# Brown “Proofs and pictures.” (1997)

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[At] this time I’ll call on your imagination; like Shakespeare’s Prologue on the imagined battlefield of Agincourt, I’ll urge you to ‘Work your thoughts!’ p. 164

There is a spectrum of ways to understand Bolzano’s achievement. … (I) *Balzano firmly established a theorem that was not known to be true until his proof. …* (II) *Bolzano’s proof explained the theorem. …* (III) *The theorem confirmed the premises of the proof. …* The consequence of adopting (III) is highly significant for our view of pictures. We can draw the moral quickly: on this view {*pictures are crucial*}. pp. 164, 5

Whewell’s ‘consilience of inductions’. p.166 w^induction

I should add that the way the picture works is much like a direct perception; it is not some sort of encoded argument. p. 166

^S: direct perception

Let us call any evidence which falls short of an actual traditional proof, ‘inductive evidence’. Mathematical *achievements* may rest entirely on deductive evidence, but mathematical *practice* is based squarely on the inductive kind. Let’s look briefly at some types. … *Enumerative induction: … Analogy: … Broad experience*:… p. 167

[T]he inferring of premises from consequences is the essence of induction; thus the method of investigating the principles of mathematics is really an inductive method, and is substantially the same as the method of discovering general laws in any other science (Russell [1907], pp. 273f.) p. 168

The relation for Godel between a general theory (such as the axioms of set theory) and individual intuitive truths is one of reflective equilibrium, to use a notion introduced by Goodman and made famous by Rawls. p. 168

~ reflective equilibrium %%

‘The minimal commonality between pictorial form and object is *logical form’ [Tractatus,* 2.18]. What this suggests is a kind of structural similarity, a notion which is captured by the concept of an *isomorphism*. p. 173

^S: Wittgenstein

Of course, the proper understanding of infinity is an unsettled question, but classical mathematics (especially set theory) seems pretty committed to actual infinities. So I see the platonistic interpretation of how the picture works as being favoured for that reason. p.174

As a ‘picture’, it represents Napoleon; as a ‘symbol’ it represents leadership, courage, adventure. The painting simultaneously manages to be about something concrete and something abstract. p. 175

If we consider a surface, the *intrinsic* features are those which characterize the surface independently of any particular coordinatization. By contrast, the *extrinsic* features depend on particular coordinate systems, and change with a change of coordinates. The connection between them is this: an intrinsic feature corresponds to the existence of a coordinate system with specific appropriate extrinsic features.(7) p. 175

n. 7 Excellent discussions can be found in Aleksandrov [1963] and Friedman [1983]. %%

It would be much better to consider the evidence acquired from pictures to be like the empirical evidence acquired from microscopes, bubble chambers, and other instruments for making observations. These instruments can be highly misleading, too. p. 178