52 Grains of Sand - Geometry of Nature.

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Work process

Each final composition for the Geometry of Nature project is the result of several steps that include multiple graphic editors and 3D modeling programs.

Example: Image #10 - ZT-07 – Tanzanite.

(Posted on the Geometry of Nature project site, 4-1, 2017)

The folder ZT-07 (Fig. 01) contains
- 3 .CIF files
-12 .TIFF files

Each .tiff file has from 5 up to 20 layers or more depending on the complexity of the object, the number of vertices and lattices.

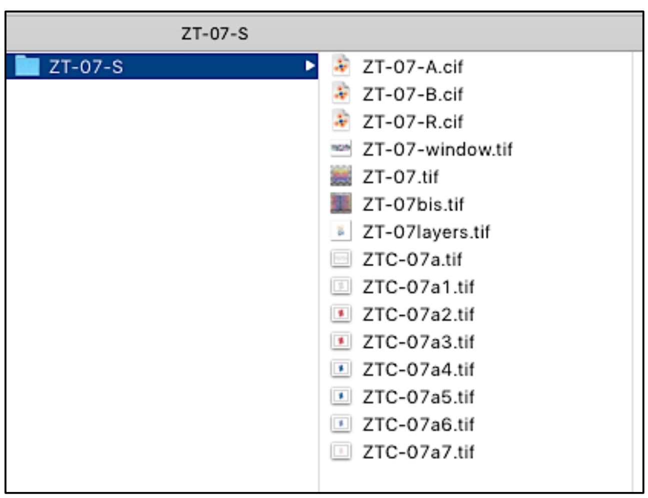

Figure 01. Folder ZT 07, content.

Step #1. Geometry of a mineral – the 3D modeling program VESTA

- I import a generic description of the mineral atomic structure available at the UofA, RRUFF library.

- I open the .CIF file in a 3D visualization program for structural models call VESTA
- The program workspace opens to 5 view options to choose from: atoms, VandeWall view, polyhedra, wireframe, binding Each object can be tilted, rotated, zoomed in or out. Below is a front view of the objects in the workspace window.

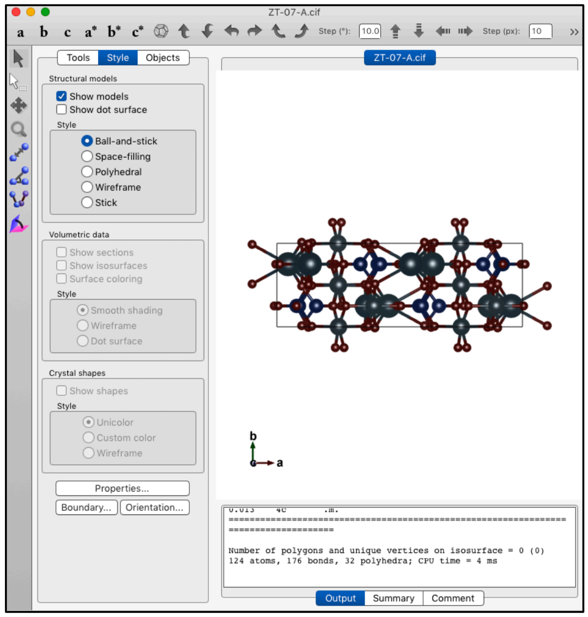

Figure 02-A. VESTA, the-workspace

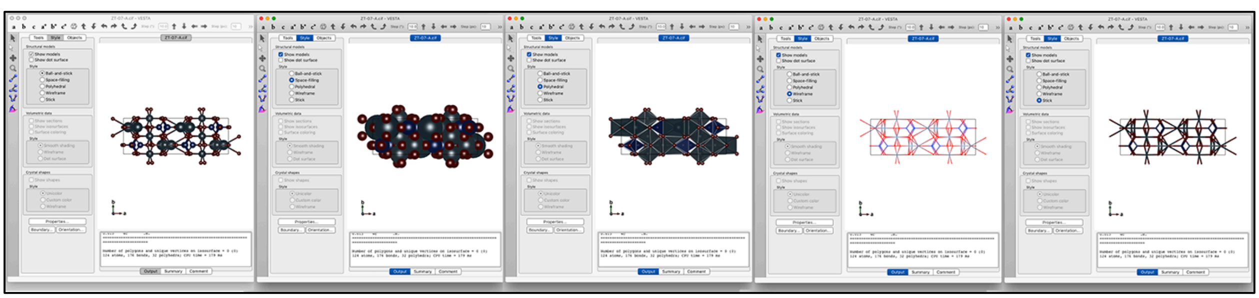

Figure 02-B. VESTA workspace, different view options: a) atoms, b) VanderWall surface, c) polyhedra, d) wireframe, e) bindings.

