

Complete publishing information for the citations in both the text and the notes is contained in the Bibliography. Only names and dates are given here.

## *Preface*

1. Although Freud's *Project* was written in 1895, it was not actually published until 1954. On Freud's neurological background, see F. J. Sulloway (1979).
2. See G. M. Edelman and V. B. Mountcastle (1978).
3. E. Morin and M. Piatelli-Palmarini (1974).
4. B. Pascal, *Pensées*, 51:434.

## *1 The "Organ of the Soul"*

1. J. H. Breasted (1930); C. A. Elsberg (1945).
2. For details on the history of our knowledge of the brain from antiquity to modern times, see J. Soury (1899); E. Clarke and C. D. O'Malley (1968); E. Clarke and K. Dewhurst (1972); H. Hecaen and G. Lanteri-Laura (1977); A. R. Luria (1980); M. A. B. Brazier (1984).
3. For an in-depth analysis of the work of Gall and his successors, see R. Young (1970); H. Hecaen and G. Lanteri-Laura (1977). See also H. Hecaen and J. Dubois (1969); H. Hecaen (1978).
4. For a historical analysis and references, see H. Van der Loos (1967); E. Clarke and C. D. O'Malley (1968); M. A. B. Brazier (1978)
5. Translation by S. Hoole.
6. G. E. Palade and S. L. Palay (1954); J. D. Robertson (1956).
7. For references to the history of the brain's electrical activity, see M. A. B. Brazier (1984); J. C. Eccles (1964).
8. F. McIntosh (1941); W. Feldberg (1948).
9. B. Falck et al. (1962); A. Dahlström and K. Fuxe (1964).

## *2 The Component Parts of the Brain*

1. See S. J. Gould (1981).
2. P. V. Tobias (1975).

3. See G. von Bonin (1937).
4. T. Meynert (1867, 1874); W. B. Lewis and H. Clarke (1878).
5. S. L. Palay (1978).
6. E. G. Jones (1975, 1981); see also S. Ramón y Cajal (1909).
7. J.-P. Changeux (1980, 1983a).
8. N. Brecha et al. (1979, 1981); B. Zipser and R. McKay (1981).
9. K. Brodmann (1909); C. von Economo (1929).
10. E. G. Gray (1959); J. J. Sloper et al. (1979); M. Colonnier (1981).
11. J. J. Sloper et al. (1979).
12. C. D. Gilbert and T.N. Wiesel (1981); E. G. Jones (1981).
13. V. B. Mountcastle (1957, 1976).
14. See D. H. Hubel and T. N. Wiesel (1977).
15. See S. LeVay et al. (1980).
16. D. H. Hubel et al. (1978).
17. J. C. Eccles et al. (1967).
18. H. Wässle et al. (1981).
19. J.-P. Changeux (1980, 1983a).

### 3 Animal Spirits

1. E. D. Adrian (1946).
2. M. Jouvet (1979).
3. J. E. Desmedt (1977).
4. J. C. Eccles (1964).
5. E. R. Kandel (1976).
6. I. Prigogine and R. Balescu (1956); I. Prigogine (1961).
7. F. Strumwasser (1965); M. J. Berridge and P. E. Rapp (1979); R. Meech (1979).
8. A. J. Hudspeth and D. Corey (1977).
9. V. P. Whittaker et al. (1964); N. Morel et al. (1977).
10. B. Katz (1966); S. W. Kuffler and J. G. Nicholls (1976).
11. Ibid.
12. H. Korn et al. (1981).
13. For references, see R. Acher (1981); F. E. Bloom (1981).
14. T. Hökfelt et al. (1980).
15. J.-P. Changeux (1981a). For references, see also A. Karlin (1983); R. Stroud (1983); J.-P. Changeux et al. (1984).
16. D. Nachmansohn (1959).
17. C. Y. Lee and C. C. Chang (1966).
18. J.-P. Changeux et al. (1970).
19. J. Monod et al. (1963, 1965).

