

state endowment of research workers received his strong support.

Sir Ronald Ross was made F.R.S. and F.R.C.S. in 1901. He was decorated C.B. in 1902, K.C.B. in 1911 and K.C.M.G. in 1918. His great discovery gained him the Nobel

Prize for Medicine in 1902 and very many Governments and Universities have awarded him honours and degrees in recognition of the great benefits which his discovery has conferred upon humanity.

J. A. SINTON, LT.-COL.

The Industrial Outlook.

Crisis in the Lac Industry.

By M. Sreenivasaya.

THE Indian lac industry is at the moment passing through a crisis which may be regarded as a logical consequence of the shortsighted policy pursued in the past. The prevailing general trade depression, common to all countries and industries, does not fully account for the increasing decline in prices for lac, and therefore, in this instance, there is not the same hope of a satisfactory recovery when trade conditions improve. Other factors, far more serious and subtle, now merged in the present trade slump, have been silently working during many years, while those responsible for maintaining the industry have not sufficiently anticipated the danger now confronting it.

The lac industry owed its brief prosperity exclusively to scientific developments in Europe and America. Before the advent of the gramophone the demand for lac was very limited, being utilized in a few of the finishing industries. In its very early days, lac was valued more for its scarlet dye than for the resin, and German synthetic dyes soon ousted this natural product, not because of superior fastness or brilliance but by their ready availability to fabrics without elaborate processing. The lac dye lost its market through dearth of economical manufacturing methods, and to-day its significance is only historical.

At that period in this country the resin had a few uses each indicating the potential nucleus of a big industry. Bangle-making could have grown into the moulding trade, later developed in the West; the lacquer industry could have been built up into the manufacture of lacquers and lacquer-enamels for metal and wood; but there existed neither the atmosphere nor the urge to elaborate industries based on the utilization of indigenous raw materials.

The industrial revolution wrought a transformation in the economic life of the Western nations; it gave an incentive into their

inventive genius which, in turn, stimulated a greedy hunt for new raw materials from all parts of the globe. India, with her vast wealth and variety of unexploited raw materials, generously responded to the call. Lac was one of the important raw materials whose production was greatly enlarged by the industrial developments in the West. The expansion of the electrical industry in America, the gramophone industry and the development of the finishing industries in general built up a steady demand for lac. In course of perfecting and rationalizing these industries, lac was subjected to rigorous tests and found wanting. Shellac as a plastic or as an ingredient for moulding compositions did not meet the exacting requirements of certain industries; for instance, although a good electrical insulator at ordinary temperatures, it cannot withstand high temperatures. The demands of industry grew more discriminating and rational, which in turn necessitated the control of the raw material from the very origin of its production. The lac industry was in a primitive state of organization. Frequent failures and uncertainty of crops led to violent fluctuations of the shellac market, which gave the exporter ample opportunity to speculate, thus doing more harm to the industry than any other single factor contributing to its present downfall. There was then no organization in the country to standardise the various lac brands, and ensure that reasonable uniformity of composition which the rationalized industries demand. Uncontrolled and greedy adulterations practised throughout the country brought down the reputation of the product and led to a rigorous system of analysis by the consumer. In short, the Indian industry did not cater sympathetically, intelligently and honestly for the needs of foreign consumers who were driven in disgust to search for synthetic substitutes

fully capable of control. It is the same spirit which induced some of the American manufacturers to lease out their own estates and forests in India for purposes of lac production.

American revolt against the shellac trade tyranny dates from 1910, because it is during this year that L. V. Redman began his investigations of the action between phenols and aldehydes under the auspices of the Mellon Institute. This intensive study, occupying three years, bore fruit in the commercial manufacture of "Redmanol". At the same time, the analogous product called "Bakelite" had been developed by L. H. Bakeland. Later these two processes were amalgamated with such fruitful results as have been witnessed during the last decade and a half. The synthetic resins have played an important part in all recent technological progress. The variety of synthetic resins now available is so great that there is a resin suitable for any rigorous specification that may be imposed. The chemistry of resin manufacture is so advanced and the properties of a material so controlled, that the specific needs of any new industry may be met. Although the synthesis of a resin identical with shellac has not been achieved, the products have advantageously displaced shellac in many of the industries. High temperature electric insulation, infusible mouldings, oil-soluble resins, compositions of varying plasticity, hardness, elasticity, colour and transparency have been rendered possible through the wide range of resins that have been revealed. The synthetic resins are not only displacing the natural products, but have also extended their field of usefulness and have stimulated the development of new processes and manufactures. For example, cellulose base plastics and quick-curing resins have entered the field of gramophone-record manufacture, and novelties in the form of flexible records are forecasted through the employment of these new plastics.

Shellac occupied a prominent position among the raw materials of the finisher and the varnish-manufacturer. The advent of pyroxylin and cellulose acetate in the year 1922 into the field of lacquers attacked both lac and the drying oils. The phenomenal development of the lacquer industry in America since 1923 is doubtless due to the industrial production of cheap solvents made possible through (1) evolution of the butyl

alcohol fermentation process and (2) high pressure catalytic synthesis of alcohols. The mass production of automobiles called for quick drying lacquers adapted to rapid spray painting, in place of the old oil varnishes which require to be heat-cured or baked for long hours. The lacquer and lacquer-enamel investigation has been so ardently pursued that the days of oil-varnishes in the linseed class are numbered, their place being taken by partially polymerised synthetic resins. The technological success of these pyroxylin lacquers has been so great and convincing that American railway rolling stock has been painted with them and the total consumption of pyroxylin for lacquers in the year 1929 was 41 million gallons.

