property of very great molecular complexity and that mesacolloidal or better still eucolloidal dimensions are necessary for the production of high elasticity. There is however much difference of opinion as to whether elasticity is the prerogative of long chain polymers only or whether three-dimensional space molecules also can be elastic. Meyer (p. 148) considers, from a study of the elastic properties of sulphur and polyphosphonitrilic chloride, that the polymerisation of these inorganic substances is similar to that of organic substances. A study of viscosity has been very helpful in determining the shape and size of polymers and indeed more than cryoscopic or ebullioscopic methods, viscosimetric methods have been employed by Staudinger in his estimation of the molecular weights of polystyrenes. The method however is limited in its application and it cannot be applied in the case of eucolloids for which Poiseuille's law does not hold. A study of flow double refraction in solutions has led Signer (p. 296) to deduce the size and shape of the polymers while the course and degree of polymerisation have been followed up by Farquharson (p. 219) by studying the magnetic susceptibility of a growing polymer.

By far the most fruitful field of research in the elucidation of the size and shape of polymers is the evidence obtained from X-ray measurements. Katz (p. 77) has studied the X-ray pattern of a very large number of polymers and it is found that in the case of many complex polymers the structure is one of long parallel rod-like chains in which as Staudinger predicted, the same structural unit is repeated indefinitely. Some polymers like rubber, etc., give diffuse rings similar to the corresponding liquid monomer and these undergo marked changes due to tension. The inorganic polymers, sulphur and polyphosphonitrilic chloride also exhibit definite X-ray patterns characteristic of their structure.

Before concluding, a word may not be out of place about the practical utility of polymerisation. Even though scientifically it is in the infant state of growth, from the technical point of view, as a successful commercial operation, polymerisation is a well-developed affair. The very large amount of natural gaseous hydrocarbons obtained in oil fields is now being polymerised by special methods into liquid fuel and thus a new industry has sprung up (Dunstan, p. 227). The production of synthetic rubber-like substances (Patrick, p. 347) by the condensation between metallic-polysulphides and dihalogenated hydrocarbons and ethers has got a large potential field of importance in the rubber industry, since these products while possessing most of the desirable properties of rubber are chemically more stable and resist organic solvents and oxidation better than rubber.

P. S. SRINIVASAN.

The Education of Girls in India.*

THE Royal Society of Arts has rendered a signal service to the cause of education in arranging this survey of the position of girls' education in India by a recognised authority on matters of women's education at this more than usually opportune time. This address gains added force in view of the fact that Lady Hartog was personally concerned with the deliberations of the Education Committee of the Statutory Commission on Indian Reforms. To the Indian public Lady Hartog's review will be of especial interest as this may help to shape the education policy of the Government with regard to girls' education under the New Constitution.

The predominant feature of the Girls' education in India is that the girls are terribly behind their brothers in education. This is generally assumed to be caused either by the prevailing apathy of parents to send girls to schools or the unpopularity of the curricula pursued at the centres of education. The last census has revealed that under 3 per cent. of the women in British India were literate and in the Native States only Cochin showed a female literary percentage of 22. This, according to Lady Hartog, is due to the dominant Christian element in the population of the State.

The importance of the education of women can hardly be overrated. The education of the girl is in short the education of the mother and through her of her children. The Education Committee of the Simon Commission have definitely recommended that "in the interests of the Indian Education as a whole priority should now be given to the claims of girls' education in every scheme of expansion." One of the most distressing facts revealed by the Report was the fact that in spite of the increasing demand for the education of girls and the opening of more schools in every grade the disparity as between boys and girls at schools was increasing. The years following the publication of the Report have witnessed a most astonishing change in the attitude of the public towards girls' education. The hectic rush of girls to schools of all grades has resulted in the unprecedented increase both in the number of schools and the number of pupils admitted. A refreshing feature of the latest Quinquennial Review on Education is that the tide is continuing to rise and every Provincial Report supports this view. In several provinces girls are even attending boys' schools as the number of girls' schools have proved to be inadequate. Co-education in the primary stage is now to a large extent an established practice. Co-education of this type would be above reproach if it were real co-education. But in many provinces it is only a makeshift to avoid the expense of setting up separate girls' schools. Moreover co-education as it is practised in the Indian schools is a one-sided affair. Girls are admitted to the boys' schools as a concession and a convenience. They do not have any real place in the school life. In none of the schools women teachers are provided and there is no special modification in the curricula to suit the especial needs of girls. A somewhat curious practice in some parts has been to allow little boys to attend girls' schools and the Education

* Abstract of a paper read before the Royal Society of Arts (Indian Section) by Lady Hartog.

