

An abstract, black-and-white fractal pattern composed of numerous semi-circles of varying sizes. These semi-circles are arranged in a complex, self-similar manner, creating a dense, textured background that resembles a stylized, organic structure. The pattern is most concentrated in the upper left and lower right areas, with more sparse arrangements in the center and along the right edge.

Mohawk Group

**FRACTAL VISION**

A STRESS-REDUCTIVE APPROACH TO DESIGN



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# A PATH TO STRESS REDUCTION

The benefits of nature are indisputable. From decreasing stress levels to improving our physical health, our natural surroundings have a powerful influence on well-being. Consequently, humans possess an innate tendency to connect with their outdoor environment.

Our day-to-day reality may be far from natural. In fact many of us spend our time surrounded by the artificial, from windowless rooms with fluorescent lighting to our constant connection to electronic devices and computers. Utilitarian surroundings may negatively impact people's cognition and health and may actually decrease productivity. Combined with our continuous exposure to technology, this impacts how we work and interact with each other and creates challenges on physical and psychological levels.

Design can be a tool to address the real challenges of our society and help us to regain a balance between the natural and built environments.

To achieve that balance, architects and designers are incorporating a holistic approach to the design of commercial workspaces and employing strategies that prioritize people. As a result, we can make environments more conducive for people to live, work, play and learn in.

To support designers in creating environments that relate to us on a physical, cognitive and emotional level, Mohawk Group is developing flooring collections that embrace a central methodology from nature—fractals—and bring it into contract interiors.

Fractals are intricate patterns that occur naturally throughout our world. From clouds and trees in nature's scenery to the blood vessels and neurons in our bodies, fractal patterns are found everywhere. They highlight the harmony and order that exist all around us.

Human vision has become fluent in nature's visual language of fractals. We are hard-wired to look for these patterns, and, when our subconscious recognizes them, we feel calmer and our stress levels reduce.

“Our continuous exposure to technology impacts how we work and interact with each other creating challenges on physical and psychological levels.”

# FRACTAL VISION

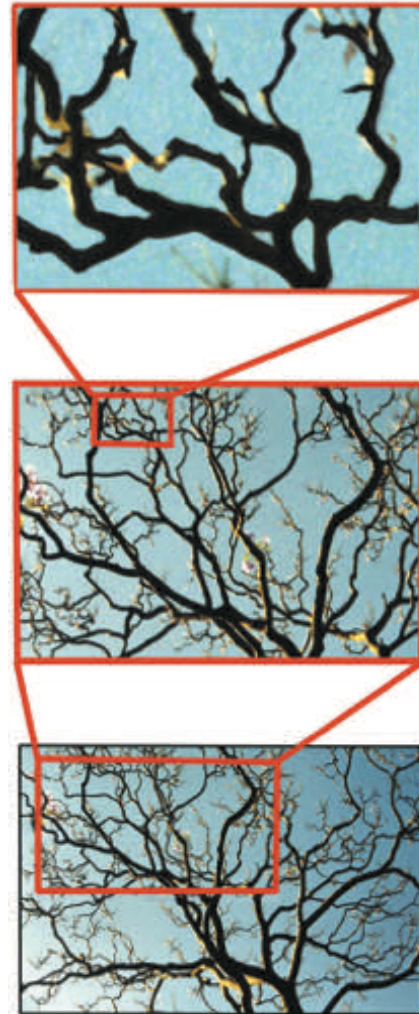
Seemingly random shapes and forms found in nature often appear haphazard. But upon closer inspection, there is a structure underlying these natural arrangements. And as we look closer and closer, the patterns repeat over and over. These are fractals.

