facts, they write what they conceive the facts to be, on a basis of their chance experience.

The intellectual world of to-day is striving and struggling toward something new, in defiance of all the social and material obstacles that stand in its way. It is seeking the absolute, because our historical sciences, at least, seem to be floundering in the quicksands of relativity. But this is a big subject. I am deeply convinced that the present age is following a deceptive bypath, and that we can attain the highest and ultimate truths of life and intellectual labor only by a profound, reverent, and resigned — but not hopeless and skeptical — study of mankind in history, and of the universe that surrounds him.

THE ORIGIN OF CONTINENTS AND OCEANS

BY ALFRED WEGENER

[*Professor Wegener is Director of the German Oceanographical Survey. He first put forward his theory of the movements of the great land-masses in* 1915, *and republished it in* 1920 *in a book called* Die Entstehung der Kontinente und Ozeane. *Because of the difficulty of obtaining German scientific publications during the war, it has hitherto attracted little attention in other countries. Professor Wegener's ideas, however, have an obvious significance for geologists, biologists, and palæontologists, as well as for oceanographers. Professor F. E. Weiss, who holds the chair of Botany at Manchester University, writes in the* Manchester Guardian *that Professor Wegener's theory 'constitutes a good working hypothesis, and the striking simplicity with which it allows many phenomena to be explained will greatly stimulate further inquiry.'*]

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Anyone who compares, on a globe, the opposite coasts of South America and Africa, cannot fail to be struck by the similar configuration of the two coast-lines. Not only does the great right-angled shoulder of the Brazilian coast find its exact counterpart in the African coast in the neighborhood of the Cameroons, but the minor curves to the south of these great angles also correspond to one another, every protuberance on the one side fitting into a corresponding depression on the other. This observation has led to a new view of the nature of the earth's crust, according to which the continents in past ages have drifted horizontally over the surface of the earth, and are still in motion at the present time.

According to this theory, known as the displacement theory, North and South America were, in Mesozoic times, continuous with Europe and Africa. They then broke away and moved westward in Tertiary times, the Andes being forced up by pressure on the forward edge of the drifting continent. Again, Antarctica, Australia, and India were formerly in immediate contact with South Africa, India then being the southern end of a long projection from the Asiatic Continent, which is now

almost entirely crumpled up and forms the Himalayas. The theory asserts that the outermost rocky crust of the earth no longer envelops the whole globe, as it once may have done, but has shrunk up, in consequence of successive compressions into mountain folds. It is now represented by the continental shelves, which are covered only by shallow seas. The bed of the deep seas is regarded as composed of the material of the underlying deeper layers of the earth, upon which the continental masses float.

It will be evident that this theory conflicts with the former fundamental views of several sciences, and especially those of geology. For a proper judgment upon it, an enormous mass of facts must be collected together from such sciences as geophysics, geology, palæontology, palæoclimatology, animal and plant geography, and geodesy. In the decade since the first publication of the theory, much progress has been made towards a wide review of the facts. The theory offers solutions for so many apparently insoluble problems, and so simplifies our views, that the interest of many kindred sciences has been aroused, as is shown by the large and growing literature on the question.

It is impossible in so little space to discuss the evidence which confirms the theory; this evidence will be found in my book, *Die Entstehung der Kontinente und Ozeane.* It must suffice here to give a few of the main lines of proof, drawing examples from each of the sciences concerned.

In drawing up statistics of the distribution of levels over the land surface and sea bottom, geophysicists have found that these heights are grouped about two well-defined values, a land height of about 100 metres and a sea depth of about 4700 metres. This law has been known for fifty years, so far without any explanation. If the heights and depths had arisen through elevation and depression of a single initial level, as geology has hitherto assumed, then we should expect statistics of level to show a grouping about a single mean value. Instead of this, there is a grouping about two values. So we must suppose that there are two initial levels, on which the elevations and depressions have been superimposed; and this is only possible if these initial levels correspond to two different layers of the body of the earth. The continental masses consist of comparatively light material,—such as granite and eneiss,—extending downward, according to Hayford and Helmert, to a depth of 100 kilometres. But the deep-sea bottom is apparently composed of heavier material,—such as basalt,—in which the continents float like great ice-floes in water. The results of measurements of gravity, and of magnetic and seismic investigations, are in agreement with this conception, and the results of dredging do not contradict it.

