

Chapter 22: What Survived Version 2 2026¹

The Man Gone; the Idea Remained

Time passed. The memorial voices faded, the speeches ended, and the Academy returned to its ordinary business.

Philip Handler's name remained in archives, reports, oral histories, and recollections, but the animating force was gone.

He no longer stood before congressional committees, university audiences, presidential advisers, Academy members, or journalists, speaking in the commanding cadence that had so often made his preferences sound like conclusions.

No more did he appoint and govern committees, develop policies, frame questions, or translate biochemical ideology into national purpose.

Handler disappeared from the scene and his personal authority disappeared with him.

The offices he held at Duke University, the National Institutes of Health, the National Science Foundation, the presidential board of science advisors, the Veterans Administration, several pharmaceutical companies, and the National Academy of Sciences passed to others.

The institutions he influenced — professional societies, executive-department agencies, congressional committees, business corporations — turned to others for advice.

The organizations through which Handler had acted remained, but his hand had been removed from the levers of authority.

Nor did the larger ambition of his public life survive in the form he desired.

Handler wanted science to occupy a privileged place in American public life and scientists to function as trusted arbiters of complex national questions.

He sought to position the Academy as an authoritative counselor to government whose judgments would carry the force of disinterested expertise.

He called for democratic society to accept the guidance of scientific elites, believing they possessed the proper language of truth.

However, Handler's ambitions did not prevail.

1

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Science did not become a sovereign fourth estate.

The Academy receded from the commanding place in public life that Handler had sought for it; the zealous advisory enterprise he had expanded did not remain the commanding apparatus of national policy.

Scientists did not acquire the stable public authority he imagined.

In that sense, much of Handler's world vanished.

The papal office he imagined for science did not endure.

The Academy's prestige did not produce permanent dominion.

The public did not simply bow before scientific authority.

Federal agencies did not become obedient instruments of Academy wisdom.

The ceremony of science remained, but the central throne Handler envisioned became far less imposing than he had hoped.

Yet the disappearance of the man and the diminishment of the office did not mean the disappearance of his historical influence.

Some of his ideas survived precisely because they ceased to appear personal.

Many assumptions he defended survived because they became embedded in the ordinary procedures of federally supported biomedical research.

That was the deeper consequence of Handler's life.

His speeches were no longer heard, but many of the assumptions they defended remained active.

The thousands of committees he appointed to provide scientific advice evaporated, but the evidentiary hierarchy they validated persisted.

His authority as an individual passed away, but the definition of biomedical science he helped institutionalize continued to shape the direction of federally supported biomedical research.

Thus neither Handler's personal authority nor the commanding Academy he had attempted to construct survived.

What did live on was the institutionalization of a definition of biomedical science: that biomedical knowledge would be treated as most legitimate when it could be expressed in biochemical, molecular, or reductionist terms.

Research questions that fit the definition would receive respect and continuing support.

Those that did not fit would struggle to obtain the same standing, even when they concerned matters of obvious human importance.

This limitation on what survived was not accidental, but rather followed from the historical work Handler had done across several decades while occupying many positions of authority.

He had not acted through only one organization.

He had acted through a department, professional societies, federal advisory bodies, research-funding agencies, presidential science-advisory roles, corporate boards, the Veterans Administration, the National Science Foundation, the National Institutes of Health, and finally the National Academy of Sciences.

Each position gave him a platform, and each platform allowed him to defend the same central proposition in a different institutional language.

The proposition was that properly conducted biomedical science must proceed through reductionist inquiry and that knowledge produced by biochemical analysis of the parts of living systems deserved the highest scientific confidence.

That proposition was never harmless; it was stringent, even when expressed in polished language.

Handler did not merely prefer reductionism.

He treated it as necessary and sufficient for the future of biomedicine.

He believed the mysteries of health and disease would ultimately yield to biochemical explanation if enough money, time, and talent were directed toward the task.

He did not present reductionism as one useful method among others, suited to particular kinds of questions and limited by the nature of living systems.

He presented it as the privileged path to biomedical truth.

That was a historical error.

Handler's confidence arose from one of the great scientific successes of the twentieth century.

Reductionist investigation had transformed physics and chemistry by revealing the laws governing the behavior of matter and the reactions of molecules.

To Handler, the continued application of the same methodology to biology promised an equally comprehensive understanding of life.

His mistake lay not in recognizing the power of reductionism, but in assuming that the extraordinary success of that method in simpler systems necessarily established its sufficiency for understanding living organisms.

In physics, using reductionism, beginning fewer than fifty years before Handler was born, physicists discovered the fundamental mathematical laws that governed the behavior of inanimate matter.

