

LOST IN THE TWENTIETH CENTURY

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It used to be said in my home town, that the cheapest funeral you could get consisted of taking a candle in your hand and going out, yourself, to the churchyard. As judged by the previous introductory articles, this one should be something like it: an obituary written by the fellow himself. Let it be that. I have no quarrel with the idea of completing my cycle of life. What goes against the grain is writing about myself, since I am averse to all forms of exhibitionism. Moreover, I like to look forward, not back.

Overlooking my case history, I find a complete dichotomy. On the one hand, my inner story is exceedingly simple, if not indeed dull: my life has been devoted to science and my only real ambition has been to contribute to it and live up to its standards. In complete contradiction to this, the external course has been rather bumpy. I finished school in feudal Hungary as the son of a wealthy landowner and I had no worries about my future. A few years later I find myself working in Hamburg, Germany, with a slight hunger edema. In 1942 I find myself in Istanbul, involved in secret diplomatic activity with a setting fit for a cheap and exciting spy story. Shortly after, I get a warning that Hitler had ordered the Governor of Hungary to appear before him, screaming my name at the top of his voice and demanding my delivery. Arrest warrants were passed out even against members of my family. In my pocket I find a Swedish passport, having been made a full Swedish citizen on the order of the King of Sweden—I am “Mr. Swenson,” my wife, “Mrs. Swenson.” Sometime later I find myself in Moscow, treated in the most royal fashion by the Government (with caviar three times a day), but it does not take long before I am declared “a traitor of the people” and I play the role of the villain on the stages of Budapest. At the same time, I am refused entrance to the USA for my Soviet sympathies. Eventually, I find peace at Woods Hole, Massachusetts, working in a solitary corner of the Marine Biological Laboratory. After some nerve-racking complications, due to McCarthy, things straightened out, but the internal struggle is not completely over. I am troubled by grave doubts about the usefulness of scientific endeavor and have a whole drawer filled with treatises on politics and their relation to science, written for myself with the sole purpose of clarifying my mind, and finding an answer to the question: will science lead to the elevation or destruction of man, and has my scientific endeavor any sense?

All this, in itself, would have no interest. There are many who did more for science, were braver, suffered more agony and even paid the penalty of death. What may lend interest to my story is that it reflects the turbulence of our days. So to give sense to my story I will have to start by asking: why all this trouble and what is its relation to science?

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Erasmus of Rotterdam, that sage of the Early Renaissance, distinguished between calm and turbulent periods of human history which shows throughout the same repetitive story. Man develops a certain philosophy and creates the corresponding institutions and there is peace. Then his thoughts change and the new outlook has to fight the outgrown structure and thinking, with all its prejudice and vested interest; there is trouble till the new views predominate and the corresponding new order is established.

The world has never known a more tumultuous period than ours and so, if Erasmus is correct, there has to be a correspondingly deep change in our ideas, a change more profound than any earlier one. It is clear to me what this change is: a transition from the prescientific to the scientific. Not only is this change profound, but it has come upon us too suddenly, leaving no time to adjust.

The difference between the two worlds is best illustrated by the story of the two stones, and of Aristotle, one of the greatest prescientific thinkers, and Galileo, one of the first modern scientists. Aristotle said that a big stone falls faster than a small one. The interesting point about this statement is not that it was wrong, but that it never occurred to Aristotle that he could try an experiment, to test his ideas. He would have considered such a proposal an insult. Man had only to think to find the truth, his mind being superior to crude experience. The mind reigned supreme. There was no reason to doubt, either, that what the senses conveyed was the last reality. If we touch things, they feel hard or soft, wet or dry; so, according to Aristotle, these had to be the ultimate elements out of which the world was built. There could not be the least doubt that it was the Universe which rotated around us. It was only a small additional step to suppose that even our feelings were trustworthy guides and that our everyday experience could be extended to problems beyond our reach. So if man resented death there could be no death, only Hades, Hell, or Heaven. If man wants a house, he has to build it, so if there is a Universe, somebody must have built it and be running it, somebody more powerful than ourselves. So man populated his world with gods, one or many, shaped in his own image. But even if there were beings more powerful than ourselves, we had to be their main concern, and remained the center.

