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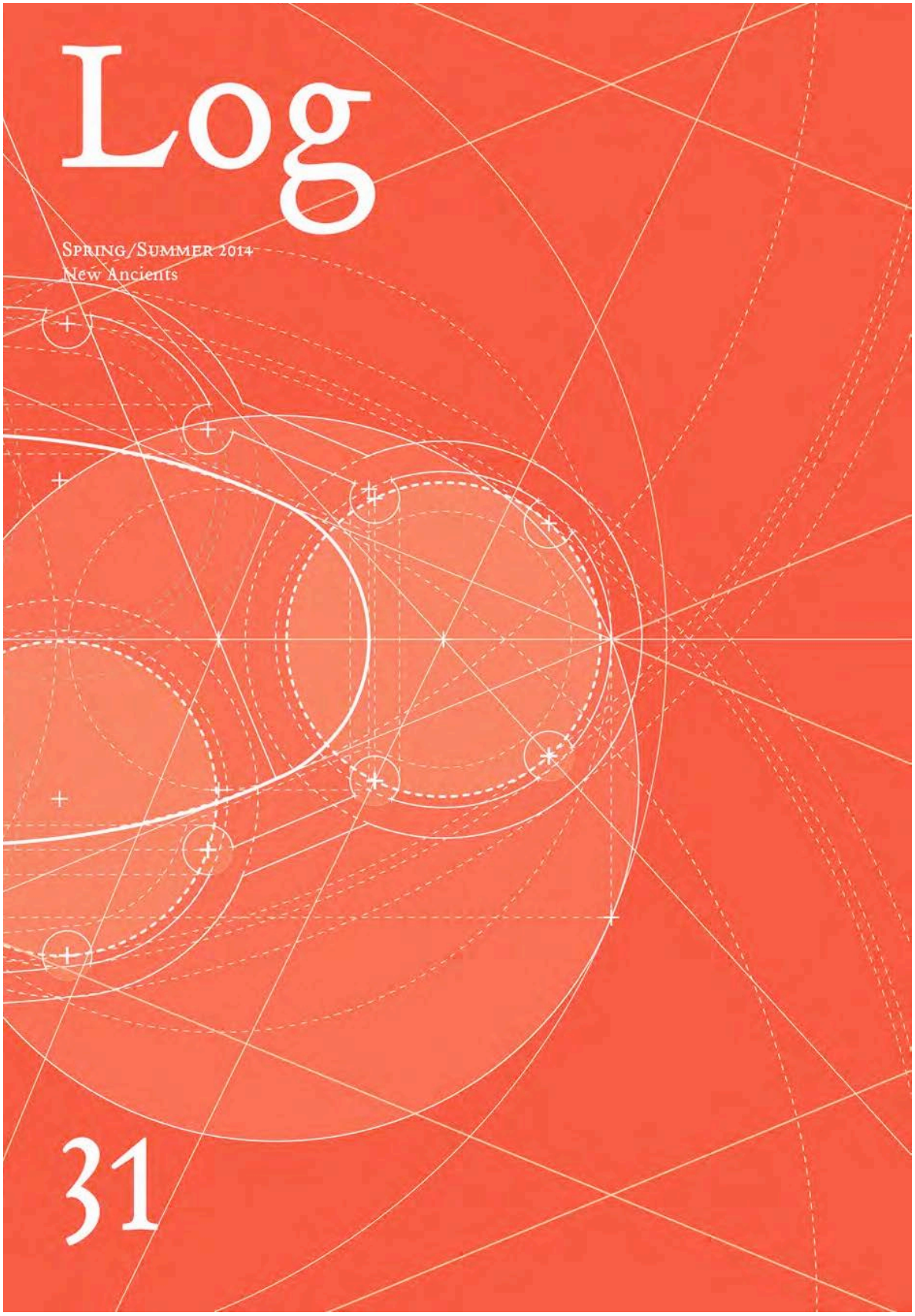
New Ancients



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Andrew Atwood

Rendering Air: On Representation of Particles in the Sky

By Air, I commonly understand that thin, fluid, diaphanous, compressible and dilatable Body in which we breathe, and wherein we move, which envelops the Earth on all sides to great height above the highest mountains.

