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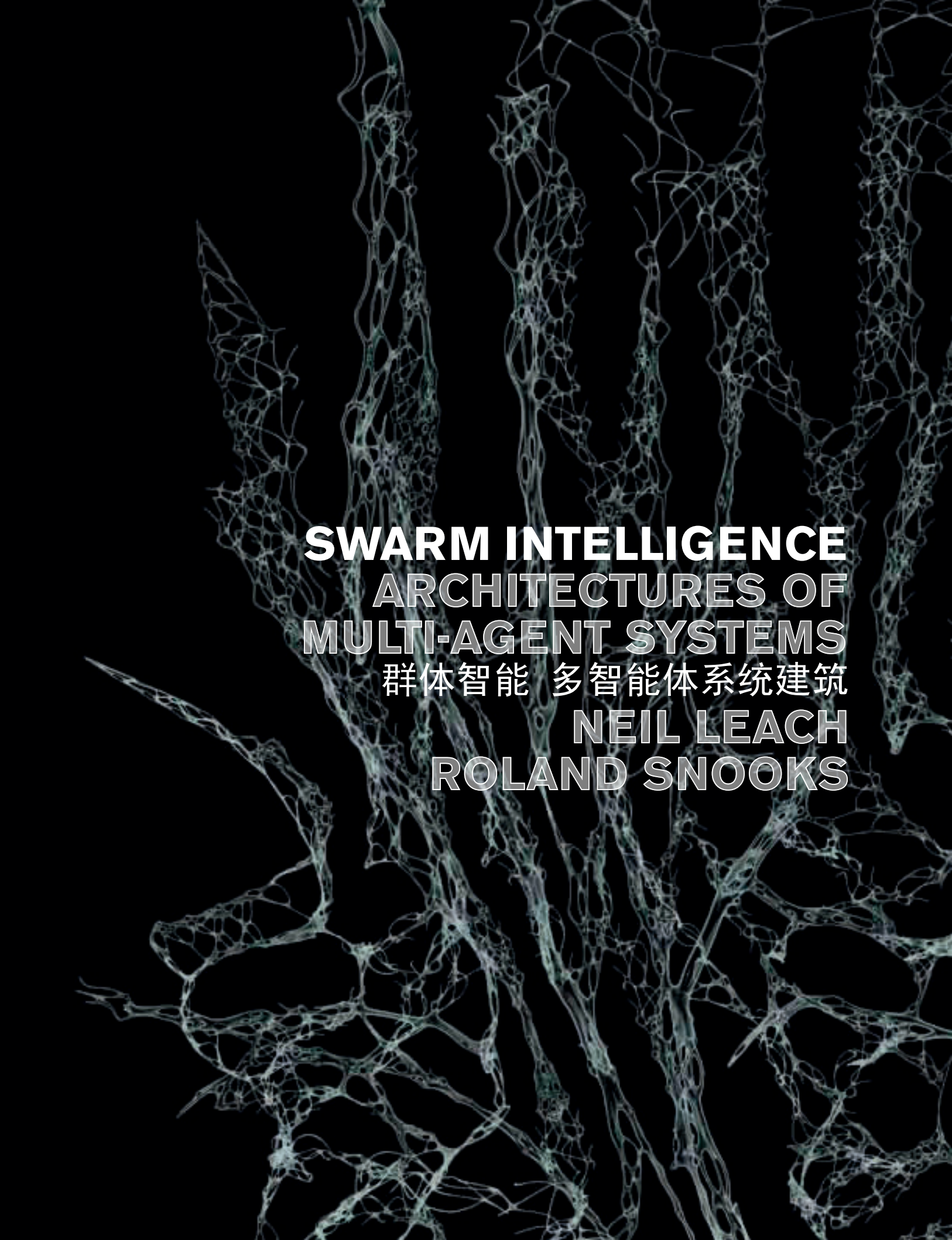
