

A Photographic Model

Clem Baker-Finch

The Australian National University

[Images taken by cameras] are able to usurp reality because first of all a photograph is not only an image (as a painting is an image), an interpretation of the real; it is also a trace, something directly stencilled off the real, like a footprint or a death mask. While a painting, even one that meets photographic standards of resemblance, is never more than the stating of an interpretation, a photograph is never less than the registering of an emanation (light waves reflected by objects) — a material vestige of its subject in a way that no painting can be. (Sontag)¹

A motive for this exhibition is the exploration and expansion of the boundaries of the photographic. The contention of this essay is to begin with a careful consideration of the ‘reality’ that the passage above and so many other critical studies of photography invoke. Such a perspective may help to illuminate what is special and intrinsic to photography and, perhaps, other mechanical imaging techniques.

The ambiguous relation between photographs and reality is an important and ongoing theme in the study and criticism of photography, and is fundamental to the theme of this exhibition. The insightful writings of structuralist Roland Barthes are often cited in this context but there is no doubt he was exploring a path prefigured by others. The common phrase ‘the indexical nature of photography’ traces back, logically if not literally, to American logician Charles S. Peirce’s foundational work in semiotics. While Peirce’s writings are extensive and varied on the subject, his taxonomy of signs, based around three categories of relations between signifier and signified, remains particularly influential. Symbolic signs are those where the relation between signifier and signified is fundamentally arbitrary and conventional, and so must be learned. Languages in general are a good example of this relation, as are traffic lights and national flags. In the iconic mode, the signifier is perceived as resembling the signified in some sense, for example portraits or cartoons, onomatopoeia, and metaphors. Indexical signs are not arbitrary, but rather the signifier has a physical or causal link to the signified, such as a footprint, smoke or, indeed, a photograph. ‘Psychologically, the action of indices depends upon association by contiguity, and not upon association by resemblance or upon intellectual operations.’² These modes are not mutually exclusive. In particular, Peirce notes that a photograph is not only iconic but also indexical: ‘photographs, especially instantaneous photographs, are very instructive, because we know that in certain respects they are exactly like the objects they represent. But this resemblance is due to the photographs having been produced under such circumstances that they were physically forced to correspond point by point to nature. In that aspect, then, they belong to ... class of signs ... by physical connection [the indexical class].’³

In the mid-1960s, Roland Barthes distinguished three semiotic aspects of photographs which he identified as *linguistic*, *connoted* and *denoted* messages. The essential feature distinguishing photographs from other images is the denoted message: ‘What is the content of the photographic message? ... By definition, the

scene itself, the literal reality. From the object to its image there is of course a reduction ... but at no time is the reduction a *transformation* (in the mathematical sense of the term).⁴ So according to Barthes a photograph is an *abstraction* of the reality it portrays. 'Certainly the image is not the reality but at least its perfect *analogon* and it is exactly this analogical perfection which, to common sense, defines the photograph. Thus can be seen the special status of the photographic image: *it is a message without a code*.'⁵

Barthes's notion of connotation falls into Peirce's iconic and symbolic categories: the connoted message is a 'coded iconic message,' a 'cultural message.'⁶ His denoted message corresponds to Peirce's indexical mode. Barthes's interest is to explore the interaction – the 'paradox' – of the two messages, for it is the existence of a denoted message that lends extra conviction to the connoted message of photographs. Our focus in this essay is on the denotation, the index.

At about the same time that Barthes was developing these ideas, Oxford mathematician Christopher Strachey was working to develop what he coincidentally described as a *denotational semantics* of computer programming languages.⁷ Strachey and Barthes may have had quite different motivations but there are some interesting parallels. Strachey's fundamental insight was that the essence of each and every computer program is the mathematical function it calculates. In Strachey's denotational approach, the meaning of a program *is* that mathematical function. There is no intervening process of conversion or translation — a striking correspondence to Barthes's observation of the 'non-transformational' relation between a photograph and the scene depicted. Just as a photograph is a pure abstraction of the reality it portrays, a program is a pure abstraction of the function it computes. A scientist like Strachey would likely accept a description of his work as developing a *model* of computer programs — that is, a 'representation of the essential aspects of a system which presents knowledge of that system in a useable form.'⁸ The process of modelling natural phenomena generally follows a familiar path and deploys familiar tools; modelling man-made phenomena, such as photographs and programming languages, can be much more interesting.

