

most part secondary to copper deficiency. Yet internal kinetics of an intravenous tracer dose of radioactive copper are remarkably similar in each disease: in both there is prolonged whole-body and hepatic retention of the tracer and decreased gastrointestinal excretion.

Presumably, the genetic abnormality that determines the disordered physiology of copper in these diseases is present from the time of conception. The chronogenetics, however, of each condition is vastly different. Both genes are "lethal", clinically speaking; In Menkes' disease the condition is manifest at or soon after birth and runs its course to death in a few months to a year or so. In Wilson's disease, however, the phenotypical manifestations are frequently delayed for years. The contrast in chronogenetics of these two diseases emphasises the necessity of considering factors other than the demonstrable disorder of copper physiology in each condition.

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## TIME-DEPENDENT ELECTROLYTIC RATE IN TWINS

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The levels of Na<sup>+</sup> and Cl<sup>-</sup> electrolytes in the human sweat having already been shown, by a previous twin study, to undergo genetic conditioning, the age modifications of the electrolytic rate have now been examined in a sample of 4-20-year-old MZ male twins.

A separate analysis has been carried out for the two age groups, 4-10 and 11-20, so as to account for possible effects of puberal processes.

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## TWIN CHRONOGENETICS: EVIDENCE FOR TRENDS IN EARLY MENTAL DEVELOPMENT AND PHYSICAL GROWTH

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When DZ twins were evaluated for the degree of concordance in mental development during the preschool years, they exhibited relatively high within-pair correlations up to 3 years of age, then dropped significantly at subsequent ages. It was notable that as the measures of intelligence stabilized, the degree of concordance for DZ twins gradually regressed towards the value expected from within-family gene segregation plus assortative mating. It appeared that there was a time-linked differential gene action operating for DZ twins which gradually reached full expression by school age.

The evidence for timed gene action was further reinforced by the data for MZ twins, who maintained high concordance at each age, and who displayed coordinated patterns of spurt and lag between ages. Evidently, the course of mental development in the preschool years was heavily dependent upon the genetic blueprint of each twin. The data on physical growth confirmed results, and showed further that disparities in birth size for MZ twins were rapidly equalized as each twin got on his genetic growth curve.

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## TWINS: CONCORDANCE FOR CHANGES IN HAIR COLOR AND EYE COLOR DURING EARLY CHILDHOOD

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Hair color and eye color were assessed routinely from 3 months to 6 years for twins participating in a longitudinal study of

growth and development. There were 169 female twin pairs, 161 male twin pairs, and 60 opposite-sex pairs. Age trends showed an appreciable darkening in both hair and eye color for both sexes over age. There was, however, a consistent sex difference with more males having lighter-color hair and eyes than females. In addition, the color for males was more likely to remain stable from age to age, whereas the color for females was more likely to change.

Within-pair concordance for color was calculated for all same-sex twins whose zygosity had been determined through blood typing. Despite the general change in both hair and eye color, the MZ twins were significantly more concordant than DZ twins at every age, indicating a strong genetic influence on the timing of color changes. Results are discussed in terms of accelerated maturation of females, and the need for genetic models, which are both age- and sex-specific, as far as hair and eye color are concerned.

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## CHRONOGENETIC MEANING OF FETAL MEMBRANES IN TWINNING

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The ovular annexes in MZ twin pregnancies seem to be particularly important to assess the times of gemellogenesis, i.e., the moment at which the zygote, or the early embryo, give origin to the separate ontogenesis of the two or more members of an MZ twinning.

A research has been carried out in the obstetrical departments of two important hos-

pitals of Rome. The full chronogenetic significance of this research will become clear once it is possible to verify that the times of the MZ gemellogenesis are in turn controlled by heredity.

As for the ovular annexes of polyzygotic pregnancies, these may be used to assess the hereditary variability of the early ontogenetic times with respect to single births, the *coeteris paribus* condition being realized, here too, by the simultaneous character of fertilization and pregnancy.

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## FERTILITY AND LIFE SPAN IN DROSOPHILA MELANOGASTER ACCORDING TO MATERNAL AGE

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Fertility and average life span in relation to maternal age have been studied in the *Drosophila melanogaster* strains: Oregon *r*; *Cn, bw, vg*; and in the two hybrid strains, (male) Oregon *r* × *Cn, bw, vg* (female), and (male) *Cn, bw, vg* × Oregon *r* (female).

For each crossing, the female offsprings have been studied, obtained from matings limited to one single day, i.e., the eighth day of opening, for males, and to the fourth, eighth, and twelfth day for females, i.e., at the beginning, the middle, and the end of the fertile period. In order to limit random variability, the crossings were repeated five times. For each experimental block, the number of births and the life span of the female offsprings were considered. A marked covariability is shown to exist between maternal age and both fertility and life span.

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