Forthcoming in *Principia*

Making Manifest:

The Role of Exemplification in the Sciences and the Arts

Catherine Z. Elgin

Abstract

Exemplification is the relation of an example to whatever it is an example of. Goodman maintains that exemplification is a symptom of the aesthetic: although not a necessary condition, it is an indicator that symbol is functioning aesthetically. I argue that exemplification is as important in science as it is in art. It is the vehicle by which experiments make aspects of nature manifest. I suggest that the difference between exemplars in the arts and the sciences lies in the way they exemplify. Density and repleteness (among the other symptoms of the aesthetic) are characteristic of aesthetic exemplars but not of scientific ones.

Keywords: exemplification, symbol, experiment, Goodman

In *Languages of Art*, Nelson Goodman identifies four symptoms of the aesthetic: syntactic density, semantic density, exemplification, and relative repleteness. In *Ways of Worldmaking* he adds a fifth: multiple and complex reference. Symptoms are indicative; they are not conclusive. So a work of art need not display all the symptoms; and a symbol that is not, and is not functioning as, a work of art may display some of them. But, Goodman ventures, the symptoms may be severally necessary and jointly sufficient for aesthetic functioning (Goodman 1968: 254). All five cannot be necessary conditions since, as Goodman readily acknowledges,

literary works are not syntactically dense. And if, as is standardly assumed, semantic reference is restricted to denotational reference, abstract paintings, absolute music and many works of dance, not being denoting symbols, have no semantics. But from the fact that the symptoms are not collectively necessary, it may be a mistake to conclude that none of them is individually necessary. I have yet to find a work of art that does not exemplify or one that is not relatively replete. Perhaps then exemplification and/or relative repleteness are necessary for aesthetic functioning. Syntactic and semantic density are features of symbol systems; exemplification, relative repleteness, and multiple and complex reference are features of individual symbols. Arguably these differences are more significant than Goodman acknowledges.

To be sure, my inability to find counterexamples is at best a weak reason to conclude that exemplification and relative repleteness are necessary for a symbol to function as a work of art, or even to conclude that they are always present in works of art. But it may suggest that exemplification and relative repleteness have a different status from the other symptoms. In this paper, I concentrate on exemplification. Relative repleteness reappears toward the end of my argument. I will argue that exemplification is a poor candidate for a symptom of the aesthetic, not because it is necessary for aesthetic functioning but because it plays *as major a role* in scientific symbolization as it does in aesthetic symbolization. Thus exemplification per se cannot serve, even as a symptom, to differentiate symbols that function aesthetically from symbols that function scientifically. I will go on to draw a distinction between aesthetic exemplars and scientific ones, and suggest (in a thoroughly Goodmanian fashion) that density and repleteness figure in the difference between aesthetic and scientific exemplars.

Exemplification: the preliminaries

Exemplification is the relation of a sample, example, or other exemplar to the features or properties it is a sample or example of. The features or properties exemplified may be dynamic or static, may be monadic or relational, and may be at any level of generality or abstraction. A tailor's swatch exemplifies its fabric, pattern, texture, and weave; an example worked out in a logic text exemplifies the application of the rules of inference being studied; an example of poison ivy exemplifies a species of toxic plant.

A swatch of herringbone tweed can exemplify herringbone tweed; a swatch of seersucker, not being herringbone tweed, cannot. The conjugation of the verb 'parler' can exemplify the form of a regular '-er' verb; the conjugation of the verb 'venir' cannot. Exemplification requires instantiation. But instantiation, even obvious instantiation is not enough; for exemplification is a referential relation. An exemplar refers to certain of its properties; it exhibits them, highlights them, shows them forth, makes them manifest. Exemplification requires both reference to and instantiation of the properties exemplified. Because an exemplar is itself an instance of the property it refers to, it affords epistemic access to that property.

