

Notes and References

Chapter 1

Some of the major sources of biographical information are listed below, others have been mentioned in the Preface. The *Dictionary of National Biography* and Sharpey-Schafer's *History of the Physiological Society* (Suppl., *J. Physiol.*, 1927) have been regularly consulted for information on Sherrington's contemporaries.

ADRIAN. Sherrington Memorial Lecture. *Proc. Roy. Soc. Med.*, 1957, 50, 991.

ANDRADE, E. N. Da C. Sherrington as a Master of Words. *The Caian*, 1958, p. 85.

BREMER, F. Charles Scott Sherrington. *Les Prix Nobel de Médecine*, Union Européenne d'Édition, Monaco, 1962.

COHEN OF BIRKENHEAD. *Sherrington, Physiologist, Philosopher and Poet*. Liverpool University Press, 1958.

CREED, R. S. Obituary notice. *Brit. J. Psychol.*, 1953, 44, 1.

DENNY-BROWN, D. Charles Scott Sherrington. *Amer. J. Psychol.*, 1952, 65, 474.

DENNY-BROWN, D. The Sherrington School of Physiology. *J. Neurophysiol.*, 1957, 20, 543.

ECCLES, J. C. Obituary. *Brit. J. Phil. Sci.*, 1952, 3, 298.

FORBES, A. Memorial Tribute. *J. Clin. Neurophysiol. EEG.*, 1952, 4, 213.

FULTON, J. F., Obituary. *The Lancet*, 1952, 262, 569.

LIDDELL, E. G. T. Charles Scott Sherrington. *Obituary Notices of Fellows of the Royal Society*, 1952, 8, 241.

PENFIELD, W. Sir Charles Sherrington, Poet and Philosopher. *Brain*, 1957, 80/III, 402.

SHERRINGTON, C. E. R. 'Memories for private circulation', delivered as the Beaumont Lecture (Yale University, November 15, 1957).

SHERRINGTON, C. S. 'Marginalia' in *Essays, etc., written in Honour of Charles Singer*. Vol. II, Oxford University Press, 1953.

WIGGERS, C. J. Some Significant Advances in Cardiac Physiology during the Nineteenth Century. *Hist. Med.*, 1960, 34, 1. (Contains the reference to Gaskell's work.)

Chapter 2

The classical books and papers on anatomy and physiology, referred to in the text, can easily be traced from the few references given

below. A bibliography of Sherrington has been compiled by the late Professor John F. Fulton and was included in Denny-Brown's *Selected Writings*, referred to below. It was republished and amended by Lord Cohen of Birkenhead in his book referred to above.

CANGUILHEM, G. *La formation du concept de réflexe aux XVII^e et XVIII^e siècles*. Presses Univ. de France, 1955.

FULTON, J. F. *Physiology of the Nervous System*. Oxford University Press, New York, 3rd Ed., 1949.

LIDDELL, E. G. T. *The Discovery of Reflexes*. Clarendon Press, Oxford, 1960.

PUPILLI, G. C., and FADIGA, E. The Origins of Electrophysiology. *J. of World History*, 1963, 7/2, 549.

RAMÓN Y CAJAL, S. *Recollections of my life*. Transl. by E. Horne Craigie. Edited in 2 vols. as *Memoirs Amer. Phil. Soc.*, Philadelphia, 1937. This book was reviewed by Sherrington under the title 'Scientific Endeavour and Inferiority Complex' in *Nature*, 1937, 140, Suppl.

SHERRINGTON, C. S. 'A Memoir of Dr Cajal' was published in *Explorers of the human brain. The life of Santiago Ramón y Cajal*, ed. Dorothy F. Cannon. Henry Schuman, New York, 1949.

Chapter 3

For the early development of Sherrington's concepts one of the best sources is his extensive contribution to Schäfer's *Textbook of Physiology*, vol. 2, Pentland, London and Edinburgh, 1900. It contains in addition everything known in neurophysiology, including the sense organs, at the time of writing, and can justly be called a piece of first-rate scholarship.

CREED, R. S., DENNY-BROWN, D., ECCLES, J. C., LIDDELL, E. G. T., and SHERRINGTON, C. S. *Reflex Activity of the Spinal Cord*. Clarendon Press, Oxford, 1932.

DENNY-BROWN, D. *Selected Writings of Sir Charles Sherrington*. Hamish Hamilton, London, 1939.

ECCLES, J. C. Some Aspects of Sherrington's Contribution to Neurophysiology. *Notes and Records of the Roy. Soc.*, 1957, 12, 216.

