

DIFFRACTIONS

ON PHOTOGRAPHY, PHYSICS AND THE IMAGINATION

Essay by
Ariane Koek

A slice of time. A sliver of space. That gap between the eye, mind and hand. Captured. Imprinted. Then Turned. Inside. Out.

What follows is a diffractory essay – deliberately echoing the way light disperses when it passes through the camera lens. It is a form which the theorist Karen Barad espoused in a revolutionary essay on that moment in time when humankind created through technology and science the light of a million suns by detonating the atomic bomb:

“Diffraction as methodology is a matter of reading insights through, rather than against each other, to make evident the always-already entanglement of specific ideas in their materiality.”¹

Non-linear – the essay is a series of dis/connections focussed on the most invisible, contentious and elusive aspect of being human – the imagination – in relation to five photographers who are part of the Backlight Festival. Entangled in readings of them, are also reflections on the physics of light, and four encounters about the nature of reality between one of the greatest physicists of all time, Albert Einstein, with four leading figures of the twentieth century.

In 1930, the celebrated physicist Albert Einstein encountered the Hindu mystic and poet Rabindranath Tagore, beginning on the occasion of his 70th birthday. In four different encounters, which were publicised initially in the New York Times, they discussed the nature of reality, free will and determinism.² They disagreed wildly. One of their discussions touched on the existence of the moon. “Does the moon only exist if we observe it?” Tagore said it could – and that it was all part of a universal mind outside human consciousness. Einstein thought the opposite – and that it only could exist in the human mind.

In this encounter, which the philosopher Sir Isai-ah Berlin called ‘a complete non-meeting of minds,’ the pair never directly discussed the imagination. Imagination is notable for its absence in their con-

versation. It's a void. Yet it is precisely at these moments, that the imagination is actually very present. Just like in physics – where the void is a place not of inactivity but of intense energy and interaction between particles. It is when apparently unrelated realities and points of difference meet, that the imagination is sparked into existence. At this point of collision – anything might happen. And can. Across time and space. Which the imagination defies.

In his series *Lunacy*, the Dutch artist Sjoerd Knibbeler collides the moon and the imagination by drawing on humankind's obsession with travelling to the moon. He imagines, and then creates, new cosmologies and constellations of bizarre spaceship forms that sometimes look like planets or errant stars. These photographs aesthetically, partly because of their use of black and white and partly the style of the objects themselves, hint at being from the past, or are a vision of the future from the past. Perhaps they even herald a future past the future-present-past. They are so fantastical and otherworldly that the photographs tantalise one into thinking the forms might be digital. But they are fantasy created out of reality. The objects are made by hand, out of the materials of wood and fibreglass which are only found on earth. The photographed objects appear timeless and space-less – they could be anytime and anywhere. They hint at a new form of coexistence – a 'spacetimemattering'³ – where all the dimensions in which we exist are interconnected and interplay in a beautiful entanglement. The earthly is entangled in the unearthly: they are in and out of this world.

This out of time and place-ness which Knibbeler's photographs simultaneously evoke are partly due to his unusual use of light. Once a month he would load his handmade spacecraft into the van and drive them into the darkest parts of the Netherlands he could find. He then built sets in open fields and took the photographs at night, using the moon as his light source.

Thus, the photographer, the eye, the camera, the photograph, the object, and the print are all imbued at different moments of the photographic process by moonlight. They are photographs – drawings of light – drawn by the elusive light of the moon which originates from the sun and not from that planet itself. Moonlight has always symbolised enchantment, magic, elusivity and unpredictability – qualities which are akin to the imagination itself. A veritable lunacy.

