**Karel Nel & Cosmos:**
*A Far-Reaching Artist-In-Residence Collaboration*

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**Abstract**

The phenomena of the universe form a common focus for the interrelationship between art that has space as its central concern and the astronomical sciences, as both disciplines strive to observe and express the mysteries of the cosmos. An unwavering mutual interest in space and mutual respect for each discipline form the nexus between the two. Some scientific projects have artist in residence programmes that promote innovative Art/Science dialogues. Although most residencies are designed for the short term, one has certainly stood the test of time. The writer analyses one fifteen-year collaboration between visual artist Karel Nel and Caltech’s Cosmic Evolution Survey, COSMOS.

**The Art/Science Dialogue**

The term Art/Science (Art/Sci) describes the integration of common interests and shared values in both art and science disciplines, from which project specific collaborations are established. The dialogues that underpin those collaborations are interrogating their interactions with a view to increasing and sustaining their relationships. The quality of their dialogue and of their engagement determines the value of the work produced, and of the interdisciplinary endeavor itself.

This article investigates various components of collaborative engagement centered around a unique visual art/astronomy dialogue developed between Karel Nel and Caltech’s Cosmological Evolution Survey (COSMOS) team. That engagement encompasses the nature and design of the artist in residency, the shared process of inquiry, as well as synergistic and sustainability factors, which are central to their collaboration. In terms of the emergence of Art/Sci dialogues and their manifestation into fruitful artist in residencies, one particularly long ranging and long-running dialogue is evidenced by the fifteen-year collaboration between artist Nel and astronomer Nick Scoville, former head of COSMOS, from Caltech in Pasadena, California, as well as the international COSMOS team.

**Collaboration and Residencies**

It has long been said that art and science are mutually enabling. Artist Arthur Woods ratchets up that relationship to the level of elements that are crucial for life itself. Woods sees the mutually enabling environment created by Art/Sci collaborations as essential to meet the growing needs of humanity. In his statement in the *Next Millennium: A Space Age or Stone Age*, he notes:
“The future of space activities, the future of humanity and perhaps even the future all life on earth is in need of skilled communicators possessing the knowledge and understanding of the scientists combined with the intuition and sensitivity of the artist.”

[1]

To reach Wood’s level of Art/Sci dialogue, practitioners would require a significant increase in collaborative residencies. It is not such a far-fetched idea, though. Besides their common interests and shared values, the most enduring elements that underpins art and science is the innate desire to practice art and the curiosity that drives scientific inquiry. Both qualities are innate and the resulting mutual imperative is the basis for Art/Sci collaborations, and instituting the platform of residencies to carry them out. One long ranging and long lasting collaboration that embodies the imperative to practice art with an inquiring scientific outlook is that of Karel Nel and COSMOS.

The COSMOS Collaboration

COSMOS is a deep wide area multi-length wavelength survey mapping a two square degree region of the sky. Its goal is to chart the evolution of galaxies and large-scale structures in the universe by looking out to greater distances, thus looking back in time. To date over 2 million galaxies have been detected, spanning 75% of the age of the Universe. This goal is being accomplished by the effort of over two hundred astrophysicists utilizing many of the world’s major telescopes on Earth and in space. [2]

As the COSMOS undertaking is long ranging and long term, so is its Artist in Residency. Having commenced in 2004, the collaboration is still ongoing. Nel’s extensive background as an artist, author, and lecturer forms a solid basis for his synergy with COSMOS and their ongoing Art/Science dialogue sustains the collaboration. The strength of that dialogue has enabled Nel’s artwork to be informed by the ideas and insights of the astronomers, and his access to the images and data issuing from radio, x-ray, infrared and optical telescopes used by the team in their research.

Prior to the engagement with COSMOS, Nel’s artistic inquiries had already focused on the interface between science and art. During his Fulbright placement at the University of California at Berkeley, he attended lectures both on particle physics, and the origins of metaphors used in art and physics. Nel’s atmospherically related works were subsequently exhibited in New York, and were brought to the attention of Caltech astrophysicist and COSMOS head Nick Scoville, just as the project was being initiated. The timing of that exhibition was fortuitous, as was the shared art/science/astronomy interests of both Nel and Scoville. Scoville’s receptivity to the idea of including an artist in residence as a member of the COSMOS team came from his family background which embraced the arts and the sciences, and his own practice of sculpture.