Commission goes to suggest that it is better to graft a system of co-education on the girls' schools, since women are better teachers for the young than men. It is gratifying to note that at least Bombay has seriously undertaken the pioneer task of providing trained infant class mistresses for its primary schools.

The obvious way to deal with the problem of "wastage," and with the principle of general compulsion would be to compel children who have entered a school to stay on through the primary course and thus provide them with a sporting chance to become literate. This is being tried for both girls and boys in Madras in the areas coming under the Elementary Education Act. The statistics for areas in which compulsory education is in force make melancholy reading, owing to the reluctance of the authorities to use their powers. The same story of the increase in numbers as in the primary schools is to be found in the secondary schools also. In the Punjab and North-West Frontier Provinces Moslem girls have begun to attend schools in increasing numbers. A source of gratification is the fact that though many of the schools are overcrowded, the accommodation is generally good. Most of the high schools are Government institutions and those founded by private benefactions are run with due regard to the comfort of the scholars.

Until recently the curricula of the girls' schools followed too closely the courses of study for boys except perhaps needle-work, which was included in the former. But of late the idea that girls require something different, fitting them better for the task of efficient "house-making", is gaining ground. As a consequence of this, domestic science has come to be regarded as an essential subject for teacher's training, and is rapidly winning a place in the syllabus of examining bodies as a subject for degree courses. Music, handicrafts and drawing are being introduced into secondary schools and greater attention is being paid to the physical education of the pupils. The Girl Guides Movement has now become widespread and has done not a little to make school life healthier and brighter, at the same time infusing the guide spirit of service. The Junior Red Cross has attracted many and in a few provinces inter-school sports are being organised. University education is becoming increasingly popular with many women. The universities have thrown open their doors to women and in many university bodies women sit in conclave with men. As in the primary schools so in all, but a few special centres, women students attend men's colleges.

This inflow of women into the universities opens up new problems. There is a crying need for opening separate institutions for women in the more conservative provinces and in the places where they go to men's colleges there is the urgent necessity for women's hostels, if women are to enjoy the full advantages of college life. The vital factor that governs all schemes for the furtherance of women's education in India is the provision of sufficient funds.

For the efficient working of the institutions a well-trained body of competent teachers is a pre-requisite, who alone can make the institutions true seminaries of learning. The agency behind the teachers to supervise and control and wisely to utilise the resources at their disposal must also be taken into consideration. Even a passing glance at the statistics shows that Madras stands pre-eminent in the field of training her mistresses and her policy is carefully guided by a Central Advisory Board for Women's Education. But as a contrast to this we see Bihar where men and women become teachers who have barely reached the lower primary standard. In Bengal again much money is being wasted on futile efforts, inasmuch as her many thousands of primary schools are left in the hands of untrained men. In the Punjab we have proof of what an enterprising and efficient inspection can do to elevate the standard of teaching. In the past, lack of suitable women teachers has acted as a serious handicap to any scheme for the spread of girls' education. But it is hoped that with the growth of women's education the situation will be eased to a great extent. Another problem demanding an urgent solution is the recalcitrance of trained teachers to do work in isolated rural areas. A beginning has been made in this direction in the Punjab by opening suitable training centres in rural districts. It is suggested that either hostels should be opened in central localities to enable women to do their work in the vicinity, while permanently residing in these hostels; or a husband and wife be induced to take up residence in a village acting as teachers for both boys and girls.

The reconstitution of the Central Advisory Board of Education is perhaps the most important outcome of the recommendation of the Simon Commission, and the inclusion of two lady members in its personnel is clear proof of the growing appreciation on the part of the authorities of the needs of girls' education in India.

In the concluding part of her speech, Lady Hartog pays a glowing tribute to the pioneer work carried on by the several missions, the *Poona Seva Sadan* and to the excellent work of Prof. Karve in connection with his Women's University. The *Lady Irwin College* for Educational Research is another example of the efforts of the All-India Women's Conference to reform the School Curricula for girls.

Finally Lady Hartog puts up a plea and with just cause for the association of women in the administrative services and hopes that the New Constitution will give "them a power which may succeed where reasoned argument has failed".

It is abundantly clear that there has been an awakening in India which has imbued its people with the zeal to stir themselves. Is this as Lady Hartog says "to lose itself as so much enthusiasm has been lost in the past in sterile sands? Or is it to be wisely directed to irrigate fertile soil so that it brings forth in abundance new life, new health, new happiness in the land?" The answer to this rests with the people of India alone.

C. N. RAGHAVENDRA RAU.