

Modern Interpretations of Traditional Islamic Geometric Patterns



Phil Webster
Phil Webster Design
Chandler, AZ, USA

Email: phil@philwebsterdesign.com
Web: <https://www.philwebsterdesign.com/>
Instagram: <https://www.instagram.com/philwebsterdesign/>

My Background

I have been creating geometric designs and models since junior high school. During a trip to India in 2012 I became especially enthralled with Islamic geometric patterns. I began pursuing my art more fully, and I am now working full time as an artist. I have been an active participant in the Bridges conference since 2013, and am excited to attend my first G4G conference this year. All of the works shown here, and many more, can be found on my website.

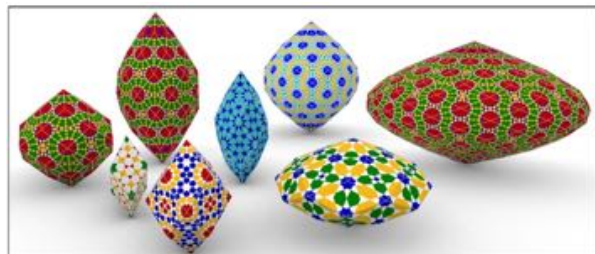
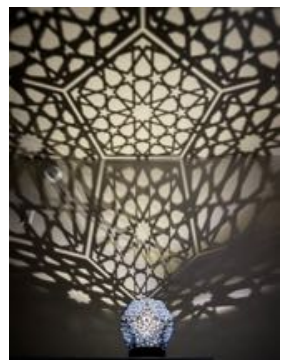
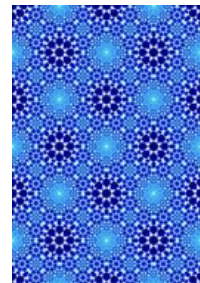
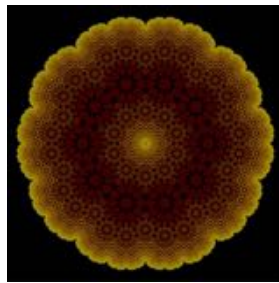
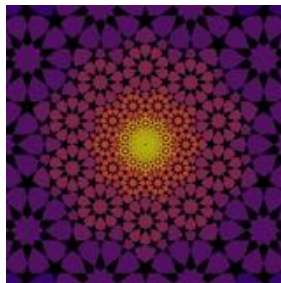
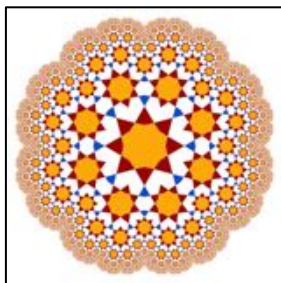
My Recent Work

In the past several years I have been exploring ways of combining Islamic geometric patterns (hereafter, IGP) [1] with various mathematical concepts to create meditative, contemporary art and décor.

I will briefly present three avenues of exploration here:

1. Arranging IGP motifs in fractal arrangements
2. Wrapping IGP around Platonic Solids
3. Applying IGP to the faces of polar zonohedra

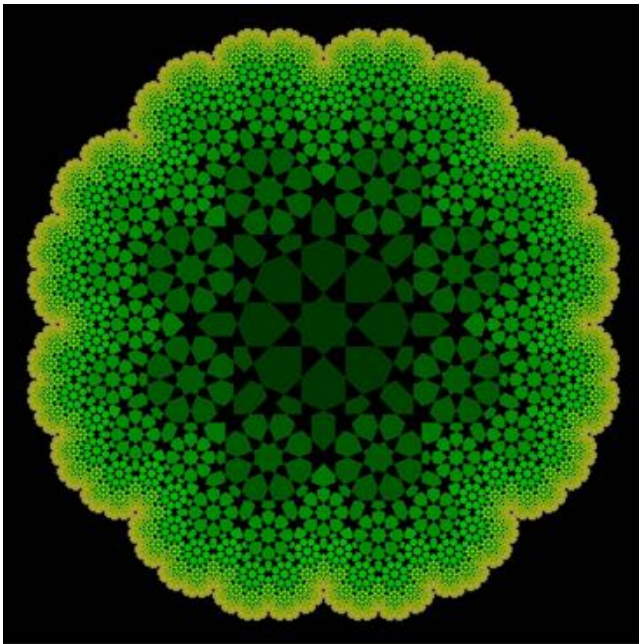
A Sneak Peek at What's Ahead...