- The property button allows specifying the size, color, transparency, and positioning of the object. Below is the polyhedra window close-up, with the object at opacity 80%, edges on (Fig. 03-A) and the property panel for atoms, binding and polyhedra (Fig.03-B). The isosurfaces and sections panels were not used in this particular example.

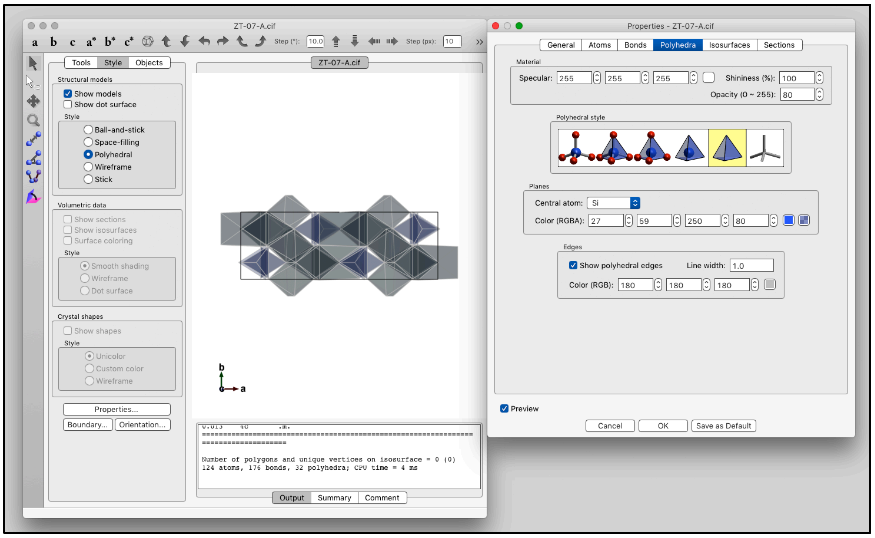

Figure 03-A. Object properties, close up: polyhedra.

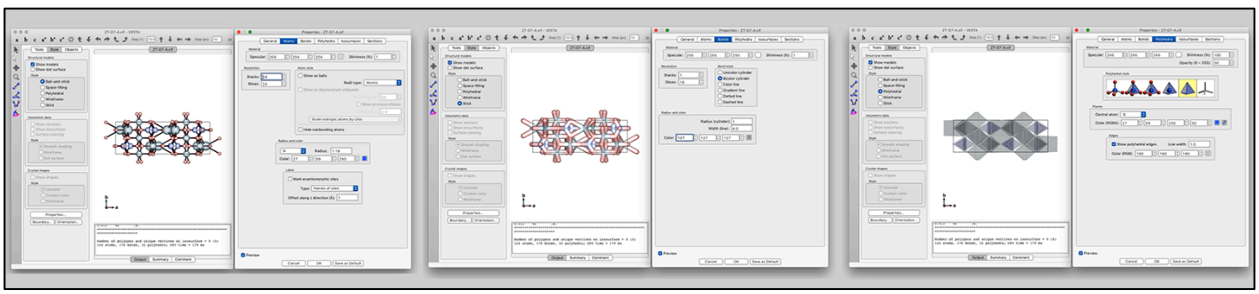

Figure 03-B. Object property panel: a) atoms, b) binding, c) polyhedra.

- More important in the creative process and for the intended visualization, the model can be altered and recomposed in the Data edit conceptual menu. This menu allows determining the size and appearance of the structure cell, its symmetry, volume, and shape. From fig 3, notice the polyhedra and atoms new shape after changing their structure and lattice parameters (Fig. 04).

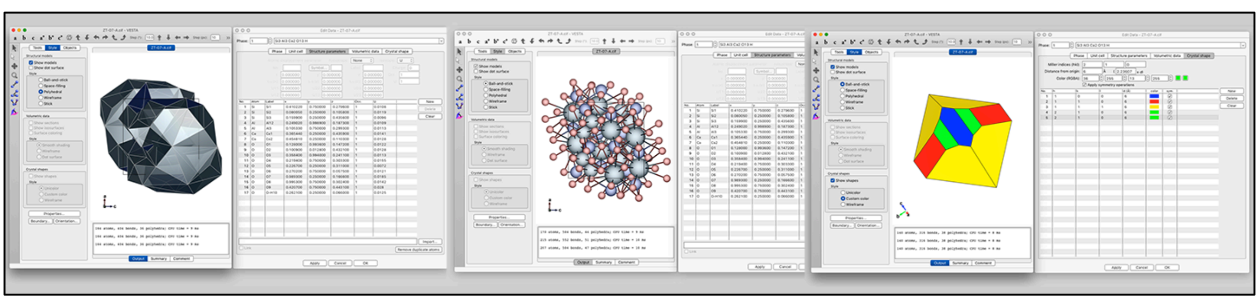

Figure 04.a) unit cell, b) structure parameters, c) crystal shape.

