London, Sheffield, Leeds, Glasgow and Manchester Universities. There will be a great paucity of space immediately after the war in these places of learning, but they hope to have a great deal more space later on. We should increase the availability of technical talent in India by sending our young and brilliant students to England and America. India needs not only scientific researchers but also technicians—persons of the foreman type who can help in the running and repairs of machinery so essential for industrialisation. Such firms as the Imperial Chemical Industries, Metropolitan Vickers and the non-ferrous metal industries in England are quite willing to train young men from India and even pay them as apprentices; we need a very large number of men with these qualifications, and we shall have to look for such training in Canada and the U.S.A. as well."

Factory and Farm

"In England great emphasis is being laid on equalising the standard of life in the cities and the villages. Agriculture still retains in England too much of its primitive character. Modern methods of application of energy on the farms, conditioned transport and proper storage of agricultural produce are still in their infancy. Canada and the United States are ahead in this field and the tractor, the motor vehicle and electric power have contributed a great deal in those countries for a better standard of life on the farm. On a value basis at present about 88 per cent. of the world's agricultural produce is used as food, 8 per cent. as textiles and 4 per cent. for other industrial purposes. The last two together form roughly one-third of the raw materials of industry. There is an increasing tendency to look to agriculture for a larger proportion of these raw materials, but these materials can only be used profitably if the factory becomes an adjunct of the farm. Industry is moving towards that ideal particularly in the U.S.A., and this may be a lesson which we in India may learn in our planning for the future. We are so primitive in our farming that this would be an idle dream unless we first improved our transport and communications and provided better methods of storage and marketing, power-driven machinery and the use of proved fertilisers."

Concluding the President described the Tennessee Valley enterprise as "the romance of a wandering and inconstant river, now become a chain of charming and lovely lakes which have contributed much to the enjoyment of life of the people, on which move, without any dangers of accidents, barges of commerce which nourish American industries. It is a fairy story of wild waters controlled by human ingenuity creating electrical energy which has been America's Alladin's lamp. I dream of the Tennessee Valley, but not without hope: for all this may happen to any river valley in India to the Damodar, to the Ganges, to the Sutlej, to the Narbada, to the Sone, if the people and the Government just give science a chance."

THE NEW OIL COMMITTEE AND FUNDAMENTAL RESEARCH

It is a matter for sincere gratification and happy augury for the future welfare of the millions of this country that the Government of India Member for Health, Lands and Education should have recently declared his firm conviction before an assembly of the representatives of trade and commerce at Madras, that the promotion of the health and education of the people and the development of the resources of the country are of "greater importance than political problems". This advice and the appeal made by Sir Jogendra Singh, himself a producer, to an assembly of commercial magnates is none too early at the present juncture of our national economy. In any self-governing country, the merchant class should consider themselves not only as the privileged distributors and trade agents of the national produce but should also act reciprocally as the enlightened patrons promoting the cause of the producers. Production requires not only the capital of the business-man but also the wholehearted co-operation and contribution of the skilled technician and of the research scientist.

The idea of creating commodity committees and making them self-supporting to carry on research and have their own services throughout the country is an extremely useful and creditable suggestion. Among such commodities, the position of oil-seeds is a very high one indeed.

Not long ago *Current Science* had an editorial on this important subject putting in a strong plea for the scientific utilisation of Indian oil seeds. After a period of nearly two years it is encouraging to find that publicists have paid attention to the points urged therein. It is well known that oil seeds form a valuable part of the annually recurring agricultural wealth of this country. Out of a total area of 300 million acres under actual cultivation about 60 million acres are under oil-seed crops. Further the 90 million acres of Indian forests also yield as minor forest produce, commercial quantities of important oil seeds. The more abundant of these are listed below for convenience of reference.

Oil-seed	Area in millions of acres	Output in millions of tons
Cotton	25·0	2·0
Groundnut	10·0	3·3
Mustard and rape group	7·0	1·0
Linseed	5·0	0·5
Gingelly	5·0	0·6
Castor	2·0	0·2
Cocoanut	1·4	1·4
Poppy	0·5	0·2

The less abundant but nonetheless valuable commercial oil seeds comprising mowra, nigerseed, safflower, kokum, domba, dhupa, chaulmogra, neem, ritha, cashew, honge, kusum hemp and many others add to a total of about 10 million tons of oil seeds, approximately valued at 100 crores of rupees. The proper utilisation of this precious raw material not only in the best interests of the agriculturists but also in the interests of landless labour and the educated unemployed, is a responsibility which no enlightened government or patriotic business-man can shirk. A unique feature of oil seeds is their potential as well as actual utility for a variety of the essential needs of man, machine, livestock, and soil, as foods and drugs, as fuel, as fodder, as fertiliser, and for a variety of other industrial purposes.