ERLANGER, J., and GASSER, H. S. *Electrical Signs of Nervous Activity*. University of Pennsylvania Press, Philadelphia, 1937.

FULTON, J. F. *Muscle Contraction and the Reflex Control of Movement*. Williams & Wilkins, Baltimore, 1926.

SHERRINGTON, C. S. *The Integrative Action of the Nervous System*. Silliman Lectures (Yale University Press, New Haven); Constable, London, 1906.

SHERRINGTON, C. S. Inhibition as a Co-ordinative Factor. *Les Prix Nobel*, Norstedt & Söner, Stockholm, 1932.

Chapter 4

The references given below are restricted to summaries dealing with the cerebellum, cerebral localization and the work of Magnus and de Kleijn.

DOW, R. S. and MORUZZI, G. *The Physiology and Pathology of the Cerebellum*. University of Minnesota Press, 1958.

MAGNUS, R. *Die Körperstellung*. Springer, Berlin, 1924.

PENFIELD, W. and ERICKSON, T. C. *Epilepsy and Cerebral Localization*. Charles D. Thomas, Springfield, 1941.

Chapter 5

ADRIAN, E. D. *The Basis of Sensation. The Action of Sense Organs*. Christophers, London, 1928.

ADRIAN, E. D. *The Mechanism of Nervous Action. Electrical Studies of the Neurone*. Clarendon Press, Oxford, 1932.

DENNY-BROWN, D. On the Nature of Postural Reflexes. *Proc. Roy. Soc.*, 1929, B104, 252.

ECCLES, J. C. *The Neurophysiological Basis of Mind*. Clarendon Press, Oxford, 1957.

GRANIT, R. *Receptors and Sensory Perception*. Silliman Lectures. Yale University Press, 1955.

HOFFMANN, P. *Untersuchungen über die Eigenreflexe (Sehnenreflexe) menschlicher Muskeln*. Springer, Berlin, 1922.

LLOYD, D. P. C. On Reflex Actions of Muscular Origin. Patterns of Organization in the Central Nervous System. *Proc. Ass. Res. Nerv. Ment. Disease*, 1950, 30, 48.

LORENTE DE NÓ, R. Transmission of Impulses through Cranial Motor Nuclei. *J. Neurophysiol.*, 1939, 2, 402.

PIPER, H. *Die Elektrophysiologie menschlicher Muskeln*. Springer, Berlin, 1912.

Chapter 6

The reference to Florey is to a Symposium dealing with inhibition in all its aspects.

FLOREY, E., Editor. *Nervous Inhibition*. Pergamon Press, London, 1961.

HODGKIN, A. L. The Ionic Basis of Electrical Activity in Nerve and Muscle. *Biol. Rev.*, 1951, 26, 339.

ECCLES, J. C. *The Physiology of Nerve Cells*. Johns Hopkins Press, Baltimore, 1957.

KUFFLER, S. W. Excitation and Inhibition in Single Nerve Cells. *Harvey Lectures*, 1960, 54, 176.

Chapter 7

The reader interested in Sherrington's work on tone and plasticity will find it described in the papers published in the *Quart. J. Exp. Physiol.* between 1909 and 1913 (see Bibliography, quoted above). Ideas on muscle tone up to 1930 have been reviewed by Bremer (below). The gamma-spindle work is of a later date and was first extensively summarized by the author in his Silliman Lectures, quoted above. The two Symposia quoted below present latest developments in both anatomy and physiology.

BARKER, D., Editor. *Symposium on Muscle Receptors*. Hong Kong University Press, Hong Kong, 1962.

BREMER, F. Le Tonus Musculaire. *Annal. Physiol. et Physico-Chem. Biol.*, 1932, 8, 199.

GRANIT, R., Editor. *Muscular Afférents and Motor Control. Nobel Symposium I*. Almqvist & Wiksell, Stockholm, 1966.

Chapter 8

SHERRINGTON, C. S. *The Assaying of Brabantius and Other Verse*. Oxford University Press, 1925.

SHERRINGTON, C. S. *Goethe on Nature and Science*. Cambridge University Press, 1942.

SHERRINGTON, C. S. *The Endeavour of Jean Fernel*. Cambridge University Press, 1946.

SHERRINGTON, C. S. *Man on his Nature*. Cambridge University Press, 1941.

SHERRINGTON, C. S. Poems printed in the *Cornhill Magazine*, vols. 154 (1936), p. 140, and 155 (1937), pp. 38 and 701.

