AMYLOIDOSIS – CONGO RED (2013) and BIFREFRINGENCE (2014)

Short explanation:
Pathologists use a special stain called Congo Red and polarized light to diagnose amyloidosis, or a disease of abnormal protein deposition.

Expanded commentary:
Amyloidosis is a family of diseases in which abnormal proteins, called amyloids, are deposited in human tissue and disrupt normal organ function. The cause of amyloidosis is, as yet, poorly understood. Symptoms of amyloidosis correspond to the organs most markedly affected by the disease, but can include abnormal heart function, splenic rupture, enlargement of the tongue, vomiting, and/or hemorrhage from the respiratory or gastrointestinal tract. Diagnosis results from the microscopic examination of tissue treated with a special stain known as Congo Red, which colors amyloids a distinctive pink or red hue. As the manifestations of the disease can be varied and non-specific, the diagnosis of amyloidosis is not infrequently made after post-mortem examination. These panels highlight amyloid deposits around blood vessels using under normal and polarized light sources.

Invented in 1883 in Germany as a coloring agent for textiles, the Congo Red special stain has a special affinity for the abnormal proteins present in amyloidosis. The dye was dubbed “Congo Red” not to reflect its origin (it was entirely manufactured from waste products of Germany’s coal gas and steel industries) but instead as a marketing ploy, intended to highlight its rarity and exoticism. Congo Red turned out to be an impractical dye for clothing but testing on histologic specimens revealed it to be an avid binding agent of amyloid proteins. Later experiments with polarized light revealed that tissue specimens with abnormal amyloid protein that were stained with Congo Red glowed apple-green under specialized conditions. Since the early 20th century, pathologists have relied on Congo Red to visualize the sometimes subtle signs of amyloidosis in human tissue.