In addition, the program contains multiple utilities such as Fourier synthesis, powder diffraction pattern, electron density and other tools used to calculate various states of the unit cell. They are not displayed in this tutorial because they go well beyond the object mathematical or geometrical representation and cater more specifically to a chemists or mineralogist needs.

Step #2 Graphic Editor(s)

- VESTA visualizations can be exported in various formats such as .svg, .eps. .tiff. or other media more adapted to a graphic editor environment. Here is an example of 3 original VESTA files imported in Adobe-Illustrator to extract lines, contours, and texture (Fig. 5).

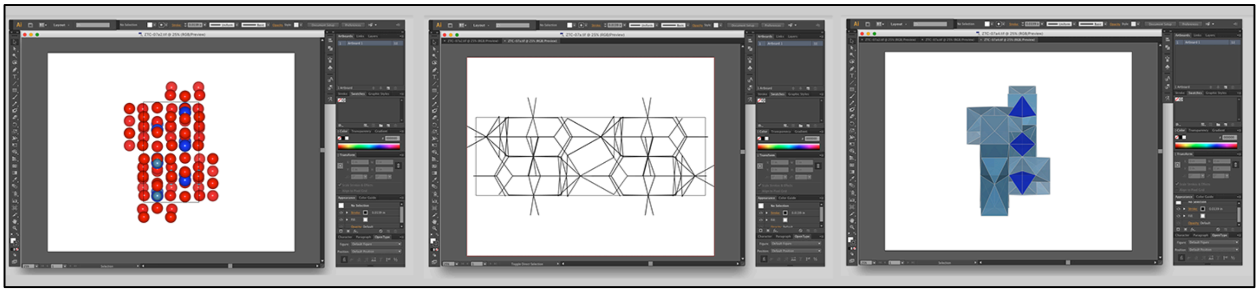

Figure 05. Adobe-Illustrator workspace: atoms, wireframe, and polyhedra.

- Each file is treated separately to preserve the integrity of the original object and may be moved between editing programs depending on specific effects technical prerequisite. In this instance, I extracted the atoms outlines in Illustrator and reimported the file in PSD to use some of the software pixel based filters and effects (Fig. 06).