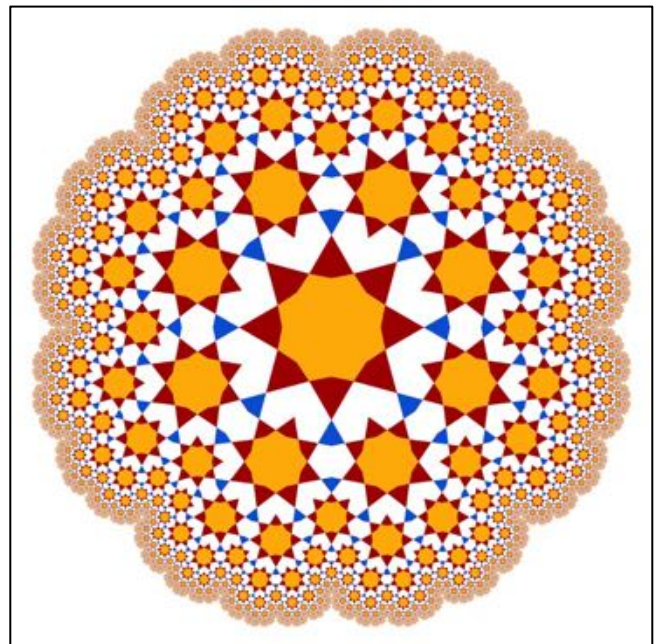
IGP + Fractal Trees

My first exploration upon returning from India was to find a way to arrange IGP in a fractal pattern, i.e., with motifs at infinitely many scales and with self-similarity throughout the pattern. Ultimately I devised a way to arrange motifs at the nodes of n -fold fractal trees, connect the motifs from level to level in a way consistent with traditional patterns, and then arrange such trees radially (with selective pruning) into radial designs (see my Bridges 2013 paper for details [2]).

