done at Leeds if they authorise the secretary to state "they have satisfied themselves that this evidence is erroneous." Those who in common with myself have looked critically and, I may say, quite impartially into the evidence have come to the conclusion that the analytical methods are quite dependable. Others will no doubt corroborate this statement. After the publication of the report the Planters' Association held a meeting, at which they passed a resolution expressing confidence in, and practically endorsing the opinion of, their own advisers, in face of the new evidence offered from the Leeds laboratory. I gathered this information from a report of the meeting in one of the Indian papers, which was forwarded to me at the time. This attitude, which may fairly be described as one of hostility, would have been stiffened by the above letter were it not therein admitted that the "biological side" of the problem is still in its infancy, and that further development in this direction is anticipated. Also it is conceded that "an entirely independent opinion" in the matter (? of the manufacturing processes) is to be obtained. Thus all the contentions of those who felt the ignominy of this great Indian industry "taking its whipping in a crouching attitude" are likely to be met, and our best wishes are, it is needless to say, with the planters. If they are, by the inexorable laws of nature, beaten in the long run, it will at any rate redound to their credit that they did not succumb without a good fight.

There is one point in the foregoing letter which appears of considerable importance, and to which I should like to take the present opportunity of directing attention. The evidence of the advisers to the association is accepted because it appears that they are on the spot and dealing with the fresh plant, while the Leeds chemists have been investigating "preserved material." Now if the Leeds results by the isatin method are correct—and I repeat that I see no reason to doubt them—it follows that "preservation" leads to an increased development of indican. May not this hint be worth following up practically? In thanking the secretary of the association for his communication, I should like, in conclusion, to repeat what I said during the discussion before the Society of Chemical Industry last autumn. The results given by the newer methods of analysis may be unrealisable in practice; it does not follow that because a certain percentage of indican is present in an Indigofera leaf the corresponding quantity of indigotin, or anything approaching that quantity, can be got out of it in the factory. All that is contended is that at the present juncture the indications furnished by a scientific quantitative method render it imperative that every resource should be strained to save the native industry. Further developments will be anxiously waited for in this country.

R. MELDOLA.

I ENTIRELY agree with the opinion expressed by Prof. Meldola in his article, entitled "A Contribution to the Indigo Question," which recently appeared in NATURE (p. 296), that the case had "at one period assumed a polemical aspect most detrimental to the real cause at issue," and I write this with no desire to discuss the responsibility for this regrettable state of affairs, or to revive it. My object is to record some results recently obtained by Mr. Briggs and myself, which we had not intended publishing, but which may prove of interest in the light of Prof. Meldola's article.

Anhydrous indican was prepared according to the method of Perkin and Bloxam (Journ. Chem. Soc., vol. xci., p. 1715); its melting point was, as stated by these authors, 176–178°. A gram of this substance was dissolved in 500 c.c. of water. Two 100 c.c. samples were withdrawn from this solution, and analysed by the isatin method of Orchardson, Wood, and Bloxam (Journ. Soc. Chem. Ind., vol. xxvi., pp. 8 and 1178), and two by the persulphate method of Bergtheil and Briggs (Journ. Soc. Chem. Ind., vol. xxv., p. 734, and vol. xxvi., p. 1173). This was repeated three times with two distinct preparations of indican. The following results, expressed as the amount of indigotin (in grams) to be derived from 100 c.c. of the solutions, were obtained. The figures are means of the duplicate experiments, which agreed very closely.

	Isatin method			Persulphate method	Theory
i.	0·0841	...	...	0·0840	0·0888
ii.	0·0855	...	...	0·0845	
iii.	0·0852	...	...	0·0845	

The indirubin obtained by the isatin method was analysed by titration with titanium chloride (Knecht) in each case, and found to be 98 per cent. pure (average of six samples); the titanium chloride solution was standardised on pure iron, and also on pure indigotin obtained by sublimation under reduced pressure (Bloxam).

The indican employed was evidently not pure, the analyses indicating a purity of 94·6 per cent. in the first case, and 95·6 per cent. in the second and third, but this degree of purity is sufficiently high for the purpose of comparing the methods. The comparisons indicate that almost identical results are obtained, the mean difference being 0·7 per cent.

Another point which these figures seem to establish is the accuracy of our method of determining indigotin (at any rate, so far as the factor for the relationship between indigotin and permanganate is concerned), for it is extremely improbable that, were an error involved in this method, it would be so exactly counterbalanced by errors in the other direction in the precipitation of indigotin by persulphate as to bring the results into such close approximation with those obtained by the isatin method.

If these two points are conceded, then the main grounds on which the contention is based, that "the older methods have overestimated the indigotin content of the dried cake, and have underestimated the amount of indican in the leaf," disappear.

C. BERGTHEIL.

Sirsiah, September 2.

An Alleged Excretion of Toxic Substances by Plant Roots.

SINCE the communication entitled "An Alleged Excretion of Toxic Substances by Plant Roots" appeared in NATURE (August 27, p. 402), it seems desirable to state the exact position taken by the Bureau of Soils on the question of deleterious substances in soils and root excretions.

Abundant evidence has already been presented to the effect that substances deleterious to plant growth do exist in many soils, and are mainly responsible for the infertility therein observed,[1] and toxic substances, to wit, picoline carboxylic acid and dihydroxystearic acid, have actually been isolated and identified. In carefully controlled experiments these toxic conditions have been shown to arise as the result of the continuous growth of the same sort of plants upon the soil. In addition, it has been shown that plants like wheat excrete substances which set up toxic conditions in the medium. Toxic conditions may also arise from the presence of the decomposition products of vegetable matter in the soil. Indeed, it has been shown that very many substances naturally occurring in plants are toxic in quite small amounts. When plants containing these substances are incorporated with the soil, they may play an important *rôle* as soil constituents.

Regarding the criteria of growth, it may be said that not transpiration alone, as implied in the article referred to, but several standards of growth were employed in the investigations of this bureau, viz. weight of green tops, dry weight, transpiration, turgidity and colour of roots, chemotropic response of the roots. All these criteria are employed in determining the physiological effect of substances on plants, but no one is regarded as absolute.

The statements made in Bulletin No. 48 of this bureau were based, as was said in the note referred to, upon many thousands of pot experiments, and the conclusions seem justified by the results of that work. It is obviously possible to choose figures from any table which are apparently discordant. A comparison of the paraffin pot method of testing soils with the results of continuous plot experiments in this country has shown good agreement.[2]

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[1] Bulletins Nos. 28, 36, 40 and 41 Bureau of Soils; Rept. Hawaii Agr. Exp. Sta., 1906, p. 37; Journ. Biol. Chem., iii., Proc. 38 (1907); Journ. Amer. Chem. Soc., xxx., 1295 (1908); *Science*, xxvii., 190, 295, 328, 329 (1908).

[2] Bull. 109, Rhode Island Agr. Exp. Sta.