Basic Neurological Sciences in the Medical Curriculum

DOMINICK P. PURPURA, M.D.
Professor and Chairman, Department of Anatomy, Albert Einstein College of Medicine, New York, New York

The past decade has witnessed dramatic developments in educational theory, methods of instruction, and student evaluation procedures at all levels from primary through graduate education. Medical schools have not been sheltered from this turbulence in education. Curriculum reform is everywhere the order of the day in theory, if not in practice. And many a curriculum committee must face up to the Herculean task of defining the basic core curriculum, and the mechanisms by which the individual student's career objectives may be attained while at the same time preserving some degree of faculty-student harmony. Evidently, in considering the role of the neurological sciences in the basic medical curriculum, it is appropriate to examine the possible consequences of curriculum reform, for these will surely have a most profound effect on the future development of neurology and neurosurgery.

It is likely that in the near future neuroanatomy and neuropsychology will no longer command significant independent segments of the medical curriculum. And the same may hold true for required lecture and clerkship courses in neurology and neurosurgery usually given in the second and third years. Combined programs in the neurosciences will be developed in most core curricula, and I would hasten to add that for the most part these combined courses will probably be planned without extensive discussion between basic science faculties and neurologists and neurosurgeons. During the past year we have been intimately involved in implementing a new curriculum at the Albert Einstein College of Medicine. When I assumed the responsibility as Chairman of this Curriculum Committee, I saw as one of the important objectives of curriculum reform the development of a sequence of neuroscience courses extending from the core program through elective or supplementary courses. It was anticipated that this sequence could provide extensive training in the neurological sciences for those students seeking a career in neurology or neurological surgery. It will come as no surprise to learn that I have been accused by some of my colleagues of placing undue emphasis on a strong neurobiology course in the core curriculum at the expense of gross anatomy dissection, biochemistry labs, or other more traditional activities of medical students. Some of these protestations are not without justification, for I have long considered an interdepartmental course in neurobiology a most important feature of the core curriculum. The moral of this story is self-evident—beware of the power of your curriculum committee! It may be on the side of the angels. It is also conceivable that a curriculum committee could formulate a curriculum that might virtually eliminate the basic neurosciences in the core program. In point of fact I learned recently that at one prominent medical school in Philadelphia neuropathology was dropped from the core curriculum as a result of some unfortunate planning. In view of this, perhaps one can understand why that renaissance philosopher W. C. Fields had inscribed on his tombstone the final epitaph, "I'd Almost Rather Be In Philadelphia."

Having stated my prejudices in respect to the role of neurobiology in the core curriculum, it is pertinent to detail some of the objectives envisaged for this course.

Planning for the core curriculum course in neurobiology at Albert Einstein has been delegated to an interdepartmental committee consisting of neurophysiologists, neuroanatomists, neurochemists, neuropharmacologists, and behavioral scientists in the medical school complex. Representatives
Basic Neurological Sciences in the Medical Curriculum

from the Department of Neurology and Neuropathology were also present during the planning sessions but, alas, I must confess to you that we did not invite the neurosurgeons to join us. Did we think that the neurosurgeons had nothing to contribute to the development and planning of a core curriculum course in the neurosciences? Why didn't it occur to us to call in neurosurgery? Perhaps one should ask: Why didn't neurosurgery make it its proper business to demand participation in curriculum matters pertaining to the neurological sciences? I might even broaden the scope of this inquiry and ask to what extent have you pressured your curriculum committee, if one exists, to play a more active role in the planning of the basic neurosciences curriculum? Perhaps this might be as important a topic as any for small group discussion during this workshop.

We have considered it important that all medical students be introduced to the basic concepts of neurophysiology, i.e., membrane potential, electrical excitation, spike generation, conduction and synaptic transmission. For this purpose, lectures and demonstrations are supplemented by readings from Sir Bernard Katz's magnificent book on *Muscle, Nerve, Synapse* which we have distributed gratis to the medical and graduate students. During the period in which the basic material is presented the students also participate in neuroanatomy lab exercises which are devoted exclusively to the gross brain, and examination of gross cut sections. The neurochemistry of myelin, the fine structure of synapses, and the excellent Pomerat film on axoplasmic flow round out one aspect of the neurobiology course which culminates in one of several clinical neurology sessions in which human neuropathophysiology problems relevant to the core material are presented and discussed.

When the student has had some time to familiarize himself with the operation of basic neurophysiological mechanisms in spinal reflexes and their servo-control systems, more complex systems such as the cerebellum, thalamus, and basal ganglia are considered. In our course, for example, the cerebellum is utilized as an example of a structure in which detailed morphological, electrophysiological, and pharmacological approaches can provide important clues to the general operation of neuronal computational systems. We have long dismissed the fantasy that one could teach neuroanatomy to medical students in a core curriculum program. I have always had great doubts about the value of more traditional and prolonged courses in neuroanatomy with their emphasis on hodology and memorization of nuclei and pathways that cross and double-cross, etc., compounding confusion with ignorance of meaningful functional relations. It is probably not far from the truth that the proper appreciation of the three-dimensional relations of internal brain structures is one of the most difficult tasks to master. My own experience with neurological and neurosurgical residents as well as those considered eligible for board certification convinces me that there is indeed an important function of that cortical association pathway that myelinates during the 4th decade of life. I suggest that this pathway is in fact concerned with establishing the capability of mastering neuroanatomy. Its function in non-neuro types must remain obscure!

We have also considered it valuable to introduce the student to the basic elements of behavioral physiology in the core program in the neurosciences. Conditioning, learning, instinct, drive, motivation, and memory all have their ultimate origin in neural and neurochemical processes. To limit the introductory course to basic neurophysiological and neuroanatomical material and dismiss the extraordinary volume of behavioral data immediately relevant to brain mechanisms is unpardonable. Suffice it to say that an increasing number of students enter medical school with a fundamental course in psychology. These students are more than eager to re-examine psychological data in the light of a neurosciences approach that is strongly oriented towards exercising arbitrary constructions disguised in the form of behavioral paradigms.

The core program in the neurosciences which has been developed for medical and graduate students during the first semester compares favorably in time with other courses such as human anatomy, physiology, biochemistry, etc. By the second semester the student is presented with a block of time comprising 30% of the school week for elective or supplementary courses. Five of the