PART III

ACTIVITY OF OCEANIC SPREADING CENTERS AND THE ORIGIN OF OPHIOLITES

INTRODUCTION

The variety of ophiolites described in part II evidently reflects a similar variety of oceanic situations where new lithosphere is created. The variety in oceanic situations arises from the effect of independent or combined factors such as spreading rate, geodynamical environment (for instance mid-ocean or back-arc ridge) and local conditions of spreading (vicinity of a hot spot, of a transform fault, tip of a propagating rift, anomalously elevated zone, etc.). One object of part III is to try to correlate the main ophiolite types described in part II with the main oceanic spreading situations. With the structural approach favored here, characterization of ophiolites will be based mainly upon geological and structural features. In this respect, the harzburgite and lherzolite ophiolite types are distinguished, and their characteristics are described in chapter 8. These two types can be related to the spreading rate, which is the most influential physical parameter of oceanic spreading. The distinction between oceanic environments, which is generally made on geochemical grounds, will nevertheless be discussed in chapter 8.

Whatever their differences, ophiolites possess several common features which reflect general processes also common to the spreading systems of origin. Structural studies of various ophiolites, including the ultramafic section, provide invaluable tools for understanding the general physical processes taking place at spreading centers. In chapter 7 we consider the melt extraction processes occurring in the mantle beneath spreading centers by adiabatic decompression. The mantle flow patterns beneath spreading centers are described in chapter 9. How they are coupled with the accreting crust and identification of the magmatic processes occurring in the critical transition zone between mantle and crust are discussed in chapter 10. Moving upsection in chapter 11, we finally consider the magmatic processes which give birth to a new crust.