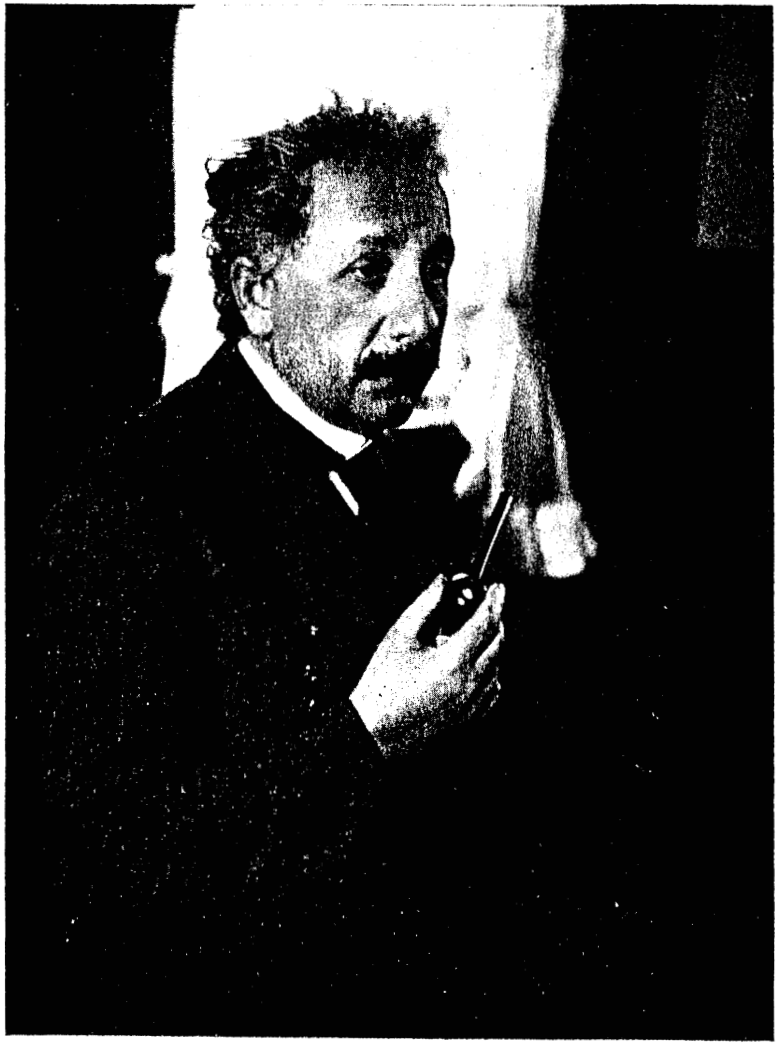

A RECENT PORTRAIT OF EINSTEIN

ALBERT EINSTEIN

A BIOGRAPHICAL PORTRAIT

BY

ANTON REISER

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To

FRAU ELSA **EINSTEIN**

WITH AFFECTIONATE RESPECT

Printed in the United States of America

THE AUTHOR OF THIS BOOK IS ONE WHO KNOWS ME rather intimately in my endeavor, thoughts, beliefs—in bedroom slippers. I have read it to satisfy, in the main, my own curiosity. What interested me was not a desire to know what I am or look like, but rather another's avowal of what I **am.**

I **found** the facts of the book duly accurate, **and** its characterization, throughout, as good as might be expected of one who is perforce himself, and who can no more be another than I can.

What has perhaps been overlooked is the irrational, the inconsistent, the droll, even the insane, which nature, inexhaustibly operative, implants in an individual, seemingly for her own amusement. But these things are singled out only in the crucible of one's own mind.

This is as it should be. For, otherwise, how could the isolation of distance be approximated?

ALBERT EINSTEIN.

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INTRODUCTION

I

CERTAIN PERIODS IN HISTORY ARE, AS BY A MIRACLE, suddenly made rich by new and profound ideas. Clear intellectual light falls on a world previously dark. New problems arise on which the scholars and thinkers of the time thrive and become great personalities. Thus the Renaissance was the age of invention and discovery, but also the age of great men of the stature of Galileo and Leonardo. It is through men of this type that the happy miracle of a new spirit prospers, manifesting its significance in creative personalities and fixing itself in works which, as eternal laws, explain nature. Most scientific efforts, however, are carried on in a different, and less heroic, manner. They show only to a limited extent the direction of the times and the creative personality. Scientific progress is attained step by step and only by slow, methodical means, till finally the great investigator through profound experience or a happy thought reaches his final inductions. He is at once father to a great effort and son of an

industrious past. Deeds of this kind are neither magical nor heroic.

The Renaissance was an age of miracles, of heroic creators. They attained new, fruitful perspectives in science; they were the builders of a new world-view which the next centuries replaced by another: that of particular methods, specific measurements, and small, concrete experiments. Since the time when Kant with his transcendental philosophy transformed scientific thought into critical thought and made skepticism the guard over imagination, exact methods have become firm, strong tracks over which advancing science has glided almost without great names. The spirit of technique has become also the technique of spirit, and a technical age has demanded a technical science—one which improves scientific method, refines the apparatus, and, if possible, transfers the result to practical life. The investigator whose genius and imagination derive from a technique of this order, must, however, first of all free himself of traditional methods and scientific prejudices. Indeed, such revolutionary action implies chiefly the awakening of an individual personality. It is in this manner that each great discoverer repeats on his own account the work of the Renaissance and frees himself from the ideas and forms of tradition. In any case, this means a threat to inherited scientific

technique and is the beginning of a heroism which combats such opposition and disturbs many a dogmatic slumber.

Kant's critical philosophy despite its skeptical character contained one inviolable dogma: the absolute accuracy of mathematics and of its allied study, natural science. Mathematics had, since the days of ancient Greece, made its royal way and had reached a point "beyond which the course man had to take was unmistakably the certain progress of a science for all time, outlined and directed to include endless vistas." Newton's system of mechanics and Euclidean geometry were therefore, to Kant, indisputable truth influencing the relation of philosophy to exact science. In the course of the nineteenth century, however, it became evident that Euclidean geometry was not the only one conceivable, but that there were other geometries. Furthermore, the magnificent structure of mechanist philosophy had been disturbed by the electrodynamic system, so that gradually a mathematical scientific conception of the world had been established, basically different from the world in whose dogmatic truth Kant had believed. This change, manifested itself only slowly and against great opposition. The old forms persisted behind the growth of new meanings which continually threatened to break the brittle shell of the past.

In the sphere of physics the important contribution was made by Albert Einstein, who finally not only invalidated Newton's absolutes of space and time, but first introduced non-Euclidean geometry into the structure of the new physical philosophy.

II

The magnificence of this achievement bespeaks the personality of Einstein. In an era apparently characterized entirely by technique, mechanics and uniform routine, his personality and its world reputation seem almost a miracle; they make the alleged impersonality of the time seem a very doubtful matter. In Einstein may be recognized the growth of a lonely man, who, entirely out of his own experience and knowledge, with incomparable acuteness, has come upon the most fundamental and radical problems of his science. and mastered them through long and intensive labor. In him may be found that great scientific intuition which relates pole and pole: the given problem and the suspected solution, the traditional enigma and the current postulate. All of these extremes together must contribute to a single work. This is the great truth which has raised Einstein, since early youth, above the scientific commonplace into the rarer atmosphere

of investigation and discovery. The story of his life is also the history of the great investigator in our times, and to be able to observe it at close range is a gain for every one to whom the progress and achievement of a new theory appears a special and wonderful stroke of good fortune.

The relation of such a man to science is other than mere love for an intellectual handicraft. It is a passion which possesses him, almost a kind of religion. Just as with the biblical prophet the divine summons is the fundamental characteristic, so with the creative thinker; and each summons is at once a matter of humility and of pride. Humble, the thinker knows that he is in the service of an idea, the divine idea of scientific truth. But in the service of the idea he himself has become the creator requiring the joyful pride of his creation. This kind of chemical synthesis of humility and pride limns the countenance of the investigator.

In Einstein, almost nothing but humility appears. He considers his work a great blessing which fortune has bestowed on him. Generally, this is his idea of the purpose of science and of the motives of research. With Schopenhauer he believes that escape—escape from a painful commonplace and the chains of one's own desires—is one of the most essential aims of artistic

and scientific creation. "It drives the sensitive disposition out of his personal life into the world of cbjective vision and understanding; it is a motive similar to the townsman's desirc which irresistibly draws him away from noisy, confused surroundings to the high mountain landscape where the far glance glides on the quiet, clear air and fixes upon restful lines which seem created for infinity."

In still another sense is Albert Einstein's scientific labor the fulfillment of a desire. His work not only frees him of his ego, inasmuch as it carries over all energies and experiences into an objective world, but also simplifies and clarifies the picture of this world. This too means the fulfillment of a human desire, since only a simplified world of forms discloses a spiritual life of rest and harmony.

The investigation of the theoretical physicist results in a world-view, just as does the work of the artist and the philosopher. It is perhaps not so comprehensive and not so anchored in personal experience as these other worlds. It results only in a familiarity with a small part of nature which is, however, so finely constructed and illuminated by all the gifts of the human spirit, that it, too, means a view of the world. This temper of theoretical physics, this metaphysical temper, if it may be called that, is especially convincing i€,

as in the case of Einstein, the physical world-view revealed is a spirited and creative innovation.

III

The decline of the mechanist philosophy and the extension of mathematical principles in the form of non-Euclidean geometry are among the greatest setbacks that the old physical world-view could suffer. Out of this upheaval the great masters of the new physics built the new structure of their science, which fulfilled in solid proportions the fundamental desire for a simplified, observable scheme of nature. Einstein feels throughout his entire being this desire for completion. The progress of his scientific work shows the continuous extension of his ideas, in order to embrace as much as possible the totality of physical forces. There is here actually an esthetic need for a unified, natural, scientific world-view. It corresponded to Einstein's longing for the universally human, for an inclusive humanity.

Einstein is certainly the complete human being, and as such a rarity in contemporary intellectual life. Mis completeness does not lie in his ability or in his learning, but in his interests and in his inclinations. A genuine creative power always sees beyond its province of specialization, and finds it necessary to attach itself to the col-

lective human mind, that is to humanity itself. One must be aware that each work is organized in the time and space of creative reason, and that everything created belongs to the great fellowship of creations.

This form of universalism is a decisive factor in Einstein's spiritual deportment. There is no human and intellectual sphere which does not interest him. He is interested in all values and occurrences that touch the intellect; no other than a social existence is conceivable to him, for in practical life every man lives with and by other men.

Leonardo possessed this universality, also Goethe. Its practical efficacy lies in the fact that the individual effort is always completed by new contents of experience. Music, to Einstein, is this kind of redintegration, as, contrarily, science was to the art of Leonardo. But Einstein is also interested in technical processes, and likes to invent mechanical improvements which are of value in practice. Here again is evident the ardent desire to include the great and the minute; the will to an inclusive view of the world and to exact mathematical measurement. Thus, too, one may perhaps explain psychologically the fact that Einstein represents the great system of natural forces in the form of a mathematical equation.

Hostinato rigore, obstinate precision: this was the device of Leonarclo. With its kelp he sought to overcome all obscurities and to attain an inclusive vision *of* the world. The same maxim is equally valid to Einstein, and enlists him in a similar work of the spirit. A vision of the world of this kind is the vision of the artist. It brings all the particulars of thought and feeling into a great ruling unity and secures it through a responsible devotion to each detail whether it be a number, an equation, a line, a diagram or an event.

For all that, Einstein is not a "modern" man. ,Nothing is further from him than a trivial selfishness and particularism of life and interests. No other phenomena are stranger to him than the pursuit of success, the brutality of gain, of lovelessness and of cruelty. The creator's joy in his "Scientific labor passes on to society. One is at once creator and creation, and it is particularly the creative human being who feels he is a product resembling, constantly bound up with, and always responsible to, all true humanity. What we are and what we create has its meaning only in the light of this common human ,interest, which is at once the common interest of all science, art and religion.

This is Albert Einstein's philosophy of life.

Chapter I

CHILDHOOD AND YOUTH

MUNICH HAD ENTERED THE NEW GERMAN EMPIRE as a southern capital, Catholic by tradition. During the decades before the establishment of the Empire, the center of political and economic life had already been shifted to the north. Prussia had become the principal German power, and Berlin the center of all efforts towards German unity and German expansion in Europe. But it had been known for a long time that even if the political unity of the German race were attained solely under the militant, cool, imperialistic kingdom of the north, the old opposition between northern and southern Germany would not be terminated by this political union. On the contrary, this opposition could only become more sharp, just as the differencesand friction between individual members of a family are greater in one home than in separate dwellings. The vast roof, reaching from the Alps to the North and Baltic Seas, looked down on a south which could only become more southern, a north which could only become more Prussian.

Yet 'Munich had hardly ever appeared so Southern as in the first decades following the establishment of the Empire. To the economically ambitious city of Berlin, the plodding, petty-trading Bavarian capital did not seem a likely competitor. Its residents lived comfortably in the past, in sight of the beautiful structures of the Middle Ages, the Renaissance, the Baroque and the Rococo, and in the holy tradition of the Catholic Church. Munich society, despite its feudal aristocracy, always had a small-bourgeois character.

In Munich of the eighties, therefore, there were to be observed few social and religious contrasts. Descent and religious denomination were not much questioned. But the Jews, though united in common interests with the Christians, lived, as everywhere and at all times, in a certain seclusion. The childhood of Albert Einstein was thus passed in a characteristically: Jewish environment.

He was born on the 14th of March, 1879, at Ulm. A year later, his parents moved to Munich. In a rented house, situated in a district appropriately removed from the brilliance and renown of the center of the city, the boy spent the next few years. From the windows of his parents' home over a lot between tall stone houses, he looked out on a scanty stretch of romantic country. During

even these early years the boy felt alone. The world in which he lived was sober. One could not dream in it, and miracles never happened.

When Albert Einstein was about four years old, he saw for the first time a small object, in his father's eyes a sort of toy, which seemed to come from another world. His father showed him a small compass, and tried to explain the secret of the dancing magnetic needle, without, however, producing any great results by his explanations. The miracle which excited the boy so that he trembled and grew cold, was different. There, in his father's hand, lay a small receptacle; in it trembled a delicate needle guided by a far, intangible, divine power. For the first time, the child had a presentiment of the mysterious web of nature, of its prodigious power, to which all being is subject. He would gladly have learned more about it, but calm explanations on the use of the compass did not greatly help him.

He sought his bearings from his father, even more than from his mother. The father was unruffled, easy, kind, loved by all acquaintances, and particularly by women. His approach to the world was optimistic, perhaps even careless, but it helped him to put up with many troubles, chiefly economic. His salutary nature conveyed its influence to his wife and children.

Though Hermann Einstein was a merchant, he

possessed a particular inclination for technical matters. He conducted an electrical business. He enjoyed technical problems and mathematics as it was taught in the lower forms of the German secondary schools. Music meant little to him, was a distant and not very necessary pleasure. But he loved literature and in the lamplight, evenings, read aloud Schiller and Heine. He was not concerned about politics, yet the rising power of the new Empire and Bismarck's mighty form impressed him.

When the peal of trumpets and the roll of drums, the clatter of cavalry and marching columns, rose from the street and reverberated against the windows, young and old looked out. The eyes of children, fascinated by the display of this military power, shone large and round. Young Albert, however, seeing these gay-colored armies, hated and feared them. They were tools with no will of their own, forced to obey, machines. The boy, told that he, too, would become a soldier, was terrified. He would never be that! He would rather go away, far away, where this necessity did not exist! His parents had to promise him that.

The mother, Pauline (née Koch) was, in many respects, more serious than the father, and did not always see the world through his optimistic eyes. She enjoyed her life, loved people and her household, and possessed a genuine and hearty humor. She was a devoted mother. For herself, she asked no more than a simple, secure existence. Of small Albert, however, she often prophesied: "Some day he will be a great professor." Both parents had come from Swabia, the father from Buchau, the mother from Cannstatt; they spoke a South-German dialect and in imagination lived amid the remembered loveliness of their native landscape. With their son and their daughter Maja, two years his junior, they went on frequent outings to a neighboring inn to eat *Weisswurst,* or up to the mountains and the upper Bavarian lakes. To the children, these Sunday outings with their parents were but an indifferent pleasure. Often, the children's little cousin, Elsa, later Albert Einstein's wife, went along with them. The children teased one another and played together. For the greater part of the time, however, the boy was quiet and retired.

Slowly, and only after much difficulty, he learned to talk. His parents thought he was abnormal. The hired governess called the still, backward, slow-speaking Albert, "Pater Langweil" (Father Bore).

But tiresomeness was more characteristic of the well-to-do philistine atmosphere in which the child was raised. After about five years the father moved to the suburb of Sendling, where he estab-

lished an electrical engineering plant and bought a private house with a large, handsome garden. On the same premises lived the uncle who also had a share in the business. In this house, the child grew to boyhood. Here, dreams and play were the early expression of a growing spiritual life. Here occurred Albert's first contacts with the spiritual world and his intimations of a larger life. Sophisticated small cousins came from Genoa, told of Italy and its people, of harbors, ships and sailors. With old factory chests they played "going to sea." The boy's world grew larger.

He experienced it particularly as nature. Each moment brought him nearer to the wonder of it. With religious awe he felt its presence and perceived it the whole of God's majesty, which compelled adoration. Thus the boy revealed a religious frame of mind which, like so much that happened within him, was not properly understood by his parents.

Albert longed for a religious life and for religious instruction. But he heard only ironic and unfriendly talk about dogmatic ritual. His father prided himself on the fact that he was a freethinker. His belief harmonized with the thought of his time, which was controlled by the philosophy of materialism. Albert's father was proud that Jewish rites were not practiced in his house.

The boy, however, grieved over the fact that the Jewish dietary laws were neglected. For him they were holy commandments which must not be despised or ridiculed.

In his own way, he sought to give his religious temper expression. He wrote and set to music brief songs in praise of God and sang them in his home and on the street. He identified God with nature. He was carried away by a Spinozistic pantheism. Like the young Goethe, he felt nature an all-embracing, all ful-filling power: "She has no speech nor voice, but she creates tongues and hearts through which she feels and speaks."

With this religious feeling, Albert Einstein, shy and slow, entered school at the age of six; first, primary school, since the Prussian system of combined elementary and secondary schools was unknown in Bavaria. From the lowest to the highest grade, school was ever to him a burdensome duty.

The methods of instruction in the primary school were far removed from any educational ideal. Rules were enforced mechanically with the ample support of thrashings and harsh words. The reigning atmosphere was hard and brutal.

In the large, overflowing classes the difference between the children of rich and poor parents was marked. In contrast to the poor, the rich children seemed strangely to show a greater power of hold-

ing out against the brutality of the school. For them after a few hours everything was over; the small pupils were again the spoiled darlings of rich citizens in Munich. For the poor children, however, there was no escape; they returned from school to the gloom and lovelessness of poverty.

Young Albert Einstein thus experienced the social problem for the first time. He never forgot his first glimpse of the injustice which prevails in human society.

At school, his religious instruction was Catholic; at home, Jewish. But he did not feel religious differences. On the contrary, he perceived the sameness of all religions. The stories of the Old Testament and Jesus' Way of Sorrow impressed him with equal power.

The Catholic teacher of religion liked him. But one day the same teacher brought a large nail to class and told the pupils that it was the nail with which the Jews had nailed Jesus to the cross. The incident stimulated in the pupils anti-Semitic feeling which was turned against their Jewish fellow-student Einstein. For the first time Albert experienced the frightful venom of anti-Semitism.

But his religious sentiments were only more and more strengthened. From nature they slowly carried over to art. Music filled him most, became a spiritual revelation. His mother, accompanied

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by engineers who worked in his father's factory, played duets on the piano, for the most part classical music, chiefly Beethoven. At the age of six, Albert was already taking lessons on the violin, but till he was twelve these lessons gave him no pleasure, remained only a duty as burdensome as school. His musical experience grew out of listening, and pleasure in his own playing came but slowly.

Albert continued to be a timid, mentally awkward boy. Rather than being with boys of his own age or with older people, he preferred being alone. He was strongly built, but he was frequently ill. The glimpses of the world which he saw at school and on the street made him sad. At home there was no wealth, but solid bourgeois comfort. When Albert saw the lives of the poor, he felt that he himself had been too fortunate, and his conscience was troubled. The idea of drawing unearned gain from an unjust world was insufferable.

The secondary school also did not satisfy his intellectual curiosity. Fundamentally, the secondary school was controlled by the same educational principles as the primary school, although these principles were less brutal and somewhat more cultivated. Here too, however, the greater part of learning was rote. Educating the student for productive work, to a deeper understanding of

science and in the experience of spiritual things, was still not understood. Education in the German secondary schools then arranged, as it does to an extent now, for an upbringing emphasizing only dead concepts and formulas and not a living point of view. The effect of such education is often evident in the character of the student. Life cannot always catch up with the omissions of education.

Albert attended the Luitpold Gymnasium at Munich. The most important study of the curriculum was the Ancient world, the Greek and Latin languages. The German secondary school had been founded on the ideal of new humanism. The instructors, however, failed to grasp its spirit. They did not wish to be intelligent guides to youth, but stood for mere authority, through office, education, and age. It was only in the higher classes that Albert met teachers possessing a true love of the spirit, capable also of transmitting this love to the student. But these teachers were exceptions. The impression of school which the six-year-old boy had already formed in the primary grades remained: school was servitude, nothing but fulfillment of duty, and very seldom real spiritual enrichment and education.

This inability to identify himself with the school, with teachers and pupils,—Albert pos-

sessed only one real friend at the school—added only to his feeling of isolation. But this feeling in him was altogether of a productive nature. He was concerned not only with himself, but also, in a real and independent way, with things of the spirit, with science and with art. Ne had a natural antipathy for excessive physical activity, gymnastics and sports. Me did not fee1 himself physically equal to such exertions. He easily became dizzy and tired. Violent activity imposed by the authority of the instructor offended him. Activity should be the result of a personal decision, of free creative emotions, making demands on itself, not compulsion, not submission before authority! Through the contrast to the mechanical carrying on of the secondary school and the conventional city life, the boy's love of nature continued to grow. It was identified with a love of the wonderful.

Albert was about thirteen or fourteen when, far the first and last time, he came in contact with an instructor whose friendship was a spiritual experience. The instructor's name was Ruess. He taught Latin, Greek and German. He had a talent for inspiring his pupils with an enthusiasm for the beauties of the classical world. In his German lessons, he introduced them to classical German poetry and so to the fundamentals of art. He was able to bring near, even to his greatest

pupil, the classical spirit and mighty creative form of Goethe and Schiller.

From that time on, Albert Einstein's love for the classical spirit in art never failed him. Shakespeare's intense, dramatic gesture, Schiller's great architecture, Goethe's universality, always remained, for him, profoundly involved in the substance of poetry. Liveliest of all remembrances was that of a lecture on Goethe's "Hermann and Dorothea." This lecture was to him the revelation of a new world, which for loveliness and wonder could be compared only to nature. The boy's love for this teacher, who alone knew how to satisfy the pupil's spiritual hunger, was so great that the punishment of staying in after school with him was a pleasure. The boy's gratitude remained after he was a man. At about the age of thirty Einstein revisited his old teacher. But he was deeply disappointed when the teacher did not recognize him. Was it possible that the young professor had formerly been his pupil? Ruess did not comprehend the matter, and to no purpose racked his brains to remember. Moreover, what did this former pupil want with him? It is not customary for former students to revisit their teachers when the latter are not going to be of service. Did this Professor Einstein intend borrowing money from him? Perhaps this was it. Both experienced a painful sensation, and Einstein hurried to end this visit to which he had so eagerly looked forward.

A strong, indelible, and creative impression not to be overlooked was produced on the twelve-year-old boy by the first small geometry book held in his tender hands. Geometry was not yet an assigned study in the secondary school. That did not begin until shortly after. But Albert already possessed the textbook, which caused him a tremendous excitement. Mere at last was a way which led to knowledge, to the mysteries of truth, to clear and honest thought. But the boy also experienced great æsthetic pleasure at the thought that the world could be built up by conceptions —products of human understanding. All these theorems and constructions seemed indescribably beautiful.

Previous to this he had learned several elementary mathematical facts from his uncle, his father's partner in the factory. In a very amusing manner he explained to the boy the essentials of algebra: "Algebra? It's a lazy kind of arithmetic. What you don't know, you simply call *x* and then look for it." This uncle also told him of the Pythagorean theorem, but he gave only the statement, not the proof. The boy's ambition was to discover the proof himself, unaided by the least knowledge of geometry. And the miracle happened: racking his brains over his small desk, the

child-head supported by the hands, Albert independently succeeded in proving the central proposition of Euclidean geometry. He busied himself more and more with geometric problems. Soon the small textbook was his favorite reading, It brought him the classical experience of perfect harmony, and his preoccupation with mathematics became the most beautiful adventure of his youth. When he secured Spieker's geometry, he at once succeeded in solving all the exercises, including the most difficult, with the exception of two or three.

Each Thursday his parents invited a poor Russian-Jewish student to dinner. This practice was **a** form of customary beneficence silently exercised in Jewish circles. To this student Albert was indebted for a knowledge of the popular books on natural science by Aaron Bernstein.

These very popular little books, twenty-one of which were published, had **at** that time an extraordinarily large circulation. They were **a** gay-colored, beautiful atlas of nature within the limits of **a** child's comprehension. To Albert, these books were veritable revelations. He consumed them with the same passion with which other boys devour Indian stories. At that time, he already had the ability to comprehend the essence of all great and beautiful things. Nature is great not only through the enormous dimensions of time and space but through the **overwhelming** experience of the wonderful. Thus there arose in him the deep veneration for nature, its mysteries as well as its laws. This **experience** was a determining factor in his future research.

