

lots) at the other. The 'propositional representations' found in computers and perhaps in brains would fall somewhere in between, and it is not entirely obvious which term should best apply to them. There may, however, be one importantly misleading effect of the "proposition" usage. The meaningfulness of Fregean propositions cannot be a problem; if they exist at all they are meanings. The meaningfulness of 'sentential'/'propositional' mental representations, by contrast, is highly problematic (as we shall see in §II.C.5.). The terminological confusion between such representations and Fregean propositions may help to explain the scandalous lack of attention paid by cognitive psychologists to this problem.

26. 1973 p.18.

27. See Kosslyn, 1980 p.471.

28. Fodor, for one, seems to have been misled here [1975 p.188].

Notes to §II.C.2.

1. Feigenbaum & Feldman, 1963; Minsky, 1968. The name "Artificial Intelligence" was originally applied specifically to the former sort of approach, but today it is commonly applied indiscriminately to any work on trying to get computers to think. See Gunderson [1985 pp.167-179] for a similar, but finer, sub-classification of possible aims within contemporary AI research.

In the earlier days of their collaboration Newell was at the Rand Corporation, but he later moved to join Simon at Carnegie-Mellon.

2. Simon, 1972; Newell, 1972.

3. Baylor, 1972; Moran, 1973; Farley, 1974. For briefer, published, accounts of this work see Baylor, 1973; Baylor & Racine, 1977; Farley, 1976.

4. There has been considerable work on representations for visual information, but this has not been specifically directed at problems of imagery or imagination, and is of questionable relevance to them. Some of this work will nevertheless be looked at below.

5. This latter strategy has recently been recommended by Dennett [1978b, 1986]. The "cybernetic" approach to the mind, as represented for example by the simple exploratory and conditionable robots of Grey Walter [1963 chap.5, p.122f; see McCorduck, 1979], did make some attempts along these lines. However, it has been very much eclipsed by AI in recent years.

6. Newell & Simon, 1972.

7. Simon, 1981 p. 67.

8. Not all problems are amenable to 'brute force' methods even on a computer, so this sort of approach is by no means without practical computing implications.

9. Feigenbaum & Feldman, 1963 p.275; Newell & Simon, 1972.

10. Farley [1974] did not use protocol analysis, as we shall see in a later chapter.

11. Moran, 1973 p.164.

12. Moran, 1973.

13. 1967.

14. Baylor, 1972 p.197. A different example and some of the resulting protocol are given in Baylor [1973].

15. Paivio, 1971.

16. Baylor, 1972 p.16; 1973 p.286.

17. Simon, 1972 p.201.

18. As he himself notes [Moran, 1973 p.168].

19. Moran, 1972 p.160.

20. Moran, 1973 p.164.

21. I have constructed this description by using the terms and content of Baylor's I-Space representation within a structure appropriate to S-Space or ordinary language.

22. See Simon, 1972 p.192.

23. See Palmer, 1977.

24. Simon, 1972 p.188.

25. 1972 p.189.

26. 1972 p.192.

27. 1972 p.191.

28. Palmer, 1975 p.282.

29. Sic. It seems to me that this could represent any quadrilateral and would need some enrichment (e.g. each angle specified as having property of being 90° , each side as unit length) to specify a square.

30. Palmer, 1975 p.285.

31. It is interesting to note that Palmer [1977 p.442] associates his views on 'propositional' visual representation with von Ehrenfels' Gestaltqualität psychology.

32. Baylor, 1972 p.104.

33. Baylor, 1972 p.104n.

34. To deal with the Block Visualization Tests Baylor's representation must in fact deal with surface colours. However, he can get away with merely specifying each face as having properties red, blue or unpainted. A real mental image would, or at least could, display quite specific shades.

35. 1978; Marr, 1982 chap.5; see also Roth & Frisby, 1986 chap.III.4.

36. Marr & Nishihara, 1978 p.286f; Marr, 1982 p.318f. I myself find this a highly implausible account of object recognition, but Marr's work is widely admired.

37. Pinker, 1980; Pinker & Finke, 1980; Keenan & Moore, 1979; Keenan, 1983; Nigro & Neisser, 1983 - however, see Neisser & Kerr, 1973; Kerr & Neisser, 1983. In fact Marr & Nishihara believe that it is right and proper that representational formats should be task specific [1978 p.292], and Marr's overall theory of vision [Marr, 1982; Roth & Frisby, 1986 part III] involves other representational formats, at more peripheral processing stages, which are "viewer centred". Marr's visual theory is probably thus more conformable with a quasi-pictorial than a 'descriptive' or 'propositional' theory of imagery as this is usually understood. But there may be problems even there [c.f. Kosslyn, 1980 p.464].

38. See e.g. Dewdney, 1986.

Notes to SI.C.3.

1. A major virtue of applying computer simulation to psychology is often said to be that it can eliminate superficially plausible but actually unworkable theories. Whether it has actually ever done this is more dubious. Failures to simulate some theory can always be blamed on lack of ingenuity in the programmer. The whole A.I. project is, after all, built on the faith that we will one day discover how to simulate psychological processes which we cannot see how to simulate at present.

2. 1977.