SUMMARIES

CHAPTER I. TRYPANOSOMATIDS (KINETOPLSTEA: TRYPANOSOMATIDA) AND INSECTS (INSECTA): PATTERNS OF CO-EVOLUTION AND DIVERSIFICATION OF THE HOST–PARASITE SYSTEMS

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Some of the most dangerous human diseases are caused by various trypanosomatid species: Chagas disease in the South and Central America, African sleeping sickness and cutaneous and visceral leishmaniasis. These diseases are common in hot climates. About three million new cases of trypanosomiasis and leishmaniasis are reported every year. More than a third of the world population lives in the areas with the constant risk of infection. Increased tourist flow and the uncontrolled migration from the southern countries into the temperate regions as well as global climate changes create multiple opportunities for trypanosomatids to spread beyond their traditional areas. Trypanosomatid expansion is only limited by distribution of their insect vectors, since the development of these parasites inside a vertebrate host (including humans) has no latitudinal constraints. In the following chapter we examine specific coevolutionary patterns connecting these parasites and their hosts. How deep are the links between a specific parasite and its host (or hosts)? How and at which levels their interactions are controlled? Is it possible for a parasite to colonise a new host and what are the factors facilitating or limiting such changes? These and similar questions, actively debated in the modern literature, are the main focus of this chapter.

Analysis of the abundant, though incomplete and, at times, contradictory, data led us to conclude that the horizontal transition to the new insect vectors is the most important mode of host-parasite systems diversification in trypanosomatid evolution. One may speculate that this group is even now evolutionary active. Trypanosomatids are constantly "experimenting" with the new hosts and, having gained access to the new resources, can expand into new territories. Factors destabilizing the existing host-parasite systems between trypanosomatids and insects may increase the risk associated with these parasites (including the ones infecting humans) expanding from their present areas.

CHAPTER II. EVOLUTION AND BIOLOGICAL RADIATION OF TREMATODES: A SYNOPSIS OF IDEAS AND OPINIONS

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The chapter is devoted to the evolution and biological radiation of digeneans (class Trematoda, subclass Digenea), a central taxon of parasitic flatworms (Platyhelminthes). A system of adaptations at various stages of the digenean life cycle is analysed and the crucial adaptations promoting the circulation of these parasites in various terrestrial, marine and freshwater ecosystems are identified. It is shown that the key to the success of this flourishing group of parasites was the acquisition of the ability of parthenogenetic reproduction of sporocysts and rediae, the life cycle phases parasitizing the molluscan host, and the emergence of the cercaria, free-living larva of the hermaphroditic generation, in the life cycle. The chapter also presents a comparative overview of theories concerning the early stages of digenean evolution and the formation of their life cycles: the sequence of host colonisation, the formation of the primary two-host life cycle, the emergence of the cercaria and the involvement of the second intermediate host into the life cycle. The role of different categories of hosts in the evolution of digeneans and in their geographic expansion and host radiation is considered in detail. Special attention is given to the coadaptation processes in the systems "mollusc–parthenitae", the formation of the genetic variation of parthenitae and cercariae as well as the assessment of their role in the microevolution and speciation of the digeneans. It is

emphasised that the macroevolution of these parasites is closely associated with the phenomenon of host switching. This process was the most intensive during ecosystem transformations, especially in the course of global biosphere changes such as periodic glaciations of the late Pliocene–Pleistocene. In the light of this, an attempt is made to forecast the influence of the present-day climatic changes on the geographic and host expansion of the digeneans and the potential evolutionary consequences of these events.

CHAPTER III. ORIGIN OF THE NEMATODE PLANT PARASITISM AND COEVOLUTION OF PLANT PARASITIC NEMATODES WITH THEIR HOSTS AND VECTORS, WITH SPECIAL REGARD TO THE APHELENCHOIDID NEMATODES

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The chapter aims to analyze the evolution of the relations of parasitic plant nematodes with their plant hosts and insect vectors in a process of speciation. The life cycle of tylenchoid nematodes is usually homoxenic with a plant host, whereas the aphelenchoidid nematodes have two hosts in their polyxenic life cycles: a fungus and a plant. In the most advanced aphelenchoidid cycles the insect vector was acquired.

The analysis of the phylogeny of tylenchoid nematodes provides an opportunity to reconstruct the hypothetical transformation series of their trophic evolution: ectotrophism – temporary endotrophism – stationary endotrophism (the feeding on the fixed specialized site with a parasitic induction of modified polynucleate host cells). A derivation of several phylogenetic lines of specialized ecto and endoparasites with similar trophic types indicates the unevenness of the evolution rates in the trophic and topological links within the host-parasite system. In nematodes with the homoxenic cycles the role of plant host has increased: the driver of speciation has changed from the soil-climatic conditions to the coevolution with plant hosts' phylogenetic lines.