At fourteen the boy was already master of the higher mathematics which the secondary school, based on humanistic principles, did not teach. Integral and differential calculus, analytical geometry—he mastered them all by himself. His mathematical knowledge was already so great that he amazed both teachers and fellow-students. The talent manifested was that of genius. To the teachers, it was not always pleasing. Many questions the boy asked embarrassed them to the point of silence.

But as a student of languages Albert was only mediocre. He lacked the phonetic, as well as the mnemonic, gift. He hated the burden of so much memorizing and did not show the slightest talent **for** learning by rote, which a study of the classi**cal** languages particularly called **for.**

Mis love for music grew with his **love for** mathematics and his religious devotion to the wonders of nature. During the years of his physical and spiritual adolescence, the classical music of Germany opened for him a world which, descending from metaphysical heights, sounded the

profoundest mysteries of the human soul. He played the sonatas of Beethoven and Mozart. He studied the music of john Sebastian Bach, which at that time was little known. These things made **up** the boy's world and with them he maintained himself against the slavery of school and the great stone city.

From time to time he read philosophical literature. He was strongly impressed by Buchner's "Force and Matter," a popular book of the time, but he did not yet perceive its philosophical weaknesses. For the time being, he was in accord with the materialistic monism expressed in similar books. The faith of his childhood now began to waver, and his social sense to grow more keen. He despised the hypocrisy of society betrayed daily before his clear and intelligent eyes. Still, his respect for the religion handed down to him could not become entirely extinct. The instruction in Jewish religion was given at the gymnasium in Munich by Rabbi Dr. Perles. His elucidations of the Proverbs of Solomon and the ethics of the Fathers were of such profound religious significance that Einstein could never forget them.

Meanwhile his father suffered one mishap after another in his business undertakings. The electrical engineering plant did not prosper. He found it impossible to make his living. The father's once so cheerful face now appeared

troubled and serious. It was natural **for** the parents not to discuss their business worries with the children. But Albert soon noticed that things **were** extremely uncertain and that his life would be critically affected.

For **fifteen** years the quiet, shy boy had lived in this **parents' world** which **was *so*** foreign to him. Its conversation, unrelated to his dreams **anti** wishes, did not interest him. He lived **in** another world within himself. In this manner, **he** passed unobservant through the streets of a city known to all the world as an art center. He did not concern himself with its buildings and the treasures of its museums. He paid no attention to the many foreigners who visited Munich, especially in summer. They were to him not very different from the priests in their black gowns, **or** from the Bavarian peasants in their jackets **and** leather breeches, or, in general, from any of **the** other people in the city. He consciously remained outside this world, and wished **to** remain more and more outside it.

The economic situation **of** the parents became so depressing that they decided to give **up** their residence in Munich and to begin **a** new **life** somewhere else. They moved to Milan, while Albert remained alone at Munich to complete **his** schooling. Registered at the pension **of a**

friendly old lady, he led an extremely quiet existence.

Italy, however, seemed a paradise to him, His younger cousins from Genoa had already told him much about it. Now his parents lived there, and their letters painted for him this land of sun, color, and free, natura1 people. Albert increasingly resolved not to remain at Munich till the time of his final examination, but to follow his family.

He worked out a plan which a doctor helped him to execute. He had a certificate drawn up which stated that he suffered from nervous exhaustion, and the doctor requested that Albert Einstein be permitted to leave the school. Thus he went to Italy. But he experienced pangs of conscience over this necessary lie which had helped him to freedom. Long afterwards he feared that he would never receive his diploma, because he had been untrue to himself.

Albert was allowed to live with his parents in Italy for half a year without going to school. The time he spent there was heavenly, the zenith of his youth. Milan was a paradise of freedom and beauty. We read much now, with that complete passion and devotion with which young men read. But he also enjoyed the landscape of Northern Italy, and the sun and warmth, which he loved above all things. For the first time in his

life he studied the plastic and graphic arts: the last supper of Leonardo da Vinci at Santa Maria delle Grazie, the collections at the Brera—a world of classical beauty! The Italians as a people also charmed the youth. His sister and he had Italian friends in whom they found constant enjoyment. He had already started to learn the language at Munich, but his knowledge of it always remained faulty.

Albert now felt that he was a citizen of the world, not bound to the state power. He desired freedom, naturalness and the beauty of living. The Italians showed a grace and a vivacity in their mode of life, unknown in Germany.

Albert, in these early years, abandoned his German citizenship, and till he was twenty-one remained a man without national allegiance. His father remained a German citizen, though he had granted his son's unusual wish. Thus Albert felt free of all social ties. Despite his Jewish descent he showed no adherence to it. He wished to lead a life completely liberated of all ties, but its future direction was still obscure.

In Milan and in Pavia, his father again started his electrical engineering business. But his commercial misfortune persisted. By degrees Albert was forced to concern himself with plans for a profession, though there was really no activity toward which he experienced any natural incli-

nation. As a result of his father's calling and his own mathematical ability, the position of technician and engineer was the first to be thought of. The choice of a profession, however, had other implications: it made necessary a relationship with society and with a mechanical life constantly controlled by ends-in-view and utilitarian purposes. Nothing seemed more frightful to young Albert Einstein. Moreover, he was not ambitious: he wanted neither fame nor success. These mundane ideas were repugnant to him.

His only wish was to be able to lead a secluded, modest, and, at the same time, ethical and intellectual existence. He had no faith in his own power to maintain him in a harsh and cruel world. He possessed neither the self-confidence, the disposition, nor the unusual resolution necessary to the attainment of the externals of life. Indeed, his parents were right. There was nothing left for him to do, but to adopt a technical profession, to become an engineer, somewhere, it was hoped in Italy, and to rest happy with a modest calling and a small income. But it all came out differently.

Among the few remembrances which Albert had taken along with him from Munich and continued to value in Italy, was a certificate from his teacher of mathematics at the Luitpold Gymnasium, in which the teacher so highly rated the

boy's mathematical knowledge and abilities that he recommended him for matriculation at the university. True enough, this sheet of paper was of no practical worth, but it had a high ideal value. The young man, so little rooted in practical life, at least felt assured of a spiritual support which in the future might be of significance.

The question of a future mode of life soon became acute during the enchanting sojourn in Italy, for the unlucky star which had directed the boy's parents and uncle from their business at Munich also appeared in the sky over Lombardy.

Disastrous commercial failure began all over again. The boy was once more surrounded by discussions and cares which seemed to belong to another world. He still showed a strong dislike for action and haste which valued material profit. The more pressing the need for a vocational activity became, the greater was his antipathy against it. He wanted only to see, to comprehend and to experience. The world, however, did not seem to approve of this very desire. The laws of society were antagonistic to the character of the thoughtful young dreamer.

They were a nimbus in Albert's Italian heaven. Though he was still too young to take up professional training, his schooling, in any event, had to be finished. After the glorious time spent away from school, and the beautiful spiritual

anarchy under which Albert read and did what he wanted, this was a heavy blow. Albert was obliged to leave Italy.

Again he adopted a new country. He was still the dreamy, timid boy disinclined to any practical activity. But in many respects he was altered. He no longer only stood amazed before nature, but felt its intimacy. He had gone on walking trips which had taken him over the Apennines and to Genoa. The absence of the scholastic routine and almost military compulsion which had made his attendance at school in Munich intolerable had enlarged his sense of responsibility. He had realized that freedom was responsibility to a single but all the more important entity: oneself. The lack of compulsion, therefore, did not lessen his individuality but strengthened it.

At the age of sixteen Albert applied for admission to the Polytechnic Academy at Zurich. He wanted to pass his entrance examination as an alternative to the required graduation certificate, to which his premature departure from the Munich gymnasium and his lack of further schooling did not entitle him. His courage was indeed considerable. Almost a year had passed since he had received any instruction, and now he had come to this strange city to get his matriculation certificate. Unfortunately, his success corresponded with the gloomy probabilities.

This first examination, which Albert Einstein needed to pass, ended in complete failure. To begin with, his knowledge of languages and descriptive natural science was unusually poor. True, he shone all the more in mathematics and physics, and astounded his professors. It was suggested that he attend certain lectures on these subjects. This suggestion, however, was not very helpful to Albert.

He found himself in a very sad position. He had lost Italy. Behind him lay sun, warmth and freedom. We was quite alone and only sixteen years old. Moreover, he understood the distressed financial condition of his parents and realized that he would soon have to be self-supporting. It was indeed an unfortunate situation for this delicate, dreamy young man concerned entirely with spiritual matters. This state of mind explains the fact, that at first he did not like the new land. It was as if he had plunged from Italian sun and warmth into an icy bath. What would the future bring and what could now be done about it? To begin, he had to acquire his matriculation certificate. His first attempt to enter the academy had been too audacious, and, as a result, unsuccessful. There remained nothing else to do but to return again to the discipline of the secondary school. It was to be hoped that this time

it would be pleasanter and less harsh than the Luitpold gymnasium.

Albert followed the advice of Rector Herzog of the Confederate Polytechnic Academy and, in the fall of 1895, reported at the Kantonalschule in Aarau. His life had suddenly changed from the metropolis of Northern Italy to the small, silent town on the bank of the Aar—the capital of the canton of Aargau. He went to the new school with fears founded on his memories of Munich. But he was pleasantly surprised; for an entirely different, a freer and more youthful, spirit prevailed here;.

He attended the technical school and took up an advanced course of modern languages, mathematics and natural science. The system of teaching was liberal, unburdened by too much authority, and resembled university lectures more than high school instruction. Each class was not confined to one room, but there was a room for each subject, so that the students moved about for the different subjects as at the university, divided according to subject at definite hours as in college. Furthermore, the teachers were enlightened, modern human beings. Albert immediately felt at home in this circle, made friends with his sound and happy school-fellows and proceeded to enjoy Aarau almost as much as he had enjoyed Italy.

EINSTEIN AS A YOUNG MAN

He lived with a teacher of the Kantonalschule, a professor Winteler, to whom he was later to be related; for, some years later the professor's son married Albert's only sister. Winteler taught German and history in the liberal arts division of the school. He was unusually kind, even if somewhat self-willed and complacent. With him and his daughter, who fascinated Albert, and also with his son, the future brother-in-law, Albert took long walks through the Swiss country. The teacher sharpened Albert's eye not only for nature, but for all human affairs. Albert also won the close friendship of his fellow students, notably young Byland, now master in a classical school at Chur. Both studied music together. He enjoyed everything at Aarau : people, landscape and instruction. Albert obtained his matriculation certificate without difficulty after a year, and could then go to the Zurich Technical Academy not as candidate but as student.

The Academy in the nineties had an extraordinary reputation. It had many famous teachers and students from all over the world. Its importance in the scientific world was even greater than that of Zurich university. Nevertheless, amid all this opportunity there was no free intellectual atmosphere. To Albert, this institution seemed, in a way, a continuation of the gym-

nasium. The air of the lecture hall was chill and unlovely, though the possibilities for learning and advancement were very great. Yet the drill which young minds received here was perhaps quite advantageous to a student with a gypsy nature like Albert Einstein's.

It was already clear to him at that time that he would not be able to pursue his original aims, which had corresponded to the aims of his parents; he could not apply himself to technical work or join the complicated organism of practical economic life. He would have to study those special subjects which corresponded with his intellectual gifts — mathematics and physics. And should the sad problem of making a living arise at the end of his studies, there would be the welcome possibility of teaching. For the Academy granted, as did the University, the right to teach in the higher schools.

Several professors exercised considerable influence over the young student. There was the physicist H. F. Weber, whose lectures were indeed a little old-fashioned, yet very gifted pedagogically, especially in their clarity and precision. There was the talented mathematician Hurwicz. Of prime importance was the mathematician Hermann Minkowski. It was he who ten years later made an extremely important contribution to Albert Einstein's investigations:

he recognized that, in accordance with the special theory of relativity, time, multiplied by imaginary unity, appears in a manner which is symmetric with the space coördinates. Thus the space-time continuity of physical reality appears as four-dimensional Euclidean space.

At that time, however, Einstein was less interested in mathematical speculation than in the visible proces'ses of physics. Nor did the Mathematician Gayser, whose teaching was subsequently influential in the development of the theory of relativity, greatly interest the young student.

Just then his one great love among the sciences was physics. But the scientific courses offered to him in Zurich soon seemed insufficient and inadequate, so that he habitually cut his classes. His development as a scientist did not suffer thereby. With a veritable mania for reading, day and night, he went through the works of the great physicists — Kirchhoff, Hertz, Helmholtz, Föppel. Shortly after, he read them in the society of the talented Serbian fellow-student, Mileva Maric, his future first wife.

Had he devoted himself entirely to technical reading, he would have contradicted his essential nature, which since earliest childhood had always shown an attraction toward the universal. The many hours devoted to reading, in the day and

late into the night, included everything of value to a knowledge of nature and the human spirit. It was the time when interest in biological problems was uppermost. He therefore read the work of Darwin and his circle and also those of positivistic philosophers like Ernst Mach.

He was consumed by a tremendous intellectual passion, by a furious impulse to understand, to search out, to be informed. Only those of his own age who were possessed by a similar desire could approach him. He thus felt allied to his fellow-student, Marcel Grossmann, afterwards professor, who many years later, in 1913, worked out with him the mathematical basis of the general theory of relativity. But this early common interest in science had also a practical reason. The touchingly industrious Grossmann kept the best-arranged lecture notes imaginable. They were for Albert an exceptionally convenient way of avoiding the results of his absences and of the gaps in his school education. For he would soon be obliged to think about examinations. The pounding and cramming of facts were no joy to him even now. He demanded space, large space, for his thoughts and his imagination.

With Albert, in Zurich, at the same time, was a young blond, sensitive student, the purest and most ardent idealistic spirit Einstein has ever encountered. This was the Austrian socialist

Friedrich Adler, who much later became world-famous as the assassin of the Austrian minister Stürgkh. Leader of the international social-democrat movement, Adler was also a physicist. After finishing his studies, he became *privatdozent* at Zurich, and appeared as a sort of saint in life and conduct. As a student he displayed the utmost zeal and patient devotion even during the most tedious lectures. For a long time Einstein believed that Adler was the only person who had really assimilated the tiresome matter of the course in astronomy. This supposition, however, proved to be an error.

There was only one instructor whose Iecfures filled all the students with enthusiasm and magnetically attracted even the incorrigible late sleepers to classes at seven in the morning. The geologist Heim gave these lectures, which were of a high order, both artistically and intellectually.

In contrast to the enthusiasm for mathematics of Einstein's school years, his interest in this subject slackened considerably. He showed very little love for this study, which seemed to him rather limitless in relation to other sciences. No one could stir him to visit the mathematical seminars. His entire concern was with physics. He did not yet see the possibility of seizing that formative power resident in mathematics, which later became the guide of his work. He still

believed that an elementary knowledge of mathematics was a sufficient prerequisite for further work in physics.

He encountered at once, in his second year of college, the problem of light, ether and the earth's movement. This problem never left him. He wanted to construct an apparatus which would accurately measure the earth's movement against the ether. That his intention was that of other important theorists, Einstein did not yet know. He was at that time unacquainted with the positive contributions, of some years back, of the great Duch physicist Hendrik Lorentz, and with the subsequently famous attempt of Michelson. He wanted to proceed quite empirically, to suit his scientific feeling of the time, and believed that an apparatus such as he sought would lead him to the solution of a problem, whose far-reaching perspectives he already sensed.

But there was no chance to build this apparatus. The skepticism of his teachers was too great, the spirit of enterprise too small. Albert had thus to turn aside from his plan, but not to give it up forever. He still expected to approach the major questions of physics by observation and experiment. His thought was most intensely bound up with reality. As a natural scientist he was a pure empiricist. He did not entirely believe in the searching power of the mathematical symbol. After several years this state of affairs changed completely.

An unusual atmosphere surrounded these young students in Zurich. By no means all of them were sons of Swiss citizens. They came from all parts of the world. They were passionate, cosmopolitan believers in science who devoted themselves with religious fervor to study and to intellectual things in general. But perhaps that is why the majority of them were not essentially youthful. They were bookmen, dry and sober.

Among them was young Albert Einstein, taking his entire course of study at this town. For four years he led a solitary but individual existence. He occupied a modest room in the suburb of Hottingen and ate in temperance restaurants. His relatives—the economic situation of his parents had become so bad that they could not support their son—gave him an allowance of a hundred franks a month. But he had to do with eighty franks, since he was saving twenty each month to pay for his Swiss naturalization papers, which he thought necessary for the future. On these eighty franks, the young student could lead only a very meager life. He managed on little, however, since he demanded no pleasures. His nourishment was insufficient. It is certain that the disease of the stomach which affected Albert

Einstein in later years was the result of these early years of malnutrition.

He spent his vacations in Milan and in Pavia. They were happy respites during these gray, monotonous student years. In the contrast presented by Italian unrestraint and the dry, sober atmosphere of Zurich, Albert recognized that he was not a pure bookman. In Zurich itself there was only an occasional opportunity to step out of his monotonous student's existence into other worlds. He frequented Zurich families but little, chiefly the house of Professor Stern, the historian, to whom he had been introduced by Milanese friends. He did not feel the slightest relationship with the .average citizen of Zurich.

The few pleasures he permitted himself were musical. He had already heard good concerts at Aarau, the most memorable a concert given by the violinist Joseph Joachim. At Zurich, he frequented the opera. He became ever fonder of playing himself, especially fantasies, a kind of free monologue addressed entirely to his own inner self. From that time on he elicited from his violin not only classical and modern music, but spontaneous improvisations which had no other meaning than that of the moment.

The four years' course of study, which had furthered not only his learning, but his spiritual perceptions in general, had in no way turned him

into a blind, uncritical adherent of science. On the contrary, his faith in the absolute authority of scientific knowledge had become decidedly shaky. He had been taught scientific activity, unmitigated specialization, the sober craft of research and learning, and all these did nothing but increase his skepticism. The essential and the inessential were so close in this type of scientific work that it was difficult to separate them. Rarely does the exactness of research succeed in approaching the arcanum of life and of things. The spontaneous natural experience which had been the private aim of his physical studies was thus not fostered, but rather hindered.

Despite all the progress in understanding and knowledge achieved by the youthful physicist and mathematician, almost a dislike for science and its intellectual technique remained with him after he had finished his course of study. He overcame it only a long time afterwards. He approached the broader aspects of thought through philosophical studies, chiefly through his readings in Kant and Schopenhauer, and later through his study of Hume, with whom he felt a special kinship.

He still saw himself outside of the commonplace world of business and utilitarian purpose. Nothing was more inconceivable to him than the thought of playing a rôle in this world. He de-

spised its harshness and its cruelties, the endless injustices which each member of human society has to suffer. He was also indifferent to its vanity and outward glamor. Perhaps it was Einstein's defiance, perhaps his financial limitations, which made him greatly neglect his clothes and personal appearance. But this was of trifling value in his existence.

He thought of the future and the dire need of having to earn his own livelihood, and, thinking thus, dreamed an idyl: somewhere a small sphere of activity, disturbed by no one, and removed from the noisy, external, cruel, avaricious world of mankind—this was his goal.

But at that time no path was open which might lead to his goal.

Chapter II

SELF-SUPPORT

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IT WAS IN THE FALL OF 1900 THAT ALBERT EINstein very successfully passed the State examinations at the Confederate Polytechnic Academy at Zurich. This made him eligible for the office of teacher. His university education was **at** an end, What he retained was a skeptical attitude towards the value of the sciences, and his white official certificate.

What next? Life was still very uncertain **and** complex, the practical possibilities open to the young scholar were not many, and nowhere was there a way which he could follow with joy. There was also the uncertainty of his material existence, the wish to free himself as soon as possible from the charity of his relatives.

It was clear that Albert Einstein would first turn to his professors. They had promised him **an** assistantship at the Polytechnic Academy, had even declared that they might establish a new position for him. When he reminded them of the matter, and explained the importance of this **question** for his whole life, his professors drew

back timidly. He saw at once that they had forsaken him. Something must have happened to turn things against him, some one must have slandered him, or one of those intrigues which are unfortunately usual in intellectual circles must be taking place. He soon learned that a ***dorent*** had somehow been irritated by him, had been discrediting him, and so caused the other teachers to turn from him. He was richer by one bitter experience and poorer by one hope.

The possibility of taking the regular examinations remained. He might still teach. But insurmountable difficulties stood in the way. Albert was still not a citizen of Switzerland. How then could he be employed in a Swiss school? And he was also a Jew, a factor which even in free Switzerland was against him. He was thus forced to lead the life of a vagabond, to give himself up to chance, to taste all the uncertainties and constraints of a roaming life till finally for him, too, the hour of a new existence struck.

In the year 1901 he obtained, quite by chance, a substitute position at the Technical school in Wintherthur. The young men who attended this school were without academic training and the twenty-one-year-old instructor at first found it difficult to get along with his scholars, for the most part older than he. Feeling superior to the young academician in age and in numbers, they

enjoyed showing what they felt. Albert's first practical activity was thus hardly pleasant. He once more perceived how harsh and cruel the world could be to the individual, especially to one as dreamy and unarmed as he. After a short while, however, Albert showed a definite talent for teaching. The students saw how much they could learn from his course and forgot the youth of their teacher. They respected him and no longer interrupted his lessons.

This substitute's position lasted only a few months. When it was over Albert had again to look for a job. He inquired of acquaintances, read the newspaper advertisements, and felt himself jobless in hard times. He answered an advertisement of a grammar-school teacher in Schaffhausen. The teacher wanted a private tutor for two boys staying at his ***pension.*** Albert obtained the position. He lived now in the small Swiss city on the Rhine. It was much visited by tourists; the fame of the city is due to the nearby falls of the Rhine.

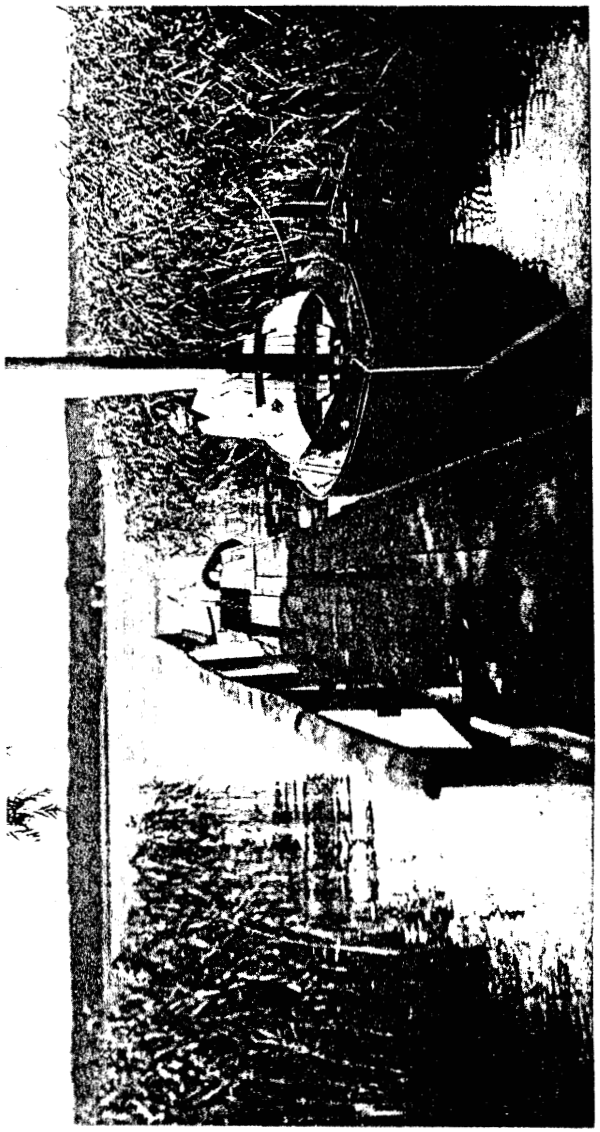
Life, here, pleased Albert a great deal. In the first place, he was the great friend of his small pupils. He again showed his remarkable talent as a teacher, and the boys sensed it. His one wish was to do a complete job, to take over the education of the two pupils entirely into his own hands. He dared to propose that the two boys be

freed more and more from the *pension* so that they might work only with him. What followed this innocent, but rather childish, plan was inevitable. The master of the *pension* saw the beginning of a widespread revolution and his boys entirely escaped from his influence. It was high time to save what still remained to be saved, and the rebel teacher had to be sent off at once. Albert again found himself without a job.

For the third time in his life he had failed to secure a position in a world whose strangeness and injustice he had already known as a child. He experienced brutally the oppression and hopelessness of an intellectual life in a world of selfishness and official positions, which could only shake off a gypsy being like himself.

But Albert still had the good friends of his student days. His Zurich classmate, Marcel Grossmann, always attached to him, heard of his plight. Grossmann spoke to his father about the desperate circumstances of the young scholar and asked for help. The father gladly wrote a warm letter of recommendation to Director Haller of the Confederate Patent-Office at Bern. Through heavy clouds glimmered a new star of hope.

When Albert Einstein appeared before Director Haller, the latter at once proceeded to examine him through and through. He knew, of course, that the young physicist could have very little



PROFESSOR EINSTEIN AND HIS SAILBOAT IN CAPUTH

knowledge of technical matters. But his duties at the patent-office required something different: judgment, insight, and an eye for practical possibilities. Albert was examined for two full hours. The Director placed before him literature on new patents about which he was required to form an immediate opinion. The examination unfortunately disclosed his obvious lack of technical training. Nevertheless, the Director decided to employ the young stranger as soon as a vacancy should occur. In the fall of 1902 Albert began his duties at Bern.