In chemistry, also using reductionism, about the time Handler was born, chemists began discovering reactions in test-tubes between nonliving chemicals extracted from living systems identical to reactions in living systems by which they extracted chemical energy from food.

But unappreciated by Handler and the earlier biochemists, living systems were not merely collections of nonliving components.

They were open systems in the sense of exchanging matter and energy with their environments which meant —unlike the closed systems studied by physicists — changing irreversibly over time, adapting, regulating, failing, healing, aging, and dying, processes that do not occur in closed systems.

Handler's error was not that he advocated reductionism to study chemical fragments extracted from homogenized cells

No serious account of biomedical science could deny the value of such methods.

His error was that he helped elevate biochemical methods into a governing definition of biomedical legitimacy.

The ultimate result was an artificial border, based on ideological considerations rather than scientific merit, between biomedical research funded by the federal government and research that was not.

Studies of molecular mechanisms, biochemical pathways, genetic disorders, infectious agents, and drug interventions fit the definition, and were readily supported by government agencies and departments.

Direct studies of the causes of chronic disease, growth regulation, regeneration, physiological stress, bioelectric regulation, healing, and life itself, did not fit in the funding framework with anything even resembling comparable ease.

The first group of questions received institutional continuity.

The second remained marginal, underfunded, or perpetually premature.

That border did not need to be announced as a prohibition.

It operated through ordinary decisions: a grant not funded, a proposal judged speculative, a method called insufficiently rigorous, a field treated as immature, a committee appointed from one evidentiary tradition, a report framed around mechanism rather than organism, a young investigator trained to ask questions capable of surviving review, or a journal editor assuming that molecular explanation was deeper than system-level observation.

Over time, these decisions formed a landscape.

The rules Handler helped secure in the 1960s did not need to be defended forever in his name.

That was precisely their power.

Once embedded in the institutions directing federally supported biomedical research, they could continue without requiring continued allegiance to the man who had helped establish them.

The National Institutes of Health was the most important of those institutions because it dispensed the largest share of the money that determined what kinds of biomedical research could mature.

The National Science Foundation, the Veterans Administration, and the Department of Defense contributed in their respective spheres.

The National Academy gave official sanction, prestige, and intellectual cover to the same narrowing of method.

Together, these institutions helped define not merely which projects received support, but what kind of biomedical question appeared legitimate.

What remained after Handler died was not his intention, but the world of biomedical knowledge his definition of biomedical science helped create, as that world was reflected in the historical record he helped leave behind.

At the general level, the answer was that biomedical science continued and

biomedical knowledge expanded enormously.

Molecular biology, genetics, pharmacology, and biochemical mechanism advanced..

At a more relevant level, the answer was more specific and more troubling.

Federally supported biomedical research remained organized around a narrowed conception of legitimate inquiry, and that narrowing continued to obstruct understanding of many of the biophenomena most important for the protection and advancement of human health.

The Institutionalization of Reductionism

Handler did not create biochemistry nor base its methodology on reductionism.

Those developments occurred during the generation that preceded his, and he first learned about them reading *Arrowsmith* and listening to lectures by his college biochemistry professor.

Handler played a major role in securing the creation of one National Institutes of Health institute, but over three decades he influenced funding priorities extending across the entire system.

The National Science Foundation was created during Handler's ascendancy to national prominence, and he influenced its policies for funding science, including biomedicine, during his many years as its chief governing officer.

For several decades, Handler provided advice regarding what constituted proper biomedical research to the Veterans Administration and the Department of Defense — both when asked and on his own initiative — that had a material effect on their respective policies.

For twelve years, Handler served as the head of the National Academy of Sciences.

He personally appointed each member of thousands of Academy advice-providing committees, and routinely exercised his right to make any changes in the committees' reports he deemed necessary.

Handler did not create the federal system of support for biomedical research, but throughout his career he encouraged policies that supported the exponential growth of reductionistic biochemical research, and opposed development of biomedical research initiatives that were not based on the principle of reductionism.

But Handler alone did not decide the fate of American biomedical science.

Such a claim is not supported by the record and would distort the nature of his importance, which lay elsewhere.

Handler's historical significance can be understood on the basis of a distinction between influence and institutionalization.

His personal influence depended upon his living voice, but the institutionalization he fostered continued after that voice was gone.

He helped institutionalize a definition of biomedical science that treated reductionist inquiry as the governing standard of legitimacy.

Handler did so not in one dramatic act, but through repeated acts of administrative judgment, public advocacy, committee leadership, professional organization, funding influence, and rhetorical defense.