So gradually, man built himself an imaginary world based on "faith," that is, accepting things without evidence. This faith was codified at different ages as religions in the name of which men tortured, subjugated, and killed one another. What underlay this prescientific thinking was man's trend for autistic thinking and his boundless self-confidence. While thinking himself the center, supreme master and judge, man had to remain the toy of Nature.

Two thousand years after Aristotle, something must have happened to man's mind for here and there people appeared, like Copernicus or Kepler, who modestly tried to put two and two together, while a boisterous young man went up a leaning tower to drop two stones, a big one and a small one, bidding his companions to observe which one hit the pavement first. What is essential about this simple act was a humble attitude: if we want to find out

something about the world around us we have to ask questions modestly, that is, do experiments.

The same young man did not trust the perfection of his senses either, and later built the telescope to improve his sight. With his improved sight he could see the satellites of Jupiter and the rings of Saturn, never seen by man before, clearly indicating that the Universe could not have been created solely for man's pleasure or temptation. Today, three and a half centuries later, we see experimental science in rapid expansion, changing all parameters of human existence, creating an entirely new world, in which man has become the short-lived inhabitant of one of the small satellites of one of the millions of stars of one of the millions of galaxies, in a Universe expanding at increasing speed, dominated by quantum laws. What underlies this change is a new scientific thinking. The essential feature of this thinking is humility, the realization of our imperfections. The first command of this thinking is to accept nothing without evidence, face problems as such, with a cool head, without fear or prejudice, with uncompromising honesty of thought, unbiassed by fear, hopes, or interest.

We are living in the middle of the transition from the prescientific to the scientific thinking, hence the "tumult." We still have God on our lips and our coins, but no more in our hearts. If we are taken ill we may still pray, but we take penicillin alongside. We pray for peace but heap up H-bombs for safety. We preach Christ and talk "overkill." This world is symbolized for me by the colossal statue of Christ, standing on a hill in Spain, stretching out His Arms to mankind, and wearing on His Head an enormous lightning conductor to protect Him, should the Almighty Father try to smite Him by lightning. We find the new expanding Universe a rather cold place and do not dare to abandon the old one. The trouble is that the two worlds cannot be mixed and the father inquisitor was right when he said to Galileo that "your teaching and the teaching of the church cannot exist side by side." We cannot build, unpunished, H-bombs by science either, and then run them with the XVIII Century egotistic, narrow, sentimental, and deceitful political thinking. It makes no sense to shoot astronauts out into space to reach other stars and erect ten-foot concrete walls to separate man from man. In its own time prescientific thinking did build a stable world, but science has irretrievably undermined the acquiescence in misery as the attribute of human existence, and has undermined the old hierarchies of gods, princes, barons, haves and have-nots, well-fed and hungry, developed and underdeveloped.

There is no way back, and we have to face squarely, the free choice between undreamed of wealth and dignity, and self-destruction which science has offered. My problem is: to what is science leading, and whether science can build a world in which man can feel, once more, at home? I will attempt to answer these questions at the end, after having given my case history.

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On my Mother's side, I am the fourth generation of scientists. My Father was interested only in farming and so my Mother's influence prevailed. Music filled the house and the conversation at the table roamed about the intellectual achievements of the entire world. Politics and finance had no place in our thoughts. I am a scientist, myself, because at an early age I learned that only intellectual values were worth striving for, artistic or scientific creation being the highest aim. I strongly believe that we establish the coordinates of our evaluation at a very early age. What we do later depends on this scale of values which mostly cannot be changed later. We are somewhat like Dr. Lorenz' goose which has hatched at the foot of a chair and recognized the chair as its mother all its later life. This is important for education, in case we are not intending to produce only "corporation men" with their intellectual crew cuts.

I must have been a very dull child. Nothing happened to me. I read no books and needed private tutoring to pass my exams. Around puberty, something changed and I became a voracious reader and decided to become a scientist. My uncle, a noted histologist (M. Lenhossek), who dominated our family and was a precocious child himself, violently protested, seeing no future for such a dull youngster in science. When his opinion gradually improved, he consented to my going into cosmetics. Later, he even considered my becoming a dentist. When I finished high school with top marks, he admitted the possibility of my becoming a proctologist (specialist of anus and rectum; he had haemorrhoids). So my first scientific paper, written in the first year of my medical studies, dealt with the epithelium of the anus. I started science on the wrong end, but soon I shifted to the vitreous body, the fibrillar fine structure I explored with new methods.

