of industrial accident and disease. It also agrees with the recommendation in the Beveridge Report that an inquiry is desirable into the relation, both in industrial and non-industrial cases, between claims to security benefit and claims for damages in respect of personal injury caused by negligence, and also a review of the law governing the liability of employers and third parties to pay damages or compensation to workmen, or their legal representatives and dependants, independently of the provision for them proposed in the new scheme; the Government has set up for this purpose a committee with comprehensive terms of reference under the chairmanship of Sir Walter Monckton.

The remaining features of this new scheme to treat workmen's compensation not as part of the law of employer's liability but as a social service may be briefly summarized as follows. The scheme will be comprehensive, will not provide for 'contracting out' schemes and will apply to accidents arising out of, and in the course of, employment and to specified industrial diseases. The liability, instead of being on the individual employer, will be placed upon a central fund out of which all benefits, both in disablement and fatal cases, and administrative charges will be paid. The fund will be maintained by weekly contributions from employers and workmen collected by stamp, with a contribution from the Exchequer. The weekly rates of contribution will be 6*d*. for adult men and 4*d*. for women, to be shared equally between the employer and workmen, with half these rates for juveniles. Benefits will not depend on a contribution qualification. The scheme will be under the general charge of the Minister of Social Insurance, with an advisory committee or council, on which employers and workmen will be equally represented, to advise the Minister on important matters of policy and administration referred to them. Employers and workmen will be equally represented on the local appeal tribunals.

The present procedure by which the workmen's claims against employers are subject to appeals to courts of law will be superseded by a system under which claims will be dealt with by a pensions officer, subject to rights of appeal to local tribunals, and further rights of appeal to an industrial injury insurance commissioner whose decision will be final. In disablement cases the benefits will be at uniform flat rates. They will consist of an industrial injury allowance payable for an initial period while the workman is incapacitated for work, to be replaced, where the disablement is likely to be permanent or prolonged, by an industrial pension which will be supplemented by a special allowance if the pensioner is unemployable. Allowances will be given for family responsibilities, and treatment allowances and allowance for constant treatment in certain circumstances. No provision will be made for commutation of the pension by a lump sum payment, but where the injury results in only a minor degree of disability, provision will be made for a final settlement by an award of a gratuity or of a temporary allowance at a special rate with or without a final gratuity. In fatal cases the scheme provides for payment of a pension to the widow with an allowance for the first child, and a higher rate of allowance where the first child is an orphan. Provision will be made, in certain circumstances, for payment of a pension to one or both parents, or where no widow's or parent's pension is payable, to one adult dependent member of the deceased workman's family.

PROBLEMS OF MODERN PHYSICS*†

By PROF. J. FRENKEL

The Atomic Nuclei, Elementary Particles and the Nature of Matter

Nuclear physics emerged as a new independent science when, ten years ago, Cockcroft and Walton, working on a suggestion by Rutherford, first used protons artificially accelerated to immense velocities for bombarding other heavier atoms. Before that time, work of this kind had only been done with the help of radioactive substances, atoms of which are transmuted spontaneously without any outside agent, with the expulsion of alpha-particles (that is, helium nuclei) or beta-particles (fast electrons). These alpha- and beta-particles can be used to transmute artificially stable atomic nuclei. This method still has its value, and with its help (by bombarding beryllium with alpha-particles emitted in the natural radioactive disintegration of polonium) it was shown that besides protons (hydrogen nuclei) complex nuclei contain also neutrons. These are particles similar in mass to protons but having no electric charge. To obtain neutrons in the free state, nuclear physics has begun to use clusters of protons or deutons (nuclei of heavy hydrogen). These are accelerated to speeds corresponding to energies of some tens of millions of volts, by special apparatus such as the cyclotron, which was invented in the United States by E. O. Lawrence in 1930.

By such methods it has been possible to cause and study a large number of nuclear reactions of the type

$$A + B \rightarrow C + D,$$

where A and B are the initial nuclei and C and D the resulting ones. These 'alchemical' reactions are in many respects similar to ordinary chemical reactions; but they differ above all in the very much larger energy balance involved (as a matter of fact it is some million times larger). As a rule, one of the reacting particles (A or B) is a very simple nucleus, such as a proton or deuton, or in the limiting case a helium nucleus, and the other is a complex nucleus. Thus the reaction $A + B \rightarrow C + D$ is usually treated as the artificial disintegration of the nucleus A by the particle B (a proton, for example), which leads to the expulsion from it of the particle D (say a neutron). Really this reaction results in the union of A and B into a complex nucleus (AB), which is in an unstable, excited state, and so spontaneously splits up: $AB \rightarrow C + D$.

