SKETCH OF THE LIFE OF EDUARD SUESS (1831–1914).[1]

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Eduard Suess, member and former president of the Imperial Academy of Sciences of Vienna, dean of the foreign associates of the Paris Academy of Sciences, peacefully and painlessly passed away on the night of the 25th of April, 1914, in Vienna, at the age of 83 years. His death is mourned by the geologists and geographers of the whole world, for all looked upon him as a master, whose authority was supreme and whose intuition was well nigh infallible; and there is not one among them who has not in some way been his disciple, and who has not received from this man of genius with his clear ideas and his exact method the taste for profound problems and the enthusiasm indispensable to persevering researches.

He was born on the 20th of August, 1831, in London, of a Jewish family, then recently come to England from Austria and who soon returned to that country. His father was a trader, a willing wanderer, like so many others of his race. Indeed, if one would understand Eduard Suess, this origin must never be forgotten. He was the man called to show and explain to us the face of the earth; to lead us, as by the hand, along all the shores and in the labyrinth of all the mountains of this planet; to make of us citizens of a humanity greater than all the nations and more enduring than all histories; this man was a splendid type of that old race, that nation elect, to whom universal supremacy was at one time promised, and whom we now see wandering without respite along sorrowful ways, moving across the continents and the oceans of the earth.

The young Eduard studied first at Prague, then at Vienna, and very early attracted attention through his taste for the study of fossils, minerals, and rocks, a study which soon became an irresistible passion. In 1852, then only 20 years old, Eduard was appointed assistant at the Hofmineralenkabinett in Vienna, a kind of practical school of geology and mineralogy installed in the buildings of the Hofberg; his scientific career was begun. A first note on the Graptolites of Bohemia appeared in this same year, 1852. In 1854, he published a memoir on the Brachiopods of the Kössen beds, and in 1855, a study

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on the Ammonites of the Hallstatt beds. This was a very decided trend toward paleontology, and even toward the most philosophical paleontology, that which seeks to reconstruct the filiations of living beings and to learn the laws of their mysterious evolution.

In spite of the brilliant qualities which shone in his first essays, the University of Vienna did not appear at all eager to open its doors to the new paleontologist; and the difficulties he encountered while seeking his doctorship more than once very nearly discouraged him, and almost led him to enter commercial life where his family would have been happy to have placed him. Success came, however, in 1857, and Eduard Suess was designated professor extraordinary of paleontology at the university. He retained this position until 1862. The death of Zippe having at that time made vacant the chair of geology, Suess succeeded him at first as professor extraordinary, then, in 1867, as professor ordinary. The paleontologist was transformed, little by little, into a geologist; and this geologist successively preoccupied, with local stratigraphy in the immediate vicinity of Vienna, then with Alpine stratigraphy, was later to turn to the Alps and by the prolonged contemplation of this great chain of mountains, to become a master of structural geology, and a little later the uncontested master of all geology.

Eduard Suess possessed in an extreme degree the qualities which make the professor worthy of the name, and even those accomplishments which make great orators; his nobility of presence, the beauty and solemnity of his features, the softness and warmth of his voice, the ease of speech and abundance of imagery; the continual tendency to soar in lofty flights to the summits of his philosophy, into those high regions above the clouds where the noise of human conflict does not reach; the gift of animating all he touched, and, by the splendor of form and enthusiasm of utterance, of making ideas and objects live; finally, the love of conquering, of instructing, of increasing his own store of knowledge, and of fully engaging his audience. From the very first year of his course the professor became celebrated. People crowded the amphitheater; they followed him on excursions which he directed to the environs of Vienna. His reputation extended throughout the whole city. His book on the Viennese subsoil, "Der Boden der Stadt Wien," appeared in 1862, revealing a new way of considering geology and of connecting it with human geography and sociology. In the same work were considered the relations between the formation and composition of the subsoil and the life of the citizens. This book soon passed from the confines of science into the midst of average culture and decided the political career of Eduard Suess; for he had two careers running parallel, one devoted to the highest and most disinterested science, the other, that of an ardent citizen, a passionate defender of municipal interests and

political liberty. It was in 1863, less than a year after the publication of "Der Boden der Stadt Wien," that he entered the municipal council of Vienna where he remained for 10 consecutive years. Resigning in 1873, he returned to it in 1882, not to leave the council definitely until 1886. In 1873, he had been elected deputy; and for many years he was in the Austrian Chamber, one of the orators of the left, one of the most resolute adversaries of the ultramontaine party, one of the leaders of the liberal party, the Fortschrittspartei.

