of the First Commission.

Request for Co-operation in International Comparative Analyses by Preparation of the Soil Samples for Mechanical Analysis. — The first International Commission for mechanical and physical soil analysis resolved at the final sitting of the International Conference of Soil Science at Rome on 16 May 1924 : " To continue the comparative researches in different institutions with different methods of preparation ". The object of the comparative analysis is the accomplishment of the work outlined in the proposals for the unification of methods to be followed in soil science experiment stations.

Tests are to be made of the following four methods of preparation :

1. *without chemical reagents* :

(*a*) agitation in distilled water by means of an automatic shaker with a horizontal motion.

(*b*) two hours boiling of the soil samples in distilled water supplemented by repeated rubbing.

2. *with chemical reagents*:
   (*c*) English method modified by HISSINK.
   (*d*) ROBINSON method with hydrogen peroxide.

The institutions taking part are at liberty to investigate, if desired, other methods in addition to the above and to compare the results.

With this object the chairman of the Commission undertook to have four average soil samples sent to every institution making application. The types of soil were: 1 tropical soil, 1 alkali soil, 1 acid mineral soil and 1 Rendzina soil containing lime and humus. Each institution is however recommended to make tests at the same time of other types of soil specially characteristic of the environment.

The dimension of the soil particle is to be regarded as the most important point for comparison: its determination should correspond to 8 hours for time of sedimentation with 10 centimetres depth of liquid, at a temperature of 20°C. The raw clay (dimensions under 2μ) must in any case be determined: if other grades have to be determined, the scale 0.2μ, 2μ, 20μ, 0.2 mm., 2 mm., is recommended for the purpose.

The determination of the particles dimensions under the conditions stated is essential and should be effected on the basis of the sedimentation either by repeated decantation or by the pipette method, etc. Any apparatus may be applied which is found to be the most suitable in the institution itself.

Each institution furnishes a report on the analyses carried out, to the chairman's office of the First Commission, and all the reports are embodied in a memorandum. This memorandum is forwarded in good time before the beginning of the Congress to all members of the Commission, so that they may make a study of it before the meeting of the Congress.

The undersigned chairman of the International Commission for mechanical analysis permits institutions which are prepared to carry out analyses with soil samples prepared for mechanical analysis, to announce their readiness to cooperate up to the end of September 1925.

Average soil samples will very shortly be sent out, and precise and detailed instructions, as to the methods as well as to the conditions which must be observed in all cases for the comparative analyses will be added.

Up to the present date the following institutions under expert direction have notified their intention of taking part in the work: Groningen (Dr. HISSINK), Munich (Dr. RAMANN), Giessen (Dr. KOETTGEN), Breslau (Dr. ZUNKER) Budapest (Dr. SIGMOND), Brünn (Dr. NOVÁK).

Dr. V. NOVÁK,
Chairman of the First Commission
Address: *Brünn, Kvetna* 19 (Czechoslovakia).

II. Commission for Chemical Soil Analysis. — The first meeting of the International Commission for Chemical Soil Analysis took place at Munich on 23 and 24 April 1914, and a report was included in the *Internationale Mitteilungen für Bodenkunde*, Vol. V, 1915. After that date the events of the years 1914-1918 brought about a serious interruption of the work. In 1922, however, at the Prague Conference, it appeared practicable to re-establish relations between members of the Committee, and as the result of cooperation it was possible at the Conference in Rome in 1924 to pass several resolutions, which may be regarded as definite steps in the direction of establishing uniform analytic methods. These resolutions relate to the question of the preparation of the hot concentrated HCl extract, as well as the chemical determination of the substances assimilable by plants.

The different resolutions are as follows: (*a*) for the preparation of the hot concentrated HCl. extract the method of VAN BEMMELEN-HISSINK is in principle adopted: only two questions in regard to the details of execution have to be agreed upon viz. the quantity of the acid and the length of time required for boiling. For the purpose of determining these points, the institutions which express their willingness to take part in the enquiry will have several kinds of soil sent to them.

