Reconstructing Nasmyth:
Manufacturing the Post-Lenticular

Thomas Parker

The manner in which architectural design practices interrogate emerging forms of technology has commonly relied on the appropriation and speculative translation of pre-existing methodologies, alongside an intimate tacit knowledge of analogous subject matter, and its philosophical and technical mechanisms. This is increasingly true when we consider the emergence of artificial intelligence (A.I.) models, able to generate vast quantities of imagery, through *post-lenticular* mechanisms. But, in practices of image-based 3D scanning, which are foundationally underpinned by principles of veracity and accuracy, novel forms of A.I. models, such as *Neural Radiance Fields,*[1] commonly referred to as *NeRFs*, are revealing paradoxical spatial entanglements, alongside a range of potential opportunities, for practitioners to develop new methodologies that break away from canonical architectural practices. These post-lenticular and artificially epistemic practices operate beyond the visual spectrum,[2] avoiding the simple translational analogies of architectural images,[3] and reveal an entanglement within the statistical operations of neural networks. Within these post-lenticular practices are a range of aesthetic, technical, and operational entanglements, alongside their representations and manufactured outcomes, that are drawn into an active and productive spatial dialogue.

Reconstructing Nasmyth investigates these entanglements through the re-construction, and re-imaging, of the speculative design practice of engineer and inverter James Nasmyth, and his practice of photographing artificial lunar landscapes. In the late 19th Century, through the careful observation of the moon via a costume built telescope, Nasmyth carved a series of plaster study models, a fine art technique appropriate from his father, that in turn became the subject of his photographic representations of the moon.[4] Nasmyth had developed this process due to the infancy of photographic technology, but as Boris Jardine highlights, Nasmyth's work was a form of "*manufactured objectivity",*[5] in which the subject of study, and the resultant representational media, had become entangled between both scientific and artistic positions. For Nasmyth this resulted in the projection of aesthetic phenomena into the scientific description of the moon, often comparing the moon's surface, and its formation, to images of his aging and wrinkling hand. In turn, Nasmyth had constructed a

form of post-lenticular imagination, in which *"...the convoluted production of an image was anything but an obstacle to its acceptance"*.[6] Nasmyth's productive entanglement, between optical observation and lenticular imaging practice, provides an affordance to research one further convoluted, yet productive step - from lenticular image to statistical neural network.

This design-led research explores this next step through a further translation of Nasmyth's original observations and models, into a triptych of artificially intelligent landscape reliefs (Figure 1). To contextualise this convoluted methodology, this research will define the statistical operations of the radiance field, and its difference to cartesian geometry, whilst also contextualising the epistemic and aesthetic roles of imagery in the training of the radiance field. These two definitions of the field, will be fundamental for the understanding of a conclusion that discusses the artificial landscape of a post-lenticular practice.

Figure 1. Photograph of the landscape triptych *'Reconstructing Nasmyth'* (Photograph by author)

REPRESENTING RADIANCE AND THE POST-LENTICULAR FIELD

Defining the broader technical shift from 3D scanning practices, based in cartesian image-measurement, to that of a neural radiance field methodology is not the sole purpose of this research, and there is already a wide range of literature that covers the technical machinations of this subject.[7] Instead, a simple comparative definition, that alleviates the need for a full technical understanding of the subject, is to consider a NeRF methodology as a form of artificially taught (A.I.) photogrammetry process. The main difference being that a NeRF is not attempting to resolve the construction of digital geometry from images, in cartesian space, and does not rely on the quantifiable and exact positional accuracy of a point cloud of measurements. Alternatively, the NeRF iterates a statistical model across a Multilayered Perceptron (MLP) neural network, attempting to *overfit* the provided positional and image information into a volumetric statistical field, which in turn, can be sampled for representational images and geometry (Figure 2). What this represents is an epistemic measurement and reconstruction process, in which a spatial model is not simply resolving geometry in space, but iteratively training speculative positional information on the optical artefacts of images, to predict its most likely representation.