In highlighting some properties, an exemplar overshadows, marginalizes, or downplays others. Exemplification is selective. Although the fabric swatch is square and frayed around the edges, in its standard use, it does not exemplify these properties. Exemplification, moreover, is not a matter of conspicuousness. A conspicuous property may fail to be exemplified, while a subtle, difficult to discern property is exemplified. The most conspicuous feature of a manufacturing procedure may be how noisy it is, while in the context of a safety inspection what the procedure exemplifies is its barely detectable, but very significant vulnerability to sabotage.

Exemplified properties need not have verbal labels.[1] A physical therapist or

choreographer might demonstrate a particular movement that is too fine-grained for her to describe. It is a matter of do this: [insert correct movement]; not that [insert another seemingly similar, but incorrect, movement]. Such an exemplar applies to itself and to whatever other movements count, in the circumstances, as doing the same thing. Nor need the labels, verbal or non-verbal, be literal. Just as a metaphorical label can genuinely denote an object, an object can genuinely exemplify a metaphorical property. If an active toddler is a metaphorical tornado (that is, is metaphorically denoted by the term 'tornado'), he may metaphorically exemplify the property of being a tornado.

Being symbols, exemplars require interpretation. The critical questions are: along which dimensions is an exemplar exemplifying; and how specifically does it exemplify? The fabric swatch might exemplify herringbone tweed simpliciter; or it might exemplify a particular brown and blue herringbone tweed. It might (or might not) exemplify the weight of the fabric, the density of the herringbone, the modulations in the shades of brown and blue, and so on. The exemplar must instantiate whatever properties it exemplifies, but it instantiates indefinitely many properties and exemplifies only a few. Interpretation is required to identify those few.

Interpretation can vary with context: in one context, the very same swatch might exemplify fairly generally – it exemplifies herringbone tweed as opposed to hounds-tooth check; in another, it might exemplify more precisely – displaying tightly packed herringbones, as opposed to a larger, looser herringbone pattern. In yet another context, it might exemplify a completely different set of features – for example, its being a good potholder, or a ridiculous fabric for an evening gown.

Exemplification involves a dual referential relationship. An exemplar directly refers to a

property it instantiates and thereby indirectly refers to other members (if any) of the extension of that property. By exemplifying herringbone tweed, a swatch refers to its pattern and indirectly to other instances of that pattern. Let us say that an exemplar *typifies* an extension when it exemplifies a property common to all and only members of that extension.

Putting the matter this way may make the twofold reference look trivial. One swatch of herringbone tweed typifies the class of herringbone tweed fabrics and thereby serves as a proxy for herringbone tweed fabrics generally. Sometimes interpretation is that trivial; but not always. A commercial sample, such as a fabric swatch, typically belongs to a regimented symbol symbol, so its interpretation is reasonably straightforward. Knowledgeable consumers know that in its standard usage the fabric swatch exemplifies its pattern but not its altitude, age, or distance from the Eiffel Tower. But not all exemplars are so regimented. One of the great benefits of exemplification is that we can improvise exemplars at will. Simply adducing something as an example typically suffices to make it one. A naturalist identifies a plant in the woods as an example of poison ivy. He may simply point out the plant, leaving his companions to figure out what extension it typifies. Or he may underscore the distinctive color, shine, shape, and configuration of the leaves. Had he ignored the plant, it still would have had all these features; but it would not have symbolized them. By pointing them out, he exploits features the vine had anyway, bringing the plant to function as a symbol. Perhaps he tells his companions which features to fixate on; perhaps not. If all goes well, his companions can now recognize poison ivy whenever they encounter it. But despite his tutelage, they may be uncertain how to interpret the exemplar. How closely do other plants have to match the exemplar to belong to the extension in question? Does the size of the leaves matter? Does their orientation? When exemplars are ad

hoc, we have no regimented system to fall back. Context and background assumptions are critical.