He stood at several junctions through which scientific money, prestige, policy, and legitimacy passed, and at those junctions he defended the reductionistic conception of biomedical knowledge.

That conception became institutional when it entered the routines of organizations.

When that occurred, it was no longer just an idea held by one man.

It became an idea embedded in review panels, funding criteria, advisory committees, professional training, and scientific vocabulary.

In the process, the idea became much harder to see as nothing more than ideology — it looked like the natural order of things.

Young scientists did not need to be told that proposing studies of biochemical mechanisms would greatly strengthen the likelihood that a grant application would be funded.

A biochemistry department chairman did not need to be told that molecular-level work carried prestige.

A review panel did not need to announce that system-level hypotheses were disfavored because that assumption had already been absorbed and became common knowledge in the domain of biomedical research.

Handler's methodological preference became an administrative expectation.

The preference began as his judgment about how best to study nature, and with his encouragement became an institutional rule about what kinds of studies deserved support.

Eventually, it became a definition of serious research.

A proposal that fit the preferred method appeared rigorous; one that did not appeared vague, speculative, or insufficiently mechanistic.

The distinction need not have been malicious.

Indeed, it operated most effectively when it was experienced not as exclusion, but as common sense.

Handler helped make reductionist dogma appear as scientific common sense within the institutions that funded, supported, conducted, and interpreted biomedical research, while alternative approaches increasingly appeared dubious, unsupported, or marginally scientific.

Handler did not demonstrate that reductionism was sufficient to explain chronic disease, healing, regeneration, bioelectric regulation, or life.

He did not show that the behavior of living systems could be explained solely on the basis of biochemical reactions in distinct parts, nor did he prove that biochemistry was a sufficient language for all biomedical questions.

Instead, he assumed its sufficiency, proclaimed and defended it, and helped secure the institutional adoption of Handlerian reductionism.

His success mattered greatly.

The assumption he institutionalized could survive without being tested for validity, as distinct from a scientific proposition, which always remained vulnerable to contrary evidence.

The assumption continued because it organized money, careers, journals, departments, and expectations.

Unlike scientific propositions, institutional assumptions did not need to continually demonstrate their validity through experiment.

They persisted because they organized the administrative structures within which experiments were conceived, funded, interpreted, and rewarded.

Investigators learned to work within them and not question them.

The preeminence of reductionism in biomedical research continued because those who challenged it were judged by standards derived from the very framework they challenged.

The principal site of this continuity was the National Institutes of Health, where Handler's earliest political success occurred.

He helped shape the NIH's funding policies and it became the dominant institution in biomedical research because of the level of funds it provided nationally, and its power to determine which fields of inquiry could develop over time.

Non-reductionistic research initiatives that were denied sustained funding did not vanish, but remained scattered, episodic, and fragile because scientific authority followed money, and money followed definitions of merit.

Handler's support for peer review of proposed experimentation by the Institutes' panel of biochemical experts — which he personally built into a powerful decision-making entity — rested on his claim that scientists alone could judge scientific quality.

Once reductionist assumptions governed the judgment of quality, peer review became more than evaluation, it became a method for reproducing orthodoxy.

The system did not need to say that emergent biophenomena were unimportant subjects of study.

It needed only to require that biomedical questions be framed in ways compatible with reductionist expectations.

The National Science Foundation, Veterans Administration, and Defense department reinforced this pattern in different ways based on their respective missions.

Each institution adopted the reductionist perspective developed by the Institutes — the nation's major institution for promoting biomedical research — when their mission called for such research.

The National Science Foundation provided a comparatively small share of biomedical funding, but Handler, one of its principal governing figures for many years, helped ensure that its awards reflected decisional standards similar to those developed at National Institutes of Health.

The Veterans Administration funded biomedical research within the medical needs of veterans, but it agreed with Handler's explicit recommendation that its awards would be based on prevailing conceptions of legitimate biomedical research methodology.

The Department of Defense was different.

Its central responsibility was national security, not biomedical understanding.

When biomedical questions intersected military technologies, as in Sanguine-Seafarer, the military had powerful reasons to favor interpretations consistent with its mission.

Its mission did not require a comprehensive understanding of living systems; it required sufficient authoritative reassurance that a weapons system could proceed.

The National Academy's role was also different.

It did not directly control the flow of money into biomedical research.

Its power was prestige, sanction, and apparent neutrality.

During Handler's presidency, the Academy became one of the principal institutional vehicles through which reductionist assumptions received official expression.

Its committees could transform disputed questions into authoritative reports.