Geology provides a very searching test of our supposition that the Atlantic is really an enormously widened rift. If this is the case, the mountain folds and other geological structures which existed before the separation must correspond when we bring the continents together again and reconstruct their original relative position, just as the lines of a torn drawing would correspond if the pieces were placed in juxtaposition. This is actually the case: the Permian folds of the Cape mountains fit exactly to the Sierras of Buenos Aires, which, according to the latest work of the Argentine geologists, are of the same age and have a completely similar structure. The distance of these mountains from the Cameroons on the one side, and from Cape San Roque on the other, is the same, so that they fit each other exactly in the reconstruction. The direction of folding

in the great gneiss plateau of Brazil also corresponds with that in the opposite regions of Africa.

In Europe there are three ancient mountain-chains, which arose in the Silurian, Devonian, and Carboniferous epochs, and these mountain chains are so placed in North America that they appear in the reconstruction as undoubted continuations of the European system. The terminal moraines of the Great Ice Age also appear now as a continuous system.

The most striking fact is not the existence of the same features across the Atlantic, but their situation at places which correspond exactly. For example, if the Sierras of Buenos Aires, which are now more than 6000 kilometres distant from the Cape mountains, lay only a few hundred kilometres farther to the north or south, the features would not fit, on bringing the continents together. Actually, they do fit, and the correctness of our theory becomes the more probable as such coincidences multiply themselves.

The results of palæontology have led to the assumption of the existence of former land-bridges, between continents now separated by deep sea, over which an unrestricted interchange of fauna and flora took place. That such an interchange has at one time taken place is shown by the identity of fossil forms and the relationship of living forms. Now these land-bridges have been assumed exactly in those places where the theory put forward here indicates a former direct connection, as, for instance, between Brazil and Africa, between North America and Europe, between Madagascar and India, and in general between all the southern continents, such as South America, South Africa, Madagascar, India, Australia, and Antarctica. It has hitherto been assumed that these land-bridges were afterwards submerged, and now constitute the bottom of the deep sea. This conception is physically untenable, for the continents are floating in equilibrium on a heavier underlying layer, and could not sink by so great an amount as five kilometres unless they were loaded down by superincumbent layers to at least an equal height. In addition, when all the necessary connecting land-masses are reconstructed, it is impossible to find room for the displaced masses of water. Further, the continents now lie so far away from each other that, even if a former land-connection existed, it would not account for the identity of their former fauna and flora. These difficulties disappear naturally when the displacement theory is assumed.

From the mass of information to be derived from the geographical distribution of animals and plants, we shall only choose a single striking example: the threefold character of the Australian fauna. The most ancient group of animals, which is now found principally in the Southwest, shows relationships with India, Ceylon, Madagascar, and South Africa. The second group, to which the characteristic marsupials and monotremes belong, contains, in distinction to the former class, only such animals as can resist cold — mammals, fresh-water fishes, but not reptiles or earthworms. This group has penetrated into the eastern Sunda Archipelago, owing to the present proximity of Australia to that region. This class has its nearest relationships in South America, now separated from it by a whole quadrant of the earth. The third group, finally, is the fauna of the eastern Sunda islands, which is found in New Guinea and which has established itself in northeastern Australia.

This relationship, formerly so puzzling, is completely explained by the displacement theory. Australia, up to the beginning of Jurassic times, was

connected in the west with India and Ceylon, and through them with Madagascar and South Africa. After breaking away from India, it was still connected through Antarctica with South America, perhaps as late as Eocene times; and this connection gave rise to the second group. Comparatively recently Australia drifted into collision with the Sunda islands, with the consequence that an interchange of flora and fauna took place.