TIME

On April 6th 1922, Einstein had one of his most explosive meetings, with one of the world's greatest living philosophers, Henri Bergson. It was an encounter which was to cost Einstein being awarded the Nobel Prize for his theory of general relativity, and being awarded it instead for the idea of photoelectric effect – light behaving like a stream of particles, rather than in continuous waves.⁴

The two men's discussion was focussed on time. Bergson was well known for his theory of time which explained what clocks did not do, such as memories, intuition and premonitions. He believed that time should not be only seen through the lens of science and that Einstein's theory of time, prevented us from realizing that "the future is in reality open, unpredictable, and indeterminate." The enraged Einstein rebutted "Il n'y a donc pas un temps des philosophes," stating that the time of the philosophers did not exist, adding further fuel to the fire the following evening by saying "There remains only a psychological time that differs from the physicist's." Philosophical notions of time were dismissed as whimsical. The much younger Einstein was judged to have beaten the older Bergson in the public debate, and Bergson's defeat was seen as representing the victory of rationalism over intuition.

The *Lunacy* series was created through testing time – mechanical clock time was pitted against

intuition over several months. Whereas Knibbeler's light meter said he should expose the photograph for 30 minutes, the experience of following his technical instruments taught him otherwise. He needed his own intuition, his own bodily responses to the moonlight, combined with his senses and the technology of his camera. He was forced to experiment, to fail, and the limits of technology were clearly exposed. This kind of time – elusive moonlight time – waits for no wo/man. Wo/man must wait for, in, of, by and through moonlight time. S/he must inhabit it. Always.

In the era of the global pandemic, time feels as if it is on hold. We are forced to feel it, rather than observe it on watches, computers and digital screens. Past, present future mesh and merge into a present-future-past to become one endless bodily and earthly present now. Utopias depend on a linear concept of time – of a sense of the past which is overturned in the present by the imagining of a future beyond both. What happens to imagining utopia when time has collapsed into itself as it has today? Time in the global pandemic seems to be imitating the physics of a black hole – those strange regions in space where gravity is strong enough to bend light, warp space and distort time. Only time will tell.

The Indian photographer Sameer Tawde's created his series *Holy Boulevard* before the pandemic – both as film and as still photographs. The series is a representation of a magical, timeless imagined utopia. Or so the aesthetics bewitch us into thinking. Awash in light, with colours and shades of whites, greys, and taupes, the photographs are dreamlike, and appear to be of beautiful, complex white structures floating in the middle of a becalmed, endless and perfect ocean. The structures have a familiarity and strangeness about them. They are both heimlich (the homely/familiar) and unheimlich (the unfamiliar/strange) – as outlined in Freud's essay on the

uncanny⁵. Their extreme beauty and whiteness are unsettling. The structures form an architectural calligraphy – their lettering spelling out a message we are not yet able to read and in a language which is so far beyond us.

Under the layers of this dream-like world, lies Tawde's actual process of making the photographs. These aesthetically intriguing structures are not pre-existing towering monolithic buildings. Instead they are miniature pieces of manmade toxic and non-biodegradable packaging and waste, most of which end up in landfills or in the sea. Their structural beauty paradoxically contributes to the climate crisis – the destruction of the very planet they are photographed on and whose resources they are made with. As the artist himself says "Though I am creating the Utopia, I am also giving a satirical commentary on the utopia of our society. It reflects on the relationship we humans have with our environment."⁶

Environmentalists, such as Vandana Shiva, Rachel Carson and James Lovelock, have long been warning that we make our planet's future, by our actions in the present and past. The pandemic is emphasising and teaching us first-hand that every action has a consequence however far or distant those actions are in time and space. We are all entangled in a universe of intra-action where anything affects everything and whose ripple effects are felt anytime, any place, by anyone. This awakening to the consequences of all actions and their 'intra-connectivity' as the theorist Karen Barad calls it, means that utopia may now not even be able exist in our imaginations because linear time is redundant. All that exists is now. *Holy Boulevard* is like the signal of the last Utopia – a dying idealism. These photographs clearly show Utopia as being already tainted by its very opposite – dystopia, the collapse of human civilisation and the sixth mass extinction, which we are being forced to look at, be part of. Experience. Now.

