proved the little known method of Puluj for measuring inductance by means of alternating currents. The method of Puluj was devised independently by Professor S. T. Moreland and reported to Section B at the Boston meeting of the American Association. The method, in its simplest form, is to connect two circuits in parallel between alternating current mains and adjust non-inductive resistances until the currents in the two branches are in phase, when the inductances in the two branches are directly as the resistances. To show when the currents are in phase an instrument called a *phase indicator* is used. This instrument is essentially a small induction motor without iron. It consists of two small coils with their planes vertical and at right angles to each other, surrounding a suspended aluminum or copper rod. These coils are connected, one in each circuit, and when the two currents are not in phase with each other the suspended rod is deflected. Martienssen modifies the instrument by winding one coil with two strands of wire, each strand being provided with separate terminals. One of these strands he connects in circuit as before, and the other constitutes a secondary coil in which a current is induced by the current in the primary strand. This induced current is sensibly in quadrature with the primary current, and by the use of an adjustable non-inductive resistance in this secondary circuit the instrument may be used, according to Martienssen, for the accurate measurement of much smaller inductions.

Puluj's method, as modified by Martienssen, is a zero method; it requires only a single adjustment; it does not require harmonic electromotive force, nor does the frequency of the e. m. f. need to be known; and it gives accurate results for inductances ranging from a few hundreds to many millions of centimeters. In short, we seem to have at last a feasible laboratory method for the accurate measurement of inductance.

W. S. F.

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*NOTES ON INORGANIC CHEMISTRY.*

AN interesting discussion has been carried on during the last few years as to the constitution of inorganic compounds, especially of the metal-ammonium bases, by Professor S. M. Jörgensen, of Copenhagen, and Professor Alfred Werner, of Zurich. Professor Jörgensen, to whom we owe so much of our knowledge of these bases, especially those of cobalt, chromium and rhodium, defends the constitution based on the present ideas of valence, which has been developed in its application to these compounds largely by himself on the basis furnished by Blomstrand. Professor Werner, feeling the insufficiency of the theories of valence to account for most of our complex inorganic compounds, has proposed a new theory of coordinated groupings, in which he seeks to account for the constitution not merely of the metal-ammonium bases, but also of all the complex inorganic compounds, including those containing water of crystallization. The last number of the *Zeitschrift für anorganische Chemie* contains the eleventh paper by Jörgensen and the fifteenth paper by Werner. In the former Jörgensen reviews Werner's theory, replies to all the objections Werner has raised to the valence theory as applied to the metal-ammonium compounds, shows the insufficiency of Werner's theory, and finally, by an ingenious piece of chemical logic, shows that Werner's own theory must, if consistently carried out, lead him to Jörgensen's own formulæ for these compounds. In this paper, and that of Reizenstein, recently mentioned in this column, one may get a good view of the arguments on both sides of the controversy.

WERNER'S paper in the same number of the *Zeitschrift* is confined to a study of the application of his theory to the double chlorids. He has tabulated all the double chlorids from the whole field of chemical literature, and grouped them in types according to his theory, considering also the water of crystallization present.

IT is yet too soon for any final judgment to be pronounced on Werner's theory, especially because the field to which it applies is so immense. The limitations of the valence theory are, however, only too keenly felt by chemists, and Werner's work is leading in the right direction. At all events, this lengthy controversy is productive of much good. It has turned the

minds of many chemists to the necessity of broader views of chemical compounds; it has stimulated many chemists to fuller investigations in the inorganic field, and it has led at the hands of the two leaders to a vast enrichment of our chemical knowledge of large classes of compounds. We may add that for the most part it has been conducted in the best spirit.

In the Trans-Caucasian region, from the Black Sea to the Caspian, are scattered many mud volcanoes, both in the naphtha regions and elsewhere. In the *Zeitschrift für anorganische Chemie*, P. Melikoff describes the analyses of the products of one of these mud volcanoes, that of Achtala. The principal ingredients of the water are salt and soda. The solid matter is chiefly a plastic clay, with fine grains of calcite, feldspar and quartz. The greater part of the paper is a discussion of the origin of the soda and of sodium carbonate deposits and waters in general. The experiments of the author show that in the presence of ferric or aluminum hydroxid, as well as of colloidal substances and zeolites of the soil, sodium sulfate and calcium bicarbonate react readily with formation of sodium carbonate, and the same is true of sodium chlorid and calcium bicarbonate. The hydroxid present, and in soils the colloidal substances, hold the reaction products with different degrees of firmness, preventing reverse reactions and allowing in natural leaching process the separation of these products. Thus in the latter reaction the ferric hydroxid has a greater capacity for absorbing soda than for calcium chlorid, hence the latter is first removed by washing, and the later wash waters contain largely soda. Similar reactions take place in the presence of ammonium carbonate, which is present in most soils. Thus the natural soda formation is attributable to the interaction of salt or sodium sulfate, on the carbonates dissolved in natural waters in the presence of the soil.

J. L. H.

## *CURRENT NOTES ON ANTHROPOLOGY.*

### LINGUISTICS OF THE CHACO.

The very few students of South American languages may be interested to learn that in the 'Proceedings' of the American Philosophical Society for October, 1898, I have published a paper of thirty pages, together with a linguistic map, on the languages of the Chaco region, embracing portions of the Argentine Republic, Paraguay, Brazil and Bolivia. The map covers the area from lat. 20° to 30° south, and long. 56° to 66° west from Greenwich. In this area the colors define the extensions of nine linguistic stocks, based on the most recent investigations. Especial interest attaches to the newly-found Ennima stock, first recognized as such by Guido Boggiari in 1895, although vocabularies of it had been printed before that date. While this paper does not solve all the problems of the Chaco tongues, it certainly diminishes their number.

### THE CRANIOLOGY OF CRIMINALS.

What are the differences between the skulls of criminals and those of 'respectable people'? This is the question which M. E. Pitard undertook to solve by comparing the crania of fifty-one convicts who had died in the penal colony of New Caledonia, with the average crania of the citizens of Paris. Practically, there turned out to be no constant difference at all, unless it was that the vertical index of the criminal skulls was slightly higher; in other words, the convicts were 'brainier' than the good folks. There was also the same amount of variation in the heads of the criminals. Some were long, others broad-skulled; some had a notably large, others a small cubical capacity; these variations running parallel to those of the general population. M. Pitard's article, with abundant data, is in the *Bulletin* of the Anthropological Society of Paris, 1898, Fasc. 3.

### THE FOLK-LORE OF THE FJORT.

This is the title of the latest volume issued by the Folklore Society of Great Britain. It is written by R. E. Dennett and edited by Miss Mary H. Kingsley. The 'Fjort' is the name applied to the negro tribes of the French Congo, who once formed the great native kingdom of Congo. The volume is much more than a collection of folk tales. Miss Kingsley in the introduction and the author in his commentary and notes furnish fresh and valuable information on the religious beliefs, marriage and burial customs and mode of life of these