Sex organ

A **sex organ**, also known as a **reproductive organ**, is a part of an organism that is involved in sexual reproduction. Sex organs constitute the primary sex characteristics of an organism. Sex organs are responsible for producing and transporting gametes, as well as facilitating fertilization and supporting the development and birth of offspring. Sex organs are found in many species of animals and plants, with their features varying depending on the species.

The sex organs of the green algae; *Chara* are the male antheridia (red) and female archegonia (brown)

Sex organs are typically differentiated into male and female types.

In animals (including humans), the male sex organs include the testicles, epididymides, and penis; the female sex organs include the clitoris, ovaries, oviducts, and vagina. The testicle in the male and the ovary in the female are called the *primary sex organs*.[1] All other sex-related organs are known as *secondary sex organs*. The outer organs are known as the **genitals** or **external genitalia**, visible at birth in both sexes,[1] while the inner organs are referred to as **internal genitalia**, which in both sexes, are always hidden.[2]

In plants, male reproductive structures include stamens in flowering plants, which produce pollen.[3] Female reproductive structures, such as pistils in flowering plants, produce ovules and receive pollen for fertilization.[4] Mosses, ferns, and some similar plants have gametangia for reproductive organs, which are part of the gametophyte.[5] The flowers of flowering plants produce pollen and egg cells, but the sex organs themselves are inside the gametophytes within the pollen and the ovule.[6] Coniferous plants likewise produce their sexually reproductive structures within the gametophytes contained within the cones and pollen. The cones and pollen are not themselves sexual organs.

Together, the sex organs constitute an organism's reproductive system.[7]

Terminology

The *primary sex organs* are the gonads, a pair of internal sex organs, which diverge into testicles following male development or into ovaries following female development. As primary sex organs, gonads generate reproductive gametes containing inheritable DNA. They also produce most of the primary hormones that affect sexual development, and regulate other sexual organs and sexually differentiated behaviors.

Secondary sex organs are the rest of the reproductive system, whether internal or external. The Latin term *genitalia*, sometimes anglicized as *genitals*, is used to describe the externally visible sex organs.

In general zoology, given the great variety in organs, physiologies, and behaviors involved in copulation, male genitalia are more strictly defined as "all male structures that are inserted in the female or that hold her near her gonopore during sperm transfer"; female genitalia are defined as "those parts of the female

reproductive tract that make direct contact with male genitalia or male products (sperm, spermatophores) during or immediately after copulation".[8]

Evolution

It is hard to find a common origin for gonads. However, gonads most likely evolved independently several times.[9] At first, testes and ovaries evolved due to natural selection.[10]

A consensus has emerged that sexual selection represents a primary factor for genital evolution.[11] Male genitalia show traits of divergent evolution that are driven by sexual selection.[12]

Animals

Mammals

The visible portion of eutherian mammalian genitals for males consists of the penis and scrotum; for females, it consists of the vulva.

In placental mammals, females have two genital orifices, the vaginal and urethral openings, while males have only one for the urethra.[13] Male and female genitals have many nerve endings, resulting in pleasurable and highly sensitive touch.[14] In most human societies, particularly in conservative ones, exposure of the genitals is considered a public indecency.[15]

In humans, sex organs/genitalia include:

Male	Female

External
• Penis
  ◦ Foreskin
  ◦ Shaft
  ◦ Glans
• Scrotum
Internal
• Prostate
• Bulbourethral glands
• Epididymides
• Vasa deferentia
• Testicles
• Seminal vesicles
 
Human male external sex organs (shaved pubic hair)
	External
	• Vulva
	  ◦ Clitoris
	  ▪ Glans
	  ▪ Body
	  ▪ Hood
	  ◦ Labia majora
	  ◦ Labia minora
	  ◦ Bartholin's glands
	  ◦ Skene's glands
	Internal
	• Fallopian tubes
	• Ovaries
	• Uterus
	  ◦ Cervix
	• Vagina
	 
	Human female external sex organs (shaved pubic hair)

Development

In typical prenatal development, sex organs originate from a common primordium during early gestation and differentiate into male or female sexes. The SRY gene, usually located on the Y chromosome and encoding the testis determining factor, determines the direction of the differentiation. The absence of it allows the gonads to continue to develop into ovaries.

