

BOOKS & ARTS

Quantum weirdness and surrealism

A joint exploration of early modern physics and the surreal art movement shows these twentieth-century revolutions had more in common than we thought, explains **Philip Ball**.

Surrealism, Art and Modern Science

by Gavin Parkinson

Yale University Press: 2008. 294 pp.

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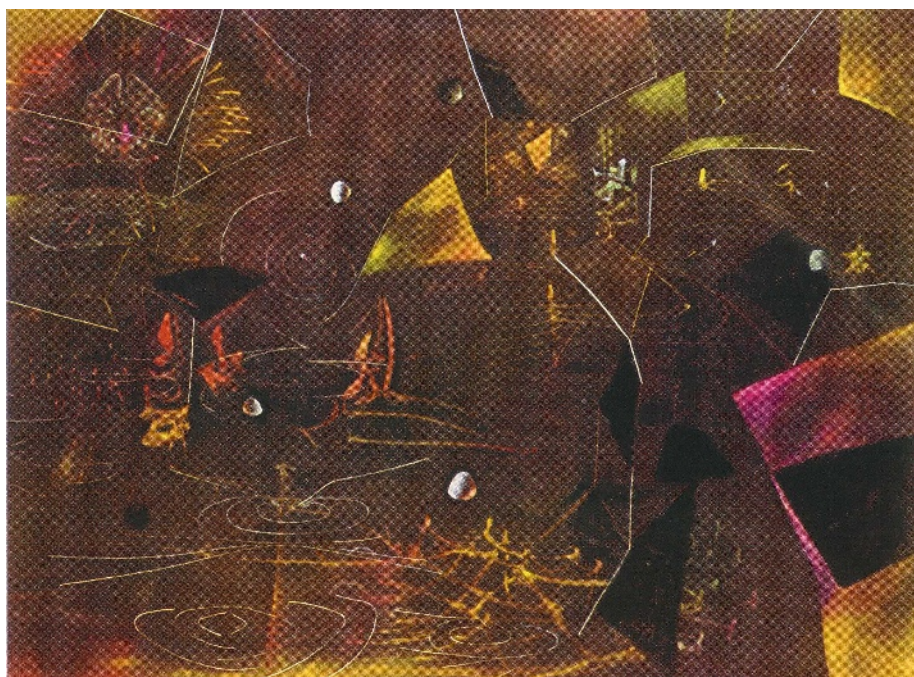
Surrealist artists working in the early twentieth century, including André Breton, Max Ernst, Man Ray and Salvador Dalí, disorientated their audiences using odd, ambiguous juxtapositions and distortions of objects and images. Around the same time, relativity and quantum theory unsettled scientists with notions of plastic time and space, multiple truths and challenges to causality.

Surrealism, Art and Modern Science shows the links are explicit, not a superficial analogy applied in retrospect. The Surrealist artists referred repeatedly to relativity and quantum mechanics in their writings. Dalí intended his drooping watches to allude to distorted space-time, describing them as a “soft Camembert of time and space”. Gavin Parkinson’s study removes any contention about the connection between surrealism and physics, and makes you wonder why it was not made before.

An art historian at the Courtauld Institute in London, Parkinson paints a engrossing picture of the period between the 1920s and 1940s, when modernism flourished and created an intellectual ferment that spawned numerous highbrow journals wherein art and science met. He challenges the simple view of physicist and writer C. P. Snow that the ‘Two Cultures’ of art and science have nothing to say to each other, and, even if they did, no mutual language in which to speak it.

An important bridge between the Surrealists and physicists was *The New Scientific Spirit*, a book published in 1934 by the French philosopher Gaston Bachelard. Trained in chemistry and physics, Bachelard became steeped in the proto-Surrealist poetry of Paul Éluard and Paul Valéry. Seeing the progression of science as a series of jumps rather than gradual advance, a position now attributed to science historian Thomas Kuhn, Bachelard considered his own times to be a period of rapid intellectual change. During revolutionary epochs, he said, there is a moment when old notions have shattered but new ones have not yet crystallized, when one must consider seemingly irrational ideas that are propelled by their own momentum.

