problems; transportation; civilian requirements; safety on and off the job and foundry industries and in the evening manpower utilization; welding problems; production and tool engineering; metallurgical problems and foundry industries.

THE *Journal* of the American Medical Association reports that the first Inter-American Congress of Radiology was recently held in Buenos Aires under the presidency of Dr. Jose F. Merlo Gomez. Delegates to the congress resolved (1) to create an Inter-American College of Roentgenology in Buenos Aires, (2) to stimulate the creation of laws in Pan American countries to promote roentgenology and protect roentgenologists and (3) to provide for retirement of roentgenologists if they become victims of the practice of roentgenology. At the close of the congress a monument in honor of Roentgen, Curie and the victims of roentgenology was unveiled in the Instituto Municipal de Radiologia y Fisioterapia of Buenos Aires.

IN its recent report the National Central Library of London, according to *The Publishers Weekly*, records a partial list of the book losses during two years of bombing of the English libraries: National Central Library—105,000 volumes lost, Birmingham Natural History Library—completely destroyed, Coventry Public Library—completely destroyed, Exeter Public Library—almost destroyed, Liverpool Public Library —150,000 volumes lost, Manchester Literary and Philosophical Library—completely destroyed, Plymouth Proprietary Library—completely destroyed, Plymouth Public Library—completely destroyed, University of London Library—many thousand volumes lost, University College Library, London—about 100,000 volumes lost.

DISCUSSION

THE DEMONSTRATION OF TONIC NECK AND LABYRINTHINE REFLEXES AND POSITIVE HELIOTROPIC RESPONSES IN NORMAL HUMAN SUBJECTS

IN decerebrate animals, in newborn infants and in functionally decerebrate or decorticate adult human subjects, rotation or tilting of the head to the side results in extension of the fore and hind limbs of that side and flexion of the limbs of the opposite side. Similarly, backward tilting of the head increases extensor tonus in both fore limbs and diminishes the tonus of the hind limbs. Forward tilting of the head produces opposite results. These phenomena are not ordinarily demonstrable, in clear-cut fashion, in normal adults, but when extensor muscles of the limbs are rendered hypertonic, by the procedures to be described, tonic neck and labyrinthine reflexes are elicited in striking fashion.

If one stands in a narrow doorway and stretches the extensor and abductor muscles of both arms for one to two minutes by exerting strong lateral pressure against the backs of the hands, placed against opposite doorposts, it is found, on standing away and relaxing all voluntary effort, that the arms float toward a horizontal position in a surprising manner. The reflex extensor hypertonus, responsible for the effect of this well-known parlor trick, gradually subsides during a minute or less and the arms fall slowly, or suddenly, to the sides. The mechanism of augmentation of the stretch reflexes, upon which this hypertonus probably depends, has been a subject for speculation.[1] Whatever the mechanism, the increased tone provides a basis for the study of the tonic neck, labyrinthine, eye, crossed extensor, nociceptive and various positive and negative combinations of these reflexes in normal subjects.

During "levitation" of the arms, turning or tilting the head to the right, or turning the eyes strongly to the left, or shining a strong light into the eyes from the left increases the abduction of the right arm and diminishes or abolishes tonus in the left arm. The reverse positions of the head or eyes or light cause the left arm to rise again to some degree and the right arm to drop. Forceful downward rotation of the eyes or light from below, or backward tilting of the head increases the tonus and degree of abduction of both arms, while upward rotation of eyes or light from above or ventriflexion of the head reduces tonus in both limbs. A crossed extensor reflex, resulting from strong voluntary flexion of one elbow, facilitates reflex extension on the opposite side. Painful stimulation, as by pinching, quickly abolishes tonus on the affected side. The reflexes mentioned may be combined successively or simultaneously in various patterns of facilitation and inhibition of the extensor tonus.

Temporary hypertonus of the knee extensors results from pushing the toe of one shoe against a wall. The resulting hypertonus may be modified by eye, neck and labyrinthine reflexes, as in a decerebrate animal.

A slight degree of hypertonus of the flexors of the elbow or knee may follow prolonged voluntary contraction of these muscles against resistance. Tonic neck, labyrinthine and eye reflexes produce the ex-

[1] A. Schwartz and P. Meyer, *Compt. rend. Soc. Biol.*, 85: 490, 1921.

pected alterations, which are, of course, opposite in sign to those affecting extensors of the same joints.

