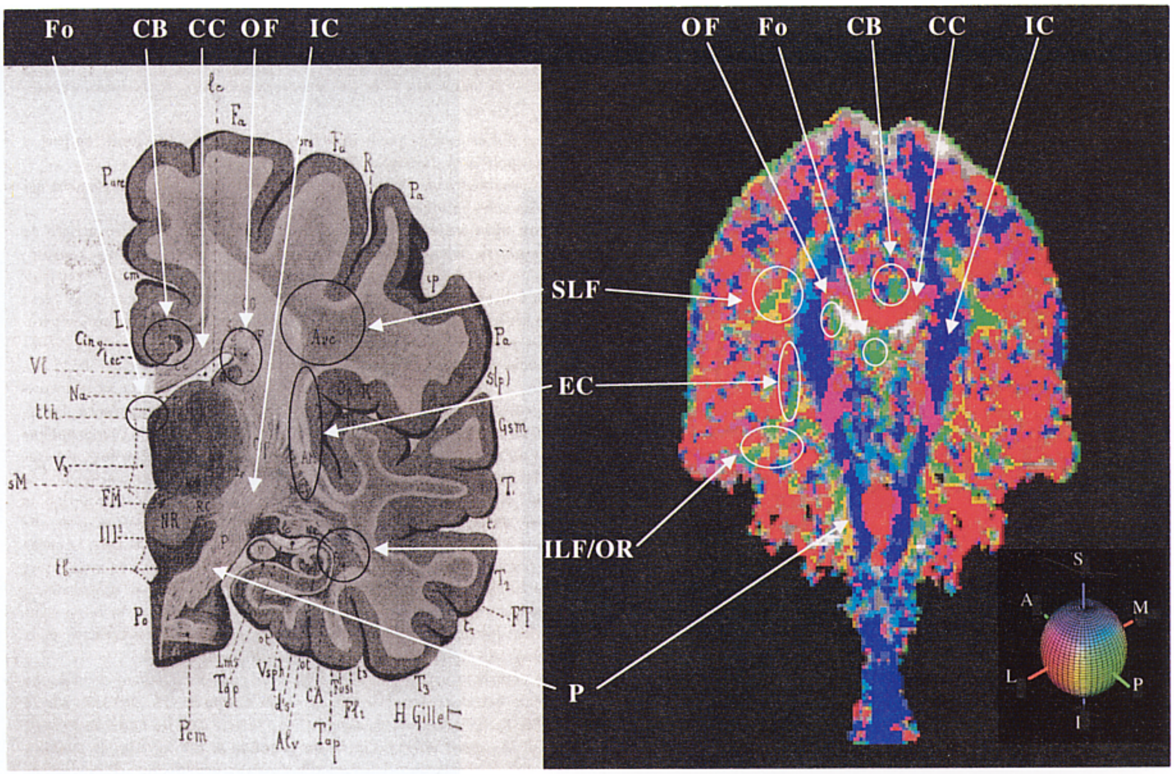

Fig. 3 Diffusion tensor imaging using MRI.[13,15] **a)** Diagram shows a coronal section taken from Dejerine[8] at the level of the red nucleus (6 mm anterior to the posterior commissure). The anatomic regions containing major white matter fiber pathways are "blocked" using a geometrical region of interest outline. Abbreviations: SLF: superior longitudinal fasiculus; CB: cingulum bundle; OF: occipitofrontal fasciculus; EC: extreme capsule; ILF/OR: complex of inferior longitudinal fasciculus and optic radiations, Fo: fornix; CC: corpus callosum; IC: internal capsule; P: cerebral peduncles; BS: brainstem. **b)** A color-coded tensor orientation map (TOM) which corresponds to the level demonstrated in a). Each pixel in the image is assigned a color based upon the direction of the largest eigenvalue of the diffusion tensor. Blue color-coding corresponds to superior-inferior, green to anterior-posterior, and red to medio-lateral.

the hodologic atlas.[15] Closely related applications will follow from the needs of surgical planning for tumor resection and epilepsy surgery.

Quantitative volumetry

Because the magnetic resonance image is an algebraic transformation of the imaged brain the method is inherently a quantitative one.[18] Methodological challenges for the present allow volumetric measurements, although in the present state of development of these methods there is a trade off between those methods which provide for "real time" efficient computation and those which provide for high levels of precision in the definition of anatomic boundaries. Methods of highest anatomic precision undertake volumetric analysis at the cost of substantial investigator time and require substantial investigator knowledge of brain topographic anatomy. More completely automated and, consequently, more efficient methods sample a large set of strategically placed topographic landmarks and computationally "warp" an image data set to that of a standard brain which has already been volumetrically analyzed by methods of high precision.[19,20] The resulting mathematical "deformation" relating the imaged to the standard brain provides a basis for volumetric estimates. The trade offs are that the warping based methods are applicable only to flawless image data sets, are less flexible in terms of the anatomic definitions they allow and inherently work at a lower level of precision of anatomic definition. Future developments will see advances in both modes so that one foresees over 5 to 10 years time a homogenization of methodology which progressively optimizes efficiency, flexibility and precision.[18]

One reasonably asks whether the advantages inherent to volumetric treatment of the brain justify the obviously substantial costs that have already been and