Like chemical reactions, these transformations can be either endothermic or exothermic. If A and B have a charge of the same sign, the stage $A + B \rightarrow AB$ requires a definite amount of energy for its initiation, and this is supplied by the kinetic energy of the bombarding particle B. This energy is needed to overcome the coulomb repulsion between the two particles. It is as if the nucleus A were surrounded by a protective rampart in the form of a 'potential barrier' of tens of millions of volts, and if the motion of material particles were governed by the classical laws of mechanics then the particle B would have to have kinetic energy at least as great as the height of this potential barrier in order to get past it. In

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† Continued from page 421.

actual fact, the penetration of B into A which leads to the formation of a complex nucleus AB is possible when B has appreciably lower energies than this. This is due to a peculiar quantum effect known as the 'tunnel-effect'. However, the probability of this 'tunnel-effect' falls off very rapidly as the kinetic energy of B decreases. For example, if the height of the potential barrier around A is ten million volts and B has a kinetic energy of one million volts, then only one such collision out of about ten thousand will result in A and B uniting. (At very small separations the coulomb repulsion between the nuclei is swamped by a force of attraction of a different kind about which we shall speak later.) So in spite of the tunnel effect, the reaction $A + B \rightarrow AB$ is for practical purposes associated with a definite activation energy; that is to say, the reaction can only take place when B has kinetic energy greater than a definite value.

This position is accentuated when a particle B travels through a solid body composed of atoms of A, for B interacts with the electrons surrounding the A nuclei and is thus rapidly slowed down. Since both the nuclei A and the particle B are extremely small, B does not as a rule collide with an A nucleus during the time it has a sufficient energy for an effective collision. As a result, such nuclear reactions occur very rarely, and out of many millions of B particles used to bombard the substance A, only one will produce the desired result. So in spite of the fact that in many isothermal nuclear reactions a huge amount of energy is given off per unit weight, the utilization of this source of internal atomic energy is impossible in practice because of the small numbers of the reacting particles. In answer to a question put to him on this subject by a newspaper correspondent four years ago, Einstein said, "It is exactly like throwing bricks at a raven—at night".

The developments of the last two or three years have, however, somewhat shaken this pessimistic point of view, and have once more prompted the hope that the problem of transmuting atoms on an industrial scale can be solved.

If for our bombarding particle B we use an uncharged body, a neutron in fact, then the activation energy becomes zero (because the neutron is not repelled by the nucleus A and can penetrate it with an arbitrarily small initial velocity); and what is more, the neutron does not interact with electrons, behaving among them just as it would in empty space. A free neutron moving through a material body must therefore eventually combine with a nucleus according to the formula $A + B \rightarrow AB$, and its efficiency is 100 per cent. Unfortunately, however, free neutrons are not encountered in Nature (and if they did exist we could not direct their motion). They can only be obtained by excitation of a nucleus by artificially accelerated charged particles, that is, with the help of the reaction $A + B \rightarrow C + D$ (where B denotes a proton, deuton or alpha-particle, and D a neutron) which, as we have just seen, is very inefficient.

In 1939 a new reaction was discovered which involves the division of a nucleus of uranium brought about by slow neutrons. The uranium nucleus is at the limit of stability (on account of its very high electric charge) and divides, under the influence of the shock imparted by the neutron, into two equal parts (rather like a liquid drop which has been highly charged), and these two parts separate with the colossal energy of about 200 million electron volts. From this reaction two or three neutrons are set free with sufficiently high energy to 'explode' other uranium nuclei. Thus the process can, in principle, become like an avalanche. To get this chain reaction, it is necessary first to separate from uranium, which is a mixture of three isotopes, the light isotope with atomic weight 235, which only makes up 0·5 per cent of the total. The trouble is that this light isotope is much more unstable than the ordinary 238 isotope, and tends to disintegrate before it can capture a neutron. This leads almost immediately to a rupture of the neutron 'chain'.

Before the beginning of the War, physicists of all countries were searching for a practical solution of the 'uranium problem', that is, to find a certain way of causing this chain reaction of uranium.