He had, at Zurich, previously obtained his Swiss citizenship papers. The process had not been simple. The Zurich city fathers definitely mistrusted the unworldly, dreamy young scholar of German descent who was so bound to become a citizen of Switzerland. They could not be too sure that he was not engaged in dangerous practices. They decided to examine the young man in person and to question him rigorously. Was he inclined to drink, had his grandfather been syphilitic, did he himself lead a proper life? Young Einstein had to give information on all these questions. Me had hardly suspected that the acquisition of Swiss naturalization papers was so morally involved a matter. Finally the high authorities observed how harmless and how innocent of the world the young man was. They

laughed at him, teased him about his ignorance of the world and finally honored him by recognizing his right to Swiss citizenship.

Albert liked his work at the patent-office greatly. At last he stood on firm ground. He could pay for his meals and be independent of his relatives. He also saw a possibility of performing useful work for society without having to give **up** his inner freedom.

He heartily admired his director. Haller was **a** character, one whom one either loved wholeheartedly or completely misunderstood. He was a headstrong Aleman, a democrat of 1848, a proud and independent man, who humbled himself before no one. His attitude towards life was skeptical. His skepticism, however, was never sharp nor depressing, rather good-natured, growling, and at times somewhat bitter. But he possessed a sense of humor and an unusually fine sense **of** moral values. It was certainly not always easy to work under such a superior, but everybody under him worked gladly.

One might easily think that duties of this nature, which were naturally strange to Albert's talents and interests, would depress him, and that he must have had a longing for freedom and independence, to live for his own scientific work. But the contrary was the case. His position seemed a blessing to him, a practical counterpoise against

pure intellectual activity. It was clear to him **even** then that it is especially the young theorist who needs some such compensation. To-day Albert Einstein still advises young scientists to work at a "shoe-maker's'' job. It seems to him the only possible way of escaping a one-sided intellectual life which may too easily lead to an empty busìness without depth or content, as well as to forced scientific overproduction, as a result of which the truly valuable contribution can only suffer. Every talent., every creative genius, is **a** blessing, a divine gift, which must be guarded against the dangers of the daily commonplace and the world interested in profits. **A** practical profession, however, is an excellent means of furthering the quiet and free development of the creative mind.

Of course, the young physicist felt his thorough superiority to the daily routine. Most of the patents presented were indescribably trivial and lifeless. Still he had to examine them carefully. The very energetic, at times heartily rude Director, himself an engineer, demanded painstaking work. Albert worked with about twelve other engineers, with whom he got on very well. All of them respected their very original Director. He taught them to think sharply and logically, and to select every word in its most exact sense.

Albert's work, though it was not too trying,

was still a strain. He was not used to sitting eight hours over official duties which he could discharge with the same degree of faithfulness in three or four. He was much too young and too high-strung to perform his duties as slowly as the others. Me soon discovered that he could find time to devote to his own scientific studies if he did his work in less time. But discretion was necessary, for though authorities may find slow work satisfactory, the saving of time for personal pursuits is officially forbidden. Worried, Einstein saw to it that the small sheets of paper on which he wrote and figured vanished into his desk-drawer as soon as he heard footsteps approaching behind his door. If he had been discovered, he would have been ridiculed as well as harmed. The Director would have laughed at him in addition to being angry; he was too great a positivist to think much of speculative science.

Shortly after Albert had made his appearance at the Patent-Office, he had been joined by a young engineer called Besso who had been his friend at Zurich. Besso was one of the finest and most versatile talents imaginable. He was equally interested in technology, physics and sociology, and was of sound judgment in these as in all phases of life.

Early in 1903, Albert married his fellow-student, Mileva Maric of Serbia. His salary allowed

him to live simply, with a certain degree of comfort, though his top-floor apartment in Kirchenfeld could hardly be called cozy in a storm. Still it was his home. He received his guests there and conversed with them night after night. His closest friends were the Roumanian student Solovini and the young mathematician Konrad Habicht, who a short time after took his doctor's degree at Bern and became a teacher at Schaffhausen. With these friends, in particular, and with the young engineer Besso, Albert discussed his scientific work as well as philosophical problems, and the conversation was often so lively and loud that the other tenants in the house did not find it a matter of spiritual enlightenment, but rather a disturbance of their night's rest.

In Bern, Albert became a father. His first son, likewise called Albert, was born in 1904. His arrival was a great joy, for the father was not only happy with his child, but about to begin the most productive years of his life.

Albert divided the spare time left him by his position, between his family and science. At that time, the young official of the Patent-Ofice, his dark head making him appear more an artist than a scholar, could be seen carefully wheeling a baby carriage through the streets of Bern. When he felt that he had fulfilled his fatherly duties, he would hurry home to pore over prob-

lems, which, like an overwhelming passion, possessed him, never letting him rest.

The fundamental problem which concerned Albert Einstein at the time was light, ether and motion. Conceptions which had dimly engaged him in his student days were now taking on a definite form. Einstein saw that his efforts began to endanger the supposedly impregnable foundations of his science. As a man possessed, he was carried away by these most difficult problems of theoretical physics, and talking about them helped more than silence. Going home from his duties he discussed his ideas and investigations with his friend Besso.

If he felt that he was nearing a solution of his problems, he would tell his friend—his own eyes glowing—that the success of his efforts was at hand. But the next day he would merely inform him sadly and gently that all his experiments of the past were wrong. Through many long years of hope and disappointment Albert carried on his experiments till he reached the final solution to his problem. When he held the key, with which he was to open the closed door, in his hand, he despaired, and said to his friend "I'm going to give it up."

But next day it was in the greatest excitement that he took up his duties at the office. He could apply himself to the dull routine only with effort.

Feverishly he whispered to his friend that now at last he was on the right track. He had made the revolutionary discovery that the traditional conception of the absolute character of simultaneity was a mere prejudice, and that the velocity of light was independent of the motion of coördinate systems. Only five weeks elapsed between this discovery and the first formulation of the special theory of relativity in the treatise entitled "Towards the Electrodynamics of Moving Bodies" (published in 1905). Other short papers—"The Law of Brownian Movement," "On the Quantum Nature of Rays," "Identity of Mass and Energy," etc.—followed. On the strength of his work entitled "A New Determination of Molecular Dimensions," Albert received his degree of doctor of philosophy at Zurich University, from Professor Kleiner, who had been the first to recognize the unusual talent of his young colleague and had for some time been following his scientific development. In 1901, Albert had already given the professor an essay on the kinetic theory of gases which had been written during the time of his tutorship at Schaffhausen. Kleiner had rejected this essay out of consideration to his colleague Ludwig Boltzmann, whose train of reasoning Einstein had sharply criticized.

However, after Einstein had taken his doctor's

degree, Kleiner thought it his duty to both science and humanity to find the young scholar the position which he merited in the scientific world. He did not agree with Albert's views on the necessities of a practical "shoemaker's job," but was convinced rather that the research worker should also teach, preferably at the university. The notion that the young physicist, at his age, solving the most difficult theoretical problems, should continue as a subaltern in the Patent-ofice of Bern, could only malte the Zurich professor shake his head. He would summon the young scholar to a professorship at Zurich!

But it is not possible to be a small official one day and a university professor the next. Albert had first to become a *privatdozent* at a university. Naturally, he had to do so at Bern, since he could not resign the position by which he supported himself and his family. His formal admission into academic Iife was, therefore, not a simple matter. Primarily, it was opposed by the physicist Forster, who, as is very often the case with older university professors, saw in every young colleague a rival who might endanger his position. Forster was an excellent teacher, but his scientific significance was negligible. Fantastic stories were told about his laboratory. It was an enchanted garden which no one might enter unless it was evident that he knew nothing

of physics. The technician was forbidden to enter. But Forster was unsuccessful in his opposition to Einstein's admission into the faculty, and Dr. Albert Einstein began his career as a lecturer.

His lectures were not attended in great numbers. To be accurate, only two students regularly reported to his classes, and these because they were persona1 friends of the instructor. Naturally, one of them was Besso. The other was a young official of the Telegraph office called Chavand, a man of great talent, with an insatiable thirst for knowledge, who through his own private studies had advanced from a simple telegrapher to an expert on theoretical electricity. The desire for education, the intellectual mobility, qualities which distinguished him from the people of his class, had so antagonized authorities and had made so many people his enemies that as a result of an overexcited sensitiveness he became affected with diabetes in the prime of his life. Sacrificed to his own intelligence and to his own intellectual asperation, he had to retire from public activity. The world in which Chavand had been born had no room for his all too lively intellect. Now, in the best of health, he lives as pensioned official in Geneva.

Albert lectured on theoretical physics, chiefly on the science of heat. He simply told his two very intimate friends what he thought about

these things. His lectures were in no sense **given** for the sake of pedagogical or scientific ambitions. His academic future worried him little. One day, however, he found a new auditor in his lecture room—Professor Kleiner. **As** luck would have it the young instructor's lecture was poorly prepared that day, and his delivery rather inadequate. The Zurich professor was not very pleased and wrinkled his brow. At the close of the session, Kleiner spoke quite frankly to Einstein. But there was no fear in the youthful face, no plea for indulgence, as Kleiner probably expected. Albert calmly explained that a professorship was quite unnecessary to him, he could perfectly well stay **at** Bern, and suggested that Zurich possessed another capable man, his fellow classmate, Friedrich Adler.

Adler's chances were very favorable. He was not only an excellent physicist, but his socialistic tendencies had found the protection of the director of public education, who was likewise a socialist. When Adler heard, however, that Einstein was also a possible candidate, he retired into the background. Ne did not wish to compete with his fellow classmate. Adler would never think of depriving a friend of a position. But he never mentioned his renunciation. It was only after some time that the matter came to light.

Albert saw this sacrifice as an additional confirmation of the portrait he had formed of the man's impeccable character. **A** straightforward, idealistic nature devoted with religious ardor to socialism and at the same time a level-headed scientist—he was a miracle in a brutal world. What must have happened, to cause this sensitive person, who had never harmed a living creature, to fire the fatal bullet at the Austrian minister, Stürgkh in 1915!

Albert Einstein obtained his professorship in 1909. For the second time in his life he established his residence in Zurich. He was not yet thirty when he started his duties as lecturer. His rapid progress had been amazing. All the usual preliminaries to a successful academic career had been omitted in this case; close affiliation with the university, prolonged service as an instructor, influence. Yesterday he had been only **an** official in the Bern Patent-office, and to-day he was professor of the first university in the land. Others would have been proud of this success. Einstein was not proud. He was not even glad.

In contrast to the gray-headed professors, the 'dark, somewhat dreamy young man produced **a** remarkable effect. They talked about their lectures, about exercises, about the private life of the faculty—the usual conversation of faculty clubs—as if it were a handicraft, a thing, an institution. Einstein had an entirely different atti-

tude toward science. He knew that his colleagues were his superiors in erudition, in the mere accumulation of knowledge. But they lacked his inspiring passion, his gift of artistic intuition. They were not always productive. Though his scientific work became more and more involved in exact mathematical methods, behind it all stood the great productive joy in theoretical speculation, by the profound recognition of law in the vast system of nature.

It was Leonardo da Vinci who said — "There is no certainty where none of the mathematical sciences can be employed, or in the case of things which can not be connected with mathematics." That this truth to-day seems to us somewhat banal is more than a little the result of the success of Albert Einstein. He made the mathematical treatment of physical problems a necessity, and once more called attention to the speculative basis of science. Twenty years before Einstein, natural science had been for the most part empirical; theory had been considered empty speculation; the laboratory the proper sphere of the investigator. Little trust was placed in speculative thought, which is able even in mathematical equations to express the wonder of nature, the multiplicity of her laws, and which makes it possible to come near to their mystery.

As a professor, Einstein had first of all to be

a teacher. It has already been shown with what joy he accepted the position of private tutor during the years of his poverty, and what pedagogical capacities he displayed. A lecturing professor, however, is hardly ever able to influence his students directly and almost never meets them personally. He stands, an expert at his lecturer's table, represents discipline, and is supposed to present his doctrines and his researches to the students. Activity of this nature — the end and aim of most professors — at first held forth very little promise for young Albert Einstein. He showed a definite timidity, which even to-day he has not overcome, toward speaking in public. He always called his lectures "performances on the trapeze." His nature, which above all enjoyed being alone, or with his work in the silence of his own room, found his professoriat activity hardly pleasant.

He was even less interested in worldly success. While he was yet in Bern, one of the most famous physicists of the time had paid him a special visit to make his acquaintance — an honor which would have made any one else happy. In a restaurant, the German professor remarked that academic honors are even more important to young researchers than to older ones, and that most scholars are appointed to academies when they care no more about it. The words intimated

his sincere admiration for Albert's work and an unexpressed wish that Albert should in spite of his youth join the famous academy of which the professor himself was a member. Albert, however, replied dryly: "Really, if these people are appointed when they no longer care about the honor, I may as well be proposed right now."

This approximated his feelings toward his professorship at Zurich. He showed no pride, led the same life in Zurich as in Bern, wheeled his son in his baby-carriage on regular walks, and when the second, Eduard, was born, loved him as much as his older brother.

That his elevated position might mean another mode of life never entered his mind. He has always been averse to conventionalities. Indeed, he hated them. He was always so unassuming as to neglect the most moderate necessities. The terrible distinction existing between rich and poor and the unequal distribution of wealth always seemed a sad injustice to him. Einstein learned a great deal about socialist teachings from his friend Adler, with whom he lived in the same house in Zurich, Indeed, were all people so conscientious, disciplined, and helpful as this Adler, the socialist paradise could certainly be realized. But Einstein's knowledge of human beings had made him skeptical about a new society which

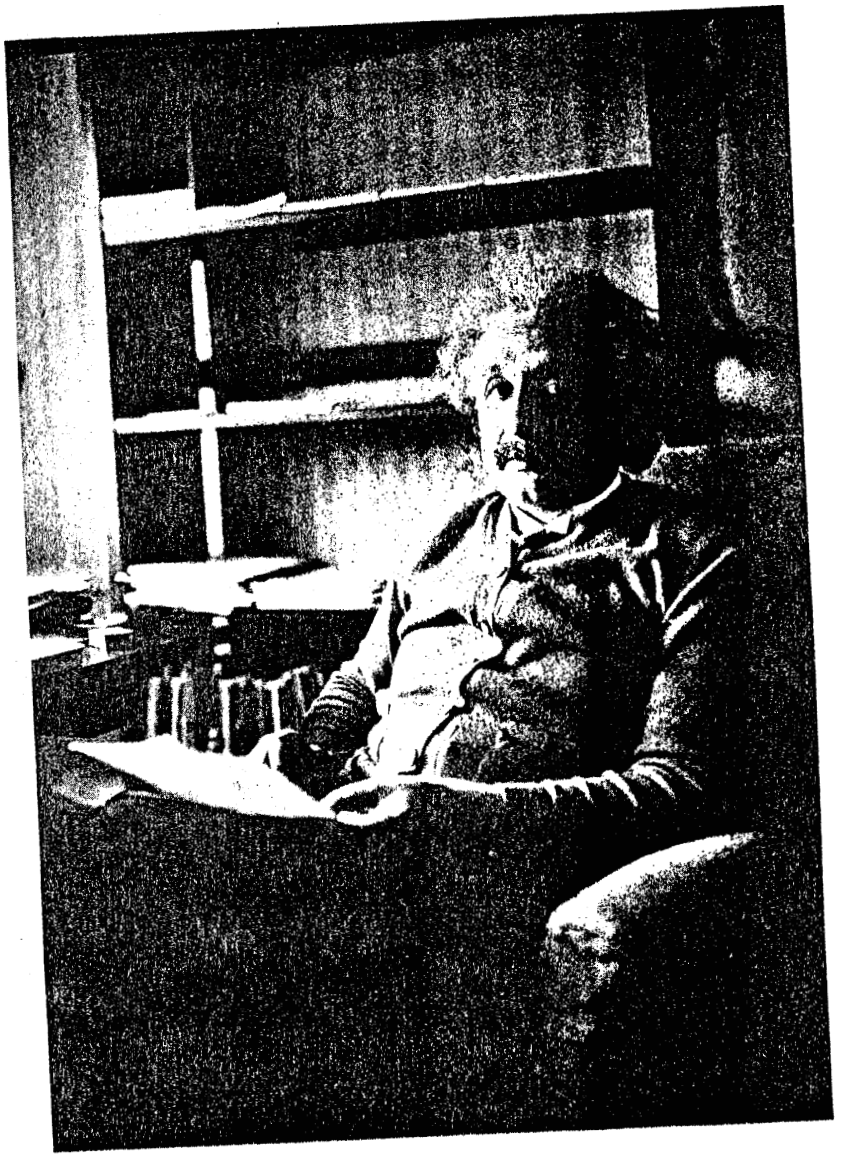
would necessarily have to be based on the same old human beings.

Adler was not only a socialist and physicist, but an enthusiastic philosopher. Like the young Lenin, he was a follower of the empirical-critical philosophy of Ernst Mach. This attitude resulted in a physical world-view differing from the one which corresponded with Einstein's labors. Adler believed that a system of natural science should come purely from experience and be inductive in its methods. Einstein did not as yet directly attack this view—at that time still general in scientific circles—but all his instincts, all his imaginative gifts, were completely opposed to it. Years later, in 1918, in an address at a banquet given to Max Planck, Albert Einstein formulated the opposing view, acknowledging his obligations to deductive physics and artistic intuition. "The greatest task of the physicist is the search for those general elementary laws, out of which by pure deduction his picture of the world is formed. There is no logical road to these elementary laws other than intuition, supplied by the understanding *of* experience." Basically this was also his belief at the time of his professorship at Zurich. But, as yet, his convictions were not advanced enough to oppose the opinions of his many colleagues. To-day, the facts of experience are indeed important, in that they indirectly

called forth the intuitively received and constructive systems of thought, and the facts are the only judges of intuition; but the facts are always begotten, ruled, and ordered by the world of pure thought, as it expresses itself mathematically.

We return, however, to Einstein's life during his Zurich years. As extraordinary professor he received a meager salary. He was also an assistant at the Institute of Physics, which gave him no additional pay. His financial position was thus not particularly good and in no way better than it had been in Bern. All that remained was the glamor of office, the sense of being involved in. the fellowship of scientific research, and the joy of' residing in Zurich, which had always meant home to him, since Munich and Italy were only childhood reminiscences.

He had been a student in Zurich, had decided to study science there and had thus outlined his future. He had won his naturalization in Zurich, and his best friends lived there. Thus there could have been no activity more obviously suited to him than his new position. But being a professor implied being a professional scientist. All that had occupied his imagination and his impassioned intellect in his quiet leisure hours and in the privacy of his study, all that had filled him as a secret task, which existed only as long as his



EINSTEIN IN HIS STUDY

work was not yet finished—had assumed a different aspect, had become a matter of official calling.

Einstein had no great love for his professorship. He was supposed to teach a science which gave him the feeling that he was pupil and creator at the same time, but not the collector of its knowledge. He had once characterized the investigator as a "singular, taciturn, lonely fellow"—a portrait which may serve as an excellent description of himself. His ambition had never been ta know everything, even about his own science. His own problems were his major interest, and the thought and knowledge of others were only means which might be used in his own research, never a mass of learning which he was proud to have mastered. As a lecturer, it was now clear to him that his technical information was not complete, and that it betrayed deficiencies which were not becoming in a professor. He had always employed his time in the pursuit of problems, in imaginative voyages of discovery in his own science, and had neglected nothing so much as a general review of all scientific knowledge.

He was oppressed by all these things as well as by the fact that his position and all that went with it never allowed him the peace necessary for his own work. Thus he thought often, and with longing, of Bern, of his quiet occupation at the Patent-office, of the many free hours he had spent

there in the pursuit of his researches, of this entire peaceful, simple life without excitement. And more and more he felt that only a contemplative existence should be his—a life away from activity, from people—a quiet, meditative life, such as artists are accustomed to live.

The Zurich years, however, were profitable in many ways. He not only became acquainted with new and important people and entered into close relationship with them, but also came into contact with the greatest scientists of his field. In 1905, while Einstein was still in Bern, the great physicist Max Planck of Berlin had already written him and extended his heartiest congratulations to the special theory of relativity, whose first formulations had just been published. Planck's letter was the beginning of a lasting, lively correspondence. It established a community of spiritual interest between them which never ceased. This correspondence concerned the most pressing problems of theoretical physics, all those problems of revolutionary significance which gradually brought about a new physical conception of the world. Relativity, Quantum theory, gravitation, the constitution of light, were all treated in these letters between Planck and Einstein, so that in private form everything was discussed which was soon to threaten to destroy the fundamental assumptions of the old science.

In 1907, there came to Bern Max von Laue, who for a number of years now has been Einstein's colleague at Berlin University. At first drawn to each other by their mutual scientific interests, they became close friends.

In 1908, while Einstein was still in Bern, he received an invitation to lecture on relativity and the constitution of light before the Congress of Scientists which was to meet that year in Salzburg. It was his first appearance before the official scientific world. He was aware this time that these were not students beginning their education as they sat facing his lecture table, but the great masters and leaders of science whose names one mentioned only with respect.

This lecture was doubly significant to him. For the first time he had met face to face the men whose works and accomplishments he already knew, and, moreover, in spite of his youth, he had been admitted to their society. This was even of more significance than his admission to the post of professor. The invitation to Salzburg implied a recognition of his investigations and a willingness on the part of this learned forum to listen to further explanations of his ideas.

All these ideas were related to the problem of the relativity of time and space, also to that of light-quantum. Einstein's colleagues had readily accepted the ideas of the special theory of rela-

tivity. Opposition came only from those scholars who were ill-disposed to theoretical physics in the first place—scholars with no faculty for an abstract and speculative order of thought. Opposition of this kind disturbed Einstein as little as recognition, or the interest of philosophers, who immediately recognized the significance of his work to a theory of knowledge.

He himself recognized the need of completing what he had already begun. In Bern he had arrived at the fundamental principles of the general theoryof relativity. But the development of these principles progressed only slowly, always interrupted by disappointments, errors and new experimentation. It took a decade (1905, Bern—1915, Berlin) to complete this entire great work.

In the meantime, Einstein was making his reputation among the scientific circles of all nations. In France, the great physicist and mathematician Henri Poincaré announced that Einstein's researches might possibly revolutionize the traditional Newtonian mechanics. Unusual interest was displayed in Holland, especially by its greatest physicist Mendrik A. Lorentz, whose own scientific works were the most important predecessors of Einstein's theory.

In 1909, the aging master and the young scientist met on the occasion of a lecture given by Einstein at Leyden. This personal acquaintanceship was a great experience for the young scholar. He admired none of his contemporaries as much as he did Lorentz. The power and courage of his ideas, the logical acuteness employed in developing them, his pure and inspired humanity, all these characteristics made an overwhelming impression. Lorentz knew people. He knew the attainments and weaknesses of his colleagues who worked with him at the institute. They came gladly to him with their hopes and troubles. They knew that he would help them if he possibly could.

From the first day of their acquaintanceship Hendrik Lorentz and Albert Einstein remained fast friends. They saw each other often, but as in the case of Einstein's friendship with Planck, what increasingly united the two investigators was a lively, scientific correspondence. When Lorentz, well advanced in years, died in 1927, Einstein was summoned to Holland to speak the memorial address over his deceased friend and master. No words were ever so painful to him and no parting-hour so shattering as this funeral hour.

Through Lorentz's influence, Einstein's fame in Holland increased steadily. Two universities —Utrecht and Leyden—offered him professorships, but he could not decide to accept them. After 1912 Einstein formed a close and lasting

friendship with Lorentz's successor at Leyden, Paul Ehrenfest, who is still closely united to him in humane and scientific interests.

At Zurich, the mathematician Zermelow was closest to him. His work was chiefly concerned with the theory of quantity. In the faculty, Zermelow was always of the opposition. He was a militant spirit constantly setting on fire the conventional atmosphere in which the Zurich professors lived. But Einstein has never been a natural fighter. He particularly dislikes public contention in the field of science. He suspects the superfluity of contention as an approach to truth, which needs no help.

Albert had been teaching for three semesters at Zurich when he received an invitation from the University of Prague. The life of a young professor may be compared to that of an actor: both are migrants, homeless, following the stars of their careers; they earn their rest only when they have reached the height of their achievement. Einstein felt that he was Swiss and did not belong at Prague in Austria. But he had been offered the position of professor ordinarius. It meant not only the highest academic rank, but a substantial raise in salary. Had the matter been entirely one of personal welfare, it would have received no consideration, for there are few people whose personal needs are so slight, whose

desire for riches and advantage so non-existent, as Albert Einstein's. He had, however, not only himself to take care of, but his wife and his two boys. They brought about his decision. In the Easter of 1911, therefore, he began his duties as ordinary professor of physics at the German university of Prague.

Before him was an entirely new world. He was in provincial Austria, a land of nationalist struggles; in an old romantic city of Catholic tradition. The old buildings, the dark streets, the magic of ruin, evoked an atmosphere of a decidedly artistic sort. The gravestones of the old Jewish cemetery told a thousand years' story of his race. Einstein's artist's nature was stirred by all this.

He had gone with fear and misgiving to his new home. He soon felt adapted to his conditions; the city filled him with enthusiasm. In contrast to his first experiences at Zurich, his position pleased him. He became friends with the physicist Lampa and the mathematician Pick. The university was a much smaller one than Zurich, so that it agreed with his pedagogical ideas—closer contact with the small number of students attending his lectures. In his free time he took walks through the city and its beautiful environs. It was on these solitary walks that the

genera1 theory of relativity matured and took form.

Politics interested him little. But he sensed the sharp, political air in which the town was steeped. The faculty meetings often resembled political conventions. The struggle between the Czechs and the Germans had already reached a dangerous impasse. The downfall of old Austria was the only thing that brought about the solution of these problems.