I have mentioned this early history of mine because it suggests that no final judgment should be made of children at too early an age.

I must have achieved some reputation as a histologist when, as a third-year medical student, I became increasingly discontent with morphology which told me little about life. So, I shifted to physiology but had to break my studies for compulsory military service. World War I found me in uniform.

Centuries-old tradition told us Hungarians to ask no question when we were called upon to fight. I did accordingly, but during the first three years of the war I was gradually overcome by a burning desire to return to science. At the same time I became increasingly disgusted with the moral turpitude of military service. I could see clearly that we had lost the war and that we were being sacrificed senselessly by a ruling clique; the best service I could do for my country was to stay alive. So, one day, when in the field, I took my gun and shot myself through the bone of my arm. With all the deeply ingrained tradition this was quite difficult to do and it was also the more dangerous road. Anyway, it took me back to the capital where I got my M.D., after which I continued my service in a bacteriological laboratory of the army. Here, I got into trouble but once, when I objected to experiments,

dangerous to life, done on Italian prisoners of war. Since the man responsible for these experiments had two stars more than I had, I was punished, and sent to the North Italian swamps where tropical malaria made life expectancy very short. A few weeks later the war collapsed and so I pulled out alive and returned to the laboratory.

I wanted to understand life but found the complexity of physiology overwhelming. So I shifted to pharmacology where, at least, one of the partners, the drug, was simple. This, I found, did not relieve the difficulty. So, I went into bacteriology, but found bacteria too complex, too. I shifted on, to physicochemistry and then to chemistry, that is, to molecules, the smallest units in those days. Ten years ago I found molecules too complex and shifted to electrons, hoping to have reached bottom. But Nature has no bottom: its most basic principle is "organization." If Nature puts two things together she produces something new with new qualities, which cannot be expressed in terms of qualities of the components. When going from electrons and protons to atoms, from here to molecules, molecular aggregates, etc., up to the cell or the whole animal, at every level we find something new, a new breathtaking vista. Whenever we separate two things, we lose something, something which may have been the most essential feature. So now, at 68, I am to work my way up again following electrons in their motion through more extensive systems, hoping to arrive, someday, at an understanding of the cellular level of organization. So the internal course of my life made a smooth sinusoid curve; not so the external course.

After the War, I became assistant at the pharmacological laboratory of the newly founded University in Pozsony, an old Hungarian town. A few months later Pozsony was given, by the Versailles Treaty, to Czechoslovakia (it is now called Bratislava) and we had to clear out. We saved our scientific equipment not without danger, getting it one night, dressed as workmen, through the closely guarded gates of the campus. Meanwhile, in Hungary, the communists took over, which meant a complete loss of all my belongings. At the very last moment, I rescued one thousand English pounds. These I shared with my Mother, whom I visited at Budapest. For such a visit the wintry Danube had to be crossed in a small overcrowded boat at night, at a point where there were no Czech patrols, who shot at sight. In my company was a nun, Sister Angelica, who was deadly frightened and clung to me desperately. On my return I had to spend a night in the snow and arrived in Pozsony with a grave pneumonia. I probably owe my life to the devoted nursing of Sister Angelica. After this, I took my wife and child and steered west. The English pounds allowed me to live, very modestly, for a little while, during which time I wanted to gratify my desire to do research. First, I went to Prague to learn some electrophysiology from Armin von Tschermak, from there to Berlin to learn about pH from Michaelis, (who later spent his last summer in my guest house at Woods Hole). From Berlin I went to Hamburg to the Institute for Tropical Hygiene. My calculation was that while I did research on physicochemical lines, I would learn enough about

tropical medicine to be hired by some colonial government, once my money gave out. This time having arrived, I bought my tropical equipment, ready to go, but fate would have it that the Dutch Physiological Society held its meeting in Hamburg, and one of the participants was W. Storm van Leeuwen, professor of pharmacology in Leiden. He had with him Professor Fritz Verzar, serving as his associate professor. Verzar was about to return to Hungary so he introduced me to Storm van Leeuwen who invited me to take Verzar's post, which I took. After two years at Leiden, where I devoted my free time to learning chemistry, I joined Hamburger's Laboratory at Groningen where I worked for another four years. Salaries were very low but allowed for a very modest life, which was happy and quiet.