The Artist in Residency – Its Nature & Design

From the perspective of Nick Scoville, the value of a resident artist is to highlight the common aspirations of both artistic and scientific endeavours. Nel describes the shared focus as both disciplines searching for an underlying value system and expressing their understanding of the world and the cosmos. Nel views the style of scientists as a convergent process in terms of
precision and specificity of focus, in contrast to the artist’s broader, more divergent approach. It is the reciprocal engagement of the two approaches that offers Nel a more nuanced view of the processes of astronomical discoveries.

The nature of the collaboration consists of inviting a visual artist to work alongside COSMOS astronomers, of Nel visiting astronomers at various sites, participating in the annual meetings when astronomers present their latest findings. Nel also presents a yearly lecture in which he reflects on those findings and their relationship to the development of his own thought and the resultant body of work produced during the year. In a sense, Nel’s function is to reflect back to the scientists the extraordinariness of the big picture emerging from consolidating their specialist findings from a layperson’s perspective.

The design of Nel’s residency is thematic, engaging with astronomical and artistic concepts. Nel engages with the astronomers’ language in various forms of data, diagrams or other representations used to express the complexity of the phenomena that the astronomers ‘see’ with telescopes, and which he translates from his terrestrial viewpoint. Over the years, Nel has become more of an honorary team member than simply an observer. An indication of his value to the COSMOS team members can be inferred from the fact that Nel, as the artist in residence, is allocated an hour for his slide presentation and the ensuing discussion when contributing astronomers are only allotted a 15 to 20-minute presentation slot. As Scoville states:

"Often in our profession, one becomes fixated on the details of narrow corridors, losing sight of the interconnectedness and poetry of the whole. Karel’s images distil these connections metaphorically, much like the physicist uses equations to unify phenomena in diverse environments and over vast ranges of scale." [3]

Scoville sees tangible and intangible gains for the astronomers from the collaboration. Tangibly, the art work created by Nel offers an opportunity to extend the focus of COSMOS astronomers beyond their individual sub-specialties within the project. Intangibly, astronomers see their own insights re-presented to them, as in Stepped Stellar Messages (Fig 1) Nel elucidates the scientific elements which informed his choice of materials:

"I am particularly fascinated by the fragile images of light that left their source millions of years ago. I make these momentarily tangible by using materials commensurate with their subject: 540-million-year-old black carboniferous dust and radiant white salt, two deeply primordial substances. The shimmering refracting surfaces of the works evoke the effervescent phenomenon of photons traveling through deep space, here materialized into dense matter." [4]
A collaboration is designed to be mutually beneficial in a variety of ways, some offering space, supplies and finance. In this collaboration, the bulk of the expenses for travel, materials and research are borne by the artist. Often, the reverse is true. Historically, the work of artists has been undervalued, and has not been financially rewarding to the extent that art can become a viable career for the many, not only for the few. However, the value exchange for Nel is his opportunity to work with eminent contemporary astronomers, and be exposed to cutting edge thinking, along with images captured by some of the world’s great telescopes. All of which informs and inspires his next art work. Nel’s position amongst the astronomical community adds an expertise and gravitas to his work that he would not otherwise enjoy. That authenticity is reflected in the value of his pieces to any connoisseur and to the history of astronomy itself. Arts residencies usually involve an artist/s for a limited span of a few weeks, or months at most, but Nel’s decision to carry this residency forward as the sole artist for this length of time is an exception to the rule.