(*b*) The subject of soil acidity gave rise to lively discussion and it was shown to be impossible to select to-day a single method best suited to every case, owing to the fact that the different methods of determination give different indices of acidity. It is also proved that the acidity indices, although they afford a good indication of the lime requirements of the soil, cannot always give correct information as to the quantities of lime to be applied. On this account it is resolved to keep separate the questions of the acidity indices and the lime requirements. It is much to be desired that further work should be done on this subject. Director HARALD R. CHRISTENSEN, Lingby, near Copenhagen, has undertaken the organisation of this work.

(*c*) As regards adsorption of bases the work of the Commission has so far advanced the problem that the possibility of devising a simple and rapid method of determining the exchangeable bases is becoming apparent. Dr. D. J. HISSINK has undertaken the organisation of these researches.

(*d*) The question of the determination of the nutritive substances assimilable by plants is one which is not yet sufficiently elucidated to allow the establishment of a simple method of determination to be contemplated. In order to help the solution of the problem a resolution for collaboration with the Committee for the study of soil fertility was passed.

(*e*) It was also proposed to appoint a Sub-commission for the alkaline soils, but as this subject also comes within the province of the Commission for Soil Classification and Nomenclature, the chairman of the Second Commission has come to an understanding with Prof. C. F. MARBUT and a proposal has been made for organising this Committee as a Sub-commission of the Fifth Commission.

In concluding this short report on the position of the work of the Committee it is satisfactory to note that the number of members, which at the time of its formation in 1910 was ten only, has now reached 64. The list of members is as follows: —

Chairman : A. A. J. von 'Sigmond, Budapest.

Vice-Chairmen : B. Aarnio, Helsingfors ; M. M. MacCool, East Lansing, U. S. A.; K. A. Vesterberg, Stockholm ; G. Wiegner, Zurich.

Secretaries : R. Ballenegger, Budapest ; N. M. Comber, Leeds ; Th. Aidel, Bukarest ; E. Scherf, Budapest.

Members : J. J. Always, St. Paul, U. S. A. ; G. André, Paris ; E. Billmann, Copenhagen ; H.R.Christensen, Lingby ; K. Daniel, Munich; J. Danzl, Munich ; D. Digenty, Budapest ; C. Duserre, Lausanne ; A. Floderer, Magyaróvár ; R. Gallay, Morges, R. Ganssen, Berlin ; G. Garola, Chartres ; Gedroitz, Nosoff ; H. Gessner, Zurich ; L. Gile, Washington ; A Ch. Girard, Paris ; K. Glinka, Leningrad ; A. Gregoire, Gembloux ; St. Haydin, Inarcskakucs ; A. Herke, Szeged ; D. J. Hissink, Groningen ; H. Jenny, Zurich ; Joffe, New-Jersqy ; A. F. Joseph, Khartoum ; H. Junk, Munich ; Kyas, Brünn ; M. H. Lagatu, Montpellier ; O. Lemmermann, Berlin ; J. G. Lipman, New Jersey ; A. Menozzi, Milan ; E. Mitscherlich, Königsberg ; L. F. Newman, Cambridge ; B. Niklewski, Posen ; E. Nyiredi, Budapest ; C. Olsen, Lingby ; J. Petersen, Ladelund ; E. Ramann, Munich ; N. Reitmaier, Vienna ; N. Ritter, Bern ; J. Rossi, Portici; E. J. Russell, Rothamsted ; L. Salacz, Budapest ; H. Sallinger, Munich ; B. Schmitz, Oerlikon bei Zurich, O. Schreiner, Washington ; L. Smolík, Prague ; H. Stremme, Danzig ; J. Szemian, Angora ; O. Tamm, Alnarp ; F. Terlikowski, Poznau ; G. Tommasi, Rome ; R. Trnka, Prague ; A. Vendl, Budapest ; W. Vernadski, Leningrad ; A. Zoehls, Budapest.

R. Ballenegger,
Secretary of II Commission,

A.A. J. von 'Sigmond,
President of II Commision.

Circular of the Second International Commission for the Study of Soil Chemistry on the question of the Preparation of Hydrochloric Acid Soil Extracts. — At the Fourth Congress on Soil Science at Rome the Second Commission passed the following resolution on the preparation of hydrochloric acid soil estracts.