The solution of this problem would open to humanity a completely new technical perspective. It would provide a new source of energy, millions of times more abundant (for equal masses of fuel) than coal or petroleum, although not so widely distributed. There is no doubt that immediately the War has finished, the uranium problem will occupy a central place in experimental and technical physics.

In addition to this there will also be an intensification of the attack on the problem of obtaining charged particles, nuclei of hydrogen and helium, with much larger energies than have been hitherto achieved. In the United States, where at the present time there are eighteen powerful cyclotrons in operation, a gigantic new one was under construction at the beginning of the War, capable of producing charged particles with energies of 100 million volts.

At these energies the efficiency of the nuclear reactions (measured by the ratio of the number of neutrons liberated to the number of charged particles used to produce them) must increase to values many hundreds and perhaps thousands of times greater than those hitherto achieved. If this is so, then the reactions can be carried out on an industrial scale; and besides just utilizing the atomic energy, it may be possible to obtain by transmutation rare and costly elements from those widely distributed in Nature.

The rarest and most costly of all are the radioactive elements—radium, thorium, actinium and the radioactive products of their disintegration. By bombarding normal stable atoms with neutrons, it has been possible to obtain new unstable atoms—radioactive isotopes of practically any element. For this it is necessary to be able to produce a sufficient quantity of free neutrons.

The cyclotrons already in existence provide in a large measure the solution to this part of the problem. With their help it is easy to obtain artificial radioactive elements in quantities equivalent in the intensity of their beta- and gamma-radiation to tens of kilograms of radium. So it is obvious what great value these results have for medicine (some large American hospitals have their own powerful cyclotrons).

These artificial radio-elements have already been widely used as indicators in various physico-chemical and biological investigations (diffusion in solid bodies, assimilation of various substances in living organisms, etc.).

One of the current problems of modern nuclear physics is therefore to increase the efficiency of nuclear reactions by producing particles with energies of tens and hundreds of millions of volts.

The cyclotrons are capable of communicating very high energies to nuclei, but not to electrons. But bombarding nuclei with high-speed electrons with energies around ten million volts appears to be more direct and effective than using protons, deutons, etc., for producing transmutations of atoms and artificial radio-elements. The first step in this direction has recently been taken, using relatively slow electrons. At the beginning of 1941, Kerst in the United States designed and constructed a simple piece of apparatus which produced a stream of electrons of practically any required energy. The application of these ultra-fast electrons and the ultra-hard gamma-rays they produce, to the transmutation of atoms, will be energetically studied by physicists of all countries as soon as the War ends.

Until now, we have considered the chief problems of nuclear physics from the experimental and engineering points of view. But there are no less alluring and important problems on the theoretical side, and their solution must lead to far-reaching changes in our conceptions of the nature of matter. These new problems arose some ten years ago when the neutron and positron were discovered, and although the respective discoveries of these two particles came independently of each other, they are from the theoretical point of view closely connected.

Until the discovery of the neutron, a complex nucleus was imagined as consisting of protons and electrons (the latter in smaller numbers to give the corresponding positive charge). The existence of electrons in the nucleus was proved, so it seemed, by the fact that the majority of radioactive elements emitted them in the form of beta-rays with an increase of one unit in the positive charge of the nucleus. From the other side, this theory led to a series of unsurmountable difficulties connected with the magnetic and other properties of the nucleus. All these difficulties were overcome when, after the discovery of the neutron, it was shown that it was possible that the nucleus contained no electrons but only protons and neutrons. This, however, raised new difficulties over the question of the production of the electrons which form the beta-rays. The final conclusion is that these beta-rays arise (in the same way as photons when light is emitted) on account of the instantaneous transformation of neutrons into positrons. This bold idea, now firmly established experimentally, was first advanced by D. D. Ivanenko.

From this, of course, it would be imagined that the neutron is not an elementary particle like a proton but something like an atom of hydrogen, consisting of a proton and an electron. This, however, conflicts with the fact, discovered by Joliot in 1934, that certain artificial radioactive nuclei (for example, the one formed by the fusion of aluminium with an alpha-particle) emit positive beta-rays consisting of positive electrons or positrons. Thus the proton can also be regarded as a complex particle made up of a neutron and a positron. Neither of these pictures Is true. Both the proton and the neutron are elementary particles in the sense that neither can be subdivided into still finer particles, although they can change one into another with the simultaneous appearance of an electron or positron. A very convincing argument, based on the law of conservation of energy and momentum, shows that during these transformations certain neutral particles like photons must appear. These have been named the 'neutrino' and 'anti-neutrino'. (In the opinion of some theoretical workers, a photon is equivalent to a pair of these particles.)