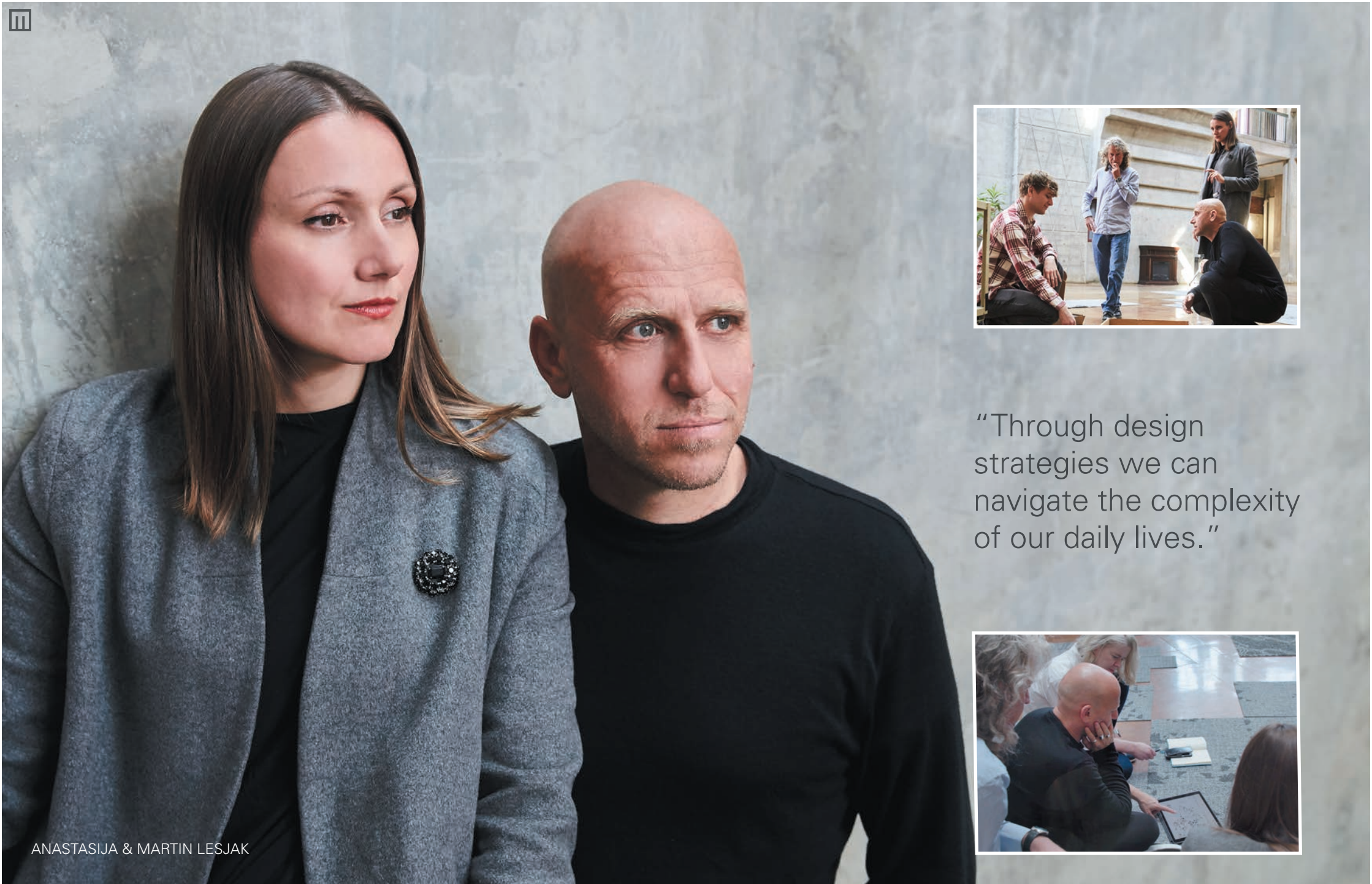
When we look at a tree, first we see big branches growing out of the trunk, then we see smaller branches growing out of each big branch. As we keep zooming in, finer and finer branches appear, all the way down to the smallest twigs.

The discovery of stress-reducing fractals holds crucial implications for society: the US spends billions of dollars annually to combat stress-induced illnesses, and stress is increasingly blamed for numerous debilitating disorders. Research has shown that surgery patients recover more quickly if they have a window looking out on nature.