Index

- Accelerans, 9, 80, 81
Acetylcholine, 23, 81, 106, 111, 124, 133
Action potential (*see* Nerve impulse)
Adrenaline, 81, 106
ADRIAN, Lord, 2, 5, 23, 29, 38, 64, 66, 72,
81, 95, 98-102, 104, 105, 134, 156
Afterdischarge, 70, 71, 159
Afterpotentials, 121-24, 128, 156
ALEXANDER the Great, 30
Algebraical summation, 79-81, 134-6
All-or-none law, 64-6, 120
ANDERSON, Sir H. K., 10
Ankle jerk, 150
Antidromic stimulation, 117-22, 127-
130, 135-7, 157, 158
Aplysia, 111, 132
ARAKI, T., 125
ARISTOTLE, 5, 17C
ASHE, T., 5
ASHER, L., 176
AUERBACH, L., 36
Axon hillock, 118, 159

BACON, Lord, 4
BARKER, D., 162
BARR, M. L., 120
BARRON, D. H., 106
BAZETT, H. C., 97
BEEVOR, C. E., 89
BEHRING, E. A. von, 10, 26, 46
BELL, C., 39
Bell-Magendie law, 39
BERGER, H., 153
BERKELEY, G. (Bishop), 173
BERNARD, C., 27, 53, 54
BERNSTEIN, J., 42, 115, 116
BIANCONI, R., 113, 147
BIEDERMANN, W., 56
BISMARCK, Prince, O. von, 16
BOYCE, Sir R., 85
BOYD, I. A., 162
BRADFORD, Sir J. R., 13
BRADLEY, K., 133, 161
BRAIN, Lord, 97
Brain, 14, 51, 86, 87, 89-91, 96
BREMER, F., 93, 107, 140, 153
BROCK, L. G., 131
BRONDGEEST, P. Q., 47, 73, 95
BRONK, D. W., 72, 98, 99, 101, 104,
138, 156
BROOKHART, J., 109
BROWN, Sir G. L., 65, 106

BROWN-SÉQUARD, C. E., 28, 41
Brown Institution, 16, 46, 85
BRÜCKE, Th., 30, 54
BRUNTON, Sir T. L., 9
BUCHANAN, F., 101
BULLOCK, T. H., 133, 159
BUYTENDIJK, F., 102, 103

CAMIS, M., 96
CANGUILHEM, G., 39
CANNON, W., 55
Central excitatory state, 78, 79, 101,
108, 109, 120, 124
Central inhibitory state, 78, 79, 101
Cerebellum, 30, 34, 53, 75, 89, 93-5,
139, 154
CHANG, H.-T., 112
CHARLES V of Germany, 169
CHITTENDEN, R. H., 48
CIPOLLONE, L. T., 77
CLARKE, R. H., 89
Clasp-knife response, 76, 162
COBB, S., 93, 97
Cocaine paralysis, 151, 154
COHNHEIM, J. F., 15
COLE, K. S., 115
Conduction velocity (*see* Nerve)
Contact theory (*see* Neurone theory)
Convergence (*see* Interaction)
COOMBS, J. S., 116, 119, 122, 131
COOPER, S., 10, 102, 147, 162, 163
Cortex (*see* Motor cortex)
COTMAN, J. S., 5
COUTTS-TROTTER, 7
COX, C., 20
COX, D., 5
Crayfish, 56, 82, 122, 139
CREED, R. S., 66, 96, 147
CRICK, F. H. C., 172
Crossed extensor (*see* Reflexes)
CURTIS, D. R., 116, 119
CURTIS, H. J., 115, 122
CUSHING, H., 20, 25, 26, 48, 84, 85, 88
CYON, E. von, 8, 9, 80

DALE, Sir H., 12, 23, 106
Dale's principle, 110, 130
DARWIN, C., 6, 171
DA VINCI, L., 38
DAVIS, L., 53, 94, 154, 161
Deafferentation, 28, 75, 76, 94, 149-51,
154

- DE CASTRO, F., 36
 Decerebrate rigidity (*see also*
 Rigidities), 52, 56, 73-6, 93, 94
 DEITERS, O. F. K., 31
 Delay paths, 70
 Dendrites, 31, 32, 36, 109, 121, 123,
 140, 159
 DENNY-BROWN, D., 22, 38, 51, 60,
 66-8, 72, 92, 97, 100, 102-4, 130,
 155, 156
 Depolarization, 80-2, 106, 107, 116,
 118, 123, 146, 153, 155, 159,
 Chapter 6
 DESCARTES, R., 38, 169
 DEWAR, Sir J., 43
 DEW-SMITH, A. G., 50
 DICKINSON, W. L., 13
 DOW, R. S., 94, 95, 154
 DREYER, N. B., 97
 DU BOIS-REYMOND, E., 15, 30, 40-2,
 95, 115
 DUCANGE, C. du Fresne, 50
 DUSSER DE BARENNE, J. G., 101, 103