Its conclusions could be treated as national scientific judgment.

Its imprimatur could make a narrowing of evidence appear to be a broad consensus of science.

The institutions did not perform identical functions. The National Institutes of Health supplied the dominant funding; the National Science Foundation and the Veterans Administration contributed support within their respective domains; the Department of Defense brought national-security priorities to scientific questions touching military technologies; and the National Academy supplied prestige and legitimacy.

Together, they formed the institutional setting in which Handler's definition of biomedical science could endure beyond him.

This endurance did not mean that all scientists became reductionists in the same way or that alternative work ceased entirely.

Becker, Selye, Dubos, Wolff, Szent-Györgyi, Burr, Brown, and others demonstrated that different questions could be asked.

They also demonstrated that such questions required experimental methods other than Handlerian reductionism.

But under the definition of research Handler instantiated in federal institutions, these methods struggled to become the central work of federally supported biomedical research.

They remained evidence that legitimate biomedical questions could be pursued through methods extending beyond Handlerian reductionism, even though such methods never received comparable institutional continuity.

That consequence was not the triumph of falsehood in any simple sense.

Reductionist research produced genuine knowledge.

It explained many mechanisms. It supported the development of useful drugs.

It illuminated pathways, receptors, genes, enzymes, and molecular interactions.

The historical consequence lay elsewhere.

A method capable of answering some questions was elevated into a standard that obstructed the asking of others.

Biomedical science became increasingly powerful within the domain it had chosen, while becoming increasingly weak outside it.

That weakness was most serious where the public need was greatest.

The public did not merely need explanations of how drugs might alter disease after disease appeared.

It needed knowledge regarding why disease appeared in the first place.

It needed to know what caused chronic disease, what interfered with growth regulation, what impaired healing, what disrupted physiological control, what role electromagnetic energy played in living systems, and what conditions sustained life.

These questions arose only in living, open, organized systems.

They could not be answered solely by studying nonliving fragments.

The institutionalization of reductionism thus produced paradoxes.

Biomedical research expanded dramatically while the direct study of many central biophenomena remained constrained.

Knowledge increased, but understanding did not increase in proportion.

Mechanisms multiplied, but causes remained elusive.

Treatments proliferated, but prevention remained secondary.

The public saw scientific progress, but often did not see the questions which the progress had displaced.

That was what survived Handler most consequentially: not a committee, not a speech, not a presidency, but a definition.

Biomedical science, within the institutions directing federally supported research, continued to be understood largely in reductionist terms.

So long as that definition endured, the boundary it created endured with it.

The question, therefore, was not whether reductionism survived. It did.

The question was what that survival did to scientific inquiry itself.

The Boundaries of Permissible Inquiry

The institutionalization of Handlerian reductionism had consequences extending well beyond the choice of experimental techniques.

As the definition of legitimate biomedical science became increasingly identified with biochemical investigation, the questions that investigators proposed gradually changed accordingly.

This transformation did not occur through any formal declaration that certain subjects were forbidden or that alternative approaches would no longer be tolerated.

The historical record reveals something both more subtle and more durable.

Certain kinds of questions increasingly fit the expectations of the institutions that directed federally supported biomedical research, while others fit them less successfully.

Over time, the distinction became sufficiently familiar that it no longer appeared to require explanation.

This historical development altered the direction of biomedical investigation long before it altered its conclusions.

Scientists seeking federal support for their research formulated hypotheses, selected methods, and designed experiments to resolve problems they regarded as significant.

Yet the selection of problems was never independent of the financial environment within which it would be conducted because research required graduate-student fellowships, technicians, equipment, experimental animals, and physical facilities.

The federal institutions that supported biomedical research necessarily became the principal arbiters of which research programs could mature over years and decades — a reality Handler long recognized and around which he shaped his career.

He adopted, advanced, and defended an ideology in which biochemical processes were regarded as the fundamental basis of life and its regulatory control, while hypotheses assigning comparable regulatory significance to electromagnetic or other physical processes were consistently rejected.

In practical effect, Handler's ideology treated biochemical processes as sufficient to account for life and for biophenomena extending from genetic function and energy metabolism to memory, growth regulation, and chronic disease.

Handler regarded localized molecular biochemical processes occurring in isolated disparate parts of living organisms as the deepest form of explanation.

He never explained how localized molecular interactions in disparate parts of an organism could be integrated into system-level consequences manifested throughout the living whole—health, growth, healing, and life itself.

Handler fiercely denied the possibility that electromagnetic energy had a fundamental regulatory and control role in emergent biophenomena, notwithstanding that it was the only known physical process by which regulatory effects could operate across distance within living systems.

