

of GABA to receptors (Dray and Bowery, Olsen *et al.*). On the other hand, GABA binding is consistently increased after freezing and thawing and after treatment with Triton X-100 (Enna, Lloyd and Dreksler, Olsen *et al.*). According to Johnston and Kennedy, these procedures remove an endogenous inhibitor, probably phosphatidyl ethanolamine (though in even more recent studies by Costa and his colleagues, the inhibitor appears to be a protein, which is competitively antagonized by benzodiazepines). If the activity of receptors can be modulated by such endogenous factors, we have an intriguing, "new" mode of regulating the efficacy of synaptic transmission.

GABA probably also plays a significant role in primary afferent depolarization. As Curtis points out in his detailed review of "pre- and non-synaptic" actions, it seems that GABA receptors are present on all neurons, in both the peripheral and the central nervous system. Since GABA also appears to be released by between a quarter and a half of all nerve endings in the brain, it may well be the most important single transmitter in the vertebrate nervous system.

It is surprising that so few studies of GABA uptake have been set in the wider context of cellular mechanisms of neutral amino acid transport; according to the generally accepted Schultz-Curran scheme, amino acids are taken up in conjunction with sodium ions and the effective driving force is the sodium electrochemical gradient. Even the thoughtful discussion of GABA transport by Levi *et al.* fails to take this into consideration. The essential role of the membrane potential is explicitly stated only by Henn *et al.*, in a report on glial mechanisms of GABA uptake. Two other features that may be of functional significance are largely ignored: the uptake process is potentially electrogenic and may be reversible when the electrochemical gradient is reversed.

The excitatory amino acids, glutamate and aspartate, are now receiving almost as much attention as GABA and glycine (Aprison and Nadi contribute a full review of glycine as a transmitter in the spinal cord and medulla). According to Fonnum, all efferent pathways from the cerebral cortex probably operate by releasing glutamate. Storm-Mathisen believes that several hippocampal afferent and efferent pathways release glutamate, aspartate, or both. Cotman and Hamberger provide particularly strong evidence that the excitatory action of the perforant pathway to the dentate gyrus is mediated by glutamate.

Several papers discuss the mode of removal of glutamate released by activity (Berl and Clarke, Van den Berg *et al.*, Hamberger *et al.*, and Bradford *et al.*). The removal may occur principally by uptake into glial cells, where glutamate is transformed into glutamine. As an inactive agent, glutamine can be safely released to the extracellular fluid (including the cerebrospinal fluid), from which it is taken up by nerve endings as required for reconversion to glutamate or GABA. There is a clear parallel with the recycling of acetylcholine via choline at cholinergic junctions. Each system seems to play its own variation on the general theme. In this instance, the enzyme that converts the active transmitter into the inactive intermediate is localized in glia instead of being present at the receptor surface.

As is reemphasized here by Bradford *et al.*, amino acid transmitters appear to be released from a cytoplasmic pool in nerve endings rather than via vesicles. One hopes that the experts on vesicle kinetics will take note of this challenge to the hypothesis of vesicular release and generate some much-needed morphological evidence bearing on vesicle turnover at central synapses.

Although the book has been put together commendably quickly, much of the material is likely to be of only ephemeral value. Few of the papers are comprehensive reviews, and some important topics—notably electrophysiological studies of mechanisms of action, particularly the puzzling and contradictory results obtained with excitatory amino acids—are hardly covered. The price of the book surely puts it beyond the resources of most investigators. But as a useful source of up-to-date information and references it should be made available in libraries.

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## Books Received

**Additives for Plastics.** Vol. 1, State of the Art. Raymond B. Seymour, Ed. Academic Press, New York, 1978. viii, 280 pp., illus. \$17.50.

**Biochemistry of Carbohydrates II.** D. J. Manners, Ed. University Park Press, Baltimore, 1978. xii, 260 pp., illus. \$29.50. International Review of Biochemistry, vol. 16.