In seeking an explanation of former climatic conditions, geologists have hitherto been averse to the assumption of large movements of the earth's poles with reference to the land. However, the idea that it is necessary to assume a considerable movement of the poles in early Tertiary times has recently been gaining more and more ground. It is impossible to overlook the fact that all former attempts to map out the position of the poles throughout the earth's history come to grief on one obstacle, namely, the Permo-Carboniferous ice-age in the southern hemisphere. Traces of inland ice at this period are found in Brazil, the Argentine, the Falkland Islands, Togo Island, the Congo, South Africa, India, Western, Central and Eastern Australia. These traces are to-day so widely separated from each other that they cover nearly a complete hemisphere; and even if the pole be placed in the most favorable position, the traces of ice most distant from it would be in a geographical latitude of only 15° and so be in the tropics.

On the other hand, we do not know of any certain traces of ice in this epoch in the other hemisphere. This fact has so far constituted a hopeless riddle, and it is no exaggeration to say that it has completely crippled the development of palæoclimatology. The displacement theory affords a striking solution of the riddle; at that period all these continents were grouped concentrically around South Africa, and we thus obtain a connected ice-cap of no greater area than that of the quaternary ice-age of America and Europe.

Similar, if less striking, simplifications appear when the position of the pole in other geological periods is determined by aid of the displacement theory; and it is not too much to say that this theory makes it possible, for the first time, to determine the former positions of the pole, from fossil evidences of climate, in a manner that is satisfactory.

Finally, the displacement theory may be tested by astronomical determinations of latitude and longitude. It is natural to suppose that the movements are still taking place; and the available estimations of geological time, in spite of their uncertainty, allow us to make an approximate estimate of the yearly movement to be expected. It would appear that in many places the velocity of displacement must be too small to be measurable astronomically in a reasonable time. However, in three or four places it should be possible to establish the movement by measurements repeated after a ten years' interval.

In the case of the movement of Greenland relatively to Europe, I. P. Koch, the cartographer of the Danish Expedition of 1906–8, has made a comparison between the observations of this expedition and those of the second German North Polar expedition of 1870 and still older observations of Sabine in 1823. He has succeeded in deducing evidence that the distance of Greenland from Europe has noticeably increased in the interval, by an amount exceeding considerably possible errors of observation. There is evidence of a movement of about 15 metres a year, which is in complete agreement with

that to be expected from the displacement theory.

We will conclude with this the series of examples from our chain of evidence. If the standpoint of the displacement theory be taken up, numerous problems immediately present themselves, of which the most important is perhaps the nature of the forces which give rise to the displacements. Here no final conclusion can be reached, but the problem has been so far examined by the theoretical physicists and geophysicists as to leave no doubt as to the possibility of such a force existing. According to the displacement theory, the continents display, in general, a movement toward the West and toward the equator. Köppen ascribes this latter tendency to the action of the force directed away from the pole, which tends to drive toward the equator all floating bodies whose centres of gravity are higher than their centres of buoyancy. This force has been calculated to be of the magnitude of one three-millionth of the weight of the body, and so to be rather more than the tidal force. It may be shown that this force is sufficiently great to pull the continental masses through the underlying layers with the necessary slowness, even if these layers are as rigid as steel at ordinary temperatures.

On the other hand, it seems questionable whether this force can explain the great Tertiary mountain-folds, which extended from the Himalayas through the Alps to the Atlas Mountains, along the line of the equator in those times. It is not impossible that at that period, and perhaps in the earlier Carboniferous period, still other forces existed in addition to the normal force directed from the pole, owing to rapid displacements of the pole and the consequent readjustment of the figure of the earth to the new polar axis, these forces being perhaps twenty to a hundred times as great. This would give possible explanation of the fact that this equatorial mountain-folding is limited to these periods.