SCIENCE

In the midst of this new endless present, is science. What we are witnessing today is science developing knowledge in real time – with all its contradictions, protocols, disagreements, and failures, as well as triumphs, successes, and hope. Struggling to understand a virus as it changes and responds to different people in different ways on a global scale. Developing vaccines which science doesn't yet know can work, and if they do work, for how long they can give immunity. It is knowledge in the process of becoming, through trial as well as error, working to save human lives. Science isn't simply a linear progression moving swiftly forwards to a resolution, as this current experience of science-in-the-making is showing us all. Reality is much more complex than that.

The Hong Kong image based photographic artist, Sheung Yiu, is fascinated by the ever-evolving relationship between photography, science and truth. Photography has had a long history as being instrumental in the advancement of scientific knowledge, revealing new invisible realities which are hidden to the human eye. From the 18th century Henri Becquerel's photographic plates which revealed radiation and William Henry Fox Talbot's photomicrographs of diatoms seen through a solar microscope, to in the twenty first century's Hubble Space Telescope recording the light of galaxies 3-8 billion light years away from the earth, photographs have been both evidence as well as initiators of new lines of scientific enquiry in the pursuit of knowledge and revealing Nature's secrets

Yiu's series *The Poetics of Science* apparently shows science-in-the-making – with images which seem to be recreating scientific experiments in all their supposed objectivity and exactitude. The photographs recall the aesthetics of science textbooks: the standard colours, the frozen actions, the dispassionate gaze of the participants and their

observant stillness. All the props are there too – notebooks, graphs, rulers, the laboratory coats – together signalling science, measurement and authority.

The artist made the photographs by closely studying the production and application of imagery in science textbooks in Hong Kong and Taiwan, together with interviewing quantum physicist, Tjonnie Li, in order to understand how such images reinforce the idea of scientific knowledge as authoritative and uncontentious. Yiu's deliberately textbook-like photographs contain within themselves hidden contradictions. The notes in the notebook are meaningless. The red dots on the forehead could relate to anything. Science in these photographs is revealed as performative – having a hollowness based solely on constructed appearance and style, devoid of content. Thus, the photographs hint that there is something 'other', beyond the material world and this scientifically clean locus of appearances and apparatuses. Something which has not been caught. Something which eludes captivity by technology and the human eye. Imperceptible but just as real. Vital.

'Knowledge is limited, imagination encircles the whole world.' This much used quote by Einstein commenting on the limitations of science was the subject of a newspaper interview with the writer George Viereck in 1929.⁷ Einstein made the comment after discussing the 1919 expedition led by the British physicist Arthur Eddington to observe the sky during a solar eclipse. Eddington's observations confirmed what Einstein had predicted in his theory of general relativity – that starlight could be bent by the gravitational field, like that of the sun. In this context, when scientific theories are only verified by observation, Einstein's quote indicates that imagination could be both a precursor and precondition for knowledge. It is only with imagination that we can go further and beyond the observable world, includ-

ing when it is enhanced by technology, to challenge the parameters of science, and create new ways of knowing. The imagination is a new way of seeing – before the process of seeing and observing itself which also runs through it. A reconfiguration of time and space.

The series *Diary of an Introvert*, also by Sameer Tawde, reveals a seeing which reorientates space. Reconfigures scale. Creates new ways of observing and looking at the world. A goldfish the size of a zepelin swims out of focus in the sea of the sky. The palm of an outstretched hand draws in the lines of power cables overhead. A pair of glasses contain barbed wire fences within their lens in stark contrast to the horizon. A bent lamp bends over a human to offers an opening as it is a portal to another world. The artist himself describes the work as being based on the opposing concepts of the real and the imaginary coming into contact with each other. Everyday objects and settings are defamiliarized from their accepted scales and place in the world, leading to new possible realities, where objects, settings and viewers relate in new ways not seen or thought to be even possible.