– Robert Boyle, *A General History of the Air* (1692)

In architecture these days, the term *rendering* usually refers to the production and composition of images using techniques borrowed from the field of computer graphics. This was not always so. Not long ago, rendering meant applying an additional layer of tone and color to complete a drawing before starting another. Rendering was not the production of the image but the application of a final layer, a technique that translated the drawing from a two-dimensional abstraction to an image with distance and depth between objects, and between the objects and the surface of the representational plane. Recently, I was asked to participate in a series of workshops and discussions on the English picturesque,[1] and it occurred to me that a 21st-century reading of the picturesque approach to drawing was as suitable an introduction as any to a more expansive understanding of rendering in contemporary architecture. The picturesque in this context refers to an aesthetic category that operates between the beautiful and the sublime, but it also includes a very specific set of representational techniques, and it was the discussion of these techniques that seemed to speak directly to my own considerations and confusions around the term *rendering* within image culture in architecture today.

Perhaps the least familiar of the half dozen or so terms used by William Gilpin to define the picturesque is *keeping*. Sometimes compared to aerial perspective, keeping refers to the representation of distance and depth in the images of the picturesque. For a picture to be considered "picturesque" in Gilpin's terms, it has to have an effect of keeping distance between objects in the painting as the composition moves from

1. "Super Jury: The Picturesque in Review" was held at the Taubman College of Architecture and Urban Planning at the University of Michigan on February 14, 2014.

front to back and from one object to the next. Keeping can be achieved through a combination of techniques, including the sorting or layering of figures from back to front, the blurring of textures internal to those figures, and the reduction of contrast between those figures and the sky as the two meet at the horizon. For Gilpin, these effects require the addition of something to displace something else. In much of his work, including his didactic images in *Three essays: on picturesque beauty; on picturesque travel; and on sketching landscape* (1792), Gilpin used Indian ink, sometimes adding washes of color after the image was completed, to different effects. About this process he wrote:

When you have finished your sketch therefore with Indian ink, as far as you propose, tinge the whole over with some light horizon hue. It may be the rosy tint of morning; or the more ruddy one of evening; or it may incline more to a yellowish, or a greyish call. As a specimen an evening hue is given. The first tint you spread over your drawing is composed of light red, and oker, which make an orange. It may incline to one, or the other, as you choose. In this example it inclines rather to the former. By washing this tint over your whole drawing, you lay a foundation for harmony. When this wash is nearly dry, repeat it in the horizon; softening it off into the sky, as you ascend. Take next a purple tint, composed of lake, and blue, inclining rather to the former; and with this, when your first wash is dry, form your clouds; and then spread it, as you did the first tint, over your whole drawing, except where you leave the horizon-tint. This still strengthens the idea of harmony. Your sky, and distance are now finished.[2]

Rather than create a color image from scratch, Gilpin preferred to set down his forms and their relationships to each other in black and white, later enhancing keeping and "the idea of harmony" with these layers of tints. His techniques required a certain level of detail, which he called "roughness," to register displacement. Keeping was achieved not by the absence of detail but by displacement and obfuscation of detail through processes of addition and erasure achieved through washing and tinting. The farther the figure was from the representation plane, the more of these processes it underwent. Considered in this light, the addition of these layers and substances to obscure distant figures can be understood as the rendering of the ubiquitous material, air.

Sometimes I think I am not much of a historian, but I rather like how fastidiously and enthusiastically Gilpin discusses color washes. It seems we might learn something from the tone and style of these descriptions. If so, what lessons

2. William Gilpin, *Three essays: on picturesque beauty; on picturesque travel; and on sketching landscape: to which is added a poem, on landscape painting* (London, 1792), 80–81.

can the 21st-century renderer learn from this 18th-century watercolorist? What are his tools? What are his assumed materials? What are his texts? So as we move further from these discussions of *traditional images*, consider the following as an attempt to sketch out these techniques as we steer toward an image of a different kind, the *technical image*.[3]

Architects in recent years have rendered air with a continually evolving set of techniques borrowed from the field of computer graphics. Sorting, layering, blurring, dodging, smudging, and erasing – to name a few – are not handled on the surface of the paper or the canvas but on an entirely new and different substrate, the raster screen. These techniques are not simply analogous to processes found in traditional image making but are sampled representations of processes of traditional image making that operate as abstractions of their traditional counterparts. The effect of air, in this sense, will always come down to a discussion of a technique of air – this is to say, air provides an opportunity to make critical discourse out of what we might take to be mundane softwares. Because air is present in almost every image, technical images are loaded with innumerable technologies and therefore full of potential for a critical mode of abstraction. Thus air offers possibilities for modes of attention and decoding that differ from traditional models of interpretation and reading.

It may be obvious, but it bears repeating that every image requires a sequence of steps that organize techniques like the ones mentioned above. Taking cues from the process discussed by Gilpin, an example might look like this: (1) sort and layer objects by distance, (2) add texture and detail to those objects, (3) light the scene, providing contrast between objects and between objects and the ground. Conveniently, these steps correspond nicely with the historical development of the computer graphic processes we now use to generate digital images in architecture. The difference between the two processes is that computer rendering offers numerous opportunities to make visible the steps of an image's production, and it this aspect of the technical image that appeals to me.