Now positrons were discovered by Anderson and Neddermeier completely independently of the neutron, during an investigation of cosmic rays and the influence of magnetic fields on their motion. It was found that a positron came into being with an electron and disappeared in company with another. The energy necessary for the formation of such an electron-positron pair is obtained through the annihilation of a photon; conversely, when a positron-electron pair disappears, one or two photons appear and carry off the energy.

These results, which have been confirmed many times during the past eight years by experiment (it has been found possible to use ordinary gamma-rays and X-rays instead of cosmic rays), have thrown up new fundamental problems for theoretical physics—problems about elementary particles.

In the nineteenth century, the elementary particles appeared to be the atoms. 'Matter', which made up material bodies, was regarded as a collection of immutable atoms of 92 different kinds.

At the beginning of the twentieth century, it was shown that the elementary particles were smaller than atoms, and that the properties of the various kinds of atom were due to the envelope of electrons. The next to be studied was the atomic nucleus, the simplest representative of which is the hydrogen nucleus. It appeared that physics had come to the end of the process of the analysis of matter, having shown that all material particles consisted of protons and electrons, and that all physical and chemical forces (apart from gravity) could be traced to electric forces.

From 1932 onwards, that is, from the moment the neutron was discovered, this simple but incorrect picture underwent enormous conplication. Besides electrons there were positrons, and these and other particles did not appear to be immutable and indestructible but apparently could appear and disappear like quanta of light or photons. If the electrons in the atoms and material bodies appear indestructible, this is only because under normal conditions there are no positrons with which they can unite and so disappear, and also because, generally speaking, changes of protons into neutrons in the nucleus are energetically 'unprofitable' and therefore impossible.

The question arises, Is the indestructibility of protons and neutrons, apart from their mutual interchange, real or only apparent, like that of the electron? A number of demonstrations and experimental facts relating to the behaviour of neutrons and protons tends to show that they are in fact, in every respect except their mass, very similar to electrons. Therefore it seems very probable that, like electrons, they can in favourable circumstances appear and disappear in conjunction with their hypothetical opposites, the antiproton (that is, a proton with negative charge) and the anti-neutron.

If for the birth of an electron-positron pair we need the 'blow' of a particle (say, a photon) with an energy of one million volts, according to Einstein's law (product of mass and the square of the velocity of light) we need for the joint birth of a neutron or proton with its corresponding anti-particle a particle with an energy 2,000 times greater, that is, with an energy of 2×10^9 volts. At the present time, such particles are found only in the cosmic rays; so it is here that we must look for the phenomenon of the 'materialization' of neutrons and protons. Later on, when physics can produce artificially particles with energies around 10^9 volts, the process of creating neutrons and protons (together with their opposites) will be controlled just as to-day we can control the creation of electron-positron pairs (by using hard

X-rays). The demonstration and control of these phenomena are the most interesting problems of nuclear physics. Of course, the reality may turn out much more complicated than our scheme based on analogies with proton and neutron on one side and with electrons on the other. The method of analogy is usually limited, but even so it is usually very fruitful (as was shown, for example, in the development of the study of light and matter). It is quite possible, however, that besides neutrons, protons and their antilogues, we shall be able to create particles with mass, magnetic moment and other properties hitherto unknown.

Physics had scarcely recovered from the unexpected appearance of neutrons and positrons when in 1937 Anderson discovered a new type of elementary particle, called the mesotron or meson, in cosmic rays. These particles have the same electric charge as an electron or positron, but their mass is some 200 times greater than that of an electron, that is, about one tenth that of the mass of a neutron or proton. They come into being in the upper layers of the atmosphere as the result of some as yet unknown process of interaction between the primary constituents of cosmic rays (photons, electrons or protons) and atomic nuclei. Their life is only some millionths of a second, yet in this time they are able to pierce the surface of the earth and penetrate to a depth of some hundreds of metres. Finally, the mesons are destroyed by some form of radioactive disintegration into electrons and neutrons.