**The Biochemistry of Myasthenia Gravis and Muscular Dystrophy.** Papers from a workshop, Bath, England, Mar. 1977. G. G. Lunt and R. M. Marchbanks, Eds. Academic Press, New York, 1978. xvi, 374 pp., illus. \$25.75.

**CRC Handbook of Chemistry and Physics.** Robert C. Weast and Melvin J. Astle, Eds. CRC Press, West Palm Beach, Fla., ed. 59, 1978. Various pages, illus. \$44.95.

**The Dark Range.** A Naturalist's Night Notebook. David Rains Wallace. Illustrated by Roger Bayless. Sierra Club Books, San Francisco, 1978. xii, 132 pp. Cloth, \$15; paper, \$8.95. A Yolla Bolly Press Book.

**Fundamentals of Gastroenterology.** Including Workbook. Lawrie W. Powell and Douglas W. Piper, Eds. University Park Press, Baltimore, 1978. x, 202 pp. Paper, \$14.95. Second edition of *Introductory Gastroenterology*.

**Genetic Epidemiology.** Papers from a symposium, Honolulu, Oct. 1977. Newton E. Morton and Chin Sik Chung, Eds. Academic Press, New York, 1978. x, 550 pp., illus. \$22.

**Humangrowth.** An Essay on Growth, Values and the Quality of Life. Harlan Cleveland and Thomas W. Wilson, Jr. Aspen Institute for Humanistic Studies, Palo Alto, Calif., 1978. xii, 58 pp. Paper, \$3.

**Ice or Fire? Surviving Climatic Change.** D. S. Halacy, Jr. Harper and Row, New York, 1978. xii, 212 pp. \$9.95.

**Immunobiology of *Neisseria gonorrhoeae*.** Proceedings of a conference, San Francisco, Jan. 1978. Geo. F. Brooks, Emil C. Gotschlich, King K. Holmes, William D. Sawyer, and Frank E. Young, Eds. American Society for Microbiology, Washington, D.C., 1978. xxii, 400 pp., illus. \$15.

**Immunofluorescence and Related Staining Techniques.** Proceedings of a conference, Vienna, Apr. 1978. W. Knapp, K. Holubar, and G. Wick, Eds. Elsevier/North-Holland, New York, 1978. xiv, 364 pp., illus. \$51.

**Introduction to System Sensitivity Theory.** Paul M. Frank. Academic Press, New York, 1978. xiv, 386 pp., illus. \$19.

**Key Works to the Fauna and Flora of the British Isles and Northwestern Europe.** G. J. Kerrich, D. L. Hawksworth, and R. W. Sims, Eds. Published for the Systematics Association by Academic Press, New York, 1978. xii, 180 pp. \$16.15. The Systematics Association Special Volume No. 9.

**A Laboratory Manual for Schools and Colleges.** John Creedy. Heinemann, Exeter, N.H., 1978. x, 248 pp., illus. + index. \$25.

**Language Intervention Strategies.** Richard L. Schiefelbusch, Marilyn Barket, and Robert Hoyt, Eds. University Park Press, Baltimore, 1978. xii, 420 pp. \$15.75.

**Mössbauer Isomer Shifts.** G. K. Shenoy and F. E. Wagner, Eds. North-Holland, Amsterdam, 1978 (U.S. distributor, Elsevier, New York). x, 956 pp., illus. \$106.75.

**Muddling toward Frugality.** Warren Johnson. Sierra Club Books, San Francisco, 1978. 252 pp. \$6.95.

**Mutagenesis.** W. Gary Flamm and Myron A. Mehlman, Eds. Hemisphere, Washington, D.C., and Halsted (Wiley), New York, 1978. xii, 402 pp., illus. \$24.50.

**The Nature of Life.** Proceedings of a conference, St. Peter, Minn., Oct. 1977. William H. Heidcamp, Ed. University Park Press, Baltimore, 1978. xii, 180 pp., illus. Paper, \$9.95.

**Negative Strand Viruses and the Host Cell.** Papers from a symposium, Cambridge, England, Aug. 1977. B. W. J. Mahy and R. D. Barry, Eds. Academic Press, New York, 1978. xxiv, 862 pp., illus. \$46.50.