But as we increasingly find ourselves surrounded with urban landscapes and artificial workspaces, we risk becoming even further disconnected from nature and its healing benefits.

In basing design on the stress-reductive quality found in fractals, the transdisciplinary team of 13&9 Design, Fractals Research, and Mohawk Group are tapping into our deep-seated desire to see patterns, to connect to nature and to have more inspiring and relaxing environments in which to live and work.





ANASTASIJA &amp; MARTIN LESJAK



“Through design strategies we can navigate the complexity of our daily lives.”



DESIGNERS, THINKERS, MAKERS:

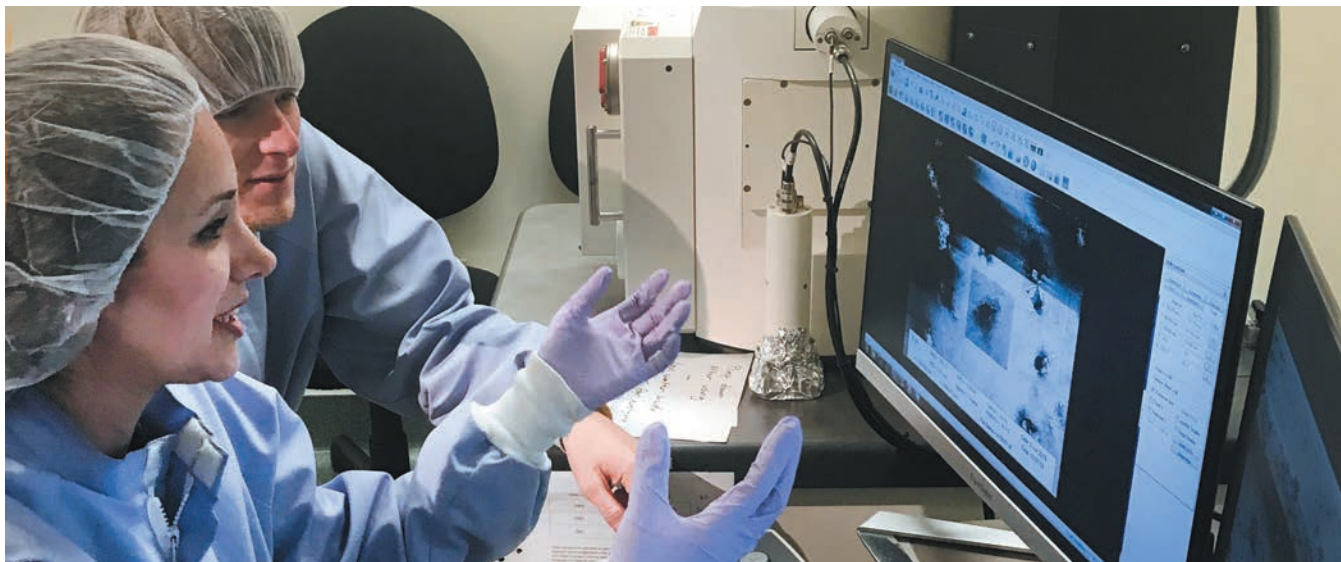
## 13&9 DESIGN

For Anastasiya and Martin Lesjak of 13&9 Design, the built environment should help to take users out of their daily routines in order for them to experience personalization, creativity, innovation, health and well-being, and social and environmental connectivity. As architects and designers, their team seeks to balance rapid technical developments by applying holistic design thinking that puts human needs and environmental responsibility at the core of their work, which ranges from architecture to interiors and product design.

Their transdisciplinary approach to product design is collaborative and scientific, based on vision, analysis, and varied experience in different fields. Their firm considers what is aesthetically pleasing or functional, as well as what is driving global shifts in modern society. They are partnering with researchers to understand how humans interact with their environments, and then with manufacturers to develop products that are not only imaginatively designed, but have purpose and meaning beyond decorative image.

“Through design strategies we can navigate the complexity of our daily lives,” explains Martin, also Co-Founder and Creative Director of INNOCAD architecture.

