

20

The Dog, *Canis familiaris*

JOHN M. STEWART AND J. PAUL SCOTT

Introduction

The dog, *Canis familiaris*, is the oldest domesticated animal. The actual time when domestication first occurred will probably never be known, but the oldest known remains, obtained from a cave in the Beaverhead Mountains of Idaho, have been carbon dated to be from the period 8300–9500 B.C., which means that they may be as much as 11,500 years old. Assuming, as Lawrence (1967) does, that the first dogs were domesticated approximately 12,000 years ago, they could have gone through as many as 6000 generations in domestication, based on an average generation span of 2 years, or, more conservatively, 4000 generations at a rate of one generation per 3 years. Since dogs associated with primitive human cultures were usually kept in small semi-isolated populations, the opportunities for rapid evolutionary change have been great. As Scott (1968) has pointed out, domestication presents a situation similar to a species entering into a new environment. We would expect the phenomenon of adaptive radiation to have taken place, particularly since dogs spread to all parts of the world and were kept not only in a great variety of human cultural environments, but also exposed to almost every climatic condition, from tropical to arctic. At the time of the historical exploration of the world, dogs were found associated with people on all continents, and most islands as well.

JOHN M. STEWART—The Jackson Laboratory, Bar Harbor, Maine AND J. PAUL SCOTT—Bowling Green State University, Bowling Green, Ohio.

The result has been that the dog has become the most variable of any domestic animal, not even excluding man. Modern breeding practices in the last 100 years have tended to preserve and extend this variation by the selection of unusual traits, by the protection of less-viable individuals, and by the practices of outbreeding and extensive matings from certain sires. Thus, the dog is a genetic gold mine, but few serious efforts have been made to exploit this. One of the earliest was Stockard's (1941) experiments with endocrine typology. The next major piece of research was Dawson's (1937) review of inheritance in the dog, followed many years later by the efforts of Burns (1952) and Burns and Fraser (1968). A major breeding study concerned chiefly with behavior genetics was conducted by Scott and Fuller (1965). Associated with the project, but using data largely from breeders, Little (1957) determined the major coat-color genes in the dog. The present chapter will summarize the major aspects of dog genetics as covered in the above basic works and review recent literature not covered by them.

Various hypotheses have been advanced concerning the origin of the dog. Darwin, who believed in blending rather than particulate inheritance, thought that the amount of variation present in dogs could only be accounted for by separate domestication from two species, the jackal and wolf. However, Mendelian inheritance and the evolutionary factors cited above will account for the variation in one species. A combination of anatomical, behavioral, and geographical evidence indicates that the most likely hypothesis is a single domestication from a medium-sized strain of wolves, such as the Arabian wolf (Lawrence, 1967; Scott, 1968). Since all species of the genus *Canis* appear to be interfertile, there is always the possibility that jackals may have contributed some genes, particularly to the southern and tropical varieties of dogs; but, if so, they have produced no major effect on the basic behavioral patterns of the dog.

Origin of Breeds

The origin of the various dog breeds and strains is largely conjectural, except for those that have been developed in relatively recent historical times, and even for these the information is often sketchy or misleading. From the viewpoint of origin, breeds fall into three classes: (1) The first class is those that have been developed from a small, isolated local population in some remote part of the world; examples are the basenji (central Africa), telomian (Malaysia), and chow (China). If the first class has been developed recently, one can be reasonably certain that outcrossing has not occurred. In the other two classes, outcrossing has al-