

## Chapter 8: Testament 1970

DURING THE FOUR YEARS Handler managed the biology project, he worked assiduously to produce a book that would foster the public's perception of biological knowledge as wholly dependent on biochemical research, and to encourage belief in the limitless potential of biochemical research to benefit humanity. His book, *Biology and the Future of Man*, almost a thousand pages, was published in 1970. Its conceptual provenance was Handler's ideology — that the laws of physics governed biology and were inherently capable of deductive explanations of the entire range of behaviors exhibited by living organisms, including life itself. He regarded the failure of physicists to explain life or its myriad phenomena as an indication of priority rather than inability — that they chose to concentrate on other tasks they found more interesting. Handler believed physicists, in their own good time, would ultimately enumerate the specifications, constraints, and conditions on the laws of physics sufficient to enable the laws to explain all of biology. Until then, he presumed, biology was best viewed as an example of applied physics expressed in the language of biochemistry rather than mathematics. He called biochemists “the modern biologists” and professed great faith in the explanatory power of biochemistry regarding all aspects of biology, including clinical medicine.

In the process of incarnating his ideology into his book, Handler manifested substantial managerial and rhetorical skills. He packaged textbook material with his opinions of its implications and presented the synthesis in a univocal authoritative narrative intended to persuade the Congress and the public that biochemical-based solutions could be found for the environmental, medical, and social problems that endangered the future of humanity. Handler projected scientific authority by means of management techniques that controlled what the reader perceived, and rhetorical devices that infused the narrative with scientific authority. He attempted to capitalize on the respect the public then had for the Academy, which was called “prestigious” so commonly in news reports, many people believed the word was part of its name. He sought to benefit from a presumption that its members were intellectually and morally superior and had validated his book as evidenced by its publication under the auspices of the Academy. During a publicity tour to introduce the book to the public, Handler emphasized its connection to the Academy, which he called “a unique national resource,” and cultivated perception of the book as authoritative advice regarding the science policies that were best for the nation.

Handler attempted to elevate the book's persuasive power by employing empiricist language that conveyed the impression scientific evidence spoke for itself, and by inserting anonymous expert judgements to create the impression his conclusions were shared not only by the listed co-authors but also by everyone in the scientific culture. He was especially keen to create the appearance that his conclusions were arrived at through judicious and rational deliberation rather than dogmatic discourse. Handler tried to intensify the persuasive force of the book by listing as co-authors almost two hundred doctors of science and their affiliations with the major scientific institutions in the nation, making it appear that the book was a monologue on biology in which the experts were in agreement and spoke univocally with authority grounded in scientific evidence.

When Handler explained how the book came about, he revealed how he systematically constructed its authority, like an engineer building a bridge. The Academy Policy Committee, of

which Handler was a member, created a Biology Panel to carry out the biological project, which Handler chaired. In that capacity, he created the Panel's numerous sub-committees and controlled all aspects of the biology project on a day-by-day basis over a four-year period. The Business Arm, which Handler chaired, physically carried out the project and managed the meetings where the wordsmithing of sub-committee manuscripts was performed by the Arm's employees. He reviewed multiple draft manuscripts provided by the sub-committee chairmen to ensure that the developing book was a harmonious document that achieved his objective — rationalization of the need for government to adopt and implement a policy of strong financial support for university-based biomedical research. The Academy's Board of Directors, of which Handler was the chairman, certified the validity and reliability and accuracy and wisdom of the book. "Accordingly," Handler wrote, "we are pleased to offer this book to all those concerned: to responsible administrators of the executive branch of the federal government, to the Congress, to our colleagues in science, to academic administrators, to foundation executives, to students, and to practitioners of fundamental or applied life sciences and all their counterparts outside our own national borders."