The team has worked with Mohawk Group since 2014, and their collaboration has resulted in numerous awards for the functionality, aesthetics and emotional qualities, or “soul,” of their collections. For the latest project, “Relaxing Floors,” their design group included fashion designer Sabrina Stadlober, industrial designer Luis Lee, as well as sound designer Severin Su. Together with Martin, Severin took the design process a step further to create a fractal music soundtrack that complements the flooring collection.



DESIGNERS, THINKERS, MAKERS:

## FRACTALS RESEARCH

Richard Taylor heads an international team of scientists who are studying the positive psychological, physiological and neurological responses to natural patterns.

His experiments show that people's stress levels reduce by as much as 60% when looking at fractals. The rich visual complexity of fractals, combined with their harmonic repetition triggers a natural relaxation effect.

"The beautiful thing about fractals is that they're very simple," he explains. "You take this pattern and repeat it at different size scales. That repetition generates an enormous amount of very rich intricate structure and that's what our visual systems get drawn towards."

By exploring the benefits of natural patterns, he and his graduate students, Conor Rowland and Julian Smith, are able to apply their findings to manufactured systems, like flooring.

"Experiments show that people's stress levels reduce by as much as 60% when looking at fractals."



RICHARD TAYLOR, PHD,



JACKIE DETTMAR

“Understanding the science behind the design is part of our commitment to create environments for decompressing and getting away from that overload of technology that we’re living with every day.”



DESIGNERS, THINKERS, MAKERS:  
**MOHAWK GROUP**

Mohawk Group is passionate about sustainability, how products are made and what they deliver to the marketplace. The company is committed to creating products that give back to the world.

Through their partnership with 13&9 and Fractals Research, Mohawk Group has brought together groundbreaking science and research, amazing design and innovative manufacturing to create products with the potential to contribute to health and well-being.

“As we’ve worked on our latest collaboration, we’ve really learned a lot about the reason why people respond to different patterns in their surroundings,” says Jackie Dettmar, VP of design and product development.

“Understanding the science behind the design is part of our commitment to create spaces for decompressing and getting away from that overload of technology that we’re living with every day.”

The result is a collection that will have a groundbreaking impact on the built environment.

## COLLECTION OVERVIEW

# RELAXING FLOORS

This collection is the culmination of art, science and human-centered design based on fractal patterns. Relaxing Floors utilizes fractals to tap into our innate affinity for nature and activate our bodies' stress-relieving response to similar patterns.



Much of our world is digitized and urban. People cannot simply disconnect or remove themselves completely. But there are strategies to help counter the continuous exposure to technology and the many physical and psychological challenges it imposes.

The Relaxing Floors collection shows respect for nature and an understanding that it can be our partner. The designs are informed by the natural world and adapted for the interior environment. As a result, the flooring fulfills the deep-seated preferences that humans have developed over millions of years, such as our response to fractals.

The creators of Relaxing Floors work holistically, seeking to create environments that balance people-place-technology. The designs that they create are helping to navigate the complexity of our modern world.

## RELAXING FLOORS

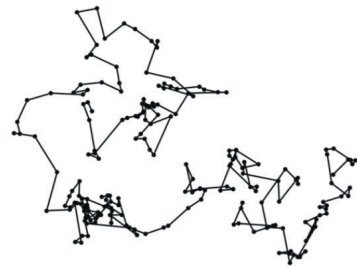
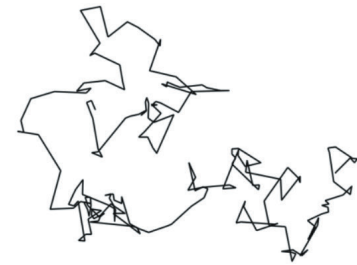
For the Relaxing Floors carpet tile collection, 13&9 and Fractals Research created flooring patterns based on how our eyes move when looking at natural scenery.

Much like the birds that flutter outside our windows, our eyes fly from location to location as we look around us. As our eyes move around the room the “flights” vary in length. Soon, a pattern emerges and this pattern when traced is used to create a fractal.

