WANTED A MUSEUM OF EVOLUTION

INDIA is a country steeped in ignorance, with her population sinking in a morass of antiquated ideas and ancient superstitions. Reactionary forces under the garb of religion keep the people in a state of virtual civil war, and riots take place on the flimsiest pretexts. How can we prevent this internecine communal warfare? Various remedies have been suggested from time to time but without much success. This problem like others has many facets and should be attacked from many sides and all remedies suggested by intelligent people should be tried. The root-cause of the trouble appears to lie in people attaching too much importance to religion which to most of them means ritualism and recitation of incomprehensible verses from religious books. Only a sutdy of Biology can broaden people's minds, so that they may realize that primarily they belong to the species *Homo sapiens* and they are human beings first, and Hindus, Moslems and Sikhs afterwards.

Biology is a revolutionary science, which changes an individual's outlook on life as no other science does. There is a common misconception that Biology is merely a study of leaves and flowers of flowering plants, and of the bones of dead frogs and rabbits. A person who has never looked through the microscope at amœbæ and paramæcia wriggling and rolling at diatoms and desmids with their beautiful symmetrical shapes, the fine lace-like structure of the stem of a herb, and at the patterns of chromosomes in the dividing cell, may be excused for his ignorance. The microscope has revealed a new world, which is infinitely more beautiful and with such variety in shape and form that it surpasses all imagination. A layman who has not studied the mechanism of reproduction in plants cannot imagine that they too have sex, and some like ferns, Cycas and Ginkgo, have living motile sperms as in animals. In fact, a biologist looks at plants and animals with a different eye, and the vision of living beings, which he acquires by study and observation, greatly broadens his outlook on life and the universe. The study of heredity and evolution reveals an orderly universe, in which the whims and idiosyncrasies of gods and their miracle-working apostles have no place. A study of evolutionary Biology serves as a solvent of religions, dogmas, superstitions and misconceptions, which we so laboriously pile up in the primæval atmosphere of our Indian homes. It is only by a study of Biology that the so-called inherently religious Indian people will drop their religious blinkers and begin to see the world in the cold and clear light of science, liberated from the thraldom of superstition.

How can we bring the knowledge of Biology to the common man? I suggest that we should open "Museums of Evolution" in the public parks of all the university towns of India. At least we should make a start by opening such museums in centrally situated towns like Delhi and Allahabad. Parties of students should be invited from all the schools served by the university concerned and given lectures in Hindustani on the evolution of life and its significance, in these museums. A programme can be arranged on a provincial basis for all schools served by a particular museum, so that these institutions and their staff remain busy all the year round.

A "Museum of Evolution" is not a Natural History Museum in which all types of animals, dead or fossilized, are preserved. In a "Museum of Evolution" only those animals and plant types which have any evolutionary significance can find a place. It is a museum whose primary function is educational. In a "Museum of Evolution", the evolutionary history of 'Life' through the various geological epochs should be pictorially shown by means of mural paintings, charts, models and specimen of animals and plants of evolutionary importance. We can also show the process of evolution in the inorganic and organic world by means of models, *e.g.*, the evolution of atoms from electrons and protons, of molecules from atoms, and of colloids from molecules. The evolution of the planetary system from gaseous matter of a Nebula can also be shown by means of models.. Then we can show the progress of life through the ages from unicellular Algæ and Protozoa to Cœlenterates, Fishes, Ferns, Amphibia and Lycopods, Reptiles and Gymnosperms, and Mammals and flowering plants to Man and the present-day vegetation, by means of mural paintings, clay models and charts. The radiation of phyla of various plants and animals can be shown on a cone-like structure. Fossils of ancient plants and animals should also be shown, and in the case of rare missing links like *Archæopteryx* and fossil horses, plaster casts obtained from geological mueums of Europe and America can serve our purpose. We can also show the evolution of limbs, skeleton, ears, eyes, brain, heart, kidneys and sex organs from worms to Man by means of models.

A Portrait Gallery of Evolutionists

A separate room should be reserved for the portraits of eminent thinkers who have discovered the theories and facts of evolution and have militantly spread the idea in face of opposition from so-called religious people, Lamarck, Erasmus Darwin, Charles Darwin, Wallace, T. H. Huxley, Hæckel, Weissmann, Julian Huxley, and H. G. Wells, will inevitably find a place in such a portrait gallery of Evolutionists, and below their portraits, a gist of their works should be given for the benefit of the visitors. In such a Museum, a Library of all available books on Evolution should also be maintained, and pictorial cards and illustrated books on the subject of evolution should be sold to visitors at cheap prices. Bible societies provide free copies of Bibles to heathens when they visit the countries of the West, while on the other side, we see that no attempt has been made in this country to provide even cheap literature on a subject of such great importance as Evolution, which affects man's outlook on life so fundamentally. Cheap stereoscopic picture-books, fitted with the usual red and blue celluloid orthoscopes, showing various geological landscapes and forms of life prevalent in those periods, can be produced at democratic prices for sale to visitors. Cheap

picture-postcards of useful evolutionary charts, fossil animals and plants, and eminent evolutionists and biologists with brief descriptive notes should also be produced for sale to students and visitors at cost price. Films showing a reconstruction of evolutionary progress of life should also be shown in these museums. Walt Disney, in his *Fantasia*, has shown us a film which can be suitably modified for educational purposes. We should diffuse the knowledge of the theories and facts of Evolution among the masses thus rousing them from their age-long sleep. It we can get the services of mural painters like Diego Rivera and Orzoco, we should also venture into the facts of social evolution, showing the march of humanity from the primitive society of the Paleolithic period, through Pastoral, Agricultural stages, and Feudalism, Mercantilism, to Capitalism and ultimately to Socialism under the impact of Technology.