With equal dedication and also without explanation, he expected all physiological observations to ultimately yield to biochemical interpretation — proposed research not expressed in his reductionist language was regarded as incomplete rather than simply different.

This conception gradually became reflected in the criteria by which proposals were evaluated and scientific merit assessed.

The consequence was not that investigators interested in broader biological questions suddenly disappeared.

Rather, their questions increasingly occupied a less secure position within the federally supported research enterprise.

Proposals directed toward molecular mechanisms naturally fit prevailing expectations.

Such proposals could be cast in terms of specific pathways, enzymes, receptors, genes, or chemical intermediates.

Their objectives could readily be described within the vocabulary that had become familiar to reviewers and advisory committees.

Questions concerning the integrated behavior of living organisms, by contrast, required a broad conceptual framework that was outside the realm of reductionist analysis.

Such proposals became progressively more unlikely to be awarded funds by institutional review panels because they first had to justify the legitimacy of the question itself.

This distinction proved especially important in investigations involving chronic disease.

Acute infectious diseases frequently lent themselves to reductionist analysis because the responsible organism or molecular defect was directly identifiable.

Chronic diseases presented a completely different problem.

They frequently developed over long periods, involved multiple interacting physiological systems, and arose from combinations of genetic, environmental, behavioral, nutritional, occupational, electromagnetic, and other influences acting together within the living organism.

Their investigation therefore required attention not merely to isolated biochemical mechanisms but also to the organization and regulation of the organism as an integrated system.

Handlerian reductionism provided no framework for such investigations.

Its emphasis remained upon identifying progressively smaller, isolated, biochemical reactions believed to underlie progressively larger biological phenomena.

Progress regarding how the results of isolated biochemical reactions could combine and integrate to produce system-level phenomena remained limited.

Nevertheless, the ideological expectation persisted that sufficient knowledge of molecular events would ultimately disclose the causes of chronic diseases.

Nevertheless, as biochemical knowledge expanded, direct investigation of the organism as an organized, living system received comparatively less sustained institutional attention.

The consequences extended beyond the problem of chronic-disease causation, the fundamental knowledge of which remained strikingly limited.

Questions concerning growth, regeneration, physiological regulation, memory, biological timing, adaptation, stress, healing, and the role of electromagnetic processes in living organisms likewise required experimental approaches extending beyond biochemical analysis of isolated components.

None of these subjects was excluded from scientific inquiry.

Yet none occupied the central position accorded to molecular biology within the institutions directing federally supported biomedical research.

Their investigators often found themselves required to justify not merely their methods, but the scientific legitimacy of the questions they proposed to study.

This historical development did not arise because contrary evidence had demonstrated such questions to be unimportant.

Nor did it arise because investigators working in these areas lacked ability or imagination.

The record pointed to a different explanation.

As Handler's conception of biomedical science became progressively embedded within advisory committees, funding priorities, peer review, professional education, and institutional expectations, the accepted definition of important biomedical research gradually narrowed.

Questions compatible with that definition advanced more readily.

Questions requiring broader biological perspectives advanced more slowly.

The result was cumulative rather than abrupt.

Each individual negative decision appeared reasonable when considered alone.

One proposal ranked above another.

One committee recommended additional mechanistic evidence.

One journal requested biochemical confirmation.

One department recruited a molecular biologist rather than a physiologist.

One funding program emphasized genetic pathways rather than organismal regulation.

None of these decisions, taken individually, transformed biomedical science.

Collectively, however, they gradually altered the direction in which the enterprise developed.

No single decision redirected biomedical science. Their cumulative effect did.

By the early 1980s, this historical process had become largely self-sustaining.

Handler's personal influence was no longer required because many of the assumptions he defended had become incorporated into the ordinary operation of the institutions directing federally supported biomedical research.

Young investigators entered a scientific culture in which reductionist inquiry in biomedical research appeared not as one historically developed methodology among several, but increasingly as the ordinary language of biomedical science itself.

The consequence was a biomedical research enterprise of extraordinary technical sophistication, capable of revealing biochemical mechanisms with unprecedented precision, yet progressively less prepared to investigate many of the larger biological questions that had originally motivated medicine itself.

Understanding of parts increased dramatically.

Understanding of organized living systems advanced more unevenly.

Molecular explanation flourished.

Direct investigation of emergent biophenomena remained comparatively peripheral.

The historical significance of Handler's career therefore lay not only in the testimonies he gave, the speeches he made, the positions he occupied or the reports he supervised, but also in the enduring influence his conception of legitimate biomedical inquiry exerted upon the questions that succeeding generations of investigators were encouraged—or discouraged—to ask.

