International Tinnitus Journal, Vol. 9, No. 2, 63–66 (2003)

EDITORIAL

The International Polygon of Neurootological Knowledge Makers

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The historical success of humans (i.e., *Homo sapiens*) is based on their senses and their interaction with their thoughts, their selves, and their actions in using their hands and their tools. Knowledge can be built up in individuals through many sensorial percepts and experiences that grow during a lifetime. Humans, who have a history of perhaps 3 million years in this world, also have developed an interindividual knowledge that had to be handed down from one generation to the next. Of this long history of some 3 million years—so paleontologists are teaching us—mainly approximately 10,000 years of the most recent history show the development of an extracorporeal knowledge, set out in creative works (pictures, sculptures, and scripts) and lasting longer than the life spans of their authors.

Because humans have developed the ability to write and to read, they can make the knowledge of individuals and groups mobile: from city to city, from country to country, and from generation to generation. During the last millennium, and especially during the latest centuries, modern scientific knowledge containing the seeds of progress was concentrated in the schools and universities of Europe and Anglo-America. During this period, the growth of knowledge—and the new knowledge—was always related to universities, where it was concentrated especially in the libraries. These libraries were used as the basis for teaching students, continuing cultural standards and establishing the basics of knowledge-making among lecturers and professors.

With respect to the relationship among students, societies, and governments, colleges and universities served as degree-granting institutions of higher education. Traditionally, each college was a component part of a cooperative body called *university*. The word is an abbreviation of the Latin, "Universitas Magistrorum et Scholarium." There, the knowledge necessary for higher education was concentrated; it gave both students and lecturers an advantage in their work and as legal protection. In some universities, particularly European institutions, students began their higher education with specialized studies because their general education already was completed in secondary schools.

Universities began to develop in Western Europe in the thirteenth century. Most well-known were those at Paris, Prague, and Bologna. Old, established knowledge and even the process of generating and introducing new knowledge was concentrated in and around special universities. Instruction in medieval universities often took the form of lectures, with teachers who were called *masters*, who read aloud from a text while students followed along.

Western European universities developed as students migrated to various places where noted teachers lectured on subjects of particular interest to them. Language was no barrier because lectures and disputations were conducted in the universal tongue (i.e., Latin). In the seventeenth century, Bologna was the great university for medicine and biology. In the United States, in New England, Calvinists founded Harvard College in 1636, the oldest American institution of learning, which later was called *Harvard University*.

During the nineteenth century, German universities became influential sources of scholarly research and examples of academic freedom. The University of Berlin was noted for philosophy, Göttingen for literature and mathematics, Heidelberg for mathematics and classics, Leipzig for psychology, Jena for pedagogy, and Würzburg for medicine. In Würzburg, for instance, Virchow wrote his famous pathology, Corti discovered the organ of hearing in the inner ear, von Troelsch established otology as a new discipline within medicine, Roentgen discovered x-rays and, among others, the first department of neurootology was organized there. Many students from foreign countries obtained doctoral degrees from German universities.

Medical education is a process by which individuals acquire and maintain the skills necessary for the effective practice of medicine. To train as a conventional doctor in the Western world, a person needs to have achieved a good level of understanding in the sciences

(e.g., physics, chemistry, and biology). Medical schools usually are part of a university, although not all universities have a medical school or facility attached. Some only offer a limited number of training places in any one year. This results in competition for places, with only the best students being admitted. Thus, the students create a special demand for medical knowledge and therefore select their university or medical school.

Most medical schools offer a student training course of between 3 and 6 years' duration. The curriculum is traditionally divided into two parts: a preclinical course, in which the basic sciences (i.e., how the human body functions) is studied, and a clinical course, in which the student is introduced into actual patient care in a hospital. The former is usually taught in science departments at the university and the latter at the hospital affiliated with the university. Students must pass examinations—written, practical, and oral—in all the different aspects of the courses that they have taken.

In modern times, the duplication of knowledge has arisen and has been enhanced in the pattern of a mathematical growth function (i.e., exponentially). What students once learned at the university is superseded by new knowledge emerging in recent decades or even within only a few years. Therefore, it is important that doctors keep up with medical progress. Such progress reflects the results of medical research concerning new forms of diagnosis and treatment. These two aspects of medical progress are regularly demanded by patients. Most often, this continuing education takes the form of reading medical journals and books and attending conferences about various aspects of modern medicine. A necessary adjunct to knowledge is discussing medical matters with other specialists in the same and even different fields.