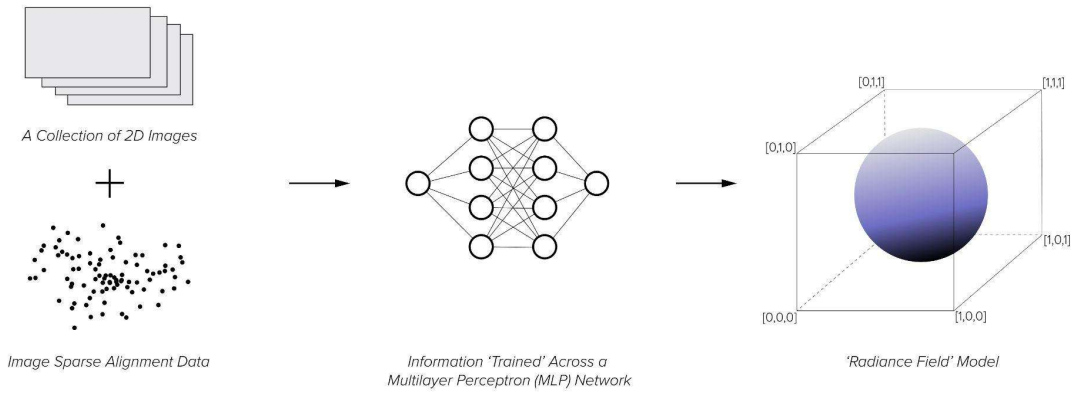

Figure 2. Diagram illustrating the Neural Radiance Field Method (Diagram by author)

To illustrate this shift, it is useful to define how the NeRF can be sampled for spatial and representational information. We can imagine drawing two spheres, one in cartesian geometry (Figure 3a), and another as a radiance field model (Figure 3b). In cartesian space the sphere can be rendered onto the picture plane [pp] following standard principles of linear perspective and optical representation. [8] In comparison, within the field, the ray based rendering of statistical information is a sampling process, projecting inquisitive rays from a singular position [PoE], to sample the field in the

definition of representational content.[9] Within this process, which could be compared more similarly to a medical imaging process, the projected rays resolve the geometry, as time within the object, rather than detecting solid surface geometry. Whilst this representational shift within a NeRF might not seem important when trying to render an 2D image, due to their resultant images being almost identical, what it does present is the potential to engage with both sampled and unsampled positional data, along with the training processes of the wider field [Fe].

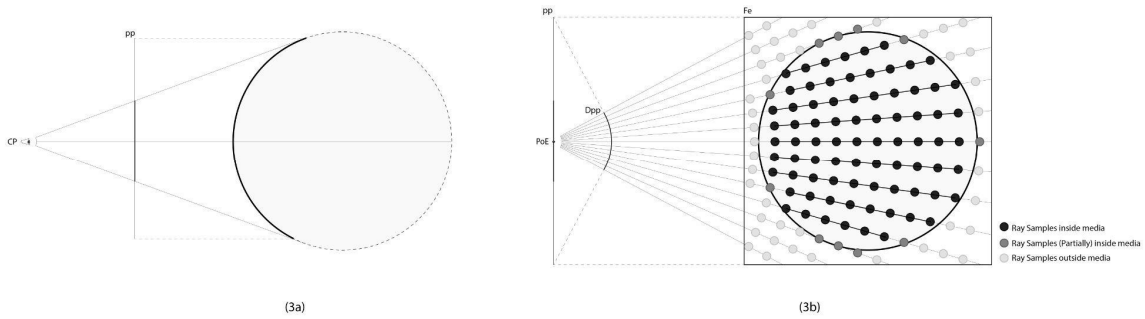

Figure 3a and b. Two diagrams, showing (a) the perspective imaging of a sphere in cartesian space and (b) the same sphere in a radiance field.

Within the training of the NeRF a latent potential exists to resolve spatial information, even if image-based parallax isn't present, and even if the underlying geometry differs vastly between images. This should be understood as a statistical process of overfitting, or as I would suggest, an *over-representation*, in which all artifacts within the field are visualised, in an attempt to always produce a result. This allows the field to contain, not only spatially resolved geometry, but also the epistemic process that desires to find measurement for all information, no matter how far abstracted it might be from its original subject matter (Figure 4). This process liberates the NeRF from a singular need to resolve positional measurements, and instead, allows for the training process to embed and entangle other forms of knowledge, projected through aesthetic conditions within its training images. This creates a latent potential, waiting to be exposed, adapted, and manipulated, to reveal new forms of digital space, suspended between the results of the epistemic field and its post-lenticular aesthetics.