" Before deciding finally on the adoption of the Van Bemmelen-Hissink, process it is advisable to ascertain :

1. If the relative quantities of the soil to the acid should be 1 gm. soil and 25 cc. acid, or 1 gm. soil 10 cc. acid.

2. If boiling for one hour is not enough, instead of two hours.

" To decide these two points it is necessary to make special experiments on samples of fine earth of various soil types, at least three kinds : acid, neutral and alkaline. »

" Those who desire to take part in this investigation are asked to address the chairman of the Second Commission, Prof. Alexius A. J. von 'Sigmond, Budapest, Hungary, 1 Szent Gellérttér 4 ".

Members of the Commission who wish to take part are accordingly asked to put themselves in touch with the Second Commission for soil samples. These samples will be forwarded on request by the chairman of the Second Committee. Members of the Commission are informed that in order to save expense the investigations proposed by the First Commission for the Study of Soil Mechanics and Physics will be made on the same samples.

As regards the preparation of the acid extract, members are reminded that the original proposal made to the Congress by the Chairman of the Second Committee was in the following terms:

(*a*) 10-20 gm., of the soil sample are set to boil rapidly in an open flask on a naked gas jet with the addition of 25 times the volume of HCl. at a concentration of 25-35 % by weight, till the boiling temperature reaches 110°C. The time necessary should not exceed 25 minutes and can usually be reduced to 10 minutes. A reflux condenser is then placed on the flask and boiling over the gas jet is continued without interruption for two hours precisely. After two hours boiling, cold water is quickly introduced and the insoluble particles allowed to settle. Then the clear solution is decanted and the process repeated till the reaction of the filtered solution is only slightly acid. In this solution the quantity of SiO_2, Al_2O_3, $Fe_2O_3(MnO_4)$, CaO, MgO,K_2O, Na_2O and P_2O_5 is usually determined.

(*b*) To remove from the insoluble precipitate the last remains of acidity, a small quantity of Na Cl is added and the lixiviation by decantation is continued until the reaction of the filtered solution is completely neutral. The insoluble residue is then dried over a water-bath, the filter paper with its inconsiderable contents is reduced to ashes and added to the insoluble residue. By this latter process the colloidal SiO_2 may lose something of its solubility in dilute alkali. To avoid this result care must be taken that only a very small quantity of the insoluble residue from the decantation reaches the filter paper. To dissolve in alkali the soluble SiO_2, it is shaken or stirred for five minutes at a temperature of 55°C. in an ERLENMEYER flask with 200 mm^3 of KOH of 1.04 specific weight. After five minutes cold water is poured into the flask and lixiviation proceeds with decantation as before, until there is no alkaline reaction, *i. e.* when there is finally added a small quantity of NaCl. In the course of the alkaline dissolution the percentage of SiO_2 is determined and, if present, also Al_2O_3 and other bases.

We are of opinion that it is sufficient to determine the quantity of silica soluble in the alkali and in the acid extract and to determine the total sesquioxides (F_2O_3, Al_2O_3) by precipitation in a warm solution of ammonia.

The detailed account of the method to be followed with the soil samples will be sent later.

Members are free to carry out also the determination of the other constituents or to try another process for the preparation of the acid extract, but in any case they are asked to carry out the determinations described.

Collaborators are asked to make their requests for soil samples before 1. September 1925.

ROBERT BALLENEGGER,
Secretary of the Second Commission.

A. A. J. VON 'SIGMOND,
President of the Second Commission.

Alkali Soils Sub-commission. — The problem of the alkali soils is a world-wide problem, and its solution can be reached only with the collaboration of all who are working at the subject. Co-operation in the work of the Alkali Sub-commission is therefore asked. The first step is to lay down the programme, and it will be helpful to receive a list of questions which it is felt should be made the subject of an international enquiry. It is recognised to be a great drawback to the work that the analysis of the alkali soils made in the different countries are not comparable, owing to the employment of widely differing methods. It appears that it would be advantageous to work out standard methods and an expression of opinion as to which methods should be adopted would be welcomed. The Second Commission for the Study of Soil Chemistry is working out a method for the digestion of soils with hydrochloric acid (method VAN BEMMELEN-HISSINK) and this method might possibly be employed also in the case of the alkali soils. There is also the question of the terminology of the alkali soils, and it is felt that the knowledge of these soils would be advanced if every worker would give a description of the whole profile of the soil. Some agreement as to terminology would be necessary here.