That influence extended beyond the lifetime of the man himself because it had become embedded in the ordinary practices of the institutions responsible for directing federally supported biomedical research.

The consequences of that development reached far beyond the scientific community.

They ultimately shaped not only the conduct of biomedical research, but also the kinds of knowledge available to physicians, public-health officials, government agencies, and the public itself.

Those broader historical consequences continued long after Handler himself had disappeared from the scene.

Biomedical Science Redefined

The historical consequences of defining biomedical research in terms of Handlerian reductionism did not become apparent immediately.

They emerged gradually as the institutions directing federally supported biomedical research increasingly defined important biomedical questions in reductionist terms, and organized their support accordingly.

The resulting transformation was therefore less a sudden change in scientific direction than a progressive redefinition of what biomedical science itself was understood to be.

That redefinition influenced the conduct of biomedical research in several related ways.

Alteration of the balance between explanation and observation was a significant consequence.

Investigators were increasingly expected to frame biological or biomedical problems in terms of biochemical mechanisms rather than observations of the organized living organism.

The identification of molecular pathways came to represent a deeper level of explanation than the direct study of system-level physiological behavior and the causes governing it.

This expectation gradually became incorporated into the evaluation of scientific merit, influencing the kinds of projects most likely to receive continuing institutional support.

The redefinition altered the balance between treatment and causation.

Reductionist investigation proved successful in identifying biochemical mechanisms that could be modified and employed therapeutically.

Advances in pharmacology, molecular biology, genetics, and immunology followed.

Yet the same methodological framework proved much less successful in directly investigating the causes of many chronic diseases because they commonly arose within the integrated behavior of living organisms interacting continuously with complex environments over extended periods.

Therapies could alleviate disease without explaining why the disease developed.

A biochemical mechanism might participate in pathology but it could not identify an initiating cause.

Molecular intervention and etiological understanding thus addressed different scientific questions, but Handlerian reductionism consistently favored the study of molecular processes.

The causes of chronic diseases — cancer and neurodegenerative diseases, as examples — remained comparatively underdeveloped within the institutions directing federally supported biomedical research.

The consequences of the narrowing of biomedical science to biochemistry extended beyond chronic disease.

The same methodological emphasis influenced investigations of regeneration, wound healing, physiological regulation, biological timing, adaptation, aging, memory, stress, and other emergent biophenomena.

Research concerning these subjects increasingly confronted the same difficulty faced by any proposed biomedical study whose hypothesis was not couched in the language of biochemistry.

The scientific legitimacy of the broader question typically required justification in the language of biochemistry before investigation of the question itself could proceed.

Electromagnetic biology illustrated the historical process particularly clearly.

During the decades in which Handler exercised national scientific leadership, evidence accumulated that endogenous electromagnetic phenomena participated in growth regulation, wound healing, regeneration, and other biological processes.

Robert Becker's work represented one prominent example, but it was by no means unique.

Similar observations emerged from investigators pursuing different approaches and working in different scientific settings.

Nevertheless, research emphasizing electromagnetic regulation remained institutionally peripheral compared with research organized around rigidly molecular models.

The issue was not the absence of scientific observation.

It was the prevailing definition of what constituted legitimate biomedical explanation.

The distinction between ideology and evidence as the basis for denying research support helped explain one of the central paradoxes of the present-day biomedical enterprise.

During the decades following Handler's presidency, funding for biomedical research expanded, technology advanced, and knowledge concerning genes, proteins, receptors, signaling pathways, and molecular interactions increased.

Yet the direct investigation of many of the organism-level questions that had originally motivated interest in new medical knowledge remained relatively stagnant.

Progress became increasingly measured by the accumulation of mechanistic detail rather than by corresponding advances in understanding the integrated behavior of living systems.

No plausible evidence suggested that investigators deliberately ignored important scientific problems.

On the contrary, the overwhelming majority pursued the questions that their training, experience, institutional environment, and available support encouraged them to investigate.

The stagnation therefore arose less from individual intention than from the cumulative operation of a research system whose priorities had gradually become aligned with Handler's conception of biomedical science.

Scientists continued to perform experiments, publish observations, and expand information, but the expansion of biomedical information was not matched by comparable growth in knowledge directly capable of preventing disease or explaining its causes.

The historical issue was the kinds of questions the institutions that directed federally supported biomedical research most consistently encouraged investigators to ask.