The Process of Inquiry

The importance of and the process of inquiry is at the heart of both artistic creation and of scientific endeavor which forms the basis of an Art/Sci dialogue. Research, such as that from educationalists Robert and Michèle Root-Bernstein, indicates that the processes and characteristics of artists and scientists often overlap and that arts and sciences are part of one, common creative culture largely composed of polymathic individuals. [6] According to academician Michael Espindola Araki, artists who are driven to investigate a range of fields are now able to access a wide array of interdisciplinary knowledge and draw upon this information in their artistic practice, thereby integrating multiple disciplines. [7]

Nel’s annual lecture does just that. He weaves concepts from art, science, philosophy, history and literature into a broad, thought-provoking presentation for the astronomers. In presenting these lectures Nel acts as a commentator, a collaborator, as well as a mediator of the team’s concepts to the general public through his own exhibitions. As arbiters of cultural change, artists must engage with technological and scientific research beyond just that of using new content, which is aptly demonstrated in Nel’s artistic inquiry into the nature of astronomical concepts.

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Figure 1. Karel Nel, Stepped Stellar Messages. Pastel, metallic dust, specularite and dry pigment on bonded fibre fabric, 850 x 2950 mm, 2015. Stepped stellar messages suggests the layering of the images – messages from far distant galaxies – elusive clues which need to be pieced together. Shimmering subtly with a scatter of specularite, the location and orientation of the image is difficult to read, as an inter-galactic void fills the lower portion while the opaque silvery messages lie stacked above. Without the defining linear grids, the information and the possibility of comprehension collapse.[5] . (© Karen Nel. Photo:Bob Cnoops.)
In 1968 astronautical pioneer, painter and kinetic artist Frank Malina reflected on the disciplines of science and art. He concluded that both were fundamentally related in that human imagination and passion drives scientific, engineering and artistic discovery alike. [8] In 2002 artist, author and lecturer Stephen Wilson further concluded Art/Sci’s dynamic interface resulted from both methods of inquiry operating at the frontier of knowledge. He charted the characteristics between the Art/Sci disciplines that are brought to bear in their processes of inquiry, all of which inform the Nel/COSMOS relationship:

- Both value the careful observation of their environments to gather information through the senses.
- Both value creativity
- Both propose to introduce change, innovation or improvement over what exists
- Both see abstract models to understand (and describe) the world
- Both aspire to create works that have universal relevance.[9]

Nel’s art work specific to the COSMOS project is layered with information, similar to the stacking of information that astronomers use to derive a single but composite result. Precise measurements are used to calculate extreme distances. Its astronomers also pay attention to light and dark, colour and hue as these provide cues to the nature of what they are observing. In a two-dimensional format, such as in his 2018 work, *Voids and Vanishing Points: Cosmos, Kyoto* (Fig. 2). Nel also engages with these notions of focus, distance, light and darkness, and the specifics of data in artistic terms. Nel explains:

“Voids and Vanishing Points deals with the reality of multiple vanishing points that must be grappled within the language of astronomy: The lengthy triangles created by the orthogonals refer to multiple vanishing points rather than a single terrestrial point. The dark spaces beyond the pointings become voids, as they are excluded from the focus of attention. Directing a telescope creates a sight-line and a vanishing point. These form a series of significant dimensional shifts, forming a metaphor for engagement with both mental and metaphysical abstraction – a form of thinking common to the artist, the mathematician, the philosopher and the scientist.” [10]

![Figure 2 Karel Nel, Voids and Vanishing Points: Cosmos, Kyoto, sprayed pigment on bonded fibre fabric, 270 by 50cm, 2019. (© Karen Nel. Photo: James Fox.)](image)

**Synergy & Sustainability**

The degree of success and sustainability of any collaboration are dependent upon a high level of mutual regard and an auspicious blend of elements specific to each project. In this instance the
collaboration is based on the group’s common focus, a shared appreciation for the values of both art and science, the flexibility of financing, the commitment of time, and structured engagements. Scoville characterizes their synergy as a mixture of Nel’s artistic skill, his appreciation of the scientific endeavor, of his significant understanding of the physics that underlies the project and his hands-on approach during his visits the COSMOS team during the year at various observatories. Furthermore, for a collaboration such as theirs to take root and flourish, any artist would need an extensive knowledge and background in art, science and also in related fields of thought, such as philosophy. And, conversely, astronomers would need to appreciate the value of art to science and to society.