In Prague, also, Einstein lived simply. The advance in his income and his position as professor ordinarius did not at all increase his need. The way of life which has always seemed the most agreeable to him is one which allows him the most rest, seclusion and leisure for scientific work. In so far as his administrative duties and social connections do not make for spiritual expansion and scientific discussion, they are superficialities from which he gladly withdraws. The modest circumstances of the German university at Prague did not make too many demands on him in a social direction. His connections were limited to German circles. He had not mastered the Czech language. Now the accepted language of the country, Czech at that time did not yet rule the city. It was spoken only in low circles and among the Czech revolutionaries, who already represented a strong, united political

group. Einstein was a quiet and interested observer of all these conflicts. Yet he stood beyond politics and felt, moreover, that he was an alien Swiss.

This sojourn at Prague lasted only a year and a half. In the fall of 1912, he was called back to Zurich. It was not easy for Einstein to make up his mind about leaving Prague. But it was the most natural step for him to accept the chair offered him at Zurich: he preferred the intimate atmosphere of the city; his friends and colleagues interested in his scientific work lived there.

The new offer did not come from the University, but from the Confederate Polytechnic Academy. Thus Albert Einstein returned as professor to the place where he had once been a student. Me could now greet his old teachers as a colleague and peer.

His name as a scientist was now so well known, that it produced a great effect even among the students. Einstein's lectures were unusually well attended. Hardly any other scientist at the academy could show so large a body of students. Notwithstanding his many official duties, numerous compared to those at Prague, Einstein applied himself passionately to the further development of the theory of relativity.

The foundation of his great system had for some time already been established and assured

for all eternity. Its general structure was firm. But beams and walls, to support the dome which crowns the whole, were lacking. These were, for the most part, of a formal, mathematical order. Marcel Grossmann, who had been Einstein's friend in his youth, now stood him in good stead. The work was carried on at enormous pains and with unsparing energy. It was natural for so inclusive a physical system as the theory of relativity to suffer repeated recoils during its development. The goal of this great, laborious work always seemed to vanish in the dim distance whenever the end was believed to be at hand.

Einstein's official duties and intensive research strained his physical energy to the utmost. The continual excitement, disappointment and renewal of hope, meant an unusual psychical burden, which only a robust nature could withstand. A person inwardly as soft and tender as Einstein was hardly equal to the excitement. In the long run, these years of constant creative activity would become too much for him to bear.

But the goal was being neared; the stupendous structure grew higher and higher. The general theory of relativity attained its final formulation during these Zurich years, even though many details were still to be accomplished before it could be definitely viewed as a finished work. The final touches followed in Berlin, in 1914, the first year

of the frightful destruction of the European continent.

Einstein's increasing scientific output aroused in him a greater desire for a life which would give him complete freedom for his researches. Just as in youth he had seen the necessity of a "shoemaker's job," and still sees it as the duty of each person to engage in an activity of service to society in general, so at this time he wished to be free of all duties which might hinder his researches. Outside of a position at a university, however, there is hardly any other mode of making a living which the scholar can fall back on.

That it was still possible to devote himself entirely to research without being interrupted by any considerable professional duties, was soon apparent when he was again offered a new position.

The great Berlin physicists Planck and Nernst turned to Einstein with the intention of winning him for the University of Berlin. People already saw in him at that time a thinker of such unusual significance that it was deemed an urgent necessity to bring him to a scientific center such as Berlin always has been. There was the additional fact that Max Planck, together with Lorentz and the Danish physicist Bohr, is one of the great contemporary physicists whose own work is concerned with the fundamentals of theoretical

physics. Einstein and Planck in Berlin would therefore make the city the center of physical research.

This viewpoint, however, did not influence Einstein's decision. The unusual nature of the professorship offered him was more of a determining factor, The physicist Van t'Hoff had died some time previously. He had been the incumbent of a professorship established by the Prussian Academy of Sciences without fixed pedagogical duties. It was this position which was offered to Einstein. **All** his wishes would be granted, a separate physical institute established for him, his duties as a teacher curtailed to a minimum since this particular professorship did not require Einstein to become **a** member of the faculty of philosophy. He retaine 1 the rank of full professorship with none of the many official duties connected with it.

These prospects were too enticing to resist. They opened a life which corresponded completely to the most secret desire for independent research. True, it was not easy for his south-German nature to become accustomed to the life of north Germany. Berlin, the great city with its active life, its raging hurry, and dry utilitarianism, was foreign to his nature: as was also the bureaucratic feudalistic militarism then prevailing in the universities and in the academies

of Prussia, as in all official circles. **Yet** despite these qualms, the prospect of doing undisturbed research was irresistible.

Einstein did not wish to renounce his rights as **a** Swiss citizen, and obtained permission to continue as such in his Prussian office. He declined the offered Physical Institute, as, during these most fruitful years, it had become clear to him that his field was pure theory rather than experiment, and the last was only an occasional aid in his theoretical research.

Thus Einstein accepted the position offered him at Berlin. **At** Easter of 1914 he began his new duties, which he still pursues. No other office has ever been as acceptable to his disposition as this one. He has remained loyal to it to this day, and to the best of human knowledge, will remain loyal to it in the future.

Chapter Three.

FORMULATION OF THE THEORY OF RELATIVITY

THE INTENTION OF THIS BOOK IS TO TELL ABOUT Albert Einstein's life. A discussion of his scientific work is, therefore, not a part of the task at hand, especially since it is rendered unnecessary by the vast literature already existing on the subject. But the work of a creative personality is bound up with its life in many ways. The work develops as an essential constituent of the life of the creator and is its crowning achievement. In the case of a person like Albert Einstein, who feels the most abstract problems of his science with an overwhelming force, and is too much the universal man not to relate his scientific production to the rich world of his profoundest human experiences, a biography which does not discuss his work remains fragmentary. His work is a biographical fact: it has taken up decades of his existence, and is the center of all his intellectual interests and passions.

The extraordinary significance of this work, which has earned Einstein a world-wide reputa-

tion, has never made him overbearing or proud. That would be not only a contradiction of his character, but also of his belief that scientific knowledge is a manifestation of religious grace, a happy vision in Goethe's sense. Just as it is certain that cool understanding and painstaking detail are necessary in the execution of physical theories, it is also certain that the essential idea

The vital point is the result, which he anticipates by his scientific imagination. The process of execution, however, is always a matter of pure method possessing all the charm of the building of a machine.

Einstein did not just happen on his comprehensive knowledge of the field of theoretical physics. He attained it after a long struggle, and after hard intellectual work. The process was a long chain of progress and retrogression in a life-work whose effects, evident in Einstein's face, make him seem older than he is. In the face of his great success and the unquestionable recognition which his work has received, he is characterized only by the profoundest humility. When the Royal

Society of London presented him with its highest distinction, the gold medal, he expressed his gratitude in these words: "The man who has discovered an idea which allows us to penetrate, to whatever slight degree, a little more deeply the eternal mystery of nature, has been allotted a great share of grace. If, in addition, he experiences the best help, sympathy and recognition of his

As we have seen, the young student at Zurich was already occupied with the problem of light, ether and motion. This problem has been a central problem of the science of optics for centuries, and was now again the center of interest, primarily as a result of the researches of H. A. Lorentz.

In the time of Newton there were already two hypotheses on the nature of the transmission of light: the emission theory, advocated by Newton himself, and the wave theory, advocated particularly by Huygens. According to both theories, light was a mechanical occurrence: either (as in the emission theory) the light bodies shot tiny particles with great velocity

into space, or (as in the wave theory) light was transmitted like sound with the help of a space-filling medium identified as ether. Newton thus assumed the existence of this mysterious ether, which had already played an important rôle in the works of Aristotle and the ancient Greek poets. Ne defined it as an immaterial substance which permeates all bodies and is contained in them. This substance. was only hypothetical; its existence has never actually been proved.

In the struggle between Newton and Huygens, Newton was the victor. His emission theory exercised unlimited and undisputed control till the end of the 18th century. But the new problems which then arose in optics (interference, diffraction) threatened the absolute authority of the emission theory, which could no longer overcome the difficulties opposing it. These events again brought into sudden prominence the wave theory, which was especially furthered by the very significant work of Fresnel, Maxwell and Hertz. The conclusion then attained was that light waves were a form of short electrical-waves. Light-ether thus became the carrier of all electromagnetic processes.

Each theoretical advance implies a simplification of the problems involved. In this case optical and electromagnetic phenomena were successfully

related. There remained, however, the mystery of a hypothetical ether, which, even yet empirically unproved, continued a kind of mystical existence. But its fatal hour was soon to follow.

After the victory of the wave or ether theory in the science of optics, the central problem of concern to physicists became the question of the physical constitution of ether: was the ether stationary or was it carried along by moving bodies? This problem is. of special importance for all fields of physical knowledge and brings up the question of the earth's movement against a fixed ether.

After theoretical reflection and experimentation, the conception of a stationary ether became the accepted one. H. A. Lorentz was the originator of this theory, which, in 1895, received its classical expression in a published treatise entitled "Attempt at a Theory of Electrical and Optical Phenomena in Moving Bodies." When the youthful Albert Einstein first occupied himself with this problem of light-ether and motion, he was not yet acquainted with this essay. He was not aware of the labors already expended in this difficult field, nor of the extent to which the problem was being discussed at the time.

Granted Lorentz's conception that the earth moved and the ether was stationary, there was the possibility of optically proving the earth's

movement against the ether. An experiment that would produce this proof would have to be carried out somewhat as follows: The experimenter must send a light-wave forwards and backwards in, but also perpendicularly to, the direction of the earth's movement. Measurements would then show that different times are necessary in order that the light-wave return to its starting point in both directions. In 1881, the late American physicist Michelson accomplished such an experiment on a large scale and with absolute reliability, but without success. A series of similar experiments attempting to prove the earth's motion against the ether was not successful.

These negative results, however, did not imply a flaw in experimental arrangements or in methods of calculation, but rather the untenableness of the whole traditional theory of light. Two laws, fundamental principles of traditional physics, no longer agreed. The entire structure seemed threatened.

These fundamental principles were the principle of relativity as accepted by mechanics and the principle of the velocity of light as a constant. Both of these principles, as formulated by Einstein, in 1905, may be given in his own words:

(1) The laws governing the changing conditions of physical systems do not depend upon which system alters its condition, of two co-

ordinate systems relative to each other and existing in uniform translatorial motion.

(2) Every ray of light moves in the fixed coordinate system with the definite velocity v, whether this ray of light be emitted by a stationary or a moving body.

In these formulations the word "coördinate system" is a mathematical symbol the place of which may be taken by any convenient body at rest. (In the popular presentation of the theory of relativity Einstein often uses the illustration of the unmovable railroad enbankment and the moving train.) The negative result of Michelson's experiment seemed necessarily to imply the falsity either of the principle of relativity or of the law of velocity of light as a constant. That the rectilinear, uniform motion of a body could be imagined and measured only in relation to another body was self-evident in an analysis of the very concept of motion. On the other hand, theoretical and experimental experience had made it probable that the Maxwell-Lorentz concept was correct—especially its principle of the velocity of light as a constant.

Even the layman can imagine how extraordinarily significant and exciting this situation appeared to the entire scientific world. Here was a difficulty disturbing the very nature of science, and there seemed to be no solution. One stood

at a sick-bed and attempted to help the patient with all kinds of court-plaster, but in the long run these remedies could have no effect. In 1905, Einstein appeared as a new physician far more radical than his predecessors. He not only achieved a cure of the patient and a solution of the problem, but a revolutionary reorganization of our fundametal principles of physics.

It was clear to Einstein that the theory of Lorentz and the principle of relativity were necessarily compatible. Since it was impossible to doubt the truth of both principles, the apparent incompatibility, as indicated by the negative result of Michelson's experiment, must be due to the traditional conception of time and space. At first, Einstein thought it possible to eliminate completely the hypothetical light-ether, which was the real disturbing element. I-le proceeded, however, with a thorough investigation of the conceptions of time and space, and invalidated the old idea according to which the time interval between two events was considered independent of the motion of the bodies involved, and according to which the spatial difference between two points of a fixed body was considered independent of its own motion. The accepted notion was that all the events of the universe could be arranged in an unequivocal, chronological order so that, at any time, it might be stated

objectively of two events which of them had happened first. The special theory of relativity did away with all difficulties; it meant a new, consistent, and much simplified conception of time and space. The essence of this conception is that space cannot be conceived independently of time, and vice versa, time cannot be conceived independently of space; there is only a universe of space-time. Hermann Minkowski, whose contribution to the mathematical development of the theory was of great importance, announced prophetically: "From this hour, time and space, as independent concepts, must sink into oblivion, and only a union of both of them can survive." A far-reaching revolution had begun, many old conceptions had to be abandoned, but the truth of the new ideas could no longer be seriously doubted.

The word "relativity'' gave rise, and still does, to the misunderstanding as to whether a pure subjectivism is to prevail, instead of the traditional greatness of physical-mathematical measurements. That, of course, is quite out of the question. The theory of relativity in no way starts with the destruction of old, fundamental principles, but rather corrects prejudices and habits of thought which have occasioned unnecessary difficulties. The new ideas do not signify destruction, but revision, extension and simplification.

Laws of nature are not overthrown. On the contrary, their validity is assured and extended.

Max **Planck,** the great physicist of Berlin, once stated the principal significance of the theory of relativity, in these words: "Einstein's recognition of **the** fact that our Newtonian-Kantian conception **of** space and time possesses in a certain sense only **a** relative value because of the arbitrary choice of the system of correlation and methods of measuring, affects the very root of our physical thought. But if space and time have been deprived of their absolute qualities, the absolute has not been disposed of finally, but has only been moved back a step to the measurement of four-dimensional multiplicity which results from the fact that space and time have been fused into one coherent continuum by means of the speed of light. This system of measurement represents something totally independent of any kind of arbitrariness and hence something absolute."

These words at once indicate the overwhelming significance, to physics, of Einstein's theory of relativity, and clearly state that the theory has not destroyed the absolute fundamentals of science, but has built them up anew. Our entire system of physical knowledge has thus been placed on a firmer basis. Laws of far-reaching significance, equal to those of Copernicus, Galileo and Newton, have been discovered.

It is not our task to explain in detail the mathematical-physical derivation of the special theory of relativity. We are dealing with biographical facts, with the emergence of these definite problems in the life of the youthful Einstein, and with the far-reaching consequences of his work. In contrast to all previous investigators, who had dealt with the fundamental problems of time and space, Einstein contributed a new conception which was of great philosophical significance. Previous to Einstein, credence had been given to these two Newtonian formulæ:

(1) Absolute, real, mathematical time flows on by virtue of its own nature, uniformly, and unrelated to any outward circumstance.

(2) Absolute space always remains the same by virtue of its own nature, unrelated to outward circumstance, and immovable.

This belief in the absolute character of time and space continued to be the secret religion of all physicists and philosophers, till the critical **year 1905.** That is now forever past. Time and space have been reduced to one objectively indivisible continuum. The realm of physical occurrences ceases to possess a three-dimensional character. The universe becomes a four-dimensional continuum in the time-space sense of Minkowski. Physical occurrences are now represented

by three spatial coördinatcs as well as by one time coördínate, or in other words, there is no Becoming, only Being.

Though at first startling, the implications of the special theory of relativity are, in the long run, quite simple. Its fundamental significance for our scientific views and our theory of knowledge is also clear. It is easy to explain why discussion of the new theory has exceeded its own special sphere and affected philosophers: The problem of space and time has for centuries been a concern of philosophy, and as such it has been treated, particularly, by Kant. The special theory of relativity has also compelled important changes in the theory of knowledge. At the same time, the theory of relativity is of practical significance, because it is capable of confirmation by observation, and because it leads to further investigation and the reëxamination of old ideas. Conclusions, of the most practical importance to further research, which the theory of relativity has yielded, are

(1) The proof of the identity of mass and energy,

(2) The proof of the identity of the electrical and magnetic fields, and, most fundamental, this prophetically significant statement,

(3) Natural laws do not change their form in the transition from one coördinate system to another similarly in movement.

In this Iast principle lies the methodistic value of Einstein's physical theory. This principle is the source of energy for all his individual results. Thus 1905 was the beginning of many new investigations in physics and philosophy.

The extraordinary significance of the space-time theory, and the lively discussion which it provoked in all physical and philosophical circles, gave rise to the important question of the general meaning of speculative science. It is strangely more true of science to-day, than of any other time, that it is directed toward the experiences of practical life. Nevertheless, no other scientific work has found such general interest as Einstein's theory of relativity, which was evolved by purely abstract and theoretical methods. It has thus proved that the purely inductive method is not capable of ordering the final principles of science. Einstein's researches have been responsible for a renaissance of theoretical thinking, such as natural science in the past has hardly experienced. Inductive research, however, has in no way been crowded out. On the contrary it has encountered new problems which it will have to solve with the help of theoretical science.

In the preface of his Theory of Color, Goethe has agreed with the demand for a complete di=

vorce of the experimental sciences from theory But he has justly replied to this demand that at no time has the mere observation of a thing helped us, but that theory has had constantly to combine with experience. "Looking passes over into observation, observation into reflection, reflection into combination, so that it might be said that we theorize with every attentive glance at the world." To make theory the object of our reflection, to evolve physical concepts so that events and our experiences of them are connected in intelligent order, is a task of such beauty and magnitude, that the Significance and force of Einstein's theoretical physics can easily be understood from this standpoint as well.

Pure empiricism, that is pure laboratory science, is hardly capable of a comprehensive, scientific world-view. It was Heraclitus who said that "nature enjoys secrecy." The laws governing the various natural occurrences lie involved in another hidden plane: the plane of our thought. Only through our thought is it possible to set **up** firm principles of order and to bring our images of natural occurrences to a certain conclusion. Our experiences and observations alone never lead us to finalities, for the multiplicity of natural phenomena is too overwhelming to be completely taken in at a glance. Theory, however, creates reliable roads over which we may pursue

our journeys through the world of observation.

The researches of 1905 had still not yielded any final conclusion. The great significance and extraordinary effect of Einstein's results did not allow his passion for theory any rest. He soon recognized that he had set foot on a way which he had, of necessity, to pursue to the end. Till now theory had dealt with occurrences of an optical, electromagnetic nature based on **a** hypothesis of rectilinear, uniform motion. This would imply that here were exceptions to the great universe of absolute physical movements. The difficult question arose: does the principle **of** relativity apply only to certain, or to all, states of motion in related systems (inertial systems)? **In** other words, is it only the absolute character of velocity which is denied, or also that of acceleration and rotation?

The young scholar found himself in a strange situation: his great scientific triumph had at once set him new and more difficult tasks. There seems to be a law of intellectual creation, stating that the completion of a work was automatically **a** new beginning and each result the inception of **a** new problem.

Einstein's intense occupation with these new problems, automatically following his previous research, and his realization of their extraordinary difficulties, took place during his stay at

Prague. As during the years at Bern, he was in a state of tensest excitement before venturing into a field which lay before him, dark and unexplored. He had spent seven years solving the problem of the special theory of relativity. He needed ten years (1905-1915) to work out the general theory.

What were the new problems? They concerned the extension of the postulate of relativity to all bodies involved. The special theory of relativity had declared the physical relativity of all uniform motion. The next step was naturally the extension of the principle to include the movements of all the bodies involved, whatever their states of motion.

This was unusually clear to Einstein, when, in 1907, he was invited to contribute to the "Yearbook of Radioactivity" an explanation of the results of his theory to date. It now occurred to him, with a certain alarm at the new overwhelming problem he was facing, that it had not been the correct procedure to employ the principle of relativity only in connection with such systems as were related to each other in uniform translation. For the first time, he recognized that opposed to the electromagnetic field, in which all optical occurrences took place, the gravitational field possessed an entirely different character of reality.

ALBERT EINSTEIN—AN INFORMAL PORTRAIT

A short explanation of the nature of gravitation is pertinent here. It had formerly been explained simply as the attraction of mass. The new physics, however, had introduced into the study of gravitation, as into the study of magnetism, the concept of "the field." Accordingly, the influence of the earth on a falling body became an indirect occurrence. Just as the magnet generated its "field" about it, as a physical reality which will affect a piece of iron, so the earth, too, generated, in its neighborhood, a gravitational field within which a stone, for instance, was induced into falling motion.

Before the statement of the general theory of relativity, gravitational phenomena were still not explained with the same clarity as electromagnetic phenomena. The electromagnetic field is always the same to the observer, quite independent of the state of movement of the observer himself. This is not the situation in the case of the gravitational field. To an observer freely falling through a gravitational field, the field does not exist at all in his immediate environs. For if the falling observer allows a stone or other object to fall freely, the stone falls to the earth *with* the observer and thus not relatively to him (as the corresponding electromagnetic occurrences would happen).

Einstein, therefore, decided that the gravita-

tional field did not exist absolutely, but only relatively to the observer. In this manner, the principle of relativity was extended to related bodies, relatively accelerated to each other. According to the so-called "Equivalence principle," by which the gravitational field and the conditions of acceleration of related systems, locally observed, are one and the same thing, it is thus possible to take into account the relative existence of the gravitational field to the observer,

This idea—as in the similar case of the analysis of the conception of time and space—led to the conception that accelerated bodies related to each other must be regarded as of equal importance, and thus to the general principle of relativity, according to which natural laws must be so formulated that they will apply to all relative, moving coördinate systems.

However, mathematical considerations and the conclusions of the special theory of relativity with regard to moving standards of measurement and time-pieces gave rise to the difficulty that so-called Euclidean geometry had no validity for the accelerated systems involved. To comprehend the essential nature of gravitation a space of an entirely different character was necessary: in other words, the inception of a system of measurement differing from that of Euclidean geometry. A space of this kind could not be represented by coördi-

nates defined by physical measurements, but only by some curvilinear coördinates such as Gauss had first used in his theory of plane surfaces. The world shows a Euclidean structure only in the infinitely small, but in its magnitudes follows the metric of the non-Euclidean geometry, particularly the Riemannian.

In this manner, Einstein not only extended the special theory of relativity (dealing with the physical relativity of all uniform motion) to related bodies in various states of motion—acceleration, for example,—but established a new theory of the gravitational field. With the help of the general theory of relativity, it is now possible to deduce, in a purely theoretical way, the attributes of this field.

The theoretical processes in this connection need not be discussed in detail. Of great importance, however, was the recognition of the fact that light-rays transmitted in a gravitational field are, in general, curvilinear. Other consequences of the general theory of relativity are the displacement of spectral lines in the light proceeding from large stars as compared with light from terrestrial sources, and a certain modification of Kepler's laws (such as the slight turning of the elliptical course of the planet Mercury). The first phenomenon has been fully confirmed by observations taken during solar

eclipses; the second has been, practically, proved by other observations. The century-old enigmatic anomaly of the planet Mercury, which many special hypotheses have in vain attempted to solve, has suddenly become clear.

After many errors, the extension of the principle of relativity was finally established in 1915. The boldness and daring displayed by its process of thought is even greater than that characterizing the advanced speculation of the special theory of relativity. It is not hard to see why the theory did not find immediate acclaim, or why it was at first cautiously accepted. In fact, it was confronted with a strong opposition which even to-day is not entirely allayed. For all the revolutionary character of the special theory of relativity, Einstein had still pursued a way which others had taken. The new theory, however, revealed a new, daring order of thought which, with the exception of the ingenious presentiment of Riemann, had not yet been encountered. People could not tolerate this situation so easily. Einstein had to experience the bitterness of which Schopenhauer speaks: "Mankind loves a simple man who moves quietly on making no attempt to be cleverer than his fellows. But with what a united majority it opposes eccentrics who threaten danger!"

Though the new theory was unusually specula-

tive, it could still be verified by observations like the solar eclipse, and thus convinced many thinkers who at first had been reluctant to accept it. It illustrated the universal qualities of the mysterious power of theoretical thought which, at a desk, establishes laws and mathematical formulæ, which may in turn be repeatedly verified by such planetary occurrences as solar eclipses, and yet which could never have been attained by induction.

Einstein's constructive work was not concluded with the general theory of relativity. He began with the explanation of electromagnetic phenomena. He had related gravitation, gravity, inertia and space measurement, but electromagnetic phenomena still remained outside this frame. Since his new harvest-year of 1915, Einstein has worked to extend his theory to include electromagnetic phenomena. The structure of a general field theory in which space, time, electromagnetic and gravitational phenomena will be united in a theoretical unity is Einstein's aim; it still requires extraordinary efforts for its attainment. But he definitely sees his goal, and the means to it are continually approaching the clear light of knowledge.

In the further development of his field theory he must finally succeed in eliminating the old concept of matter and find a new concept on the

basis of accumulated fields. In this manner, the simplification of physical concepts, introduced by the special theory of relativity, would be brought to a successful conclusion, which Albert Einstein has briefly described in a lecture employing these symbolic words: "Space, brought to light through the corporeal object, raised to scientific reality through Newton, has in the last decade consumed ether and time and is about to consume field and corpuscles, so that it remains to-day the only theoretical representative of reality."

This statement presents in broad, general lines the structure of Einstein's physical theory. Its predominantly philosophical angle of vision characterizes the work of a lifetime which is still not ended, but which already exists for us as an astounding monument of thought. To what great extent these intellectual creations are involved in Einstein's life has already been explained. But only through particular knowledge of his personality is it possible to understand how much of an experience his work is, and to what extent it keeps him devoted as to a vision or a religion.

For Albert Einstein is the direct opposite of the journeyman specialist who increasingly continues to control contemporary scientific life. He believes in the intellect, in human understanding and in the scientific faculty of perception, as supreme ideas. For this reason, scientific work, to him, is not a more or less mechanical task in a limited field, but a devotion to work which is both duty and grace, and always a unified conception of the essences of intellect and nature.