It is considered also that it would advance the question of the reclamation of alkali soils if experiments on the same plan could be made in different parts of the world. But before undertaking this work on a large scale, it is important to gather all the available data on soil surveys in alkali districts.

Any suggestions that may be made on this subject will be very acceptable.

ROBERT BALLENEGGER, *Secretary*,
A. A. J. VON 'SIGMOND, *Chairman*,
Alkali Soils Sub-commission.

III. Commission for Soil Bacteriology. — A date early in July for a meeting of the Committee in Berlin will be fixed after consultation with the Chairman, Prof. STOKLASA.

IV. Commission for the Study of Soil Fertility. — No report has yet appeared.

V. Commission on the Nomenclature Classification and Mapping of Soils. — Prof. C. F. MARBUT, Washington, U. S. A. (Chairman).

Sub-commissions.

(1) Sub-commission for Eurasia on the Nomenclature and Mapping of Soils:

Dr. B. FROSTERUS, Finland (Chairman); Dr. D. K. GLINKA, Russia; Dr. S. MIKLASZEWSKI, Poland; Dr. H. STREMME, Germany; Prof. L. CAYEUX, France; Dr. O. T. TAMM, Sweden; Prof. W. WOLFF, Germany; Prof. V. NOVARESE, Italy. The committee will be still further enlarged by appointments made by the Chairman.

(2) Sub-commission for Eurasia on the Mapping of Soils.

Prof. G. MURGOCI, Roumania (Chairman); Prof. W. WOLFF, Germany (General Secretary); Prof. L. CAYEUX, France (Treasurer); Dr. B. FROSTERUS, Finland; Dr. D. K. GLINKA, Russia; Dr. S. MIKLASZEWSKI, Poland; Dr. H. STREMME, Germany; Prof. PETER TREITZ, Hungary.

Additions to the membership will be made by the Chairman.

(3) Sub-commission for the Americas on the Nomenclature and Classification of Soils.

Prof. C. F. MARBUT, Washington, U. S. A. (Chairman); Dr. P. E. BROWN, Ames, Iowa, U. S. A.; Prof. M. L. MILLER, Columbia, Missouri, U. S. A.; Dr. F. J. ALWAY, St. Paul, Minnesota, U. S. A.; Prof. A. R. WHITSON, Madison, Wisconsin, U. S. A.; Prof. G. W. CONREY, Columbus, Ohio, U. S. A.; Prof. C. F. SHAW, Berkeley, California, U. S. A.; Prof. W. L. POWERS, Corvalis, Oregon; U. S. A.; Prof. J. G. HUTTON, Brookings, South Dakota, U. S. A.; Prof. H. L. WALSTER, Fargo, North Dakota, U. S. A.; Prof. A. L. PATRICK, State College, Pennsylvania, U. S. A.; Prof. L. F. GIESEKER, Bozeman, Montana, U. S. A.; Dr. M.M. MCCOOL, East Lansing, Michigan, U. S. A.; Prof. R. S. SMITH, Urbana, Illinois, U. S. A.; Prof. H. O. BUCKMAN, Ithaca, New York, U. S. A.; Prof. A. W. BLAIR, New Brunswick, New Jersey, U. S. A.; Dr. G. E. CONDRA, Lincoln, Nebraska, U. S. A.; Mr. J. F. STROUND, Montgomery, Alabama, U. S. A.; Prof. L. M. CARTER, Athens, Georgia, U. S. A.; Prof. W. B. COBB, Chapel Hill, North Carolina, U. S. A.; Dr. G. S. FRAPS, College Station, Texas, U. S. A.; Prof. G. N. RUHNKE, Guelph, Ontario, Canada; Mr. A. H. HAWKINS, Saskatoon, Saskatchewan, Canada; Dr. AVELINO I de OLIVEIRA Rio de Janeiro, Brazil; Mr. Horace WILLIAMS, Rio de Janeiro, Brazil; Director Juan R. MONTES DE OCA, Buenos Aires, Argentina.

(4) Sub-commission for the Americas on the Mapping of Soils.

