

## From Mind to Brain: New Emphases on Psychiatric Education

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I cannot be in the company of still active Yale colleagues without having far too many memories. To suffer reminiscences, Freud noted, is to suffer neurosis, and this should probably not be inflicted—even on deserving friends! Nor has Fritz Redlich done anything so drastic, in spite of being busted in bronze and hung in portraits, for us not to celebrate his astonishingly productive present.

I first encountered Redlich's openness to innovation and search in World War II. Later, almost exactly 30 years ago, as a psychologist studying medicine, I enjoyed sharing the excitement of learning at Yale about human biology and about both the depths of the brain and depth psychology. With a provocative dubiety, Milton Winternitz, the founder of the "Yale system," would challenge students—in his view, machined products fit only to grind out A's and B's—to think and dare to investigate. Ideas at Yale were to be actively pursued in the best company available—a range of experts in every department who were curious and willing to lend a hand in developing and transferring technologies and science information in what then were the hardly promising pursuits of the application of biology to psychiatry. The professorial names ranged from Fulton, MacLean, Livingston, Long, Burr, Pribram, Gardner, German, Peters, Powers, Jackson, Darrow, Yannet, Hitchcock, Dollard, Janis, Miller, Delgado, to Barnett, Welch, J. White and—of enormous personal meaning—Giarman; and so many others. Learning from one's peers as a Yale student, and from the vantage of a professor—the peerless, regenerating flow of Yale students, are hallmarks of a Yale education and its science environment. The inventive and determined nurturance of this richly evolving climate of opportunity is what indelibly marks Dr. Redlich's long transit at Yale.

We have moved far from that time when—beyond the limits to consciousness and coma set by energy metabolism—there was no vital chemical link of brain to behavior, let alone to the psychoses. Today we know brain as a highly differentiated and specific endocrine and information-generating organ, and of biochemical and macromolecular sequences in brain function relevant to the pathophysiology of psychotic states. Yet from an era of innocence, we have arrived at a more consequential ignorance. Like general medicine, we now possess a range of potent therapies that can be all too rapidly and mindlessly implemented, and the biobehavioral infra-

structure—the science base underlying their use—is too often uncomprehendingly ignored, as are the social consequences of technology. Medicines, just as devices, can be trivialized as conveniences, rather than fundamentally understood—and respected as but a *part* of the accountable therapeutic activity of physicianly interventions. And they can be overestimated either as menaces or as the sole magical ingredient of therapeutics. Thus one is tempted to say to today's pharmacotherapeutic robots what a pediatrician long ago expostulated to a surgeon: "For heaven's sake, don't just *do* something—stand there!"

Nevertheless, we do have distinct new knowledge to teach and wisely use. I will not spell out a curriculum or opine on specifically how to teach neurobehavioral sciences in psychiatry. I, in fact, am uncertain that specifically designed courses are desirable. We should not, in any event, exempt the preclinical sciences from teaching behavioral biology—for that is, in essence, what biology is all about! Nor would one advocate, in the teaching of the clinical sciences, the omission of psychological medicine, psychosocial aspects of the doctor-patient relationship and the distress of illness—for that is what the practice of medicine has been about. Pragmatically, of course, many of the relevant approaches to brain and behavior will have to be subsumed in courses labeled "biological psychiatry." But this can invite distortions of what general psychiatry—in its real span—utilizes and what basic science precisely perceives. And it is no different a pedagogical dilemma than an undue focus on the psychology of man which can ignore not only drives but the intrinsic bodily functions and limits of psychological mechanisms.

Biological psychiatry is a term I've always disliked. It evokes an image of narrow and rigid mechanisms as counterposed to a broad humanistic concern and philanthropic receptivity to the life of the mind. This is somehow viewed as opposed to the mere molecular "machinery." The events in the engine room are seen as lacking in both wonder and challenge to man's highest aspirations, and as serving only to power the imagination and values of lofty staterooms above. That such distorted "humanism" can be the defensive slogan of the lazy, masking self-indulgence, and that ignorance of design is an affront to the highest comprehension of the human potential, is too often ignored.

In human biology, we don't, in any event, have a Society of Biological Internists, although we recognize special emphases around organ systems or treatments. Psychiatry today—as was the case 30 years ago for internal medicine—is now ready for true specialists in the major disorders and treatments. Hopefully this will not be at the expense of fragmenting its core unity. I would prefer, then, to preach what Redlich so consistently practiced here: whatever areas of psychosocial or biological inquiry enhance psychiatry's understanding of the regulation and development of behavior is welcome and of teaching interest—if it is spiced with a healthy skepticism!

Further, it is impossible to conceive of human biology without concern for the experience of the mind and the events of behavior, or of psychiatry without *both*. Thus biological psychiatry without a behavioral science is as useless as a hammer without an anvil—and if misapplied, perhaps as dangerous. So while psychiatrist-investigators may spend a lifetime tracing specific molecular sequences, the ultimate reference is to behaviors. Nor in clinical science are the advent of pharmacotherapies and various group therapies antagonistic developments. Although the means and mechanisms are different, they both evoke brain operations involving attention, arousal, and the phasings of cognitive or interpersonal processes. I do not intend this as a melioristic view; rather, it is essential to a basic biological viewpoint of man as a part of nature.