Now, I thought myself capable of tackling a biochemical problem. I embarked on biological oxidations. At that time a violent controversy raged between O. Warburg and H. Wieland and their followers. The former thought that oxygen activation was the most essential feature of respiration, while Wieland put H-activation in the fore. I could show that both processes were involved. I simply knocked out O₂ activation (and with it, respiration) by cyanide and then added methylene blue to the minced tissue. The dye restored respiration, replacing O₂ activation. It was reduced by activated H and then reoxidized spontaneously. During these experiments I became fascinated by the succino- and citrocodehydrogenase. These dehydrogenases differed from other dehydrogenases by being bound to structure, and "structure" had to mean something very important. They could not possibly be just ordinary metabolic enzymes, they had to have some general catalytic role. If this was so, then the whole of respiration had to be inhibited once the succino-dehydrogenase was inactivated, which could be done by malonic acid, as shown earlier by Quastel. So I added malonic acid to the minced tissue, and respiration stopped. This proved that succinic acid (and citric acid) had to have some general catalytic activity and could not be simply metabolites, as thought before. These ideas were later completed by Krebs and are the foundation of the so-called "Krebs cycle." It was partly this discovery of the C₄ dicarboxylic acid catalysis which was honored later by the Nobel prize.

I also became interested in vegetable respiration, being convinced that there is no basic difference between man and the grass he mows. Plants, at that time, were divided into two groups: the "catechol oxidase" and "peroxidase" plants. I started with the catechol oxidase plants which contain catechol and a strong catechol oxidase. I simplified the accepted, rather complex ideas about this oxidation system. Then I shifted to "peroxidase plants" which are called so because they contain peroxidase in high concentration. If peroxide is added to a mixture of peroxidase and benzidine, immediately an intense blue color appears due to the oxidation of benzidine. I found that if the reaction was performed with the plant juice, instead of purified peroxidase, there was a very short delay, of a second or so, in the benzidine reaction. This fascinated me. There had to be present a reducing agent which reduced

the oxidized benzidine, the delay corresponding to the time necessary to oxidize away this unknown reducing agent, later to be known as ascorbic acid.

I mention this story in such detail because it illustrates the basic trait of my way of working. I make the wildest theories, connecting up the test tube reaction with broadest philosophical ideas, but spend most of my time in the laboratory, playing with living matter, keeping my eyes open, observing and pursuing the smallest detail. The current fashion is to avoid making theories (they may be wrong!) and limit one's observations to reading pointers. I think that an intimate finger-tip friendship with living matter is still important for the biologist. By working in this way, usually something crops up, some small discrepancy, which, if followed up, may lead to basic discoveries. The theories serve to satisfy the mind, prepare it for an "accident," and keep one going. I must admit that most of the new observations I made were based on wrong theories. My theories collapsed, but something was left afterwards.

I also made theories about the adrenal gland which led me to assume that the reducing agent of peroxidase plants should also be present in the adrenal cortex in high concentration. I found it was present (though the underlying theory turned out to be wrong later).

Hamburger's death made an end to all this. His successor was a psychologist who disliked chemistry and disliked me with it. I thought that I had to give up altogether, being still a beginner in science, who had no more money and no foreign diploma. So I sent my wife with our child back to Hungary to her parents and prepared for the end. I saw no chance left. For a farewell to science I went to attend the International Physiological Congress at Stockholm (1926). The presidential address was delivered by Sir Frederick Gowland Hopkins, who, to my surprise, mentioned my name three times, more than anyone else's. So, after his lecture I picked up all my courage and addressed him. "Why don't you come to Cambridge?" he asked. "I will see to it that you get a Rockefeller fellowship." And so he did. He was, and still is, a mystery to me. He was the man who had the most influence on my scientific development though I never talked to him about science and heard him speak but once or twice. His papers were not especially fascinating, yet he had a magic influence on the people around him. That little unassuming man, with all his childish vanity, was a humble searcher of truth. What his individuality proclaimed was that in spite of all the hard work involved, research is not a systematic occupation but an intuitive artistic vocation.

