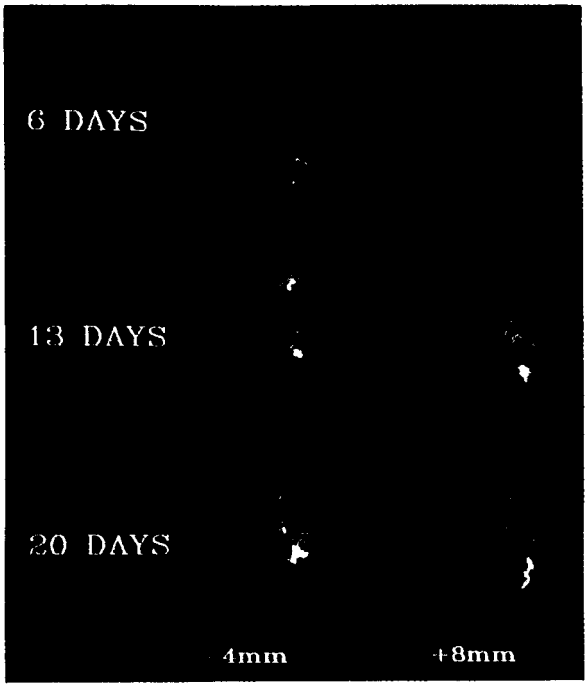

Fig 2—Sample transaxial [^{11}C]-PK 11195 images showing comparable slices for the 3 days.

−4 mm and +8 mm = distances of slice from AC-PC line.

There is some evidence that the prevention of secretory and phagocytic activity of mononuclear phagocytes shortly after ischaemic injury can improve functional recovery.[6] We suggest that the procedure described here can be used to detect the anatomical localisation in vivo of the accumulation of macrophages and that the temporal profile of this response in brain lesions can be monitored.

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Reversed cerebral asymmetry and breast cancer

SIR,—Dr Sandson and colleagues (Feb 29, p 523) report that patients with breast cancer have a different pattern of cerebral lateralisation than controls. However, although they describe this as reversed cerebral asymmetry, that is not strictly correct; rather the patients are best interpreted as showing an absence of cerebral asymmetry. The difference is theoretically important in the understanding of the biology of asymmetry.

With respect to Sandson and colleagues' data on occipital width, for those individuals who do show asymmetry 70 of 87 (80%) controls show a larger left side, compared with 20 of 53 (38%) patients without metastases; although the control data are significantly different from 50% (chi-square test, $p < 0.001$), indicating a population-level directional asymmetry, the data for patients without metastases do not significantly differ from 50%, suggesting the presence not of reversed directional asymmetry but of fluctuating asymmetry. Lateralisation is therefore absent, not reversed.

Fluctuating asymmetry[1] is the biological baseline from which directional asymmetries have evolved.[2] In both the viable genetic models of handedness and cerebral dominance,[3] one of the genotypes results in fluctuating asymmetry, as is the case for the inheritance of situs inversus in mice;[4] a similar mechanism results in teratogenic phenocopies of situs inversus in mice.[5]

There seems little doubt that breast cancer is more common on the left side than the right. However, in Sandson and colleagues' study there is no association between laterality of tumour and direction of cerebral asymmetry. The association of breast cancer and atypical cerebral lateralisation cannot therefore be explained as resulting from the existence of a lateralised growth factor. Since cerebral asymmetry is determined before birth, absent cerebral asymmetry probably results from a lack of developmental stability, loosely characterised as "biological noise", which disrupts canalisation and produces the phylogenetically more primitive, or atavistic, condition of fluctuating asymmetry rather than directional asymmetry. If the empirical results of Sandson et al can be replicated then any explanation should postulate an early developmental event that disrupts both normal cerebral lateralisation and, presumably, the normal development of breast tissue. Although altered testosterone concentrations[6] may be one mechanism for such an effect, that theory is not without its drawbacks.[7]

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SIR,—Dr Sandson and colleagues' finding that women with breast cancer are more likely to have reversed cerebral asymmetry supports the hypothesis that disorders associated with cerebral laterality or left-handedness involve sensitivity to prenatal and adult sex hormones.[1] Sex hormones vary seasonally and with maternal age,[1,2] and being born in the winter and advanced maternal age are predisposing factors for left handedness and for four disorders that show an excess of this handedness—breast cancer, schizophrenia, Alzheimer's disease, and Down's syndrome.[1-3] Nicotine affects oestrogen and androgen concentrations,[4] and smoking is more common in left-handed individuals,[1] increases the risk of having a left-handed child,[5] and decreases the risk of breast cancer and Alzheimer's disease.[4]

Breast cancer shows five features of cerebral laterality that might relate to sex hormone sensitivity: excess left handedness and winter births that are associated with early-onset left-sided disease, reverse cerebral asymmetry, seasonality, and advanced maternal age.[3,6] Alzheimer's disease shows five such features: excess left handedness and winter births, advanced maternal age, thyroid disorder, and low concentrations of serotonin.[1] Chronic exposure to oestrogen