The focus on commercial and pedagogical exemplars might be misleading in another way. Typically the adducer of examples or the manufacturer of samples first fixes exemplificational reference and then attempts to convey it to her audience. Such exemplars are vehicles of information transfer, not sources of knowledge or understanding. But some exemplars function differently. A mining inspector takes a sample of air from a mineshaft in order to find out something no one yet knows about the gases in the mine. If the sample is properly taken, he has reason to believe that the proportion of gases the sample exemplifies is typical of the proportion of gases in the mine. A pollster surveys opinions on the economic crisis. Although she may have her suspicions, she does not know what opinions will be exemplified until the results are analyzed. A critical question in both cases is what extension is typified. Is the air in the sample characteristic of air throughout the mine or only air at a certain depth in the mineshaft? Whose opinions does the poll represent? Saying it represents those who share the opinions voiced is true, safe, and uninformative. Saying it represents the class of likely voters, or the class of citizens from a particular demographic group, or the population at large is risky but informative. If the poll is well designed and properly analyzed, the risk is minimized. Exemplification is critical then to the growth of knowledge as well as to the transmission of knowledge.

To summarize: a well chosen or well crafted exemplar can afford epistemic access, not only to some of its own properties, but also to the wider class of cases it represents. Because exemplars are symbols, they require interpretation. Because their reference depends on context,

interpretation is keyed to context. Although an exemplar typifies the extension of items that share the exemplified properties, that extension can be described in multiple ways, both literal and metaphorical. So an exemplar can be informative. But because a non-trivial identification of the extension it typifies relies on fallible background assumptions, although exemplars afford fairly direct epistemic access to the properties they exemplify, the epistemic access they provide to wider classes of cases is sensitive to the adequacy of the background assumptions.

The Arts

Goodman is notorious for not discussing particular works of art in any detail. As a result of his reticence, we may fail to appreciate the range of exemplification in the arts. Although we recognize that Mondrian's works exemplify squareness and primary colors, that Bach's works exemplify counterpoint, that Stravinsky's works exemplify tensions between tonality and atonality, we may overlook the exemplification of labels that are not exclusively or predominantly aesthetic. This would be a mistake, since it would blunt the force of Goodman's contention that encounters with the arts advance our understanding of the world(s) beyond the arts. To give a feel for the breadth and importance of literal exemplification in the arts I will discuss a couple of examples.

The Judson Dance Theater was a group of postmodern dancers in the 1960s who sought to present dances as nothing more than ordinary human bodies moving in space. Their works have no narrative structure, no expression, and indeed no mandatory focus of attention; the viewer decides for herself what to look at. Judson dances consist of mundane, non-stylized, uninflected movements of the sort you can see on the street. What might be the value of such a dance? We see people walking, running, climbing over barriers, carrying loads every day. Why

should we go to a performance to watch them? Why should we pay for a ticket? Sally Banes suggests that the answer lies in defamiliarization, a process by which what is familiar is rendered strange (Banes 3-5). When something is familiar, we are so accustomed to it that we do not focus on it or attend to it. A passing glance enables us to recognize it for what it is and then move on. Defamilarization heightens awareness of things that are so obvious that we routinely ignore them. We walk, run, climb and see others doing so without giving it much thought. When we carry a mattress, we do give it thought. We are painfully aware that carrying a mattress is hard. It requires continually readjusting our bodies to accommodate the awkwardly shifting center of gravity of the bulky, heavy, unwieldy burden. But we are intent on the task – we want to get the mattress moved. So we attend to the task and not to our doing of it. The Judson dancers put us in a context where we attend to the physical intelligence that goes into such mundane activities. We notice and attune ourselves to the minute, intricate muscular adjustments involved in keeping one's balance while carrying a mattress. We notice the rise and fall, the small and large physical adjustments that it takes to walk or run across the floor. The dances then exemplify features that mundane motion instantiates but that we, either makers or observers of that motion, routinely overlook. The exemplification is literal. The dancers exemplify features of walking by walking. They exemplify features of climbing by climbing. On the one hand, their message seems to be 'What you see is what you get'. On the other hand, they create a context where we can ask, 'Well, what do we get?' and see, perhaps for the first time, what was before our eyes all along. By sensitizing us to the physical intelligence of ordinary, mundane movement, the Judson Theater's dances heighten our awareness and advance our understanding of ourselves as organisms capable of locomotion. (Elgin 2010: 86-89)