Mr. J. W. MCKERICHER, Washington (Chairman); Mr. F. J. MARSCHNER, Washington; Prof. C. F. MARBUT Washington; Mr. T. D. RICE, Washington; Mr. W. E. HEARN, Washington; Mr. H. H. BENNETT, Washington; Mr. M. H. LAPHAM, Washington; Mr. M. BALDWIN, Washington; Prof. A. H. JOEL, Saskatoon, Canada; Prof. G. N. RUHNKE, Guelph, Canada; Dr. AVELINO I. DE OLIVEIRA, Rio de Janeiro, Brazil; Director Juan R. MONTES DE OCA, Buenos Aires, Argentina.

This list will be completed later by adding names for Mexico, the States of Central America and of the other countries of South America.

Report of the Work of the Commission for the Agro-Geological Map of Europe, 1924. — In accordance with the resolutions of the Fourth and Fifth Commission on the International Agro-geological Conference at Rome on May 1924, a Commission has been formed for the preparation and publication of an international pedological map of Europe on the scale of 1 : 2½ million as well as of the separate European countries in 1 : 1½ million. The headquarters of this Committee is Bucarest (W Soseaus Kisseleff 2), the chairman, Prof. MURGOCI, the vice-chairman, Prof. CAYEUX in Paris, the Secretary, Prof. WOLFF in Berlin, and members of the executive, Prof. FROSTERUS in Helsingfors, Prof. GLINKA in Leningrad, Prof. von MIKLASZEWSKI in Warsaw, Prof. STREMME in Danzig and Prof. TREITZ in Budapest.

The first business of this Committee was the issuing of directions for a uniform construction of the maps in the different countries. These directions have been very carefully drawn up by Prof. MURGOCI and brought out by Prof. TILL in Vienna under the title: "Instructions pour la préparation de la Carte Générale du sol de l'Europe" and forwarded to the individual members. It is proposed to send as supplementary aids to work a dictionary of technical terms in soil science in the languages concerned and a specimen map of the Rumanian plain and the Northern Dobrudscha, but these have not so far reached the members.

By the death of Prof. MURGOCI, who had devoted himself unreservedly to this work, the Commission has sustained a severe loss; it is now important, that all the preliminaries should be concluded, so that the coming summer may be fully utilised for the field work which is to be carried out in each country.

As regards work in Germany, a petrographic representation of the German soils on the principle of the international geological map is being prepared, and arrangements are in progress for a purely pedological survey of the country during the summer. W. WOLFF.

VI. Commission for the Application of Soil Science to Scientific Agriculture. — A report will appear in the next issue of this Review.

Personal. —

G. M. MURGOCI,
GEOLOGIST IN CHIEF,
CHIEF OF THE SECTION OF THE RUMANIAN
GEOLOGICAL INSTITUTE,
PROFESSOR OF THE BUCAREST POLYTECHNIC SCHOOL,
CORRESPONDING MEMBER OF THE RUMANIAN ACADEMY,
CORRESPONDING MEMBER OF THE FRENCH ACADÉMIE D'AGRICULTURE,
CHAIRMAN OF THE INTERNATIONAL COMMITTEE
ON SOIL MAPPING AND DIRECTOR
OF THE PEDOLOGICAL MAP OF EUROPE, ETC.,

died at Bucarest on 5 March, at the age of 53 years.

An obituary notice will appear in one of the next issues of this Review.

Prof. R. GANSSEN, Divisional Director of the Prussian Geological Provincial Institute in Berlin and Director of the Pedological Laboratories celebrated his 60th birthday in March.

Dr. SOKOLOWSKY, of the Agricultural Institute at Kharkov, was appointed in August 1924 to the Executive Committee of the Soil Science Research Bureau, as Professor at the Agricultural Institute, as well as member of the Scientific Commission for Ukrainian Agriculture.

Errata. —

In the article "Ein Beitrag zur Charakt. der Hannaböden" von V. NOVÀK,, published in *Internat. Mitt. f. Bodenkunde*, XIV, H. 3-6, under the illustration on p. 95, read Fig. 3 instead of Fig. 2, and on p. 103, Fig. 2 should be substituted for Fig. 3.