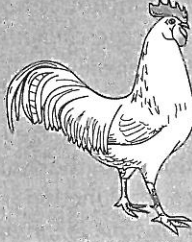


formed by John Hunter in England some 80 years previously (Sawin, 1996). When Berthold castrated juvenile roosters, they failed to develop normal reproductive behavior and secondary sexual characteristics, such as the rooster's comb, in adulthood (**Figure 5.2**). Berthold observed, however, that placing one testis into the body cavity of these castrates could preserve normal development of adult anatomy and behavior. These animals began crowing and showed the usual male sexual behaviors. Because the nerve supply to the testis had not been reestablished, Berthold concluded that the testes release a chemical into the blood that affects both male behavior and male body structures. Today we know that the testes make and release the hormone testosterone, which exerts these effects.

The French physiologist Claude Bernard (1813–1878) helped set the stage in the nineteenth century for the emergence of endocrinology as a science. Bernard stressed the importance of the internal environment (“internal milieu”) in which cells exist and emphasized that this environment must be carefully regulated. He regarded a constant internal body environment as necessary for independent activity in the external environment.

This idea was later embedded in the concept of homeostasis advanced by American physiologist Walter B. Cannon (1871–1945) in the 1920s. **Homeostasis** is the maintenance of a relatively constant internal environment by an array of mechanisms in the body. Clinical and experimental observations starting in the late nineteenth century showed the importance of hormones from several glands—including the thyroid, the adrenal cortex, and the pituitary—for maintaining this constant environment inside our bodies.

homeostasis The tendency for the internal environment to remain constant.

	Group 1	Group 2	Group 3
			
	Left undisturbed, young roosters grow up to have large red wattles and combs, to mount and mate with hens readily, and to fight one another and crow loudly.	Animals whose testes were removed during development displayed neither the appearance nor the behavior of normal roosters as adults.	However, if one of the testes was reimplanted into the abdominal cavity immediately after its removal, the rooster developed normal wattles and normal behavior.
			
Comb and wattles:	Large	Small	Large
Mount hens?	Yes	No	Yes
Aggressive?	Yes	No	Yes
Crowing?	Normal	Weak	Normal
Conclusion Because the reimplanted testis in group 3 was in an abnormal body site, disconnected from normal innervation, and yet still affected development, Berthold reasoned that the testes release a chemical signal, which we would call a hormone, that has widespread effects.			

2 The First Experiment in Behavioral Endocrinology Berthold’s nineteenth-century experiment demonstrated the importance of hormones for behavior.