**New American Pocket Medical Dictionary.** Nancy Roper, Adapted from the 13th British edition by Jane Clark Jackson. Scribner, New York, 1978. x, 380 pp. Paper, \$5.95.

(Continued on page 1369)

## BOOKS RECEIVED

(Continued from page 1334)

**The Personal Experience of Time.** Papers from a conference, New York, May 1975. Bernard S. Gorman and Alden E. Wessman, Eds. Plenum, New York, 1978. xiv, 296 pp. \$22.50. Emotions, Personality, and Psychotherapy.

**Perspectives in Coeliac Disease.** Proceedings of a symposium, Galway, Ireland, Sept. 1977. B. McNicholl, C. F. McCarthy, and P. F. Fottrell, Eds. University Park Press, Baltimore, 1978. xx, 504 pp., illus. \$39.50.

**The Pesticide Conspiracy.** Robert van den Bosch. Doubleday, Garden City, N.Y., 1978. x, 228 pp. \$8.95.

**Petroglyphs and Pictographs of Utah.** Vol. 1, The East and Northeast. Kenneth B. Castleton. Utah Museum of Natural History, Salt Lake City, 1978. xxiv, 216 pp., illus. Paper, \$15.

**Petrology and Geochemistry of Continental Rifts.** Volume one of the proceedings of the NATO Advanced Study Institute, Oslo, Norway, July 1977. E.-R. Neumann and I. B. Ramberg, Eds. Reidel, Boston, 1978. xxviii, 296 pp., illus. \$36. NATO Advanced Study Institutes Series C, vol. 36.

**Phosphorus in the Environment.** Its Chemistry and Biochemistry. Papers from a symposium, London, Sept. 1977. Elsevier/Excerpta Medica/North-Holland, New York, 1978. x, 320 pp., illus. \$31.75. Ciba Foundation Symposium 57 (new series).

**Physical Change and Aging.** A Guide for the Helping Professions. Sue V. Saxon and Mary Jean Etten. Tiresias Press, New York, 1978. 192 pp., illus. Cloth, \$9; paper, \$5.95.

**Physics for Applied Biologists.** N. C. Hilyard and H. C. Biggin. University Park Press, 1977. viii, 224 pp., illus. Paper, \$13.75.

**The Physiology of Growth.** Richard J. Goss. Academic Press, New York, 1978. xii, 442 pp., illus. \$29.50.

**Piaget's Theory of Intelligence.** Charles J. Brainerd. Prentice-Hall, Englewood Cliffs, N.J., 1978. viii, 326 pp. \$11.95.

**The Pineal and Reproduction.** Russel J. Reiter, Ed. Karger, Basel, 1978. vi, 224 pp., illus. \$64.75. Progress in Reproductive Biology, vol. 4.

**Plant Disease.** An Advanced Treatise. Vol. 2, How Disease Develops in Populations. James G. Horsfall and Ellis B. Cowling, Eds. Academic Press, New York, 1978. xx, 436 pp., illus. \$37.

**Plant Pathology.** George N. Agrios. Academic Press, New York, ed. 2, 1978. xii, 704 pp., illus. \$22.95.

**Policy Implications of the Computed Tomography (CT) Scanner.** Office of Technology Assessment, Washington, D.C., 1978 (available from the Superintendent of Documents, Washington, D.C.). x, 196 pp., illus. Paper, \$4.

**The Politics of Cancer.** Samuel S. Epstein. Sierra Club Books, San Francisco, 1978. viii, 584 pp. \$12.50.

**The Politics of Pain.** Helen Neal. McGraw-Hill, New York, 1978. xviii, 222 pp. \$9.95.

**The Powdery Mildews.** D. M. Spencer, Ed. Academic Press, New York, 1978. xx, 566 pp., illus. \$54.75.

**The Presidential Election Game.** Steven J. Brams. Yale University Press, New Haven, Conn., 1978. xx, 242 pp., illus. Cloth, \$15; paper, \$3.95.