### 4 Into Action

1. Y. Leroy (1964); D. Bentley (1971); D. Bentley and R. Hoy (1974).
2. J.-P. Changeux et al. (1973).
3. G. S. Stent et al. (1978).
4. See D. S. Faber and H. Korn (1978).
5. The Mauthner cell also receives electrical synapses, mixed with chemical ones.
6. See E. M. Stricker et al. (1976); B. I. Rolls and E. T. Rolls (1981).
7. U. von Euler and J. Gaddum (1931).
8. T. Hökfelt et al. (1980).
9. C. B. Pert and S. H. Snyder (1973); E. J. Simon et al. (1973); L. Terenius (1973).
10. J. Hugues et al. (1975).
11. B. P. Roques et al. (1976).
12. J. L. Henry (1980); L. Terenius (1981); J. M. Besson et al. (1982).
13. R. A. Wise (1980).
14. J. M. Davidson (1980).
15. C. Fox and G. Knaggs (1969); C. Fox and B. Fox (1971).
16. M. R. Murphy et al. (1979); M. R. Murphy (1981).
17. C. N. Woolsey (1958).
18. J. H. Kaas et al. (1979, 1981).
19. See H. Hecaen and M. Albert (1978); B. Kolb and I. Q. Whishaw (1980).
20. P. D. MacLean (1970).

### 5 Mental Objects

1. S. Atlan (1979); A. Bourguignon (1981b).
2. J. A. Fodor (1975, 1981a, 1981b).
3. M. Denis (1979); S. Kosslyn (1980).
4. R. N. Shepard and J. Metzler (1971); R. Shepard and S. Judd (1976).
5. See J. Bouveresse (1979).
6. J. A. Fodor (1975, 1981a, 1981b).
7. J. M. McCaugh (1973).
8. See H. Hecaen and M. Albert (1978); A. Luria (1980).
9. D. O. Hebb (1949); G. M. Edelman and V. B. Mountcastle (1978); R. Thom (1980); C. von der Malsburg (1981); C. von der Malsburg and D. Willshaw (1981); J. Hopfield (1982); A. Pellionisz and R. Llinás (1982); J.-P. Changeux et al. (1973); J.-P. Changeux (1981b, 1983a, 1983b); see also W. Little and G. Shaw (1975, 1978).
10. See D. O. Hebb (1949).
11. G. M. Edelman & V. B. Mountcastle (1978).

12. See R. Thom (1980).
13. J.-P. Changeux et al. (1973); J.-P. Changeux (1981b, 1983a, 1983b); G. M. Edelman and V. B. Mountcastle (1978).
14. R. Thom (1980).
15. F. de Saussure (1915).
16. R. A. Fiskens et al. (1975).
17. R. Lorente de N6 (1938); E. R. Hilgard and D. Marquis (1940).
18. B. Katz and S. Thesleff (1957).
19. J.-P. Changeux (1981a).
20. T. Heidmann and J.-P. Changeux (1980, 1982).
21. C. Pull and M.-C. Pull (1981).
22. H. Hecaen and M. Albert (1978).
23. On serotonin, see S. Peroutka and S. Snyder (1979). On dopamine, see D. Burt et al. (1976); P. Whitaker and P. Seeman (1978).
24. H. Pi6ron (1913); H. Ey et al. (1975).
25. G. Moruzzi and H. W. Magoun (1949); H. W. Magoun (1954).
26. B. Falck et al. (1962); A. Dahlstr6m and K. Fuxe (1964); T. H6kfelt et al. (1980).
27. M. Monnier and L. H6sli (1964); M. Sallanon et al. (1981).
28. P. Boyer (1981); S. Schwartz (1982).
29. S. A. Hillyard et al. (1978); R. Galambos and S. A. Hillyard (1981).
30. For references, see U. Ungerstedt (1971); A.-M. Thierry et al. (1973); H. Simon (1981).
31. J. J. Bouyer et al. (1980); P. Buser (1980).
32. J.-P. Mialet (1981).
33. G. M. Edelman and V. B. Mountcastle (1978); G. M. Edelman (1981).
34. See D. Ferrier (1880); B. Kolb and I. Q. Wishaw (1980).
35. A. R. Luria (1980).
36. C. Jacobsen (1931); C. Jacobsen and H. Nissen (1937).
37. R. W. Sperry (1968); M. Gazzaniga (1970); S. Springer and G. Deutsch (1981).
38. S. Kety and C. Schmidt (1945); N. Lassen (1959).

#### 6 *The Power of the Genes*

1. R. W. Guillery et al. (1975).
2. R. W. Guillery (1974).
3. H. de Vries (1901).
4. V. S. Caviness and P. Rakic (1978); J.-P. Changeux and K. Mikoshiba (1978); C. Sotelo and A. Privat (1978); P. Rakic (1979).
5. J. Lejeune et al. (1959); J. Lejeune (1977); F. Gullotta et al. (1981).
6. See S. Benzer (1967, 1973).