What we once called biological psychiatry has come out of the closet, not as a perversion to skew our vision of human behavior, but as a part of the whole. That is how I believe fundamentally it should be taught. And in going from mind to brain, or in teaching pharmacotherapeutics, there is no warrant for us to be mindless in concepts or practice, or ignorant of the life of the socio-culturally tutored mind. If we indeed teach the neurobehavioral sciences in the context of other active psychiatric developments and in conjunction with the preclinical sciences, our ability to educate will occur in the general framework of medical education—of human biology—whether at the pre- or postgraduate levels. The general climate of this effort of medical education deserves some attention because it is highly relevant to what we, in psychiatry, are educating for.

### PROFESSIONAL DELEGITIMIZATION AND MEDICAL EDUCATION

What has always provided the attractiveness of medical careers is the tension between knowledge and its application and the awesome challenge to therefore exercise skilled judgment in the context of specific human need. But these polarities of action and reflection also pose the problematics. There are today obvious perturbations affecting professional roles and practices. In brief, both poles of the dialectic of knowledge and action are simultaneously straining.

One pole is the explosion of knowledge. The other is a pressing focus on distributive justice—on what to do for whom. Toumlin [1] has noted this in the academic disciplines as an intrinsic alternation between the substantive and technological; concerns of how to do it *and* why and value concerns—for whom to do it. There is an alternation between Truth and Justice, echoed in the arts and knowledge disciplines as swings between the formal and the functional, the classic and the romantic, the timeless and the temporal. Biomedicine clearly contains these swings within it; thus the recurring tensions between preclinical and clinical sciences, between education and training, science and its “doings” also reflect the knowledge-action polarity.

Without cataloging the fundamental value confusions epitomized by the Guadalajara rule, few would question that we have for the moment, in broad public policy, lost the balance between public interest, resource allocation and the art of the possible as adjudicated both by scientific evaluation and responsible lay review. The governance of adjudications in science and *control* over the disposition of its efforts and products are different functions. But the contemporary regulatory and legislative clamors strike not only at the very act of medical decision-making, but also at the very value of knowledge and the social institutions necessary for *any* medical system linked to the sciences. The evidentiary process is not identical with the law's adversarial process, nor should we forget that Lysenkoism—imposed by autocrats or by populists—can be the fate of the social institution we call science.

There are a variety of both serious and vulgarized belief systems challenging our educative and professional sanction. These question who it is that should deliver medical care and what the emphasis on medical care should be. Thus general medicine is attacked because it is not exclusively preventive medicine; academic centers, because they foster research and thereby raise expectations; and basic biological and behavioral sciences, perhaps because new findings may expand costly services, but—more disturbingly—because such effort is thought to distract us from human services and social reform.

There is a real need to ration health care and shape public expectations on utilizing expertise. But many are attempting to reduce consumer demand by enhancing

mistrust, or by inventing counterfeit expertise or by diverting attention into various fads and movements. We are thus witnessing a progressive “delegitimization” *both* of medicine as a profession and its science base. Both lay cults and experts now promise to reduce costs and to significantly impact morbidity and mortality by advocating or legislating a frenzy of good hygiene and generalized abstinence.

Psychiatry predictably will then be invited to *make* people behave rather than to develop and apply our burgeoning science base to the major psychoses and biobehavioral dysfunctions. I see no evidence at all that the hard social-psychological research that is necessary truly to understand the evolution of personal orientations to disease and discomfort, or in the utilization of “medicine men,” is being programmed in the current fad of “life-style.” We will ever more frequently hear the call to summon the “behavioral sciences” (whose success in changing the life-style of our youth, or drug cultures, addicts and alcoholics has not been notable) to somehow bring forth their wonders in enforcing compliance with “doctor’s orders.” Psychiatric and liaison medicine have indeed learned something about the behavior and psychological infrastructure of asthmatics, diabetics and many other chronically ill persons; the use of treatment, or of groups and, especially, of self-help movements have been not without value, even not without some savings in utilization of high cost medical services. But none of these efforts are known to be so precise or potent in their effects as to promise significantly to mitigate morbidity and mortality. Nor have decades of effort to change the nutritional habits of “backward peoples” or child-rearing practices been triumphs of applied “behavioral science.” Indeed we know little about the systematic application of ideology to change deeply rooted behavior, in spite of the triumphs of advertising. So, in the name of science, we will hear expectations and emphases which will divert us from fundamental research in the mental illnesses. Further, the thrust will be thoroughly political and fundamentally will accompany the move to a federally regulated “Health Vatican”—a Goebbels’ Office of “Truth in Health.”

