

1 Article

2 **Research on Urban Micro-community Planning and Design** 3 **Inspired by Functional Properties of Analogous Cells**

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7 **Abstract:** As the basic unit of life, analogous cells possess efficient spatial utilization, material
8 exchange, and information transmission characteristics, which provide important insights for
9 micro-community planning and design. Based on the three functional attributes of spatial
10 utilization performance, material exchange, and information transmission of analogous cells, this
11 study proposes planning and design principles and methods for micro-community inspired by the
12 functional properties of analogous cells. In response to the efficient spatial utilization
13 characteristics of analogous cells, this study proposes the design principles of compact
14 communities. By reasonably arranging community spaces, improving land use efficiency, and
15 achieving maximum functional diversity within limited areas, this study introduces design
16 methods such as vertical greening and rooftop gardens to increase community green space and
17 improve residents' living environment. Drawing on the material exchange characteristics of
18 analogous cells, this study focuses on enhancing community fluidity during the planning and
19 design process. Specifically, it optimizes the road system, reduces the exposure time of motor
20 vehicles in the community, and embeds low-carbon travel modes such as walking and cycling,
21 thereby reducing air pollution in the micro-ecosystem. Inspired by the information transmission
22 characteristics of analogous cells, this study focuses on connectivity and accessibility during the
23 initial planning process. By reasonably planning public spaces and pedestrian networks,
24 strengthening the connections between various parts of the community allows residents to
25 conveniently and efficiently reach their destinations within a short period of time. This study
26 conducts a planning and design practice for a micro-community inspired by the functional
27 properties of analogous cells using a micro-community in Wuhan, China as an example. The
28 results show that micro-community planning and design inspired by the functional properties of
29 analogous cells can maximize micro-community functions, promote sustainable development and
30 renewal of community functions.

31 **Keywords:** Bionic; Analogous Cell; Functional Optimization; Micro-community; Sustainability

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