7. J. Hall (1978); Y. N. Jan and L. J. Jan (1978).
8. W. Quinn et al. (1974); Y. Dudai (1981).
9. D. Byers et al. (1981).
10. W. Bodmer and L. Cavalli-Sforza (1976).
11. J. Mendlewicz et al. (1979, 1980); J. Mendlewicz (1980).
12. J. Monod (1970).
13. F. Gros et al. (1961); F. Jacob and J. Monod (1961).
14. For references, see J. Watson (1976).
15. F. Gros et al. (1961); F. Jacob and J. Monod (1961).
16. See J. Gurdon (1974); L. Hood et al. (1975).
17. P. Kourilsky and P. Chambon (1978); R. Breathnach and P. Chambon (1981).
18. R. Scheller et al. (1982).
19. P. Kourilsky and P. Chambon (1978); R. Breathnach and P. Chambon (1981).
20. W. Hahn et al. (1978); J. van Ness et al. (1979).
21. See F. Jacob (1979).
22. T. R. Wright (1970); J. Postlethwaite and H. Schneiderman (1973); P. A. Lawrence and G. Morata (1983); see also W. McGinnis et al. (1984).
23. E. Hadorn (1967, 1968).
24. D. Bennett (1975); H. Shin et al. (1982).
25. R. Goldschmidt (1940); C. Stern (1954); A. Garcia-Bellido (1981).
26. S. Strickland and V. Mahdavi (1978).
27. S. Levine (1966); C. Aron (1974); B. McEwen (1976); R. A. Gorski (1979); Y. Arai (1981).
28. S. Strickland and V. Mahdavi (1978).
29. On the rat, see S. Levine (1966); C. Aron (1974); B. McEwen (1976); R. A. Gorski (1979); Y. Arai (1981). On man, see E. Sullerot (1978).
30. C. de Lacoste-Utamsing and R. L. Holloway (1982); see also P. V. Tobias (1975); R. Holloway (1980).
31. For references, see D. W. Pfaff (1980).
32. For references, see P. Rakic and P. Goldman-Rakic (1982).
33. J. B. Angevine and R. L. Sidman (1961); P. Rakic (1974).
34. C. J. Shatz and P. Rakic (1981).
35. On monkeys, see J. S. Lund et al. (1977); R. Boothe et al. (1979). On humans, see J. L. Conel (1939-1963).
36. J. S. Lund et al. (1977); R. Boothe et al. (1979); L. J. Garey (1984).
37. H. Van der Loos and T. Woolsey (1973).
38. J. H. Scholes (1979); N. Bodick and C. Levinthal (1980); K. A. C. Martin and V. H. Perry (1983).

7 *Epigenesis*

1. J.-P. Changeux (1972, 1983a, 1983b); J.-P. Changeux et al. (1973); G. Stent (1973); J.-P. Changeux and A. Danchin (1976); W. M. Cowan (1979); see also S. Ramón y Cajal (1909).
2. See E. R. Macagno et al. (1973).
3. F. Levinthal et al. (1976).
4. R. E. Wimer et al. (1976).
5. B. Mintz (1974).
6. R. Mullen (1977); M. L. Oster-Granite and J. Gearhart (1981); D. Goldowitz and R. J. Mullen (1982).
7. R. B. Campenot (1977).
8. W. M. Cowan (1979); R. Pittman and R. W. Oppenheim (1979).
9. P. A. Redfern (1970); M. R. Bennett and A. G. Pettigrew (1974a, 1974b); P. Benoît and J.-P. Changeux (1975, 1978); M. C. Brown et al. (1976); J. -L. Gouzé et al. (1983).
10. F. Crepel et al. (1976); J. Mariani and J.-P. Changeux (1981); J. Mariani (1983).
11. P. R. Huttenocher et al. (1982); L. J. Garey (1984).
12. G. M. Innocenti (1981a, 1981b); D. O'Leary et al. (1981); G. O. Ivy and H. P. Killackey (1982).
13. V. Hamburger (1970); K. L. Ripley and R. R. Provine (1972).
14. D. Jouvet-Mounier (1968); C. Dreyfus-Brisac (1979).
15. R. Marty and J. Scherrer (1964).
16. For references, see J.-P. Changeux (1981a).
17. For references, see D. M. Fambrough (1979); J.-P. Changeux (1981a); M. J. Dennis (1981).
18. A. Michler and B. Sakmann (1980); C. G. Reiness and C. B. Weinberg (1981); J. Steinbach (1981).
19. For references, see G. D. Fischbach et al. (1976).
20. See also J.-P. Changeux et al. (1973).
21. For references, see J.-P. Changeux (1981a, 1983a); W. A. Harris (1981); P. G. Nelson and D. E. Brenneman (1982).
22. G. Giacobini et al. (1973); S. Burden (1977a, 1977b); J.-P. Bourgeois et al. (1978).
23. R. Pittman and R. W. Oppenheim (1979); R. W. Oppenheim and R. Nuñez (1982).
24. P. Benoît and J.-P. Changeux (1975, 1978); W. Thompson et al. (1979).
25. R. A. D. O'Brien et al. (1977, 1978).
26. J.-L. Gouzé et al. (1983).
27. See C. E. Henderson et al. (1981); C. E. Henderson (1983).
28. J.-L. Gouzé et al. (1983).

