

appears to be functioning by day 2 or 3, as indicated by the presence of cortical evoked potentials to tone stimulation (7), and the electroretinogram, an index of functional maturity in the retina, appears at day 6 (15).

Neural pathways to association cortex may be different for each modality and may develop at different rates. Actual pathways of input to these areas are not yet known (16), but even if there is one common system, as has been suggested (9, 17), there must be a separate input for each modality at some point, possibly the reticular formation. Thus, the actual locus of differential development may be found at a subcortical level.

Our findings of this developmental sequence (visual, auditory, somesthetic) may seem puzzling in view of the fact that almost all sensory ontogenesis studies in mammals and birds—behavioral, anatomical, and physiological—reveal the maturational sequence of somesthetic, auditory, visual (18). Our data are, however, supported by Marty (12), who reports that gross evoked potentials to auditory and, especially, to somesthetic stimuli were difficult to record outside the primary sensory areas in his youngest kittens. Although it is unclear why the response sequence of association area PMSA development is different from that in other systems, the major import of these data is that response properties of single neurons of this area are maturing during the time when many behaviors in the cat's repertoire are developing, including visual exploratory behaviors, play, and predatory activities (19). Lesion and electrophysiological studies have suggested involvement of cortical association response areas in attentive aspects of behavior, stimulus integrative activities, and initiation of movement (11, 20). Thus, the maturation of the cortical association areas may be involved in the development of complex behavioral sequences in the cat. Furthermore, although these data may be a function of autonomous postnatal differentiation in the nervous system (21), the phenomena reported here may also provide a means whereby the growth and development of neural processes can be modulated by the sensory experience of the organism (22).