 ECCLES, Sir J. C., 6, 23, 66-9, 79, 83,
 106-8, 110, 112, 116-24, 127-34,
 140, 141, 143, 147, 156, 157, 159,
 161
 EDINGER, L., 17
 EHRLICH, P., 17
 EINTHOVEN, W., 43, 58
 EISENBERGER, J. P., 64
 ELDRED, E., 146, 149, 150, 153
 Electroencephalogram, 139, 153
 Electromyography, 65, 66 101-4
 Electrotonus, 42, 80, 106
 ELIZABETH I of England, 4
 End organs (*see also* Muscle)
 discharge from, 98, 99
 joint, 47, 95-100, 112
 neck, 96
 skin, 14, 99
 vestibular, 91-6
 End plates (motor), 105, 106, 116, 125
 ERLANGER, J., 58, 59, 107, 111, 112,
 143, 151
 EULER, C. von, 139, 153, 164
 EULER, U. S. von, 106
 EVES, R. C., 22
 EWALD, J. R., 60, 94
 Excitation (*see also* Nerve fibres,
 Transmission)
 chemical, 105, 106, 110
 electrical, 105, 118, 133
 postsynaptic potential in, 119-24
 theories of, 80, 81, 105, 106, 118
 Extensor thrust, 62
 Eye (*see* Retina)
 EYZAGUIRRE, C., 132, 139

 FATT, P., 116, 127, 129-31
 Feedback, 21, 54, 136, 142, 145, 152, 158
 FELDBERG, W., 106
 FENG, T. P., 115
 FERNAND, V. S. V., 112
 FERNEL, J., 1, 5, 88, 169-71
 FERRIER, Sir D., 14, 51, 89
 FLECHSIG, P., 41
 Final common path, 62, 81, 101
 FLOREY, Lord, 97
 FLOURENS, M. J. P., 53, 94
 FODERÁ, M., 75
 FORBES, A., 5, 64, 70, 77, 101, 130, 143
 FOREL, A., 32
 FORSTER, E. M., 18, 19
 FORSTER, H. V., 86, 87, 91
 FOSTER, Sir M., 7-10, 27, 28, 36, 40,
 41, 50, 59, 73
 FRANCIS I of France, 169
 FRANK, K., 140
 FRANKENHAEUSER, B., 118, 139
 FRANKLIN, K. J., 8
 FREUSBERG, A., 61
 FRITSCH, G. T., 14, 51, 89, 90
 FRÖHLICH, A., 88
 FULTON, J. F., 27, 48, 77, 78, 85, 88,
 89, 92, 96
 FUORTES, M. G. F., 139
 FURSPAN, E. J., 133
 Fusimotor fibres (*see* Gamma fibres)

 GAIRDNER, 10
 GALVANI, L., 41
 Gamma bias, 149, 152, 160, 161
 Gamma fibres
 defined, 143
 physiology of, 149-53, 160-2, 164
 Gamma loop, 146, 151, 152, 154, 160
 GASKELL, W. H., 8-13, 16, 17, 29, 82, 92
 GASSER, H. S., 58, 59, 106, 111, 113,
 122, 140, 143, 151
 GELFAN, S., 120, 121
 Generator potential, 116
 GEORGE ELIOT (Evans, M. A.), 14
 GERARD, R., 115, 117
 GIBSON, W. C., 97
 GIFFORD, Lord, 1, 165
 GOETHE, J. W. von, 165, 166
 GOLGI, C., 32-7, 73, 77, 128, 145, 152
 Golgi tendon organs (*see* Tendon
 organs)
 GOLTZ, F. L., 8, 13, 14, 27, 29, 41, 60,
 61, 89, 92
 Gonville and Caius College, 3, 10, 87
 GÖPFERT, H., 105
 GORDON, C. G. (General), 17
 GOTCH, F., 52
 GRAEFE, A. von, 30
 GRAHAM, J., 117
 GRAHAM BROWN, J. J., 14, 15
 GRAHAM BROWN, T., 60, 88, 97, 130