The development of the internal and external reproductive organs is determined by hormones produced by certain fetal gonads (ovaries or testicles) and the cells' response to them. The initial appearance of the fetal genitalia looks female-like: a pair of urogenital folds with a small protuberance in the middle, and the urethra behind the protuberance. If the fetus has testes and the testes produce testosterone, and if the cells of the genitals respond to the testosterone, the outer urogenital folds swell and fuse in the midline to produce

the scrotum; the protuberance grows larger and straighter to form the penis; the inner urogenital swellings grow, wrap around the penis, and fuse in the midline to form the penile raphe.[16][17] Each sex organ in one sex has a homologous counterpart.

The process of sexual differentiation includes the development of secondary sexual characteristics, such as patterns of pubic and facial hair and female breasts that emerge at puberty.

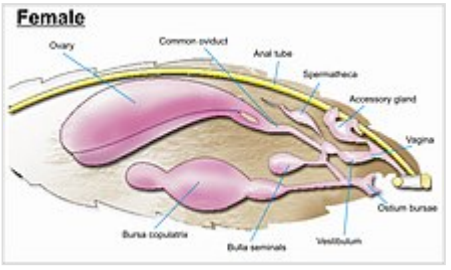
Because of the strong sexual selection affecting the structure and function of genitalia, they form an organ system that evolves rapidly.[18][19][20] A great variety of genital form and function may therefore be found among animals.

In many other animals, a single posterior orifice (the cloaca) serves as the only opening for the reproductive, digestive, and urinary tracts (if present) in both sexes. All amphibians, birds, reptiles,[21] some fish, and a few mammals (monotremes, tenrecs, golden moles, and marsupial moles) have this orifice, from which they excrete both urine and feces in addition to serving reproductive functions.[22] Excretory systems with analogous purpose in certain invertebrates are also sometimes referred to as cloacae.

Sexing fish is determined by the shape of a fleshy tube behind the anus known as genital papilla.

Insects

The organs concerned with insect mating and the deposition of eggs are known collectively as the external genitalia, although they may be largely internal; their components are very diverse in form.



The female genitalia of Lepidoptera

Slugs and snails

The reproductive system of gastropods (slugs and snails) varies greatly from one group to another.

Planaria

Planaria are flat worms widely used in biological research. There are sexual and asexual planaria. Sexual planaria are hermaphrodites, possessing both testicles and ovaries. Each planarian transports its excretion to the other planarian, giving and receiving sperm.

Plants

In most plant species, an individual has both male and female sex organs (a hermaphrodite).[23]

The life cycle of land plants involves alternation of generations between a sporophyte and a haploid gametophyte.[24] The gametophyte produces sperm or egg cells by mitosis. The sporophyte produces spores by meiosis, which in turn develop into gametophytes. Any sex organs that are produced by the plant will develop on the gametophyte. The seed plants, which include conifers and flowering plants, have small gametophytes that develop inside the pollen grains (male) and the ovule (female).

Flowers

In flowering plants, the flowers contain the sex organs.[25]

Sexual reproduction in flowering plants involves the union of the male and female germ cells, sperm and egg cells respectively. Pollen is produced in stamens and is carried to the pistil, which has the ovary at its base where fertilization can take place. Within each pollen grain is a male gametophyte, which consists of only three cells. In most flowering plants, the female gametophyte within the ovule consists of only seven cells. Thus there are no sex organs as such.

Fungi

The sex organs in fungi are known as gametangia. In some fungi, the sex organs are indistinguishable from each other but, in other cases, male and female sex organs are clearly different.[26]

Similar gametangia that are similar are known as isogametangia. While male and female gametangia are known as heterogametangia, which occurs in the majority of fungi.[27]

See also

- Andrology
- Emasculation
- Genital modification and mutilation
- Human sexuality
- Hysterectomy
- Intimate part
- Obstetrics and gynaecology
- Oophorectomy
- Orchiectomy

References

1. Clark, Robert K. (2005). *Anatomy and Physiology: Understanding the Human Body* (https://books.google.com/books?id=4idMNpe04qgC&q=primary+sex+organ&pg=PA268). Jones & Bartlett Learning. p. 25. ISBN 9780763748166.
2. Deol, Pooja Soni (2023). *ANATOMY PHYSIOLOGY OF FEMALE REPRODUCTIVE SYSTEM* (https://books.google.com/books?id=gO7aEAAAQBAJ&pg=PA14). Blue Rose Publishers. p. 14.
3. "Parts of a Flower" (https://www.amnh.org/learn-teach/curriculum-collections/biodiversity-counts/plant-identification/plant-morphology/parts-of-a-flower). *American Museum of Natural History*. Archived (https://web.archive.org/web/20230319032014/https://www.amnh.org/learn-teach/curriculum-collections/biodiversity-counts/plant-identification/plant-morphology/parts-of-a-flower) from the original on 19 March 2023. Retrieved 19 March 2023.
4. Chisholm, Hugh, ed. (1911). "Pollination" (https://en.wikisource.org/wiki/1911_Encyclop%C3%A6dia_Britannica/Pollination). *Encyclopædia Britannica*. Vol. 22 (11th ed.). Cambridge University Press. pp. 2–5.
5. "Mosses and Ferns" (https://web.archive.org/web/20120728014926/http://biology.clc.uc.edu/courses/Bio106/mosses.htm). Biology.clc.uc.edu. 16 March 2001. Archived from the original (http://biology.clc.uc.edu/courses/Bio106/mosses.htm) on 28 July 2012. Retrieved 1 August 2012.

