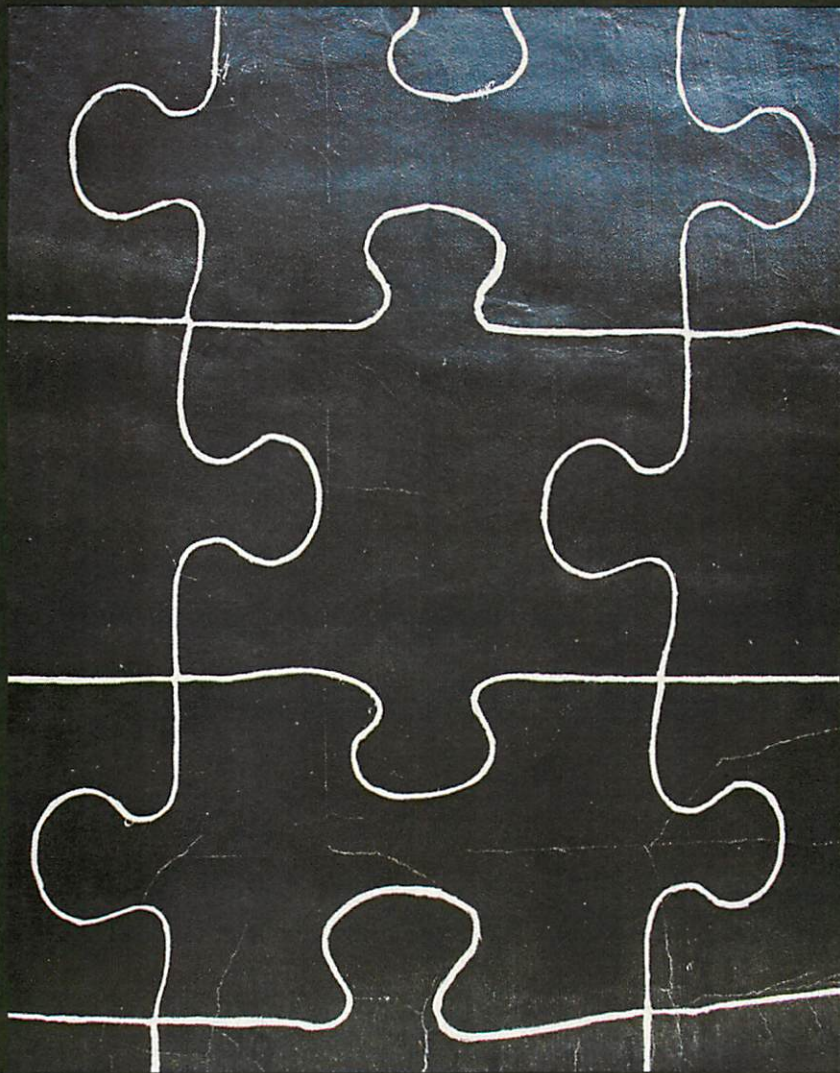


Developmental Dynamics

Special Issue: Sex Determination

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Forward to the Special Issue on Sex Determination

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This special issue of *Developmental Dynamics* was inspired by the *Sixth International Symposium on the Biology of Vertebrate Sex Determination* that took place in April 2012. This meeting gathered researchers working in many different vertebrate species, hailing from the United Kingdom, France, Germany, Spain, Poland, Sweden, Switzerland, Singapore, Japan, Taiwan, Canada, Mexico, Australia, the United States, New Zealand, and Saudi Arabia. In contrast to many developmental fields centered on particular birth defects or developmental disorders that affect a small proportion of the population, sex determination affects the phenotype of every one of us, as well as our ability to produce the eggs or sperm that propagate the next generation.

In addition, the study of sex determination reaches into many basic questions in development and evolution. For example, *primary sex determination* is the decision within the *bipotential gonad primordium* to embark on testis or ovary organogenesis – a classic fate decision with the dramatic outcome of imposing male or female phenotypic sex on the whole animal. It might be predicted that such an important process would be highly conserved. However, it turns out that many different pathways,

dominated by genetic (GSD) or environmental (ESD) influences, have been recruited to the task of sex determination, in contrast to most other developmental processes that have been studied. What does this tell us about developmental plasticity? Is there an underlying convergence of these distinct sex-determining mechanisms? In GSD systems, many different chromosomes have taken on the job of sex determination. How do distinct sex chromosomes evolve, and what does this suggest about chromosome dynamics during evolution? How do closely related species switch between chromosomal systems? Do epigenetic mechanisms play a role in sex determination, and if so, how does this factor into the decision to be male or female? The environment (e.g., temperature or behavior) is known to play a dominant role in the establishment and maintenance of sexual fate in some species. How might our changing environment affect sex determination and sexual fitness? While hormones are not involved in primary sex determination in eutherian mammals, they play an important role in sexual differentiation in all vertebrates, and assume a primary role in some. Surprising new pathways for hormone synthesis are emerging that affect sexual differentiation in humans.

BOX 1 -- GLOSSARY

primary sex determination: the decision within the gonad to initiate differentiation as a testis or ovary.

bipotential gonad primordium: the primordial organ that differentiates into either a testis or ovary.

GSD (genetic sex determination): a system that is dominated by a single gene, or a whole chromosome that is only present in one sex.

ESD (environmental sex determination): a system that can be dominated by environmental influences such as temperature or behavior.

heterogametic sex: the sex that produces two different kinds of gametes: XY (males) in mammals; ZW (females) in birds

protandrous: among species that change sex as adults, those that are first male, then female

protogynous: among species that change sex as adults, those that are first female, then male

somatic supporting cell lineage: the somatic cell lineage that supports the development of germ cells (oogonia or spermatogonia) during reproductive life.

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