- GRANIT, R., 2, 6, 19, 20, 22, 24, 37, 45, 46, 48, 51, 68, 71, 125, 126, 135, 136, 138, 139, 145-7, 149, 150, 153, 154, 156-8, 160, 164
- GREEN, J. D., 139
- GREGORY, R. A., 85
- GRÜNBAUM, A. S. F., 86, 87
- HAGBARTH, K.-E., 69, 112
- HAGIWARA, S., 133, 159
- HALL, M., 40
- HAMBURGER, H. J., 51
- HANNOVER, A., 30
- HARDY, W. B., 3
- HARTLINE, H. K., 137
- HARVEY, W., 169
- HEAD, SIR H., 11, 12, 17, 47, 82
- HELD, H., 17, 36
- HELMHOLTZ, H. von, 30, 39
- HENATSCH, H.-D., 156
- HENLE, F. G. J., 30
- HENRY II of France, 169
- HENRY VIII of England, 4, 169
- HERING, E., 56, 82
- HERING, H. E., 56, 88
- HERRMANN, L., 42
- HIS, W., 17, 36
- HITZIG, E., 14, 51, 89, 90
- HODGRIN, A. L., 42, 115-18, 139
- HOFF, E. C., 97
- HOFF, H. E., 97
- HOFFMANN, P., 58, 59, 102
- HOLDEN, H. A., 4
- HOLMES, G., 97
- HOLMGREN, B., 154
- HOLMGREN, F., 43, 158
- Homeostasis, 55
- HORSLEY, SIR V., 3, 89, 93
- HUFSCHMIDT, H.-J., 147
- HUME, D., 165, 173
- HUNT, C., 65, 113, 146-49
- HUNT, R., 92
- HUTTER, O. F., 12
- HUXLEY, A. F., 42, 115-17, 139
- HUXLEY, T. H., 7
- Hyperpolarization (*see also* Inhibition, postsynaptic, Repolarization), 138
- IGGO, A., 157
- Inactivation, 139
- Inhibition
- autogenetic, 77, 147
 - cerebellar, 93
 - 'direct', 100-10, 112, 139
 - history of, 40, 41, 51, 54-8, 80-2
 - inactivation, 139
 - lateral, 137
 - peripheral, 56, 82, 105
 - polysynaptic, 112
 - postsynaptic, 128-32, 134, 141
 - presynaptic, 82, 139-41, 147
 - reciprocal, 55, 56
 - recurrent, 128-31, 135-7, 157, 158
 - remote, 140
 - retinal, 45, 46
 - theories of, 57, 58, 80-3
 - vagal, 12, 56, 82
 - Wedensky type, 82, 140
- Interaction, 62-6, 80, 159
- Interneurones, 32, 56, 57, 81, 110, 120, 127-30, 159
- Intracellular technique, 112, 116, 117
- Ionic theory, 116-18
- ITO, M., 157
- JACKSON, J. H., 14, 75, 76, 90
- JAMES, W., 41
- JANSEN, J., 163
- JASPER, H., 96
- JEFFERSON, SIR G., 97
- JOB, C., 147
- JOHN, A., 22
- KAADA, B., 146, 149
- KANDEL, E. R., 139
- KATZ, B., 12, 106, 133
- KEATS, J., 47, 170
- KELLER, C. J., 59
- KERNELL, D., 125, 126
- KEYNES, R. D., 115
- King's College (Cambridge), 9
- KLEIJN, A. de, 95, 96, 150, 151
- Knee jerk, 45, 46, 58, 65, 120
- KOCH, R., 10, 15, 16, 26, 46
- KOKETSU, K., 127, 129-31
- KÖLLIKER, A. von, 17, 30, 31, 34, 47
- KRIES, A. von, 102
- KUFFLER, S. W., 65, 113, 132, 139, 146, 148, 149
- KÜHNE, W., 11, 15, 47
- KUNO, M., 157
- LANDSTEINER, K., 27
- LANGLEY, J. N., 9, 10, 11, 13, 16
- LAPICQUE, L., 169
- LAPORTE, Y., 113, 147
- LARRABEE, M. G., 138
- LASLETT, E. E., 62, 96
- Law of forward conduction, 41
- LEA, A. S., 11
- LEIBNITZ, G. W., 173
- LEKSELL, L., 143, 149, 153
- Lengthening reaction, 76, 77, 154, 160-2
- LEWES, G. H., 14, 46
- LEYTON, A. S. F., 87, 89, 90
- LIDDELL, E. G. T., 5, 12, 22, 23, 27, 28, 31, 32, 39, 51, 53, 66, 71-5, 83, 92, 142
- LIEBERKÜHN, N., 30
- LILJESTRAND, G., 95
- LIM, R. K. S., 88