A Model of Reality

If we accept that photographs hold such a fundamental relation to reality, a model of that reality may be a fruitful place to begin developing a (denotational) model of photographs. This 'reality' we inhabit is a limit point between the past and the future; it is the present, a period of time of zero length, impossible to detain. What is reality now is immediately gone. How do we perceive this reality? Visually, through a simple stereoscopic projection: some aspect of this three-dimensional world is projected onto a pair of two-dimensional planes (our retinas), from which our brain has learned to reconstruct something of the *z*-axis (depth) from those images — already our perception filters reality, as do photographs. Photographs capture an element of reality, a moment in time which then persists until that photograph is destroyed, so in some sense they are more real than that moment itself. Looking out the window, the leaves move, the sky changes colour. A photograph taken out the same window fixes the leaves forever. We can look at it for as long and as often as we wish. Putting aside stereoscopic technologies, in general since photographs are a projection of reality on to the *xy* plane, they offer a diminished representation of

depth, relying on the viewer's perceptions of perspective, and learned inferences from lighting.

The arguments shift slightly if we take a more modern scientific approach, treating time as a fourth dimension with an equal status to height, breadth and depth. In this four dimensional model, all of the past and all of the future is represented. However, in life we travel through this infinite four-dimensional hypercube on a finite continuous path in time and space. At least theoretically we can move anywhere in three-dimensional space, but the time component of this path is a monotonic linear path of fixed gradient for us all — it is not, and cannot be, within our control. In this framework an ordinary still photograph can be considered as a projection of four dimensions onto two, by fixing a point on the z -axis (the film or CCD plane) and the t -axis (the moment of firing the shutter). Add to that some more data defining the framing, elevation and azimuth of the camera and we have a detailed model of the reality denoted by a photograph. So long as the image survives we have at hand an element, a proof of that reality. In the same sense that a computer program is an abstraction of its function, a photograph is an abstraction of some point in history. More precisely, it is a particular two-dimensional projection of that point in history.⁹

This proposed model is purely visual — if we were present, all our other senses would be involved in the experience. But *denotationally* a photo is purely visual so we abstract out other sensory aspects, up front. The image may offer coded messages regarding other senses but that is not our immediate interest.

Subverting the Index

The type of consciousness the photograph involves is indeed truly unprecedented, since it establishes not a consciousness of the being-there of the thing (which any copy could provoke) but an awareness of its having-been-there. What we have is a new space-time category: spatial immediacy and temporal anteriority, the photograph being an illogical conjunction between the here-now and the there-then. (Barthes)¹⁰

To be useful, a model must be fit for its purpose — that is, it should be sufficiently accurate and manageably convenient to apply. For example, Newtonian mechanics is a relatively straightforward (but ultimately imprecise) model of the physical universe, but it is good enough for building bridges, roads and houses. Einstein's relativistic models are more precise physical models but they are also much more complex, so scientists and engineers only deploy them when necessary, such as in the design of global positioning systems or nuclear weapons.