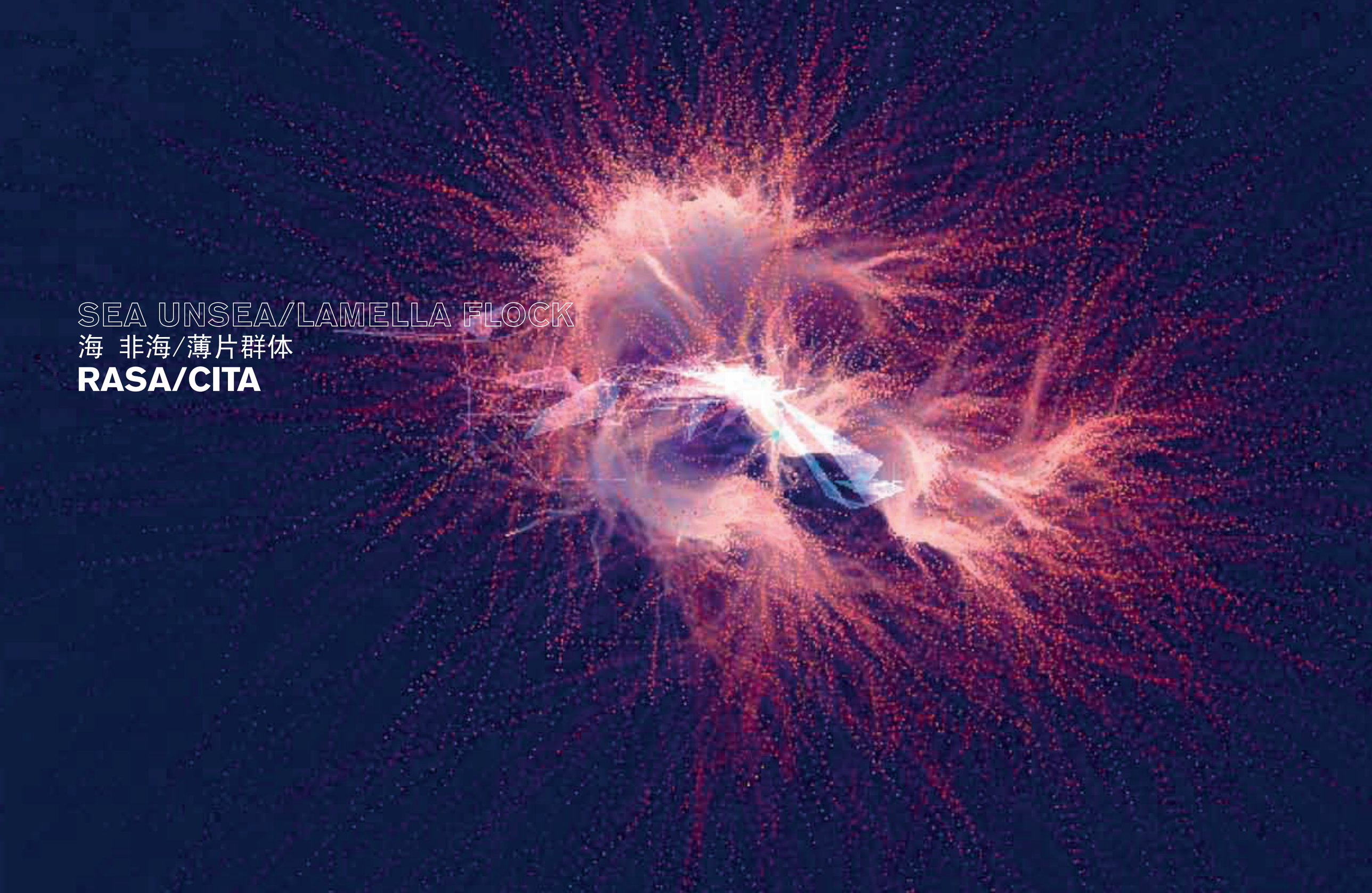
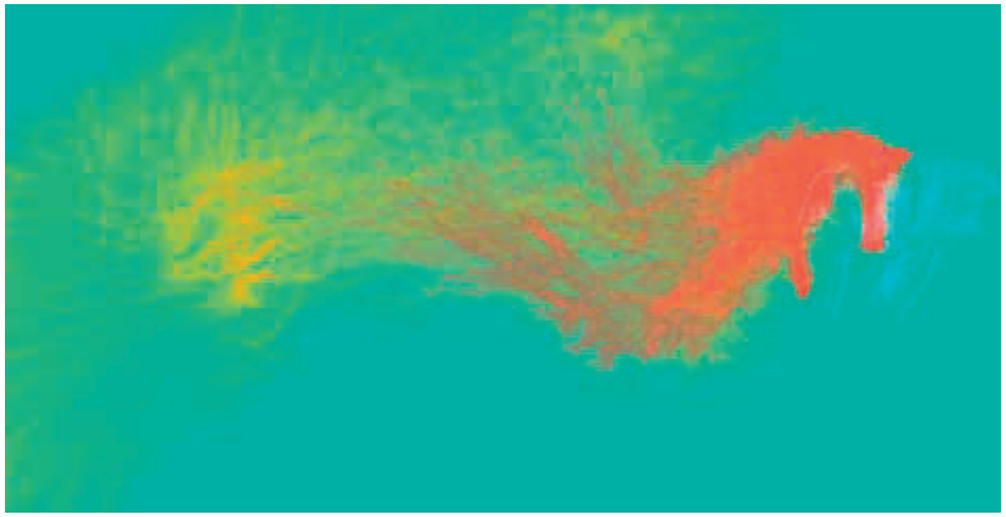