- Limulus*, 137
 LING, G., 117
 LINNÉ, C. von, 168
 LIPPMANN, 58
 LISTER, Lord, 46, 85
 LLOYD, D. P. C., 59, 61, 92, 108-13,
 121, 124, 138, 140, 146, 147
 Localization (cortical), 14, 89, 90
 LOEWENTHAL, M., 93
 LOEWI, O., 81, 105, 106
 LORENTE DE NÓ, R., 34, 36, 59, 100, 159
 LOYOLA, I., 169
 LUCAS, K., 64, 82, 83, 101, 105, 140
 LUCIANI, L., 94
 LUDWIG, C., 8, 9, 30, 40
 LUNDBERG, A., 131, 138, 139, 147, 156
 LUTHER, M., 169
- McCOUCH, G., 92, 96, 97
 MCKENDRICK, J. G., 43
 Magdalen College, 19, 178
 MAGENDIE, F., 39, 53, 75
 MAGNUS, R., 60, 62, 88, 95, 96, 150, 151
 MAGOUN, H. W., 153
 MARCHI, V., 28
 MARCOU, I., 97
 MATTEUCCI, C., 42
 MATTHES, K., 97
 MATTHEWS, Sir B. H. C., 98, 106, 140,
 144, 145, 153
 MATTHEWS, P. B. C., 65, 151, 154, 160,
 163
 MATTHEWS, R., 98
 MELANCHTON, Ph., 169
 Membrane potential (*see* Resting
 potential)
 MENDEL, G., 171
 MERTON, P. A., 146, 149, 150, 152-4,
 158
 MEYER, J., 30
 Microcapillaries, 117
 MILLER, F. R., 97
 MONAKOW, C. von, 92
 MOND, L., 89
 MONNIER, A., 169
 MORTON, R. A., 85
 MORUZZI, G., 94, 95, 153, 154
 Motoneurons,
 defined, 32, 56, 57
 discharge frequencies of, 101-4
 intracellular recording from, Chapter 6
 intracellular stimulation of, 125-7
 number of, 120, 121
 phasic, 156, 158
 tonic, 156-9
 Motoneurone pool, 67
 Motor cortex, 51, 86, 87, 89-91
 Motor units,
 addition of, 64-7
 contraction value of, 69
 isolation of, 101-3
- MOTT, F. W., 88
 MÜLLER, J., 5, 27, 30, 39, 40
 Muscle,
 action potentials of, 42, 65, 66, 101-4
 extrafusal, 143, 151, 152
 intrafusal, 143, 151, 152
 phasic, 155
 tonic, 155
 Muscle contraction,
 isometric, 50, 64-6
 isotonic, 50, 64
 Muscle spindles,
 afferents from, 47, 77, 78, 146
 anatomy of, 73, 78, 162, 163
 gamma control of, 144-6, 149-64
 historical, 47, 77, 78, 143-6
 primaries of, 146, 148-51, Chapter 7
 secondaries of, 146, 161-3
 theoretical views on, 152, 153, 159,
 160
 Myography,
 types of, 50
 used in reflex work, 51, 52, 64-72
- NASTUR, W. L., 117
 Needle electrodes, 104
 Negative feedback (*see* Feedback)
 Nerve fibres,
 alpha, 143, 148
 conduction velocity of, 59, 107, 109,
 111, 113, 143, 156
 diameter of, 59, 107, 111-13
 gamma, 143, 148
 grouping of, 111, 113
 Nerve impulse (*see also* Ionic theory),
 discovery of, 40, 42, 81, 98, 99
 theories of, 42, 118
 Neurone theory, 32, 36, 43
 NEWTON, I., 173
 Nor-adrenaline, 106
 NORRSELL, U., 139
- OBRADOR, S., 97
 Occlusion, 70
 OLMSTED, J. M. D., 97
 Opisthotonus, 154
 OTANI, T., 125
- PASCAL, B., 18
 PASCOE, J., 135
 PASTEUR, L., 10, 46, 157, 158
 PENFIELD, W., 4, 20, 85, 89, 91, 96
 PFLÜGER, E. W., 42
 PHILLIPS, C. G., 132, 139, 157
 PHILLIPSON, M., 77
 Physiological Society, 9-12
 PIPER, H., 101, 102, 104
 Piper rhythm, 102
 Pi-SUÑER, J., 77, 78
 Plasticity, 76, 77, 160-2
 POLLOCK, L. J., 53, 94, 154, 161