Although many scientists and Academy employees had a role in the biology project, the evidence clearly indicated that Handler was the sole controlling force and the actual author of the resulting book. There was an exact correspondence between the science policies it advocated and the policies Handler had long championed; moreover, the book contained no disagreements, opposing or contrary opinions, or even an indication they existed. The opposite was true. Handler reinforced the fiction that one voice could speak for biology by systematically excluding from the book information that would suggest otherwise. He did not reveal his hegemony over the goals, scope, timing, and cost of the biological project, or the dynamics of the process that produced it. He did not disclose he had paid for the biological project by arranging for donations of half a million dollars from the Institutes and the Foundation, two organizations over which he held sway, or that he completed the project only after acquiring control of the Academy's Business Arm and directing it to provide the resources he needed. He did not provide any details about how he selected the members of the sub-committees; the book contains no discussion of who else was considered and gave no indication of what alternative, equally qualified sub-committees might have concluded. He did not explain why readers should believe he had actually molded a large group of diverse scientists into speaking with one voice, or why he prevented them from commenting on the nature of the molding process. He did not allow any sub-committee member or Business Arm employee to publicly discuss any aspect of the project or any contribution they may have made to the book; everyone who participated in the project was barred from making any public comments about the book that might undermine the appearance of complete unity. He did not include information about changes or revisions to avoid projecting a sense of contingency, and for the same reason he omitted minority opinions and alternatives to avoid highlighting the roads not taken.

The book was Handler's testament to his conviction that what biochemists had already accomplished was true and reliable evidence of the power and promise of biochemistry to solve all of mankind's problems. It had the tone and tenor of a sacred writing whose author was a participant or witness to all of mankind's interactions with biochemistry. It was exhortatory, like

a book in the New Testament, but without an ethical motif such as adhering to God's commandments. Instead, the repeated idea in the book that colored every major idea, observation, or conclusion was a financial motif of government funding for biochemical research.

Handler and the several hundred co-authors he chose, speaking with one voice, described what biochemistry had accomplished and estimated the biochemical knowledge required to satisfy what Handler perceived to be the needs of society for the remainder of the century. Obtaining the needed knowledge, Handler asserted, required increased federal spending for biochemical research that would, he assured the reader, produce societal benefits that far exceeded the costs. He said when he began the biology project four years earlier, he believed public support of biochemical research "to be among the greatest investment bargains available to the American people," and after having completed the project he knew that to be true.

A dozen chapters were textbook descriptions of biochemistry interlaced with rhapsodic assertions concerning the merits of biochemistry. Handler's fundamental assertion in the biochemical chapters was that pointillist biochemical research paid for by the government but controlled solely by the biochemists who performed it was essential if mankind were to enjoy a healthy and happy future in a hazard-free pollution-free world. His enthusiasm for the idea shaped and guided the voice that spoke throughout the book, often emotionally and aesthetically rather than scientifically. In an early chapter, Handler asserted that biochemists were the true scientists of biology and that "The theme of this book is that life can be understood only in the language of chemistry." A little later, Handler predicted that all unanswered questions in biology would soon be answered by biochemists. "The work of thousands of biochemists showed that all phenomena manifested by living things could be explained in terms of biochemistry. Although much remains to be learned, biochemists have no doubt that all the answers will be found in the near future." He added, "The only two major questions that remain unanswered are how does life begin in a solution of chemicals and how does a solution of chemicals create a mind."

Further along, after glorying in how far biochemistry had come, Handler revealed foreseen contingencies that haunted biology's future and outlined a plan to overcome them: "In the final essay on biology and the future of man are presented some of the major challenges for today and tomorrow. If these are met with vigor and determination, a shining, hopeful future lies ahead. If apathy, indifference, and cupidity outweigh determination, man could be defeated by his own biology." He emphasized the existential nature of the immediate challenges. "The time of decision is at hand," he said, and added and that there were "momentous decisions man must confront tomorrow." In a tone of great happiness, he declared, "It will be evident that the huge intellectual triumph of biochemistry in the past decade will, in all likelihood, be surpassed tomorrow — to the everlasting benefit of mankind." Handler completed the textbook chapters by euphorically affirming the central importance of biochemistry, "Biochemistry provides the closest insight man has yet obtained of the nature of life, and therefore of himself."

Some chapters dealt with what Handler called "matters of current social importance," which he identified to be pesticides, pollution, the relation between biochemistry and medicine, and his idiosyncratic ideas about ecology and agriculture. His metaphor for

confronting the matters was that of mankind at a fork in a road where one path led to a promising future and the other to darkness. The chapters essentially were pleas to the government to recognize that a healthy population and strong economy were critically dependent on resolving the matters he identified, assertions that only biochemical research could do so, and warnings of dire consequences for the future of mankind if his advice were neglected.