Another example, this one drawn from painting, is this:

Compare a commercial color palette with the work *Rosso Gilera, Rosso Guzzi* painted in 1971 by the Italian artist Alighiero Boetti . . .. Boetti's piece consists of two square, nearly identical panels, one next to the other, whose meager distinction from each other is a slight variation in their red paint, and the raised names and code numbers that identify the different paints, which are inscribed on the panel. Like a color palette, Boetti's piece juxtaposes two different kinds of reds and in that way it is possible to distinguish between them. In a certain sense, then, the work functions as a paint sample: they exemplify two different synthetic reds, with their commercial codes (60 1232 and 60 1305) and names ("Rosso Guzzi" and "Rosso Gilera"). However the work does not only function as a simple color sample, but exemplifies other properties that a chip of paint in a color palette does not exemplify. "Rosso Guzzi" is the red used to paint Guzzi motorcycles, and "Rosso Gilera" is the one used for the Gilera motorcycles, the two rival Italian motorcycle manufacturers. Put side by side, the two panels not only exemplify a slight difference in color but stand for the divide between passionate advocates of each brand. That is to say, since each kind of red possesses the property of being used to paint a specific kind of motorcycle, they can further exemplify the two brands, and via a chain of reference the rivalry between the two companies. In addition, since the difference in reds is barely noticeable, the piece can further symbolize the negligible distinction that sustains this rivalry. . . . Boetti's piece is made out of synthetic commercial paint intended to lacquer vehicles instead of common fine arts materials, and in that way, the artistic properties – glossiness, brightness, viscosity, or the drippings left when applying it on

> the panel are exemplified. . . . Unlike a paint sample, whose interpretation is straightforward, the interpretation of a work of art is open ended and never ending. (Capdevila, 130-131)

On looking at *Rosso Galera, Rosso Guzzi*, we initially confront two, barely distinguishable bright red squares of paint. The picture is one of those that leads people to sneer dismissively, 'Anyone could do that!' But Capdevila's discussion shows that the Boetti is referentially rich and symbolically complex. It exemplifies a host of properties – colors, brands of motorcycles, ardent affection for one brand and hostility toward another, a crossover from commercial paint to the fine arts, and so forth. She could have gone further. Having become attuned to the negligible differences that sustain the rivalry between afficionados of different Italian motorcycles, we may take the work to exemplify a more abstract property – the negligible differences that constitute and sustain rivalries in general. As with the Judson dances, the question 'why are we looking at this?' or, more to the point, 'why should we look at this *as art*?' has a complex and rewarding answer. Works of art instantiate a variety of properties that they share with mundane objects. By exemplifying those properties, they sensitize us to them and their instances.

Talk of expression in the arts is far more familiar than talk of exemplification. We say that works express joy or sadness or a subtle blend of the two. Expression, Goodman maintains, is metaphorical exemplification by a symbol functioning aesthetically. Tschaikovsky's Sixth Symphony (*The Pathétique)* expresses hopelessness in that it refers to the hopelessness it metaphorically instantiates and thereby affords indirect access to other instances of the property. This sounds pretty banal. But of course the work does not (metaphorically) exemplify hopelessness tout court. It exemplifies the complex contours of a certain kind of hopelessness –

the ebbs and flows of despair, the ways they pervade, are manifest in and exacerbated by social, romantic, and public settings. In this case, the defamiliarization and distancing is from our own emotional lives. The 5/4 beat of the second movement – a 'a waltz with a limp'[2] – may exemplify the feeling of being perennially out of step with the world. We may come to understand our own emotional lives, and those of our fellows, better through our understanding the work. Emotions are not just feelings, they involve patterns of attention. (Elgin 2007) They orient us to features of things that we might otherwise miss. A work of art that expresses an emotion can afford epistemic access to aspects of ourselves and our situation that we ordinarily overlook.