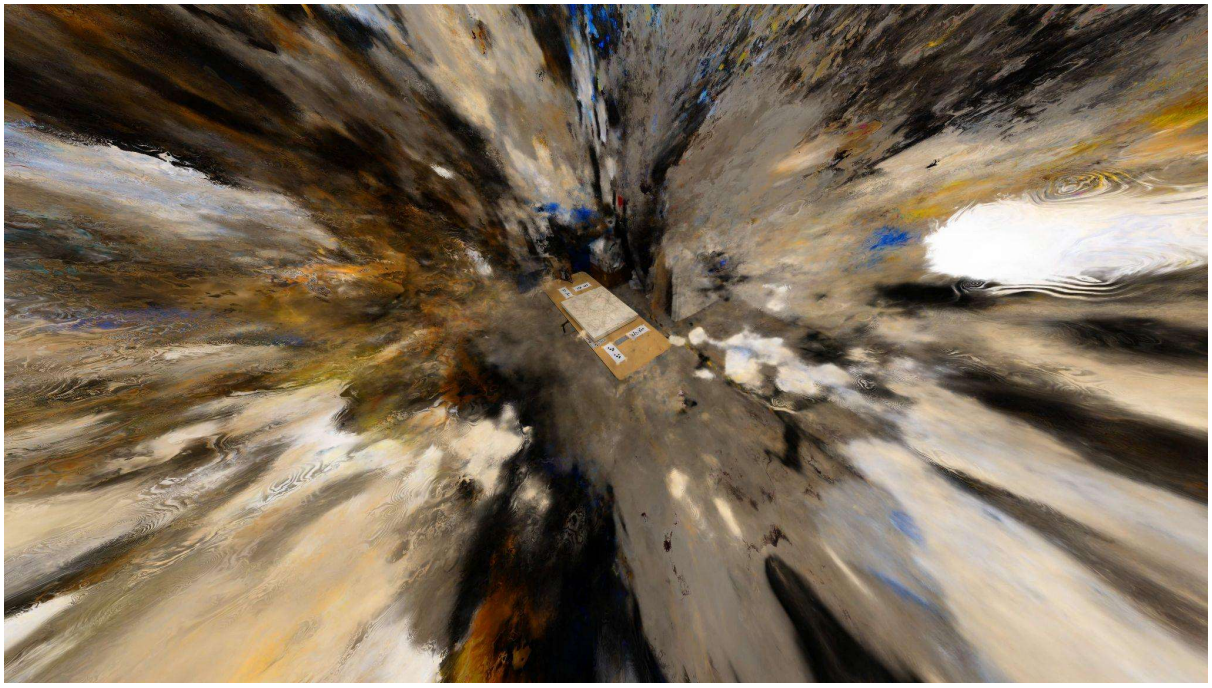

Figure 4. Neural Radiance Field Methodology Render, showing the context of the 'wider field' (Image by author)

BEYOND GEOMETRY: MANUFACTURING THE EPISTEMIC FIELD

Shifting beyond conventional geometry and returning to the subject of study, Nasmyth's plaster carvings of the Moon's craters *'Maurolycus and Barocius'*, a series of alternative aesthetic modelling practices are deployed to interrogate, and exhaust, the post-lenticular field. To begin this process, one of Nasmyth's original plaster landscape models, housed in the Science Museum Collection, London, was digitally 3D scanned. This scan was then subsequently machined, and recast in plaster, to produce a workable study model, which locates itself as a central piece of the triptych of landscape models (Figure 5). From here, the plaster facsimile became the subject of the research investigation, and was subsequently 3D scanned again using a NeRF subverted methodology to create the two alternative landscape models of the triptych.

Alterations of the underlying data, by which the NeRF is trained, draw upon the Nasmyth rich aesthetic language, alongside his illustrative photographic images, that were used to describe his imagined lunar landscapes.[10] Using a combination of more commonly deployed A.I. image-to-image, and text-to-image, transfer processes, the training images were iteratively subverted. The linguistic description of Nasmyth's apple core decaying, which he used to illustrate the formation of the lunar surface, shifts from being aesthetically comparable, to a driving intention in the reconstruction of a

new surface condition. Simultaneously, Namyth's staged photographic images of the moon, produced through his translational methodology and photographic practices, reproject their raking light into an iterative translation of the landscape. In this combined study of alternative landscapes ideas of descriptive language, projected aesthetics, epistemic dialogues, artificial images, and operational statistics, all become actively entangled in the resolution of form.