Handler concentrated on what he called the “pesticide problem,” the safety of consuming food that contained residues of DDT. He characterized the problem as a premier example of the government’s misguided policies regarding assessment of the consequences of technology. He presumed levels of DDT residues in human tissues “were of low enough toxicity for general use,” and likely to remain safe even if they increased. Handler asserted that the government should not ban DDT because of unfounded health concerns but rather should protect the interests of the chemical industry and farmers. During the period of continued DDT use he recommended, Handler urged initiation of research on animals and human volunteers fed diets containing DDT to ascertain any toxic effects and, if found, further studies of biochemical mechanisms responsible for the effects. He said the government was justified in establishing safe level of DDT residues on crops only after all the research he described was completed, and the results unequivocally proved toxic hazards occurred which could be explained biochemically.

He did not address the reality that biochemical mechanisms interested only biochemists and were irrelevant to the safety issue in the sense that harmful effects demonstrated in gold-standard studies on animals directly proved particular DDT levels were unsafe, irrespective of biochemical considerations. It was as if he had a walnut-sized brain that could not grasp the fact that gold-standard studies demonstrated the existence of a health risks, and biochemical studies he proposed were solely of academic interest. Undaunted, Handler concluded the government should apply his policy for technology assessment of DDT to all cases of possible health risks from side-effects and pollution.

Handler seemingly acknowledged pollution-induced cancer was a reality, “It is abundantly clear that humans are surrounded by chemical agents that can produce cancer under certain conditions.” But his subsequent comments revealed his conviction that a link between environmental chemicals and cancer was only a theoretical biochemical possibility, not an existential public-health problem. Handler asserted that a chemical could not be regarded as a cancer-causing agent until the level of the chemical in the environment was shown capable of causing cancer in animal experiments, and the chain of biochemical reactions was proven beginning with the presence of the chemical agent in the human body and culminating with the actual occurrence of the cancer. Nil chemicals met Handler’s criteria; consequently, he could provide no examples of his recommended policy in action.

Handler advocated adoption of unethical research policies never seriously proposed by an erstwhile responsible influencer of governmental policy. He proposed that the government permit industrially produced chemicals to remain in the environment until “careful epidemiological studies” of their putative connection with cancer were performed. Essentially, his proposal called for the intentional use of unsuspecting humans as experimental subjects in studies to evaluate the safety of the chemicals. Additionally, Handler advised against regulations to protect against cancer, and he reiterated his position that the government should err on the side of protecting the polluter rather than the public.

Handler's formulaic approach to all the issues he discussed in his book was to describe the problem he saw, propose a solution based on biochemical research, and paint an optimistic picture of the future while expressing confidence the government would do the right thing and fund the needed research — the chemical-cancer problem was no exception. He wrote, "The goals of elucidating the causes of cancers, and means of preventing them, are worthy of a major continuing effort." He emphasized that the goals could not be achieved on a fixed time scale, like an engineering problem such as sending a man to the moon, because cancer was a problem in biology. But he wrote optimistically, "The complex, frustrating problem of cancer is giving way, but slowly and grudgingly to research," and that "The outlook remains bright toward reaching, through research, the goal of prevention of many kinds of cancer in man." Handler conditioned his buoyant view of the consequences of providing adequate government financial support for biochemical research, using the saccharine rhetoric he commonly employed to elevate biochemistry's potential for good. He wrote, "The task of restoring and then maintaining the quality of our environment, of identifying and tracing the origins of all the potentially hazardous factors, of discovering their capacity for injury, of stipulating non-injurious amounts, of preventing injury in an increasingly complex technology, may seem to be impossible." However, he asserted, "With the imaginative collaboration of dedicated scientists, with the support of industry, with the understanding assistance of legislators, a wholesome environment can be achieved." Therefore, he concluded, there was "a reassuringly sound basis for optimism" that a healthful environment was realizable.

In a chapter on the relation of biochemistry to clinical practice, Handler depicted medicine as entirely dependent on biochemical knowledge, as if the practice of medicine began only after biochemistry was discovered. His characterization of medical practice skinned and eviscerated it of any historical or inherent scientific foundation, all of which he imputed to biochemistry. Handler's message to the government effectively was that if it wanted medicine to advance, biochemical research must be well funded. He hammered on the notion that medicine was entirely dependent on biochemistry for "Progress toward the social objectives of good health, cure of disease, and increased quality of life." He said medical research lacked a "conceptual framework," and praised medicine only to the extent it had adopted the principles of biochemistry. Because it had the wisdom to do so, he said, "The phenomena of life are being understood to a degree that is truly revolutionary. He was at pains to explain biochemistry's importance: "Superficially it may appear that the advances in medicine were due to clinical investigations," but "they were actually made possible mostly by advances in biochemistry." "To be sure," he wrote, "medicine has achieved success by outright empiricism, but the returns have been relatively poor and the price high.

