ponents. These exponents, denoted by Greek letters, ν, α, β, γ, are ubiquitous in the book. They are, of course, very reminiscent of critical phenomena, and in chapter 10 de Gennes very clearly describes the analogy, first discovered by him, between the two. Briefly, N^{-1} plays the role of $(T-T_c)/T$, the deviation of the temperature from its critical value, and R is analogous to the correlation length which diverges at T_c; $\nu = \frac{1}{2}$ then corresponds to a mean field exponent.

The above is intended to give some flavor of the calculational complexity in the book. The book in general contains very few computational details. The author steadfastly keeps his eyes on the universal features and ignores "numerical coefficients in most formulas, where they would obscure the main line of thought." As further stated in the introduction the book "is meant for experimentalists in polymer science who wish to incorporate the recent advances into their modes of thinking." In my opinion "experimentalists" is far too restrictive. I recommend the book to all scientists, experienced or beginning, interested in the subject of polymers.

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Control Theory

A History of Control Engineering, 1800–1930. S. BENNETT. Published on behalf of the Institution of Electrical Engineers by Peter Peregrinus Ltd., Stevenage, England, 1979 (U.S. distributor, INSPEC/IEEE, Piscataway, N.J.). x, 214 pp., illus. $35. IEE Control Engineering Series 8.

Applications of the concept of feedback developed in three stages. The first extended from antiquity to the invention of the mechanical governor at the end of the 18th century; the second was the development of control theory as a scientific discipline, before the advent of electronic control; and the third runs from around 1930 to the present. The first period was the subject of Otto Mayr's *Origins of Feedback Control*, which MIT Press published (in translation from the German original) in 1970. The present volume traces the second period, with some overlap at either end. The history of the third period remains to be written.

Although control theory is regarded largely as a branch of electrical engineering nowadays, it is appropriate that this account, which was commissioned by Britain's Institution of Electrical Engineers (IEE), was written by a mechanical engineer. From him we learn that control theory was first elaborated on the basis of mechanical devices such as regulators of the speed of steam engines and other prime movers; that the use of the governor by scientists led them to study its dynamics and to formulate stability criteria; that the first servomechanisms were steam steering engines that came into use in the 1860's, closely followed by hydraulic servos for the control of torpedos and ship stabilizers, decades ahead of the gyroscopes developed by Sperry and others in the early years of the 20th century; and that the first electrical applications were in the control not of rotating machinery but of the gap width of arc lights. To be sure, Bennett does not merely chronicle "firsts" (although they are recounted and meticulously documented), he takes us through a *catalogue raisonné* of the contributions made by Airy, Poncelet, Maxwell, Vyshnegradsky, Stodola, Lyapunov, and above all Edward John Routh (1831–1907), the Canadian-born mathematician who was senior wrangler in the Cambridge mathematical tripos of 1854, the year Maxwell came second. In recent years Routh, who was Airy's son-in-law, has come to be regarded as the founder of stability theory and his *Treatise on the Stability of a Given State of Motion, Particularly Steady Motion* (1877) as a seminal work. In the U.S.S.R., he is recognized as Lyapunov's precursor; and in 1977 the IEE commemorated the centenary of the *Treatise* by a Routh centennial lecture, which was given by E. I. Jury of Berkeley.

The principal discoveries are painstakingly traced in two long chapters, "Towards an understanding of the stability of motion" and "The development of servomechanism," which occupy half the book. The book is in no wise a popularized account; differential equations and engineering drawings abound, as do references and notes (216 in these two chapters alone) and extended quotations. Some of the quotations are set rather abruptly at the head of chapter sections, without exegesis; and one could have wished for the dates of birth and death of the engineers and scientists mentioned. But these are minor faults of an otherwise fine book, packed with information and full of illuminating insights by an engineer who is also an expert historian of technology and of one of its parent sciences, mechanics.

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