It is difficult to believe to-day that the man who in 1875 wrote "Die Entstehung der Alpen," and from 1878 to 1883, the first volume of "Das Antlitz der Erde"—those books whose principal characteristic is their calmness—is the same man who simultaneously became excited in parliamentary contests and startled his adversaries by the vivacity of his attacks and his quick repartee. The identity of the great scholar and the man of politics reappears, however, in the speeches of the latter. At all times—say those who have heard him in the chamber—his eloquence aroused in him a sort of poesy, without analogy or precedent, a poesy in which are seen to pass in review the earth and its inhabitants, in which are heard chords of universal harmony. Thus, for example, he compared the abrupt dawn of glory and influence of the old English universities to the sudden appearance in the sky at a point until then hidden from the constellated firmament, of a new star, such as Mira Coeli, whose light, although unsuspected, existed, nevertheless, for centuries, and proceeded toward our gaze in fathomless space. Sometimes, wishing to speak of the train of great thoughts and worthy ideas which travel from nation to nation bettering mankind everywhere, he described to the astonished and mute assembly that isolated reef at the extreme tip of South America, where navigators have placed a cask, sheltered by no pavilion, and belonging to no one. Each ship that passes sends off toward this desolate rock a little boat and the sailors who climb its sides place in the cask letters addressed to their native lands, and from it take the letters which they find there bearing the address of the countries toward which they are bound. The sailors' letters thus wander about from port to port without being directed by anyone and they proceed slowly but surely toward their distant goal. Full of such figures, this manner of speech belongs to Eduard Suess; it is his style; and never was a style more personal than his.

In the memory of the Viennese the name of Eduard Suess will ever remain connected with two great municipal works: The introduction of drinking water and the regulation of the flow of the Danube. They still say in Vienna, "Suess's water," when to a stranger they praise the purity and freshness of the water used in that great city, and which since 1873 has replaced the unwholesome water of the Danube and the lakes. That is justice to Suess, for it was he who

first indicated the sources which were advisable—the mountain springs come to light in the Alpine region not far from Schneeberg on the borders of Styria and of Lower Austria—and he it was who strove with tireless energy from 1863 to 1866 before the municipal council for the adoption of that project. It required seven years to complete the work, and it was on the 24th of October, 1873, that the new water commenced to flow and was greeted by the joyful cries of the people of Vienna. The good people had indeed reason to applaud; the mortality in the city was almost abruptly diminished by one-half. The regulation of the Danube was achieved in 1875 by opening a new river bed from Nussdorf to Stadlau. In the eyes of Suess this was but the very small beginning of a gigantic project, through which the Danube was one day to be set right across the whole Empire from Passau to the Gates of Iron; but this beginning, due to Suess more than to any other man, was of great benefit. It protected the life and property of the inhabitants along the banks of the river, bringing to the center of the capital the most beautiful river route of Austria and permitting the creation and development all along the regulated bed of the river of a new faubourg, built and equipped for commerce and industry.

Even after retiring from affairs, and until the last years of his life, Eduard Suess continued to be interested in municipal and political struggles. He remained always the citizen of Vienna, with all the force of the beautiful word "citizen." On the last night of every year he was accustomed, with some political friends, to make a pilgrimage to the Reichsbrucke, and there, above the muddy waters that flowed past as the years roll on, to drink a glass of wine to the glory and prosperity of the city, his city, one of the first objects of his thoughts. But, then, who could say how his thoughts were divided—what fraction went to the city, what other to the Empire, what to the earth, and what to humanity?

Contemporaneously with his political career, the scientific career of Suess developed, just as brilliant, just as fecund, it seemed, as though the first had not existed. In 1866 he published a memoir on the Loess; in 1869, his "Remarks on the salt deposit near Wieliczka"; in 1871, a study on the tertiary continental faunas of Italy; in 1872, his book on the structure of the Italian Peninsula; in 1875, his "Die Entstehung der Alpen" (Origin of the Alps); in 1877, his considerations of the earthquakes of southern Italy and a little brochure, "Die Zukunft des Goldes" (The Future of Gold). From 1878 on he commenced the writing of "Das Antlitz der Erde," and this was a labor uninterrupted for 30 years. He remained professor of geology at the university until 1901, or a total of 39 years. In 1901 he asked for retirement. At first replaced by Uhlig, one of his best pupils,

yet after the death of Uhlig he had the consolation of seeing his own son, Franz-Eduard Suess, take possession of this same chair. The incomparable joy of being succeeded by a son who continues the work of the father and who is known to be worthy of so doing, that joy known to but few men of genius, was not refused him.