Apparently the mesons play an essential part in the creation of attractive forces between protons and neutrons at small distances (as, for example, when they are bound together in a complex nucleus). According to a theory put forward in 1936 (that is, before the discovery of the meson) by the Japanese physicist Yukawa, the attraction between neutron and proton can be described as due to a kind of 'ball game' during which fragments are emitted by one particle and absorbed by the other. From considerations of the radius of action of nuclear forces, Yukawa concluded that these fragments should be about 200 times more massive than an electron, and would therefore correspond to mesons. However, the development of Yukawa's theory into a general explanation of nuclear forces has not been completely satisfactory as yet.

The development of physics during the last ten years has given rise to numerous completely new and unexpected problems connected with the nature of matter. The conception that matter consisted of indestructible elementary particles with immutable properties has been shown to be false. True, we have not yet had direct experimental demonstration of the destruction of the heavier elementary particles such as protons and neutrons, but already the one fact of their mutual interchange (in the beta-decay process of radioactive substances) shows that they are no more permanent than electrons. To-day, the problem of matter is concerned not so much with the explanation of the properties of elementary particles as with the explanation of the circumstances of their appearance, disappearance and mutual interchange. There is also the fact that certain particles are not only material objects but also agents of transmission of force between other particles. Thus, for example, photons play the part of transmitters of electro-magnetic forces between charged particles (electrons, protons and mesons), and are tossed across the separating space like balls. As we have seen above, mesons play an analogous part in the transmission of non-electromagnetic 'nuclear' forces between nucleons, as protons and neutrons are called. It is possible that nucleons themselves will be shown to be agents of transmission for as yet unknown forces between unknown particles.

The material world, which a short time ago contained only protons and electrons, is beginning to be occupied by an increasing number of particles of ephemeral existence and the double role of sources and transmitters of force. It is not too much to think that with the use of more powerful sources of energy, physics will be able, starting with known particles such as protons and electrons, to discover or rather create new particles with completely different masses, mechanical and magnetic moments, and electric charges. Some of these will be unstable or radioactive like the meson, while others, like the positron, will be stable in the absence of their anti-particle with which they unite and disappear.

This picture of matter, painted by modern physics, appears fantastic at first sight. Actually it is only unusual in terrestrial conditions. In the interior of stars where temperatures reach millions of degrees centigrade, the picture would be completely normal. To-day it can be taken as established that the source of energy coming from the sun and other stars is a nuclear reaction (probably chiefly the formation of helium from hydrogen). A still more intense stream of energy comes from certain stars during a spontaneous process of explosion, which results in the formation of what is called 'nova'. The metamorphosis of matter which occurs in the interior of these stars leads to the emission of a huge quantity of energy.

Information about these distant cosmic processes comes not only from the rays of visible light emitted by stars, but also from the cosmic rays which traverse the earth's atmosphere and penetrate the earth itself to a depth of some hundreds of metres. At the limit of the earth's atmosphere and in the stratosphere, the cosmic rays consist predominantly of photons and charged particles, electrons, mesons and some protons with energies ranging up to 10^{16} volts. The mesons, as also apparently the electrons, arise at the edge of the earth's atmosphere. So the question of the original composition of the cosmic rays remains unanswered, like the question of the origin of these rays. Providing the answers is one of the current problems of modern physics and astrophysics.

The conception that matter consists of elementary particles is one-sided, although practically it is justified under terrestrial conditions with our comparatively meagre sources of energy.

The mutual interaction of material particles can be handled with the help of the concept of the dynamic field. To-day we know three kinds of such fields: gravitational, electromagnetic, and finally the recently discovered and as yet unnamed fields which characterize nuclear forces.

These fields extend continuously throughout all space, concentrating in the neighbourhood of material bodies and particles which give rise to them.

The fields due to separate particles can be combined into a 'resultant'. This raises the question of the action upon an individual particle of its own field, which was first posed by J. J. Thomson in connexion with charged particles. It was shown that to a first approximation the reaction of an electromagnetic field upon the particle producing it was formally identical with the force of inertia. Applying this result to a single electron, Lorentz showed that the inertia or mass of the electron could be completely attributed to the reaction of its electric field, if the charge was supposed as concentrated in a sphere of radius 10^{-13} cm. According to this, the law of motion of an electron turns out to be equivalent to the statement that the electron moves so that the total force on it, as determined by the resultant field, is zero. This 'Lorentz principle' is equivalent to the conservation of energy, momentum and moment of momentum for any system of electrons if we associate these magnitudes not with the electrons themselves but with the electromagnetic fields they produce.