In Cambridge I isolated the reducing agent found at Groningen. I crystallized it from oranges, lemons, cabbages, and adrenal glands. I knew it was related to sugars, only did not know which. "Ignosco" meaning "don't know" and the ending "ose" meaning sugar, I called this carbohydrate "Ignose." Harden, the editor of the *Biochemical Journal*, did not like jokes and reprimanded me. "Godnose" was not more successful and so, following

Harden's proposition, I called the new substance "hexuronic acid" since it had 6 C's and was acidic. I got my Ph.D. for it.

The trouble was that I could make it on bigger scale from one material only, adrenal glands, but these were not available in England in sufficient quantity. So I accepted N. Kendall's invitation to go to the Mayo Clinic, at Rochester, Minnesota, where ample material from the St. Paul slaughterhouses was available. I worked for one year in the USA, to return to Cambridge with 25 grams of "hexuronic acid" in my pocket, most of which I gave to Haworth, the great carbohydrate chemist, who undertook the constitution analysis.

Hungary, at that time (1932), had a very outstanding Minister (Secretary) of Education. He wanted to modernize Hungarian science and asked for my help. So I accepted the chair of medical chemistry at the University, Szeged, and left Cambridge with a heavy heart, for the University of Szeged. My laboratory was soon filled with able young researchers. I went back to oxidation and was soon fascinated by an unknown yellow dyestuff, "cytoflave," with its splendid fluorescence and reversible reducibility. Having no spectroscope, I could not describe it properly. Now it is called riboflavin. I also became interested in lactocodehydrogenase, found its activity linked to a coenzyme, a nucleotide, which I isolated in quantity in order to hydrolyze it for its analysis. I had a strong hunch that pyridine derivatives were involved as bases. I wanted to precipitate the hydrolysate with platonic chloride but when I came to it I found, to my dismay, the bottle of platonic chloride empty. With the shortage of chemicals my efforts to get hold of some platonic chloride failed, and so my hydrolysate just withered away. I followed practically the same route which led Warburg to the discovery of the pyridine nucleotides.

One day a nice young American-born Hungarian, J. Swirbely, came to Szeged to work with me. When I asked him what he knew he said he could find out whether a substance contained Vitamin C. I still had a gram or so of my hexuronic acid. I gave it to him to test for vitaminic activity. I told him that I expected he would find it identical with Vitamin C. I always had a strong hunch that this was so but never had tested it. I was not acquainted with animal tests in this field and the whole problem was, for me, too glamorous, and vitamins were, to my mind, theoretically uninteresting. "Vitamin" means that one has to eat it. What one has to eat is the first concern of the chef, not the scientist.

Anyway, Swirbely tested hexuronic acid. A full test took two months but after one month the result was evident: hexuronic acid was Vitamin C. We made no secret of this and finished the test which left no doubt about the identity. So, we (Haworth and I) rebaptized hexuronic acid to "ascorbic acid."

There we were. Ascorbic acid seemed medically most important but there was none of it, and none of the available vegetable sources allowed big-scale preparation. Adrenals were not available, in quantity, in Hungary. As it

happened, Szeged is the center of the paprika (red pepper) industry. Paprika was not available at Cambridge. I once saw it on the market but the vendor cautioned me that it was poisonous. One night we had fresh red pepper for supper. I did not feel like eating it and thought of a way out. Suddenly it occurred to me that this was practically the only plant I had never tested. I took it to the laboratory and about midnight I knew that it was a treasure chest of vitamin C, containing 2 mg per gram. A few weeks later I had kilograms of crystalline Vitamin C which I distributed all over the world among researchers who wanted to work on it. This soon made complete analysis and synthesis possible. I received my Nobel prize partly for this work which also led to another unexpected discovery. When I still had only impure but highly concentrated solutions of ascorbic acid we tried my extracts in cases of Henoch's Purpura. In scurvy there is a great capillary fragility causing subcutaneous bleeding, so it seemed logical to try my extracts in purpura (subcutaneous bleeding). They worked. When I had crystalline ascorbic acid we tried it again, expecting a still stronger action. It did nothing. Evidently, my impure extract contained an additional substance responsible for the action. I guessed that it might be "flavones" which did the trick. My guess proved right. I isolated the flavones from "paprika" and they cured purpura. I called this group of substances Vitamin "P." I used the letter P because I was not quite sure that it was a vitamin. The alphabet was occupied only up to F so there was ample time to eliminate "P" without causing trouble if the vitamin nature became disproved.