It is no wonder the new physics appealed to the diverse, volatile band that constituted



Roberto Matta's *The Vertigo of Eros* conveys the collisions and confusions of modern physics.

the Surrealists. Motivated by deep, even ponderous, philosophical ideas, these artists wanted to discard the comfortable certainties of representational work while avoiding the retreat into mysticism that total abstraction threatened. For many Surrealists, art was a means of investigating the world, particularly the self. The influence of Sigmund Freud's psychoanalysis on them has been well documented, but physics offered vindication of their concepts too. The painter Roberto Matta said that Albert Einstein was as important as Freud to the modern artist, and filled his pictures with geodesic space-time grids like those now used to illustrate black holes and wormholes. The polymathic Valéry, Breton's mentor, cultivated friendships with physicists Paul Langevin and Louis de Broglie, Jean Perrin, Niels Bohr and Einstein.

Physicists sometimes reciprocated. Marie-Antoinette Tonnelat, de Broglie's colleague, said in 1952 that “In physics as in painting, Surrealism denies the possibility of a description which does not carry explicitly the stamp of the observer” — we construct what we see. In 1934, philosopher Henri-Charles Puech wrote that in modern physics “the exact delineation of reality gives way to a vaguer consideration of

unities more or less arbitrarily defined.”

No radical artist could resist this message. Thus, Surrealists sought to enlist physics to unbalance our preconceptions. If you think our pictures are absurd and bewildering, they said, just look at what the physicists are saying. Some artists betrayed a kind of science envy: Dalí spoke of science's “burning analytic precisions”. Both he and Breton tried to steer a path between art and science, maintaining ambiguity about their true goal.

Were these appropriations of science merely misconceived analogies? Parkinson, whose introduction to the physics of this era is splendid and nuanced, is aware of that danger, as were some of the artists. The Viennese painter and writer Wolfgang Paalen criticized some fellow Surrealists for using science simply as poetic ornament. Other artists cloaked their superficial understanding in the opaque verbal blanket for which French philosophy later became notorious. Breton's partial grasp of physics did nothing to check his arrogant appropriation of it: after he interpreted Einstein as saying that “one event can be the cause of another only if they can both be brought about in the same point in space”, he blithely added “that is what I have always thought.”

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The Surrealists' interest in physics was genuine. But *Surrealism, Art and Modern Science* gives the impression that it was one of several themes commandeered for, and then shoehorned into, a radical social and political agenda. Breton and his fickle coterie flitted between Werner Heisenberg's uncertainty principle, Marxism, magic and occultism. This need not be problematic if they were simply looking for artistic inspiration, but Breton's intent was to make statements about the nature of reality.

One difficulty is that the scientific dilettante often converts particulars to generalities. What

applies under one special, constrained set of circumstances is held up as a principle applicable to all things. Relativistic distortions and quantum indeterminism become universal attributes. Dalí, for example, spoke of a "psychic dilation of ideas" — as if our adherence to classical concepts were a conservative, bourgeois delusion rather than a necessary approximation. Parkinson describes how, when physicists such as Arthur Eddington used everyday analogies for pedagogy, their artist readers took them literally.

Perhaps we should not listen to what the

artists say, but look at what they do. In his painting *The Vertigo of Eros*, Matta conveys as well as anything I have seen the collisions and confusions of the new sciences, combining multiple reference frames with allusions to Hermann Minkowski's bent space-time and to particle physics. The picture does not precisely illustrate, still less illuminate, the science that inspired it. It creates a nexus of reference points that sets the mental pathways buzzing. That is surely what good art does. ■

Philip Ball is a consultant editor for *Nature*. His latest book is *Universe of Stone*.