Because Nel is a visual artist who engages with the scientific, he straddles the interface between mental abstraction and close observation, two diverse approaches used in the disciplines of both art and science. Nel is dedicated to getting the astronomical concepts accurate in his efforts to represent and understand the extremes of space and capture the big picture. For example, in *Point to Line to Plane, An Astronomical Treatise, Kyoto* (Fig. 3), Nel emphasizes the extremities of space by elongating the image analogous to astronomical images being created by a series of pointings that are stitched together to create coherent overarching composite views. [11]

![Figure 3. Karel Nel, Point to Line to Plane: An Astronomical Treatise, Kyoto, sprayed pigment on bonded fibre fabric 270 by 50cm. 2018. (© Karen Nel. Photo: James Fox.)](image)

The work depicts the conceptual strategy of projecting one’s consciousness and training one’s eye on a particular point in space:

“The line of sight aligns itself with the phenomenon of light travelling in straight lines, regardless of the fact that we understand light as being wave and/or particle. The individual planar images are visual representations of data that form ‘slices’ of the universe, which are often stacked on top of one another to provide an in-depth view.” [12]

Residencies differ in scope as defined by the dictates of their umbrella entities in the academic, governmental, civil and commercial sectors. The Nel/COSMOS residency began just after the new millennium, and developed in an insular fashion to suit the needs of the team astronomers primarily, as contrasted to the New Space culture’s community-based approach designed to engage the participation of an extended group, such as Forest Stearns’ work at Planet.

As principal artist in residence at Silicon Valley’s small satellite industry disruptors Planet, Forest Stearns laser etched over 300 nanosats in their Dove flock constellation with artwork created by himself, (Fig. 4) other artists he extended residencies to (Fig. 5) and Planet’s
employees and family members. Planet’s work spaces, receivers, dishes, radomes as well as the fairings of Orbital ATK’s Minotaur and the Indian Space Research Organization’s PSLV-C37 rocket also received an artful make-over. In his five years there from 2013-2018 Stearns, created for Planet the largest art exhibition in Earth’s orbit. [13]

![Fig. 4 Dove satellite, Build 31. 2013. (©Forest Stearns)](image)

![Fig. 5. Dove satellites, 2013. (©Forest Stearns)](image)

Both residency models are tailored to their sponsors, participants and audiences and their creative contrast is the key to their success. Scoville notes that the growth in attendance at the annual COSMOS meetings over the years are atypical for such a lengthy project, and credits Karel’s artwork and presentations as one of the reasons why people keep coming back, and why a larger number of younger astronomers are continuing to engage each year. Scientists, too, enjoy inspiration from the arts. Nel’s interest and commitment was reciprocated by the astronomers welcoming him in their midst, being interested in what he thought of their research, and curious as to how he would represent their emerging findings.

Both art and science require time dedicated to their pursuit, and a measure of their sustainability is predicated on devoting time to the project. Nel visits observatories globally and spends one third of his studio time on astronomical artwork. Additionally, the Nel/COSMOS collaboration is
sustained by a dialogue based on the continued absorption in both art and science over an extended period of time.

**Going Forward**

From 2004 to present, the Nel/COSMOS collaboration is one of a growing number which are having a cumulative effect as art focused on the phenomenon of space is becoming increasingly more complex and wider in scope. The increasing dialogue between artists and scientists contributes to a deeper understanding of the complex reality in which we are embedded. What Scoville had originally envisioned as a four-year project for COSMOS has expanded into fifteen. As COSMOS’s success is measured by their ongoing discoveries, the parameters of the project keep deepening. Its momentum will continue to nurture many new astronomers on into the future.

The potential to develop more collaborations, such as that of Nel with COSMOS and Stearns with Planet, has never been as replete with possibility as the global culture becomes more reliant on space technology and the New Space Culture develops exponentially. The motivation to analyze Art/Sci collaborations is to add to the body of knowledge that surrounds the value of space art to space science and the reverse. This data will inform the design of future Art/Sci collaborations to exploit the global drive towards space exploration and become an even more significant influence in the next evolution of the space industry.

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**References**


11. See Nel [10]

12. See Nel [10]


**Biographical Information**

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