Just as the movement from the poles manifests itself principally in mountain folds along the equator, so also the westward movement of the continents is evidenced by many striking features of the earth's face which have hitherto been completely unexplained. We have already instanced the frontal resistance which the American continental masses experience in moving through the ancient and deeply cooled bottom of the Pacific, a resistance which has led to the throwing-up of the gigantic mountain-chain of the Andes. Since this frontal resistance must have a much greater influence for small masses than for large, these small masses will be left behind in the general westward movement. Thence arises the great sweep of the Antilles, left far to the east by America, and the great bend of the so-called Southern Antilles between Tierra del Fuego and West Antarctica. Thence also comes the partial separation of the eastern edge of Asia in the form of chains of islands, and the separation, long ago completed, of the former Australian coastal chain which now forms New Zealand.

By the same movement Ceylon has been broken away from India; and we see evidence of it also in the bending of the ends of continents toward the east, such as the southern end of Greenland, of Tierra del Fuego, and the northern end of Graham Land. Schweydar has suggested an origin for the force driving the continents westward, which he believes to be due to the procession of the earth's axis; but the whole question of the origin of the forces is so much in a state of flux that it is impossible at present to reach any final conclusions.

THE POETRY OF CHINA

BY SOONG TSUNG FAUNG

[Professor Soong occupies the chair of French at the University of Peking. He received his education in China at St. John's University, Shanghai, and in Europe at the University of Geneva. From Switzerland he went to France, where he became so much interested in the drama that he is said to have seen more French plays produced than any other man in China. Before joining the faculty of the University of Peking, he taught in Tsing Hua College. Professor Soong speaks Italian, French, Spanish, German, Russian, and English, so that he views Chinese literature, in which also he is well read, from a peculiarly cosmopolitan standpoint.]

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The absence of epic poetry is characteristic of all Oriental literatures except that of the Hindus, and this is as true of the Chinese as it is of the Arabs. There is not a single epic among the twenty-four volumes of poems at the Escorial. What a contrast with this is the flowering of epic poetry in Greece, where the bards were wont to sing in the presence of princes the exploits of their ancestors, when sumptuous banquets celebrated a victory!

Of the origin of Chinese poetry very little is known. Was it poetry that preceded music, as is the case in all other countries of the world, or was it music that preceded poetry, as numerous critics have asserted? Wang Tsa overthrew the latter theory when he said that, according to the *Yukee* (The Book of Music), poetry translates thought; song, the voice, and the dance interpret movement; and these three artistic forms come from the depths of our heart, whereas musical instruments were not developed until later.

Poetry was not solidly established in China until the beginning of the Sang dynasty, since Confucius, who collected the existing poems and made an anthology of them, began with the poems of that dynasty. Our great moralist tells us that — for some reason we do not understand — the poetic muse was silent for a period. After this interruption a new kind of poetry developed, the Fou. Then Tchiou Yuan, a native of Tsou, began to write the Li Sao, a style of writing which enjoyed such a vogue that, throughout the whole latter part of the Han dynasty, numerous writers reflected its influence. We may mention here Song Yu and Sih Ma Siang Jou.

At this time poetry split off from music. There were 'ancient poems' that cannot be sung. There were also the Yu Fou, which were written only for music. At this period, also, verses of seven feet and of five feet appeared in definite form. Li Liu is said to have been the first poet who wrote verses of five feet, and the Emperor Han Ou Ti, the first poet to write verses of seven feet. It was after these two new forms of poetry that the other forms developed — verses of three, four, six, and nine feet respectively.

Then came Seng Yah, with his minute study of tones. Chinese lyric poetry was divided into two very distinct kinds, the Lie and the Zie. While the former is less rigorous in form, the latter demands symmetrical phrases and requires a profound knowledge of the technique of poetry, of literary allu-