a constant factor of modulus unity. This implies that every nonnull element of $H^1(T)$ can be factorized as qg^2, where q is inner and g is outer in $H^2(T)$. A function f in $H^2(T)$ is outer if and only if

$$\int_0^{2\pi} \log |f(e^{ix})|\, dx > -\infty .$$

From these results of Beurling it is possible to deduce the following theorem due to G. Szegö: If w is a nonnegative integrable function on T then

$$\exp \frac{1}{2\pi} \int_0^{2\pi} \log\, w(e^{ix})\, dx =$$

$$\inf_P \frac{1}{2\pi} \int_0^{2\pi} |(1 + P(e^{ix}))|^2\, w(e^{ix})\, dx ,$$

where P ranges over all polynomials. The densely packed chapter on Hardy spaces covers all these and much more. It may be noted that this last theorem of Szegö is at the heart of the theory of prediction of discrete time one-dimensional stationary stochastic processes developed by N. Wiener in the US and A. N. Kolmogorov in the former USSR during the Second World war. (A multidimensional version of Szegö's theorem when w is a positive definite matrix-valued function on T with summable entries was obtained by N. Wiener and P. Masani when they met at the Indian Statistical Institute in Calcutta during 1955–56.) By exploiting the standard conformal map from the unit disk to the upper half plane the author indicates how a theory of Hardy spaces $H^p(\mathbb{R})$ could be built. (This can be used to develop the prediction theory of one dimensional continuous time stationary stochastic processes.)

A fairly extensive discussion of the theory of conjugate functions in a whole chapter is followed by a brief account of ($\mathbb{R}$ and $\mathbb{R}_+$–) translation invariant subspaces of $L^2(\mathbb{R})$ and $L^1(\mathbb{R})$ covering the results of Wiener, Beurling and Titchmarsh.

If $\varphi \in L^2(\mathbb{R})$ then its Fourier transform $\hat{\varphi}$ is a tempered distribution in $\mathbb{R}$ and the support of $\hat{\varphi}$ is called the *spectral set* of φ. The spectral set of a bounded bilateral sequence, i.e. an element of $l^\infty(\mathbb{Z})$ can be similarly defined as a subset of T. An element $\varphi \in L^\infty(\mathbb{R})$ has exactly one point λ in its spectral set if and only if $\varphi(x) = \exp i\lambda x$. If $\{\alpha_n\}$ is a bilateral sequence whose terms are drawn from a finite set of complex numbers then its spectral set is the whole of T unless $\{\alpha_n\}$ is periodic. A bilateral sequence of 0's and 1's is the Fourier–Stieltjes transform of a complex measure on T if and only if it is periodic after dropping a finite number of terms. Pretty surprises of this kind are strewn around in several places in this flower garden of harmonic analysis.

Helson concludes with a little chapter on equidistribution theorems originating in the work of H. Weyl. A sequence $\{u_k\}$, $k \geq 1$ in $[0, 1]$ is said to be *equidistributed* if for any interval $[a, b] \subset [0, 1]$

$$\lim_{n\to\infty} \frac{1}{n} \#\{ j \,|\, u_j \in [a, b],\ 1 \leq j \leq n\} = b - a ,$$

where # denotes cardinality. To verify the equidistribution of a real sequence $\{u_k\}$ modulo 1 it is enough to check that

$$\lim_{n\to\infty} n^{-1} \sum_{k=1}^{n} e^{2\pi i j u_k} = 0$$

for every $j \neq 0$. Thus equidistribution and trigonometric sums are closely related. It is a theorem of van der Corput that a sequence $\{u_k\}$ is equidistributed modulo 1 if for every positive integer p the sequence $\{u_{k+p} - u_k\}$, $k \geq 1$ is equidistributed modulo 1. Equidistribution theorems and uniquely ergodic transformations are intimately connected as pointed out by H. Furstenberg. Exploiting these relations it is shown that for any real polynomial $P(x)$ with at least one term of the form ux^n, where u is irrational and $n \geq 1$, the sequence $\{P(k)\}$, $k \geq 1$ is equidistributed modulo 1.

With its well punctuated historical comments and instructive exercises this little but very rich volume offers an enjoyable guided tour of classical harmonic analysis with some scope in trimming its price for the Indian market.

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Fish Bioenergetics: Fish and Fisheries Series 13. Malcolm Jobling. Chapman & Hall, 2–6 Boundary Row, London SE1 8HN, UK. 1995. ISBN: 0-412-58090-X. 309 pp.

The Fish and Fisheries series by Chapman & Hall aims to present timely volumes reviewing important aspects of fish biology. Title number 13 concerning Fish Bioenergetics is authored by Malcolm Jobling, who has made extensive contributions to fish bioenergetics. Energetics is a study of energy transformation in living system and hence provides the physiological frame for the study of relationship between food intake, metabolism and growth of fish subjected to different environmental conditions. Rightly, the author has chosen to make the presentation in three major sections. The first one describes nutritional and dietary formulations, the second deals with energy gains, losses and transfer within the fish, and the third briefly highlights the effects of selected environmental factor on one or more of the energetics parameters.

As the respiratory metabolism of most fishes is predominantly based upon lipids and proteins, rather than carbohydrates and lipids, the section concerning the basics of energy metabolism indicating the entry points of different amino acids and fatty acids into citric acid cycle for ATP production may prove to be very useful; this information does not usually find a place in most general and comparative animal physiology books. Equally useful is the presentation on dietary ingredients and feed formulations, especially for incoming aquaculturists.

Commendable is the part 2 concerning the physiological energetics, which represents a summary of the voluminous literature that has accumulated from sixties to nineties. However, it is not clear why the author has not relegated a section on herbivorous and omnivorous fishes. No doubt they constitute less than 10% of the fish species, but they make more than 35–55% of coral fishes and some of them have been most successfully cultured for ages. Equally a section on digestion is also missing, despite the fact that the author himself has contributed land-mark publications on this theme. The lowest measurable metabolic level of an animal is variously recognized as the

basal, resting, routine, low routine, and fasting metabolism by fish physiologists, and regarded as the approximate equivalent of basal metabolic rate (BMR), a term used by mammalian physiologists. Many aquatic animals are known to actively absorb dissolved amino acids and simple sugars; hence it may be difficult to force a gill-breathing fish to undertake complete fasting; secondly, obligate air-breathing fishes undertake routine breathing movements. For these reasons the term low-routine metabolic rate may be more appropriate for 'fishes'. With reference to anaerobiosis, Kutty (*Mar. Biol.*, 1972, **16**, 126–133) presented a new concept of ammonia quotient relating the volume of NH_3 excreted to volume of O_2 uptake. When tilapia was forced to exercise continuously it drew some anaerobic energy throughout the exercise utilizing more protein. The sub-section on hypoxia and anaerobiosis should have included some of these ideas on ammonia quotient.

In general, aquaculture is rather a tropical occupation. But the author has chosen examples mostly from temperate fishes (e.g. Tables 3.3, 7.1, etc.). In Table 15.1 *Anabas* is indicated as facultative air-breathing fish but it is an obligate breathing fish. Despite these, the book represents a good contribution and deserves to be placed in the libraries.

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