In an essay with the same pretentious title as the book, Handler adopted the verbal posture of a visionary and described what he saw as the nature of man, the great hazards humanity faced, and the opportunities available to humanity if it chose to follow wherever the road of basic biochemical research led. The nature of man, according to what Handler wrote, was that of a social being whose thoughts and character were "expressions of inherited genes" and whose future will be determined "through man's political leaders." Consequently, he asserted, the more that biochemists discovered about the genetic basis of the behavior of humans and their leaders, the more their aberrant behaviors could be avoided.

The great hazards Handler identified were war, overpopulation, and the environmental degradation that that stemmed from the development of technology. Regarding war, Handler berated the obvious; nuclear weapons were “sufficiently powerful to make complete extermination of man a possibility,” “some of mankind would probably survive a nuclear war,” and “there can be no guarantee that mankind could reconstruct civilization.” His comments about overpopulation exactly matched what he had offered for years in testimony, speeches, and interviews — essentially, that overpopulation was mankind’s greatest biochemically-based problem.

Handler addressed the hazards of chemical technology and distinguished between his notions of health hazard and health risk. He defined health hazard as an adverse physiological change caused by a chemical agent that entered the body and induced a known series of biochemical reactions. No chemical should be viewed as a health hazard, he said, unless it produced toxic effects by means of a proven cascade of biochemical reactions. The example he offered was the occurrence of blue skin in people who ingested nitrates by drinking polluted water, which caused low blood oxygen levels owing to biochemical reactions detailed in textbooks. He asserted what was called a health risk was only a psychosomatic fear which lacked a biochemical connection with an environmental chemical agent. He objected to inferences of health risks from gold-standard studies on rats and dogs because biological effects observed in animal studies were uncertain in humans. His attitude was that biology was biochemistry which consisted of chemical reactions that, when they occurred, were never uncertain and for that reason he asked rhetorically, “from whence uncertainty?” A heavy preponderance of biologists, medical researchers, and physicians viewed a health risk as something real, but none spoke in the book. It contained only Handler’s voice, and he begged the question of the existence of health risks — he assumed that a health risk had no biochemical basis and argued it was an unreality because it had no biochemical basis.

Handler called for a weighing of the benefits technology produced against its adverse consequences — which he variously labeled risks, hazards, or dangers, mostly risks — to determine whether the risks were socially allowable. But the weighing process as well as the that for assessing risks and benefits were subjective and ideologically driven. He routinely assumed risks were minimal and the benefits of technology were obvious and substantial; consequently, his weighing of risk against benefits always favored the industrial stakeholders. He exemplified the operation of his notion of risk-benefit analysis using the safety of DDT saying, the need to “balance the great benefit of food production against the risk to public health” indicated that “the risks of exposure to DDT were acceptable.”

The environmental policy Handler touted reflected an extreme viewpoint — freedom for technology to develop regardless of the resulting environmental risks. He intended his risk-benefit construct for use in connection with risks from all industries whose products were linked to side-effects and pollution. Handler opposed regulations that required industry to provide evidence of safety; he criticized requirements that industry disclose health risks uncovered by its secret research; he objected to regulations that prohibited industry-sponsored experts from testifying in Congress or the courts that there were no health risks when the industry had evidence they existed.

Handler did not discuss the social justice aspect of the policy he urged the government to adopt, that of supporting the industry's economic position at the expense potentially endangering the health of people who were unknowingly exposed to environmental chemical contamination. Growing up in New York City he was politically liberal. At Duke, where Jim Crow laws severely restricted the social freedom of black people, Handler quickly learned to keep his opinions about social issues to himself, and he rose to a position of influence. Even so, he manifested his latent sympathies in wily ways. One day, an avowed racist, who controlled space allocation in the building that housed Handler's biochemistry department, ordered the sign "Whites Only" painted on the bathroom doors. At night, a biochemist in Handler's department used acetone to surreptitiously remove the sign. The surgeon demanded Handler disclose the identify the culprit. Handler, who opposed segregation and had supplied the acetone, denied knowing who was responsible. The surgeon repainted the sign and the biochemist removed it again, and the surgeon again sought the identity of the perpetrator from Handler, but to no avail. The scenario was repeated many times until the surgeon eventually gave up the fight. Because of Handler, the building became the first desegregated location at Duke. However, by the time Handler became the head of the Academy and published his book, he had scant interest in the social justice implications of the policies he pursued. His concerns were securing a permanent stable supply of money for biochemical research, growing the objective edifice he believed science to be, and ingraining the mentality of scientism into society, concerns which aligned well with the interests of industry. Handler chose to use the Academy's aegis to defend the financial interests of industry at the expense of the health interests of the public, mindless of the social justice implications of his actions.