Outward Radial Patterns



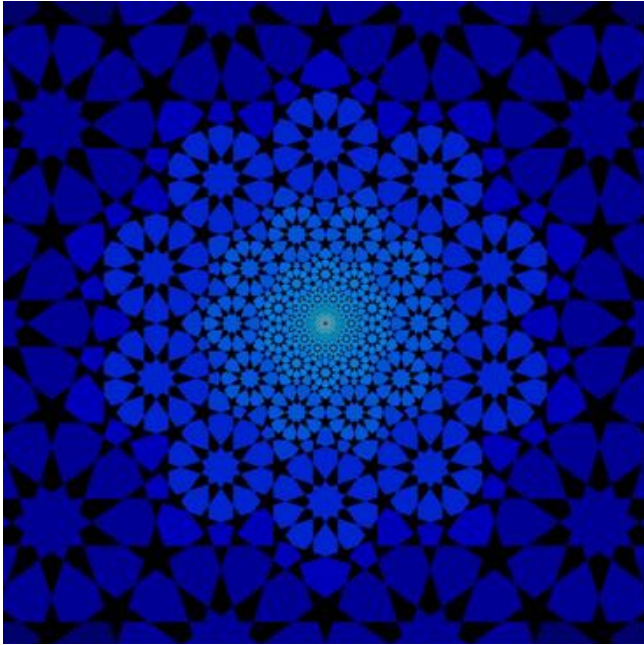
Infinity Bloom 8 - Forest Green/Yellow



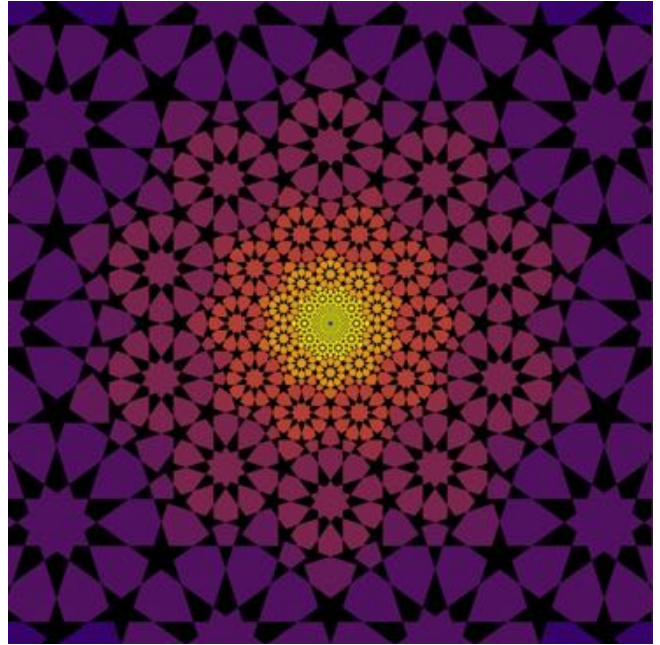
Infinity Bloom 8 - Moroccan on White

Points of convergence on the peripheries of these designs suggested patterns that shrank radially inward, instead of outward, and the two can be elegantly combined into an “inward-outward” pattern as well.

