

# THE ANNALS of PROBABILITY

AN OFFICIAL JOURNAL OF  
THE INSTITUTE OF MATHEMATICAL STATISTICS

## The 1973 Wald Memorial Lectures

The probability theory of additive arithmetic functions  
PATRICK BILLINGSLEY 749

### Articles

Residual life time at great age..... A. A. BALKEMA AND L. DE HAAN 792  
The capacity region of a channel with two senders and two receivers  
R. AHLWEDE 805

Cross-spectral analysis of processes with stationary increments in-  
cluding the stationary  $G/G/\infty$  queue..... DAVID R. BRILLINGER 815  
Some problems on random intervals and annihilating particles  
P. ERDŐS AND P. NEY 828

$R$ -theory for Markov chains on a general state space I: solidarity  
properties and  $R$ -recurrent chains..... RICHARD L. TWEEDIE 840  
 $R$ -theory for Markov chains on a general state space II:  $r$ -subinvariant  
measures for  $r$ -transient chains..... RICHARD L. TWEEDIE 865

Transformation of local martingales under a change of law  
JAN H. VAN SCHUPPEN AND EUGENE WONG 879  
On stopping rules and the expected supremum of  $S_n/a_n$  and  $|S_n|/a_n$   
MICHAEL J. KLASS 889

Sums of independent random variables on partially ordered sets  
R. T. SMYTHE 906  
Strong laws of large numbers for weakly orthogonal sequences of  
Banach space-valued random variables  
ANATOLE BECK AND PETER WARREN 918

The optimal reward operator in dynamic programming  
D. BLACKWELL, D. FREEDMAN AND M. ORKIN 926

### Short Communications

The optimal reward operator in special classes of dynamic program-  
ming problems..... DAVID A. FREEDMAN 942  
A Gaussian paradox: determinism and discontinuity of sample func-  
tions..... SIMEON M. BERMAN 950

A note on stationary Gaussian sequences..... CHANDRAKANT M. DEO 954  
The multiplicity of an increasing family of  $\sigma$ -fields  
M. H. A. DAVIS AND P. VARAIYA 958

### Book Reviews

Review of *Markov Processes and Learning Models* by M. Frank Norman  
RADU THEODORESCU 964  
Review of *Branching Processes* by K. B. Athreya and P. E. Ney  
JOHN A. WILLIAMSON 966

---

Vol. 2, No. 5—October 1974