I felt I had now enough experience for attacking some more complex biological process, which could lead me closer to the understanding of life. I chose muscle contraction. With its violent physical, chemical, and dimensional changes, muscle is an ideal material to study. If one embarks on such a new field one usually does not know where to begin. There is one thing one can always do, and this I did: repeat the work of old masters. I repeated what W. Kühne did a hundred years earlier. I extracted myosin with strong potassium chloride (KCl) and kept my eyes open. With my associate, I. Banga, we observed that if the extraction was prolonged, a more sticky extract was obtained without extracting much more protein. We soon found that this change was due to the appearance of a new protein "actin," isolated in a very elegant piece of work by my pupil, F. Straub, while I "crystallized" myosin. Myosin, evidently, was a contractile protein, but the trouble was that *in vitro* it would do nothing. A contractile protein should contract wherever it is. So we made threads of the highly viscous new complex of actin and myosin, "actomyosin," and added boiled muscle juice. The threads contracted. To see them contract for the first time, and to have reproduced *in vitro* one of the oldest signs of life, motion, was perhaps the most thrilling moment of my life. A little cookery soon showed that what made it contract was ATP and ions. My conclusion, that muscle contraction was essentially an interaction of actomyosin and ATP, was soon strongly attacked, so I developed (later at Woods Hole) the method of glycerination,

and glycerinated (extracted with diluted glycerol at low temperature) the psoas muscle of the rabbit. This method is now widely used for conservation of biological material such as sperm. On addition of ATP, my glycerinated muscle contracted, developing the same tension as it developed maximally *in vivo*. This satisfied me and I was sure that in a few weeks' time the whole problem of muscle contraction would be cleared up, but ten years later I still did not understand muscle, which made me conclude that something had to be missing from our basic ideas, something that was essential for the understanding of energy transformation. So I left muscle to find what this something is. This took me, gradually, into my present field, that of electronic dimensions and mobility.

As a temporary president of my university at Szeged, I tried to put into action the ideas picked up in the west. I created an intense cultural life among students which culminated in our producing Hamlet, and producing it well. But my democratic ideas brought me more and more into conflict with the rising tide of fascism. It was not I who went into politics. Politics came into our lives and when books were burned and my Jewish friends were prosecuted I had to say "yes" or "no." I said "no" and when later, during World War II a group of leading Hungarians came, secretly, to me and asked me to do something to save Hungary from Germany's grip, I went, under cover of an alleged lecture, to Istanbul to get in touch with the British and American diplomats to see what could be done. This was a risky undertaking, for German-occupied territory had to be crossed and Istanbul was the spying center, with highly developed techniques, and I was a newcomer in this business. I felt that I could be more useful if I did not go merely as a private individual to Istanbul and took a chance. I went to our Prime Minister, Mr. M. Kallay, and told him about my plans. Outwardly, Mr. Kallay was a Nazi, but I suspected that he was a good Hungarian, waiting for his chance to bring his country over to the other side. My guess was right. Instead of having me arrested he asked me to represent him and convey certain messages to the Allies. In Istanbul I succeeded in getting in touch with the head of the British Secret Service, making with him detailed plans which soon had the blessing of London. What made these dealings exciting was that, till the end, I could not know for certain whether I was dealing with the British, or the German Secret Service. This I could only find out later, when crossing German territory. Not being arrested on my return, I was finally sure that it was the British to whom I had talked.

Unfortunately, the secret of my mission leaked out, and I could not set up a secret wireless station which was essential for my plans. I was placed under house arrest. Hitler demanded my delivery. Later, when he occupied Hungary, I avoided final arrest by the Gestapo only by an inch, owing my escape more to good luck than ability. Arrest would have meant a very painful death. Even my daughter had to go into hiding, an arrest warrant having been issued also against her. Working against Hitler and living underground was full of colors which were not always pleasant. I expected to be killed so I

wrote up my observations on muscle, which I did not want to be lost. I sent them for publication in the *Acta Scandinavica* to my friend Hugo Theorell. Not knowing where I was, he corroborated acceptance by wire, "care of Swedish Legation, Budapest." Fate would have it that at that time I was actually hiding at the Swedish Legation, and so Theorell's wire gave me away. The Gestapo immediately searched the surrounding houses for subterranean exits from the Swedish Legation, which served as a warning. Also, a hint from a friendly German diplomat made it evident that arrest was imminent. So Per Anger, the head of the Legation, smuggled me out in the back of his car the next night. Shortly after, the Nazis broke into the Swedish Legation, searched, robbed, and practically destroyed it. Then followed a series of exciting situations shared by my wife. At the end, we had to part, hiding together becoming too risky. Two of my hiding places were destroyed by bombs shortly after I left them, and, in the end I could avoid arrest only by hiding in the vicinity of the Soviet lines where the Gestapo did not dare to come.