To gain confidence in our model of photography, we may test its robustness: does it hold together when we move away from the most pedestrian conception of a photograph? For example, these days even the most basic digital cameras time-stamp the images they create, thereby creating a three-dimensional projection.¹¹ With GPS technology (and some cameras already have that built in) it is possible to collect most or all the other so-called metadata that defines an instance in our model, placing the accompanying photographic image precisely at a time and place. There are examples, such as *Viewfinder*, of systems which extrapolate from a collection of such metadata, to produce an immersive, navigable space, although as yet — and quite reasonably so — little consideration is given to the time axis.¹²

In terms of our model, a standard photograph is a two-dimensional abstraction (a projection) of some place and time. This may be the usual consensus of a photograph but now that we have a model to explore it is reasonable to propose more controversial possibilities. Consider, for instance, Sascha Pohflepp's *blind camera*. There is no lens, no aperture. The only interface is a shutter button and a liquid crystal display on the back, just like a regular digital camera. In fact the blind camera is a networked device, taking advantage of internet sources. When the button is pressed, the time is recorded and, using wireless technology a request containing that time is sent to the *Flickr* photo sharing servers, to begin a search. Some time later, when it finds a photograph with the same time-stamp has been uploaded, that image is sent back to the blind camera and displayed on the LCD screen. What is being 'photographed' by this machine? What is the indexical abstraction in this case? Unlike a regular camera that projects a visual reality onto an xy plane, the blind camera projects solely onto the time axis — there is no denotation of place.¹³



Blind Camera

Extending the Index

*Mathematics ... does not undertake to ascertain any matter of fact whatever, but merely posits hypotheses, and traces out their consequences. It is observation insofar as it makes constructions in the imagination according to abstract precepts, and then observes these imaginary objects, finding in them relations of parts not specified in the precept on construction. (Peirce)*¹⁴

Having adopted a convincing model, a common scientific research activity is to attempt to extend the model beyond the concrete phenomena that were the original motivation. An important constraint when extending a model is to not break what you already have — in other words, we want what works in the basic model to also work smoothly in the extended model. An example from mathematics is the Bakhshali Manuscript's introduction of negative values to what was already a perfectly good domain of cardinal numbers. The success of such an enterprise is to be judged on how smoothly the extensions interact with the original model. The important thing is to extend the *behaviour* of the model (such as, in the case of negative numbers, operations such as addition and multiplication) along with the extension of the *domain* in a sound and consistent way — hence the felicitous 'choice' that the product of two negative numbers is positive, for example.

What does that have to do with photography? Suppose — just as a thought experiment, say — we wanted to explore the idea of extending our model of reality to include what some may call *virtual objects* — those that exist as data sets, say within a computer or some other storage device.¹⁵ Now any arguments about whether these things are (really) objects is not our immediate concern, just as the inventors of negative numbers were not so concerned with their factual existence. For now this is just a formal game — we are changing the rules by simply *declaring* virtual objects to be in the same domain as physical ones. The real/virtual distinction becomes merely a classification which may from time to time be useful. We are not embarking on a thorough exploration here. My ambition goes no further than to propose a model for exploration, a framework against which to pose questions that may be answered in a useful way. And questions do arise: do virtual objects exist in something like time and space? Should we place them in separate, constructed universes? A defensible case can be made that virtual objects are just conventional icons, but that does not preclude consideration of their potential indexicality.

In particular, what might we choose as constituting a *photograph* of these virtual objects? A screen shot corresponds to a two-dimensional projection — the familiar abstraction — but now other imaging possibilities arise. If we produce a three-dimensional rendering of the virtual object, say in an immersive virtual reality environment — or in a standard monitor for that matter — is that an image, or is it the object? Here we make no claims to answer these questions, only to propose a structure within which to discuss and test hypotheses — the fundamental scientific method.

We close with a cursory consideration of a particularly rich example of a constructed universe of virtual objects. *Second Life* is an on-line world inhabited and created by millions of 'Residents.' Particularly interesting from the perspective of this essay is the Second Life Marketplace and the idea that the Linden dollar — the 'inworld' unit of currency — can be traded against the US dollar. The membrane separating the virtual and real worlds is leaking, it seems.

