

# PART I

## Pentateuchus

### Becoming Mapping

He had brought a large map representing the sea,  
Without the least vestige of land:  
And the crew were much pleased when they found it to be  
A map they could all understand.

“What’s the good of Mercator’s North Poles and Equators,  
Tropics, Zones, and Meridian Lines?”  
So the Bellman would cry: and the crew would reply  
“They are merely conventional signs!

Other maps are such shapes, with their islands and capes!  
But we’ve got our brave Captain to thank”  
(So the crew would protest) “that he’s bought *us* the best —  
A perfect and absolute blank!”

— Lewis Carroll (1876)  
*The Hunting of the Snark*  
Fit the Second (The Bellman’s Speech)

This introductory Part I is an exploration in five chapters of the algebraic theory of set-valued mappings.

My emphasis is on the topics that will be of use to us on our continuing journey in relational biology. Some theorems will only be stated in this introduction without proofs; their proofs may be found in Chapter 1 of Aubin and Frankowska [1990], Chapter 2 of Berge [1963], or Chapter 1 of Burachik and Iusem [2008]. These are among the very few books that contain the subject of set-valued mappings, and even therein, the algebraic theory is only a prelude that is quickly passed over to concentrate on the analytic and topological aspects. I should note that the ‘forked arrow’ notation  $F: X \multimap Y$ , to be introduced in Section 2.1, for a set-valued mapping  $F$  from set  $X$  to set  $Y$ , is my own.