Inward Radial Patterns

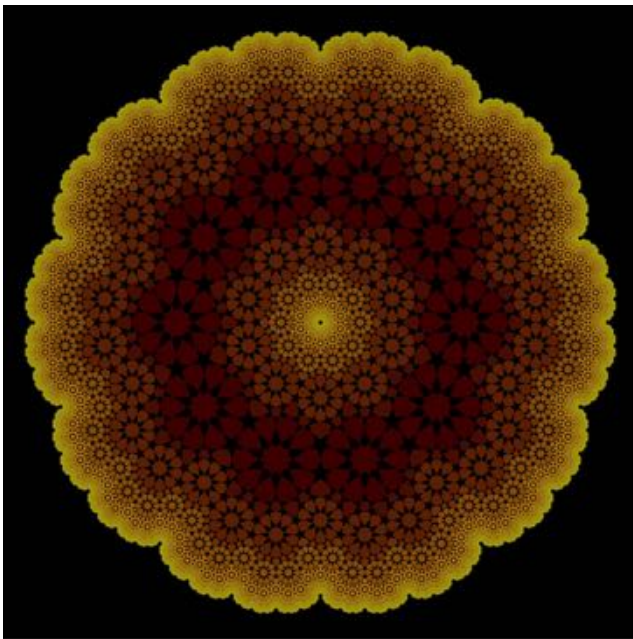


Starburst 10 - Blue

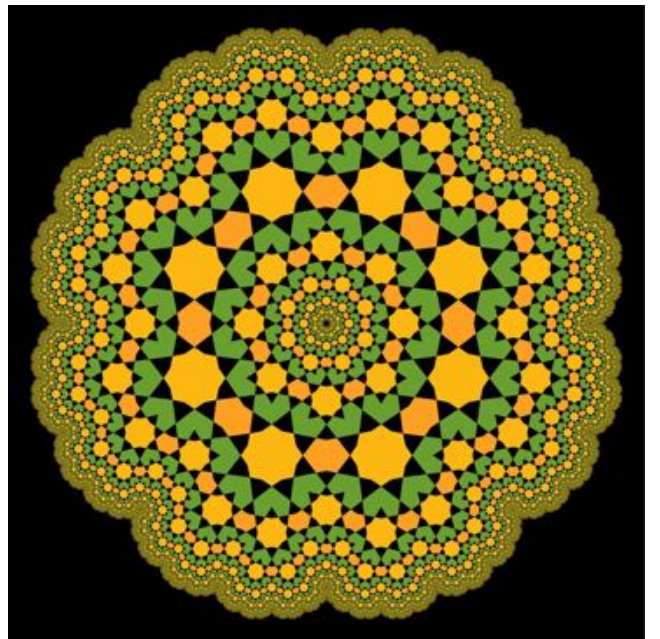


Starburst 10 - Plum/Honey

Combined (“inward-outward”) Radial Patterns



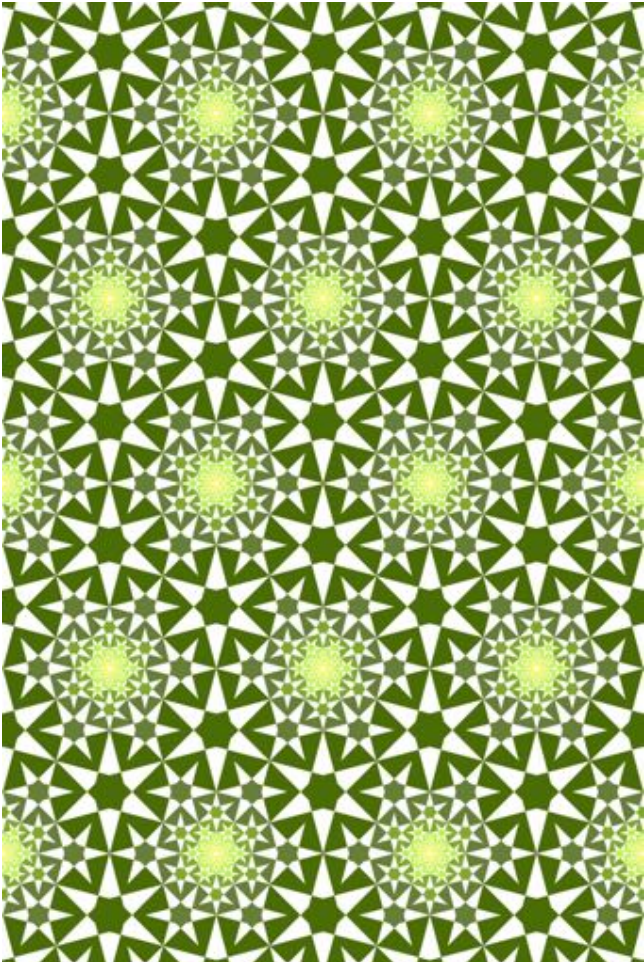
Infinity Bloom 10 - Garnet/Honey



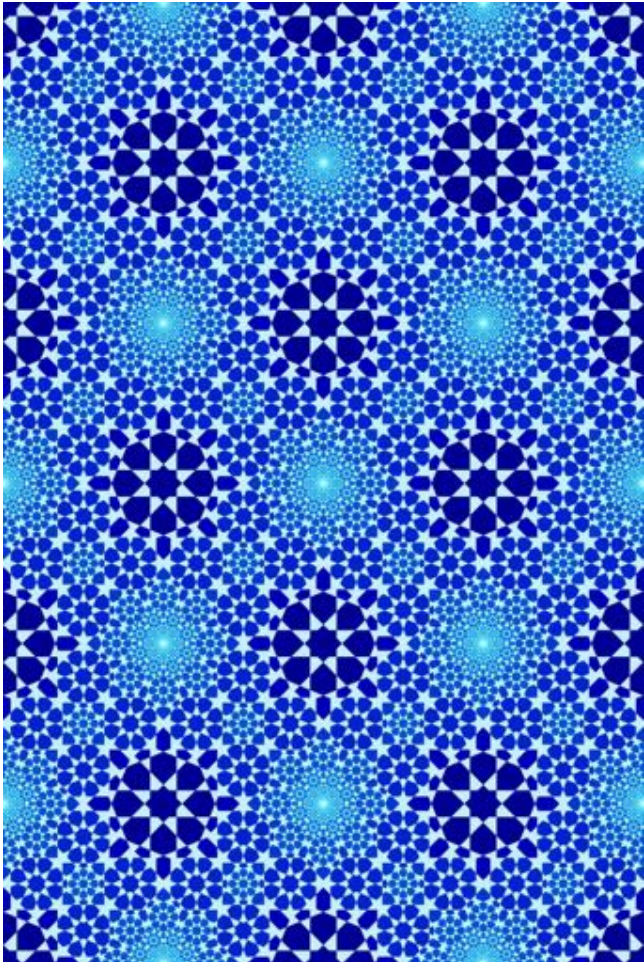
Infinity Bloom 8 - Emerald/Honey

Finally, some such patterns lend themselves to periodic repetition in the plane, coming full circle back to the original aesthetic but with “embedded” areas of fractal diminution.