As Handlerian reductionism became progressively embedded within those institutions, the scientific enterprise increasingly rewarded investigations that fit the assumptions of the ideology while providing comparatively fewer opportunities for sustained inquiry into broader organism-level phenomena.

The consequence was not the disappearance of scientific creativity.

It was the narrowing of the principal avenues through which creativity could obtain continuing institutional support.

Biomedical science remained productive, innovative, and technically sophisticated, but it became less methodologically diverse.

The historical significance of this development extended beyond biomedical research itself.

The knowledge produced by federally supported biomedical science increasingly informed medical education, public-health policy, regulatory decision-making, expert testimony, and public understanding of disease.

The scientific questions encouraged within the research enterprise therefore influenced not only laboratories but also the broader framework through which physicians, government agencies, and society understood health and disease.

These consequences did not arise because Philip Handler alone directed American biomedical science.

They arose because the conception of biomedical science that Handler consistently defended gradually became incorporated into the ordinary practices of the institutions directing federally supported biomedical research.

Once that conception became institutionalized, its influence no longer depended upon Handler's continued presence.

It had become part of the accepted definition of biomedical science itself.

The remaining question, therefore, was not what survived Philip Handler, but what responsibility that historical inheritance placed upon those who would subsequently direct federally supported biomedical research.

The Inheritance of Handlerian Reductionism

Handler's successors inherited a functioning institutional framework whose assumptions had become established practices and whose historical origins had largely disappeared from view.

Handler helped construct the institutional framework and embed within it his definition of legitimate biomedical science.

His successors inherited that framework after its assumptions had become established practices and its historical origins had largely disappeared from view.

During the four decades following his death, the principal features of that inheritance remained substantially unchanged.

The institutions directing federally supported biomedical research continued to favor biochemical and molecular investigation, regard molecular mechanism as the controlling form of biomedical explanation, and employ review procedures developed within that intellectual tradition.

They educated young investigators in the vocabulary and methods most likely to satisfy those procedures, rewarded professional achievement within the same framework, appointed advisory committees composed largely of scientists whose careers had developed under its expectations, and distinguished central research from marginal or premature inquiry according to standards substantially shaped by Handlerian reductionism.

They also continued to distinguish legitimate biomedical research from marginal or premature inquiry according to standards substantially shaped by Handlerian reductionism.

The persistence of these arrangements did not depend upon continued admiration for Handler.

Most scientists who entered biomedical research after his death knew little about his career, his ideology, or the controversies through which he had promoted it.

They encountered instead a functioning research enterprise in which the relevant decisions had already been made.

Funding priorities, evidentiary requirements, peer-review expectations, scientific language, educational customs, professional incentives, advisory structures, and definitions of biomedical legitimacy were presented not as historical choices, but as ordinary features of scientific practice.

The resulting continuity did not prevent scientific progress.

Reductionist research continued to produce important information concerning genes, receptors, enzymes, molecular pathways, infectious agents, biochemical abnormalities, and therapeutic interventions.

Its usefulness remained beyond dispute within the range of questions it was capable of addressing.

The historical error was not the continued use of reductionism, but the continued treatment of that method as the governing framework for biomedical research generally.

That error carried a continuing cost.

During the nearly half-century since Handler's death, federally supported biomedical research remained overwhelmingly directed toward questions that could be investigated in biochemical or molecular terms.

Correspondingly, direct investigation of the causes of chronic disease and of emergent biophenomena such as growth, healing, regeneration, physiological regulation, memory, adaptation, stress, biological timing, and life itself received only a small fraction of sustained federal support.

The resulting scarcity of knowledge concerning chronic-disease causation was therefore not surprising.

The institutions supported the study of molecular mechanisms and treatments far more consistently than the direct study of why chronic diseases arose in living organisms.

Scientists working within that system were not free agents who independently determined the direction of biomedical research.

They required salaries, laboratories, equipment, assistants, students, institutional appointments, publications, and continuing financial support.

They necessarily pursued investigations that the institutions directing the enterprise were prepared to fund.

They framed proposals in language likely to survive review, selected methods acceptable to review panels, trained students according to prevailing expectations, and built careers within the opportunities available to them.

Nothing in this history supported Handler's cathedral model of science as purely objective endeavor or his belief that scientists constituted a special class of human beings uniquely capable of separating objective judgment from personal or institutional values.

Scientists remained ordinary human beings.

They responded to ambition, professional recognition, institutional incentives, financial security, accepted doctrine, and the expectations of those who controlled research support, much as people in other professions ordinarily did.

Some scientists challenged prevailing assumptions.

Others produced judgments consistent with the interests, missions, or expectations of the organizations that employed, funded, or favored them.