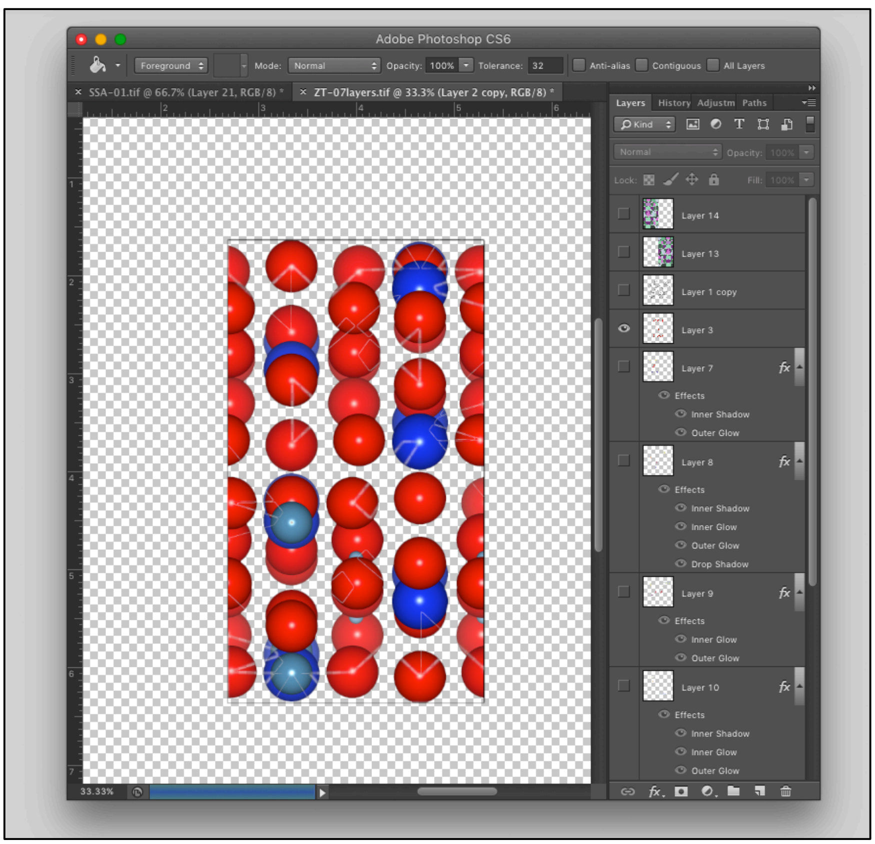

Figure 06. PSD, object build-up.

- The individual files are finally merged into a composite file to build the final visualization and integrates all the selected objects in one single consistent geometrical design. (Fig. 07, Fig 8).

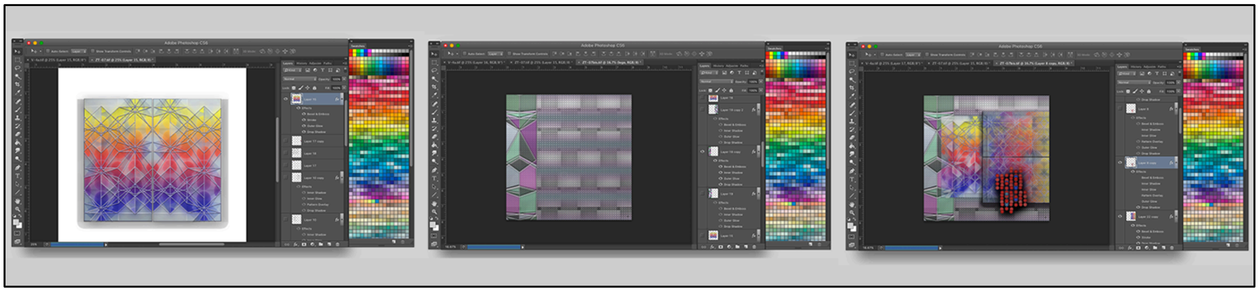

Figure 07. Merging 3 different objects in one composite file.

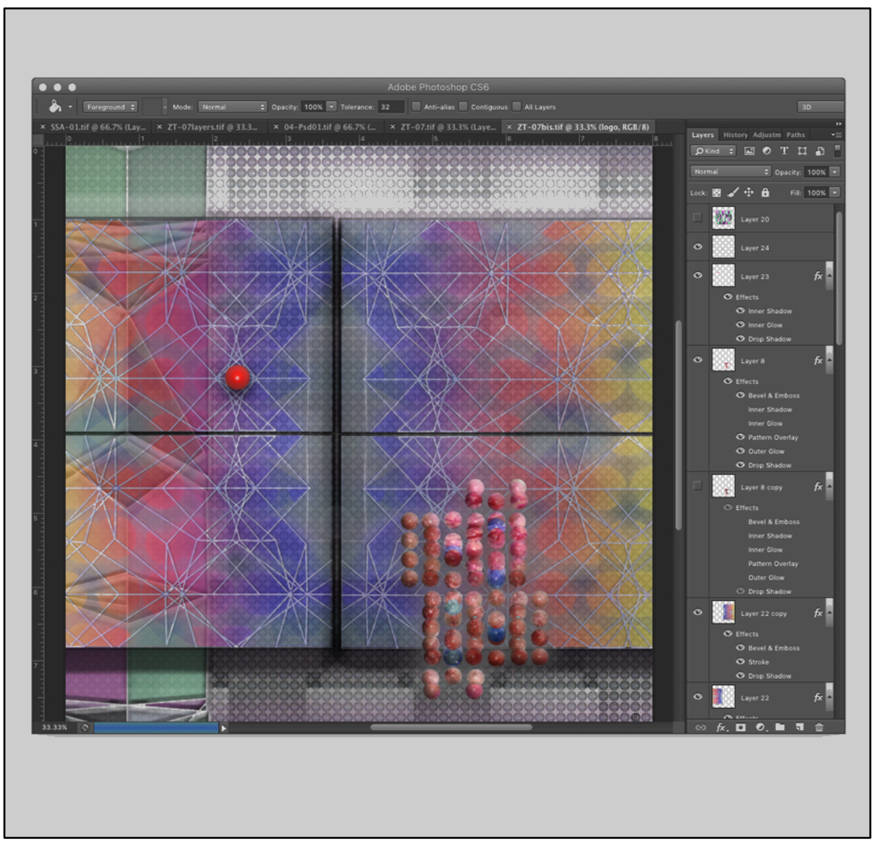

Figure 08. Composite image #2, 24 layers.