The profound disgust we felt for Nazism made us guilty of a fatal sin in politics—wishful thinking. It made us believe that after Hitler was finished all we had to do to bring on the great golden age of peace was to show good will towards the Soviets. It is true that in the short communist period of Hungary, after World War I, the Communists behaved very badly, but that was long ago. A new world was to come. This was a most tragic error with fatal consequences. From my hiding places I contacted Governor Horthy, who was still the master of the situation. We met in secret, and I offered my services as an envoy to the Allies to prepare Hungary's joining them. He seemed to accept but when he noticed my friendly disposition towards the Soviets he edged out of the room and I never saw him again. I can reproach only myself for this failure. I should have taken Horthy's mentality into account. He hated Russia and feared it.

Personally, I did not expect a better treatment from the Soviets than I had expected from Hitler, having given my heavy golden Nobel Medal to Finland when the Soviets declared war on her, and this medal meant more than just gold. So I was not surprised when, after the "liberation" of Budapest, a Soviet patrol, with an English-speaking major at its head, came searching for me. I gave myself up. To my surprise the patrol did not come to arrest me but to bring me to safety on Molotov's personal order. I refused to go along, not wanting to leave my wife's big family in the very dangerous situation then prevailing in the Capital. So the whole family was taken to safety, while my wife and I were taken to Malinowski's headquarters where we were fed back to life with utmost care and consideration. Later, I was invited to Moscow where I spent two months and attended the Centennial Celebration of the Academy, finishing up with a trip to Armenia.

I went to Moscow with the hope of seeing Stalin. What made me want to meet him was the fact that the Soviet Army in Hungary behaved very badly. Near my home town a Hungarian regiment laid down its arms, not

wanting to fight for Hitler. The whole regiment was crowded into a small prison where it was soon exterminated by typhus fever. In Budapest the ends of streets were suddenly closed by Soviet soldiers and all the younger men were herded together. Their documents were taken away, which wiped out their identity. About 30–40,000 men were arrested this way and then herded to Czegled, a nearby camp where there was no food and poor sanitation. Dysentery and typhoid began to decimate them. The screams could be heard from long distances. Those who were left were herded into trains, the doors of which were sealed; nobody knew where they went. We could not guess, at that time, that these people were simply taken to Russia as slaves, the whole transaction recalling the darkest days of African slave trade. With our wishful thinking we tried to find excuses for the Soviet atrocities. We even tried to find excuses for the individual misbehavior of Soviet soldiers; war is a beastly business, and makes beasts of men. So, I went to Moscow with the hope of being able to tell Stalin what was going on in Hungary, that we Hungarians wanted to be friends with the Soviet but couldn't be if he did not end this rule. I asked for an interview and was taken into the Foreign Office before Mr. Decanozov, who had to find out what I wanted from Stalin. Mr. Decanozov must have been a very high official because he was later executed together with Beria. He asked me what I wanted. I told him. His reaction was unexpected: he began to shout. At this moment I felt that what I thought to be the overzeal of local commanders was all planned in Moscow. Going home, I still continued working for an understanding with the Soviets. If we had to live together, we had better understand each other. The Russian people are a fine people whom one cannot help liking once one knows them.

I thought, also, to have another vocation: to help rebuild the devastated culture of Hungary and save our leading intellectuals from starvation. I could help only a limited number, so I started a new "Scientific Academy," and selected its members, 50 or 60. The Academy consisted, chiefly, of a grocery store which was kept well-stocked and from which members of the Academy could take what they needed, free of charge. A friend of mine helped me finance this enterprise. He also helped me to establish a new school of biochemical research. This was not easy, because, to find a potato in those days was a full-time job, and if I wanted my associates to work I had to feed them. My laboratory looked like a chick embryo with its great vitelline sack. It consisted of a big kitchen, led by my wife, and a laboratory, led by myself.