In brief, we can anticipate a continuation of the past decade’s radical critiques of contemporary biomedicine. The unifying thread in the new fad is the rejection of the value of the special knowledge base *rather than* a balanced reflective view of the appropriate way and places to apply it. David Musto [2] aptly described the lay cults and radical movements, such as Thompsonism in the 19th century, challenging professional medicine (and not without warrant, if one judges the knowledge base and practices of 1850). The original “family practitioners” were books of the late 18th and 19th centuries in which the mother and women were hailed as the useful service deliverers; professionalism was angrily rejected in favor of herbals, exercises and self-help. The licensure laws in most of the states were repealed. Twentieth century medicine—including psychiatry—must yet negotiate where special expertise, folk expertise and the arts and accountabilities of educational, religious and welfare institutions should play their role in the care of human ills. Nevertheless, there are today a number of educated professionals and “health planners” echoing 19th century anti-medicine.

Both serious and vulgarized belief systems are challenging professional educators and the sanction of education. They emphasize the high costs and dangerous practices of establishment medicine, if not its elitist and male dominated nature, and in one guise or another seek a return to natural remedies and self-help. While most of us can see some very useful correctives in this, the rhetoric of both banal and serious publications is caught in their titles: *The End of Medicine; The Death of Medicine; Pills, Profits and Politics; The Therapeutic Nightmare*, and so on.

No doubt technology and science have, in a supersonic transit of 30 years, brought us to a bureaucratized and impersonalized medicine. For medical leadership, it has had the consequences of a kind of jet lag for those who began the trip. For medicine's institutional arrangements, we can define a cultural lag. Neither academia nor our practicing alumni have caught up with or innovated arrangements with which to keep the balance between personalized care and the delivery of technically sophisticated services. Survival in that adversarial procedure of being a patient in a modern medical center requires not only the skills of medical science, but a kind of Darwinian primitive vigilance and wit. In mercy, we are all victims, so enmeshed within the tangle that third parties are probably necessary for rescue. Yet as leaders struggle to envision ambulatory and primary care as alternatives to the bureaucracies of hospitals (in which we cannot distinguish who is striking, struck or stricken), there may well be a confusion that it is *simply* and *solely* the *site* of training that is equivalent to a sound core education in medicine. So what is at question is not only our capacity to implement education, but the valuing of it. And it is not at all clear as to whether we will have to choose between the polarities of educating and vocational training, rather than an artful conjunction of both.

### UNIVERSITY EDUCATION AND TRAINING

We are indeed moving from a university definition of medical education to that of the normal school. We are in the midst of a huge new ritualized industry of continuing medical education and evaluation which is only a part of the "industrialization" of academic medicine. It is a trend in which the exact sum of each of the conceivably calculable parts is mistaken for the whole; in which the notion of accountability is replaced by countability; and authenticity vouchsafed solely by a syllabus. Credibility is no longer synonymous with creditability; rather than concern with the categorical imperative, we are obsessed by the "category one" imperative!

Training has utility. But the invitation today is to substitute programmed devices for education and to teach psychiatry in the burgeoning primary care area by providing a ritual for drug treatment and a *minimum* of the necessary knowledge base. There are many uses of "training" in the course of education in human biology. The growth of computer and information sciences, the application of behavioral analysis and learning theories not only has advanced the neurobehavioral sciences and experimentation, but has accompanied the kind of analyses of medical decision-making which Feinstein has so probingly advanced for medicine. Psychiatry still awaits this inquiry. Educators increasingly are attending to precise specification of what they are about. Such devices help to teach us how we think, as well as to provide computer programs, algorithms and other incremental aids to learning. Yet the invitation today is to substitute devices for education and to machine a product in terms solely of presumptive (short-sighted) service system needs. It is too soon to know whether or not pharmacotherapeutics and psychodiagnostics, now so crucially linked to therapy, can be wittingly or willingly applied by primary caretakers. If this *can* occur, we will need fewer but far more highly educated psychiatric specialists. That would very much change the level and focus of education!

Thus the need for a thoughtful approach to the transfer of knowledge from the bench to bedside—so-called technology transfer—is clear. But the term is also a Congressional code word proffered to afford an escape from special knowledge and clinical judgments, and to contain costs. Some envision that in our culture we can train as physicians an equivalent of the Maoist foot doctor who will implement the single best average treatment for the average expectable disorder in an average

dosage (legalistically enshrined in a piece of religious literature known as the Package Insert). All of this will be determined by a few Congressionally sanctioned clinical scientists who will be charged with “determining” the relative efficacy of therapeutic interventions, along with a potpourri of peerings by quasi-regulatory and consumer bodies. However, whether or not medicine of necessity will be practiced by the accountant’s computer still leaves in place the unanswered question of whether we are to cultivate and build a knowledge base for the clinical applier. We have, then, yet to resolve the aim and limits for the education of the modal physician of the late 20th century as we shift—and are not too subtly shifted—from professional to vocational training.

The components of medical practice can indeed be rapidly transmitted. Emergency and Army medicine clearly demonstrated this. But the question is whether the paraprofessional and primary professional receiving special training is a part of a system in which competence boundaries are clear and in which patients might receive some of the fruits of what can be delivered in the way of modern diagnosis and treatments with some thread of personal accountability to the individual still retained. It is most of all what is “in the head” of the skilled physician as he does or refrains from doing with the patient—not his doings that comprises true professionalism. *Valuing of this internalized knowledge and the judgment it entails is at issue.*

I mention this strain between education and vocational training because in our solipsism psychiatry sometimes believes that its particular problems of establishing special knowledge or of determining where in the phase of coping with human ailments it is to be applied are unique. We in mental health have, of course, observed among mental health workers in various settings a veritable orgy of role transvestism which clearly blurs what an education is all about. But when we see similar problems of aim and definition of function confronting our mother disciplines in medicine, we have reason to be concerned for the sanctioning of special knowledge.