**Principles of Mammalian Aging.** Robert R.

Kohn. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1978. xvi, 240 pp., illus. \$18.95. Prentice-Hall Foundations of Developmental Biology Series.

**Proceedings of the Fourth Annual Conference on Restoration of Coastal Vegetation in Florida.** Tampa, Fla., May 1977. Roy R. Lewis, Ill, and Dorothea P. Cole, Eds. Hillsborough Community College, Tampa, Fla. 1977. iv, 166 pp., illus., + appendix. Paper.

**Proceedings of the James C. Kimbrough Urological Seminar.** Vol. 11. Denver, Nov. 1977. Norwich-Eaton Pharmaceuticals, Norwich, N.Y., 1978. xxxii, 344 pp. Paper, \$10.

**The Process of Question Answering.** A Computer Simulation of Cognition. Wendy G. Lehnert. Erlbaum, Hillsdale, N.J., 1978 (distributor, Halsted [Wiley], New York). x, 278 pp. \$15.

**Professional Engineer's License Guide.** What You Need to Know and Do to Obtain PE (and EIT) Registration. Joseph D. Eckard, Jr. Herman Publishing, Boston, ed. 3, 1978. xx, 108 pp. Cloth, \$11.95; paper, \$6.95. Herman's Career Management Guides.

**Progress in Assessing Technological Innovation.** Vol. 2. H. R. Clauser, Ed. Technomic, Westport, Conn., 1978. vi, 164 pp. \$20.

**Progress in Behavior Modification.** Vol. 6. Michel Hersen, Richard M. Eisler, and Peter M. Miller, Eds. Academic Press, New York, 1978. xvi, 252 pp., illus. \$18.50.

**Progress in Human Nutrition.** Vol. 2. Sheldon Margen and Richard A. Ogar, Eds. AVI Publishing Company, Westport, Conn., 1978. xiv, 314 pp. \$22.

**Progress in Inorganic Chemistry.** Vol. 24. Stephen J. Lippard, Ed. Interscience (Wiley) New York, 1978. viii, 494 pp., illus. \$35.95.

**Progress in Theoretical Biology.** Vol. 5. Robert Rosen and Fred M. Snell, Eds. Academic Press, New York, 1978. xiv, 378 pp., illus. \$39.50.

**The Runaway Universe.** Paul Davies. Harper and Row, New York, 1978. 206 pp. + plates. \$10.

**Science and Technology of Rubber.** Frederick R. Eirich, Ed. Academic Press, New York, 1978. xiv, 672 pp., illus. \$42.

**The Syntax and Semantics of Complex Nominals.** Judith N. Levi. Academic Press, New York, 1978. xxiv, 302 pp., illus. \$22.

**Tachyons, Monopoles, and Related Topics.** Proceedings of a meeting, Erice, Italy, Sept. 1976. Erasmo Recami, Ed. North-Holland, Amsterdam, 1978 (U.S. distributor, Elsevier, New York). xii, 286 pp., illus. \$37.75.

**The Varieties of the Meditative Experience.** Daniel Goleman. Irvington, New York, and Halsted (Wiley), New York, 1978. xxviii, 130 pp. \$12.50. Irvington Social Relations Series.

**The Visionary Eye.** Essays in the Arts, Literature, and Science. J. Bronowski. MIT Press, Cambridge, Mass., 1978. xii, 186 pp., illus. \$10.

**Vitamin D.** D. E. M. Lawson. Academic Press, New York, 1978. x, 434 pp., illus. \$42.40.

**Ways of Worldmaking.** Nelson Goodman. Hackett, Indianapolis, 1978. xii, 142 pp., illus. \$9.95.

**Wind in the Rock.** Ann Zwinger. Harper and Row, New York, 1978. x, 258 pp., illus. \$15.

**The Wired Society.** James Martin. Prentice-Hall, Englewood Cliffs, N.J., 1978. xii, 300 pp. \$12.95.

**Your Brain and Nerves.** J. Lawrence Pool. Scribner, New York, ed. 2, 1978. xii, 212 pp. Paper, \$3.95.



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