In the lacquer industry, shellac, as the chief ingredient of spirit varnishes, has lost its pre-eminent position and is now subordinated to lending gloss, brilliance, hardness with water-proofing and adhesive qualities to the pyroxylin finishes.

Intercommodity and interprocess competition has adversely influenced lac because of high and unsettled prices, variable composition, and incapacity to meet some of the new needs. In 1924, America overproduced synthetic resins and the essential raw materials, of which America has now made herself independent of foreign import. This is a serious situation which gives little hope of recovery for the shellac market, since America would naturally strive to utilize her home-made and abundant synthetics to her best advantage, in preference to shellac which she has to import. If the American demand, which still accounts for sixty per cent. of the trade continues to decline, the lac industry will have to face a ruinous crisis. During the last few months, shellac has found a few new markets in Europe, but compared with what it stands to lose in America, these are negligible.

The remedy to this threatening situation lies not in propaganda in foreign countries extolling the virtues of our raw material but in building up indigenous industries which will consume it in our own country. When Japan's camphor industry was threatened with severe competition from German synthetic camphor, Japan immediately organized her national industry and founded a trust to control the prices. When she found that the economic price could no longer be maintained, Japan founded the celluloid industry which consumes a considerable

part of her natural product. India should now adopt a similar policy with respect to the lac industry. The spirit lacquers and lacquer enamels which consume shellac as the principal ingredient should be manufactured. Intensive research work will have to be undertaken to discover suitable solvents and plasticisers which will impart to the shellac film the desirable qualities of gloss, hardness, resistance to water and to other forms of chemical action. The solvents of shellac as compared with those of cellulose esters are far cheaper and are at present available in large quantities in the country; if necessary, their output could be increased.

The use of shellac could be extended to the manufacture of certain types of mouldings which need not be exposed to high temperatures. Many of the electrical appliances, switches, plugs, etc., with dials, stands and other artware could be manufactured. Much research is required to elucidate the fundamental physical and chemical properties of shellac before we can think of other appropriate uses. In the meanwhile a beginning can be made on the lines indicated.

To encourage exploitation of new uses for shellac, research fellowships and prizes should be founded on a liberal scale in the country and in this matter the Government should help the industry. The Rubber Growers' Association launched a similar

scheme a decade ago, as a result of which 10,000 suggestions were put forward for novel uses of rubber. The technology and industrial applications of rubber have benefited immensely as a result of this scheme which has no doubt greatly stabilized a trade at present suffering from overproduction. The Imperial Council of Agricultural Research should immediately take this matter in hand and investigate a situation which bears heavily on the economic prosperity of the country.

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Effect of Ionization on Impregnated Paper Insulation.

(*Electrical World*, July 30, 1932, Vol. 100, 5.)

MR. K. S. WYATT, Research Department, Detroit Edison Co., has experimentally shown that if ionization occurs in an operating cable, the impregnating compound itself may deteriorate and increase considerably in dielectric loss. The deterioration products may not be uniformly distributed throughout the cable, but may be concentrated in spots which conceivably might factor in breakdown. The modified Becker cell used in the investigations appears to be an effective tool with which to investigate the influence of Corona discharge on the dielectric loss characteristics of insulating oils and papers.

Science News.

WE have pleasure in acknowledging with sincere and heart-felt gratitude, the generous donation of Rupees Five Hundred granted to the "*Current Science*" Funds by the Senate of the Madras University for 1932-33. May we not hope that this shining example of Madras to uphold and advance the cause of Science in India will be promptly followed by the other Universities?

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In an extension lecture of the Allahabad University, Prof. A. C. Banerji, M.A., M.Sc., addressing on "Modern Science and its influence on some of the Philosophical ideas of the present century", outlined the far-reaching changes brought about in man's outlook of the Universe by modern theories of physical science. The age of the mechanical scientist is gone and the quantum theory, atomic theory and relativity have replaced the law of causation and determinism, whereby Nature could only follow one path, i.e., the road mapped out for her from the beginning of time to its end, by the Law of Probability and Uncertainty. There is no real distinction between aspects of matter or light. It is a case of the principle of duality as suggested by C. G. Darwin.

According to the Heisenberg's principle of indetermination, it can no longer be asserted that a complete knowledge of the present would make it possible for us to predict the future with certainty.

Discussing the theory of the expanding Universe as suggested by LeMaitre, DeSitter and Eddington, Prof. Banerji said that it is possible to reconcile the age of the Universe as calculated by Eddington and as obtained from Astronomical and Geophysical evidence by assuming that the reddening of Spectral lines was due to gravitational effect as postulated by Zivicky.

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The following papers were read before the U. P. Academy of Sciences, Allahabad, on the 8th of August 1932 :—

1. "On a Generalized Formulation of Trouton's Law". By Mr. Satyendra Nath Ray, M.Sc., Lucknow.
2. "A generalization of a well-known theorem" (Vivanti-Borel-Dienes Theorem). By Dr. T. Vijayaraghavan, D.Phil., Dacca.
3. "On the absorption spectrum of some higher oxides". By Mr. A. K. Dutta, M.Sc. & Mr. P. K. Sen Gupta, M.Sc., Allahabad.