Personally, I had no complaints against the Soviet, who always gave me the most distinguished treatment. In order to stock my "Academy" I needed trucks and with my friend, the writer, L. Zilahy, we asked for trucks from Marshall Voroshilov who readily complied. With these trucks we established a travel agency. In those days everybody wanted to get away from the capital but there was no transportation. So, we could charge high prices for taking people to the country, where, with the fares collected, we bought food for the Academy.

In spite of the personal favours it became more and more difficult for me

to find excuses for the Soviet's behaviour, which I still did not understand. One day I went to Switzerland to restore my health on my skis. The Soviet Commander used my absence to get rid of my capitalist friend who financed my laboratory and Academy. He was kidnapped. The next day the Communist papers brought out articles about him, saying that he stole money and ran away. I was informed about the real happenings and put in all my influence to have my friend released. The authorities miscalculated. If I had been in Hungary I could have done nothing. At large, in Switzerland, I could call the World's attention to what was going on in Hungary, and this would have been a bad point in Moscow for our local Communist leaders. My wires to the Prime Minister and the Communist Dictator left no doubt about my determination. My friend was released, and given a passport to leave the country, having "seen too much." To prevent a second kidnapping, my wife accompanied him by car to Switzerland, hoping that the Soviet would not risk touching her. In Switzerland I learned from my friend what was going on behind the prison walls, which I could never find out at home. This filled me with such profound disgust that I was unable to return. To go back and resist the Soviet made no sense and accepting favours was impossible. So I decided not to return. Eventually, I found my haven in Woods Hole, where I am enabled, now, by American generosity, to work unhampered by any other factor than my own personal limitations.

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The sole general interest in this story is that it sheds a vivid light on the turbulence of our days, showing the conflict between my scientific world and prescientific surroundings which were immiscible. Looking back gives me the feeling of frustration. Resisting Hitler, building academies, research schools, living for years with a finger on the trigger instead of fingering test tubes—and all this to see the part of the world I worked for trodden down as a colony, and to see mankind on the brink of extinction. The idea of being killed for my ideas never frightened me. At one time it even seemed natural. But to have spent so much life and energy in vain is depressing, and I have to ask myself, as so many other scientists must do: has research any sense? Should science not be stopped till man reaches the maturity necessary to deal with the forces which science creates, without the danger of self-destruction?

In a way, the question has no sense, for scientific progress cannot be stopped. Human curiosity cannot be quenched. The question is, rather: does scientific progress offer a way out? To this question my answer is an emphatic "yes."

In the preamble, I have touched upon two facets of science, its ways of thinking and the tools it creates. The danger of our days is that politics has run away with the tools, leaving the way of thinking behind. The forces created by science can be handled only by the mentality which created them. So if there is a way out it is not in suppressing, but in spreading science till scientific thought becomes sufficiently strong to create its own world order.

It may be objected that human relations are not dominated by thoughts but by morals, and science has no moral content. Morals are the simple prescriptions which make living together possible. They have no intrinsic meaning. It would make little sense to say to a tiger: "Thou shalt not kill," or preach to a mouse: "Thou shalt not steal." But a human society cannot exist without such rules.

But is it true that science has no moral content? Is science not more than just a method of thinking, tools, or a collection of data and books? Is science not a living society? I think it is. To me, science, in the first place, is a society of men, which knows no limits in time and space. I am living in such a community, in which Lavoisier and Newton are my daily companions; an Indian or Chinese scientist is closer to me than my own milkman. The basic moral rule of this society is simple: mutual respect, intellectual honesty, and good will. So I think science does have its moral code which it offers as its third facet on which a new world order can be built. Science has raised man from stench and dirt, liberated him from the miasmas which decimated him in earlier times. It allows the bearing of children without fear. It has already shown the possibility of a dignified life, the expectation of which it has greatly extended. It is true, it has reduced man to a very modest place in Creation, but, then, why not try to lift ourselves, accepting the responsibility for our own fate? Why pull down one another, further poisoning our own atmosphere, showing how easily life can be wiped out? Science has opened endless possibilities for expansion if we work together instead of snatching small advantages from one another. Science has helped us to understand and master Nature. Maybe it will help us to understand and master ourselves, creating an elevated new form of human life, the wealth and beauty of which cannot be pictured today by the keenest imagination.