SWARM INTELLIGENCE
ARCHITECTURES OF MULTI-AGENT SYSTEMS
群体智能 多智能体系统建筑

NEIL LEACH
ROLAND SNOOKS



SEA UNSEA/LAMELLA FLOCK
海 非海/薄片群体
RASA/CITA



SEA UNSEA

SEA UNSEA是一个由建筑师Mette Ramsgard Thomsen和编舞者Carol Brown合作发展的实际建筑作品。这个项目想要探索基于多代理的环境与它的实时业务之间的突变关系。在SEA UNSEA这个项目中，表演者处在一个连接在架设好的相机上的表面中。当舞者移动时，他们牵动一群与他们的存在相互作用影响的视觉基础多代理。多代理处于相片所在的2D平面上。当多代理受到引力点的牵引或者被黑影阻碍而在平面上移动时，他们遇到了表演者并且体现了他们的存在。

环境在两个层面上形成。第一个层面定义了表演者和数字环境之间的关系，第二个层面以此建立了可视环境。这个环境是由多代理的运动形成的。多代理的密度和数量定义了粒子云，而多代理的速度和灵活性生成了表演期间不断形成的分解的晶状结构。

SEA UNSEA对建筑——用变化的条件来定义其状况的活生生的空间——提出了质疑。

这个项目是由Alan Penn和Chiron Mottram在Bartlett虚拟环境课程中合作完成的。

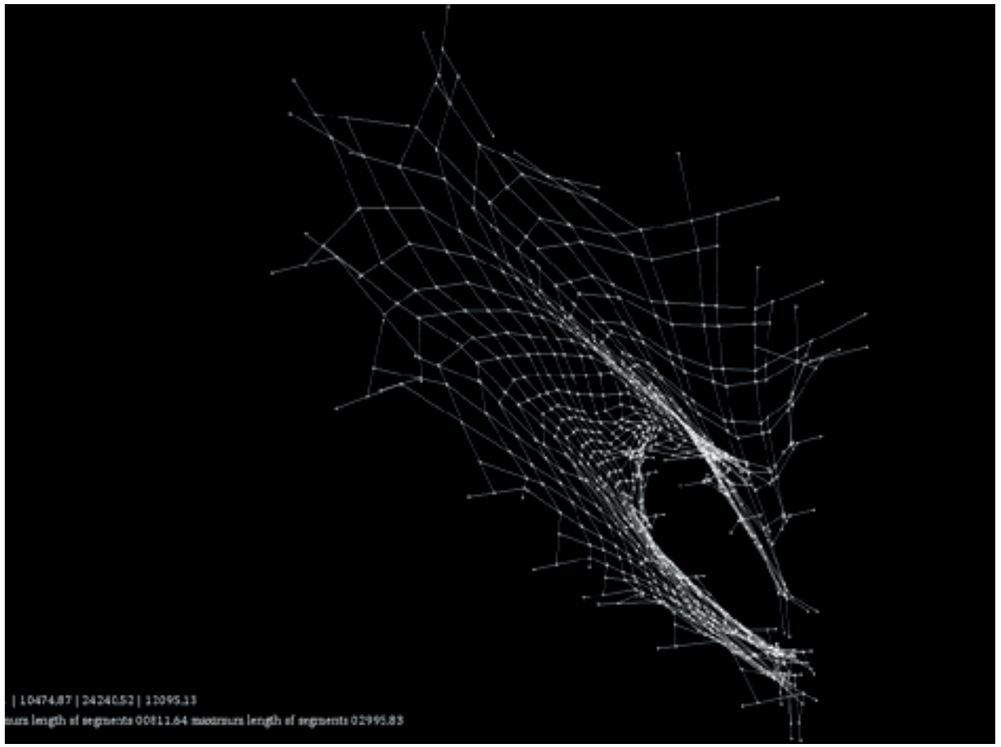
SEA UNSEA

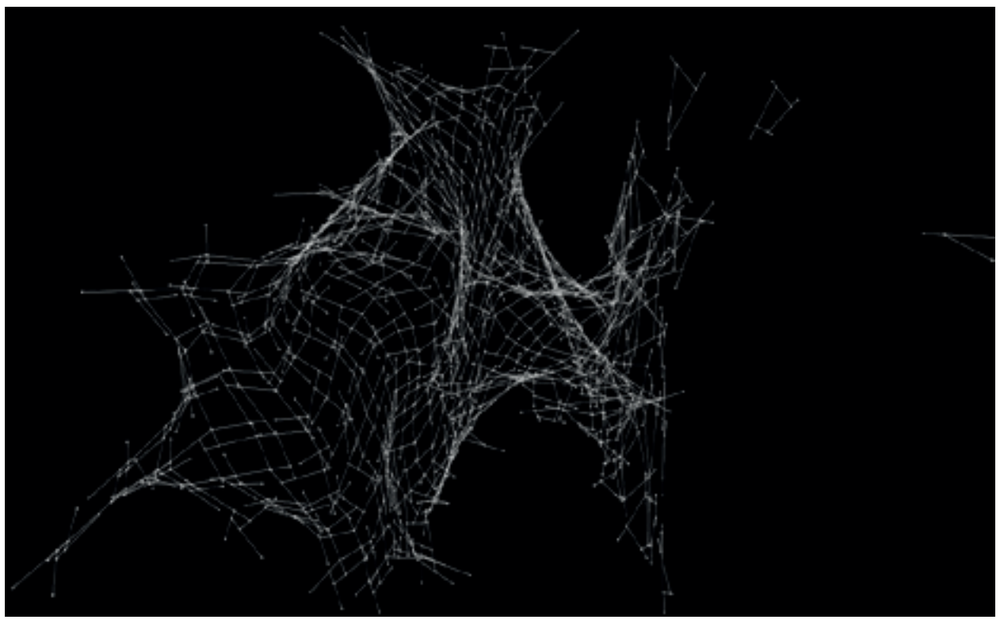
Sea Unsea is a live architectural work developed as a collaboration between architect Mette Ramsgard Thomsen and dancer choreographer Carol Brown. The project explores the emergent relationships between an agent based environment and its real time occupation. In Sea Unsea the performers inhabit a surface interfaced through a mounted camera. As the dancers move they engage a swarm of vision based agents that act and react on their presence. The agents inhabit the two dimensional surface of the camera picture plane. As they seek to navigate the plane, drawn by points of attraction, and hindered by shades of darkness, they encounter the performers and negotiate their presence.

