

to explore the previously uncharted systems relationships of diverse and widely distributed brain regions. Such explorations are a natural companion to those proceeding through the methodology of functional MRI.

### Developmental Disorders of Obscure Nature

The observations and speculations reviewed here have arisen in the course of work undertaken in a fundamental investigative laboratory but which is based in a large general hospital. Clinicians who are directly concerned with developmental disorders have participated as equal partners with computer scientists, statisticians and physicists in this program. Inevitably application of this methodology to obscure developmental disorders has been close to the surface of thought in this community. In particular such work has been and will be directed toward explorations in autism and schizophrenia, both disorders which may be expressed in early life and which are associated with profound impairments of socialization.<sup>34-41</sup> In autism, more than in schizophrenia, there may be, but variably, impairments of cognitive, language functions, motility and even seizures. Findings to date based upon MRI morphometry must be regarded not only as preliminary but puzzling, puzzling in the sense that the findings do not readily conform to any ready theory of structure functional correlation based upon a modular systems view of neural function. Thus, the brain, and indeed forebrain structures, in autism are at least as large as those of normal counterparts and in fact trend to larger sizes than those of controls.<sup>41</sup> There is in fact no preferential reduction in the volumes of "limbic" structures, a finding that might have satisfied predictions of limbic systems advocates who also would take the point of view that the disease process, whatever its nature works regionally upon cognitive modules concerned with socialization. A wide assortment of gyral volumes does differentiate volume wise from the volume distributions of normal counterparts. However, given the large number of observations in what inevitably is a relatively small study population this could happen due to chance alone. Moreover, the specific deviations frankly do not really add up to much when referenced to current thinking about systems organization.

Inevitably there will be further need to illuminate this conundrum, certainly the need for more observations but importantly the need for other theoretical models for the disorder. To be considered as an early exploration is the idea that gyral variance in these disorders does not obey the same rules of determination observed in the normal brain.<sup>18</sup> Variance might be either excessively constrained or relaxed reflecting in either case generalized dysmodulation of adaptive developmental mechanisms where relatively small per-

turbations may be expected to be large in effect in the neural systems functional domain. Such speculations are offered in a search for directions and possibilities within the larger potential offerings of MRI-based brain morphometry.

**Acknowledgments:** The graphic reconstructions in figures 3 and 4 were contributed by Andre Worth. These investigations were supported in part by NIH grants NS27950, DA09467 and NS37483; NIH grants NS34189 and MH57180 as part of the Human Brain Project; grants from the Fairway Trust, the Giovanni Armenise-Harvard Foundation for Advanced Scientific Research and Cure Autism Now Foundation.

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