Part II

$M$-Adhesive Transformation Systems
This second part of the book presents the algebraic approach to graph transformation in the general framework of $\mathcal{M}$-adhesive categories, which instantiate to graphs of the form $G = (V, E, s, t)$ considered in Chap. 2, but also to a large variety of further types of graphs and other kinds of high-level structures, such as labelled graphs, typed graphs, hypergraphs and different kinds of low- and high-level Petri nets. The extension from graphs to high-level structures was introduced in [EHKP91a, EHKP91b], leading to the theory of high-level replacement (HLR) systems. In [EHPP04] the concept of HLR systems was joined to that of adhesive categories of Lack and Sobocinsky in [LS04], leading to the concepts of adhesive HLR categories used in [EEPT06] and $\mathcal{M}$-adhesive categories in this book, where all these concepts are introduced in Chap. 4. Moreover, this chapter includes an overview of different adhesive and HLR notions and several results concerning HLR properties, which are used in the general theories of Chapters 5 and 6 and for the construction of $\mathcal{M}$-adhesive categories. In fact, $\mathcal{M}$-adhesive categories and transformation systems constitute a suitable general framework for an abstract theory of graph and model transformations, which can be instantiated to various kinds of high-level structures, especially to those mentioned above. All the concepts and results—introduced for graph transformation in Chap. 2—are carefully presented and proven in Chap. 5 for $\mathcal{M}$-adhesive transformation systems and in Chap. 6 for multi-amalgamated transformations. Finally it is shown in Chap. 6 how multi-amalgamation can be used to define the semantics of elementary Petri nets.