

deal with the angular power spectrum coefficient C_ℓ , while the rest is devoted to peak statistics, Minkowski functionals, and topological features of the polarization maps. To date, 99% of the cosmological

information derived from the CMB has come from the C_ℓ of the anisotropy and the polarization, so the coverage of topics in the book is rather unbalanced. To give another example, although the authors devote many pages to the Sakharov modulations—baryon acoustic oscillations and the acoustic peaks in the angular power spectrum—they do not mention any of the modern power spectrum calculation codes such as CMBFAST, CAMB, or CMBwarp. Again, the history is interesting, but the book does not help one learn how to work in CMB physics.

Chapter 5 offers examples of the dependence of C_ℓ on cosmological parameters, but no discussion is included about the efforts that went into verifying and crosschecking the CMB power spectrum codes. The Russian edition of the book was published in 2002, so that omission is notable. In addition, the English translation has a few clunkers. For instance, the authors state that the density perturbation equation has a “solution that grows and then decays with time,” but the equation actually has a growing mode and a decaying mode. The book also contains many mathematical typos and numerical errors, such as a factor-of-two error in equation 1.33, a 20-Gyr lifetime for uranium-235 when it should be a mean lifetime of 1 Gyr, Ω_U instead of Ω_M , and μm for μK . Also, the “30 cm” IRAM telescope is actually a 30-m telescope. The Laplacian of the potential ϕ is represented by either $\Delta\phi$ or $\nabla^2\phi$ in different sections.

Because of the frequent use of Fourier transforms in the field of CMB physics, a well-defined and consistent normalization convention should be used. Unfortunately, the text has a typo in the equation of the integral definition of the transform; it could be fixed in two different ways, leading to very different normalizations. The power spectrum of density perturbations $P(k)$ in section 3.9.1 is supposed to follow the normalization in *Principles of Physical Cosmology* (Princeton U. Press, 1993) by P. J. E. Peebles, but equation 3.76 for $\sigma^2(M)$ differs by a factor of $8\pi^3$ from the normalization found in Peebles. And equation

4.143 has yet another normalization. The literature is full of different normalizations for $P(k)$, but one would think it reasonable to expect a book to be consistent throughout.

The CMB is the cornerstone of the new precision cosmology; thus it is unfortunate that the book has many inconsistencies and many precise but inaccurate statements. In fact, the first equation in the book gives the temperature of the CMB as $T_0 = 2.7356 \pm 0.038\text{ K}$ (95% confidence). Yet this is a misprint from their reference to the 1998 article by Henrik Nordberg and George Smoot, which claimed a confidence interval of $\pm 0.0038\text{ K}$. In chapter 2, T_0 is given as 2.735 K, with a reference to Dale Fixsen and colleagues, who in 1996 gave a figure of 2.728 K. The two different values for the photon number density are both inconsistent with the stated T_0 , and none of the values are consistent with the best temperature from the *Cosmic Background Explorer's* (COBE's) FIRAS detector, $2.725 \pm 0.002\text{ K}$, which was obtained by John Mather and colleagues in 1999.

Overall, *The Physics of the Cosmic Microwave Background* spends too much time chasing after possible non-Gaussianities and claimed discrepancies at the fringes of the field and not enough time interpreting the key results from the CMB. For example, in figure 9.2 the authors claim that “the entire range of large-scale anisotropy measured by COBE ($\ell < 30$) happens to lie outside the optimal curve,” and yet inspection of the figure shows that at least 68% of the data points have error bars that intersect the curve. So I would not recommend the book, except for its different perspective on the historical development of CMB physics.

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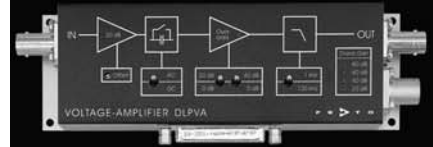
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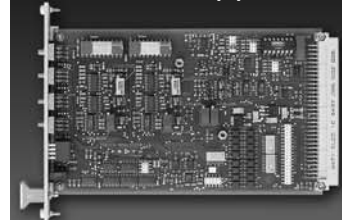
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