A work of art that instantiates political or commercial or mundane or arcane properties can exemplify those properties. Even if the properties are familiar, a work of art may defamiliarize them, heighten our awareness of them, juxtapose or contextualize them so as to enable us to appreciate them and their significance in ways we had not previously done. As Goodman says, 'After we spend an hour or so at one or another exhibition of abstract painting, everything tends to square off into geometric patches or swirl in circles or weave into textural arabesques, to sharpen into black and white or vibrate with new color consonances and dissonances' (Goodman 1978:105). We see things, hear things, feel things, and understand things differently as a result of our encounters with the arts. These new ways of seeing, hearing, feeling and understanding are tested by further looking – not just at art, but at other aspects of our experience. Like all conclusions, those drawn from the arts are fallible, testable, and revisable.

The Sciences

In principle any item can exemplify any property it instantiates and any property that is

instantiated can be exemplified. But what is feasible in principle is not always straightforward in practice. Although Cherenkov radiation in nuclear reactors is a distinctive, brilliant shade of blue, a paint manufacturer would be ill advised to suggest that its customers visit a nuclear reactor to decide whether that is the color they want to paint the woodwork. Nuclear reactors are relatively rare and inaccessible. Anyone who gains access to a reactor unlikely to use the visit as an opportunity to fine tune her plans for painting the house. The paint company does better to create a lasting, readily available, easily interpretable sample of the color – one whose function is precisely to make the color manifest. Such a sample should be stable, accessible, and mundane enough that none of its other properties distract attention from the color. Effective samples and examples are carefully selected or contrived to exemplify particular features. Factors that might distract are omitted, bracketed, or set aside.

Some exemplification is achieved simply by directing attention. A naturalist brings an unassuming plant to exemplify poison ivy simply by pointing it out as such. Although the method is more complicated, in proving a theorem, a mathematician does something similar. Relations among mathematical truths obtain timelessly. That the square of the hypotenuse of a Euclidean right triangle is equal to the sums of the squares of the other two sides did not await a geometrical proof to make it so. The proof's function is to exemplify mathematical relations that held anyway. By juxtaposing axioms and articulating consequences, it affords epistemic access to those relations. One might think that the value of the proof consists in its establishing that the conclusion is true. Arguably, exemplification is not needed for that; instantiation alone would be enough. But mathematical practice discredits this hypothesis. Mathematicians value proofs of propositions like '2+3=5' whose truth is not in doubt. They also value multiple proofs of the

same theorem. If all they were concerned with is whether the theorem was true, they would not. Assuming they considered the first proof conclusive (which given the rigor of mathematics they typically do), if truth were the sole concern, any subsequent proof would be redundant. Because a new proof exemplifies different mathematical relations, it is not. Such a proof enriches understanding of the relations among mathematical propositions.

Information exemplifies different patterns depending on one's interpretive orientation. A geneticist looks for the genetic underpinnings of a disease like diabetes. An immunologist focuses on the physiological events that trigger its onset. An epidemiologist attends to the distribution of the disease in different environments. All may draw on the same data. But because they have different overriding interests, they interpret the data differently, each taking it to exemplify features relevant to his concerns. None, of course, believes that his approach discloses the whole story about the incidence of the disease. None denies that the disease instantiates the patterns the others highlight. The epidemiologist readily concedes that diabetes has a genetic basis; but that is not his concern. He consigns genetic considerations to the background in order to foreground environmental factors. By shifting the focus of attention from the organism to the environment, he may be able to discern patterns in the data that would be lost in the welter of details had no choice been made, and that would be obscured in interpretations of the data that focus on the individual organism or its DNA.