When we physically see, our eyes at first actually see 22 different images. Our brain re-oriens these images, collates them, and then gives us back just one.⁸ What happens if there are brains which can't manage this consilience? If there are secretly people who see more than one image when they look at material reality and the world? Is this what artists really are – because somewhere their brain is resounding with the memory of those other 21 discarded images? Perhaps imagination is the ghost of the eye.

THE VOID

In May 1911 Einstein was in Prague. So was the writer Franz Kafka. Both these masters of looking at reality and perception through their respective fields of

the arts and sciences were in the same place at the same time, but did they ever meet? Apparently not, because there is no material record of them ever having done so. However, we know that both men attended, on at least one occasion, evening gatherings in the famous salon of the public intellectual Berta Fanta, and that Einstein may have lectured to this audience on the relativity principle in May 1911. It is likely that Kafka was present at this lecture too.

The book *Einstein in Bohemia* by the science and cultural historian Michael D Gordin picks up the threads of this 'unknown' but 'likely' meeting to show how Einstein's time in Prague shaped the science, literature, and even politics of the city for decades to come.⁹ He also shows the same is true in reverse: the acquaintances Einstein made in Bohemia and ideas he was first exposed to there, continued to occupy him throughout his life. During this time Einstein wrote an early paper on gravitational light deflection, published 4 years before the completion of his general theory of relativity; he seriously thought about nationalism; and even more deeply about his identity as a secular Jew, when he was introduced to the Zionist movement in Prague. In turn his thinking influenced his friend the physicist Philip Frank, who subsequently headed up the German University in Prague, into leading the city to become a centre of a philosophical tradition that was inspired and challenged by Einstein's innovations in physics.

By taking a void in the historical record, Michael D Gordin shows the possibilities of taking lack of historical record as a jumping off point to pursue instead other multiple histories, including that of the city itself. Maybe Kafka and Einstein didn't physically meet, but maybe their minds did in a different way. Physics says that today we share the same breath as that of Einstein and Kafka, as well as those of dinosaurs millions of years ago. Similarly physics also shows we are all made from the explosion of stars from the Big Bang, some of which lodges in the

bones of our skeleton. Indeed, every hour, we have tiny mini explosions within our own bodies as particles of matter meets antimatter and annihilates, creating a beam of light within us which shows up on scans and is a mimicry of the Big Bang 13.8 billion years ago. Thus, our very existence, as well as our own bodies, are a form of time and space travel. Our breath and our bones are attest to this. Michael D Gordin shows interconnectedness, by taking as its starting point a history which materially is not there, to reveal other histories. The missing history becomes a way of looking at history in another way – looking through the void of information to come up with other related realities and multiple interconnected histories.

The void is an important concept in both science and philosophy which fascinates the photographer Marjolein Blom in her series, *A Monkey Peeled an Onion* which is subtitled *In Search of Nothing*. For the ancient Greeks, like the pre-Socratic philosopher Democritus, the universe existed of atoms existing in the void, whilst Aristotle rejected the idea of the void entirely. Over time, the debate shifted from could a true void exist philosophically to investigations into it from empirical science like physics and astronomy. Some of the most fundamental scientific discoveries and theories came from this investigation: for example Einstein's general relativity theory, Paul Dirac's theory of matter and anti-matter deriving from the vacuum, and the quantum-void, being examined in particle accelerators, showing an infinitely deep vacuum, filled with particles and buzzing with energy.¹⁰

Blom's series of photographs seem to show experimentation in progress – some absurd, some possible. A gloved hand is pumping up a balloon. A ball is hurtling towards a board. A glass of water contains a landscape held in suspension upside down. The photographs are driven by an aesthetic which gives the photographs an aura of

mythmaking and fabulation in contrast to the textbook aesthetic of Yiu's *The Poetics of Science*. Blom also alludes in the series, with two black photographs, one which shows a deep fissure in rock, to dark matter and dark energy – which are thought to comprise the other 95% of the universe which we know nothing about, hence the word dark – a void at the centre of our understanding of nature and her processes. The photographs are playful ode to the act of searching, even when possibly nothing will be found. They are an encouragement for everyone, to keep wondering, exploring, discovering as well as imagining beyond what we already know of reality – even if we find nothing.