- Finally, I look for images of the mineral available on a professional website such as Mindat.org to reevaluate my color scheme, if needed.

As part of the Geometry of Nature project, I found important to do this as the last step because I find the experiment to be more significant if I can extract from the unit cell and its abstract geometry an image that conveys the general feeling and beauty of the actual mineral (Fig 09).

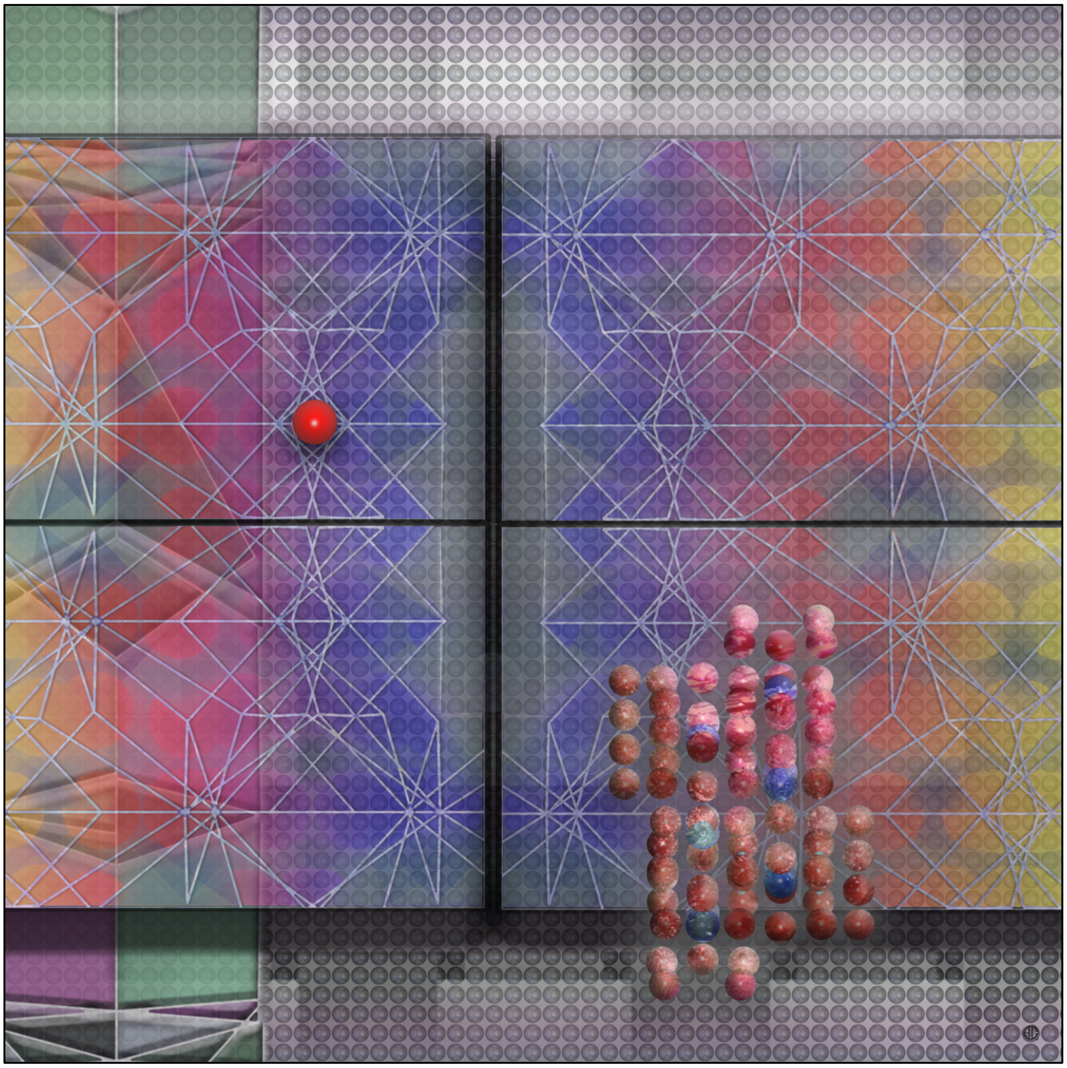

Figure 09. Final composition and picture of an actual Tanzanite mineral.