More recently, our medical community is able to communicate with one another and to receive the latest information using electronic media: PCs, diskettes, CDs, and the Internet. By means of the World Wide Web, doctors can link their computers to different centers, universities, laboratories, individuals, and hospitals. Thus, knowledge expanded and grew out from the library towers of a single university into a mobile, fluctuating cloud of knowledge floating in the virtual world of the Internet.

Only our newly designed medical field, neurootology, dealing with the normal and pathological function of the cybernetic network of the human senses (e.g., hearing, vision, equilibrium, taste, and smell), is establishing the practice by which specialists (e.g., in Japan), who are designing new tests for investigating special aspects of the complex mosaic of human sensorial function and sensorimotor activities, are linking themselves with questions and reports about their experience to specialists in Germany, Poland, Italy, Spain, Portugal, France, the United States, Australia, India, New Zealand, and the like. Via the Internet, a private center of development and investigation in Buenos Aires can easily exchange data with a private center in Bad Kissingen, Germany, and also with such a center in New York.

This metamorphosis in intellectual habits and procedures has led us to found an Internet-based journal, *Archives of Sensology and Neurootology* (ASN). It is accessible by any persons around the world as long as they identify themselves. The knowledge base, consisting of facts, figures, text, and pictures, is kept on hard disks, in this case within a server in a U.S. information technologies company. This tool of professionally organized interests, contacts, and creativity quickly allows interested specialists to review the most recent progress in the field (e.g., with respect to tinnitus; to vertigo and nausea; to oscillopsia, dysosmia, or dysgeusia). Analyses of most diseases (e.g., Ménière's disease, acoustic neuroma, whiplash injury, epilepsia, slow brainstem syndrome, syndromes of the hypersensitive ear) can be worked up on a personal computer screen.

The building cube of the old libraries of our well-known universities and university hospitals is being expanded to a virtual international polygon of neurootological knowledge, wherein the most recent results, in comparison to classical knowledge and literature, are being welded to new standards within computers linked to the World Wide Web and modern retrieval machines. Now standard textbooks regularly have to be revised in the short term. Therefore, adaptive changes in present knowledge via electronic networks provide specialists with their closest contacts in this international polygon and with their most recent techniques, results, experiences, and interpretations, permitting specialists to transfer the benefits of their own work and patient results.

Teaching in our classical universities and medical schools, however, demands a systematic presentation of facts, ideas, skills, and techniques from lecturers to students. Although human beings have survived and evolved as a species because of their capacity to share knowledge, teaching as a profession did not emerge until relatively recently. The relationship between teaching and learning—what and how teachers teach and how and what learners learn—has long been a subject of controversy. This conflict especially arose when the reality of knowledge available among the "knowledge-making" specialists, by means of their results in publications and their Internet presentations, already for some time had overrun the standard of knowledge from the current textbooks from which the students were forced to learn during their teaching courses.

In ancient India, China, Egypt, and Judea, teaching was often carried out by a priest or prophet; thus,

teachers accordingly enjoyed prestige and privilege. However, in those days, teachers had a fixed concept of what they were going to teach, a concept that lasted for most of their lives. Context and concepts currently are changing so rapidly that teachers who are in contact with the present state of the art regularly have to rewrite textbooks and the concepts of their teaching. Therefore, they also must be in very close contact with the discipline they are teaching, especially if they are active scientists.

Awareness is growing in many countries that the connections between stable government, economic growth, and effective education exist in an untoward interrelation. As in medicine, teaching has become an international activity, with practical and theoretical knowledge that can be freely exchanged across borders. However, one of the major problems faced by the universities and students these days is that of funding in the face of reduced grants.

