RESEARCH ITEMS.

Determination of Finite Groups.—An important contribution to the problem of determination of all finite groups has recently been made by Fitting (*Jahres. bericht. der deut. Math. ver.*, Bd. **48**, pp. 77–141). Although the complete and satisfactory solution of the problem is still far from us this contribution makes us realise all possible groups of finite order provided the simple non-abelian groups and their group of automorphisms are known. A summary of the leading steps of his procedure is as follows:

A group is termed semi-simple if it has no normal subgroup which is soluble. If G be any finite group it follows that either it is semi-simple or it will contain a maximum possible normal subgroup N which is soluble. N is, obviously characteristically invariant (*i.e.*, for every autorphism α of G, $N^{\alpha} = N$) and G/N is semi-simple. Hence if one determines all soluble groups N_i and all semi-simple groups S_k, then every finite group can be obtained by extending some N by some S in the sense of the general theory of Schrier. The problem of determining when two such groups are isomorph is also solved here.

Next he comes to the question of determining all finite semi-simple groups. G is termed completely reducible if it is a direct product of simple groups. He shows first of all that G is semi-simple if and only if every factor in its decomposition is non-abelian. He then introduces the groups (n, G) which are formed by the n-dimensional vectors $v_\alpha = (a_1, a_3 \ldots a_n)$ where a's are elements of G and (n, G) is constructed through v_α in such a way that $v_\alpha . v_\beta = v_{\alpha\beta} = (a_1 \beta_1, a_1 \beta_2 \ldots a_n \beta_n)$. The first fundamental theorem is the following: If $E_1, E_2, \ldots$ are all the non-abelian finite groups, then every completely reducible semi-simple group G is constructed as the direct product

$(n_1, E_{s1}) \times (n_2, E_{s2}) \times (n_3 \times E_{s3}) \times \ldots$ where $s_1 < s_2 < s_3 \ldots$ and n_r's run through all positive integers.

He then shows that every semi-simple group G possesses a maximum possible characteristically invariant subgroup which is completely reducible, N say. He also proves the important result that $N \neq e$. It is clear therefore that G must be obtained by extending N by a suitable factor-group. The Zentralisator Z_N of N in $G = e$. Therefore it follows that every such G must be a subgroup of the group of automorphisms of N. The group A of the automorphisms of N is obviously the direct product of the group of automorphisms of its individual factors which are all simple and non-abelan. Hence if these groups and their groups of automorphisms are known then the problem of obtaining all the semi-simple groups is solved, provided the problem of finding when two of them are isomorph is solved. It is shown by means of a procedure analogous to the proof of the known result that the group of automorphisms of a simple non-abelian group is closed, that two such groups G_1 and G_2 which are subgroups of the group of automorphisms A of the completely-reducible semi-simple group G are isomorph if and only if G_1 and G_2 are conjugate in G.

Next he deals with soluble finite groups. He proves that every such G must itself be nilpotent or it must possess a characteristically invariant maximum possible nilpotent sub-group N and $Z_N = N$. It is known that every finite nilpotent group is the direct product of its sylow sub-groups. Therefore the soluble groups G can also be obtained as the extensions of N.

He gives another method for the Schrier-extension of a group N by the factor group H which possesses a distinct advantage over the older method, *i.e.*, it enables us to find out whether two such groups G and G′ possess an isomorphy which leaves N invariant. In the extensions that are required for his purpose what is wanted is only this, as the normal subgroups considered are all characteristically invariant. The most difficult part of the whole theory consists in finding out all possible factor-systems. The article contains a good extension of Schrier's theory. In particular the problem of determining all possible p-groups is solved partially as the extension of its centre by the corresponding factor-group whose structure is assumed to be known by induction. The extensions in case where the normal subgroup has no element of the centre other than e is considerd. It is also shown as was remarked by R. Baer that the extension problem can be taken to be solved completely provided in the case when N is abelian it is completely solved. K. V. I.

A New Method of Weed Eradication.—Under the title, "Biological eradication of Kans (*Saccharum spontaneum*) in field patches" G. C. Tambe and Y. D. Wad of the Institute of Plant Industry, Indore, Central India, draw attention to what appears to be a simple and efficient method of eradicating troublesome weeds (*Agric. and Livestock in Ind.*, **8**, Part IV). The method adopted was to cover, by means of a thick mulch of green material such as sunn hemp, green grass or even green weed growth removed from fields, the patches of land overgrown with the particular weed desired to be destroyed, and allow the mulch to remain through the rainy season. At the end of this period it is found that the decomposing green material had acted on the root system of the weeds under the rotting cover green mantle and had effectively killed it. In addition to such destruction, the treated land is also said to have increased in fertility. Wheat and cotton grown on such treated plots gave significantly higher yields than the controls and in the case of wheat, the quality also greatly improved. The improvement related mainly to the total nitrogen and gluten content which were 2·07 and 11·53 per cent. respectively as against 1·65 and 8·04 per cent. in the control. The treated plots showed a higher content of organic matter in the upper zones of their soils than the