Figure 5. Photograph of the landscape triptych *'Reconstructing Nasmyth'* (Photograph by author)

The epistemic process of training geometry into a field, as opposed to traditional forms of measurement and reconstruction, reveal vastly different surface conditions to be manufactured. These alternative geometries are machined into existence, scored into the material surface, no longer representing a singular reconstruction through measurement, but instead a language of alternative aesthetic desires (Figure 6). The liberation from the singular command-line instructions of most common computer-aided design (CAD) modeling practices represents a dialogic shift for the modelling of spatial artefacts and scenes. Finding a convoluted resonance with Nasmyth's original studies, the landscape triptych reveals the opportunity to not simply measure the spatial construction of images, but also the inner workings of the tacit knowledge of uncertain systems.

No longer simply measuring the landscape that Nasmyth viewed, or reimagined in his models and images, a new, more complex form of knowledge, the inner workings of the Neural Networks Multi-Layer Perceptron (MLP), is drawn into dialogue between subject matter and author. These

entangled artefacts, representing lunar landscapes, hold within them definitions of alternative aesthetic measurements of phenomena beyond the visual spectrum, and representations that go beyond those found in conventional architectural practices. What they represent is the beginning of a post-lenticular practice that can still be physically resolved, whilst drawing new forms of knowledge into its orbit.

Figure 6. Detail photograph of the landscape triptych *'Reconstructing Nasmyth'* (Photograph by author)

CONCLUSION: A POST-LENTICULAR PRACTICE

Emerging forms of post-lenticular tools and methods are enabling the repositioning of tools of measure and truth, towards positions of abundant and speculative imagination. This repositioning illuminates the very nature of the large-scale disruption that is already occurring, across architectural design practices, that previously relied on the over use of analogous translation descriptions.[11] Other forms of knowledge are beginning to subtly infiltrate the long standing cannon of architectural design practice, and at first glance these A.I. tools appear to be technologies of speed and pro-

duction, but upon deeper inquiry reveal other, more dialogic and epistemically inquisitive, positions. If optics, and in turn the study of perspective, is considered the study of light, and the resultant philosophical illumination,[12] then post-lenticular practices would represent a philosophical position of contrast that doesn't find such simple binary resolution. Positioning this softer, almost flickering or fleeting illumination, becomes a more productive analogy by which we might engage with the often uncertain and constantly changing logics of A.I. and its post-lenticular operations.