A rational plan of utilisation of these oil seeds will naturally resolve into a systematic assessment of the scientific value and the industrial potentiality of the three components into which they may conveniently be separated: (1) The shells and husks of the oil seed, (2) the oils and fats derived from the kernels and (3) the residual oil-cakes. Each of these forms a valuable starting material from which a succession of industries could be built up. Taking first the most important components of them, *viz.*, the oils and fats, one need only peruse the following list of their industrial uses for realising their vast and varied importance.

(1) Refined salad and edible oils, including hydrogenated vegetable ghees, (2) toilet, textile and liquid soaps including Turkey-red oils, (3) illuminating oils, candles and liquid fuels, (4) glycerine and explosives, (5) paints, varnishes, lacquerware and plastics including rubber substitutes, (6) shoe and leather-dressing greases and polishes, (7) simple and compound lubricants, (8) linoleum and water-proof fabrics, (9) medicinal oils and pharmaceutical compositions, (10) various fine chemicals including valuable synthetic perfumes.

Each one of these uses has led to the development of a special branch of oil technology. The progress attained so far in each of these, however, has been based chiefly on imitation of experience gained outside India, and as such suffers from being too wooden and static to inspire continuous research on them so as to ensure a progressive efficiency and economy. For example the oil hardening and vegetable ghee industry has factories all over the country where some of the foreign formulæ are imitated in specially imported foreign machinery, affording neither incentive nor encouragement to creative research in this field of chemical industry. For instance other catalysts than nickel can certainly be found to effect hydrogenation of oils. To take another example, other oils than castor may be treated so as to yield Turkey-red oils. Again, satisfactory liquid fuel for lamps as well as for engines can be made from cheaper vegetable oils by suitable cracking processes or by other chemical treatments. Another important branch of oil technology in which commercially valuable results are possible by systematic research is the production of candle material and wax substitutes from most of the common oils by special hydrolytic or oxidative methods. In a similar way many common semi-drying or non-drying oils like castor oil or even groundnut oil can be converted by oxidative and dehydration methods into linseed oil substitutes for the purpose of the paint and varnish industry. In fact the scope for fundamental research leading directly to results of industrial value is almost unlimited in every branch of oil technology. The above examples are only a few illustrations of such possibilities.

One of the most attractive and in the writer's opinion the most outstanding contribution which applied chemistry can make to oil technology will be the establishment in this country of a genuine synthetic ghee industry. It will be an achievement alike for the chemist, the technologist, the industrial captain, and the administrator if they will co-operate through an industrial research laboratory to make this a commercial success. It will mean firstly the establishment of a fatty acid key-industry employing either fermentation methods of hydrolysis of oil or the more drastic hydrolytic methods of oil splitting by caustic alkalis or mineral acids. In both these cases glycerine liquor will be a concomitant bye-product, and the production of pure glycerine from this bye-product will be the second stage of the future synthetic ghee industry. The third stage will consist of the esterification with pure glycerine of the various fatty acids mixed together in the right proportion as found in genuine cow's ghee or buffalo-ghee or goat's ghee so as to effect thereby the formation of a genuine ghee by purely synthetic methods. Accessory food factors like vitamins, sterols and colouring matters may be added to this product to make it perfect as a genuine substitute of ghee.

Turning next to oil-cakes it is needless to emphasise that the utility of oil-cakes not only by themselves but as raw materials for further chemical industries is almost unlimited. Many of them are capable of yielding by suitable methods of extraction, hydrolysis, or other chemical treatments a variety of useful industrial products in the form of fatty and protein foods, as medicinally valuable glucosidic alkaloidal and resinous drugs, as detergents and soap substitutes and as adhesives and glue ghee substitutes besides affording mineral constituents like phosphates and potash salts as rich fertilisers. In fact there is a crying need for a systematic chemical research on the scientific and industrial potentialities of our abundant oil-cakes. It is rather difficult to foresee in full the immense possibilities in this direction. It is permissible to add in this connection that even a fine chemical industry involving a series of amino-acids on the one hand and sterols, phosphatides and related compounds on the other, is possible of establishment by using oil-cakes as starting material.