These various studies on postural tonus are best observed by the subject himself, for he alone can be certain that they are involuntary phenomena. However, they have been tried on numerous persons who were not aware of the responses to be expected, and the results, so far, have been concordant.

The evidence for the effects of light on muscle tonus, which has been obtained in the course of these studies, indicates that man possesses latent positive heliotropism. As demonstrated by Garrey[2] for the robber fly, the alterations of tonus are directed in such a way as to assist in turning the body toward the light.

Observations on these reflexes have proved very useful for the teaching of neurophysiology. It is hoped that they may also be of assistance in evaluating the degree of excessive or diminished tone of muscles in neurological examinations or in tests of fitness or fatigue.

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CHOLINESTERASE

IN SCIENCE (November 19, 1943) an attempt has been made by de Laubenfels[1] to claim for Alles and Hawes the priority of our discovery that two distinct cholinesterases exist in the animal body: a specific or true cholinesterase and a non-specific or pseudocholinesterase.[2]

Alles and Hawes,[3, 4] to whose work we referred in our first communication,[2] consider the cholinesterase activity of whole blood as due to the activities of a serum and a cell enzyme. This classification is based on a misconception. Experiments reported by us[5] show that the cholinesterase activity of serum is due to the presence of two distinct enzymes, one of which is specific like the enzyme in red blood cells[2] and brain,[6] the other being a non-specific catalyst. Consequently, any statement regarding the properties of the so-called serum enzyme would always refer to the properties of a mixture of these two enzymes. De Laubenfels' assertion that Alles and Hawes, who moreover were unaware of the existence of a specific and a non-specific enzyme, have "thoroughly demonstrated" the existence of the true and pseudo-cholinesterase is therefore invalid.

Regarding de Laubenfels' suggestion that the authors select more suitable names for discriminating between the two enzymes, we feel that the prefix "pseudo" emphasizes the non-specificity of the enzyme to which the name cholinesterase, suggestive of substrate specificity, has hitherto been applied. As we mentioned in the article in SCIENCE, the term "pseudocholinesterase" has been provisionally chosen until such time as the physiological function of this enzyme has been determined.

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APPARENT TIME ACCELERATION WITH AGE

I HAVE read the letters to SCIENCE on the apparent time acceleration with age, and I should like to add a comment that is based on a study of numbers I made several years ago. My thought is that our sensations of elapsed time is strongly influenced by the number of remembered and half-remembmered things that have occurred. Thus at age ten a single day may bring to a boy a number of new events, sensations and thoughts, while at 50 a considerably greater time must elapse before an equal increase is accumulated. These things that fix themselves in our memories are our units of time, and if at 50 a week passes without a remembered event that week is telescoped toward the vanishing point.

An astonishingly large number of natural phenomena are arranged on a logarithmic scale. Thus we may say that an eleven-pound dog is slightly larger than a ten-pound dog, but an 801-pound horse is the same size as an 800-pound animal. Here we would require an 880-pound horse (+10 per cent. as in the case of the dog) before we would admit a perceptible difference. This mode of thought, which sets up a logarithmic scale of measurement, is inherent, I believe, and it has strongly influenced our factual literature, of which memory of past events is a part.

Returning to our sense of elapsed time, I believe that we must add a fixed fraction to our accumulated sense of time before we admit the addition of a new unit, and this makes our elapsed time sense follow the same law that governs our sense of brightness, loudness, weight, etc.

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I HAVE been interested in the discussion of the apparent acceleration of time with the age of the

[2] W. E. Garrey, *Jour. Gen. Physiol.*, 1: 101, 1918.
[1] M. W. de Laubenfels, SCIENCE, 98: 2551, 450, 1943.
[2] B. Mendel and H. Rudney, *Biochem. Jour.*, 37: 1, 59, 1943.
[3] G. A. Alles and R. C. Hawes, *Jour. Biol. Chem.*, 133: 2, 375, 1940.
[4] R. C. Hawes and G. A. Alles, *Jour. Lab. and Clin. Med.*, 26: 5, 845, 1941.
[5] B. Mendel, D. B. Mundell and H. Rudney, *Biochem. Jour.*, 37: 4, 473, 1943.
[6] B. Mendel and H. Rudney, SCIENCE, 98: 2539, 201, 1943.