The following description of this process may appear overly technical, but there is good reason for this. Notice, for example, how often we use the expression, "the computer needs" or "the computer must": this is simply a reminder that we are not in the world of hands and eyes. We are in the world of discrete pixels, which must be coaxed into giving the appearance of continuity. In the production of a rendering, a

3. For a more developed description of the difference between traditional images and technical images, see Vilém Flusser, *Towards a Philosophy of Photography* (London: Reaktion Books Ltd., 1983), 14–20.

three-dimensional model must be turned into a two-dimensional image on the raster screen; this is what we see, and it is the only thing we ever see. We take it for granted that the raster screen represents the picture plane. The computer must have a means of assigning each point on the model to a pixel, which is larger than a point but is the smallest unit of the raster image. Most important in this first step of sorting things by distance, the computer must assign a depth to that pixel, despite the absence of any real depth or physical distance. To represent depth, the computer must eliminate depth values that correspond to points hidden from the point of view of the camera aligned with the picture plane. These are the calculations that ultimately allow us to make a distinction between a foreground, a middle ground, and a background. What a renderer calls a "z-buffer" is a technique developed by Edwin Catmull in 1974. Catmull described a "subdivision algorithm," which subdivides the surfaces within a model so that no resulting subdivision corresponds to more than one sample point on the screen. Ultimately, in computer graphics the z-buffer provides a secondary substrate for subsequent rendering operations; adding "lens blur," for example, is not typically created by a simulation of lens optics, but by coordinating a blurring algorithm with an image's z-buffer. Z-buffers are one of many forms of data generated during the rendering process that can subsequently be imaged. Such an image could be considered an image of nothing but the data of distance.

Like Gilpin's watercolorist, the renderer must also apply textures to the objects in an image. Tuong Phong at the University of Utah originally developed techniques for adding detail to computed surfaces in the early 1970s. His work expanded on Catmull's research, allowing for objects modeled using surface patches to be rendered smooth by altering the way the objects are "painted" on the screen. These *shaders* split the computer's graphic representation of the object from its computed, geometric description. Splitting is a distance-making operation. The distance in this case allows for the introduction of an ever-growing list of techniques that continue to displace the geometric object from its graphic representation. Texture mapping, for example, allows for surface color and smoothness to be controlled via external image data. Formalized by James Blinn and Martin Newell, this technique is called mapping because it relates points on a virtual three-dimensional model to a two-dimensional representation of displacement. Adding an image that is mapped to

the surface of an object can also control color. These mapped images are already split from the original object.

The final step of the process is to light the scene. Before he died, media theorist Friedrich Kittler spilled his last pools of ink on the problem of lighting in computer graphics. As he showed, although these techniques are closely associated with an experience of light, they relate to the physics of light only obliquely.[4] In this case, I can do little more than point to the assumption of a "camera" within the software that was written by Turner Whitted in the late 1970s and early 1980s, called *ray tracing*, and the absence of a camera in the process outlined by a team at Cornell in the mid-1980s, now known as *radiosity*. Ray tracing and radiosity have remained the dominant modes of calculating light in computer renderings. However, as Kittler pointed out, the differences between the two processes – not just technically but also conceptually – are so vast that they remain almost entirely separate. Modern rendering engines calculate each separately, making images of both available as output.

According to some, architecture is rapidly approaching an image discourse,[5] becoming more and more focused on photographs and renderings and whatever may lie in between. The techniques that produce these images are typically thought of as shoptalk – or worse, passed off as magical tricks of the trade that are best left behind the scenes and never discussed. However, the techniques of image production represent data that could extend the process of rendering beyond a photorealistic endgame by creating distance between a form's traditional geometric description and its computer graphic representation. In fact, the greater the reliance on texture mapping and surface effects, the more removed the image becomes from any source. This is an opportunity to conceptualize what we are doing when we render without appealing to essences, experiences, or habits.

The historic move toward abstraction in painting required awareness not only of the picture plane but also of the techniques of layering, displacing, washing, keeping, and rendering. Since contemporary rendering already offers a ready substrate of technical forms, it makes sense to use these techniques productively toward a critical discourse of our own methods for representation. Of air, or of anything else.

4. For more on the importance of these differences, see Friedrich Kittler, "Computer Graphics: A Semi-Technical Introduction," *Grey Room* 2 (Winter 2001): 30–45.
5. I am not sure where I first heard this term. I might have made it up, but it sounds like something Sylvia Lavin would say.

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