Different shapes were inserted at the locations between the flights, much like the bird dropping seeds when it lands. These seed shapes, which included dots, dashes, squares and lines, were then grown into fractals by repeating the pattern at different scales. During this seed growth, specialized software developed by 13&9 and Fractals Research adjusted the design to aim for maximum stress reduction.

Although all fractals are complex, the level of complexity varies between patterns. This complexity is measured by a parameter labeled D. Patterns with mid-range complexity—a mid-D value—are the most common in natural scenery and it is these patterns that reduce the observer’s stress-levels. All of the Relaxing Floors patterns have been optimized to have a mid-D value—as denoted by the ‘D’ suffix on each of the pattern names.

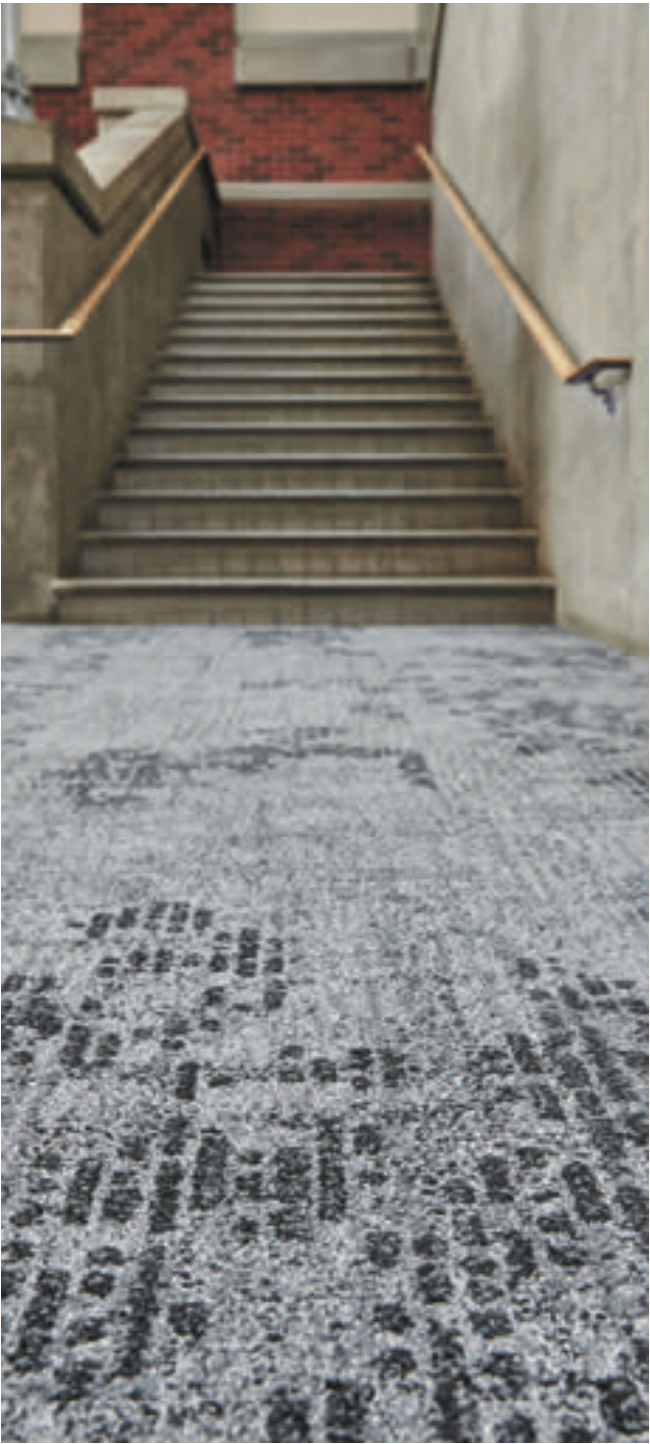
In the Relaxing Floors collection, designers have a choice of several designs all arranged in a fractal pattern. These patterns are available as carpet tiles, which can be cut and arranged randomly where the seam is hardly recognizable. Even randomized, these carpets maintain their fractal quality.





