DIGITAL MEDIA | CMU SoA PRECOLLEGE 2019 | WEEK FOUR

DOUBLE THICK: Digital constructions become infinitely more valuable when we find ways to bring them into the physical realm. This project will put your Rhino skills to the test and introduce a few commands that will help us fabricate and assemble a small installation. Starting with a series of curves, we will define a complex surface of varying thickness, and then deconstruct those surfaces into elements we can make by hand.

1. Each student pair to draw two curves on their designated betweenPLANES layer:
    a. Both curves must be flat, curved in 2, not 3, dimensions.
    b. Each curve must start on the top of the upper student's box and end at the bottom of the lower student's box. It does not necessarily need to touch the endpoints.
    c. Both curves must fit within a vertical 16x32in rectangle (see reference Rhino file).
    d. The curve closest to the y-axis (green grid line) should be 1-degree (this one will look like a polyline).
    e. The further curve from the y-axis should be 3-degree.
    f. Curves should always maintain a minimum distance of 2in between (use Offset to check if you are unsure).
2. **We will compile and redistribute the template with all lines on it in class. Wait for instruction.**
3. Copy relevant (to-you) curves and bounding box onto appropriate layers. Trim your copied curves so you can focus on just your individual box.
4. Loft your 3-degree curves together with Normal settings.
5. Loft your 1-degree curves together, Developable settings.
6. UnrollSrf the developed lofted surface (triangles) as well. You can use DupBorder and DupEdge to identify cuts and folds. See material note.
7. Create a flat grid of points every 2in on the z-y plane, set 1in inside the box (total 64 points). (Can use Array or Copy, make use of Project and Grid snaps.)
8. Use Project in Right view to project this grid of points onto the normal lofted surface.
9. Draw a vertical Circle, starting from one of the points you just projected, with a 1in radius, parallel to the y-axis.
10. Extrude 1.5in towards the y-axis (solid, deleteinput). Explode, delete the surface the point is on, and rejoin the other two surfaces (you should have something that looks like a cup, or cylinder open on one end).
11. Copy with Point Osnaps to produce duplicates of this object positioned the same way on each of the points in your projected point grid.
12. Without deleting the original surfaces, create a solid of the volume between your two original lofted surfaces. (Might utilize Split with Join or Boolean commands.)
13. Use Contour and PlanarSrf to create a waffle frame (planes should be arrayed in the y- and z-axes).
14. IntersectTwoSets with your waffle frame (surfaces only). One set will be zx, the other xy.
15. Make sure lines are copied on both Intersect layers.
16. Use BoxEdit to scale them to half size without changing their position. (You are scaling X on both layers; set one to scale at x-min and the other at x-max.)
17. IntersectTwoSets again, using your zx surfaces and the cups. (Note: This is a memory-intensive operations. Please save your work if you haven't already. Also helps to shift to wireframe view temporarily.)
18. Group waffle surfaces and intersections by axis in a 2D view.
19. UnrollSrf (nothing checked) each piece of the waffle frame. Each time you do this, it will place the unrolled group at the origin - be sure to stay organized and move them before proceeding. You can use Text or TextObject to add labels, in addition to arranging them in space, grouping, etc.
20. Use DupBorder to get an outline of each waffle surface.
21. Use Offset w/ flat cap to add thickness to each of the waffle intersection lines (these will become cuts). The cup intersections should be maintained as reference lines for attaching the cups to the cardboard.
22. Layout for printing. These will be used as templates to cut out of cardboard. You can either rough-cut and tape the template directly onto the cardboard, or you can use a pushpin to make registrations from which you can carefully follow with an Ulfa.
23. Print to pdf for physical printing. Be sure to print vector and at 100% true scale.
24. Submit prior to physical printing: wk4_perry_cutout.pdf (number if multiple pages, e.g. cutout1, cutout2, ...).
25. Copy object (waffle surfaces, a copy of the developed surface, and the cups) off to the side. Create a 45 degree plan oblique 3d drawing of the object (Rotate, Shear, Make2D). Copy elements along the diagonal to produce the effect of an exploded axonometric. Although we will find it easier to edit lineweight in Illustrator, combining lines (Join) and regions (CurveBoolean) is easy in Rhino.
26. With our Make2D drawing selected, we can File>Export to Illustrator. This will be slightly easier to edit and manipulate than if we print to pdf, as it will maintain additional object and layer information. Export at 4:1.
27. Once in Illustrator, you can select by layer or by stroke to adjust lineweights and types. Place on a 24x18in artboard and save a copy as pdf for submission: wk4_perry_oblique.pdf

WHAT + WHEN:

- Cut sheets for printing, wk4_perry_cutout.pdf. Digital submission due at 8pm, July 24.
- Plan oblique final drawing, 18x24, wk4_perry_oblique.pdf. Digital submission due at 8pm, July 24.
- **Final installation review at the start of class, July 29.**

MATERIALS: Mostly leftovers from studio - you may need to purchase a sheet of cardboard. Plotting paper provided by the school, but vellum/trace may be needed for the developed surface. Cups will be provided. Hot glue may be used in assembly, but should NOT be visible