pressure gradient across the membrane. The initial elimination of nitrous oxide from the body should be minimal because there is a very small partial pressure gradient across the membrane.

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Sir,—We thank Dr Lin for his interest in our article. He suggests that gas uptake and elimination should be measured, or rather calculated, across the alveolar membrane. We have used a traditional concept of gas elimination through the mouth, i.e. including FRC in the body. Regardless of which concept is used, alveolar dilution by nitrous oxide during elimination lowers the alveolar concentration of oxygen. This is explained by the difference between elimination of nitrous oxide and uptake of nitrogen across the alveolar membrane. We used hyperventilation with end-tidal carbon dioxide concentrations of 6.7–7.4%, at 30 min. During this moderate hyperventilation, end-tidal nitrous oxide concentration at 3–50 min was approximately twice the end-tidal concentration of nitrous oxide during normoventilation. As the total partial pressure of alveolar gases must be constant, any increase in carbon dioxide or nitrous oxide inevitably leads to decreased oxygen concentration, with a resultant risk of diffusion hypoxia.

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Therapeutic suggestions during general anaesthesia

Sir,—In his recent paper [1], Professor Millar reported the results of a meta-analysis conducted on two studies. The studies in question were those of Evans and Richardson [2], who found that therapeutic suggestions during surgery under general anaesthesia were beneficial, and Liu, Standen and Aitkenhead [3], who suggested for improving the methodology which is used to assess the efficacy of intraoperative suggestions. In a typical study, patients hear a tape comprising several different suggestions and are then assessed on various indices of recovery (12 measures were used in the studies by Evans and Richardson, and Liu, Standen and Aitkenhead), with a significant improvement in any of these scores being taken as a positive result. This experimental design has an unacceptably high probability of producing a type 1 error, that is, a spuriously significant result. Interpretation of the results is particularly difficult when a significant improvement is observed with a measure which does not relate directly to the suggestions given (such as the incidence of postoperative pyrexia in the study of Evans and Richardson).

We are concerned, however, that Professor Miller's paper may be interpreted as refuting the claim that learning can occur during anaesthesia. Other indirect memory tests, particularly those which have already been used to demonstrate learning (such as the incidence of organic amnesia or subliminal perception of target stimuli [4]), may provide a more sensitive test of learning during anaesthesia than do therapeutic suggestions. Several researchers have used tests such as preference judgements and category generation to investigate intraoperative learning. Although the results are so far equivocal [5], there are too many positive findings to be dismissed lightly. The results of a meta-analysis (particularly studies in different centres with different anaesthetic techniques and perhaps also different postoperative stay protocols) should not be accorded greater significance than those of a single study fulfilling the standard criteria of random assignment of patients and anaesthesiologists to the experimental conditions.

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Sir,—I am grateful to Drs Andrade and Munglani for their constructive comments. My paper was not intended, nor should it be taken, as a general refutation of the claim that learning might occur during anaesthesia. In studies of positive suggestions, however, and as the two authors themselves acknowledge, the methodologies are often so flawed, and the results so discrepant, that no reliable conclusions seem possible.

One would agree absolutely with their general premise that, whilst results so far are equivocal, if learning does occur during anaesthesia, then tests of implicit or indirect memory may be the most sensitive means of assessment. My concern is, however, that such tests are often applied in the uncritical belief that they are unambiguous measures of unconscious memory, when there is evidence to the contrary [1]. I cannot, however, agree with their statement that "there are too many positive findings to be dismissed lightly." A similar argument has been advanced for the existence of "unidentified flying objects" (UFO), namely that there have been so many reported sightings that they must exist. I am open-minded about "flying objects" (UFO), namely that there have been so many positive findings to be dismissed lightly. The results of a meta-analysis (particularly studies in different centres with different anaesthetic techniques and perhaps also different postoperative stay protocols) should not be accorded greater significance than those of a single study fulfilling the standard criteria of random assignment of patients and anaesthesiologists to the experimental conditions.