Psychiatry, I am convinced, must be taught in the community of the clinical disciplines and their basic sciences. But the uneasy link between service and the generation and transmission of knowledge brings into question whether this can be done. The service link today involves such massive cash flow issues as to make it problematic whether universities will long tolerate this fiscal perplexity in their midst. Action and reflection again pose polar tensions as provosts and presidents, basking under the scientists’ grant-contingent overhead lights, peer at their service budgets and see red! Historically no university has been entirely comfortable with its medical school. After all, doctors are people who, while ministering to misery, touch and feel—at least once they did. For our academic colleague in the humanities, touching in teaching might be turpitude—at least before the current crime of chauvinism! So in this uneasy perch, as we think of new emphases in psychiatric education, we must confront the fact that there will probably only be a few university centers and fortunate collections of opportunities, minds and purpose that characterize a university school of medicine.

There is no question that we will emerge from this climate of clamor and disarticulation of our perceptions of the rules of evidence and our valuing of it. We will find some way for appropriate exchanges of competencies between interested parties, be these the public and the profession or the educator and his student. Third parties indeed may help mediate what all of us embedded in our institutions cannot manage to provide alone. Trustees, committees and commissions—when values are heeded and shared—have indeed accomplished this in the history of transitions. Nor will this Kierkegardian catalog of either/or, of thesis and antithesis, be without its

resolutions. But during chaotic and distracting change, it is important to keep in high focus the function and purpose of a professional education. One such function is to mediate and regulate—for both individuals and their social systems—the intrinsic tension between knowledge and its application, standing always on the side of reflection no matter how the null point of this fundamental equation shifts with circumstance.

This social function of education in regulating the tension between thought and action is not dissimilar from other tutoring functions in human growth and development. A part of the aim of medical education is thus a moral one. The aim is for the student to learn in the context of supervised practice how to regulate himself and in so doing how not only to utilize scientific information, but how to regard it when it is not directly useful.

### THE “OUT OF PHASE” GROWTH OF PSYCHIATRY

What I do find auspicious and unnoted in contemporary psychiatry—a development “out of phase” with the decline in medical education—is the way in which both its heritage and new developments are coalescing into a distinct emphasis on the major psychoses and mental dysfunctions. The putative mid-19th-century father of academic psychiatry—Wilhelm Greisinger—was thwarted in his academically centered design for coherent treatment systems. Using his qualifications as an internist for sanction, he ensconced psychiatry within the medical school in Berlin, established bedside teaching (an astonishing necessity to “introduce” the patient and the student-clinician), and provided a clinical emphasis with wards and clinics. He designed half-way houses and different arrangements within the community in the hope of dealing specifically with the various distinct subpopulations which comprised psychiatric work and posed different problems. But organized psychiatry in the rural state hospitals opposed this academically centered coherent design for a differentiated psychiatry.

The problem was—and to a great extent still is—that different populations, conceptually important for psychiatry, are encountered in widely different settings, at different phases of illness, dysfunction and recovery. The challenge for 150 years has been to bring the necessary span of inquiry and expertise to bear and to overcome the relative isolation of clinical activity and inquiry from the scrutiny and assessment of the academic sciences. Almost exactly 11 years ago [3], I noted that Yale was poised to shift the balance between action and reflection through the Connecticut Mental Health Center with both its service challenge and its research base. One could view this shift as a realigning, in the light of modern requirements and knowledge, of the balanced approach developed by Winternitz and the very concept he shared with Hutchins, of an Institute of Human Relations. With the Yale Psychiatric Institute, the West Haven Veterans Hospital programs and the General Hospital facilities, as well as the Mental Health Center and its research in varied disciplines, Griesinger’s problem of a coherent and academically based system has come close to solution in New Haven. One can both apply basic science and generate new knowledge with a range of relevant populations accessible and in mind.

What is striking, and was not generally evident even 10 or 20 years ago, is the distinct clinical focus in which the astonishing developments in the pharmacological and brain sciences are meaningfully tested. The study of patients under treatment and the study of major clinical dysfunctions, rather than of isolated case descriptions, are now modal in the major academic centers. Psychobiological events both in individual

patients and populations can now be noted and highly meaningful hypotheses tested. This is matched by a new psychiatric epidemiology utilizing clinically relevant tools and by follow-up studies that are coupled to a new focus on diagnosis. With relatively non-invasive procedures, the peripheral measures of hormones, amines, polypeptides, single fiber myography [4], supraspinal influence on peripheral motor neuron action [5], eye tracking [6] or evoked potential analysis, all can be logically pursued in the service of important questions bearing on disease and its treatment. What are now known or knowable central neural or biochemical events can more frequently be deduced by peripheral measures in man [7].