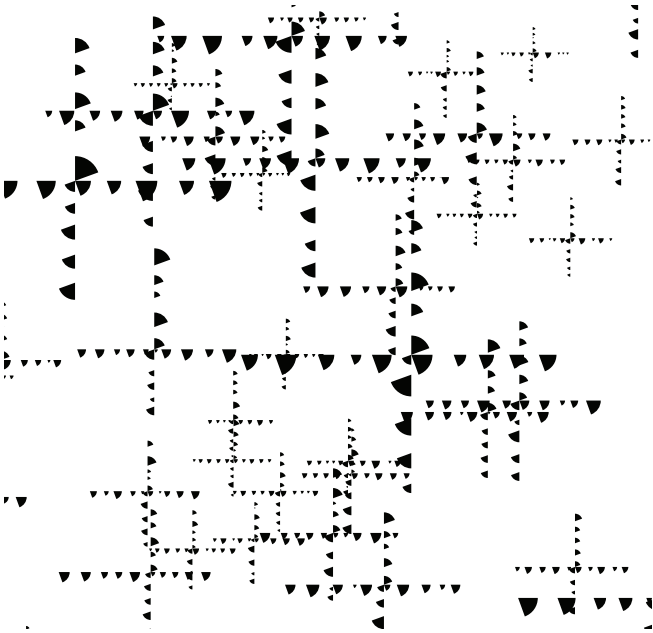
# mellowD

*mellowD* is one of two styles within the 12"x 36" carpet plank collection that mimic eye movements that occur as we view a natural landscape. Style *mellowD* utilizes a line-shaped seed which repeats at different magnifications.



# chillD

The second style within the 12"x 36" carpet plank collection, *chillD*, incorporates patterns using a computerized growth process to design fractals that reduce stress, as discovered during scientific studies. The plank visual is grounded by triangular segment-shaped seeds.



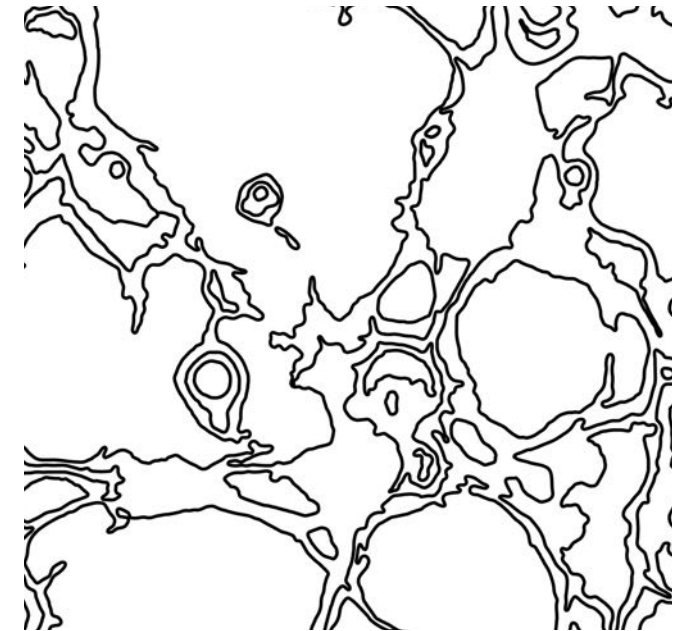
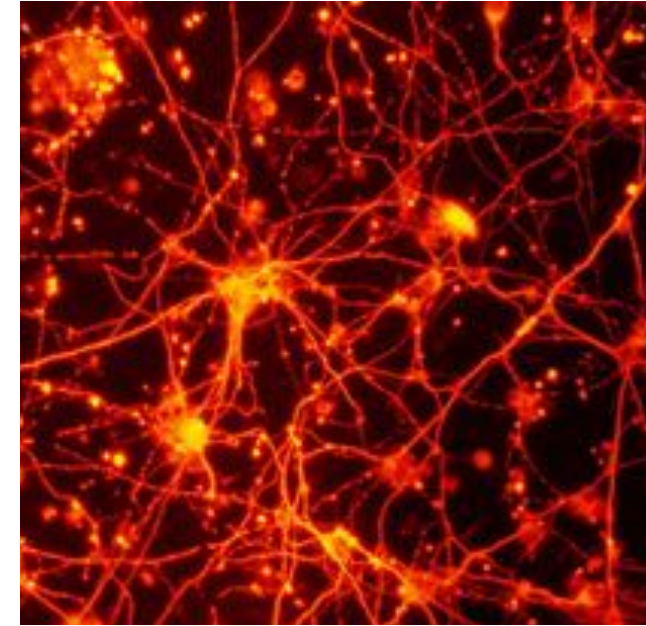
## restD