The voids at the core of the photographs, *Into The Underworld / Ngā Mahi Rarowhenua*, by the New Zealand artist-surveyor, Chirag Jindal, have a very different significance. His photographs reveal vast networks of empty, unseen underground lava caves which were once the site of urupā (burial) and war shelters, and are considered wāhi tapu (sacred) by local Māori groups. These spaces below ground are shown together with the 'developed' space above ground populated by cars, houses, roads and shops in a vast urban sprawl. Ongoing discoveries of these underground yet sacred spaces are going unreported by developers who then destroy them, and few are expected to remain by the end of the century.

These vast photographs are luminous cross-sections, almost biopsies, of the landscape, showing simultaneously below and above ground in one photograph. But they are also an inversion of light and darkness, with the dark underworld caverns full of light.

The technique used to make these photographs is LIDAR (which stands for light imaging, detection and ranging) was originally used in meteorology by the National Center for Atmospheric Research in the USA for measuring clouds. The general public first became aware of the usefulness of lidar sys-

tems in 1971 during the Apollo 15 mission, when astronauts used a laser altimeter to map the surface of the moon. It has since been used for archaeology and for analysing the forensic science in crime scenes. LIDAR technology registers objects by illuminating objects with pulsed laser light and measuring the reflected pulses with a sensor. The differences in laser return times and wavelengths then creates millions of data points which makes the digital representation of the object. Unlike a normal analogue camera trapping light, the LIDAR camera sends it out.

Jindal's earthscapes evoke visually for the viewer the use of CT scans on the human body, including the brain, thus aesthetically linking the human with the land, breaking down the distinctions between human and non-human. Landscape becomes 'the skin of the earth' and 'a layered material geo-neuro-bio-graphy of bones and bodies, ashes and earth, where death and life meet.'¹¹

Jindal's work illuminates this layered 'geo-neuro-bio-graphy'. But there is also another layer to his work – race. It is clear that what we are also looking at is the oppression of the indigenous people of New Zealand by capitalism and the white community. The caves are built over and the land above it is 'developed.' The word 'developed' suggests progress, but these ancient sites filled with ancient knowledge and learning are being destroyed and the spaces above them are being colonised, the buildings literally suppressing and pressing down on the ancient culture beneath them. Jindal's work in the way it examines and shows the conditions and context of its own making – racially and structurally – is an example of what the photography philosopher, Daniel Rubenstein, says is the purpose of photography in the 21st century: digital technology enables photography to move away from the image being everything, instead enabling it to expose the conditions and contexts of its own making outside the photograph itself. Jindal's work cer-

tainly does this, by first bewitching the viewer in by its virtuoso, beguiling aesthetic and its dimensions and then pulling the viewer into its deconstruction of context and viewpoints. Note also the way in which Chirag consciously refers to himself as surveyor-artist – bridging the gap between the two professions to make them one.¹² His work literally shines a light on the structures and hierarchies which lie beneath human society.

LIGHT

When it's a dark, there appears to be no light. But from a physicist's point of view, the darkness in fact is full of light everywhere, in the form of electromagnetic radiation with different frequencies and different ratio of waves. So, nothing is really as it appears – or as we have defined it by using binaries to create oppositional ways of perceiving and thinking about our world. Dark is in fact light.

When we look at the light of the stars at night, it is actually taking hundreds, thousands and even millions of years to travel from the other side of the universe to meet our gaze. So, we are in fact looking back in time.