Repeating Patterns



Vibration 6 – Moss/Yellow



Vibration 8 - Blue

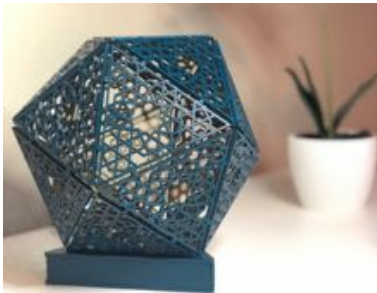
IGP + Platonic Solids

Lamps

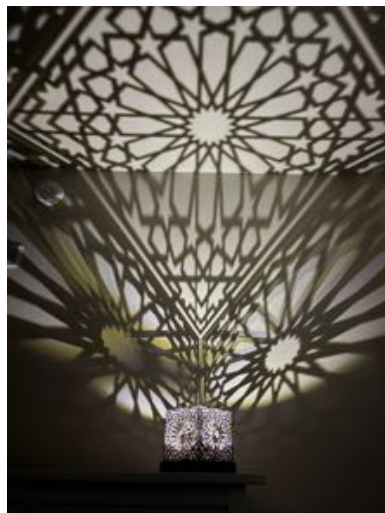
Since many IGP repeat on grids with local repeat areas of equilateral triangles, squares, and pentagons, it is an easy conceptual leap to take these repeat areas and apply them to the surface of the Platonic solids. Many others have followed this approach to create solids with beautiful surface patterns.

What I have done which is slightly different than most is to focus on cutting the patterns through the faces. This idea was directly inspired by the carved sandstone screens featured prominently in the forts and palaces of Northwest India, known in Hindi as *jaali* (meaning “net”) [3]. Thus I call my shapes that combine this idea with polyhedral shapes, Jaalihedra™. My most recent series of work has been a number of Jaalihedra™ Lamps, of which a few are pictured below. As you can see, they function as sculptures in their own right when unlit, but cast dramatic shadows when lit.

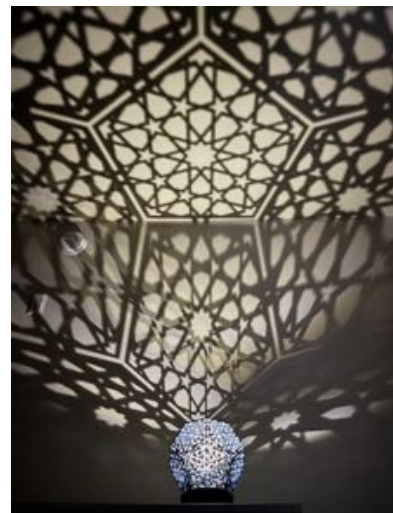
Jaalihedra™ Lamps



“Hex”



“Mexuar I”



“Pentastar I”

Sculpture

A different approach is to custom design face patterns that would not necessarily tile the plane in the original repeat pattern. As long as the edges and vertices of each face are compatible with adjoining faces, the resulting patterned solid can still be cohesive and attractive.

In the middle of 2020 – in order to celebrate in the advance the end of that oh-so-trying year! – I decided to embed “2021” into a piece of art. Ultimately, I designed a custom IGP that placed 7 petals of a rosette at each corner of a pentagon, thus yielding 21-pointed rosettes at each of a dodecahedron’s 20 vertices where 3 faces meet — hence, 20(21). Furthermore, placing 20-fold rosettes in the center of each of the 12 pentagonal faces yielded $(20)_{12}$ – the year I first started investigating IGP in depth. The resulting sculpture was meticulously built using hand-painted wood and laser cut mat board, and is shown below (as well as detail of one face on the cover page).