Other interactions across the virtual/real divide can be found, such as Linda Kostowski's and Sascha Pohflepp's *Export to World* system which, as the name suggests, allows virtual objects to be 'exported' from Second Life to the real world. Using a range of software tools, the data sets of Second Life artefacts can be taken, manipulated into life-size cut-out papercraft models, then printed and used to construct corresponding artefacts in the real world, such as the bubble gum machine below.¹⁶ In that case, which is the signifier and which is the signified? It appears incontrovertible that there is a photographic (indexical) relation but if so, in which direction? The original (virtual) bubble gum machine looks like an image of the constructed one but to repeat an earlier quote from Peirce, the constructed machine was 'forced to correspond point by point' to the virtual one.



Second Life



Real Life

Returning once again to the difficulty of distinguishing a virtual object from its image, perhaps a fundamental issue is that there is less sense of those objects existing in a history; They have no single point in time. Either they just *are* or they exist anew each time they are rendered or apprehended. If that is the case, it seems an essential difference between photographs and rendered images of virtual objects is that, to paraphrase Barthes, there is a temporal immediacy as well as a temporal anteriority. As well as a sense of *having-been-there*, we are also faced with an awareness of *always-being-there*.

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- 1 Sontag, Susan (1979). The Image World. *On Photography*. Penguin.
 - 2 Peirce, Charles S. (1931–58). *Collected Writings (8 volumes)*. Harvard University Press. Volume 2, page 306. (References to Peirce’s writings are commonly given in terms of this collection, citing the volume and page number.)
 - 3 Peirce, Charles S. *ibid.*, (2.281)
 - 4 Barthes, Roland (1977). Rhetoric of the Image. *Image, Music, Text*. Hill & Wang.
 - 5 Barthes, Roland. The Photographic Message. *ibid.* Barthes. From a mathematical background, I have occasionally been puzzled by Barthes’s qualification, ‘... not a transformation (in the mathematical sense of the term).’ My current interpretation is that the photograph itself is clearly a metamorphosis of the original, but the image is ‘true’ to the object, it is a ‘perfect analogon.’ I note in passing that the mathematical concept of *homomorphism* closely corresponds to this idea of ‘analogy.’ Emanuele Martino takes issue with Barthes’s proposition, arguing that there is a (mathematical) projective geometric transformation taking place. However, that seems to me to be exactly the ‘reduction’ that Barthes refers to. While I believe a counter-argument can be made to Martino’s position, this is not the place for an extended rejoinder. Martino, Emanuele (2003). A Set Theoretic Approach to Indication and Indexicality in Photography. *Semiotica* 147–1/4.
 - 6 Barthes, Roland. Rhetoric of the Image. *ibid.*
 - 7 Strachey, Christopher (1966). Towards a Formal Semantics. *Formal Language Description Languages*. North-Holland. pp.198–220.
 - 8 Eykhoff, Pieter (1974). *System Identification*, John Wiley.
 - 9 The matter of *history* is central to Barthes’s investigation of the photographic paradox: ‘thanks to the code of connotation the reading of the photograph is thus always historical; it depends on the reader’s “knowledge” just as though it were a matter of a real language, intelligible only if one has learned the signs,’ Barthes, Roland. Rhetoric of the Image, *ibid.*
 - 10 Barthes, Roland. Rhetoric of the Image. *ibid.*
 - 11 The three dimensions being the *xy* plane and the time axis.
 - 12 *Viewfinder* is a collaboration between the Interactive Media Division and the Institute for Creative Technologies at the University of Southern California.
<http://interactive.usc.edu/viewfinder/>
 - 13 Sascha Pohflepp’s projects are on-line at <http://www.pohflepp.com/>, with discussion of the blind camera at <http://www.blinksandbuttons.net/>. The *Flickr* website is at <http://www.flickr.com/>
 - 14 Peirce, Charles S. *ibid.*, (1.240)
 - 15 To be clear, ‘virtual object’ will be used here as an indivisible term to refer to this concept. In other words, we are not using ‘virtual’ in its adjectival sense.
 - 16 Kostowski, Linda, and Sascha Pohflepp, Sascha. *Export to World*,
<http://www.exporttoworld.net/>