Some exemplification requires isolating aspects of phenomena. A scientist brings a water sample to exemplify electrical conductivity by distilling out impurities before running an experiment. Had she run her experiment using ordinary rainwater, it would not have been clear whether the current she detects is due to the conductivity of H_2O or that of the impurities.

Because conspicuousness is independent of exemplification, considerable stage setting is sometimes needed to bring a rare or recondite property to the fore. An elaborate experiment may be required to exhibit slight differences between amino acids. A delicately phrased questionnaire may be needed to distinguish between closely related attitudes.

By referring to some of the features it instantiates, an exemplar affords a measure of epistemic access to those features. Epistemic access can be better or worse. One reason for careful sampling is to insure that the sample has the properties of interest; another is to obtain a sample that affords ready epistemic access to them. Some chemicals occur only in minute quantities in pond water, so although in suitable circumstances a liter of water drawn from the pond exemplifies them, they may still be hard to detect. Moreover, such a sample may include confounding factors, such as organic material, which although unexemplified and (for current purposes) irrelevant, obstruct epistemic access to the exemplified properties. Thus instead of working with samples drawn directly from nature, scientists often process samples to expose features of interest and/or remove confounding factors. They simplify, streamline, manipulate, and omit, so that factors that threaten to impede epistemic access to the properties of interest are eliminated or their effects are minimized, marginalized, or canceled out. They amplify, augment, and exaggerate so that the delicate factors they want to discern are detectable. Scientists study entities that are not to be found in nature by subjecting them to provocations that do not occur in nature in order to figure out what goes on in nature.

Again background assumptions are key. To determine whether bisphenol-A (a chemical used in plastic) is carcinogenic, investigators place genetically identical mice in otherwise identical environments, exposing half of them to massive doses of the chemical while leaving the

rest unexposed. The common genetic endowment and otherwise identical environments neutralize the vast array of genetic and environmental factors that are believed to standardly influence the incidence of cancer. By controlling for genetics and for most aspects of the environment, scientists insure that these factors, although instantiated by the mice, are not exemplified. They arrange things so that, as far as anyone can tell, exposure or non-exposure to bisphenol-A is the only environmental feature exemplified, thereby enabling the experiment to disclose the effects of bisphenol-A. The use of mice is grounded in the assumption that, in the respects that matter, mice are no different from other mammals, including humans. Given this assumption, the experiment is interpreted as exemplifying *the effect on mammals,* not just on mice. The mice are exposed to massive doses of bisphenol-A, on the assumption that the effects of large amounts of bisphenol-A on small mammals over a short period is reflective of the effects of relatively smaller amounts of bisphenol-A on larger mammals over a long period. So the experiment is interpreted as exemplifying *the effect of bisphenol-A* rather than just the effect of high doses of bisphenol-A. To make a cognitive contribution, of course, the experiment must be properly interpreted. If the scientists took the experimental situation to replicate life in the wild, they would be badly mistaken. But if their background assumptions are accurate and adequate, then they understand the ways the experiment is and is not representative of nature – that is, they understand what aspects of the experiment symbolize and how they do so. That enables the experiment to advance understanding of the effect of bisphenol-A on mammals.

The experiment is highly artificial. Even the mice are artifacts, having been intentionally bred to exhibit a certain genetic structure. Exposure is to a vastly higher dose of bisphenol-A than would occur outside the lab. The environment is rigidly controlled to eliminate a huge array

of factors that normally affect the health of mice. The experiment eliminates some ordinary aspects of mouse life, such as the dangers that predators pose. It nullifies the effects of others, such as the genetic diversity among members of a wild population. It exaggerates others, exposing the mice to much higher levels of bisphenol-A than they would encounter in the wild. Rather than rendering the experiment unrepresentative, these divergences from nature enable the experiment to disclose aspects of nature that are normally overshadowed. They clear away confounding features and highlight significant ones so that the effects of bisphenol-A on mammals stand out.