He had been a member of the Imperial Academy of Sciences for a long time when in 1893 he was made its vice president. In 1899 he was elected president of this illustrious company, and kept that honorable position for 12 years. Named correspondent of the Academy of Sciences of Paris in 1889, he took his place, some time in 1900, among the foreign associates, succeeding Frankland. Honors came to him in proportion as his authority and reputation increased; the man himself remained modest, indifferent to titles, disdaining riches, voluntarily bound to a family life, austere and simple, his soul shut to personal ambitions, open only to noble ideas, to the disinterested cultivation of science, to the love of his fellow citizens, and of all mankind, to the tender affections which are born and cherished in the atmosphere of the domestic hearthstone.

An admirable life, deserving of happiness, and which indeed attained it in the measure at least in which a man of such great comprehension can be happy. Eduard Suess knew the ineffable sweetness of a peaceful life, in the midst of a numerous and closely united family. This existence had its hours of sorrow, but these do not come without consolation and never bring with them despair. He saw his six children grow up around him and later numerous grandchildren, and in his family circle, delightfully intimate, when he ceased to work, to think, to teach, when he stopped to chat or smile, he had only to lend ear to the rumblings from without. Among these rumblings, some no doubt the inarticulate sounds of the great city, came one sound which he well knew, for he had heard it from his youth, the sound of praise. An honor discreet and lasting, the gift of universal acclamation, accorded by the unanimous admiration of all who cultivated the same science, were interested in the same problems and had the same ideal; an appreciation expressed constantly by the receipt of an enthusiastic letter, a book bearing an inspired dedication, a visitor who presented himself with the pious and grateful attitude of a pilgrim, full of love, at the shrine of some sanctuary of former times.

The end was worthy of the entire life and lingered serene and splendid like "the twilight of a beautiful day." Until the spring of 1913 the aged master enjoyed good health and old age, which never affected his intelligence, touched his physical strength but timidly as with regret. His age was betrayed only by hesitation and difficulty in walking. Once seated, he seemed as he was ten or a dozen years

before, almost young in appearance with his beautiful grave face a little pale and his magnificent eyes where one could almost see the reflection of the illimitable oceans, and which looked, tender and full of feeling, into the depths of one's soul. He spoke with a deep, expressive, richly modulated voice, in which the glow of former intense or high-wrought emotions was extinguished, and there remained but hushed sonorousness and quiet feeling. Then around the circle of his listeners a murmur would pass and they would give their close attention, fearing lest they lose a word, an accent; they would have wished to fix this instant of inestimable value in the passage of time which, alas, never stops. Thus we see him in 1903 at the Geological Congress in Vienna, keeping aloof from the sessions and official receptions, but willingly receiving his friends of every country with a marked predilection for his friends of France. Thus we see him again nine years later in August, 1912, at Innsbruck, come from his Hungarian village expressly to preside at the reunion of the geologists of the Alps, at the principal function of the excursion organized by the Geologische Vereinigung. This was the last manifestation of his scientific activity. Is it not fitting that this last effort was made by the author of "Die Entstehung der Alpen," on behalf of the geology of the Alps and in the presence of the investigators through whom the Alps have become better understood? Before this time, in 1905, Eduard Suess had sojourned several weeks in the Basse-Engadine; and from this trip of 1905, the last in which he had been able to make excursions on foot among the rocks themselves, hammer in hand, and to make personal observations, he made announcement of his full and entire compliance with the doctrine of great "nappes de recouvrement," or overthrust, a compliance soon formulated in a note to the Academy of Sciences of Vienna, "Das Inntal bei Nauders," and affirmed more briefly still in 1909, in the last volume of "Das Antlitz der Erde." Now, in 1912, controversies had ceased and our reunion at Innsbruck, gay and fraternal, had a character almost triumphal. * * *

Now, in the soil of Hungary, in the cemetery of the little town of Marczfalva, repose the mortal remains of Eduard Suess, until the day when the angel—

> * * * swinging open the gates,
> Shall, faithful and joyous, make gleam again
> The tarnished mirrors, quicken the dead flames.

The Hungarian plain has become the tomb of him who so much loved and so well understood the mountains. But the Alps are not far off; they cut across the horizon; and indeed we know that in their mad journey toward the Carpathians, their waves of stone passed even here. The place is, therefore, not ill chosen to shelter the dust

of the man who was the incomparable singer of all these things. Neither the steps nor the cries of the living come to trouble the sleep of the master. From time to time, however, a geologist will come, who, full of respect and gratitude, will meditate before the solitary slab, praising God for having instilled so much grandeur and such a reflection of his divinity into the souls of the giants of the human race.