The point is not that university, industrial, military, or governmental scientists necessarily fabricated results or interpretations.

The historical problem was more durable and did depend upon scientific fraud or intentional deception.

Different employers and funding sources selected different questions, rewarded different interpretations, emphasized different uncertainties, and pursued different purposes.

When university findings threatened important commercial or military interests, industry or military science could produce alternative analyses that emphasized uncertainty, disputed causation, or demanded additional proof.

The resulting contest did not necessarily replace knowledge with falsehood.

More commonly, it prolonged doubt, delayed recognition, and allowed activities carrying possible health risks to continue while scientific uncertainty remained unresolved.

This circumstance made the source and purpose of research funding critically important.

Federally supported biomedical research existed because Congress determined that advancing biomedical knowledge would produce a foreseeable public benefit.

Public money was not appropriated merely to sustain scientific employment, enlarge universities and laboratories, or advance the professional interests of investigators.

Its lawful purpose was public: the acquisition of knowledge expected to protect health, prevent disease, improve treatment, and otherwise benefit the people whose resources supported the enterprise.

Handler had resisted that limitation early in his career. He wanted scientists to receive public money while retaining primary authority to decide what research they would perform.

In effect, he wanted the recipients of federal support both to receive the money and call the tune.

Congress rejected that principle when it required public expenditures to serve foreseeable public purposes.

Handler nevertheless helped create a system in which congressional committees possessing limited capacity to assess competing scientific methodologies appropriated increasingly large sums, while the institutions receiving and distributing those funds exercised broad practical control over the questions that would be studied.

Scientific authority and constitutional authority thereby became jumbled. Scientists possessed expertise concerning the conduct of research, but that expertise did not confer authority to determine the public purposes for which taxpayer money would be spent.

The institutions directing federally supported biomedical research administered public resources; they did not own them.

Their discretion existed within a constitutional system in which Congress appropriated funds, executive agencies administered them, and the public remained the intended beneficiary.

In practice, however, effective accountability by the agencies was weak.

Congress focused upon appropriations, technological achievement, cures, military advantage, and plainly visible scientific accomplishment.

It seldom examined the methodological assumptions governing the research it authorized or the important questions excluded by those assumptions.

The funding institutions therefore acquired broad freedom to perpetuate their own definitions of merit, while facing little enforced obligation to demonstrate that the resulting research agenda represented the full range of foreseeable public benefit.

The historical question left by Handler's career was not whether scientists should continue to use reductionist methods.

They should whenever those methods were appropriate to the problem under study.

The question was whether the institutions directing federally supported biomedical research fulfilled the public purpose for which their authority and resources were granted when they allowed one method — reductionism — to define the boundaries of legitimate biomedical inquiry.

The record indicated that they did not.

Only a small part of the scientifically legitimate range of questions necessary to understand health, disease, growth, healing, regulation, and life received sustained institutional support.

The remaining questions existed beyond a border created not by scientific evidence, but by the institutionalization of Handler's ideology.

The biomedical research enterprise that resulted accumulated enormous molecular detail, developed useful treatments, and supported powerful industries, but produced scant understanding of the causes of chronic disease and the principles that governed the control and regulation of emergent biophenomena.

That was the inheritance of Handlerian reductionism.

Its continuation is no longer Handler's responsibility.

He died in 1981.

Nor can responsibility rest upon scientists, whose employment and research necessarily depend upon the priorities of those who provide funding for biomedical research..

In a constitutional democracy, ultimate authority rests with the public acting through its elected representatives, because the public supplies the resources, bears the health risks, suffers the diseases.

The public — not scientists as Handler would have it — is the only proper beneficiary of federally supported biomedical research. [Too cold.](#) [Too assertive](#) [Too literal](#)

The ultimate beneficiary of federally supported biomedical research was the public, not the scientific endeavor, as Handler would have it, or the scientific institutions entrusted to administer the funds.

The funding institutions were created to administer appropriated funds within the public purposes established by law; they possessed no independent authority to substitute institutional purposes for those public purposes.

Their use of appropriated funds to confine biomedical inquiry within an ideologically defined molecular framework was a historical error.

The historical significance of Philip Handler's career extends beyond Philip Handler himself.

It demonstrates how one man's stringent ideology, advanced through positions of scientific authority and embedded within the institutions directing federal research, could narrow the meaning of biomedical legitimacy for generations.

Whether that inheritance continues is not for scientific institutions alone to decide.

In a constitutional democracy, scientific institutions administer the public trust; the people, acting through their elected government, determine the purposes for which that trust exists.