The evolution of the polyxenic life cycles of aphelenchoidid nematodes started from epy ancestors combined mycotrophism and predation. Their life cycles diversified to include an adaptation either to the plant host or to the insect vector (a detritophage or pollinator). Then the latter became a true host of the parasitic nematode with a cycle involving two hosts (plant and insect) or into an obligatory entomoparasitic mode with a monoxenic cycle. The success of the aphelenchoidid colonisation of the cold Holarctic territories was ensured by the acquisition of the resistant juvenile. There were two ways of the specialization to the insect vector. First way: the resistant nematode juveniles were transformed into transmissive stages (dauer juveniles) and then into the endoparasitic juveniles. Second way: the transmissive function was taken by inseminated but immature (non-egg-laying) females.

CHAPTER IV. HOST-PARASITE RELATIONSHIPS OF ACARIFORM MITES (ACARIFORMES), PERMANENT PARASITES OF MAMMALS

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This chapter concerns acariform mites permanently parasitizing mammals. This large ecological group, including several phylogenetically distant lines, consists of about 2000 species belonging to more than 250 genera of 20 families. Among them 16 families are represented by exclusively permanent parasites of mammals. The general external morphology of parasitic acariform mites permanently associated with mammals is described. The use of various parasitological terms and definitions in this context is briefly discussed. The morpho-ecological types of these mites in relation to their localization on the host body (skin mites, skin burrowing mites, fur-mites, intradermal mites, respiratory and interstitial mites) are characterized. Reconstructions of the origin and the evolution of "parasitic" morphoecotypes and different ways of colonization of various microbiotopes on the host body are proposed. Distribution of parasitic acariform mites among mammalian orders is considered and coevolutionary relationships of most their families with the respective hosts are analyzed.

Several phenomena associated with permanent parasitism of acariform mites are discussed: synhospitality, host specificity, and male precopulatory guarding behavior. A separate subchapter concerns acariform mites of a great medical and veterinary importance.

CHAPTER V. HOST-PARASITE RELATIONS OF MITES OF THE PARVORDER PSOROPTIDIA (ACARIFORMES: ASTIGMATA) WITH BIRDS

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This chapter provides a review of modern concepts and hypotheses about host-parasite relationships of feather mites with birds. Feather mites, a species-rich group from the infraorder Astigmata, are highly-specialized permanent parasites of birds. This group comprises 2500 species of 36–36 families belonging to two non-sister superfamilies, Analgoidea and Pterolichoidea. Most of the feather mites, as their name suggests, inhabit various microhabitats of the plumage but mites from several families with the most derived parasitic relationships with the hosts live on the skin and in the respiratory system.

General morphological adaptations of feather mites to particular microhabitats on the host body are considered. Nine morphoecotypes of feather mites, based on a complex of specific morphological adaptations to particular microhabitats, are described in detail. All morphoecotypes developed gradually within both superfamilies. Similar morphological and ecological adaptations associated with the colonisation of the same microhabitat evolved independently in the two superfamilies and even in different lineages of feather mites.

Coevolutionary relationships of feather mites and birds are considered. It is shown that taxonomic components of the parasitic fauna associated with a particular order of birds may have a different origin. They could be inherited from the ancestors of the order or transferred from birds of another order and successfully settled on new hosts. Analyses of host-associations of each currently known feather mite family on avian hosts and previous cophylogenetic studies show that almost all families display a clear phylogenetic parallelism with the corresponding taxonomic groups of hosts. At the same time, in almost all feather mite families some violations of exact pattern of phylogenetic parallelism caused by the horizontal transfers are observed.

CHAPTER VI. TRENDS IN THE EVOLUTION OF ERIOPHYOID MITES (ERIOPHYOIDEA)

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Eriophyoid mites (Acariformes, Eriophyoidea) are an ancient group of hypomorphic miniaturized chelicerates highly adapted to parasitism on vascular plants. Despite the extreme specialization to their hosts and the canalization of their evolution, eriophyoid mites demonstrate a remarkable multicomponent evolutionary plasticity. It is manifested in numerous reversions, parallelisms and modifications associated with colonization of various niches, gallogenesis, host-shifts and adaptations to climate changes. Further evolution of eriophyoids is mainly constrained by their miniaturization. The pattern of plant colonization of plant by eriophyoid mites can be divided into three periods. The ancestors of eriophyoids had evolved in the Paleozoic on the precursors of seed plants. In the Mesozoic eriophyoid mites colonized gymnosperms. Later they colonized angiosperms and diverged greatly following the evolution of monocots and eudicots.