No matter how carefully they set the stage, irrelevancies remain. Scientists do not and ought not read every aspect of an experimental result back onto the world. Not only are there irrelevant features, there are issues about the appropriate vocabulary and level of precision for characterizing what occurs. The fact that the experiment occurred in Florianopolis is unimportant. The fact that the mice exposed to bisphenol-A were more likely than members of the control group to become obese may or may not be significant. The experiment both presupposes and contributes to an understanding of the phenomenon in question through its exemplification of telling features. The quality of its contribution depends on the adequacy of its presuppositions.

Changes in background assumptions can motivate reinterpretation. When the experiment was originally run, let us suppose, scientists had no reason to consider differential weight gain to have any bearing on the issue under investigation. So although they recognized that the mice exposed to bisphenol-A were more likely than members of the control group to become obese, the exposed mice did not exemplify their propensity to obesity. If, with the growth of

understanding, it becomes evident that obesity and cancer are correlated, the experiment might be reinterpreted so that the propensity to obesity is exemplified.

A sample is not just an instance of a property; it is a telling instance. An experiment does not just provide just an instance of a property; it provides a telling instance. A telling instance is one that exemplifies the properties it is an instance of. If the sample is well taken or the experiment is well designed, we have good reason to project the property it exemplifies onto the extension it typifies. On the basis of the mouse experiment then we can responsibly project 'carcinogenic' onto untested instances of exposure to bisphenol-A. On the basis of the air sample we can project 'contains .002% carbon monoxide' onto the rest of the air in the mine.

The upshot is this: Exemplification plays a major, indeed ineliminable role in both mathematics and empirical science. I have found no reason to think it is any less important in the sciences than it is in the arts.

Is There No Difference?

Languages of Art makes a convincing case that exemplification is important in the arts. Nothing I have said undermines that. But my argument indicates that exemplification is equally important in the sciences. Nevertheless we should probably not conclude that the ubiquity of exemplification blurs the distinction between art and science or that there is no significant difference between exemplification in art and exemplification in science. One of the main themes of *Languages of Art* is that different symbol systems have different syntactic and semantic structures, and therefore different capacities and limitations. Although exemplification is vital to both the arts and the sciences, I believe that artistic and scientific exemplars differ in ways that enable them to perform different functions. Three differences seem significant. Two

stem from the symbol systems the exemplars function in; the third stems from the practices they belong to.

To make out the first point requires extending the concepts of syntactic and semantic density and finite differentiation to exemplificational systems. This is straightforward and seems almost required by consistency if we are to take exemplification to be a genuine mode of reference. Exemplars are syntactically dense if and only if between any two items with the capacity to exemplify in a given system, there can in principle be a third. If a Mondrian painting is syntactically dense, the exact dimensions of a component rectangle may exemplify; then the slightest difference in the dimensions of the rectangle would make it a different exemplar. This seems to be so. In fact, it is why Mondrians turn out to be surprisingly difficult to forge. Exemplars are semantically dense if and only if the field of properties available for exemplification by symbols of a given system is dense.[3] Then between any two such properties there is a third. Again, this seems to be so. As Capdevila's discussion of *Rosso Galera, Rosso Guzzi* shows, exemplification in works of art draws on a seemingly unbounded candidate pool. Any of the properties and any number of the properties instantiated by a work of art are available to be exemplified. Therefore, interpretation of an aesthetic exemplar is open-ended. In the arts, I suggest, exemplars often belong to, and typically exemplify features from, dense fields of alternatives.

In the sciences, however, exemplification normally takes place in finitely differentiated systems. Science sets a limit on the differences it will deem significant. The air sample drawn from the mine does not exemplify the precise proportions of its component gases; it exemplifies those proportions only to a fixed number of significant figures. It is perhaps .002% carbon

monoxide. Even if precisely .002154% of the molecules in the sample were carbon monoxide molecules, beyond a thousandths of a percent, further precision is dismissed as insignificant.