Einstein is, therefore, of those people who are productive not only at their desk but above all in their conversation. When he is occupied with new problems, he finds it necessary to speak of them. And if he has been successful in his work and secured his results, his chosen form of communication is not the printed word, but discussion in the circle of his colleagues.

His entire working procedure is surprisingly analogous **to** that of the artist. Once he has come upon a problem his path toward a solution is not a matter of slow, painful stages. He has a definite vision of the possible solution, considers its value and the methods of approaching it. If he is fortunate enough to remove all difficulties standing in the way of a clear, certain, and accurate solution, he is moved not only by the sum of new scientific truth but by æsthetic pleasure. His difficulty is now simple; he has created a clear, harmonious world of thought. **At** these times, he has been known to say: "What a beautiful solution!" Or, while he is still working: "I hope this is right, the result would be lovely!"

In these utterances one recognizes his artistic nature, expressing itself in abstractions.

For his work, he does not need more than paper and pen. Frequently, he allows even these to sink to his **lap,** looks dreamily forward, but continues to reflect with the greatest exactitude on physical laws and mathematical equations. Only in rare cases does he need experiments. Others execute these for him. The tasks of his assistants are limited, for the most part, to proofs of difficult mathematical calculations.

Einstein's work is not set for any particular time of day. **It** is interrupted by official duties, friendship, good-fellowship and particularly by music—by the last, even, nay especially, during his most intense periods of production. His music is a kind of balance to his purely mental investigations. When, **he** knows that he is alone, he improvises on his grand piano, and breaks off suddenly to return to his work.

All these characteristics are important for **the** history of the development of his theories. Since his scientific work is at once the very essence of his existence and a form of religious duty, it lights up all the utterances of his life and orders them into a unity—into a continuity which lies in the universality of his intellectual nature. It is not a universality of knowledge and ability, but one of existence. There **is** hardly a realm of thought

which does not interest Einstein, no activity which he finds entirely lacking in human values. **He** finds a harmony of science and art **in** man, whose mind and soul has transformed itself into creation. His belief in science is a belief in the human mind. **A** recognition and a love of the human mind, an understanding and proper evaluation of its most modest efforts and accomplishments, is **part** of his deepest nature.

Chapter IV

WAR-TIME AND AFTER

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ON UNTER DEN LINDEN, OPPOSITE THE MONUment of Frederick the Great and adjoining the University, stands the huge structure of the Prussian State Library. It was built several years before the outbreak of the World War. Its style is that of other government buildings of the time. In the foreground are the rooms of the Prussian Academy of Sciences, which, before the building of the new Library, had its small, architecturally elegant and charming house of the time of Frederick the Great.

The Berlin Academy is the oldest scientific institution in Germany. Planned by Leibniz, it was established by King Frederick the First of Prussia as the "Society of Sciences," but received its present constitution in the year 1812. Germany's greatest scholars, such as Leibniz, Schleiermacher, the brothers Grimm and Savigny, have been among the members. Here, too, J. G. Fichte, during the time when Berlin resounded with the tramp of French troops, gave his "Addresses to the German Nation."

The Academy is concerned not with teaching but with investigation. Its regular members are for the most part professors of the University of Berlin or of other universities. For it is only rarely that the Academy bestows professorships whose purpose it is to grant positions to famous investigators, to enable them to devote their entire time to scientific work. It was this type of professorship that Albert Einstein accepted in 1914. It is an office for the scientific investigator, while his teaching activity at the University is more a right than a duty.

Thus Einstein never gives regular lectures and seminars at Berlin University. The lectures are almost always concerned with the theory of relativity. As a teacher, he derives more pleasure from his seminars than from his lectures, for his seminars, in contrast to the lectures, malte possible a personal relationship of teacher and student.

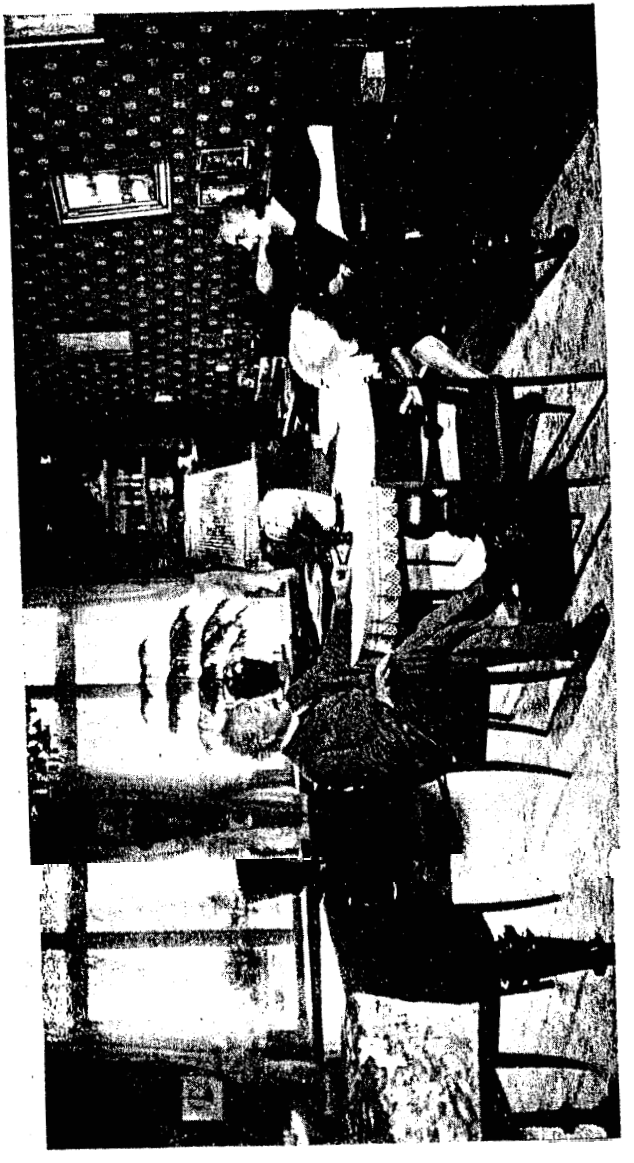
The entire faculty of the Academy meets once a week for a discussion of current matters. At these meetings, the members present, in lecture form, the latest results of their research. When these lectures were first instituted, they were given on the basis of a supposition which to-day is no longer tenable — that all members of the Academy have universal scientific interests. At the time of Leibniz, when specialization in science was not developed as it is to-day, it could still be assumed that the faculty of the Academy represented a republic of scholars to whom all special subjects were equally interesting. To-day the situation is changed: even this scholarly body cannot always adequately comprehend the special themes of certain lectures. The Academy is, nevertheless, the highest authority in scholarly circles. It publishes the work of its members, supports important research, arranges for the publication of important works, both old and new, and offers prizes. In fact, next to the university, which is concerned with instruction, it is the most important center of learning.

Einstein joined the staff of the Academy at an age when scholars are rarely granted this distinction, let alone receiving an academic professorship. Essentially, his new position meant an opportunity to devote himself, with the greatest independence, to his research. His official duties are few. They left him not only time for the completion of his general theory of relativity, but enough time for other exciting problems.

Along with his professorship Einstein was given the direction of the Kaiser Wilhelm Institute for Theoretical Physics — a task which does not take up too much of his energy, and is, for the most part, performed by a substitute. The Institute is part of the Kaiser Wilhelm Society for

the Advancement of Science, which was founded by various economic leaders in the year 1911, on the occasion of the hundredth anniversary of the University of Berlin, and is supported by Prussia and the German state. The various institutes of this society together with the Harnack House, which is named after the president of the society, the great theologian Adolf von Harnack, and is at once a home of science and good-fellowship, form a center in the suburb of villas, Berlin-Dahrlem. On the outskirts of this great city and at the edge of the Brandenburg woods, Einstein first took up his residence at Berlin. A change in his domestic affairs caused him to give it up.

Shortly after Einstein's removal to Berlin, his first marriage was dissolved. He remained single, for a short time, and then married his cousin Elsa Einstein. Since earliest childhood, Albert and Elsa Einstein had been attached to each other,, They had played together in the home of Albert's parents in Munich, and had, at the same time,, had their first artistic experiences at the Munich Opera. Albert's attractive little cousiq sat in the orchestra, while he himself sat in the highest gallery. A mature woman, she rejoined him, a mature man, at the height of his creative energy, devoted to his scientific work, which was;



PROFESSOR AND MRS. EINSTEIN AT HOME, BERLIN

no longer a matter of search and stumbling but a path with fixed direction and definite scope.

Frau Einstein finds it her duty to further with all her energy the life most suited to the character and tasks of her husband. It is a scholar's life, yet susceptible to all contemporary problems and to all human affairs. Both husband and wife are one in their constant readiness to help people with word and deed. Frau Einstein holds her husband's work to be a realm of great dignity and deep seriousness. She recognizes the need for keeping all disturbing elements away from him, especially when he is working on new problems which require his entire energy. She knows also that the strain of intellectual activity requires a counterpoise of good-fellowship, and, even more, of music. The Einstein residence is the quiet home of a scholar, but also a home of good-fellowshiy in which the leading personalities of all countries meet. Here also well-known musicians often gather and play; classical music with the head of the household.

Albert Einstein's present residence is situated in the west end of Berlin, in the so-called Bavarian quarter. His working chambers, separated from the house itself, are located in the little corner turret, and thus entirely undisturbed. They are furnished with puritan simplicity. Einstein's residence, the Academy, the University and the

Institute of Physics are his home ground in the bustling life of Berlin.

Into this life, in the summer of 1914, broke all the strange horror and ravaging violence of the World War. To a person like Einstein, whose entire life and work has been based on the assumption of a peaceful, humane commonwealth, nothing could be more frightful than the gruesome destruction of the Great War. When Berlin rejoiced in August of 1914, and all differences between classes, parties and religious denominations throughout Germany disappeared for a time in enthusiasm over the war, Einstein could not take part in the general celebration. He saw beyond the moment, saw the fearful ruins impending, the gruesome misery of a bleeding continent. He could not join the throng of enthusiasts; he had to stand aside. He had experienced the same feeling at school after passing his graduation tests: while his comrades had celebrated the end of school by a large consumption of alcohol, he had felt isolated, not a member of the party. He still feels isolated to-day, isolated by his deepest nature, which desires peace and international understanding, but which is also skeptical in face of a future overshadowed by war.

His chief comfort during these frightful years of the war was his work. In the history of Germany we often encounter great personalities, like

Goethe and Hegel, who, during the fiercest wars, achieved their greatest work, and, in that way escaped the suffering and destruction of the battlefield. During the war, Einstein not only completed his general theory of relativity, but published various other works concerning new and important problems in theoretical physics. In 1916, he published a treatise on Planck's theory of radiation; in 1917, cosmological considerations on the general theory of relativity, dealing with the problem of the density of matter. At the same time, he began work on a unified field theory in order to give the theory of relativity its final form.

In the last chaper we saw that after the conclusion of the theory of relativity, Einstein took up the problem of the field theory. The concept of the "field" is to him the most profound idea which theoretical physics has developed since the classical age of Newton. Faraday, Maxwell and Lorentz contributed to the steady growth of this idea and thus indicated a new direction for physical research. Their aim was to correlate all phenomena and to express a "logical unity" with the least possible number of concepts and axioms. The way to this goal had already been pointed out by the theoretical works of H. Weyl, Eddington and Kaluza. At first, Einstein directed his ideas on field theory along simi-

lar lines, only to forsake them and to depart on an entirely new train of thought. It became clear to him that a natural representation of the physical properties of space as framed by a field theory should logically be the result of a fusion of the Riemannian metric and the postulate of the convergence of parallel lines in infinity. In this manner, Einstein developed the mathematical structure of his new theory, on the further extension of which he is still working.

The war years were thus very fruitful in scientific achievement. Only thus could he endure the frightfulness of that destructive period. His travels through Holland, however, gave him glimpses of a peaceful world. Einstein had already joined the faculty of the University of Leyden in 1912. From then on, through the war, he continued to give lectures there, and stopped only in 1928 when illness compelled him to give up active teaching at Leyden.

He is very fond of this little Dutch town, Rembrandt's birthplace. It lies in the broad plain of southern Holland near the coast along the North Sea, and its inhabitants lead a comfortable existence. They deal, to a large extent, in wool and woolen products. Entirely apart from this life is the old University, which was founded in the year 1575. It is still scientifically the most eminent in the country. For Einstein, the University is associated particularly with the name of Lorentz; Einstein has always considered him a thinker deserving of the profoundest respect and one of the greatest investigators. As a professor at Leyden, he attended Lorentz's lectures. His feelings towards his old master were always those of a pupil for a teacher. Their close friendship came to an end only with Lorentz's death.

Nationalistic prejudices continued to grow not only during the war, but even after the peace pact. They darkened the political situation, created suspicion even between members of the same groups and professional classes. In a world of national egoism and passions Einstein felt very much alone. He could not decide to sign the blind and ill-advised declaration entitled "Not true," which 93 German scholars and artists submitted to the public at the beginning of the war. He was not concerned with the problem of fixing the responsibility for the war, but rather with a way out of the conflict which would make a repetition of the frightful destruction and collapse of society an impossibility in the future. Einstein is a pacifist to the depths of his soul.

The war and its attendant nationalistic sentiments again gave rise to the Jewish question. The end of the World War, with the destruction of Czarism and the elevation of bolshevism had created a new situation for the Eastern Jew. The

'Jew was blamed for all the misfortune and new unrest which Europe was suffering. To bigoted nationalists and anti-Semites, bolshevism and Judaism became identified. Since logic plays no rôle in political antagonisms, the Jew was also blamed For the war, for its outcome, for the general triumph of capitalism, especially in the German inflation. All these motives led to frequent, animated discussions of the Jewish problem in Jewish and non-Jewish circles, immediately after the war, as did also the influence of the ever-growing Zionist movement.

Since childhood Albert Einstein's ties with his Jewish past and his Jewish religion had not been very strong. The situation at the end of the war, however, called for a positive stand.

In 1919, a number of Jewish intellectuals of Berlin—professors, writers and followers of Zionism—met in a back room of a Berlin restaurant to discuss the question of a general Jewish congress. They thought the hour had come to create a parliament which should solve the burning questions of the Jewish present and future, They saw the need for not standing back at a time when all social and political problems were to be ordered anew, and decided that the rehabilitation of the world should mean a renovated justice and a new existence for the Jews.

This preliminary conference of the projected,

congress, which in itself was never realized, was attended by Einstein. Silent and attentive, he listened to speeches and opinions, and for the first time in many years experienced his oneness with Jewish destiny. From this hour, he felt in duty bound to help his ancient race towards a solution of its problems. Despite his divergence from Zionistic ideology and his recognition of the nationalistic dangers of the movement, it was yet clear to him that the movement was the most powerful in Jewish life at that moment, and that it had accomplished fruitful work in two essential directions: relief for the Eastern Jews, who were suffering unbearably as a result of Russia's civil wars and the pogroms in the years after the war; and the education of the Western Jew from timidity to a joyous and race-conscious life. 'These facts in favor of Zionism made Einstein a friend of the movement and a believer in the Jewish renaissance.

His practical assistance implies above all a social benevolence. Me has worked untiringly, given ,advice and help, and been involved in the wor-,ries, problems and experiences of the Jewish community. Yet his sudden rediscovery of Judaism has not narrowed his outlook or caused him to abandon his relationship with German and European society, His social ethic and his feeling of

unity with Western culture saved him from such danger.

His ethic still compels him tg devote himself to any problem of human betterment, especially to any pertaining to a peaceful future for Europe. Every day he devotes hours to such problems of practical humanity. When he is warned that he is sacrificing himself and that he is prematurely using up his energy, he usually answers, "Can I do anything eise? I have no choice about it. If I am in a position to help, I must help." This social ethic and this deep passion for helping humanity explain Einstein's sympathy for Zionism and Jewish reconstruction. I-lis sympathy was at its highest when he had the opportunty to observe the new Jewish homesteads in Palestine, the profound passionate life of the immigrant and his faith in the Jewish future for which he is working in the greatest poverty and privation.

The fate of the Jews concerns Einstein not only for the egoistic reason that he is one of them. Much is symbolized in the old communion of Jewish faith and tradition, of suffering and loyalty, which is significant for the many vain endeavors in history. The Jewish problem confronted Einstein at a moment when Europe lay in ruins and when Germany began to realize the appalling consequences of its defeat. Everybody who had preserved his faith in Europe and who

had experienced the insanity of the World War was yearning for a new world order to be permeated by a peaceful and humane spirit. The small number of Jews, however, stood once more at the center of all political passions—scapegoats who were to be made responsible for the tremendous German catastrophe.

Those men who soon after the conclusion of the war had approached the solution of the Jewish problem, with great zeal, did so with a two-fold view: they saw the new waves of anti-Semitism in Germany, Austria and in the East; and they recognized the political opportunity of Zionism, since the Peace Treaty had brought about the separation of Palestine from Turkey, and the Balfour Declaration had guaranteed unrestricted Jewish colonization in the Holy Land. Amidst the political discord of civil-war Germany, Einstein, too, recognized the importance of these two occurrences, and as a result of the ever increasing anti-Semitism which unscrupulous agitators systematically aroused in the years of famine and horrible privations he felt himself a Jew. Zionism appealed to him as a movement which might educate the Jews to a new feeling of self-respect and give them the courage of their own true natures. Indeed, Einstein does not understand the attitude of the non-Jewish world which, in Europe as well as in America, attaches so much significance to

this small Jewish minority. He recognizes, however, that one must face facts, take the world as it is, and act according to one's best knowledge.

An age of overheated nationalism and an age of the sharpest social and racial differences cannot advance by means of compromises. Einstein sees himself as a European closely related to German culture. But he is, a Jew, nevertheless, and realizes that the nineteenth-century formula of a "German citizen of Jewish faith" does not correctly represent the condition of the Jewish German in our very different period. The outer pressure on the Jews, even in times of peace and in democratically governed states, has helped maintain and renew the Jewish community. At the end of the Great War, and amidst the destruction which threatened the existence of the German state, this pressure increased tremendously and resulted in a Jewish renaissance such as had not happened in centuries. The colonization of Palestine is a symbol of this renaissance and at the same time an example of a new, self-sacrificing Jewish life. Yet Einstein has never desired a Jewish state, never desired the concentration of the Jewish people in Palestine, nor the abandonment of their old homes in Europe and America;; ?he colonization of Palestine has a totally different meaning for him: "Palestine will be a cultural center for all Jews, a refuge for those

most oppressed, a field of activity for the best among us, a unifying ideal, and a source of spiritual health for the Jews of the entire world." These words express anything but Jewish nationalism. Among the many suspicions and aspersions that have been cast upon Einstein this is the most ridiculous. His attitude is purely social, He sees the suffering of the Jews, he sees the ever-renewed tragic fate of a community which, in spite of all formal advances in their political condition, and in spite of all productive work for European culture, is hated, attacked and despised. He sees only two necessities: recognition and aid. He recognizes the times, even in the Jewish situation, and he desires to help in the way which is most natural to him: social aid; help for the community. The reconstruction of Palestine and the fostering of Jewish union outside of Palestine are for him means of social help and, at the same time, educational measures which promise a more noble future.

But Einstein is also deeply concerned in the fate of Europe and Germany. He is not a politician and belongs to no party. He is altogether too skeptical to believe in ideological formulæ for the future. The years from 1914 until to-day mean ruin, destruction, the threatening of all culture, the most horrible mockery of human society,

Berlin presented various scenes during these

years. In the beginning of the war Einstein saw, on his walk to and from the university and the academy, the troops marching along Unter den Linden wildly applauded, decorated with flowers, on their way to the front. For years the picture remained the same, but enthusiasm cooled, and the faces reflected no longer joy and jubilation but sorrow. Determination was there, and here and there already secret rebellion.

Einstein was a Swiss citizen, hence he was not compelled to take part in the war. But he also acquired Prussian citizenship, and in common with all Germans experienced the great victories and the great defeats. The longer the war lasted, the higher the emergency rose, and the more hopeless the war seemed for Germany, the more he yearned for peace. In the over-patriotic camps, to which most of the professors belonged, Einstein was considered politically unreliable—a defeatist and a pacifist. For many this was the equivalent of high treason. They could not understand this man who, though not a politician, foresaw the fated disappointments and desired nothing more earnestly than the peaceful fellowship of all nations.

Einstein is not a pacifist out of party affiliation or dogma, but out of his innermost nature. Through humility and human love he ardently; desires the conquest of all violence in the lives

of men. The greater brotherly love, the more susceptible the human heart to the need and suffering of the individual and the masses, the more creative is the human mind in all its divisions. Einstein realizes a contradiction and a betrayal of the spirit when the achievements of science and technique are used to destroy human beings, nations, and their products. This is fundamentally the obvious attitude of every creative intellect. The psychology of war-time, however, had generally destroyed this attitude, and this psychology still exists in all countries of Europe.

Pacifism, however, not political, but the necessary condition of mind and humanity, has existed at all times and in all independent minds. David Hume defined war as being without any justification, and expressed himself on the wars of his own period with biting satire: "When I observe two nations engaged in war, I seem to see two drunkards fighting with cudgels in a china shop. Not only will it take them a long time to heal the scars which they inflict on each other, but they will have to pay all the damage which they cause." An opinion which is now very much to the point.

Every exaggerated feeling of nationalism—this heroic vice, as Lessing called it—carries with it the danger of war. One would think that

the horrible experiences of the last war would teach Europe better. The best minds had hoped so, but even after the defeat, rational people had a hard time of it. The downfall found the great masses of Germany unprepared. They could not understand how these things had happened and they were afraid of the future. During the days of the downfall many professors who until then had suspected Einstein politically discussed with him the reorganization of political conditions and the future of Germany after the revolution.

Many people believed that Einstein was a revolutionary and suspected him as such. He could only laugh at this, although these insinuations which labeled him a Bolshevik endangered his life during the years of anarchy and political insecurity. Even now there was no party which Einstein could join. To-day he declares himself in favor of the republic, since under the existing conditions every other form of government for Germany is impossible. Naturally, as an adherent of social justice and as an enemy of privilege, for a feudal aristocracy he must oppose a monarchy.

Socialism seems to him to show the highest ethical desire to remove the appalling chasm between the classes and to produce a more just economic system. Certainly, evolution is tending: towards a new non-capitalistic economic system.

Organization and collectivism regulate our life more and more. The fate of the individual is increasingly subordinated to that of the community. Industry cannot remain on the outside, it cannot be left in an anarchistical condition; industry, too, must be organized; capitalism of the Manchester type has no future. And yet Einstein cannot adopt a socialistic program. In spite of all the socialistic tendencies, he appreciates the adventure of solitude and the happiness of freedom too much to welcome a system which threatens completely to eliminate the individual. His remark about Lenin is characteristic: "I honor Lenin as a man who completely sacrificed himself and devoted all his energy to the realization of social justice. I do not consider his methods practical, but one thing is certain: men of his type are the guardians and the restorers of the conscience of humanity."

Guardians and restorers of human conscience arose in Republican Germany. But the times were difficult for them; the opposition of aroused passions, of narrow dogmas, of discord and of hate, was terrifying. During the revolution there were again processions of solid masses, thousands and thousands of human beings marched through the streets of Berlin with banners and song. But there was no inspiration in the faces of the revolutionaries, only bitterness, hunger and rebellion.

,Without inspiration no revolution is possible. The constantly increasing pressure which was brought to bear on Germany from the outside did not help. War did not cease.

During these days men appeared in the political arena who really would have preferred a life of intellectual meditation to one of politics. They were compelled to activity by the need of the hour and a sense of duty striving towards a new world of peace and humanity. Naturally, Albert Einstein was very sympathetic towards such men, whose ethical spirit made the heroic sacrifice of assuming the leadership of the state at such a time. The best tendencies of the intellectual man were united in Walter Rathenau: culture, a knowledge of the economic situation and deep humanity. Einstein became acquainted with Rathenau in the home **of** an author in Berlin. Friendship united the two men so different in their character and fields of endeavor, but still closely related in their intellect and their humanity. Rathenau, like Einstein, had devoted much thought to the Jewish problem. I-le had remained faithful to his religion and his race, but his attitude towards the Jewish problem was not Zionistic.

Einstein felt the urge to malte a man like Rathenau acquainted with the endeavors of the Jewish renaissance. In his home he introduced

Rathenau to Chaim Weizmann, the president of the Zionistic executive. In a conversation intellectually of the first rank and of the deepest moral seriousness, Rathenau and Weizmann exchanged ideas on the Jewish problem. Rathenau had a special realization of the mission of the Jews. In spite of all their suffering and all their need, he recognized the deeper meaning of the dispersion of the Jews among the nations of the continent. For Rathenau the Jews were the salt of the earth.

The characteristics that increasingly drew Einstein to Rathenau were the latter's intellectual humanity, the freedom and independence of his thinking, and his determination to carry on a policy of European reconciliation and understanding in spite of all opponents. Rathenau knew how much he endangered himself by this policy and how greatly his life was threatened by the tremendous anti-Semitic and nationalistic propaganda. Many a time his friends had warned him. Many a time he had found on his desk notes threatening him with death. He realized that he would have to die if, as a minister, he persisted in this political attitude and in his Judaism. He did not want to flee from his fate. Thus came June 24, 1922.

