

This thesis consists of three articles. The first article focuses on compact metrizable spaces homeomorphic to their respective squares, the main result being that there exists a family of size continuum of pairwise non-homeomorphic compact metrizable zero-dimensional spaces homeomorphic to their respective squares. This result answers a question of W. J. Charatonik. In the second article we prove that there exists a Borel measurable mapping assigning to each Peano continuum X a continuous function from $[0, 1]$ onto X . We also show that there exists a Borel measurable mapping assigning to each triple (X, x, y) , where X is a Peano continuum and x, y are distinct points in X , an arc in X with endpoints x, y . In the third article we prove that the homeomorphism relation for absolute retracts in \mathbb{R}^2 is Borel bireducible with the isomorphism relation for countable graphs. Moreover, we prove that neither the homeomorphism relation for Peano continua in \mathbb{R}^2 nor the homeomorphism relation for absolute retracts in \mathbb{R}^3 is classifiable by countable structures. We also show that the homeomorphism relation (as well as the ambient homeomorphism relation) for compacta in $[0, 1]^n$ is Borel reducible to the homeomorphism relation for continua in $[0, 1]^{n+1}$.