Most of the current measures in psychobiology reflect central drug actions, but others are more directly revealing of a sequence of pathophysiological processes. Still others, as traits and markers, are useful to studies of individuals at risk and for pedigree analysis. Such work is useful in bringing more specific treatments—and estimates of their efficacy—to specific subpopulations of depressed and schizophrenic individuals. In brief, while the incidence of major dysfunctions has not discernibly changed over 150 years, the appreciation and recognition of mental dysfunctions, and some degree of specificity in their treatment and remarkable success in preventing relapse, is indeed possible. And if measures of blood levels of substrates and metabolites in man help—as they promise to do—to guide and predict therapy in specific patients, this too should be a major practical gain.

The agonizing irony, however, is that this more differentiated set of observations, hypotheses and interventions has but recently become available because of the momentum and investment begun 30 years ago, and in the current climate could be readily abandoned. Psychiatry, somewhat later than Internal Medicine, now has the need and capacity to subspecialize; one can even predict that the depressed patient could be attended by—or receive consultation from—a psychiatric specialist in depression rather than the renaissance generalist of the past. Thus at a time when general medicine has to face its crises of over-specialization, the development of psychiatry requires subspecialties. At the very time that social forces are retreating from the generation of fundamental knowledge, the explosion of the brain sciences and of skilled biobehavioral scientists with tasks to do on behalf of understanding the mental illnesses require and merit the kind of confidence and support that was forthcoming in the mid-50s for basic knowledge. In this perspective, our gains and capacity to advance are truly out of phase with the times.

#### A PERSPECTIVE ON ADVANCES IN PSYCHIATRIC KNOWLEDGE

This confluence of clinical investigations is based on four developments. One, as noted, is in the arrangement of services. A second is a small cadre of trained investigators who brought both ethical concern, clinical and therapeutic competence and basic science skills to the research tasks. A third—and one often overlooked—is our appreciable transgenerational store of experience in dealing intensively with a wide range of troubled people and their families.

Forty years of psychodynamically centered activities with severely ill but often ambulatory patients have brought us a perspective on the *function* of pathological symptoms and their range of variability in different contexts. The intention of psychiatrists in the 50s to come to know mentally ill individuals as people—not as psychodynamic machines—has been overlooked. The ability to understand a wide range of avoidance behaviors, and not only the subjective meaning of symptomatic behavior, but its linkage to situations, persons and symbols, has enlarged our notion of variability of symptoms and their potential for change. We can offer a keener



assessment of the intensity and fixity or flexibility of only apparently similar presenting problems than was modal 40 years ago. The ability to understand families and the behaviors of various social groups when stress supervenes, as well as our intensive probings of mental life, have provided more than the isolated snapshot of disordered behavior as produced by the rigid, phenomenological mental status examination.

This enhanced canniness about what lies behind and what might evolve from symptomatic behavior represents the beginnings of an eventual psychosocial "anatomy and physiology" of behavior disorder. The proposition that behavior is multiply determined, and the observations of subjective motivational meanings and dynamics attached to all experience, does not, of course, mean that we necessarily, through a glimpse of these processes, always gain significant leverage that is effective for behavior change or the prevention of disorder. Rather, it tells us something of the inevitable functioning of mental life. When we see a patient with pyrexia and right lower quadrant rebound tenderness, we do not insert a probe into the hypothalamus because that is where physiology has taught us that temperature is regulated, but diagnose appendicitis with an understanding of the mechanism of the febrile reaction. Our intervention is proximal and pragmatic, and not a rote replication of physiological facts. And so it is with applications of psychological "anatomy and physiology." We can better identify and assess symptoms and direct our psychological interventions with a better sense of their goal and limited utility. Today there is also a greater emphasis on delineating differences that make a difference, on observation and testing of hypotheses, and on understanding the conditions in which psychological mechanisms operate. What is critical is that these "conditions" frequently are the biological referents of behavior, and manipulation of them an increasingly important therapeutic target which ultimately facilitates the acquisition of optimal psychological functioning.

The dynamic schools of psychiatry also taught us that pausing for self-knowledge in the context of reflective one-to-one relationships could be one of man's adaptive techniques, and a wide range of contemporary interventions either owe much to their psychoanalytic origins and do not admit it, or call themselves psychoanalytic when they are actually quite derivative. It is above all clear that the discovery of the transference has been important to the training of psychiatrists. Indeed its inevitability is an adaptive trait providing not only the potential for growth and treatment, but for nurturance and aid in moments of stress and phases of dependence—and hence is intrinsic to the doctor-patient relationship. I believe it takes several generations to master and sift through the utility of discoveries that reflect on or derive from subjective experience, and especially to learn how to teach and utilize them well and appropriately in psychiatry.

So today we do not advocate practicing the 50-minute hour with each patient, while we hopefully can still teach with "one-to-one." We do not confuse the treatment modality with etiology, or psychotherapy with psychogenesis. Indeed, Redlich's recent re-visit to his classic 1950 study (and I doubt if he fully realizes that the results reflect the accomplishments of his stewardship at Yale) showed, in actual fact, that a shorter, problem-oriented approach, with drugs as needed to help the patient to manage, is modal practice. Thus we expect today's student to differentially diagnose the condition as far as this is possible, but also to diagnose the person with the disorder; his situation; his resources; his preferred mode of learning, and—with these variables in mind—to design treatments which best accord with what is possible.