I have cited above the principal works of Eduard Suess. It is necessary to add to the list I have given many short notes and articles on different subjects: Tectonics, comparative geology, volcanoes, seismology, questions on the origin of meteorites, the question of the composition and the structure of the moon, the question of the recent displacement of the coast lines, and many others. The majority of the notes were published in the "comptes rendus" of the Academy of Vienna; the articles almost all appeared in the Neue Freie Presse, of which Suess was for a long time one of the scientific chroniclers. But that which is essential in both is found in the last chapters of "Das Antlitz der Erde." Among the colossal labors of Eduard Suess, those which immediately attract attention, those which will endure for an indefinite time on their own merits without becoming obsolete, to preserve for centuries the glory and majesty of the beautiful ruins, are the two books, "Die Entstehung der Alpen" and "Das Antlitz der Erde."

"Die Entstehung der Alpen" is a small work of 168 pages, published in Vienna in 1875, composed of 8 chapters. The author brings up and defends the idea that in the formation of mountains the preponderating rôle is played by horizontal displacements, moving in one direction. Each chain is a whole, thrust from the same quarter over the preexisting formations, which resist, and on which the compressed zone advances. There is but one cause which has produced the whole Alpine system; this cause is a thrust from the south or southeast. Characteristics analogous to those of the Alps are manifested in the Balkans, in the Caucasus, in the chains of the American northwest. * * * Each chain is the work of a very long period, and its formation is the sum of a multiplicity of occurrences. The author insists on the coincidence of the Alpine zone with geosynclines. He remarks—and no one before him had cared to do it—on the magnitude and the generality of certain marine transgressions; for example, of the Cenomanian transgression. He foresaw the periodicity and the quasigenerality of transgressions and recessions. In the next to the last chapter he invites us to make with him the tour of the earth; he shows us in Europe and in the east of northern America the predominance of thrusts toward the north; he calls our attention to those immense regions of the surface of the

earth which seem refractory to folding, and which are traversed by fissures whose direction almost follows the meridian; he makes us see that in central Asia the overthrust of the chains is usually toward the south. The conclusion of this rapid journey around the globe is that in terrestrial deformation there is no simple geometry; that the mountains result from the irregular and unequal contraction of a planet devoid of homogeneity; finally, that this lack of homogeneity goes back to the period of consolidation of the lithosphere. It could not become hard all at once; it presented for a long time the appearance of an archipelago of scoriaceous masses floating on a fluid and incandescent sea. The earth was then a variable star.

The influence of the book was great. It was short, readable, perfectly clear; it revealed a new geology, unsuspected, immediately accessible; it is written in language simple and beautiful. * * * It has directed young geologists of every country toward the study of the mountains; it definitely destroyed the old theories. It substituted, in the minds of all geologists, for the principle of direction the principle of continuity; it accustomed investigators to the idea of transportations of strata; it fixed attention on the great movements of advance and of retreat of the sea. In a word, it was the preface of "Das Antlitz der Erde," the prelude of that incomparable symphony.

"Das Antlitz der Erde" is an essay on geologic synthesis, extended to cover the entire earth; and it is the first essay of its kind. The work, of gigantic dimensions, comprises three volumes. The first appeared in 1883; the last part of the third in 1909. Twenty-six years were required for the complete achievement of this magnificent work. It is well known that by the care of M. Emmanuel de Margerie the entire book has been translated into the French language and published in Paris under the title, "La Face de la Terre." The last part of the third volume of this French edition is at present in press.[1] "La Face de la Terre" is enriched with notes, maps, and cuts, added by the translator, which happily supplement the text and illustrations of the German edition.

The general plan of "Das Antlitz der Erde" will be recalled. The first volume comprises two parts—the movements of the outer crust of the earth and the mountain ranges. The second volume is given to the third part of the work, the oceans. The third volume, much more voluminous than the first two, embraces the fourth part, which is the detailed study, not only geographic, but also, and especially, geologic, of the face of the earth. The first half of this third volume is composed of 9 chapters, in which the author describes entire Asia, and northern Europe. The second half comprises 18 chapters, in which are delineated, first, the rest of Europe, the east of northern

[1] This volume has since been issued.