The assassination of Rathenau moved Albert Einstein deeply. He mourned not only for a man

who was close to him, but he realized the wh horror of the internal situation of Germany that time, the unlimited fanaticism of an Semitism which did not hesitate at murder or a other vileness. At that time Einstein wrote f the Rathenau Memorial number of a Berl monthly: "For Rathenau I felt and still feel r spect and gratitude for the fact that he gave m hope and consolation in the present gloomy co dition of Europe and that he bestowed upon m the unforgettable hours of a man of clear sigh and warm emotions. His grasp of vast economi systems, his psychological understanding of th peculiarities of nations, of all classes of peopl his knowledge of the individual man, were ad mirable. And he loved them all, although he knev them, as only one can love who has the power t enjoy this life positively. A precious combinatio of elements and a genuine Berlin humor made hi conversation a unique pleasure when he talked with his friends around the table. It is not hard tc be an idealist when one dwells in Cloud-Cuckoo-Land; but he was an idealist, although he dwelt on earth and knew its odor as did hardly anybody else.

"I regretted the fact that he became minister. In view of the attitude which large numbers of the educated classes of Germany assume towards the Jews, I have always thought that the natu-

ral conduct of the Jews in public life should be a proud reserve. I would never have thought that hatred, blindness and ingratitude could go to such extremes. But I should like to call to those who have guided the ethical training of the German people in the last 50 years: by their fruits ye shall know them."

Horrible 'fate of Germany! The country is defeated, the treaty of peace seems only to prolong famine and hunger without end, and domestic discord, strife and murder continue the war. The feverish rise of inflation permits this country only a sad to-day, while to-morrow is totally insecure. It is not certain whether the republic will survive the political struggle. It is not even Certain whether it is possible to preserve the integrity of the empire. A ghostly dance of death forms the picture of the first post-war years in Germany.

The scarcity of food is felt in every household; the years of famine continue beyond the end of the war. Switzerland remembers her great son Albert Einstein. Packages of food supplies are regularly delivered at his home and welcomed enthusiastically. As for the rest, the demands which Einstein makes on external life are so ridiculously small that he does not suffer in the least by being deprived of small pleasures. But he suffers from the situation in Germany, from the unlimited hatred and discontent which

make the reconstruction of Europe so difficul

Einstein is anything but a politician, yet h sees the great problems of his times and forms hi personal opinions of them. Fanatic nationalism which is more radical and unbounded than th attitude of the proletarian revolutionaries, is op posed to him. The fact that he is a good Euro pean, that he abhors war, that he is glad to ex tend his hand to all endeavors which seek tc accomplish a peaceful future on the continent, is enough to make him appear dangerous to the extreme camps of the right, enough to malte them hurl filth upon him in the form of the meanesl agitation against him. In the insane misinterpre- tation of his scientific work he is described by this same camp as an unscrupulous iconoclast of science, as a revolutionary spirit who would gladly destroy everything created before him, simply to substitute his own mental world for scientific tradition. These reproaches, which are sometimes uttered even by people from whom one might expect a certain seriousness, are simply, grotesque. They misrepresent the essence of sci- ence just as much as they do the achievements of Einstein. There has never been a science which could cut itself loose from the achievements of the past. The theory of relativity, especially, is the elaboration and completion of trains of thought which have developed through centuries. It does

not destroy traditional science, but perfects it and solves problems which have always existed but which have never before found a satisfactory solution.

Einstein faces such opposition with childlike surprise. What do they want of him? He does not desire any rôle in public life, he stands far from every kind of politics. He desires only a peaceful future and the fellowship of intellect, which obviously must be international. He looks back upon the seventeenth century, in which art- ists and scholars of all Europe were joined in a close association uninfluenced by political events. The Latin language was the expression of this learned International. He greatly regrets that, to-day, scholars have frequently become the pro- tagonists of most intense nationalism, while, con- versely, politicians have made themselves the representatives of internationalism and become the instigators of the League of Nations which Kant demanded 125 years ago.

When the League of Nations created a com- mission for intellectual coöperation, in which the individual nations were to be represented by leading intellectual personalities, Einstein was elected as a representative of Germany. He ac- cepted election, although it meant a new demand on his already overfilled time. But he did not think that he had a right to refuse a possibility to

restore intellectual confidence between natior This commission held its first meetings in Gene under the chairmanship of the philosopher Hen Bergson. Einstein regularly took part in the wor All hopes that he had placed in the League Nations, however, seemed to be destroyed whe France again sent troops into conquered German and occupied the Ruhr. This event, the politic: and spiritual menace of which greatly dismaye him, justified Einstein's resignation from th commission of the League of Nations. Year later, when a rapprochement between German: and France occurred, and when Germany becam a member of the League of Nations, Einstei again joined the commission for intellectua coöperation. Two years ago he resigned thi office on grounds of health. I-lis office is now filled by the general director of the Prussian State Library.

Though Einstein is not politically active, and though the politics of all countries seem questionable to him, his interest in the public problems of these stirring times is considerable. He is especially interested in social questions, and also in economic and financial questions, which he likes to discuss with experts. He is not separated from his time but in it, though, naturally, his affiliation is undogmatic and altogether independent. Me is too optimistic and has too wholesome a

sense of humor to believe in ruin, even in the worst years. Germany, and perhaps all Europe, does not have the statesmen of genius to bring about a rapid salvation of the continent. Yet after the downfall the Germans showed an imposing vitality which guaranteed a better future. These is here a peculiar parallel between the Germans and the Jews, which Goethe expressed in these words: "The Germans, like the Jews, may be suppressed but cannot be destroyed. They cannot be discouraged and would remain strongly united even if they were no longer fated to have a native land."

Einstein often had the opportunity to leave ruined Germany and to live and work somewhere else under the most gratifying material conditions. He always refused such offers. His position in Berlin is in keeping with his character; he likes living in this city and in Germany. He would have considered it a betrayal of himself, if he had been tempted by material advantages to give up an existence in keeping with his nature. In the midst of the greatest political unrest, when his family even feared for his life, he did not think of leaving Berlin.

He likes to take advantage of the opportunity to discuss the European situation with leading statesmen. Thus he conversed with Stresemann, whose political acumen and intellectual charm he

greatly admired. Thus, recently, he discussed with Briand the necessity of a German-French reconciliation. He is on the side of every non-political undertaking that may result in a peaceful future. He shuns no pains and no work to help wherever he is able to help. When university courses were introduced in Davos, in order to make education possible for sick young people, Einstein was glad to accept the invitation to take part in the lectures. In his opinion the worthwhile can only be produced if many individuals work together impersonally. "Hence it is a very great joy for a philanthropist when a community organization is created with great sacrifices, with the sole purpose of fostering the art life. The advantages of the new institution should be all the more considerable if the circumstances of its creation definitely exclude any political tendencies. International understanding is advanced by coöperation in vital work." Thus Einstein lectured in the Swiss resort although he no longer felt physically well in the beginning of the year 1928. In Davos started his severe heart disease, which kept him chained to his bed for a long time.

His whole nature and the experiences of his entire life have led him to value freedom among the highest human possessions. Einstein is, therefore, an enemy of every dictatorship, which

necessarily destroys intellectual creation and intellectual growth. He once said, "Dictatorship introduces the muzzle and this produces stupidity. Science can flourish only in an atmosphere of free speech." All his political. desires tend towards free international understanding, towards disarmament on land and sea, towards a solution of the problems of war guilt which has made Germany the eternal slave of the victorious countries. But he also desires the peaceful development of Soviet Russia, since the great social experiment of that country is of decisive significance for the whole world.

A peaceful, intellectual European desires peace and the intellectual freedom of all countries! This is the political opinion of Einstein, which does not appear actually, which does not result in political activity, but which nevertheless guides his actions, just as his social opinion makes him help wherever he is able to help. Einstein's opinion found its most beautiful and touching expression in the words with which he congratulated the sixty-year-old Romain Rolland.

"Only once did I see your face, when you were suffering from the recent impression of the European catastrophe,—a lonely man, a visionary, suffering for humanity beyond words, oppressed by the consciousness that you were not

able to create light and to save. You have neve been able to find complete consolation in th effects of your art and your word upon the deli cately constituted. You wish to help the poo human creature, suffering self-made misery.

"The coarse masses do their work as result of stolid passions to which they and the political states which embody them are completely subject. They rage against each other in their delusion and drive one another into misery; but, on the whole, they achieve their abominations without inner discord. The few, however, who do not share the coarse feelings of the masses, but cling to the ideal of human love, uninfluenced by passions, have a much harder lot. They are banished from their community and are treated like lepers if they do not commit actions against which their conscience rebels and if they do not keep silent like cowards about the things they see and **feel.** You, honored master, did not keep silent, you suffered, struggled and consoled like a great soul.

"During these times, so shameful for us Europeans, it has been proved that intellectual æstheticism does not exclude pettiness and savage emotions. I believe that noble, humane feeling does not flourish any more in the universities and academies than in the workshops of the unknown inarticulate man of the people.

"To-day you are greeted by the community of

those who see in you their shining example. It is the community of solitary people who, always immune to epidemics of hatred, are striving for the extermination of war as the first goal in the moral health of mankind, which seems to them incomparably more important than the special interest of their own nation or their own state."

Chapter V

FAME

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THE ELEGIAC WORDS OF RAINER MARIA RILKE MAY be applied to Einstein: "In the last analysis, fame is only the epitome of all the misunderstandings which gather about a new name."

The new name, indeed, had been known and celebrated in scientific circles for many years when it was first mentioned publicly. Then there very rapidly followed the extensive popularization of the name and its achievement (misunderstood to a large extent) among the masses and the gradual creation of a legend such as has not been evolved about any other contemporary personality. This legend originated at a time when all order seemed to be dissolved, all passions directed towards destruction and annihilation, when belief in the omnipotence of scientific truth was tottering more and more. At this time people heard of the new physics, heard that the doctrines of classical mathematics were forever overthrown. People even extended the revolution in physics into a general skepticism, an intellectual nihilism.

Einstein's life work could not be misunderstood more thoroughly. How could this misunderstanding arise? The word *relativity* was responsible in the first place. The word was confused in lay circles and, to-day, is still confused with the word *relativism*. Einstein's work and personality, however, are far removed from the ambiguity of the concept of relativism, both in the theory of knowledge and in ethics. The theory of relativity in nowise teaches the idea that our impressions are relative, that they do not grasp objects themselves, but only their interrelations and conditions. On the contrary, the theory of relativity has succeeded in determining the physical phenomena with greater exactness and simplified the whole physical system by means of the combination of space and time into a continuity and by means of the new explanation of gravitation. Ethical relativism, however, which denies all the generally obligatory moral norms, totally contradicts the high social idea which Einstein stands for and always follows. Nevertheless, these misunderstandings have not entirely disappeared. Even to-day, they completely misrepresent his achievement and personality; These misunderstandings read intentions into a theoretical work which arise only in the attitude of the times.

And yet Einstein's great fame is a fact which

is not only justified by his incomparable achievement, but a fact which has become more and more a part of the consciousness of our times. This fact provokes thought and presents us with the problem of solving a mystery which cannot consist of misunderstandings only. The legend of a man, the immense popularity of a name in all parts of the world—these facts as they reappear in history from epoch to epoch, find explanation only in the one miracle of history and life, namely the magic of a great personality. Every fame that lasts more than a day, every real human legend has this magic for its cause. Even though the work of a personality is open to a very small circle, and even though the profit and the enjoyment derived from this work may for all future times be open only to a small part of humanity, the great significance of this work impresses the simple human mind all the more, inasmuch as it senses the magic and the magnitude of a creator even in the most ordinary things.

At the beginning of the Einstein legend, there were dissensions and misunderstandings; there was unbounded excitement in the various camps of the scientists; and, at the same time, there was a premonition of greatness which does not deceive. There was the premonition that Einstein's achievement, quietly attained and not intended for the great public, had suddenly made

a scientist the center of all discussions of the world, and this at a moment when Germany was in a more pitiable and helpless position than ever before. In April of the year 1922, there appeared in the Parisian paper *Œuvre* a cartoon that amusingly yet seriously illustrated this situation. In the cartoon, the French government is asked: "But you do admit that Einstein has revolutionized science?!" The answer is "As long as Germany doesn't pay—never!" This cartoon is significant of the political moment during which Einstein's great fame began. Back in the year 1919, there appeared, on the title page of the *Berliner Illustrierte Zeitung,* the portrait of Albert Einstein. Hundreds of thousands of people saw this face for the first time; heard for the first time the name of this Berlin professor of physics; learned for the first time, through the printed article, about the problems of the theory of relativity. In all probability, his face made as deep an impression on the readers as the popular and abbreviated summary of his great discoveries. From then on, it became the property of the great number of people who derive from these features a living impression at once undeceiving and unforgettable.

A calm and serious face. Beneath the strongly arched forehead, there are dreamy and kindly eyes. And above the forehead, the long gray hair

—this face speaks a clear language. Every one understands this language and receives the impression of creative greatness, of achievement and vision, of loneliness and kindliness, of intellectual mastery and social service. The more successful Einstein's theory became, the more silent his opponents, the greater the admiring appreciation from scientists of all countries, the deeper became the impression of his personality and the impression of this, now so often published, portrait. This legend of a great personality creates an impression all the more powerful in a democratic age characterized by the mass of mechanized life.

The cardinal points of the Einstein legend are his scientific work and his humanity. The world needs both at all times. The hopes and wishes of innumerable people cling to both. When one sees how these hopes and wishes find their way day after day into the quiet study of the scholar, when one sees the tireless zeal with which this man devotes himself to all the petitions and requests which are placed before him, one sometimes receives the impression of a man who has set himself to gather the tears of the world in his hands. People turn to him as to a miraculous Rabbi who can always heal and help. People write to him from the four corners of the world. They submit to him their most intimate worries; they

tell him things that are totally foreign to him and which often make him smile, and this all happens in the firm belief that "this man can help us, this man will help us."

Poor people beg for money, for clothing, and jobs. A young man has taken the notion to become an explorer; won't Einstein help him to get to India or Africa? A woman telegraphs would the professor please obtain a visé. Actors ask for engagements; young people in small towns who have hardly attended high school would like to come to Berlin and become his disciples. Einstein reads all these requests with kindliness and understanding and also with a sense of humor. These are obligations of fame which one must bear with a smile, but this fame has other consequences frequently responsible for bitterness, There are letters and magazine articles filled with hatred, malice, envy and vulgarity. And since Einstein is a Jew and an opponent of all nationalistic pride, all the garbage of political strife is also cast at him. In addition, there come the fools and the prophets, who sprout like mushrooms, especially in the years of insecurity, and anarchy. This one writes that he has finally discovered the essence of sleep. That one writes that he has found the only correct way to lower the price of coal. Another one has invented new senses, since the old five senses are no longer sufficient for man's use. Technicians report on their new inventions. They send blue prints of new contraptions and flying machines. Still another is engaged in overthrowing the traditional astronomy and building up a new one. Still another believes that he has found new mathematical formulæ—and all these piles of patient paper that fools and wise men, good and bad men, have written upon pass through Einstein's hands, and not one but is read. The human world, in view of these daily letters, must seem queer to him: a mixture of need, despair, foolishness, humanity and misanthropy. Touching tokens of admiration are among them. For instance, poor people, who have heard that Einstein helps the oppressed, congratulate him on his birthday; or somebody writes that he has named his son Albert in Einstein's honor; or a cigar manufacturer informs him that he has given the name "Relativity" to his new brand. How human all this is, both the good and the bad. And Einstein has such a deep understanding of all things human.

But he does not desire this noisy fame. He does not want to stand exposed to the gaze of the people. He suffers when popularity oppresses and injures him too much. Then it often happens that he complains, "What do these people want of me? Why am I not permitted to live like anybody else? What barbarous nonsense all this is."

And when the more intrusive tools of this popularity, interviewers, photographers and autograph hunters, take after him too hard, it happens that his kindliness is transformed into anger and that he forbids these too obtrusive importunities.

Albert Einstein is the first German whose name attained national significance after the World War. He is also the first intellectual personality who found his way beyond the German boundaries and into formerly hostile capitals, to be honored and welcomed. When, in the year 1921, he accepted an invitation to deliver lectures in Paris, he was attacked most violently on nationalistic grounds. He received letters from unknown persons who wrote him that for the honor of Germany he should not enter a country whose troops were occupying German soil. These persons overlooked the fact that nothing could be more advantageous for Germany than this peaceful conquest by means of creative achievement. No better start could be conceived for a new European community than the eternal internationalism of science. As a matter of fact, at that time there was still present on both sides of German boundaries a cool reserve towards all attempts to reconstruct European society. Thus Einstein's visit to Paris bore fruit by inducing France to think again of its great European,

mission of culture and to enter upon a closer intellectual affiliation with its German neighbors. Since then this affiliation has been greatly strengthened. At first, of course, a certain portion of the Parisian press found it necessary to excuse Einstein's visit with the explanation that he was not a German but a Swiss. That was intended as a kind of sedative for nationalistically heated minds at a time when it was still dangerous to talk German on the streets of Paris. However, the effects of his personality and of his teaching, which found strong approval, especially in French scientific circles, so that Einstein, even to-day, stands in close touch with French fellow scientists, were so great that the political question of nationality subsided of its own accord.

There was a repetition of this event soon after in London. In the first years after the war, the tension between Germany and England was not as great as that between Germany and France, but nevertheless, the English were cool and reserved towards everything German. In spite of that, London prepared a very warm reception for the German scholar. Lord Haldane introduced Einstein's lectures in Kings College with a speech in which he unreservedly gave Einstein the prominent position which is due him. "You see here before you," he turned toward the audience, "the Newton of the twentieth century, a man who

has called forth a greater revolution of thought than even Copernicus, Galileo, or Newton himself." The reception bestowed upon Einstein's lecture was vividly described by the London periodical *The Nation:*

"There was at first no applause. Something like a light tremor was felt in the air. Is not Einstein really a German? But Lord Haldane, smiling, clever and merciless, passed over this point. A fact like this must be suppressed. The dose, however, is not diminished no matter how distasteful the truth is: the greatest investigator whom the last centuries have produced is a German Jew. They gazed at Einstein. He was calm, dreamy and looked at nothing.

"The great reception bestowed upon Einstein's lecture, in proportion to his importance and his presentation, certainly represents a turning-point in the emotions of the post-war period in this country. Science and the arts have no boundaries, This is a fact, but this fact, like many others, was denied in the general conflagration of the war. The appreciation of obvious genius is a symptom of returning health, and we may now justifiably hope for the gradual restoration of the sane conditions of pre-war times, if an Austrian artist like Fritz Kreisler and a German scholar like Albert Einstein are heard with avidity and welcomed enthusiastically in the capital of a formerly hostile country. The position of scholars, English as well as German, was not irreproachable during the war, but this welcome shows that genius is no longer denied admiration, for the admiration of genius is rooted as deeply in human nature as the desire to injure the enemy. Our outlook on life, our ability to distinguish the noble from the bad, has been crippled and shamed long enough by the passions of war. It seems sanity, understanding, and harmony are being restored by men of creative genius."

The last words of this report completely express Einstein's own opinion. How can anybody live the life of an intellectual human being when one reaches, after a trip of a few hours on the train, a boundary beyond which one is considered an enemy, a member of an inferior nation, a person potentially harmful? How is it possible to preserve the century-old tradition of European science as an essential inner experience when it is possible that the brutal violence of war may suddenly destroy this noble tradition and annihilate everything that sums up the real meaning of life to a man of intellect? How can it be possible to have one's own work known only in one's own native land when the premises of this work were created in such a great diversity of countries? Einstein's visits and lectures in the European capitals proved the existence of a

scientific community superior to nationalism This proof was completely successful. The miracl happened; since these visits,,the scientific circle of all European countries are again in clos touch with each other; the former exchange o ideas and the former fellowship of labor among scholars has been resumed and is starting **pro.** ductive work.

In Germany itself, the opponents of Einstein had not as yet been silenced. To a large extent, they were led by political, anti-Semitic motives, There could be recognized also amidst this opposition the old, hoary, pedantic scholasticism which can endure no scientific revolution and refuses every new thought which might cause the traditional system of science to totter. Of course, in time, resistance diminished. Many a Saul became **a** Paul. Many a skeptic or opponent of the theory of relativity gave up his resistance and became a disciple of the new doctrine. But the smaller the opposition to Einstein became, the more bitterly it fought. Thus the most fanatical opponent of the theory of relativity among the German professors of physics refused, at a scientific convention, to shake hands with **Albert** Einstein. When, in the year 1922, the Society **of** German Scientists and Physicians, assembled,. at Leipzig for their Centennial, announced lectures on the theory **of** relativity, a group of physi-

cists, mathematicians and philosophers expressed in the press their regret as to "the misleading of public opinion, to which the theory of relativity is offered as a solution of the riddle of the universe, and which is kept in ignorance of the fact that many highly-respected scholars in the three above-mentioned subjects not only consider the theory of relativity a hypothesis without proof, but even deny it as a fundamentally erroneous and logically untenable fiction." The manifesto concluded with this shameful sentence: "The undersigned consider it irreconcilable with the seriousness and the dignity of German science íhat a theory extremely open to attack is prematurely and vulgarly broadcast to the lay world and that the Society of German Scientists and Physicians is used to support such endeavors."

A really shameful document which has deservedly disappeared into complete oblivion! I-low many of the signers would now be overcome with shame **if** they again saw this manifesto! Einstein himself bears such hostility with a sense of humor. He can not be angry with anybody. He has a sympathetic understanding for everything **and** a hearty laugh. He finds a too-obtrusive friendship much more unbearable than hostility. He dislikes the noisy and distasteful worship which endeavors to turn the personality of the scientist and his discoveries into a sensation.

Nothing is more distasteful to him than the fact that the public busies itself with his private life. Members of his family must carefully keep from him all newspapers which contain articles about him or pictures of him. If, accidentally, such a sheet does fall into his hands, he throws it away infuriated, or looks at his picture with a laugh, and says: "Bah! What a nasty, fat fellow."

Although lecture tours repeatedly expose him to the disadvantages of fame, to the annoyances and intrusions of publicity, and to the painful experience of the sensational, Einstein has often been lured by far-away places. Travel increases inner freedom. It makes one conscious of the diversity of man, peoples and landscapes. It brings about an emotional experience which bears fruit forever. In the first years of the post-war period, the yearning for a larger world was especially strong in Germany: all the more so since the war had introduced, almost throughout the world, a remarkable period of change which had greatly changed the characters of the different countries and their ways of living. It was especially the realization of this change which made possible the wide influence of the theory of relativity on the circles of intellectuals of all nations.' The realization that there exist in science, and especially in exact natural science, problems and solutions of tremendous revolutionary power, is

closely related with another revolutionary realization which concerns the great changes in the social life of all peoples. In view of the lively interest that Einstein takes in sociological and economic problems, traveling in foreign countries is especially interesting to him. But the spiritual secrets of the individual peoples and races, their art and their psychological characteristics, also have a tremendous appeal for him, and are brought closer to him by personal observation.

Travel means not only the reception of impressions, but a comparison of nations, scenery, cultures and, finally, a comparison of strangers with oneself. Count Hermann Keyserling says 'that the shortest road to oneself leads around the whole world. For this very reason the creative power of travel cannot be replaced by anything else. Of course, on the screen, we see the foreign landscape and also the faces of its inhabitants, but since the vivid atmosphere is lacking the creative power of comparison is also lacking. In his travels, Einstein has felt this power very deeply. He has written a careful diary of his impressions, which is of literary, and even poetic importance. These impressions are among the most valuable sensations of his life.

His lecture tours led him through various European countries, to North and South America and to Japan. He saw the European cities; he

felt New York as the new capital of the world. Of all these journeys, that to Japan (1922-23) is certainly the most important because of the multitude of scenic and human impressions which Einstein received. The further away his trip took him from Europe, the diseases and all the wants of that continent, the more a feeling of freedom, of devotion, and inner youth blossomed in him. The parting from Europe was not very hard for him. He took it with humor and, in his diary, entered this event as his last on his native continent:

"Lost my wife at the border but she was recovered immediately." As the most vivid memory of the city of Marseilles, he recorded: "Bugs in the morning's coffee."

Cut then appeared the ocean, tropical colors glowed, and the varied activities of the Japanese steamer began. In the crew, consisting entirely of Japanese, Einstein observed interesting national characteristics and already found a type which his stay in Japan generally corroborated. These Japanese sailors affect one almost impersonally, like a unified community. They do their duties: cheerfully. They are content with their social position and proud of the fact that they belong to their nation. It does not seem to them to be, threatened by its outward Europeanization. With'' keen eyes Einstein recognizes this fundamental;

t'rait of the Japanese: "Me is impersonal, but not really reserved, because in his social life, he does not appear to own anything personally which he would want to seclude or hide."

Even on shipboard a scientist works: the problem of gravitation and electricity, the real substance of his new field theory, attains new developments on the way from Marseilles to Japan. On the deck of the spotless steamer, letting his eyes travel from waves to shore, then to the books and papers in his lay, he senses mind and nature not as contradictions, but as mutually necessary and enriching factors. The richer, more southerly and more tropical the landscape becomes on this journey, the more the traveler recognizes the connection between scenery and culture, atmosphere and character. The conviction arises within him that in classical antiquity the atmosphere of the Mediterranean region was not as soft and enervating as now. If, since then, the capitals of intellectual life have moved toward the North, the reason for it is surely that life there is more difficult and man, consequently, more wide awake, more tense and more creative.

Einstein also looks back upon his life. Whát a change from his lonely and painful youth to the 'present! This journey, which assumes more and more the character of a triumphal procession, which indeed contradicts his character, is,

nevertheless, a proof of the meaning and succes of his life's work. One could not have imagined i more beautiful and sincere. How distant he use(to be from other men! How shy and awkward Now there are stretched toward him everywher(hands in hearty greeting. Nevertheless, even nov he feels strange in a busy, active world, which in spite of all the different landscapes and people is still the same and must remain foreign to th(innermost secrets of his being. He feels the beauty of the Oriental landscapes with childlike joy. Bu(even in the Orient he remains a scientific observe(and studies with the greatest interest the various atmospheric phenomena.