If in teaching basic biological sciences or diagnosis we do not keep human

psychology in mind, we, of course, will be brokers for a particular position—selling futures on ideologies when we are asked simply to describe both our information and our ignorance. Nor do I see this as a fragmented eclecticism, but as a coherent mode of approach in which several frames of reference must be kept in mind. At the same time there is no retreat from precision of thought and action. Psychiatrists must increasingly anticipate specificity for disorders; they can no longer afford to fail to try to distinguish depression from senility or manic disorders from schizophrenia.

The fourth factor derives from advances in biobehavioral sciences applied as psychopharmacological developments. Many puzzles and perplexities surely lie before us. We have only one partially specific anti-manic drug. Chemotherapy of the psychoses utilizes compounds active in both organic and schizophrenic psychoses. Anti-depressants, though efficacious, are not uniformly so, nor are all satisfactory in their speed of action. While proud and pleased, we cannot be too self preening with these applications. But the current advances in diagnosis and treatment are real in their consequences to patients.

The truly fundamental engine in developing these clinical investigations is the basic science advances. Pharmacotherapies have compelled belief that brain chemistry must be relevant *either* to the etiology of mental disorder (although there is no proof) *or*, at least, to reparative functions—which is true. But what is astonishing is a new domain, a universe of transactions that can be investigated within the brain, providing a biologically coherent logic for pursuit—rather than belief. It is this fundamental knowledge base in brain sciences, linked to physiology, pharmacology and behavioral sciences, that holds such promise for our future ability to deal saliently and rationally with clinical disorders.

#### BRAIN SCIENCES IN PSYCHIATRY

We do not as yet in fact know how far we can legitimately expect to go in comprehending mental disorder or its intrinsic rates of change. We do not know how far downstream from more primary events our current measures of brain function in disease are tapping, or whether we must seek separate factors as determining the occasion and other factors in the form of the psychosis—schizophrenic or depressive—and still others for the maintenance or intensity of symptomatology, or whether (as Griesenger believed) we deal with one rather than with many psychotic disorders. Nor do we know why we cannot as yet predict the specific person, even within high risk groups, who will become actually ill, or why we cannot as yet recognize the *formes frustes* of adult disorder; is it our imperception or because of inadequate fundamental knowledge? We can and have launched longitudinal and prospective studies with biopsychological measures of infants at high risk and we already can identify semi-independent dimensions of behavior that enable us to more sharply differentiate amongst the various psychoses—premorbid status, presenting phenomenology, and social and functional outcome.

And we have tantalizing glimpses into the future. In an extension of the various molecular coding systems which carry out their chores at some distance from the grand double helical design, we now know of polypeptides such as endorphins—the body's opiates. Other receptors specific for valium-related compounds may provoke a search for endogenous substances related to intrinsic defences against anxiety and dysphoria. Another tack is the recognition that morphine—or lobotomy—produce an indifference to internal signals of pain. Are there neocortically linked pathways whereby endogenous or synthetic peptides could produce “indifference” to the internal noise and static to which the psychotic so intensely attends? In brief, new

ways to arrive at rearrangements of internal regulations may be found. But tempting as such futurism may be, our current focus on neuroregulatory substances remain to be articulated with the more complex arrangements of the "triune brain" of MacLean.

That brain is built to behave. Its ongoing behavioral disposition and activity is the key to the influence of the next signal or input for which sensorimotor systems are set or prepared. So-called corollary discharge tells us that overt responses have been internally signalled (to central sensorimotor control systems) before or just as the behavior emerges. And it's best we teach a healthy wariness of conceiving of juices as necessarily "*forcing*" behavioral states upon these ongoing neuronal systems. Precise lesions depleting cortex or hypothalamus of norepinephrine do not affect the regulation of sleep, sleep phases or activation. Amines may influence the quality of linkage, organization and timing—and hence the intensity—of behaviors and hence their adaptive efficiency; this does *not* mean that regulation of basic functions won't occur in their absence. One juice-one disease is not likely. Although we know of drugs that may reliably produce a model psychosis, and of enzymes in man that can produce psychotogens, I know of no synthetic or endogenous molecules—including reserpine—that directly and reliably produce a model depression.

We should thus teach that there may be changes in current dogma—our working hypotheses and metapharmacology—remembering that amphetamine was once a model anti-depressant and currently is a model for schizophrenia; postencephalitic Parkinsonism was an organic model for schizophrenia and current dopamine blockade therapy would have us postulate Parkinsonism as antithetical to schizophrenia. If we today teach well, we need not in the future be caught with our categories down! What is clear is that neuronal assemblies can be studied. Behaviorally relevant basic processes (inhibition, habituation, sensitization, adaptation, and rate control) and regulation of behavioral associations and dissociations, can be increasingly approached. What we can learn about the fundamental dimensions of overt behaviors can be as startling as past discoveries in depth psychology and neural science.