This goes also for when we look at anything down on earth. We are always seeing everything in the past – a few seconds later. This is because we are simply interacting with light that's hitting our eyes now. We don't actually really see the photograph we are holding in our hands and looking at. What we are really looking at are photons of light hitting our eye that left a photograph a few nano-seconds ago. This is then reconstructed into the photograph by our brains. So, the human eye and the camera are not that dissimilar – they are united in being mechanisms which can never represent the present as anything other than being the past.¹³

The Italian philosopher Frederico Campagna says that since the 17th century and up until now, we have been ruled by *Techne* – by the rigid logic of

science, in which data, technology and linearity are privileged as the true paths and access to truth and knowledge. In his book *Technic and Magic: The Reconstruction of Reality* he shows however that this is a repressive strategy created to keep society, populations and the individual under control, and as a way of containing the potentially revolutionary zeal of magic – and what might also be defined as the imagination. He shows how in fact magic, alchemy and the imagination were an essential part of the physical sciences, but how in the Enlightenment, arts and science were falsely separated and became binaries opposed to each other, one being seen as rational and the other as imaginative.

Photography transcends the binaries of technique and imagination, art and science, knowledge and the intuition – showing their intra-connection, breaking the binaries down to show a more complex world beneath. The imagination in photography is not just confined to the envisioning and creating of new worlds which are subsequently photographed. It is also part of the technological process of taking, exposing, developing and printing the photograph, as well as the experience of the viewer looking at it – what Walter Benjamin calls ‘the optical unconscious’ the term he coined in 1931 to capture the realm of the unseen that photography introduces. The term also signals the medium’s unsung role in allowing us to glimpse the expansive terrain of the human imaginary.¹⁴

The five photographers from this Festival encountered in this essay trouble and disturb accepted notions of time, space and materiality. They shake our simple acceptance of them as constants, inviting us to see the unseen and what lies beyond the frame, by creating new imaginaries contributing to the reshaping, renaming and re-experiencing of the world we are inhabiting in all its complexity. They are in the words of Donna Haraway – ‘staying with the trouble’ – and in so doing, are releasing the transforming power of photography as imagination.

- 1 *Troubling time/s and ecologies of nothingness: re-turning, re-membering, and facing the incalculable* New Formations Issue: 92: Posthuman Temporalities Autumn 2017 Karen Barad
- 2 <http://www.physedu.in/publication/webspecials/PE-WS17-06-082>
- 3 A term used by Karen Barad to denote the intra-action and inter-relatedness between space, time and matter. Cited in *Troubling time/s and ecologies of nothingness: re-turning, re-membering, and facing the incalculable* New Formations Issue: 92: Posthuman Temporalities Autumn 2017
- 4 *The Physicist and the Philosopher: Einstein, Bergson, and the Debate That Changed Our Understanding of Time* by Jimena Canales © 2015 by Princeton University Press.
- 5 <https://web.mit.edu/allanmc/www/freud1.pdf>
- 6 <https://www.photofairs.org/news/artist-takeover-sameer-tawde-dialogues-introvert>
- 7 http://www.saturdayeveningpost.com/wp-content/uploads/satevepost/what_life_means_to_einstein.pdf
- 8 I am indebted to the CERN physicist Alan Litke for long and detailed discussions about the human eye
- 9 *Einstein in Bohemia* Michael D. Gordin Princeton University Press 2020
- 10 *The Void* Frank Close (Oxford University Press 2007)
- 11 *Troubling time/s and ecologies of nothingness: re-turning, re-membering, and facing the incalculable* Karen Barad New Formations Issue: 92: Posthuman Temporalities Autumn 2017
- 12 *What is 21st century Photography?* Daniel Rubenstein Philosophy of Photography, Volume 7, Numbers 1-2, October 2016, pp. 155-160 (6)
- 13 When we look at a photograph, it is said we are confronted with what Roland Barthes labels the “having-been-there” quality of its contents. It is a testament to the existence of a specific thing in a specific place at a specific time A photograph can only show the past-but it represents it in such a way that it appears in the present. This paradox lends every photograph a touch of nostalgia or longing. But what is forgotten in this, is that everything we see is actually in the past due to the nature of light itself – as essential to the workings of the camera as it is the universe itself. We never see anything in the present.
- 14 Walter Benjamin, “A Small History of Photography,” in *One-Way Street* (London: New Left Books), 240–57.