

meant by the word species, since it involves our whole conception of the process of organic evolution. Whilst species were formerly held to be of fixed, if slightly modifiable, character, to be incapable of fertile intercrossing, and to have been separately created, they are now considered to have been evolved from pre-existing species by gradual modification, to have no absolutely fixed character, and to be by no means always sterile when crossed with each other. Organisms need not necessarily be alike to be of the same species; as, for instance, in the case of the alternation of unlike generations, or of sexual differences. Similarity (of the individuals of one sex) at some stage of their life-history, and 'blood relationship,' are the only essential common characters of the individuals of a species. Each of the characters of the individuals of a species may vary about a mean, no two individuals being exactly alike. The specific characters of an assemblage of individuals (species) are those which are most developed in the largest number of individuals. By these the species may be defined. (E.S.G.)

Linnaeus defined species in terms of creation: 'Species tot sunt diversae, quot diversae formae ab initio sunt creatae.' Cuvier accepted and widely promulgated this orthodox doctrine. Buffon and Lamarck contended for the transmutation of species, whereby the accepted dogma was rendered nugatory. The number of German species of hawkweed, according to one botanist, is some 300, according to another less than twenty. The term 'species' was introduced by Ray, and the binomial system of nomenclature now universally adopted is due to Linnaeus. See CLASSIFICATION (in biology), VARIETY, VARIATION, HEREDITY, and EVOLUTION.

Literature: LINNAEUS, *Philosophia Botanica*; DARWIN, *Origin of Species*; KERNEB, *Gute u. schlechte Arten*; ROMANES, *Darwin and after Darwin*, ii; A. R. WALLACE, *Darwinism*; K. PEARSON, *Grammar of Sci.* (2nd ed., 1900). (C.L.L.M., E.S.G.)

Species (and Specific Marks, in logic). A relatively narrow class and the marks which belong to it. See LATIN AND SCHOLASTIC TERMINOLOGY, 4, 14, and cf. DEFINITION. (C.S.P.-J.M.B.)

Species considered as disjunctively co-ordinated under a genus are called 'disjunct.' See DISJUNCTIVE. (J.M.B.)

Specific: see SPECIES (in biology, and in logic).

Specific Energy of Nerves: Ger. *speci-*

fische Sinnesenergie, spezifische Energie der Nerven; Fr. *énergie spécifique des nerfs*; Ital. *energia specifica dei nervi*. (1) The theory that each sensory nerve and nerve-fibre, in whatever manner stimulated, gives rise in consciousness to a specific sensation, different from that produced by stimulation of any other. 'This function of the individual nerves, determined by their anatomical connections, is called their "specific energy"' (Landois and Stirling, *Human Physiol.*, 1891, 714). (E.B.T.)

(2) Specific energy, it is now thought, depends on the end-organ, together with (especially) the central connections in the cerebral cortex.

The doctrine of specific energy of nerves was enunciated by E. H. Weber, and especially elaborated by Johannes Müller (*Physiol.*, ii. 250, 1840). The doctrine in the form (2) can be easily demonstrated with the sensory nerves of sight, hearing, and touch, including temperature and possibly pain. Taste and smell present extreme mechanical difficulties to experimental demonstration of the law. Oehrwall's recent experiments on taste (*Skand. Arch. f. Physiol.*, 1890, ii. 1) point strongly to its application to this sense. (C.F.H.)

Literature: a full discussion is given by WUNDT, *Physiol. Psychol.* (4th ed.), i. 285, 323-32; EBBINGHAUS, *Psychol.*, 144 ff., and references; LEWES, *Physiol. of Common Life* (1860), chap. viii; and *Problems of Life and Mind*, i. 135 (1874); HORWICZ, *Psychol. Analyse* (1872), i. 108. (E.B.T.)

Specific Gravity: Ger. *spezifische Schwere* (or *Gewicht*), *Dichtigkeit*; Fr. *poids* (or *gravité*) *spécifique*; Ital. *gravità specifica*. The ratio of the weight of a body to the weight of an equal volume of water; now replaced by the word DENSITY (q. v.). (S.N.)

Specification [Lat. *species*, kind]: Ger. *Spezifikation* (Fries); Fr. *spécification*; Ital. *spezificazione*. The act of making specific (1) by a new determination of a mental content or object, or (2) by the determination of a notion in a less general class or in an individual.

The first meaning is useful in connection with the growth and successive modifications of a mental content, each reappearance of the content being a new specification of it. This usage is due to Stout. Cf. DETERMINATION. The second is the more popular, and the meaning in logic. (J.M.B., G.F.S.)

Spectator: see PRODUCTION, and PRODUCER.

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