### THE BIOLOGICAL VIEWPOINT IN PSYCHIATRY

Now in spite of my title and charge, it should be obvious that I do not intend a paean of praise for the range of exciting developments in what is called biological psychiatry. Rather, in this broad but growingly coherent base of pragmatically oriented psychiatry, there has been a wide range of relevant investigatory thrusts, and I see biological viewpoints, as well as biological discoveries, as a unifying rather than fragmenting force. Most of our academic forefathers indeed had a major fascination with the mind/body problem: how living matter can accommodate the links of bodily function, subjective experience and overt behavior. The link of nerves, humors, acts and objects can today be found in a wide array of studies in experimental biopsychology, which might help reveal how controls within the brain are organized and linked to the behaving organism and its environmental nutriments. In a deeper sense, this has been the concern of general biology: to establish links between molecules and behaviors, studying the codes which produce the modalities through which the environment shapes biological destiny. General biology is concerned with the adaptation of populations. Those of us who study individuals, raphe nuclei and projections, or *Aplysia*, are similarly interested in adaptation and in a range of responses based not only on predesigned programs—Lorenz's "internal school-marms"—but on the information conveyed by the environment.

All biology is thus insolubly linked to a transactional and developmental view of

behavior: from evolution to embryology, from the ontogenesis of behavior to complex problems of behavior change [8]. We can no longer afford not to appreciate the manifold of nature and nurture, nor to be distracted by fears of reductionism. Perhaps we could borrow the wisdom of Pascal. He wondered why learning—the acquisition of habit—was not natural. And he answered that nature itself was only first habit, while habits are second nature. In our attempts to understand individuality (rather than solipsistically celebrate its subjective manifestations), we can see that it is the very tools of nature that provide for the variability we cherish. The study of isolated systems has shown that it is the very design of the way we are prewired and genetically coded or preset that *requires* individual differences as well as the operation of environmental events for the realization of genetic potential. Similarly, it is mainly in studies of isolated assemblies that, in constructional analysis, the brain reveals itself. From such banal witnesses as fossils, peas, bacteria and fruit flies we construct our knowledge of molecular biology. So the study of design and adaptation of living organisms, their concomitant balance of stability and change, the givens of nature and their peculiar skew towards efficient flexibility for adaptation, is our business.

These views emerge in part out of 19th century physiology and philosophy—from Bernard and from Bergson—and have evolved today to what is known as structuralism or control and regulation theory, or systems theory and the like. In brief, concepts that use the idea of holism—of the integration and coordination and goal seeking and setting of the component parts—are variations of this basic theme. The rules are that the state of the organism changes but not the laws it obeys; the organism—through its mechanisms—tends always towards equilibrium. Regulatory structures are given and so situated as to evolve. They exist to diminish rather than aggravate perturbation, and hence tend towards persistence, redundancy and stability and permit change in the service of this function. With perturbation, the organism regulates itself to move somehow from the disturbance, and with feedback systems to construct new set points and new equilibria if necessary. Thus when we are studying amine levels, or the metabolites in urine, CSF and blood, we are catching a snapshot of a system of regulated equilibria with their compensatory processes, rather than a unidirectional response to perturbation.

Freud in his Project understood the nervous system similarly as consisting of contrivances for transforming external quantity to quality in the service both of survival and minimized perturbation. The transduction of energy and information at the synapse—this change of state—indeed is where modern physiology directly meets the mind/body problem, a change from one state to the next. Regulatory structures evolve in transactions. For Freud, the explanation of vivid states, hysteria dreams and forgetting provided the text through which the operations of these basic biological regulatory principles could be constructed [9]. Sherrington, Eccles and Sperry have also utilized both clinical and experimental data for such models of the control systems through which bodily and environmental needs can be transacted. All try to build a picture of a brain that can conform to the requirements of analyzed behavior. And since Hughlings Jackson, some hope to learn from the operations of brain what components of behavior should more fruitfully be analyzed!

This general mode of biological thought and design extends to our clinical work as well. We see symptoms not necessarily as givens, but as reactions; schizophrenic symptoms as restitutive attempts to cope after some prior and as yet unknown rupture or injury. We can look at depressive agitation—the escalatingly intense self castigation—as some thwarted attempt on the part of the organism to mobilize itself

and reduce immobilizing pain. Our various therapies—from getting the patient angry to drug effects—all aim at the mobilization of the patient into goal directed activity. Physiological and behavioral systems are not static.