Neurons are the electrical wires of the human body. They carry the signals that allow us to see, feel and move.

Through sophisticated imaging techniques, we can visualize these microscopic conductors. It is these images that form the basis for the Relaxing Floors *restD* plank style and a coordinating *Connecting Neurons Definity* broadloom style.

Under a microscope, these neurons look like miniature trees with fractal branches and glow red due to a fluorescent dye.

Starting from a high-resolution neuron image, the designers selected an area with a pleasing pattern, a balanced spread of neurons and good properties for a seamless pattern match. The neuron formations were then reduced to their outlines to create a literal visualization of the fractals that exist in our own bodies.



Through image optimization and editing, the pattern was aligned over a large area and the repeat was multiplied and tiled alongside each other to simulate a carpet plank application and ensure a perfect pattern match.

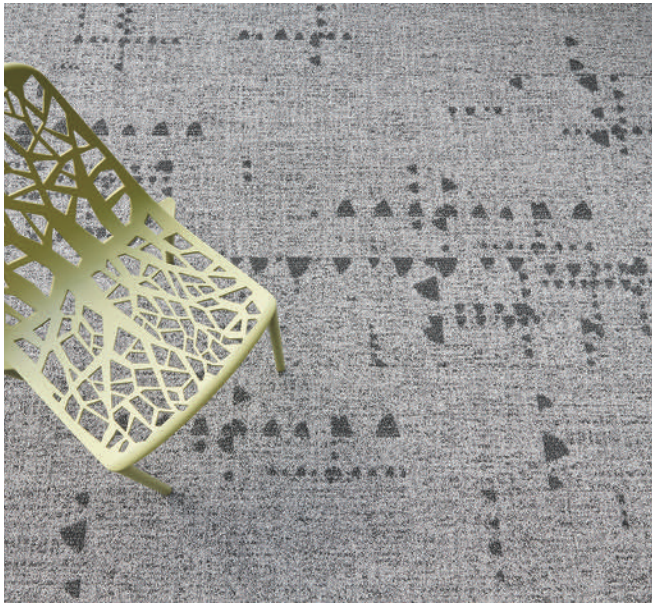
*restD* is an organic design. The tendrils of the neurons twist and turn as they weave across the carpet. The *restD* plank style builds on the University of Oregon's studies of fractal-based electronics. These electronics have the capability to connect to the eye's neurons with the potential to revolutionize the medical world.

Completing the Relaxing Floors collection is *Fractal Ground*, which offers a coordinating organic groundcover visual in a 12"x 36" plank format.



Designed by 13&9 Design in collaboration with Fractals Research and Mohawk Group, the Relaxing Floors collection is a response to the artificial environments of contemporary corporate workspaces.

This human-centered flooring solution is scientifically researched, imaginatively created and designed to be therapeutic. These innovative carpet plank styles translate stress-reducing fractals into patterns for commercial environments.



## ABOUT MOHAWK GROUP

As the world's leading producer and distributor of quality commercial flooring, Mohawk Group believes that better floor coverings emerge from better design, innovation, sustainability, project solutions and operational excellence. Mohawk Group addresses the unique challenges and opportunities in contract interiors with a comprehensive carpet and hard surface portfolio of all types and price points. As the commercial division of Mohawk Industries, the company has a heritage of craftsmanship that spans more than 130 years. To learn more about our full line of flooring products, please visit **[MohawkGroup.com](https://www.mohawkgroup.com)**.

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