Such "Museums of Evolution" should have a prominent place in our post-war educational programmes and plans. This is an age of visual education, and the plan of museums of Evolution with mural pictures, models and specimens, which we have outlined above, all serve as a better medium of instruction as compared with scores of schools and colleges. School teachers and students, who would come from all over the countryside to these museums, will become apostles of science and culture and will play an important role in educating India and in producing a generation of enlightened and cultured people, who will be able to hold their own in the vanguard of world progress.

M. S. RANDHAWA.

PROF. OTTO HAHN

PROFESSOR OTTO HAHN, who has been awarded the Nobel Prize in Chemistry for the year 1944, is a distinguished worker in the field of radioactivity. He has to his credit the discovery and isolation of several radioactive elements, as also the now well-known phenomenon of nuclear fission. Born on the 8th March 1879, he started his career as an organic chemist in an industrial concern and quitted this early to take up the study of the chemistry of the radioactive elements, being impressed by the outstanding work of Madame Curie and Rutherford. Working at first under Sir William Ramsay in the University College, London, he studied the activity of thorianite and isolated radio-thorium. In 1905, he proceeded to Montreal to work in Rutherford's laboratory and discovered radio-actinium. Returning to Berlin to work in the radioactivity section of the *Kaiser Wilhelm Institut Fur Chemie* (of which, later, he became the Director), he discovered mesothorium and perfected a method of separating radioactive products, using the recoil phenomenon. When he was elected to the Prussian Academy of Sciences in recognition of these researches and referred to his good fortune in working with men like Ramsay, Soddy and Rutherford, the President of the Academy naively remarked, "In science we very often find work without luck, but never luck without work". It will be interesting to recall that at a meeting in Bangalore some years ago to honour Sir C. V. Raman on his receiving the Nobel Prize, the Chairman, Prof. H. E. Watson, made a similar remark, "Accidents come to only those who look for accidents".

In the year 1918, in collaboration with Fraulein Lise Meitner, Otto Hahn discovered protoactinium, the immediate radioactive parent of actinium. They also came across the first example of nuclear isomerism in studies of the disintegration of uranium. With v. Baeyer and Meitner, Hahn showed by means of a magnetic analysis that the internal conversion electrons associated with gamma-rays always consist of perfectly homogeneous groups. When the idea of the possible existence of elements of atomic number higher than that of uranium was being put forward by Fermi, based on experiments on neutron-irradiated nuclear reactions carried out by him and his collaborators in Rome, Irene Curie and Savitch in Paris and Hahn and his co-workers in Berlin, set out to examine the products formed by the entry of the neutron into the uranium atomic nucleus, to confirm Fermi's conclusions. Actually, the searching chemical analyses of Hahn and Strassmann revealed that short-lived isotopes of barium and lanthanum are formed when neutrons bombard uranium. In announcing these unexpected results in the columns of *Naturwissenschaften* of 6th January 1939, they wrote with a certain amount of trepidation, "Perhaps, after all, our results have been rendered deceptive by a series of strange accidents". Soon after this announcement was made, Lise Meitner and Frisch pointed out in the columns of *Nature*, that the entry of the neutron into uranium brings about the disruption or "fission" of the nucleus, into two lighter fragments of nearly equal mass and charge, flying apart with great energy. Further chemical investigations in Hahn's laboratory showed that xenon and strontium were the final products in the break-up of the uranium nucleus. On the 23rd July 1939 Prof. Otto Hahn gave a talk on these researches at the Royal Institution in London, as a special guest of the Royal Society. Prof. Niels Bohr who attended this meeting, on his way back to Copenhagen from U.S.A., gave an account of his theory of nuclear fission, on the basis of the liquid drop model of the atomic nucleus, put forward by him, sometime earlier. A more elaborate theory of the mechanism of fission was given subsequently by Bohr and Wheeler in the *Physical Review*. Further experimental work by F. Joliot in Paris and Glasoe, Fermi and others in U.S.A., established the phenomenon of nuclear fission and indicated that it may be brought about in other heavier nuclei as well, by irradiation with neutrons or in some cases with gamma-rays. In conclusion, it may be recorded that the investigations of Hahn and his co-workers are unsurpassed in the assiduity with which they have been carried out and the far-reaching developments they have led to.

C. K. SUNDARACHAR.
G. SURYAN.