6. "Flowering Plant Reproduction" (https://web.archive.org/web/20121008233734/http://www2.estrellamountain.edu/faculty/farabee/BIOBK/BioBookflowers.html). Emc.maricopa.edu. 18 May 2010. Archived from the original (http://www2.estrellamountain.edu/faculty/farabee/BIOBK/BioBookflowers.html) on 8 October 2012. Retrieved 1 August 2012.
7. Chisholm, Hugh, ed. (1911). "Reproductive System" (https://en.wikisource.org/wiki/1911_Encyclop%C3%A6dia_Britannica/Reproductive_System). *Encyclopædia Britannica*. Vol. 23 (11th ed.). Cambridge University Press.
8. Eberhard, W.G., 1985. Sexual Selection and Animal Genitalia. Harvard University Press
9. Schmidt-Rhaesa, Andreas (30 August 2007). *The Evolution of Organ Systems* (https://books.google.com/books?id=iiwTDAAAQBAJ). Oxford University Press. p. 252. ISBN 978-0-19-856668-7.
10. switze, International Conference on Comparative Physiology 1992 Crans; Bassau, Short & (4 August 1994). *The Differences Between the Sexes* (https://books.google.com/books?id=zunYrumtsR8C&q=evolution+of+sex+differences). Cambridge University Press. p. 54. ISBN 978-0-521-44878-9.
11. Langerhans, R. Brian; Anderson, Christopher M.; Heinen-Kay, Justa L. (6 September 2016). "Causes and Consequences of Genital Evolution" (https://doi.org/10.1093%2Ficb%2Ficw101). *Integrative and Comparative Biology*. **56** (4): 741–751. doi:10.1093/icb/icw101 (https://doi.org/10.1093%2Ficb%2Ficw101). ISSN 1540-7063 (https://www.worldcat.org/issn/1540-7063). PMID 27600556 (https://pubmed.ncbi.nlm.nih.gov/27600556).
12. Simmons, Leigh W. (2014). "Sexual selection and genital evolution" (https://doi.org/10.1111%2Faen.12053). *Austral Entomology*. **53** (1): 1–17. doi:10.1111/aen.12053 (https://doi.org/10.1111%2Faen.12053). ISSN 2052-1758 (https://www.worldcat.org/issn/2052-1758). S2CID 53690631 (https://api.semanticscholar.org/CorpusID:53690631).
13. Marvalee H. Wake (1992). *Hyman's Comparative Vertebrate Anatomy* (https://books.google.com/books?id=VKlWjdOkiMwC&pg=PA583). University of Chicago Press. p. 583. ISBN 978-0-226-87013-7.
14. Brigitta Olsen (15 November 2009). *Daphne's Dance: True Tales in the Evolution of Woman's Sexual Awareness* (https://books.google.com/books?id=l9xrbK6CwzUC&pg=PA9). Brigitta Olsen. p. 9. ISBN 978-0-9842117-0-8.
15. Anita Allen (November 2011). *Unpopular Privacy: What Must We Hide?* (https://books.google.com/books?id=fxYhR6hqc3QC&pg=PA219). Oxford University Press, US. p. 219. ISBN 978-0-19-514137-5.
16. Hodges, Frederick Mansfield S.; Denniston, George C.; Milos, Marilyn Fayre (2007). *Male and Female Circumcision: Medical, Legal, and Ethical Considerations in Pediatric Practice* (https://books.google.com/books?id=U0EyBwAAQBAJ&pg=PA10&dq=). Springer US. p. 10. ISBN 978-0-58539-937-9. Retrieved 24 November 2023.
17. Martin, Richard J.; Fanaroff, Avory A.; Walsh, Michele C. (2014). *Fanaroff and Martin's Neonatal-Perinatal Medicine E-Book: Diseases of the Fetus and Infant* (https://books.google.com/books?id=AnVYBAAAQBAJ&pg=PA1522&dq=). Elsevier Health Sciences. p. 1522. ISBN 978-0-32329-537-6. Retrieved 24 November 2023.
18. Hosken, David J., and Paula Stockley."Sexual selection and genital evolution (http://www.sexologia.ulusofona.pt/biblio/Indice_files/Sexual%20selection%20and%20genital%20evolution.pdf)." Archived (https://web.archive.org/web/20171012045147/http://www.sexologia.ulusofona.pt/biblio/Indice_files/Sexual%20selection%20and%20genital%20evolution.pdf#) 12 October 2017 at the Wayback Machine Trends in Ecology & Evolution 19.2 (2004): 87-93.
19. Arnqvist, Göran. "Comparative evidence for the evolution of genitalia by sexual selection (http://heart.sdsu.edu/~website/biology_307/pdfs/genitalia.pdf)." Archived (https://web.archive.org/web/20120127135826/http://heart.sdsu.edu/~website/Biology_307/pdfs/genitalia.pdf#) 27 January 2012 at the Wayback Machine Nature 393.6687 (1998): 784.

