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# Major Sex-Determining Genes

With 34 Figures



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To Midori

in anticipation of our coming silver wedding anniversary

## Preface

Upon wresting the control of the earth from the Titans, Zeus assigned the task of creating living creatures to two Titan brothers who had sided with him in the epic battle just concluded. Because Epimetheus, who had been endowed only with hindsight, had the first hand in this creation, all the good attributes were exhausted by the time the lion, the elephant and other animals were created. When the time came for the creation of man, there were precious few materials left to work with. Not surprisingly, man was made weak and naked. Prometheus took pity on this miscreation and gave man the use of fire. For this foresight, Zeus meted out horrible punishment, binding Prometheus to a rocky pillar in the Caucasus Mountains and letting a vulture consume his liver daily.

It seems to me that the ancient Greeks in their unfathomable wisdom understood the essence of the evolutionary process very well. Had *Escherichia coli* of 200 million years or so ago been endowed with the foresight to anticipate the eventual emergence of and subsequent dominance by mammals of this Earth, they would no doubt have equipped themselves, in anticipation of the coming certainty, with the lac operon to deal with lactose in the suckling mammalian infant's gut. Had they been able to do so, the actual emergence of mammals would have exerted no selective pressure upon existing *E. COLI*. In this manner, we come to realize that foresight is forbidden and that only hindsight prevails in the Darwinian world of evolution by natural selection. Today, it is becoming fashionable to believe in the rigid heritability of human intelligence. If our intelligence too is the product of natural selection, the lack of foresight must be inherent in our intelligence.

In 1967, I published my first monograph, *Sex Chromosomes and Sex-Linked Genes*, as the first of this very series by the same publisher. There was already a great deal to discuss concerning the dosage compensation mechanism for X-linked genes caused by random X-inactivation in the female, and the evolutionary conservation in toto of the mammalian X-linkage group. Unfortunately, the sex-linked genes then under discussion had nothing whatsoever to do with the mammalian sex-determining mechanism *per se*. For this central theme, there was precious little to talk about. Indeed, we have come a long way in the last ten years. Yet, looking back, I am appalled by my own lack of foresight. After all, H-Y antigen became known in 1955. Furthermore, its discoverer, E. J. Eichwald, spent a few months in my laboratory during the early 1960s. Although I have a suspicion that Eichwald himself already suspected the possible role of his H-Y antigen in mammalian sex determination, I must admit that such a thought never crossed my mind at that time. Similarly, the testicular feminization syndrome of man had al-

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ready become a well-defined entity in 1953. Yet I then regarded it merely as one of the multitude of structural mutations that cause all sorts of pseudohermaphrodisms and intersexualities. Accured is the human intelligence, bound by the hindsight of natural selection.

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