**Burdzy, K.**

**Multidimensional Brownian excursion and potential theory.** (English) Zbl 0691.60066
Pitman Research Notes in Mathematics Series, 164. Harlow: Longman Scientific & Technical. 172 p. £17.95 (1987).

The book under review is an up-to-date work on excursion theory for multidimensional Brownian motions with applications to potential theory and angular derivative problems, written by a pioneer specialist of the subject. Brownian excursions are the parts of trajectories of Brownian motions which lie in a fixed open set. Roughly speaking the excursion laws - the subject of the book - are infinite measures on the space of paths which describe the exit-system for the local process at the Martin boundary of the given open set. Therefore it is not surprising to see that excursion laws are closely related with the distributions of h-processes and many proofs in the book could be understood in the language of these processes, especially in the case where the Martin boundary is identical with the topological boundary of the given domain or in the case of 2-dimensional domains (Chap. 7 and 10).

The book contains eleven chapters, the last one is reserved to open problems. The contents of each chapter are summarized by the author in the introduction (page 2) as follows:

"The main part of the book starts with chap. 3, presenting the most fundamental properties of Brownian excursion laws. Chapter 4 gives some approximation theorems providing in this way an intuitive explanation of the idea of an excursion law and preparing tools for explicit computations in the next chapter. Excursions from hyperplanes are simplest multidimensional excursions and the related excursion laws have many nice properties shown in chap. 5. Chap. 6 contains a few theorems with long and complicated proofs which are used in chap. 7 to study excursions in Lipschitz regions. Chap. 8 presents some excursions and generalizations of known results in potential theory obtained using probabilistic methods. Chap. 9 proposes a potential theoretic- probabilistic approach to the angular derivative problem and gives solutions to two problems which have not been solved using the classical methods. Chap. 10 reviews the properties of two-dimensional excursions in simply connected regions."

The book is written in a clear and precise style, most results presented here are new in the literature and are proved quite recently by the author and co-authors in their works dated from 1985-1987.

Reviewer: X.L.Nguyen

**MSC:**

60J45 Probabilistic potential theory
60-02 Research exposition (monographs, survey articles) pertaining to probability theory
60J65 Brownian motion



**Keywords:**

excursion theory for multidimensional Brownian motions; Martin boundary; topological boundary; Brownian excursion laws; Excursions from hyperplanes; excursions in Lipschitz regions; potential theoretic-probabilistic approach to the angular derivative problem