THE UNIVERSITY OF MANCHESTER.

October, 1949

Dear Sir/~~Madam,~~

I have to inform you that the Ph.D. Committee has approved your application for admission to the course for the degree of Ph.D., subject to the approval of the Applications Committee of Senate. The period of attendance will be . TWO . YEARS AS FROM OCTOBER, 1949 . . . . and your Supervisors are

. . Professor Bartlett and Mr. Moyal . . .

Will you please consult with your Supervisors and inform me as soon as possible which courses you propose to attend apart from your research work ?. You should also complete your registration immediately, if you have not already done so. Forms can be obtained from the Faculty of Science Office.

Yours faithfully,

~~A. E. Gillam~~, G. N. Burkhardt
Secretary to the Ph.D. Committee.

Mr. A. Ramakrishnan Alladi.

DEPARTMENT OF MATHEMATICS.

PROFESSOR M. H. A. NEWMAN, F.R.S.
PROFESSOR S. GOLDSTEIN, F.R.S.
PROFESSOR M. S. BARTLETT.

THE UNIVERSITY.
MANCHESTER, 13.
ARDWICK 2681

6th January 1950.

Dear Ramakrishnan,

I have not finished looking at the notes you gave me yesterday, but your solution of the G,F equations is very pretty. I notice that you did not derive the solution for the moments from the complete solution, and it would seem to me advisable to do this, at least for the mean, as a check on the expression for the complete solution.

The immediate point I would like to make about your solution is that in all cases where you can solve these equations for the marginal distributions you can solve my complete equation, (equation (32) in my symposium paper), as the auxiliary equations for the latter are equivalent to your two equations. I attach such a complete solution, based on your own method of deriving the G,F solution.

Yours sincerely,

M S Bartlett

Alladi Ramakrishnan, Esq.,
Mathematics Department.

[Extracted from the *Proceedings of the Cambridge Philosophical Society.*
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PRINTED IN GREAT BRITAIN

STOCHASTIC PROCESSES RELATING TO PARTICLES DISTRIBUTED IN A CONTINUOUS INFINITY OF STATES

By ALLADI RAMAKRISHNAN

Communicated by M. S. BARTLETT

Received 2 February 1950

1. INTRODUCTION

Many stochastic problems arise in physics where we have to deal with a stochastic variable representing the number of particles distributed in a continuous infinity of states characterized by a parameter E, and this distribution varies with another parameter t (which may be continuous or discrete; if t represents time or thickness it is of course continuous). This variation occurs because of transitions characteristic of the stochastic process under consideration. If the E-space were discrete and the states represented by $E_1, E_2, \ldots$, then it would be possible to define a function

$$\pi(\nu_1, E_1; \nu_2, E_2; \ldots ; t)$$

representing the probability that there are ν_1 particles in E_1, ν_2 particles in E_2, ..., at t. The variation of π with t is governed by the transitions defined for the process; $\nu_1, \nu_2, \ldots$ are thus stochastic variables, and it is possible to study the moments or the distribution function of the sum of such stochastic variables

$$N = \nu_1 + \nu_2 \ldots$$

with the help of the π function which yields also the correlation between the stochastic variables ν_i.

But if the E-space is a continuum no such π function can be defined, for we have a continuous infinity of stochastic variables representing the numbers in the elementary ranges dE. The concept of correlation has to be generalized and a consistent formulation is necessary before we deal with such a system.

In quantum mechanics such processes arise since the transitions may occur between continuous sets of variables. Examples of such transitions are collision loss, radiation loss by fast particles or pair creation by high-energy photons.

The method described in this paper is quite general, and the word 'particle' is used to facilitate understanding of the problem from a physical point of view. It is also to be noted that the continuous parameter referred to in the title is E and not t. There is no restriction on t. Whether t is continuous or discrete depends upon the definition of transition probabilities.

2. DESCRIPTION OF THE METHOD

Let $M(E; t)$ represent the stochastic variable denoting the number of particles with parametric values less than E. Then $dM(E; t)$ represents the stochastic variable denoting the number of particles in the elementary range dE. We shall assume that the probability that there occurs one particle in dE is proportional to dE, while the probability that there occurs more than one particle, say n, is of order $(dE)^n$ and hence is vanishingly

From THE CLERK TO THE COLLEGE,
MAGDALEN COLLEGE, OXFORD.

16.i.51

Dear Sir,

I am glad to be able to assure you that when I saw them last (January 4th) your son and daughter seemed to be well on the way to recovery. I have since received a letter from your son, dated 8.1.51, in which he makes no mention of his indisposition, so I do not think you need worry.

I have much appreciated getting to know them. I have great respect for A.R's originality and am convinced that he will go far.

Sincerely yours,

David G. Kendall

Letter from Professor D. G. Kendall

to Sir Alladi Krishnaswami Iyer

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THE UNIVERSITY OF MANCHESTER.

EXAMINATION RESULTS.

The following results are published subject to confirmation by Senate.

DEGREE OF Ph.D.

The following have satisfied the Examiners:-

Ames, T.R.
Armitage, J.B.
Bayoumi, S.E.A.
Bhandari, R.R.
Darwin, J.H.
Davy, G.S.
Duckworth, H.W.
Elborai, A.M.A.
Farrar, John
Gill, S.S.
Glasgow, E.L.H.
Goldsack, S.J.
Greenhalgh, C.W.
Harker, Janet E.
Hodson, A.L.
Keepe, Winifred G.
Knowles, C.B.
Lock, M.V.
Mitchell, K.J.
Nash, W.F.
Ramakrishnan, Alladi
Robinson, W.G.
Rosser, W.G.V.
Sehon, Alec
Sen, J.K.
Shimmin, J.D.
Spedding, Harold
Taylor, C.A.
White, T.R.
Wilcock, W.L.
Woodbine, Malcolm

July 4th, 1951.

Registrar.