Wish you were here?

A Nuclear Family Vacation: Travels in the World of Atomic Weaponry

by Nathan Hodge and Sharon Weinberger
Bloomsbury: 2008. 336 pp. \$24.99, £12.99

How are you spending your next holiday? Tired of the same old thing? You might want to pick a different destination from *A Nuclear Family Vacation*, a new book and travel guide by veteran defence reporters Nathan Hodge and Sharon Weinberger.

This husband-and-wife team take the reader on a rapid, darkly comic tour of nuclear weapons sites across the world. A rare achievement in a nuclear policy book, their narrative demystifies an intimidating topic for a broad audience without sacrificing substance.

Instead of pontificating on thermonuclear war, Hodge and Weinberger give us an eye-level view, often through their car window. They take us to former Soviet testing grounds in Kazakhstan, missile defence sites on remote Pacific islands and nuclear laboratories around the United States, including once-secret nuclear bunkers built to shelter dignitaries in the Catoctin Mountains, 100 kilometres north of Washington DC. The couple meets the people who work there and listen to their stories.

US Air Force missile men still work three-day shifts in underground silos, ready to launch nuclear warheads with 15 minutes' notice. Workers at the Y-12 complex in Oak Ridge, Tennessee, are tearing down the buildings in which cold-war arsenals were assembled, and constructing new ones for another generation of warheads. Scientists at labs nationwide continue to dream up new weapons, even with the lack of a clear and present danger. Gerold Yonas of Sandia Laboratory in Albuquerque, New Mexico, was one of the architects of the Strategic Defense Initiative, or 'Star Wars

programme', a proposal to protect the United States and its allies from attack by nuclear-armed missiles. He admits that his career "has not been marred by a single success", but past design failures have not stopped him from dreaming up new doomsday weapons. The book paints a powerful portrait of a sprawling, decaying nuclear complex struggling to perpetuate itself without a clear purpose.

When *A Nuclear Family Vacation* is good, it is very good. Hodge and Weinberger tackle the suitcase nuke, a small nuclear weapon that could be delivered by a single soldier, something I get asked about at nearly every lecture. They describe the closest US attempt to build such a device, the Special Atomic Demolition Munition, by taking us to the National Atomic Museum in Albuquerque, where a mock-up of the weapon is on display. They discuss the history of other tactical nuclear weapons. My favourite is the Davy Crockett, a nuclear bazooka designed to fire a sub-kiloton warhead 2 kilometres — the US Army eventually realized this was not such a good idea. These stories bring the issue alive.

Hodge and Weinberger interview scientists, bureaucrats and politicians to flesh out daily life in the nuclear weapons complex, including the labs at Los Alamos and Sandia in New Mexico, Lawrence Livermore in California, and Oak Ridge. Standing alone in a vast desert, settled alongside a major progressive city, or tucked into the Appalachian mountains, these remnants of cold-war infrastructure battle to define their new role. Once bustling centres

of activity are skeletons of their former selves. Safety and security standards have dropped and gifted scientists are drifting away.

But the laboratories and weapons are not fading away completely: the money is still flowing. For many communities, the labs are an important source of jobs. For many officials, nuclear capability is still central to the national security strategy. The United States spends more than \$54 billion each year on nuclear weapons and related activities. Plans for a reliable replacement warhead, or RRW, would enlarge the weapons production facilities. The new warhead is the cornerstone of an ambitious expansion plan called Complex 2030, in which the United States would ramp up its ability to produce nuclear weapons and design and field thousands of new warheads. At a price. William Hartung of the New America Foundation think-tank conservatively estimates that "the full costs of Complex 2030 could easily reach \$300 billion ... a \$125-billion increase over the estimated costs of maintaining the current complex."

Future plans must take into account more than fluctuating budgets. Hans Kristensen



Iran's Isfahan atomic facility: a hot destination for nuclear tourists.

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