In Colombo, Eastern 'Asia really begins for the travelers to Japan. In the first Hindu whom Herr and Frau Einstein see, the secret of this ancient people, of its culture and religion, is evident. The diary records: "Here, for the first time, we saw an elderly I-Jindu, delicate, refined features, with gray beard. He brought us two telegrams and begged for a tip. We saw other Hindus—brown and black, sinewy figures, expressive faces and bodies, and subservient behavior. They look like nobles changed into beggars; an inexpressible amount of pride and depressing characteristics are united in them."

The excursions in India corroborate the cleavage between the aristocracy of outward appear-

ances and the social degradation. Einstein feels the greatest inhibitions and a strong distaste when he is invited to enter a rickshaw—one of the little wagons drawn by human beings of the noble body and fine face. He is filled with shame to be a participant in such treatment of human beings, but then he sees the begging, the continual self-degradation of these royal beggars, and is finally forced to yield. Like all the Europeans and all the wealthy Hindus, he permits himself to be pulled by a human animal through the bright, heavy splendor of the Indian streets.

The life and the appearance of these Hindus explain their attitude toward the world and their religion. Europe is far away. I-?islast impressions of Europe are of the noisy people of the Levant. The vast difference between the Orient and the Occident is forced upon Einstein. "When one inspects these people closely, one can scarcely any longer care for Europeans, because they are more effeminate and more brutal and look so much coarser and greedier; therein, too, unfortunately, rests their practical superiority and ability to conceive big things and to carry them through. I wonder whether we would become like the Hindus in this climate?"

Japan is slowly drawing near. The feeling of home arouses in the crew an increased nationalistic feeling. Europe is now far away; Jap-

anese music awakes in the blood of the sailors. Before the passengers of the steamer, they perform this music, which sounds barbarous to Einstein, accustomed to the classical music of Germany. I-lere is a means of expression which will surely remain closed to the European forever, even then when he thinks he knows Japan and its people.

In Singapore begin the accompanying phenomena of the scientist's journey, which become livelier, stronger and more wearying as the journey approaches its end. Invitations, receptions, interviews, and everlasting posing for photographers begin here. A rich jew has invited Einstein and his wife to stay with him. Einstein can not very well refuse, especially since this particular visit has already been arranged. Einstein studies the features of the lively old gentleman, They appear familiar to him somehow. They remind him of a face of a man to whom he gave all his love and devotion. Indeed, this Jew of Singapore recalls the Hollander, H. A. Lorentz, And yet how different! The warm sparkling eyes of Lorentz are here reserved, cautious, sly, and the facial expression indicates regard for order and work rather than the great human kindness and the social inclinations of the Dutch master.

In Singapore begins the first act of the great Oriental Theater of Farne whose hero Einstein

is compelled to be for several months. The same thing is repeated over and over again in languages which he does not understand. Speeches of welcome are given to the scholar by the authorities, professors, students and clubs, to whom he must answer with grateful words which they in turn do not understand. Then, affectionate handshakings with thousands of strange people, laughing and joking. Then, finally, the sacrificial ceremonies by the high priests of popularity: photographers, journalists. The flashlight flares, autograph albums are presented, the banquet drags for hours, speech after speech, and finally universal weariness. This is the queer ceremonial of fame which Einstein had to endure several times a day during his stay in the Far East.

ßut how all the peoples of the Orient differ from each other, in spite of many similarities! The similarities, like the differences, have their natural bases in the atmosphere and climate. How the Chinese differ from the I-lindus and how both differ from the Japanese! Outwardly, the Chinese attract attention by their industry, the small demands of their method of living and their wealth of children. They are more cheerful and childlike than the Hindus. Yet to a large extent they are burdened people: men and women who crack stones day after day and carry them

for a wage of only five cents per day. They themselves seem too stolid to realize the horror of their lot. But it is a sad sight to a man who desires to see social happiness, economic justice, international peace and peace between the classes throughout the world.

In Shanghai, there appears a bit of home and the mother tongue. The German Consul greets his fellow-countrymen and leads them through the European and Chinese districts of the famous seaport. Then, Japan, the dream of blossoms, but it brings with it not only its scenery but the height of strain and fame, the great experience of a people of exceptional culture and deep emotional sensitiveness. Already on his arrival at Kobe, Einstein is honored like the sovereign of a great Empire. He and his wife are led through all the big cities. They are shown Japanese life in its scientific, artistic, and popular aspects. Speeches and works of art are presented to them. The whole country declares a holiday.

An intelligent Japanese assigned to Einstein as secretary accompanies him on all his journeys throughout the country. Numerous University lectures are arranged and the secretary translates them into Japanese with great skill. Einstein and his wife become acquainted with all the beauty of the vegetation, and the wealth of

customs and habits, when, in the company of the German Ambassador, Dr. Solf, they are taken to the feast of the chrysanthemums in the Imperial Garden. Here Einstein converses with the Empress in French. His shifting impressions follow one upon another. How rich this country is in art and artistic handiwork! But the admirer of Bach and Mozart cannot acquire any liking for Japanese music. How rich is Japanese culture, which manifests itself in numberless ceremonies presenting a spirit of introspection and enjoyment. A Japanese gentleman who has invited Einstein for a visit proudly shows him a four-volume book which he himself has written about the various tea ceremonies of Japanese high society.

Of all celebrations and receptions, Einstein prefers those of the young people, students and pupils. What happiness and beauty in these graceful, delicate girls and youths! It is true there are too many receptions. Einstein suffers from the strain, and is troubled by the feeling that too much love and affection are being heaped upon one who does not deserve such blessings. His modesty and humility never leave him.

What a queer people these Japanese are, so rich in their capabilities and accomplishments. They have a closed world of mental and emotional values and still admire and use all things foreign. With touching devotion, the Japanese

to-day still revere their old Chinese teachers, but Japanese scholars who studied in Germany speak also with affection and deep spiritual gratitude of their German professors. Summing them up, Einstein expresses this opinion, "serious respect without a trace of cynicism or skepticism is characteristic of the Japanese. Pure souls as found nowhere else among men. One must love and respect this land."

In no place in Japan can the inhabitants dispense enough attention and gifts. Trunks and boxes are filled with mementos. In return, the Japanese beg only for scientific instruction and autographs which Einstein must paint upon silken materials with long brushes and Japanese ink. For Einstein, parting from Japan means parting from an astounding vegetation, a superior culture, a fine, noble people and many new friends with whom he wishes to keep in touch in the future.

A visit in Shanghai had given him a view of Chinese life. The city showed the difference in the social position of Europeans and Chinese which make the later revolutionary events partially comprehensible. In Shanghai, the Europeans form a class of masters, while the Chinese are their servants. They appear as a tormented, stolid and unintellectual people, not in any way related to the great intellectual past of their

country. They are good-natured laborers and as such are appreciated by the Europeans, to whom they are far inferior intellectually. Einstein's social sympathy again awoke at the sight of this people working, groaning, yet stolid. It seemed to him the poorest people of the earth, cruelly abused and treated worse than cattle.

On the way back from this trip to the Orient, Mr. and Mrs. Einstein stopped in Palestine. The land of Biblical myth, the holy land of the three great monotheistic religions, surrounds the visitor with an incomparable mass of memories totally different from that of other famous places. When one enters other places of historical memory one probably recalls cultures once absorbed in school, but Palestine is the Holy Land, and the Biblical myths, which mean much more to us than ltnowledge, are values which again and again speak to our emotions. As one enters this country, which is the background of so many prophetic figures and religious experiences, memories of the Biblical age lay hold of one with a force which no other land and no other place can show.

But Palestine is not only the country of the religious symbols of Judaism, Christianity, and Islam, but also the land of present-day Jewish colonization. The interest of the traveler is attracted not only to the Wailing Wall, to the I-Ioly Sepulcher and to the mosques, but also to the

countless settlements in which a new generation of idealistic Jews is struggling for new homes in a hard battle with the poor soil. Thus this small country with its sparse vegetation offers the traveler more views than almost any other country on earth. There are the memories of Jewish antiquity, of the origin of Christianity, of the old Arabian culture, and the simultaneous life of three religions and their adherents, in a country which is sacred ground to all of these religions. There are the new Jewish homesteads erected in the indomitable faith in a future for the Jewish people, destroyed again and again and rebuilt just as often: little worlds which grow up and are preserved out of an idealism to be found nowhere else to so great a degree.

Naturally, in view of the great interest that Einstein takes in the work of Jewish reconstruction, he was glad to take advantage of the opportunity to visit Palestine on the way back from Japan. In Port Said, he left the ship, and parted from his Japanese and European acquaintances who had accompanied him on the way back. The return trip, too, had been filled with manifold impressions.

On the ship, where he finally had quiet again for work, and where he could again resume his scientific correspondence with men like Arrhenius, Bohr and Planck, political news of his native land reached him. They boded little good, since the occupation of the Ruhr, long threatened by Paris, had taken place, thus reviving the atmosphere of war and hate between Germany and France. Unfortunate Europe, that cannot learn to be a continent of peace and union!

In Palestine, on the other hand, Einstein encountered a self-sacrificing devotion for the sake of the community and its peaceful future. Einstein was a guest of the governor, the high commissioner, and stayed at his palace, which formerly was an estate of Emperor William the Second. The governor at that time was Sir Herbert Samuel, a thorough British aristocrat and a cultured European, but at the same time proud of his Jewish descent. He acted as the guide of the Einsteins through old and new Palestine, through the stern bare landscapes between the Jordan and the coast, and through the old Jewish-Arabic world of culture. In the governor's house, Einstein enjoyed a long-absent pleasure. He could play music with English officers and again enjoy the great German music after the foreign, unintelligible, world of sounds of the Japanese. There was a recurrence of all the usual honors which he had experienced in the Far East. Solemn welcomes, banquets, presentation of addresses, the illimitable army of photographers, interviewers and autograph hunters.

The old sacred language of the Jewish people resounded in his ears everywhere, but since Hebrew is almost as strange to Einstein as Japanese he delivered his lecture at the recently established Hebrew University in French, and otherwise expressed himself in German. A very special surprise was the prosperous Jewish city, Tel Aviv, founded but a few years before. I-Jere he was welcomed in the high school. I-Ie listened to several classes, enjoyed watching the physical training exercises of the pupils, and then visited the uncompleted Ruthenberg power plant, the agricultural experiment station, and factories —a city which in spite of its youth already shows a well-developed industrial, economic life. These impressions called forth Mr. and Mrs. Einstein's unlimited admiration. The example of Tel Aviv proved what sane idealism, intelligence and organization can accomplish even under the most difficult conditions. With impressions which filled him with great hope for the future of Jewish reconstruction, Einstein left Palestine and resumed his journey from Port Said to a Europe' still not at peace.

On board ship, he received news of the horrible economic struggle which the German inhabitants were waging with the French army of occupation. Would his native land never again become peaceful and happy? When he landed in Marseilles,

Einstein sensed a decided anti-German feeling. It was dangerous to talk German on the street. Again there was the hatred for Germany, and again the future of Germany seemed gray and hopeless. An awful reception on the old soil of Europe, especially sad after a journey so rich in colorful impressions and so peaceful.

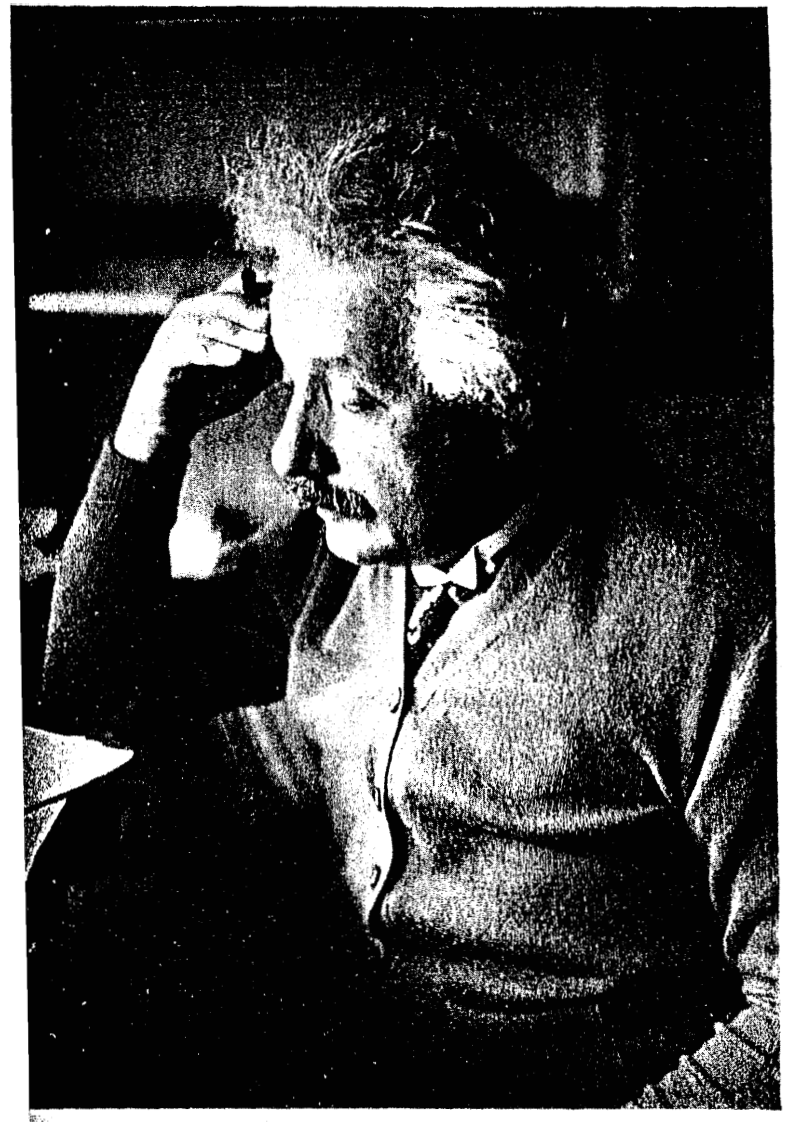
From Marseilles, Herr and Frau Einstein did not return directly to Germany, but accepted an invitation to Madrid. For the last time before their return to their home in Berlin, they had to undergo the ritual of fame—this time in its Spanish form.

Einstein secretly disappeared from the capital. He enjoyed the beauties of Toledo, the great works of Spanish art, especially the powerful paintings of El Greco, the landscapes, the architecture and the art of the Escurial. . . . The University of Madrid conferred an honorary doctor's degree upon him. He was also elected a member of the Academy. An audience with the king aroused a hearty liking for Alphonso XIII. For the rest, the visit to Madrid consisted of speeches, banquets, and Einstein's favorite recreation—music.

In his native land Einstein's great fame has never become an official ritual. In this case, the old proverb of the prophet who is nowhere without honor except in his own country applies to

an extent. But it is foreign to German character: to celebrate a great scholar in this manner. In Berlin and in Germany, 'Einstein is something else. Me is popular. His picture appears often, He is seen at concerts and at the theater, at scientific and official occasions. These appearances impress his picture more and more upon the consciousness of the times. In his native land, fame is not always easy to bear, since the scholar must frequently permit himself to be stared at, and to hear his name whispered. But he is only. rarely the center of these occasions. That pleases: him; that makes him enjoy life. If, sometimes,: an accidental expression of popularity reaches him, it usually does so in an amusing way and arouses only Einstein's humor and his hearty! laughter. Thus on one occasion a little boy stared:' at him, then stepped up to him and said,'! "You're Einstein." Whereupon, the scientist replied with a laugh, "Quite right, my boy."

But in the vicinity of Berlin, his fame has been perpetuated for all time in a different manner. On a hill in the near-by city of Potsdam, there rises a group of buildings, the Astro-Physical Institute. A few years ago, a tower planned in the latest manner of modern architecture was added to this institution and provided with the most exact instruments for the observation of the stars. This tower, which affords a wide view



EINSTEIN AT WORK

over the surrounding landscape, bears the name, Einstein Tower. Here, then, is one of the rare cases of a monument erected. during the lifetime of a great contemporary. On another occasion, the fame and significance of Einstein's investigations impressed the masses, when the Einstein film was produced for the first time in Berlin. It is obviously impossible to present in a film a system of theoretical physics like the theory of relativity. Only a few practical illustrations can be shown which show the correctness of the theoretical speculations. But such illustrations carry vital conviction, and are the meaning and the justification of such an undertaking.

In the year 1921, Einstein received the Nobel **prize** for physics, the highest honor at the disposal of international science. Unselfishly, in keeping with his whole character, he did not keep a penny of the considerable sum for himself. Before and after, academic honors were showered **upon** him. Einstein himself does not know the number of universities which have given him the 'honorary doctor's degree, nor the number of academies of which he is a member. I-le calls the official documents, which heap honors and dignities in such great measure upon him, rolls of ostentation, and hides them from his visitors,

If in the course of his lifetime and his work he has lost some of his inhibitions and his shy-

ness toward his fellow men, he is, to-day, essence' tially still lonely and far removed from all the vanity and activities of the world. The only natural human relations are comprised for him in friendship with a few and in social help for the rest. In both he is tireless. Both help him to endure the inconveniences of his great fame.

Since his life is most peaceful in Berlin, he likes it there, and as much as possible avoids all travel and extended lecture tours. In the year 1925, his last lecture tour took him to South America. I-Iere, again, recurred the same series of exertions and sacrifices. Lectures, receptions, addresses, banquets with the German Ambassador in the different capitals, and audiences with presidents and ministers. Then, again, the ever-changing impressions of people, cities and scenery. 'This trip to South America was probably Einstein's last great lecture tour. Only on special occasions does he trave1 abroad to expound his scientific investigations before foreign audiences. Thus he visited the sick students at Davos to bring them comfort and help. It is' extremely dangerous for young people to be ill; alone. They should be brought intellectual relief, Einstein, himself, had said, "To be deprived for a long period of time of normal, exhilarating work, to be exposed to brooding about one's: physical condition causes one to lose moral

strength and the feeling of completeness in the struggle for existence. One becomes to some extent a hot-house plant, and after physical recovcry it is often difficult to find the way back to normal life. This is especially true of academic youth. An interruption of intellectual training during the critical years of development leaves a gap which can hardly be filled later on." He was glad of the opportunity to help to fill this 'gap at Davos, although his own physical condition at that time was not of the best.

For the last time a foreign country honored .Einstein, when in the year 1929, the Sorbonne in Paris bestowed the honorary doctor's degree upon him with the most solemn ceremony. On ,this occasion, he delivered several lectures on his new field theory. Almost a decade had gone by Since he had lectured for the first time in Paris in an atmosphere which was still far from peaceful. In the meantime the world had advanced, and the tension between Berlin and Paris had visibly diminished. No one mentioned the fact that Einstein was a Swiss citizen. He stayed at the Embassy, as a guest of the German Ambassador, and took advantage of the opportunity to discuss with Briand the necessity of a *rapprochement* between France and Germany. The words of the scientist in a foreign land should not be only the words of science, but of

its highest ideal—the intellectual community of all nations.

This is a secondary effect of his fame which Einstein is glad to recognize; a mission which he gladly fulfills. Science must raise the apparent chaos of phenomena into a higher, harmonious order. But is not that somehow the mission of politics? Even though science keeps away from political activities, it can set an example for peoples and nations in its purely intellectual, peaceful work. After all is said, it is intellect whose deeds remain for all time and which constitute the highest glory of nations.

In Germany, at the present time, there can be found no more noble and convincing example than the figure of Albert Einstein.

Chapter VI

EINSTEIN TO-DAY

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THE LITTLE TURRET OF THE APARTMENT HOUSE IN Berlin in which Einstein lives rises somewhat above the gray sea of houses. When this turret was built, it was intended only as an ornament and had no definite purpose. Its two little rooms, of puritanical simplicity, permit complete retirement and, therefore, independence. In these rooms no visitors are received. Einstein rarely has anybody else here but his assistants and his secretary. These rooms are consecrated entirely to work.

The scholar is seated in an old armchair, his dreamy glance goes far beyond the small room. On his knee rests a pad; his hand holds a **pen;** a clear, fine handwriting such as is characteristic of mathematicians covers the paper with formulæ and equations. Suddenly his hand comes to rest; his eye seeks the Car-away distance. Deep in thought, the scientist strides up and down the small room. This is his method of working. I-Ie discusses the mathematical execution of his ideas with his assistants; he expresses his hope and

skepticism about new ideas. Then, together, they check up on the mathematical processes.

Einstein's hair is gray, only his little mustache is black. And yet this man is barely fifty-odd years of age. But his face shows all the traces of the intense, intellectual labor of decades. The handwriting of intellect makes deep and indelible marks on human faces. His face is pale and has the indoor complexion of a man who lives in the big city. But, in summer, Einstein gives himself up to nature. He *goes* on long walks or goes sailing on the Havel and its lakes. Then there return to his face the color and freshness which were consumed by the winter before.

In his little study, he worlts beneath the pictures of three thinkers of whom he is especially fond, Faraday, Maxwell and Schopenhauer. The simplicity of the room is repeated in his clothing. Me prefers to wear a simple woolen pullover, and in the summer time a sport suit. Nothing is more foreign to him than elegance: or ceremonial garb. In this he agrees with Spinoza, who refused a new coat with these words, "Will that make me a different man? It would be a bad situation if the bag were better than the meat that's in it." And so it frequently happens that Einstein appears at some occasion in an impossible get-up, that he delivers his lectures in the University in a sport suit and sandals,

or that he appears in high society in a business suit. When he was about to deliver lectures at Oslo under particularly formal circumstances, it was discovered at the last moment that he did not have a full-dress suit. What next? Einstein responds to such worries with hearty, boyish laughter. He calmly put on his usual dinner-jacket and said, "I will simply fasten a tag on it with a notice: *'This suit has just been brushed.'*"

All the ceremonies of high society appear very ridiculous to him. The value of a man is not expressed in such outward things. Social forms are like false faces which people put on to cover up their true ones. Furthermore, the elegance and dignity of these forms often express conceit, and to a man with the humane emotions of Einstein nothing is more painful and distasteful than the arrogance of wealth and position. Mis character is generally so sincere and simple that words or gestures of this kind can offend him to such an extent that he breaks off all relations with the people in question

He dislikes most those ciistinctions which transplant him to an atmosphere of wealth and social superiority. On his journey to New York, a cabin de luxe had been reserved for him on the steamer, providing quarters of a comfort and convenience far different from that of all the other passengers on the ship. It had been hoped

that Einstein would be pleased. ßut not at all he rebelled against this special privilege, agains the luxury and against the riches, against his isolation from his fellow passengers. He declarec furiously that he would rather travel steerage than in this luxurious apartment. He quieted down somewhat, only when it was pointed out to him that the company had desired to please him and that his refusal might give offense.

In spite of all this, he is somehow fond of social life, but it must be an inner friendliness, of true human communion, of question and answer between beings who understand each other. Although Einstein does not consider social virtues highly, and although he detests nothing more than conventional conversation, he is, nevertheless, a companion of very great charm in an intellectual way. In his conversation he is anything but a scientific expert, but he does take for granted, in the case of men, some intellectual attainments, in order to malte possible any kind of contact—even though it be only an evening's conversation. In women he appreciates most highly naturalness, lack of self-consciousness, the intelligence of their intuitive beings. And he enjoys all these things tremendously.

Mis discussions with scientists and with men of intellect in general usually tend toward philosophy. Einstein himself possesses comprehen-

sive philosophical training. He has read the most important works of classical philosophy, and in his hours of leisure he returns with especial pleasure to Plato, Hume and Schopenhauer. But frequently he directs mocking words against the too formalistic philosophy which followed Kant. He is not at all a positivist, although this philosophical tendency is especially frequent among natural scientists. Einstein's own work is too speculative in its character for that, but he has to smile at the everlasting observation and investigation of concepts which correspond to no reality. Thus, he frequently criticizes theoretical investigations which take place in a vacuum and seem not at all connected with exact natural science.

Still he is glad to admit the extent of approval which the theory of relativity has found among philosophers, who are justified in considering it an addition to investigations in the theory of knowledge and in the philosophy of nature, At present the situation in theoretical physics, in which so many new problems and methods have been created, is very close to that of philosophy. One might say that the theory of knowledge and theoretical physics overlap in part, or, rather, that many problems of the theory of knowledge have been taken over from physics. For this reason the strip of borderland

of these subjects is being cultivated successfull by physicists as well as philosophers. For the: events Einstein has an open and attentive min Thus he was glad to see the University of Berli institute a separate chair for this borderlan between philosophy and physics.

In philosophical cliscussions Einstein assume a point of view which might be called critica realism. He admires Kant's great intellectua achievements, but on many points he is com pelled to differ from him. Kant's doctrine of th transcendental ideality of space and time, a: found in the "Critique of Pure Reason," oppose; Einstein's own doctrine of space and time. Kan believed in the absolute truth of the mathematic: and physics of his own time, which has since suf· fered tremendous changes. For Einstein all these events are stimulating and he devotes his deepest interest *to* them. Almost imperceptibly his discussions with philosophically-trained men glide into this borderland of philosophy and physics from which so many paths lead to his own field of activity.

On investigating the present situation of theoretical physics as it has been shaped by the theory of relativity, the mechanistic theory and the atomic theory, one must admit that the leading problem of theoretical philosophy must be solved anew within the realm of physics. At times

the situation appears so critical that it seems nothing will be left of the old scientific maxims. Quantitative mechanics has questioned the law of causality, which is at the foundation of our scientific thought, and attempted to substitute for it purely statistical laws. It seems hardly possible that simple determination should not be taken for granted in nature. Yet this view is defended as a matter of fact by leading physicists. It is perhaps the most radical expression of the new scientific reasoning, which Einstein cannot accept in these almost paradoxical conclusions. The new quantitative ntechanics is, in his opinion, only a system of half truths and lacks a complete comprehension of real occurrences. He feels almost a reactionary opposed to such radicalism, but he does not fail to appreciate with what enthusiasm and with what scientific success these theorists make their bold attacks.

