

Neuropathology in Its Second Century

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Neuropathology was born in Germany, France and England in the late 19th and early 20th century as a fusion of neurology and pathology. It initially focused on the correlation of clinical signs and symptoms of neurologic diseases with pathologic changes seen at autopsy. This was a particularly fruitful approach leading to a deeper understanding of the major neurologic illness of the time: stroke, trauma, infection, intrauterine and birth injury to name but a few. At the same time, neuropathologists explored new territory by defining an entirely new class of diseases, the neurodegenerative syndromes. The most common of these, Alzheimer's and Parkinson's Diseases, are increasingly recognized as major public and research concerns. In the first half of the 1900s, with the growth of neurosurgery in the United States and Canada, the pathologic diagnosis of brain tumors became an active concern of neuropathologists. They have led the way toward characterizing these tumors and understanding some of the basic mechanisms in their formation and evolution.

Over the past 100 years, the technology that neuropathologists have brought to bear to these disease processes has broadened considerably. The pathology laboratory in the late 19th century relied on methods derived from the emerging chemical, dye, precision instrument and optical industries including fixation of tissue with aldehydes, sectioning with microtomes, staining with anilines, and examination with the compound microscope. The introduction of heavy metal salts into the staining process at the turn of the century was essential to the understanding of basic neuroanatomy and neurophysiology as well as the discovery of the degenerative pathologies. Diagnostic histochemistry, developed between World Wars I and II on both sides of the Atlantic opened up new fronts with the ability of neuropathologists to recognize a variety of biochemical pathologies such as amyloid, abnormal carbohydrates and lipids within tissues. The introduction of electron microscopy in the 1960s spurred another expansion in the knowledge of nervous system basic structure in concert with much deeper understanding of degenerative diseases and tumors. Along with the emerging field of enzyme histochemistry it gave birth to the fields of diagnostic nerve and muscle pathology. The 1970s and 1980s witnessed the introduction of immunodiagnosics in the form of specific antibody stains of autopsy and biopsy tissues. The rise of research and diagnostic genetics at the turn of the

21st century is common knowledge.

Neuropathology today remains a fusion of all these techniques. While the majority of diagnostic specimens seen by neuropathologists are processed in much the same way they have been for some time—fixed in aldehydes, embedded in wax, sectioned on a microtome, stained with aniline dyes and observed under a compound microscope—metallic stains, histochemistry, electron microscopy, enzymatic stains, immunohistochemistry and molecular testing are put to use every day.

That being said, what is the future of neuropathology in its second century? With diagnostic imaging and molecular genetics advancing by leaps and bounds will the pathologic examination of patients' tissues become moot? As research becomes more specialized along the lines of specialized techniques, will the investigative role of knowledgeable neuropathologists become superfluous? These are serious questions which cannot be dismissed with platitudes such as the depth of knowledge that neuropathologists bring to the subject being irreplaceable or the grand historical tradition of the specialty rendering it immortal.

What has made neuropathology vital in the past is the compelling nature of the disease processes plus the energy and intelligence of the students that it attracts. The diseases that neuropathologists deal with on a daily basis, particularly neurodegeneration and brain tumors, still compel us since they are understood imperfectly and are without satisfactory treatment. What remains for neuropathology is to convince students like you that these problems are yours to solve and to help make that happen.