Coming last to the shells and husks of oil seeds the position regarding the scientific knowledge about them is even more scanty than that of oil-cakes. Many of them contain valuable colouring matters, tannins and carbohydrates and cellulosic materials of various types, besides being rich sources of valuable potash and phosphates in their ashes. At present they are either burnt off as cheap fuel or in rare cases used as adulterants of doubtful fodder value. The proper industrial exploitation of our oil-seed shells and husks is yet to be thought out. To indicate the possibilities in this direction one may refer to a few that have yielded useful industrial products as a result of systematic scientific research. It is well known that cocoanut shells are rich sources of phenol and acetic acid on their being subjected to destructive distillation. Similarly cashew shell oil which is a bye-product in the cashew industry on the west coast of South India is a rich source of higher phenolic compounds capable of yielding valuable plastic material on suitable treatment. The case of cotton seed hulls is another instance of hidden wealth brought out to light by systematic investigation. The hulls have been shown by the writer to be a very rich source of the valuable chemical substance, *viz.*, furfuraldehyde which is readily optained from it by a simple hydrolytic treatment. The utility of furfuraldehyde in the synthetic plastic industry as well as in the synthetic dyestuff industry is well known. Further the ashes of cotton seed hulls are almost entirely composed of potashes, which are so useful in the fertiliser industry. The hulls also yield a dyestuff which can colour silk or cotton yellow. The case of groundnut shells is very similar to that of cotton seed hulls, and can yield the same products besides pure alpha cellulose. Another direction in which the shells can be utilised is for the preparation of active carbon. It may be said in general, therefore, that a systematic investigation into the scientific and industrial value of the immense quantities of the oil-seed shells and husks is almost an unexplored field full of industrial potentialities and will repay severalfold any amount of investment in the cause of their scientific investigation.

The above are only a few illustrations of the great industrial possibilities arising from a systematic scientific research into the industrial utilisation of our oil seeds and oil-seed products. It is not an exaggeration to say that if properly utilised the raw oil seeds of India may form a starting material capable of yielding a variety of useful finished products not in any way inferior in importance or utility or wealth to the products of the well-established coal-tar industry in India or elsewhere.

In carrying out the above schemes of research it is necessary to emphasise that a number of co-ordinated Provincial institutions, devoted exclusively to locally available oil seeds will be more useful than a centralised institute in any one part of the country. Equally important with these is the provision that will have to be made for the training of skilled artisans and scientific workers for a periodical demonstration and dissemination of the results of research among the interested public through the medium of local vernaculars. It is only by such increase of Indian scientific man-power among the middle class intelligentsia of this country through vernacular education that we can gather the moral and social momentum necessary to raise our country to the vanguard of the progressive nations of the world.

Our greatest hopes, therefore, lie in the new Vegetable Oil Committee which the Government of India have wisely helped to constitute at a most opportune moment in the history of our country. P. RAMASWAMI AYYAR.

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INFLUENCE OF MERCURY ON INSECT EGGS—PART I

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THE use of mercury for the protection of stored pulses from insects is an age-old practice in Mysore. Kunhi Kannan (1920) first brought this to the notice of Entomologists in India and elsewhere. He also found that the eggs of the pulse beetle, *Bruchus chinensis,* failed to develop and hatch in the presence of mercury. Larson (1922) made similar tests and confirmed this finding. Dutt and Puri (1929) later found that mercury was equally effective in arresting the multiplication of the grain weevil, *Calandra oryzæ.* Gough (1938) working on the flour beetle, *Tribolium confusum,* showed that mercury had a deleterious effect on the eggs while the grubs remained unaffected. Recently, Wright (1944) carried out observations about the effect of mercury on the eggs of other stored grain insects.

This note embodies in brief the results of a series of experiments conducted here to elucidate certain important details of the influence of mercury on the eggs of stored-grain insects. The aim of these experiments has been to fix the exact quantities of mercury and the methods of using it finally in the case of large-scale storage of grain.

TECHNIQUE

In all the experiments, tall and empty cylindrical jars of known volumes were used. Known quantity, by weight, of mercury was exposed in open paraffin crucibles of uniform dimension and thickness. These were kept at a height of 2·5 cms. above the level of the eggs arranged in a single layer, on filter paper in a petri dish. One hundred fresh eggs were taken for each experiment. The jars were kept covered with air-tight lids. Proper controls under identical conditions were maintained (Fig. C).

The time allowed to determine the effect of mercury was in each case twice the period taken for the larvæ to hatch out normally from the eggs in the control series. This period was considered necessary in order to allow time for any delayed hatching, in the experimental series.

(1) *Observed results of exposure of the eggs to mercury.*—Eggs (not older than 16 hours) of the following insects were tested: *Corcyra cephalonica, Bruchus chinensis, Calandra*