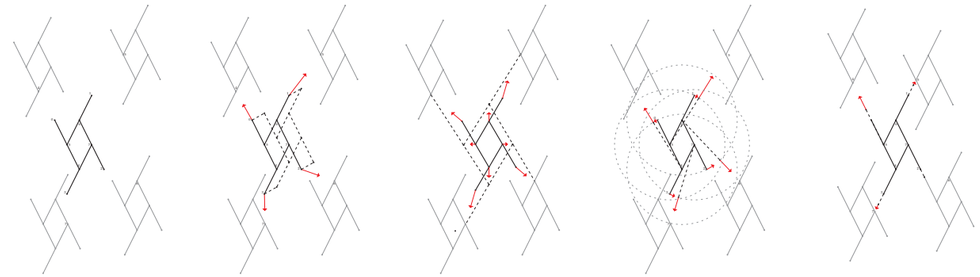
The environment is developed in two levels. Where the first level defines the relationship between performer and digital environment, the second level generates the visual environment. The environment is generated through the movement of the agents. The density and number of the agents define particles clouds while the speed and agility of the agents generate crystalline structures that form and decompose across the time of the performance.

Sea Unsea questions architecture as a live space in which the condition of motility become defining conditions.

The project is developed in collaboration with Alan Penn and Chiron Mottram at the Bartlett program of Virtual Environments.







LAMELLA FLOCK

Lamella Flock质疑了构造系统通常形成的方式，并提议自组织作为迎接随着未来复杂度的增加而带来的挑战的设计方式。Lamella Flock调查了设计和物质建造的互联系统的可能性，这个系统是以多重循环附属物为基础的。他还扩大了可再生材料木的用途。

Lamella Flock把它看做是和传统木工艺的创造力的分离点。木质Zollinger系统拥有使公共节点的数量最少化的高效的节点系统，和由大量互联产生的结构力量，它的结构能力由基于多代理的方法形成。

Lamella Flock把对自治实体的理解引入到传统的严格几何的网格系统结构中。四个互联部分的组合被赋予一系列简单的行为属性和互动的能力，这可以使他们根据相互之间的关系在设计空间内调整位置和大小。在Lamella Flock中，动态进程的优点和互动建模工具作为混合环境中使用的工具。这包括了和设计者的实时互动，以及考虑到有限元算法，材料和生产限制的结构分析的使用。

用这种方式，多代理系统在设计意图、构造需要和建造之间进行交涉取舍，并在不确定性和实体化之间建立了直接的联系。

Lamella Flock是由CITA设计发展的，受到HSB系统，Hundegger, Trebyggeriet.no, Knippers & Helbig 高级工业 和 Christoph Gengnagel教授的支持

LAMELLA FLOCK

Lamella Flock questions how tectonic systems are usually formed and proposes self-organisation as a mean for future design challenged by increasing complexity. Lamella Flock investigates the possibility of designing and physically producing interlinked systems based on multiple and circular dependencies and expands the use of renewable material wood.

Lamella Flock takes it point of departure in the ingenuity of traditional wood craft. The structural ability of the wooden Zollinger system, its efficient joint system that minimizes the amount of shared meeting points and its structural strength based on a high amount of interconnectivity is fostered by an agent based approach.

Lamella Flock introduces an understanding of autonomous entities to the traditionally geometrically highly restricted structure of the lattice system. Combinations of four interconnected members are given a simple set of behavioural properties and the ability of dynamic interaction that allows them to negotiate their position and size within the design space in relation to each other. Within Lamella Flock the advantages of dynamic processes and interactive modelling tools are implemented in a hybrid environment. This includes real-time interaction with the designer as well as the implementation of structural analysis linking to Finite Element Calculation, material and production constraints.

Hereby the agent system negotiates between design intent, tectonic needs, production and creates a direct link between the speculative and its materialisation.

Lamella Flock is designed and developed by CITA with support by HSB Systems, Hundegger, Trebyggeriet.no, Knippers and Helbig Advanced Engineering and Prof. Christoph Gengnagel.