The exponential growth of functional demands of modern medicine shows an increased dynamic development since the last half of the twentieth century. Academic freedom was and is a right of teachers and research workers. Particularly in colleges and universities, they urgently need this freedom to investigate in their respective fields of knowledge and to express their views without fear of restraint or dismissal from their positions. The right rests on the assumption that open and free inquiry within teachers' or researchers' fields of study is essential to pursue knowledge and to perform their proper educational duties. It also is necessary for enlarging the existing body of knowledge. The concept of academic freedom further implies that tenure of employment depends primarily on the competence of teachers in their fields and on their acceptance of professional integrity, rather than on extraneous considerations, such as political or religious beliefs or affiliations.

Unfortunately, beginning in the early 1970s in the United States and somewhat later in other countries (e.g., Britain and Canada), institutions of higher education were faced with serious financial problems. Steps taken to deal with these difficulties also took a toll on academic freedom. For example, proliferation of or irregular faculty appointments intended to save money created a virtual underclass of teachers lacking the employment security generally considered necessary for the exercise of academic freedom. This development has just begun in Germany also.

With respect to teaching, the possibility now exists to introduce teaching machines, which systematically present to students a programmed sequence of instruction about facts, figures, and interactions. Computers as teaching machines offer an increasing potential. They can be programmed to judge student input and to tailor lessons to individual levels of mastery. In a tutorial mode, computers can present instructional input and require mastery of each step in ways that were not possible in the early machines.

Epistemology is concerned with the definition of knowledge and related concepts. It is a cornerstone of the concept of our universities. Nowadays, however, we are fact-driven. Knowledge that was thought to be rock solid and unchangeable overthrown overnight when somebody—merely by performing private experiments, by building a private investigation device, by analyzing private statistics—can reveal the soft spots of the existing system. This currently happens in the field of neurootology worldwide. Small, privately financed centers are approaching, investigating, modeling, and testing the borders of the unknown. New concepts are being introduced by individuals living in central Europe or the United States or in sites as far-flung as Buenos Aires, Chile, India, and Australia. These individuals can exchange their findings and ideas within minutes with other neurootology specialists in other parts of the world. They can talk to their distant friends and research partners as if they were in the same room. Creative spontaneity is enhanced.

Yet, if they try to exchange their special interest in neurootology and the resulting gain in knowledge within the confines of their own university, they usually experience great difficulty in finding those who are sufficiently well trained and skilled to understand the new and creative concepts presented to them.

Thus, the university has remarkably reduced or even lost its function as a center of disputation of the innovations in our specialty of neurootology. However, now one knowledge maker can easily find his partner knowledge maker in the virtual arena of the Internet. Even the universities need to base their progress in updating their standards of knowledge on such retrieval machines as Google and American Online. The method for dealing with the problem of clarifying the relation between the act of knowing and the object known has grown. The scientific reality cannot not be overlooked even by an extremely experienced researcher and scientist.

Aside from the virtual production of new and important knowledge, there exists a human emotional aspect: that the knowledge makers would like to know one another personally, whether they live side by side or half a world apart. The knowledge makers also want to come together as a group to share their knowledge and establish human contact. This purpose is being served by the international congresses, such as the annual meetings of the International Society for Neurootology and Equilibriometry (NES).

We must learn that these get-togethers must not necessarily happen at universities or even in university

cities. Any hotel resort with a lecture hall and technical equipment for projection and gatherings is suitable, as long as it can be easily accessed by air or surface traffic or by ferry boat. At these meetings, we regularly meet persons and groups from 30 to 35 nations.

Clearly, the international neurootological knowledge makers have found new ways to come together and to improve the current knowledge base. This development of scientific interaction of knowledge makers is possible especially in a new field—neurootology—that has arisen between the borders of some older subdivisions of medicine (e.g., surgery, internal medicine, orthopedic surgery, ophthalmology, neurology). The professional structures wherein the international neurological knowledge makers are carving out their living can be very different. These specialists are housed not only as government employees in universities and elsewhere: Some are working to develop innovative techniques by producing machines. Others work at running a private medical office, and still others are working in classic university centers.

The enthusiasm and spirit of neurootology and the new field of neurosensology are binding all of us together. Whoever wants to join us is invited to do so. The impact from institutions with genuine restrictions and regulations has been remarkably reduced, as long as we are not applying for financial support. In our field, we have come to the age of free research in neurootology. The only thing that counts is the quality of our work. As a bonus, we are compensated by a great international group of friends!

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