The positive natural sciences, especially biology, arouse his interest just as much as philosophy. The profound mystery of organic nature, which already excited him as a boy and filled him with religious fervor, is most apparent in this science. In this field, too, is to be found a balance against his own speculative mathematical labors, so that the conviction grows that speculation as well as observation, theory as well as experience, are the way

to the essence of nature and its processes. Medicine, in its scientific labor, is dependent on both these factors, and even if theoretical physics is not directly connected with the science of the human organism, its perspectives tend somewhat in that direction, making it possible to affirm the idea of a uniform nature which is manifest just as much in the realms of space and time as in the complicated organism of the human body. Perhaps it was this conviction which decided the medical faculty of the University of Rostock to confer the honorary doctor's degree upon Einstein.

Following Einstein's natural universality, his interests are not limited to science. In literature he admires especially the creators of form and great characterization. He considers Shakespeare's mighty work, as great in its characterization as in its poetic form, the high point of the world's literature. He is, furthermore, an admirer of the at present unfashionable Schiller. Drama appeals to him, since it is closest to human life. Lyric and epic forms arc foreign to him. He is fond of the deep self-confessors of the East, like Tolstoi and Dostoevski, and also of the skeptical laughter of Anatole France and Bernard Shaw. Gerhart I-Iauptmann is for him the most profoundly affecting of contemporary German poets. In no other contemporary does

Einstein find a poetic world of human beings, of real flesh and blood, of such profound social feeling, to compare with Hauptmann's. Hauptmann's personality is like his work. Association and conversation between Hauptmann and Einstein are, therefore, a source of joy for both. Though the abstract, thoughtful work of the one differs profoundly from the emotional, vivid work of the other, the human characteristics of the poet and the thinker are yet alike. Both are men of the highest type, closely related natures opposed to everything artificial and formal in life. Einstein and Shaw feel a similar mutual understanding: in this instance, both men are united by their skeptical humor and their social attitude.

But Einstein's greatest love is music, especially classical music. Here profundity and significance of experience is joined with beautiful form, and such a union, to Einstein, means the greatest human blessing. The human will to live as it is experienced hourly in great and small things has been raised by means of music to an absolute force, which in turn absorbs every experience and dissolves it into a transcendent, beautiful reality. The school of German music from Bach to Beethoven and Mozart best manifests €or Einstein the essence of music. It does not follow that he is dogmatic and depises other musical personalities

and tendencies. He loves old Italian music, he also loves the German romanticists, but the peak of musical achievement is, in his opinion, this triple constellation. On one occasion when he had to answer a questionnaire about Bach he said briefly: "In reference to Bach's life and work: listen, play, love, revere, and—keep your mouth shut!"

He himself is a proficient violinist. Hardly a day passes that he does not pick up his violin and, usually accompanied by distinguished pianists, play sonatas and concertos. He is also fond of chamber music and joins prominent professional musicians in trios or quartets. At such times he is completely carried away into the realm of music; he combines so much reverie and forgetfulness of the world with unfailing technique that he is lost to all else. He gladly consents to play at charity concerts, though two considerations make him hesitate. In the first place, he does not like to compete publicly with professional artists, since in his artistic modesty he considers himself only an amateur; and, in the second place, he fears he might hurt professional musicians, who secure all the advantages of a public appearance by participating in charity concerts. Years ago it happened that a musical critic wrote after such an event: "Einstein's playing is excellent, but he does not deserve his world fame; there are many other violinists just as good." The critic had never heard of Einstein, the physicist. Very recently, when Einstein again placed himself and his instrument at the service of charity, a wit remarked that Fritz Kreisler would have to deliver lectures on physics, since Einstein was so busy with his concerts.

Einstein habitually improvises on the piano. His very charming improvisations are reminiscent of Mozart, but he breaks off as soon as a stranger enters the room. This music is a private matter to Einstein and is intended for no strange ear. It means only relaxation after labor, or a period of recreation or inspiration before new work.

The regularity of his life and work was suddenly and dangerously interrupted when early in the year 1928 a severe disease of the heart attacked him. It was in the Engadine. Einstein had just finished his lectures at Davos when he suffered a weakness of the heart which aroused the greatest anxiety in his family. He was taken to Zurich and there he was nursed by his wife, by friends and physicians, so that after a few anxious weeks he could return, with all possible precaution, to Berlin. For four months he had to keep to his bed; his recovery occurred very slowly. He spent the summer of 1928 with his family at a lit-

tle resort on the Bay of Lübeck—still sick and weak and not yet strong enough to walk even short distances. This condition lasted almost a year, and condemned Einstein to a life of great caution and quiet. All lectures were canceled, all activities which he otherwise would gladly have undertaken in a good cause refused. Einstein is still nominally a member of the philosophical faculty of Leyden but since his sickness he has not delivered any lectures there. His sickness has also been responsible for his resignation from the commission for intellectual coöperation in the League of Nations.

He was very patient in his suffering. He never complained about the tediousness of his rest cure. Sometimes, indeed, he seemed to enjoy the atmosphere of the sick room, since it permitted him to work undisturbed. So it came about that this year of sickness, 1928, saw the new field theory greatly advanced.

The body, formerly strong, had been weakened by the long sickness, the face had become very pale, when he finally began to recover his old strength. Ever since that time he has been compelled to show more consideration for his health and greater caution in his way of living. Frau Einstein takes special care to save her husband from unnecessary exertion and excitement.

This reason and his dislike for public celebration persuaded Einstein, in March, 1929, to avoid the celebration of his fiftieth birthday. He had to hunt for a place where nobody could find him. All the big cities of the world would have welcomed him, but he would not have felt safe. Safety was to be sought near by. For no one who would look for him in vain at his home in Berlin would think that Einstein had found refuge in the near-by vicinity of the city. This plan succeeded completely. With great glee he enjoyed the pleasure of being looked for everywhere. The most diverse opinions were expressed and nobody suspected that he was spending his birthday in the simple gardener's cottage of an estate on the Havel. He had arrived there a few days before his birthday in order to eliminate all risks. He had no service whatever. He prepared his own meals. That was just what he liked, since he considers occasions like birthdays and anniversaries too ridiculous to celebrate on their own account. On March 14th, 1929, only his immediate family had found its way to the gardener's cottage. How happy that made him, how little he cared that on this day all the newspapers of the world were printing articles about him and that the public was honoring him! When a clever correspondent of an American paper did find him in this out-of-the-way place

the angry features of the famous birthday child soon drove him away again.

The birthday cards which arrived at his Berlin residence during these days filled several wash baskets. Nobody wanted to be among the missing. The Chancellor, and the German government, the Prussian government, universities and academies of all countries, scientific and humanitarian organizations, fellow scientists and scholars of all branches of science, and friends without number, sent their greetings to Albert Einstein, who did not see this wealth of attentions till a few days late. It is characteristic of him that it was not the words of admiration and the famous names that made him happy, but the wishes of the many poor people who knew nothing of his work and who associated the name of Albert Einstein with a good, helpful and great man. Many wishes of this kind came on his fiftieth birthday. Poor women who earn their daily bread as seamstresses and factory workers sent him verses. One man out of work had saved a few nickels to send the great man a small pack of tobacco, Einstein was deeply touched and made very happy by this expression of anonymous love. The first to have his greetings acknowledged was this poor man without work.

Such little, everyday traits display Einstein's character most clearly. They show his human

feelings, his feeling of oneness with all creatures, and his opposition to every untruth and hollowness of outward life. He feels strange in a cold, harsh world which worships success and knows nothing of the way of pain which must precede success. Often, in sad moments, he is overcome by his thoughts of this world of injustice which spoils him so much and abuses and murders so many other valuable human beings, by the boundless injustice committed against the poor and the unsuccessful, by the discontent and the hatred of a world unable to learn anything from centuries of history, by the ever-new injustice exercised against the Jews. All this often fills Einstein with bitterness and disappointment and makes him bury himself more and more in the silence and seclusion of his scientific work, in a world which belongs to him alone and in which there is no right and wrong but only truth and error.

On his fiftieth birthday he discovered that clumsiness can destroy even good intentions. This particular occasion, however, evoked in him only a feeling of unlimited amusement. The incident, having to do with the city of Berlin's birthday present to Albert Einstein, began with the comical ignorance and inexperience of the good city fathers and ended with party politics. Even the city council of the federal capita1 knows that Einstein is enthusiasti-

cally devoted to the sport of sailing. There is no greater pleasure for him on a summer day than sailing on the Havel and its lakes—either alone or with very few companions. He loves the landscape, its modest, yet varied character and the melancholy shores of the broad lakes so close to the great city. Since he did not own any estate outside of the city he had stored his little sailboat with friends on the Wannsee. Whenever his time permitted and the weather was favorable he went out and spent the whole day on the water. For some time it had been his deepest wish to own a small area of land on the waterfront and there to spend the summer months in a very simple home, so that he might be able to go sailing whenever he wished. The city of Berlin wanted to gratify this wish and wanted to present a beautifully situated house on the Havel to her great citizen. To begin with, the affair was amusing enough, but it became more and more so as time went on. The gift, which was never presented, furnished material for many cartoons and became the occasion for loud laughter, in which all parties joined.

Opposite the Wannsee, where the Havel joins the wide bay of the lake, is the small village of Cladow. The banks of the lake are somewhat hilly; the houses, which afford a beautiful view of the river and the lake, are scattered over the

hillsides. Next to the village lies the estate of Neu Cladow with its small castle and beautiful, old-fashioned park. Here, close to the waterfront, stands a small house built in the classical style. At the incorporation of Cladow with Berlin, the city acquired the extensive estate, intending to make use of it.

The council was considering this building in the park of Cladow as a present for Albert Einstein on his fiftieth birthday. No present could have been more beautiful or in better taste. The small house with its dignified architecture is hardly visible in the old park with its rows of fruit trees. It is the ideal residence for a person of creative intellect and at the same time suitable for a man fond of sailing, since it is situated right on the banks of the Havel. Pictures of the "Einstein house" appeared in all newspapers. Mrs. Einstein had inspected the estate and was enthusiastic. But to her great surprise she found that people were still living in the house. The residents soon appeared and were in turn exceedingly surprised when Mrs. Einstein informed them that she and her husband were to move into the house, and declared that her notion could not possibly be considered. They said that the city of Berlin had expressly guaranteed them the right to live there when the city acquired the estate,

This surprise was very painful and had to be cleared up immediately. In the City Hall in Berlin the officials put their heads together and busily examined documents. As a matter of fact the agreements had not been studied carefully and it had therefore been overlooked that the family von X could not be ejected from their home. A painful situation, and a way out had to be found before the affair became public.

They found a way out which did not seem so bad. The park at Cladow was big enough for another residence which would not interfere in the least with the family von X. The honorable city council designated a part of the park situated near the water as the ground to be placed at Professor Einstein's disposal for the erection of a summer home. Mr. and Mrs. Einstein declared themselves satisfied with this solution. Everything seemed settled.

But the council had again acted with unpardonable ignorance. The family von X opposed this project too, and could prove that they had received a guarantee that no house would be built in the park during the next few years and that the ground would not be subdivided. The council tried all methods and means to persuade Mr. von X to retract his objection. They were useless; the second gift could not be granted.

The situation became still more painful, and threatened to bring disgrace with it.

Einstein's family did everything to keep these embarrassing occurrences dark. At bottom, the intentions of the council had been good, and no one desired to make the unsuccessful giver ridiculous. But gradually all kinds of rumors became public. In the first place, Mr. von X did not keep quiet. He began to be annoyed by the photographers and the interviewers and by the repeated assertions that he ought to make room for Professor Einstein, which he was not at all willing to do. After a while, the first reports appeared in the papers and placed the council in a very painful situation. A scandal threatened which could easily have had political comequences, since all the enemies of the city administration of Berlin use such occurrences for their own purposes. A decision had to be made as quickly as possible. The affair had to be settled so that Einstein could get his birthday present, which was by now rather belated.

The administration in the City Hall of Berlin again considered the problem. Documents were scrutinized and decisions were made. They thought that now the solution had been found and that the gift could finally be presented, although it no longer afforded real satisfaction to anybody connected with it.

The estate of Cladow owns a farm which fronts the Havel water and is part of the village of Gatow. The land, which does not compare in scenic charm with Cladow, is at least close to the water, and thus a suitable site For the erection of a small house. The grounds cannot be approached directly from the street—buildings intervene—and the property leading to them belongs to a Motor Boat Club. The council would request this club to permit the Einsteins and their guests to pass through its property. Hardly an ideal solution of the problern: the newspapers would soon find out the undesirability of the municipal birthday present and would not refrain from criticizing it. In the long run, however, the affair would quiet down, Einstein would own an estate on the water and build a home according to his taste.

Everything seemed to be fairly well arranged. Mrs. Einstein was invited to inspect the property. With the greatest difficulty she found her way through the adjacent estate and at last set foot on the ground which was ceremoniously to be presented to her husband. The reception she received was surprising. **A** laborer stepped **up** to her and brusquely asked her whether she was Mrs. Einstein. When she answered in the affirmative, she was given the charming instructions to get off the property at once. Mr. von X, the laborer said,

had given these orders, as the land was under his jurisdiction. Mr. and Mrs. Einstein's feelings in the matter may be easily imagined. They Certainly had had more than their share of civic attention and regretted the hour in which Berlin and its municipal council had resolved to honor Berlin's great citizen.

In the meantime, news of this third vain attempt at a gift was broadcast by all the papers. They created a scandal which was at once humorous and serious. Einstein himself joined heartily in the laughter which the gaucherie had called forth. He is never angry at another man's inefficiency, especially if he is its victim.

They thought differently in the Red House of the City Mall. This scandal was the last straw for the city council, which had had to surmount so many political and economic difficulties. The telephones from City Hall to the Bavarian quarter worked incessantly. But the Einstein family could hardly find **a** solution to the problem which the council had created. The incident has about it the droll, musty story element of **a** rustic town. It seems unbelievable that the good council should have presented three successive grants to which they did not own the deed; unbelievable that the incident did not happen to our grandfathers in a small provincial town of long ago, but to the municipal council

of the metropolis of Berlin in our own time! It was really a great joke. Such ridiculous ignorance was too much.

High city officials came to Einstein to discuss this painful affair. But what was there to discuss? Any pleasure which he might get out of the gift had been thoroughly spoiled, and he repeatedly expressed the wish that the council should drop the whole plan. Such a step was impossible. It would increase the scandal and make the mayor and the council more ridiculous than ever. After much thought, they finally decided on a plan which would involve considerable cost to the city.

Since the city had no jurisdiction over any water frontage in the western part of Berlin, it would have to buy the property it wished to present to Einstein. The solution at last! To avoid all difficulties—experience had made the officials not only wise but timid—it was decided to leave the choice of the property to Einstein.

Since the search in the vicinity of Berlin would have been too strenuous for him, and since he no longer took any real pleasure in the affair, Mrs. Einstein undertook this difficult task. She inspected many possibilities. Before this they had already negotiated with a firm of builders who had worked out the plan of a frame house of spacious dimensions to be built on the property

in Cladow. A young architect had made the plans, which were generally acceptable, Mrs. Einstein had meanwhile developed into an expert on real estate and building construction. She was now well-informed on the price of real estate as well as about the condition of the soil, and she finally found a beautiful site which she thought would meet with the wishes of her husband. When he inspected it himself, he approved of her choice and was glad that the annoying affair was at last over with. The site, however, situated in the village of Caputh, was rather a long way from his residence in Berlin.

Caputh is a village of one long street, and lies between Potsdam and Werder-on-the-Havel. On Sundays and holidays, the tourists from Berlin do not come here in big crowds; most of them do not go further than Potsdam. The scenery here has all the charm of the province of Brandenburg. The broad stream of the Havel is surrounded by hills and woods. The village itself is quiet and countrified, so that nobody would suspect the nearness of the metropolis, which many of the natives have never yet visited. The site which the Einsteins selected is situated just beyond the village itself—not on the I-lavel but only a few minutes' walk from it. The sandy ground rises gently and after a few steps changes into the floor of a beautiful, dense forest. The view from the edge

of this forest has an unforgettable charm. There lies the village, its little scattered roofs with the one wide road running between them. Beyond the roofs, the eye passes over hills and woods to the silvery ribbon of the Havel, upon which sailboats and rowboats move as tiny dots. The village church greets one as a guest from Italy, for it is an Italian basilica with a campanile, but from this point, only the vague outline of the tower is visible.

The council approved of this choice and found the purchase price agreeable. At last, at last the beginning of the end! The architect made some few changes in his plans and prepared everything for the builders. The attacks and the ridicule in the papers began to die down. Then there occurred an event which no one could have foreseen. Once more began the scandal, once more there was loud laughter. The civilized world laughed at the expense of the poor municipal council, and Berlin's **gift** to Albert Einstein was then interred, stillborn.

This is how it happened. The plan for the purchase of the property in Caputh was submitted by the council to the assembly of city representatives. It is difficult to decide whether such a step was necessary. At any rate, the public had not expected this step, the danger of which was apparent to everybody who knew the political make-up of the municipal assembly. It could be expected that the red majority of socialists and communists would accept this proposal, as would the bourgeois Center, but there was also a very strong Right opposition which would hardly fail to reproach the council and moreover, capitalize the situation politically. The council explained the proposal and requested its acceptance. In fact, they did not doubt that it would be accepted. At that point, however, the German nationalists raised objections and were so successful. about it that the affair was dropped from the order of business of the day and postponed to a later meeting. This meant the beginning of a political debate which, once started, would give rise to a prolonged struggle between the council and the Right opposition. The subject of the debate would be Albert Einstein. He would not permit this. Me could not permit this.

Einstein decided on the radical step of refusing the gift. In the interest of the city, and. in his own interest, he saw no other way out of the situation. Was he to be dragged into petty party strife for the sake of a birthday present? He knew what that meant in Germany. Even if the proposal were finally passed he would be so embittered by the experiences which he would have to suffer while the debate lasted, that he would

not derive **any** pleasure whatever from the gift. ßut: he did not take the affair at all tragically. His sense of humor did not desért him. He wrote to Mayor Böss that, judging by his experiences, human life lasted only a short time, while the decisions **of** magistrate and assemblies were very long-lived; that for this reason he did not have time to wait any longer for the gift which they had so kindly intended; and, finally, requested them to drop their good intentions completely. Einstein's decision was very embarrassing to the magistrate; a definite defeat which his political opponents would not fail to capitalize. They begged Einstein to change his mind, assured him that it would be easy to find a majority in the assembly to support the plan. But Einstein had really had enough of the affair. The magistrate was forced to see this and issued a very diplomatically worded announcement which stated that an agreement had been reached between the council and Professor Einstein, in perfect harmony, and that the plan of a municipal gift had been given **up** in accordance with Einstein's wishes.

But the land in Caputh had been selected and the purchase had been promised to the owner! The architect had already prepared the sketches and the firm of builders had received the contract. **A** retraction would be inconsistent with

Einstein's idea of justice. Until now he had laughed heartily at the tragi-comedy of the affair, had been glad that millions of people were laughing with him. With glee he had seen the many cartoons in the papers which showed him, his cottage, the city council and city representatives. While at other times the publication of his picture makes him furious, these cartoons had amused him greatly. With a laugh he said, "the affair has its good points, after becoming for many people the occasion for the best thing there is in this life: I mean a laugh." But now the matter had become serious since he did not know how the negotiations about the land would end. I-Je finally decided to buy the land in Caputh with his own money and to build a summer cottage, This plan would hardly have been considered under other circumstances, since it meant an unusual financial burden for the scientist. But he saw no other way out, since he had obligated himself to such an extent to both the owner of the property and the architect. Thus, in the summer of 1929, the property was bought at his own cost, and building operations began immediately.

After a few months, the structure was finished. Because of its elevated position, this frame house is visible from afar. Its special construction and its roominess make it much more than a cottage for week-ends. It is rather a small country

estate which is even suitable for residence in winter. For a long time, Einstein considered the question whether he should give up his home in the city altogether and move to Caputh permanently. Practical reasons, however, make him live in Berlin during the winter months and in Caputh during the summer.

Smooth brown paneling covers the walls of the house and gives the rooms their character. Everything is of the greatest simplicity and yet absolutely modern, so that the house forms an unusual contrast to its rural surroundings. Einstein uses a room on the first floor. It serves as his study as well as his sleeping quarters. Along the walls are bookshelves. In a recess stands the bed. In front of the French windows stands a desk from which the scholar can look out upon the hillside, the village and the woods.

Very little of the outside world penetrates this quiet. The quiet forms the best part of the recreation afforded by this summer cottage. Einstein refused to have a telephone installed, but this precaution is perhaps of doubtful value. Inasmuch as it is impossible for visitors from Berlin to announce themselves by telephone, they often appear without previous warning, and usually with wishes that demand time and exertion. With a sigh Einstein owns that there is no place in the

world where he can be absolutely safe from such invasions.

His favorite and most restful recreation is sailing. On the occasion of his fiftieth birthday, several friends united in presenting him with a new sailboat, complying throughout with his own specifications and wishes. A few minutes' distance from the house is a dock, near which his boat, built of solid mahogany, lies at anchor. Einstein is not interested in long trips or speed records. He is interested in daydreams. He enjoys the distant views, the light, the colors, the quiet shores and the soothing, gliding motion of the boat, steered by a slight motion of the rudder. All this creates within him a happy feeling of freedom. His scientific thinking, which never leaves him even on the water, takes on the nature of a daydream. Theoretical thinking is rich in imagination; without imagination no reality can be attained. While his hand grasps the rudder, Einstein takes delight in explaining to his companions his latest scientific ideas, and in the summery atmosphere the abstract thought processes become so permeated with the processes of the scientist's deepest emotion that one realizes the unity in him of a free existence and ever-dominating work. He handles the boat with the skill and fearlessness of a boy. He raises the sails himself, climbs around the boat in order to

straighten out ropes and lines, and works poles and hooks to cast the ship off from shore. The joy of this activity is reflected in his face, in his words, in his happy laughter.

Frequently, he is recognized on the water. Other boats approach his. The passengers stare curiously at him and sometimes focus their cameras at his head, already photographed countless times. That frequently spoils his good disposition, which he nevertheless recovers very quickly. A few grumbling words about the intrusiveness of these people from Berlin—and then his old cheerfulness returns.

He is very popular in the village. The villagers soon became acquainted with the impressive face and the long, gray hair. Usually, when Einstein goes walking through the village and the woods, he is dressed in a simple white linen suit and does not wear a hat. The natives, especially the children, greet him as one of their own. That pleases him and he returns their greetings heartily.

The proximity of nature fills him with happiness. Though he loves the metropolis and admires its industry, though he is carried away by a vitality and modernness which no other European city possesses, he is anything but a city dweller. The façades of the big buildings cover up so much human need: a race of poor and rich slaves

chained to their labor; labor which has for its object almost exclusively the satisfaction of material wants. In nature all this disappears. Each house is surrounded by light, air and vegetation, and man joins nature's great innocence. Einstein's childhood experiences of nature, which have influenced his whole development, are recalled in his maturity. He takes a deep and naïve delight in the beauty of the landscape and enjoys sharing this feeling with other people. Thus he likes to escort his visitors to those places in Caputh which possess a special charm, and he is as happy as a child when the others, too, admire their scenic beauties.

This experience of nature strikes a balance with the realm of pure reason. For Einstein the two are closely related: the miracle of mind is manifest in nature; the miracle of nature is manifest in a superior intellect. In this conviction, Einstein approaches the pantheism of Spinoza. He, himself, remarked on one occasion: "My concept of God is an emotional conviction of a superior intellect manifested in the material world." But he is not concerned with dogmas, with interpretations, but only with a humility toward the forces of nature and of reason. Humility is Einstein's religion. It consists of a childlike admiration of a superior mind "which is manifest in the little reality which our weak reason can grasp."

Out of this conviction arises his social morality, which is not divine command, but a human necessity.

Thus he is to-day at the high-water mark of his life, his work and his fame. He is one with all the miracles of existence and intellectual creation. The rare atmosphere of theoretical speculation is perhaps the greatest miracle of this existence. His unrestrained thought advances to regions which are not open to our limited experience but which are yet part of our experience. His creative work is of an artistic order. Einstein is convinced that the motives behind scientific and artistic creation are identical and that these two realms of the human intellect are fed by the same source of longing.

Conquest and service, discovery and humility, determine the fate of creative man. In Einstein these forces never conflict, but always work in harmony. This makes for the great happiness and charm of his unified personality. His figure appears in our age as a product of his fame, resulting from the incomparable significance of his work and the already legendary character of his personality. His fame has left his essential humanity unchanged. He has remained apart from all the splendor and all the danger of popularity, which has always repelled him and still does. His way follows the law of methodical thinking and

the law of his own nature. His humble gratitude knows the rare fortune which has permitted him to remain true to himself and to complete his work to so large an extent. That is a blessing for which one must be humble and grateful. It is also the marvel of the great personality, isolated with the solitude of a great work occurring but once in centuries, and yet admired and honored by contemporaries.

Is this not a rare, incomprehensible miracle? The present generation, which threatens to sink more and more into coarse materialism, has bestowed the palm of fame upon a man whose labor has been pure reason and whose life has been a matter of quiet and modesty. It seems that even in a period of technique and mechanization, intellectual superiority and intellectual creation are the highest of all values.

The figure of Albert Einstein in our times almost seems to prove it.

THE END