29. For references, see S. LeVay et al. (1980); T. N. Wiesel (1982).
30. See also M. Imbert and P. Buisseret (1975); Y. Frégnac and M. Imbert (1984)—for the effects of activation on the development of orientation selectivity in visual-cortex neurons (Chapter 2).
31. See C. Trevarthen (1973, 1980); S. Springer and G. Deutsch (1981).
32. D. C. Rife (1940); M. C. Corballis and M. J. Morgan (1978); M. J. Morgan and M. C. Corballis (1978).
33. K. Hummel and D. Chapman (1959); W. Layton (1976).
34. J. G. Chi et al. (1972); D. Teszner et al. (1972); J. A. Wada et al. (1975).
35. H. Gordon (1920); D. C. Rife (1940, 1950); R. Howard and A. Brown (1970).
36. E. H. Lenneberg (1967).
37. For the opposite views, see B. T. Woods and H. L. Teuber (1973); H. L. Teuber (1975). For the subtler one, see H. Hecagen (1976).
38. M. J. Dennis and H. Whitaker (1976).
39. See also J. Mehler (1974).
40. P. Marler (1970).
41. P. D. Eimas (1975); K. Miyawaki et al. (1975).
42. S. Sasanuma (1975); M. Iwata (1984).
43. J. Elman et al. (1981).
44. For the initial findings, see R. Cameron et al. (1971). On the lack of confirmation, see A. R. Damásio et al. (1976).
45. A. Tzavaras et al. (1981).
46. G. S. Stent (1981).
47. J.-P. Changeux et al. (1973).
48. P. R. Huttenlocher et al. (1982).

8 *Anthropogenesis*

1. J. de Grouchy (1982).
2. W. Beermann and U. Clever (1964).
3. J. de Grouchy (1982); see also M. C. King and A. C. Wilson (1975).
4. M. C. King and A. C. Wilson (1975).
5. For references, see J. Ruffié (1976, 1982).
6. R. Holloway (1975); P. V. Tobias (1975, 1980); Y. Coppens (1981).
7. S. J. O'Brien and W. G. Nash (1982).
8. S. J. Gould (1977).
9. L. Bolk (1926).
10. Ibid.
11. W. Leutenegger (1972).
12. J. Catel (1953).
13. S. Packer and K. Gibson (1979).

14. B. Inhelder and J. Piaget (1964); J. Piaget (1977).
15. S. Saint-Anne Dargassies (1962).
16. F. Jacob (1979); U. Rutishauser et al. (1982).
17. See also R. Goldschmidt (1940); M. C. King and A. C. Wilson (1975).
18. G. D. Snell (1929); M. Wintzerith et al. (1974).
19. P. Evrard et al. (1982).
20. F. Gullotta et al. (1982).
21. G. Isaac (1978).
22. M. Godelier (1982).
23. J. Neel et al. (1964).
24. S. Mellen (1981).
25. See Y. Coppens (1976); see also J. Piveteau (1956).

### 9 The Brain—Representation of the World

1. See M. Piatelli-Palmarini (1979); M. Bunge (1980); S. P. R. Rose (1980); J. A. Fodor (1981b).
2. See J. A. Fodor (1975).
3. Ibid.
4. E. Mayr (1963); R. C. Lewontin (1974); T. Dobzhansky (1977); M. J. D. White (1978); S. J. Gould (1982).
5. B. André-Leicknam and C. Ziegler (1982).
6. N. R. Jerne (1967); J.-P. Changeux (1972); J. Z. Young (1973); G. M. Edelman and V. B. Mountcastle (1978).
7. M. Jeannerod and H. Hecaen (1979).
8. See P. Benoît and J.-P. Changeux (1978).
9. B. de Spinoza (1843).



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