That the concepts of conservation of energy, momentum, and moment of momentum, which arose in the mechanics of moving particles, could be applied to the electromagnetic field, had been realized before Lorentz put forward his theory. It was, however, only after the inertia of the electron had been explained as the result of electromagnetic reaction that its kinetic and potential energy could be treated as the electric and magnetic energy of its field.

In this way the electromagnetic field was shown to be the vehicle of all the mechanical properties (energy, mass, momentum, etc.) which were earlier ascribed to material particles. The particles were thus considered not as sources of fields but as products of them—rather like knots in the lines of force. The question of the force of interaction between these 'knots', like the question of self-reaction, loses its meaning, as the resultant force experienced by each of them is zero. The laws of motion of the particles formed by the field agree completely with the law of conservation of energy and momentum of the field.

The further development of field theory concerns the solution of three types of problems: first, problems of the structure of electrons and the atomic nature of electric charge; secondly, the dynamics of nuclear fields; and thirdly, the quantization of dynamical fields.

The structure of the electron has been tackled hitherto from two angles, one treating it as a point charge and the other as if it had extension. Along both avenues of approach insuperable difficulties have been encountered. These difficulties, as also those connected with the atomic nature of the charge, will probably be solved by a thorough application of quantum theory ideas, but before this is possible we need further development of modern quantum mechanics.

The importance of the dynamics of nuclear fields is due to our ascribing the inertia of nuclear particles to the reaction of their own fields. The attempts which were made earlier to treat the inertia of protons as due to the reaction of their electromagnetic field lost their meaning when the neutron was discovered, for the neutron, even without electric charge, has a mass very close to that of the proton. In a number of papers to-day this non-electromagnetic mass is treated as a magnitude corresponding to some nuclear 'charge' bearing the same relation to the nuclear fields as the electric charge does to the electromagnetic field. The protons and neutrons themselves are thus regarded as 'knots' in a nuclear field, either apart from or in combination with an electromagnetic field.

From this point of view matter is a collection of interpenetrating dynamical fields, electromagnetic and nuclear, with material particles and bodies forming knot points. These points can under certain conditions appear and disappear, although the energy of the field, the momentum and other fundamental properties remain unchanged.

This picture is still only a provisional sketch. In order to complete it we need further development of the ideas of the quantum theory. The essence of this theory is an organic statistical synthesis of continuity and discontinuity. It was first introduced in the studies of the motion of particles and of light, and through the development of the quantum aspect of dynamical fields has helped enormously towards the solution of the problem of matter. As a result, new particles have appeared on the physics scene. These are in addition to those which create, or are created by, the known dynamic fields, and serve as vehicles of interaction between the original particles.

In the case of electromagnetic fields, for example, the sources, or if you like products, of which are electrons, the corresponding quantum particle, the transmitter of electromagnetic action is the photon. In the case of nuclear fields created by protons and neutrons, the corresponding quantum particle is apparently the meson. On the other hand, mesons, like electrons, take part in the creation of the electromagnetic field. This prompts the very natural thought that in a sense all particles are quanta with respect to some other particles. In particular, the electron positron pair could in all probability be treated as quanta of some as yet unknown field, which in its turn is created by other particles, for example, the nucleons. But the nucleons could play the same part in relation to other particles probably as yet undiscovered.

But here we are crossing the boundaries of modern physical science and risk falling into the realm of unscientific phantasy. Nevertheless, recent developments of physics have shown how limited and narrow our previous ideas about the physical world were, so in a survey of the problems of modern physics we need not fear a certain extension of its frontiers, even if it is not yet fully justified.

VALUE TO THE STUDY OF CHINESE CIVILIZATION OF COLLECTIONS AND MUSEUMS IN BRITAIN

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"AT no period in the history of the world has the attention of civilized nations been so fully directed towards China, its early history and modern position as at the present moment." These words, though true to-day, were in fact written exactly a century ago to preface the catalogue of London's first Chinese Exhibition. It was the enterprise of an American, named Nathan Dunn, who, during twelve years spent in China as a merchant, had collected the 1,341 exhibits, representing, so he claimed, "the Chinese world in miniature". More than fifty thousand persons visited his collection in a pavilion built for it near Hyde Park Corner. Presumably the exhibits were in due course shipped back to their owner in Philadelphia.

The next display of the kind remained in England and so contributed to the beginnings of our Chinese