Appendix A.

A formal exposition of the social brain.

A collection of human brains is a social brain if it is possible to line them up so that each human brain is capable of sending a cue directly to the human brain (s) adjoining it. These brains are affected by the material and immaterial properties of the physical environment in which they interact with each other.

For example, consider brains A, B and C, where C can send and receive messages directly from both A and B but A and B cannot directly communicate with each other. A, B and C constitute a social brain as they can be arranged in the sequence A C B with A and B able to communicate with each other indirectly through C.

But when is it possible to line up human brains in the mentioned manner? Let us consider n human brains carrying the labels 1, 2, 3, 4, …………n. Consider all those mappings {f(i)} from the original set of labels to itself, each of which relabels every label with a unique number. Now define a homogenous set as a set containing a single number label or consecutive number labels that correspond to human brains which can communicate directly with each other. An undominated homogenous set is a homogenous set such that the largest homogenous set containing it is itself. It is easy to see that every sequence of numbers created by any f(i) has the property that it can be divided fully into undominated homogenous sets.

We can say that the collection of human brains is a social brain iff out of {f(i)}, a particular f(i) exists such that the undominated homogenous sets created through it have the property that no adjoining undominated homogenous sets on the number line are disjoint sets.

If this property is violated, then the chain of transmission of messages is broken. For example, consider three human brains with the labels 1,2,3 where 2 and 3 can communicate with each other directly but 1 cannot communicate with either 2 or 3. Irrespective of how we relabel 1, the undominated homogenous set containing it is a single element set with no intersections. Hence, the three brains do not constitute a social brain.

Now consider four human brains with the labels 1,2,3 and 4 where the label 3 corresponds to a human brain which can communicate directly with 1, 2 and 4 but 1 and 2 cannot communicate directly with 4. If the relabelling does not change any of the labels, then the undominated homogenous sets formed are {1,2,3} and {3,4}. These sets are obviously not disjoint, with messages easily able to travel from a brain located in one set to a brain located in the other. Thus, the four brains form a social brain.