America, the chains of northern Africa, the old Laurentian continent, the immense African Plateau, and the chains of the Cape, the chains of the islands of Oceania, the mountain systems which extend the length of the west coast of the two Americas; followed by general considerations on folds, on the depths, on the manner of formation and the distribution of volcanoes, on the moon and recent geologic theories, and, finally, observations on life.

The book is an exposition of the planet viewed from without, as travelers from other stars of the solar system would see it. It contains scarcely any theories. The author does not seek to explain or to convince; he shows. He leads his reader by the hand; he makes him see the peaks and the abysses; he makes him touch the seams and fractures with his hand; he leads him along the shores, not only those of to-day, but also those of the ancient seas; and he goes over with him step by step the traces, three-fourths effaced, the wrinklings, the foldings of former times. In the company of the master one soars on geologic time as on the air of this earth. The impression is singular, immediate, unforgettable; one knows no longer, indeed, at what epoch in the duration of time, life came on this earth; and there are seen, sketched simultaneously on the face of the planet, the ancient features and the present features. A vision, giddy, often confused and troubled, like those which pass, on a high mountain, under the eyes of the Alpinist, a day of heavy cloud and violent wind; "a vision a little cloudy, a little sybilline, in which there are mist and clearness, thunder and great silence, diluvian floods and sun-fêtes, days and nights of inordinate length, and which recall "A Legend of the Centuries," in which man was lacking.

The usefulness of such a book is to arouse great and growing enthusiasm and to create an interest in this luminous science through all their lives among hundreds of young men who without that incentive would have done nothing or would have groped about in the dark, to enlarge our thoughts, to give us the taste for general problems and the thirst for synthesis. It can be said without exaggeration that Eduard Suess had his part, often a preponderating one, in all the geologic discoveries of the end of the nineteenth century and the first years of the twentieth. The geologic sciences, which have advanced with giant steps for 30 years, would not without him have advanced so rapidly. He did not say all, he made few personal observations, he did not foresee everything—but by his intuitions, truly those of a genius, of relations and their causes, he incited, prepared, made possible decisive observations, observations which have revolutionized our ideas and illuminated our knowledge.* Among the most important discoveries, among all those which have changed the aspect of geology, there figures in the first rank the verifying, in mountain chains, the structure in great nappes, which makes of these mountains

immense piles of strata misplaced and drifted. This discovery is not of Eduard Suess—if it is of any one man, that man is Marcel Bertrand[1]—but who would have dared, even dream of it, before having read "Der Entstehung der Alpen" and the first volumes of "Das Antlitz der Erde"? And when Suess in the chapters of Volume 3, which he consecrated to the Alps, adopts in his turn this manner of seeing, and speaks of the Helvetian nappes, the Lepontine nappes, the Austro-Alpine nappes, thrown one on the other, this theory so new and so audacious, seems to spring spontaneously and naturally from what he taught formerly.

Genius never lacks detractors. The author of "Das Antlitz der Erde" has often been criticised and cried down. One of the bitternesses of his life was the incomprehension and ingratitude of some of his pupils; one of his consolations, on the other hand, was the immediate and lasting success of his book in foreign lands, and especially in France. He has been reproached on the score of obscurity and lack of preciseness; but this lack of clearness and preciseness is usually, in the nature of things, the result of the imperfections of our knowledge, of the insufficiency of observations, of the difficulty of the problems confronted. "When Suess affirms," as I said in 1910, in reviewing the last volume which had just appeared, "one is quite certain that he does not deceive; when he is unprecise, it is because preciseness at that time is impossible; when he is obscure, it is because he has not yet understood, and because he finds obscurity preferable to the clearness of an illusion created complete in all its parts by his imagination." His splendor of style has been reproached, and, as it has been called, his geopoesy, as though the writer of genius were master of his tongue, as though the eagle could flutter about after the manner of a barnyard fowl. Finally, he has been reproached with not taking sides in the warmly controversial questions, with preserving an indecisive, timid attitude, by which was shown his embarrassment. This last reproach would be grave enough if addressed to a theorist; but Eduard Suess was never a theorist. This man once accustomed to teaching and to conquering, ardent also in political disputes, had for a long time ceased to argue on scientific matters; he was content with seeing, and after having seen, with showing. No mind has been more intuitive, or more exclusively intuitive than his. * * *

[1] "The concept of overthrusts in the Alps was first described in detail by Albert Heim and later developed by Marcel Bertrand; but neither of these geologists was the author of the idea of the great overthrust sheets, which owes its at present accepted form to Maurice Lugeon."—BAILEY WILLIS.