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The Brains of the Matter

By Joshua Lederberg

THE HUMAN BRAIN is the focus of man's scientific introspection. His three pounds of gray and white matter are the very tool of that insight; how this organ develops is the ultimate secret of human nature.

Science
and
Man

Knowing this, I am astonished at how thinly this field of biology is explored. Philosophy aside, the texture of life is the interaction of brains. The transactions are mainly verbal, educational and persuasive; the exchange of symbols signifying love, threat or information.

Primitively, brain deals with brain as if they were not matter at all, but pure consciousness. Nevertheless, brain is matter: it can be befuddled by alcohol or narcotic drugs and consciousness will cease when gray matter is mashed by a bullet. But for every battalion of students of the development of personality there may be only a lonely worker on the physical and chemical development of the material brain. Nor is any other organ of the human body more poorly analyzed than this central one.

These remarks are inspired by a report by Dr. Stephen Zamenhof, a biochemist at UCLA medical school, published last June in Science magazine. His first observations were published 25 years ago.

His recent publication is a corroboration of his previous report on the effects of pituitary growth hormone on brain development in rats. Pregnant rats were injected with the hormone daily for

the latter two weeks of their three-week term. The litters of these and untreated ones were carefully studied as newborns and at 20 days of age. The treated offspring showed an increase in brain weight of 17 to 30 per cent, and even larger increases in the proportion of neurons in the cortical gray matter.

More highly purified hormone was used in the latest experiment, brain DNA was also shown to be augmented and more careful attention was paid to the kinds of cells found in the brain. A British team, B. G. Clendinnen and J. T. Eayrs, had essentially repeated Zamenhof's results in 1961, together with evidence of "intellectual" improvement, which is also supported by one other study. I do not know of any published criticisms.

THESE FINDINGS have extraordinary implications, being the first toehold on the normal developmental control of the size of the brain. The human baby would be severely taxed at birth by a brain larger than has already evolved. But modern obstetrics lets us sidestep the constraint on intellectual evolution imposed by the female pelvis. Of course, we would first have to understand the impact that enlarging the brain has on personality.

Growth hormone is one of the most obscure secretions of the pituitary and we know much less about its normal function than of the hormones that regulate the adrenal or the sex glands. However, variations in growth hormone are probably interwoven with many diseases — diabetes may be the most interesting — and we could start a fascinating contemplation of the impact of these diseases on brain de-

velopment of the young. More generally, we know almost nothing of the biological foundations of the observed variation in human brains, and we have no better lead than Zamenhof's observations.

The report is, however, almost painfully tantalizing. For such a critical question, we would want overwhelming corroboration. The experiments were not double-blind. A great deal of drudge work has doubtless already been planned to pin down the dose requirements and the timing for greatest effect. There is hardly any proof that this effect is specific, and many other proteins might do the same. Since pituitary from cattle was used, the pregnant rats might have developed immunity to growth hormone. The behavioral consequences need the most careful further study.

Some of our ablest scientists in related fields are repelled from working on notorious subjects: those overexposed to the public limelight and offering no chance of calm deliberation, but which may have the most dramatic impact on human affairs. But brains are an irresistible target for our best brains to study.

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