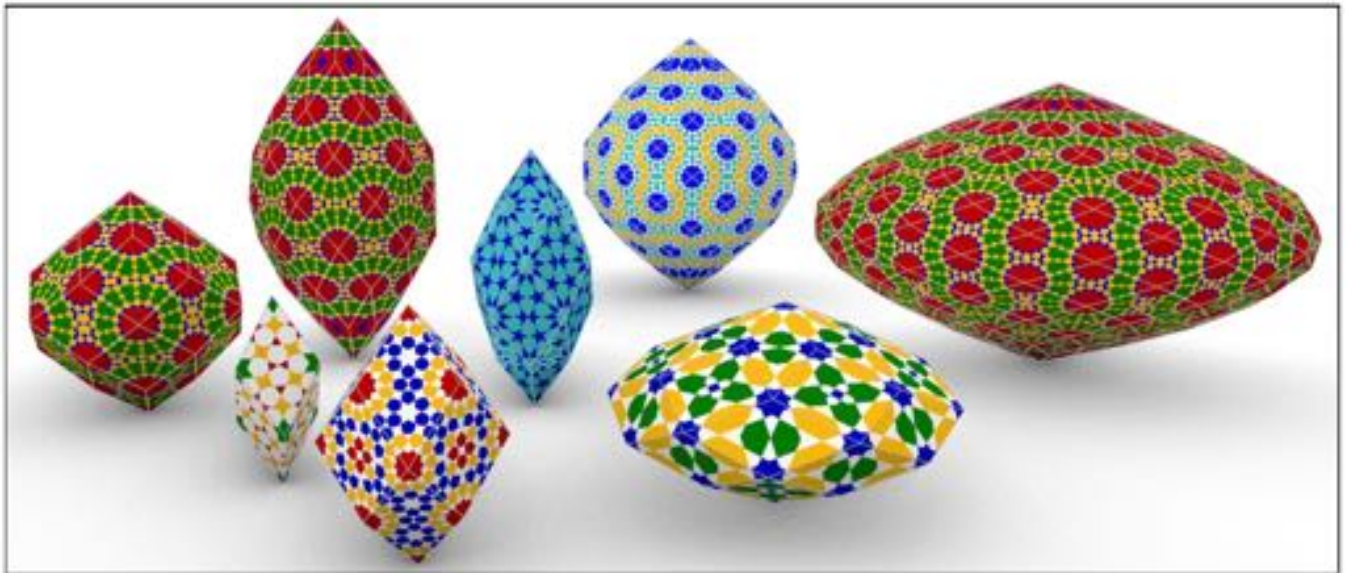


(20)12-20(21): Ten Years of Inspiration

IGP + Polar Zonohedra

In addition to the repeat areas listed above, rhombic repeat areas are also quite common in IGP. There is a class of beautiful polyhedra called polar zonohedra (hereafter, PZ), all of whose faces are rhombi of various aspect ratios [4].

I have a forthcoming Bridges paper [5] in which I discuss how to identify PZ whose face angles are “close enough” that IGP with N-fold local symmetry can be applied to all of the various faces of a single PZ in a cohesive manner with minimal distortion. The examples shown below are digital models, but I plan to execute many of these as physical sculptures and lamps in the coming months.



A variety of polar zonohedra decorated with rhombic-repeat IGP

Conclusion

The tradition of IGP is so vast and rich that there are countless opportunities for modern artists to expand these patterns in new directions. I will continue to explore these horizons, and encourage anyone who finds these patterns as captivating as I do to embark on explorations of their own!

References

For those interested in more information on some of the topics mentioned here, see:

[1] **Islamic geometric patterns** -

https://en.wikipedia.org/wiki/Islamic_geometric_patterns

[2] **Fractal Islamic patterns** - <http://archive.bridgesmathart.org/2013/bridges2013-87.html>

[3] **Jaali** - <https://en.wikipedia.org/wiki/Jali>

[4] **Polar zonohedra** - <https://archive.bridgesmathart.org/2021/bridges2021-7.html>

[5] **IGP on polar zonohedra** - <https://archive.bridgesmathart.org/> (exact URL TBD; look for year 2022 and/or search this page for “Webster”)

All images © Phil Webster. All rights reserved.