KATHLEEN S. MAYERS
RICHARD T. ROBERTSON
EDWIN W. RUBEL
RICHARD F. THOMPSON

Department of Psychobiology,
University of California, Irvine 92664

References and Notes

- P. R. Huttenlocher, *Exp. Neurol.* **17**, 247 (1967); R. Marty, *Arch. Anat. Microsc. Morphol. Exp.* **51**, 129 (1962); C. R. Noback and D. P. Purpura, *J. Comp. Neurol.* **117**, 291 (1961); A. B. Scheibel, *Recent Advan. Biol. Psychiat.* **4**, 313 (1962).
- D. H. Hubel and T. N. Wiesel, *J. Neurophysiol.* **26**, 994 (1963).
- E. W. Rubel, *J. Comp. Neurol.*, in press.
- R. J. Ellingson and R. C. Wilcott, *J. Neurophysiol.* **23**, 363 (1960).
- G. H. Rose and D. B. Lindsley, *ibid.* **31**, 607 (1968).
- C. Grossman, *Arch. Neurol. Psychiat.* **74**, 186 (1955); R. Marty and R. Scherrer, in *Progress in Brain Research: Growth and Maturation of the Brain*, D. P. Purpura and J. P. Schadé, Eds. (Elsevier, Amsterdam, 1964), vol. 4, pp. 222–236; J. E. Rose, H. Adrian, G. Santibañez, *Acta Neurol. Lat. Amer.* **3**, 133 (1957).
- R. Pujol and R. Marty, in *Ontogenesis of the Brain*, L. Jilek and S. Trojan, Eds. (Charles Univ. Press, Prague, 1968), pp. 377–385.
- D. Albe-Fessard and A. Rougeul, *Electroencephalogr. Clin. Neurophysiol.* **10**, 131 (1958); K. E. Bignall, *Exp. Neurol.* **18**, 56 (1967); P. Buser and P. Borenstein, *Electroencephalogr. Clin. Neurophysiol.* **11**, 285 (1959).
- R. F. Thompson, R. H. Johnson, J. J. Hoopes, *J. Neurophysiol.* **26**, 343 (1963).
- E. Bentol and B. Bihari, *J. Neurophysiol.* **26**, 207 (1963); Y. Shimazono, H. Torii, M. Endo, S. Ihara, H. Narukawa, M. Matsuda, *Folia Psychiat. Neurol. Jap.* **17**, 144 (1963); R. Dubner and L. T. Rutledge, *J. Neurophysiol.* **27**, 620 (1964).
- L. A. Bettinger, J. L. Davis, M. B. Meikle, H. Birch, R. Kopp, H. C. Smith, R. F. Thompson, *Psychonom. Sci.* **9**, 421 (1967).
- R. Marty, *Arch. Anat. Microsc. Morphol. Exp.* **51**, 129 (1962).
- R. F. Thompson, R. T. Robertson, K. S. Mayers, H. Birch, in preparation.
- H. Kasprzak, D. N. Tapper, P. H. Craig, *Exp. Neurol.* **26**, 439 (1970).
- B. Zetterström, *Acta Physiol. Scand.* **35**, 272 (1956).
- P. Buser and K. E. Bignall, *Int. Rev. Neurobiol.* **10**, 111 (1967); K. E. Bignall, *Exp. Neurol.* **17**, 327 (1968); S. P. Narikashvili, D. V. Kajaia, A. S. Timchenko, *Brain Res.* **14**, 417 (1969); G. H. Rose and D. B. Lindsley, *Science* **148**, 1244 (1965).
- D. Albe-Fessard and A. Fessard, in *Progress in Brain Research: Brain Mechanisms*, G. Moruzzi, A. Fessard, H. H. Jasper, Eds. (Elsevier, Amsterdam, 1963), vol. 1.
- G. Gottlieb, in *Biophysiology of Development*, E. Tobach, Ed. (Academic Press, New York, 1970).
- A. Kling, J. K. Kovach, T. J. Tucker, in *The Behavior of Domestic Animals*, E. S. E. Hafez, Ed. (Williams & Wilkins, Baltimore, ed. 2, 1969), pp. 482–512; W. I. Welker, in *Functions of Varied Experience*, D. W. Fiske and S. R. Maddi, Eds. (Dorsey, Homewood, Ill., 1961), pp. 175–226.
- R. H. Johnson and R. F. Thompson, *J. Comp. Physiol. Psychol.* **69**, 485 (1969); R. F. Thompson and R. F. Kramer, *ibid.* **60**, 186 (1965); R. F. Thompson, K. S. Mayers, R. T. Robertson, C. J. Patterson, *Science* **168**, 271 (1970); R. F. Thompson and J. A. Shaw, *J. Comp. Physiol. Psychol.* **60**, 329 (1965); J. M. Warren, H. B. Warren, A. Akert, *ibid.* **54**, 629 (1961); T. J. Teyley, R. A. Roemer, R. F. Thompson, in preparation.
- V. Hamburger, *Dev. Biol. Suppl.* **2**, 251 (1968).
- A. H. Riesen, in *Functions of Varied Experience*, D. W. Fiske and S. R. Maddi, Eds. (Dorsey, Homewood, Ill., 1961), pp. 57–80.
- Supported in part by NIH grant NS 07661 and NIMH research scientist award 06650 to R.F.T., NIMH research training grant 11095, NDEA Title 4 award to K.S.M., NIGMS award 42521 to R.T.R., and NIMH postdoctoral fellowship 31195 to E.W.R. We thank S. J. Adams, C. J. Patterson, and S. A. Beydler for technical assistance.

16 October 1970; revised 30 November 1970 ■

Specialization of Rabbit Reticulocyte Transfer RNA Content for Hemoglobin Synthesis: Erratum

In the report by D. W. E. Smith and A. L. McNamara (12 February, p. 578) the lines of Table 2 were accidentally scrambled by the printers. The correct Table 2 follows.

Table 2. Acceptance of amino acids by preparations of tRNA from rabbit reticulocytes and livers.

Amino Acid	Residues/hemoglobin molecule	Acceptance activity (pmole/absorbancy unit)		Ratio of acceptance activity of reticulocyte tRNA to:	
		Reticulocyte tRNA	Liver tRNA	Residues per hemoglobin molecule	Acceptance activity of liver tRNA
Alanine	56	125	57	2.23	2.19
Arginine	12	41	52	3.41	0.79
Asparagine	24	31	36	1.29	0.86
Aspartic acid	22	52	48	2.36	1.08
Cysteine	4				
Glutamine	12	19	18	1.58	1.06
Glutamic acid	32	33	35	1.03	0.94
Glycine	40	99	48	2.48	2.06
Histidine	38	35	11	0.92	3.18
Isoleucine	8	14	31	1.75	0.45
Leucine	70	34	53	0.49	0.64
Lysine	48	60	61	1.25	0.98
Methionine	4	49	54	12.25	0.91
Phenylalanine	32	37	19	1.16	1.94
Proline	22	41	39	1.87	1.05
Serine	42	50	62	1.19	0.81
Threonine	32	58	49	1.81	1.18
Tryptophan	6	19	21	3.17	0.91
Tyrosine	12	16	15	1.33	1.07
Valine	58	95	38	1.64	2.50