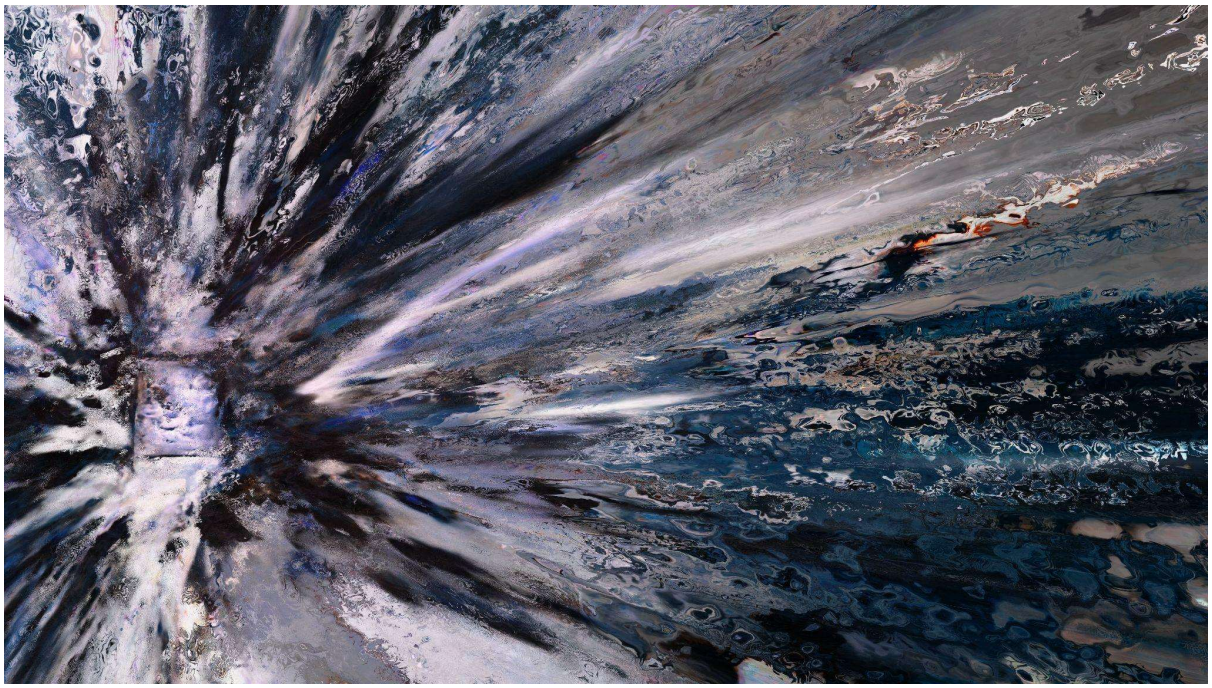

Figure 7. Neural Radiance Field Methodology Render, showing the expanded conditions of the altered field (Image by author)

Defining the statistical variables of contemporary mathematics that underpin post-lenticular systems is essential for acquiring a tacit knowledge of their operations. Best-fits, outliers, over and underfittings, deviations, cullings and paddings, become the terms of engagement, and active variables. These variables, that are trained only on the *"artefacts of human attention"*[13] enable our post-lenticular operations to evolve beyond the desired certainty of architectural production. They enable broader positions of epistemic uncertainty, trained upon the statistical stochastic noise, that would most commonly be discarded as erroneous information or representation (Figure 7). But, as Francesca Hughes describes, this perceived error is potentially the precious import that architectural practices so often desire, in search of more original methodologies.[14] With this in mind, our systems of measurement and control should become more comfortable with their logics being ambushed

from within, to create new knowledge, in the expression of truly dialogic, and post-lenticular, forms of spatial practice.

Acknowledgements

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Bio

Thomas Parker is a transdisciplinary design researcher and educator, operating at the intersection between architectural design, digital measurement systems, computer vision, and artificial intelligence imaging practices. Thomas has a keen interest in the role emerging technologies play in the speculation of new representation realities and architectural conditions. Thomas is an Associate Professor at The Bartlett School of Architecture, where his teaching draws on over a decade of industry experience in 3D scanning, and is currently completing his PhD, 'Aesthetics of Noise: Latent Fields of Potential Architecture'.

Notes

[1] Ben Mildenhall et al., 'NeRF: Representing Scenes as Neural Radiance Fields for View Synthesis', version 2, preprint, arXiv, 2020, https://doi.org/10.48550/ARXIV.2003.08934.
[2] Jussi Parikka, *Operational Images: From the Visual to the Invisual* (University of Minnesota Press, 2023), https://doi.org/10.5749/9781452970929.
[3] John May, *Signal. Image. Architecture: Everything Is Already an Image* (Columbia Books on Architecture and the City, 2019).
[4] James Nasmyth and James Carpenter, *The Moon: Considered as a Planet, a World, and a Satellite.* (John Murray, Albemarle Street, 1874).
[5] Boris Jardine, 'Made Real: Artifice and Accuracy in Nineteenth-Century Scientific Illustration', *Science Museum Group Journal* 2, no. 2 (2014), https://doi.org/10.15180/140208.
[6] Jardine, 'Made Real'.
[7] AKM Shahariar Azad Rabby and Chengcui Zhang, *BeyondPixels: A Comprehensive Review of the Evolution of Neural Radiance Fields*, version 3, 2023, https://doi.org/10.48550/ARXIV.2306.03000.
[8] Martin Kemp, *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat*, Nachdr. (Yale University Press, 1992).
[9] Ryan Brucks, 'Shader Bits', *Creating a Volumetric Ray Marcher*, 16 November 2016, https://shaderbits.com/blog/creating-volumetric-ray-marcher.
[10] James Nasmyth, *James Nasmyth, Engineer An Autobiography* (John Murray, 1897).
[11] John May, *Signal. Image. Architecture*.
[12] François Laruelle, *Photo-Fiction, a Non-Standard Aesthetics: = Photo-Fiction, Une Esthétique Non-Standard*, Bilingual edition, trans. Drew Burk, Univocal (Univocal, 2012).
[13] Michael Young, *Reality Modeled after Images: Architecture and Aesthetics after the Digital Image*, 1st edn (Routledge, 2021), https://doi.org/10.4324/9781003149682.
[14] Francesca Hughes, *The Architecture of Error: Matter, Measure, and the Misadventures of Precision* (The MIT Press, 2014).