- POLYAK, S., 14
 POMPEIANO, O., 154, 161
 Postactivation potentiation, 138, 139, 159
 Postsynaptic excitation (*see* Excitation)
 Postsynaptic inhibition (*see* Inhibition)
 Postsynaptic potential (*see* Excitation, Inhibition)
 Postural reflexes (*see also* Tone), 93, 95, 96, 154, 155
 POTTER, D. D., 133
 PRATT, F. H., 64
 PREISENDORFER, F., 102
 Presynaptic inhibition (*see* Inhibition)
 Psychophysics, 100
 PURKINJE, J. E., 30, 139
- RAMÓN Y CAJAL, S., 15-18, 24, 32-7, 41, 58, 63, 158
 RANSON, W., 159
 RATLIFF, F., 137
 Rebound, 45
 Receptive field, 63, 74
 Reciprocal innervation, 50, 51, 54-6, 60, 72, 93, 109, 110
 RECKLINGHAUSEN, F. D. von, 31
 Recruitment (*see* Reflexes, recruiting)
 Recurrent collaterals (*see* Inhibition, Reflex action)
 Reflex action graded by
 after-hyperpolarization 121-6, 156, 157
 frequency of discharge, 72, 104
 membrane current, 125-7
 membrane potentials, 119
 number of neurones, 72, 103, 104
 recurrent inhibition, 135, 137, 138, 152
- Reflexes,
 autogenetic, 74, 77, 142, 145, 147
 crossed, 66, 68, 78
d'emblée, 72
 disynaptic, 57, 59, 110, 131, 147
 extensor, 55, 56, 62, 67-72, 74
 flexor, 55, 56, 62, 67-72, 74
 history of, 38-41
 monosynaptic, 58, 92, 108-10, 119-124
 neck, 95, 96, 149, 150
 Phillipson's, 77
 polysynaptic, 57, 59, 108, 112, 120
 recruiting, 71, 72, 102, 103
 righting, 60, 95, 96
 scratch, 57, 62, 93
 stretch, 73-78, 102-4, Chapter 7
- Reflex figures, 61, 95
 REICHERT, C. B., 30
 REID, R. W., 97
 REIS, D., 147
 Release, 75, 149
- REMAK, R., 30
 RENAN, E., 20
 RENKIN, B., 135, 136
 RENSCHAW, B., 109, 127, 129, 130, 144, 158
 Renshaw cells, 127, 128, 130, 131, 133, 145, 159
 Repolarization, 128
 Respiration, 41, 164
 Resting potential, 42, 115, 117, 118, 140
 Reticular theory, 32
 Retina, 10, 31, 36, 45, 46, 63, 114, 167
 RETZIUS, A., 30
 RETZIUS, G., 17
 REXED, B., 112
 RICHTER, C., 26, 27
 Rigidities,
 alpha, 94, 154, 161
 gamma, 149-51, 154
 RIOCH, D. MCK., 92
 ROAF, H. E., 97
 Root potentials, 106
 ROSE, C., 5
 ROSENTHAL, I., 95
 ROSSI, G., 153
 ROY, C. S., 8, 14-16
 RUCH, T. C., 94, 97
 RUFFER, SIR A., 46
 RUFFINI, A., 73, 146, 163
 RUSHWORTH, G., 151
 RUSSELL, Lord (Bertrand), 166
- SANDERSON, Sir J. S. B., 7, 101
 SASSA, K., 97
 SCHAEFER, H., 105
 SCHÄFER, E. A., 84, 113
 SCHIEFFERDECKER, P., 41
 SCHIFF, M., 27, 28, 41, 73, 94
 Schiff-Sherrington phenomenon, 94
 SCHULTZE, M., 30, 31
 SCHUSTER, E., 88
 SCHWALBE, G., 17
 SCHWANN, T., 30
 SEARS, T. A., 164
 Sense organs (*see* End organs, Muscle spindles, Tendon organs)
 SETCHENOW, I. M., 40
 SHARPEY, W., 7
 SHARPEY-SCHÄFER, Sir E. A., 7
 SHAW, B., 17
 SHERRINGTON, C. E. R., 86
 SHERRINGTON, Sir C. S.,
 at Cambridge, 7-14, 28, 51
 at Eastbourne, 2
 at Ipswich, 4, 5
 at Liverpool (*see below*)
 at St Thomas's Hospital, 17, 19, 30, 45-7
 at Strasbourg, 13, 29, 60
 death of, 2