Nor should we forget advances in the behavioral sciences. Given the human's intrinsic developmental lags, Freud saw the *specifics* of a neurosis as ultimately based on two factors: "intensity," or factors related to *reception* of input—and "accidental" factors—environmental events. Their timing was crucial. And today conditioning theories are teaching us the importance of so-called "incidental reinforcers" that somehow are so coupled with ongoing behaviors as to lead to maladaptive and entrenched behavior—polydypsia and colitis, for example. The determinants of behaviors that become inflexible or entrenched are not at all well understood. But it is clear that in its disposition to behave, organisms—say a rat working on a simple schedule of reinforcement—can reliably learn these apparently maladaptive responses. It appears that chance-induced events, because of their timing, somehow create reinforcement set points—these then become the determinants of what the behavior is behaving for. Thus while often the behavioral reinforcer can be readily empathized and identified, we know that with certain manipulations animals will work very hard to *receive* electric shock to the feet. We know that humans too manifest rigidities and often incomprehensible repetitive behaviors. For the masochist, it may be that the unconscious guilt and cathartic indignation are secondary to other aims around which the behavior is organized. Perhaps it is not the bruise, but the reliable evocation of the loss of control of the aggressor which is reinforcing. For the addict, the ability to self-administer from moment-to-moment is a mastery which transcends the obvious damaging consequences around which behavior can be powerfully organized. The point is that many such regulations require an objective analysis of behavior to discern their presence and role, however their subjective elaborations are construed. In behavior therapies we know we can treat symptoms as dysfunctions in their own right and that with analysis of the contingencies sustaining the symptom, whatever our ignorance of the origins of behavior, we can help the patient gain momentum that competence and mastery bring, as well as gaining symptom relief. In brief, we know that we learn from many modalities, our muscles as well as our head, as well as our reflection on the backlog of experience. What we do not know are the various timing and other dimensions which account for the apparently meaningless and powerful and often inflexible patterning of entrenched behavior in both man and animal.

Thus among the proximal and distal causative events, it is important to know those which operate under non-intuited rules—march to a "different drummer"—and equally crucial to understand the weight to ascribe to the multiple factors regulating behavior. Man's ability to institute remedial action through organic or psychosocial invention and intervention does not directly correlate, of course, with establishing etiological sequences or preventive measures. We can establish new equilibria; we do not "reverse" what is past [8]. In psychodynamic terms we speak of seeking structural change, and in pharmacodynamic terms of establishing new set points. Digitalis affects the force of cardiac contraction, but analysis of its action does not directly lead us to nor reverse the initial causes of decompensation. The triumph of the aphasic who learns new approaches to utilizing language (and thereby teaches us about the nature, limits and potential of brain processes in language) is no less noble an achievement than the schizophrenic who, with pharmacotherapy, can learn sufficient self-mastery to cope and satisfy some human longings (while teaching us more about the conditions and operations that permit the willful deployment of

attention in affectional and social contexts). In this general approach, a posture of advocacy rather than inquiry can produce future decades of ignorance in our attempt to comprehend what Percy Bridgeman once called “the way things are.” In that comprehension lies the true power and perspective of change in biobehavioral and cultural development.

### THE COMPREHENSION OF MIND

It is the destiny of ontogenesis that we are built to “know” more than we can explicate, to mean more than we can convey; we thus have language intrinsically built for metaphor. Such mentalistic language must be used initially to understand brain and behavior. But in the sequential educational process by which we transcend our givens, we intend to understand the language of brain processes. Thus the brain has a mind of its own! Molecules speak in coded language to molecules, and membranes to membranes, and so forth. So we will do no favor to talk about our drugs as mood changers when we know that they are affecting cognitive, rate and perceptual processes, nor to hint at luridly specific behavioral control when we know that we deal always with transactional and state-dependent processes. And we know that drugs affect stop and start mechanisms, affect thresholds that change the rate and range of signals to which the nervous system responds. This is a far cry from a sole focus on mood or on malevolent behavioral control. We do not have a clockwork orange, not even a clockwork lemon! We do not aim to be controllers of behavior in any event, but rather to enhance self-regulation. In brief, we know, from what we already know of brain function, that there is a kind of order which underlies complex behaviors as it does in the simpler systems with which biology can demonstrate mechanisms. In this sense, reductionism allows—when the sequence of control mechanisms can be described and identified—a clearer understanding of how it is we behave the way we do.

There is much in modern biology to unify our basic approach in psychiatry, whatever our special focus. Many or all of these approaches can teach us something about the limits and nature of material systems through which information is exchanged and coded. I have tried to emphasize that in teaching this we are not losing but gaining in our comprehension of mind. Medawar has referred to the days before empirical truthfulness was thought to be either a necessary or desirable characteristic of professedly factual statements. That we now must seriously attend to factual statements does not mean that they comprehend all of truth, or all of the truth we want to know; nor all the facets of apprehended experience we need to know to tell a truthful story. It is simply that they are a necessary beginning.

So we all face our commonalities with impersonal forces which determine our behavior along with that of the rest of the living species, and yet we seek personal meaning in our brief transit. This tension between biology and the psychology of the self has haunted the history of psychiatry but lies developmentally within each of us [10]. Our problem has been how to rescue the dignity and uniqueness of man for ourselves and our patients, while thoroughly appreciating the descriptions of impersonal biosocial processes—realities that we do not directly apprehend. Insofar as a true behavioral science is requisite for mankind’s survival in the 21st century and beyond, this comprehension will be increasingly necessary. It will be if we truly are to transcend our ignorance of man and his limits, and hence realize how to achieve our potential. Piaget described the child’s developing grasp of reality as he moves from egocentrism and begins to perceive of himself as an “event among related events.” And it is in that relational context that the new biobehavioral emphases in psychiatric

education must continue. It can do so exactly on the generative template of inquiry, imaginative curiosity, and skepticism (i.e., modesty) that Fritz Redlich constructed at Yale.

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