20. Schilthuizen, M. 2014. Nature's Nether Regions: What the Sex Lives of Bugs, Birds, and Beasts Tell Us About Evolution, Biodiversity, and Ourselves (https://books.google.com/books?id=xqM7AgAAQBAJ&dq=nature%27s+nether+regions&pg=PT2) Archived (https://web.archive.org/web/20230614234747/https://books.google.com/books?id=xqM7AgAAQBAJ&dq=nature%27s+nether+regions&pg=PT2) 14 June 2023 at the Wayback Machine. Penguin USA
21. "Male reproductive behaviour of Naja oxiana (Eichwald, 1831) in captivity, with a case of unilateral hemipenile prolapse" (https://www.researchgate.net/publication/335270872). 2018.
22. "Page:The Works of William Harvey (part 1 of 2).djvu/283 - Wikisource, the free online library" (https://en.wikisource.org/wiki/Page:The_Works_of_William_Harvey_(part_1_of_2).djvu/283). *en.wikisource.org*. Archived (https://web.archive.org/web/20230325152215/https://en.wikisource.org/wiki/Page:The_Works_of_William_Harvey_(part_1_of_2).djvu/283) from the original on 25 March 2023. Retrieved 25 March 2023.
23. Purves, William K.; Sadava, David E.; Orians, Gordon H.; Heller, H. Craig (2001). *Life: The Science of Biology* (https://books.google.com/books?id=kS-h84pMJw4C&q=plant+sex+organs). Macmillan. p. 176. ISBN 978-0-7167-3873-2.
24. Pal, Nishant (6 December 2021). *Plant Biology* (https://books.google.com/books?id=Y-_czgEACAAJ). Independently Published. ISBN 979-8-7799-0473-5. Archived (https://web.archive.org/web/20230410180903/https://books.google.com/books?id=Y-_czgEACAAJ) from the original on 10 April 2023. Retrieved 25 March 2023.
25. Purves, William K.; Sadava, David E.; Orians, Gordon H.; Heller, H. Craig (2001). *Life: The Science of Biology* (https://books.google.com/books?id=kS-h84pMJw4C&q=plant+sex+organs). Macmillan. p. 665. ISBN 978-0-7167-3873-2.
26. Heritage, J.; Evans, E. G. V.; Killington, R. A. (26 January 1996). *Introductory Microbiology* (https://books.google.com/books?id=C0Q0ApyDFzcC&q=sex+organs+in+fungi&pg=PA19). Cambridge University Press. p. 19. ISBN 978-0-521-44977-9.
27. Manoharachary, C.; Tilak, K. V. B. R.; Mallaiah, K. V.; Kunwar, I. K. (1 May 2016). *Mycology and Microbiology (A Textbook for UG and PG Courses)* (https://books.google.com/books?id=Neg4DwAAQBAJ&q=female+sex+organs+in+fungi&pg=PA328). Scientific Publishers. p. 328. ISBN 978-93-86102-13-3.

Further reading

- Leonard, Janet L.; Córdoba-Aguilar, Alex (2010). *The Evolution of Primary Sexual Characters in Animals* (https://books.google.com/books?id=PgtXj5R6OfMC). Oxford: Oxford University Press. ISBN 978-0199717033.