Burnside William | Encyclopedia.com

(*b*. London, England, 2 July 1852; *d*. West Wickham, England, 21 August 1927)

mathematics.

Burside's research was in such diverse fields as mathematical Physics, complex function theory, geometry, group theory, and the theory of Probability. On the basis of his work in the first two field, he was elected a fellow of the Royal Society in 1893. It was to the theory of groups, however, that he made his most significant contributions. The beginnings of an interest in groups can be detected in papers of 1891 and 1892, in which groups of linear fractional transformations of a complex variable are involved. By 1894 the theory of groups of finite order had become the central concern of much of his research, and for the next twenty years Burnside remained one of the most active contributors to its development. A number of his results have become an integral part of the modern theory of groups and their representations.

With the hope of stirring up interest in group theory in England, Burnside published his *Theory of Groups* in 1897. It was the first treatise on groups in English and also the first to develop the theory from the modern standpoint of abstract groups vis à vis permutation groups, although this approach had already been pioneered by H. Weber in his *Lehrbuch der Algebra* (1896). One topic Burnside excluded from his book was that of linear groups, because it did not seem that any result could be obtained most directly by considering linear transformations. This opinion soon became outdated, however, with G. Frobenius' development of the theory of group representations and characters (1896–1899), and Burnside was one of the first to recognize the importance of Frobenius' ideas and to contribute to their development, simplification, and application.

Using group characters, Burnside was able to prove, for examle, that every transitive group of prime degree is either solvable or doubly transitive (1901) and that every group of order $P^a q^b$ (p and q prime) is solvable (1904). The latter result greatly extended results of Sylow (b = 0, 1872), Frobenius (b = 1, 1895), and Jordan (b = 2, 1898). It was also Burnside who discovered that groups of odd order admit no nontrivial real irreducible representations, and he was led by its consequences to suspect that every group of odd order is solvable, W. Feit and J. G. Thompson finally established this in 1962 with a proof that involves, among other things, frequent applications of Burnside's discovery.

Because he was convinced of the important role that representation theory was destined to play in the future advancement of group theory, Burnside devoted considerable space to its systematic presentation in the second edition of *Theory of Groups* (1911). This edition was widely read and is now considered a classic.

BIBLIOGRAPHY

I. Original Works, Besides *Theory of Groups of Finite Order* (Cambridge, 1897, 1911), Burnside also composed a treatise on probability, *Theory of Probability* (Cambridge, 1928), which was published posthumously.

II. Secondary Literature The only article dealing with Burnside's life and work in any detail is A. R. Forsyth' obituary notice in *Proceedings of the Royal Society*, **117A** (1928), xi-xxv; the emphasis is upon Burnside's early work, and insufficient attention is paid to his role in the development of the theory of groups. Some idea of the later can be obtained from the historical and survey articles scattered throughout *The Collected Works of George Abram Miller*, 5 vols. (Urbana, Illinois, 1935–1959), esp, II, 1–18 and III, 1–15 See also H. Burkhardt and H. Vogt, "Sur les groupes discontinus." in *Encyclopédie des sciences mathematiques*, I, 1, fasc. 4 (paris-Leipzig, 1909), 532–616.

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