During his career, Handler used Duke University, the biochemical societies, the Institutes, the Foundation, and his silver tongue which he displayed more than a hundred times when he testified before congressional committees, Handler raised federal funding priority for biochemistry to great heights in science and technology, reaching a level second only to engineering, the specialty that developed technology. But his level of success plateaued. He produced a glut of biochemists who were employed by federal grants to do pointillist research that summed to nothing. The government, prompted in part by the apparent aimlessness of the research, reduced support for biochemical research and education. From Handler's perspective, the most important problems facing society were primarily biological, and biochemistry was the language in which the solutions to all problems in biology were written; consequently, he condemned the funding decrease as "irrational" and set about trying to reverse it. He pursued the objective continually while he was chairman of the board at the National Science Foundation and head of research planning for a presidential commission on how to best fight disease, constantly pleading for money. In the process, he misrepresented biochemistry by promising that cancer and other major diseases would be conquered, even though the evidence suggested, at most, only a remote likelihood of success. He misleadingly claimed that more biochemical research would result in clear-cut economic benefits, even though economists had only a dim understanding of the role that biochemical research played in economic development, if any. Despite Handler's efforts, the annual decreases in funding for biochemical research continued. But he did see himself as a failure and initiated an unconventional publicity campaign to secure passage of a law that

would guarantee funding for biochemistry and place it at the pinnacle of U.S. science. The law would require spending fifteen percent of the nation's gross annual product on basic research. Handler's idea was that university biochemists would sup at the trough of public funds, with the permission of a biochemical advisory panels appointed by senior biochemists. But Handler's proposal gained no support outside the several dozen biochemistry societies that formed his constituency.

Handler created the biology project to once again make his case for government recognition of biochemistry's crucial importance to society and for the necessity of permanent stable financial support by the government. To carry out the project, he surrounds himself with malleable biochemists who acquiesced to his perspective, which insured the book spoke in his voice. The project cost more than a million dollars, lasted four years, and involved many hundreds of workers, all of whom he appointed or hired, and directed. In the resulting book, Handler made the same urgent pleas for recognition of the societal importance biochemistry and society's responsibility to fund the endeavor adequately, the same pleas he had made many times previously in many settings except that, this time, he was the most well-known and politically powerful scientist in the nation and his words bore the imprimatur of the National Academy of Sciences.

Nevertheless, in the end, the book and the biological project that spawned it were epic failures in terms of impact on the contemporary culture of science, far greater than his previous failures to explain and elevate biochemistry and achieve a high level of stable funding for biochemical research. The foremost American journal of science criticized Handler for failing to identify areas for research or to specify major questions and problems. The premier English science journal said the book failed to live up to its promise of discovering the strengths and weaknesses in basic biological research, but rather was only a memorandum on biology, largely unrelated to its title except when it highlighted Handlers personal priorities — overpopulation, environmental pollution, and overcrowded cities. The national medical association said the book was a spotty review of basic biology, and a journal that reviewed books in biology recommended Handler's book only to teachers of introductory biology. The book was not taken seriously by the Administration or the Congress, and none of Handler's recommendations were adopted.

Handler's claim that that biochemistry could provide answers to all problems in biology was substantially rejected by politicians, economists, sociologists, and the science press. The strong negative response to his book essentially ended Handler's dream of guaranteed perpetual funding for basic biochemical research, and his aspiration that the government would recognize the primacy of biochemistry in science. Handler turned his gaze toward shaping the structure and processes of the National Academy of Sciences into a platform suitable for advancing the aspects of his ideology view that he thought still remained politically viable. He could take solace in the realization his metaphor for biology as a machine survived in the form of unvetted government support for the kind of biomedical research he fostered at the Institutes. Although profoundly wrong — because biology was a process not a machine — the scientific establishment of his time was insufficiently perspicacious to recognize the error. The evil of a purely reductive biology survived as a long-lasting taint of government supported biomedical research.