controls and it is surmised that the better quality of the wheat in the treated plots may be due to this increased organic matter content. The essential feature of the method is the use of green material as such in contradiction with dry material like straw or *bhusa* which are found to be ineffective. The method deserves to be tried in the case of other difficult weeds such as the hariali grass (*Cynodon dactylon*) of the black cotton soils, a weed which greatly reduces cotton yields and involves much cost and labour to eradicate and is seldom permanently removed even then. The touch-me-not *Mimosa pudica* is another such weed against which cultural, chemical and other methods are in practice out of the question and a suitable adaptation of this new method deserves a trial. We look forward to the author for a further study of the method on a more extended basis. A. K. Y.

The Relative Values of Organic and Inorganic Nitrogen Fertilisers.—An account of certain manurial experiments for testing the superiority of any of organic nitrogenous fertilisers over inorganic fertilisers supplying the same quantities of nitrogen conducted on the Jealot's Hill Farm of the Imperial Chemical Industries has been abstrated in the *Journal of Agriculture and Livestock in India*, **8**, Part IV. The conclusions are in accordance with the opinions which used to be held until recently when organic nitrogenous manures are being credited with special virtues by reason of their content of organic matter. The experiments were conducted both on the field and in pots and cover two seasons. The crops dealt with were Brussels sprouts, mustard, barley and wheat. By organic nitrogenous manures are meant only those which supply a fairly large quantity of nitrogen entitling them to be called fertilisers and not bulky organic materials with comparatively a low nitrogen content like cattle manure. The results show that organic fertilisers are not superior to inorganic fertilisers in crop-producing power; they have no value beyond what is due to their nitrogen content. Provided the lime status of the soil is maintained at an adequate level inorganic nitrogen fertilisers will give at least as good results as organic fertilisers supplying the same amounts of nitrogen. The slow release of available nitrogen, the humus content of the manure which is held to improve the physical condition of the soil and the presence of a specific beneficial substance such as certain hormones are explained to confer no special advantages on the organic over the inorganic nitrogenous fertilisers. One feels these are far too sweeping conclusions: but even granting their correctness, it is at least doubtful if they will apply to tropical and sub-tropical conditions and furthermore over a more extended period than the two-year period over which these experiments have been carried out. A. K. Y.

Changes in the Testis of the Musk Turtle.—Very little is known about the seasonal changes in the testis of Reptiles, especially of Turtles. P. L. Risley (*Journ. Morph.*, 1938, **63**, No. 2) observes that in the musk turtle (*Sternotherus odoratus*) the spermatogenetic cycle in the testis is limited to the summer months of the year, closely paralleling that of Anura. Spermatogenesis begins in July and is completed in October. The spermatozoa are found in large numbers in the testis from September to May, in the latter month they are all expelled and the germinal epithelium prepares for the spermatogenesis. The spermatogonial divisions are most common in June.

Multiple Chromosomes of *Paratritropodia*.—The chromosomes of most Acrididæ show a remarkable uniformity in number. In males the diploid number is 23 and in females it is 24. The number in *Paratritropodia* as studied by R. L. King and H. W. Beams (*Journ. Morph.*, 1938, **63**, No. 2) is 19 in the male and 20 in the female. The reason for this decrease in number is the association of four pairs of non-homologous chromosomes to form four V-shaped multiples. These multiples result in associations of a higher order than tetrads (hexads and octads) in Metaphase I. But in *P. brunneri* the authors describe, for the first time in Acrididæ, a decad found in the 1st spermatocyte, which is formed by the accessory chromosome associated with an octad.

The Indian Central Jute Committee.*

JUTE is one of the principal cash crops of India. Though its cultivation is restricted to the Eastern Provinces, in 1936–37 it covered an area of 2·886 million acres, which produced a crop of 9·663 million bales. Assuming a price of Rs. 31 per bale, which was the average quotation of the Calcutta market on 9th March 1938, the present-day value of the jute crop raised every year in India amounts to the huge figure of Rs. 30 crores. Out of this crop over 4 million bales are exported each year in the raw state to foreign countries, a nearly equal quantity is first manufactured in the Indian Jute mills and then exported, while about 1·7 million bales of jute goods are consumed within the country.

The figures given above would give one an idea of the gigantic issues involved in the cultivation, transport, marketing, manufacture and storage of Indian jute. These issues create numerous intricate problems, some of a biological, others technical, yet others of an economic nature. Hitherto these problems have either been ignored or have been tackled in an isolated and scattered way without any systematic plan or efficient

* The Indian Central Jute Committee.—*First Annual Report*, for the period 1st December 1936–31st March 1938. Pp. 60.