- in Berlin, 15, 16
 in Spain, 15
 Lectures by
 Ferrier, 66, 73
 Gifford, 1, 165
 Linacre, 77, 78, 113, 114, 143
 Marshall Hall, 92
 Nobel, 80
 Silliman, 29, 48, 49
 marriage of, 85
 parents of, 5
 President of the Royal Society, 1
 Professor at Liverpool, 25, 60, 84-95
 Professor at Oxford, 1, 19, 22, 23,
 29, 64-71, 75, 78-83
 teaching of, described, 19, 20, 97
 SHERRINGTON, E. (Lady S.), 23, 85
 SHERRINGTON, J. N., 5
 SHOLL, D. A., 33
 Shortening reaction, 76, 160, 161
 SHORTESS, G. K., 125, 126
 SKOGLUND, S., 157
 Sleep, 152, 153, 155
 SMITH, R. S., 125
 SNIDER, R. S., 95
 SÖDERBERG, U., 153
 SOWTON, S. C. M., 97
 Spasticity, 156, 162
 SPENCER, W. A., 139
 Spinal animal, 60, 92, 147
 Spinal paths (long, short), 96
 Spinal shock, 92
 SPRIGGE, Sir S., 3
 Squid (nerve), 115, 118
 Stabilization of discharge, 80, 105, 134,
 157
 STEG, G., 135, 156-8
 STRACHEY, L., 17
 STRÖM, G., 147
 Strychnine, 77, 101, 133, 161
 Subliminal excitation, 68-70, 78, 79,
 109
 Subliminal fringe, 67-9, 72, 73, 109, 157
 Subs synaptic currents, 111, 122-4, 132
 SWIFT, J., 39
 Synapse (defined), 36, 43, 57
 Synaptic action, 43, 57, 59, 63, 64, 80,
 93, 110, 111, 119-24
 Synaptic cleft, 44
 Synaptic convergence (*see also* Inter-
 action), 66-8
 Synaptic delay, 58, 119, 120
 SZENTÁGOTHAI, J., 128

 TAIT, L., 3
 TAUC, L., 111, 132, 133
 Teleology, 54
 Tendon organs, 47, 73, 77, 145, 152,
 158, 162
 THERMAN, P. O., 112
 THOMPSON YATES, S. A., 85, 86

 THRELFALL, 3
 TIGERSTEDT, R., 37
 Tone (*see also* Postural reflexes)
 cerebellar, 94
 general, 48, 73
 present ideas on, 153-5
 Sherrington on, 76, 94, 95, 154, 155
 TOZER, F. M., 97
 Transmission (at synapses)
 chemical, 105, 132, 133
 electrical, 105, 106, 133
 Transmitters, 81, 106, 111, 130, 131
 TRAUBE, L., 30
 TRAUTWEIN, W., 12
 Trinity College, 78
 TÜRK, L., 40, 41

 VAN DER MEULEN, J. P., 113
 VERWORN, M., 82
 VICTORIA of England, 46
 VIETS, H., 97
 VIRCHOW, R., 10, 15, 16, 30, 85
 VOLTA, A., 41
 VULPIAN, E. F. A., 27, 53, 73

 WACHHOLDER, K., 102, 104
 Wakefulness, 152, 153, 155
 WALDEYER, W., 17, 32
 WALKER, E., 96
 WALL, P., 139, 140
 WALLACE, A. R., 171
 WALLER, A. D., 27, 28, 32, 41, 47, 77
 WALLER, A. V., 43
 Wallerian degeneration, 27, 28, 32, 41,
 47, 77
 WALSHE, F. M. R., 97
 WATSON, J. D., 172
 WATT, J., 54
 WEBER, E. F., 56
 WEBER, E. H., 56
 WEIGERT, C., 17
 WEISMANN, A., 47
 WHITEHEAD, A. N., 25
 WIDAL, F., 87
 WIGGERS, C., 9, 13
 WILKINS, M. H. F., 172
 WILSON, V. J., 130, 158
 WOHLFART, G., 69, 112
 WOLSEY (Cardinal), 4
 WOODWORTH, R. S., 88
 WOOLF, V., 50
 World War I, 18, 52, 58, 66, 177
 World War II, 18
 WRIGHT, E. (Lady Sherrington), 85
 WYCKOFF, R. W. G., 120

 YEO, G. F., 9
 YOUNG, J. Z., 112, 115, 120

 ZOTTERMAN, Y., 81, 98, 102, 113
 ZUNTZ, N., 16