Second, in works of art, exemplars tend to be be relatively replete; in science they tend to be attenuated. Goodman's comparison of the Hokusai drawing and the EKG brings this out (Goodman 1968: 229). The Hokusai exemplifies along many dimensions. Contours, density, thickness of line, color, contrast, texture, even the weave of the paper may all exemplify, and all may do so at any of a vast number of levels of precision. In the EKG, only the amplitude and period of the wave and perhaps the regularity or irregularity of the pattern are exemplified, and only up to a certain limit. Thickness of line, intensity of color, characteristics of the paper, and so forth play no exemplificational role.

Third, in science just what range of factors a given exemplar has the capacity to exemplify is typically recognized in advance. Before the experiment described above is run, scientists recognize that if the gap between the incidence of cancer in the mice exposed to bisphenol-A and those not so exposed is n, the experiment will afford evidence that bisphenol-A is carcinogenic; if it is less than $n\text{-}\Delta$, it will afford evidence that bisphenol-A is non-carcinogenic; if it is between n and $n\text{-}\Delta$, it will have a null result. The values for n and Δ are justified statistically. Prior to the generation of a scientific exemplar then, there is typically a consensus about how it is to be interpreted. This is not to deny that the experiment can be reinterpreted. As I mentioned earlier, if a correlation between obesity and cancer emerges, the differences in weight gain between the mice in the two groups may come to be exemplified. The point is rather that the scientific community is in general accord about what a given experiment has the capacity to exemplify and about what factors influence what a given experiment has the capacity to

exemplify.

Science values intersubjective agreement. To attain such agreement, it limits precision and constrains repleteness. If only a few, antecedently recognized dimensions of an exemplar matter, and only up to an antecedently recognized point, agreement among the knowledgeable is readily achieved. If, however, in principle, any aspect of an exemplar might exemplify and do so at any level of precision, we should expect disagreement about what exemplifies and what is exemplified. This is what we find in the arts, 'where we can never determine precisely just which symbol of a system we have or whether we have the same one on a second occasion, where the referent is so elusive that properly fitting a symbol to it requires endless care, where more rather than fewer features of the symbol count' (Goodman 1978: 69). That critics never achieve consensus about exactly what Debussy's *La Mer* exemplifies is no indication of a defect in the work. Indeed, it may be evidence of its aesthetic merit. But if scientists never achieve consensus on what an experiment exemplifies, that is strong evidence that the experiment is flawed.

Rather than taking exemplification itself as a symptom of the aesthetic, we should recognize that exemplification plays a major role throughout cognition. What is symptomatic of the aesthetic is exemplificational density and repleteness. What is symptomatic of the scientific is exemplificational differentiation and attenuation. These are, as Goodman recognized, merely symptoms. One can probably find reasonably articulate and attenuated exemplars in the arts and at least somewhat dense and slightly replete exemplars in the sciences.[4] Still, dense and replete exemplars are more likely to function aesthetically; and articulate and attenuated exemplars are more likely to function scientifically.

Conclusion

It might seem that my argument amounts to a little light housekeeping. It tidies up some relatively insignificant infelicities in Goodman's position, but leaves that position basically intact. If my argument is read as a commentary on, or critique of, Goodman, I think this is correct. But if we take my argument to pertain to epistemology, the situation is different.

The overarching thesis of *Languages of Art* is that the arts function cognitively. The rationale for developing the taxonomy of symbol systems and for explicating the various modes of reference is that by construing works of art as elements of symbol systems – specifically as symbols that perform one or more referential functions – we can recognize their contributions to cognition. The taxonomy comprehends symbol systems beyond the arts; and non-denotational reference is found outside the arts as well as in them. Nevertheless, we might harbor the suspicion that denotation and truth are the hallmarks of science, while exemplification is more at home in the arts. My argument shows that if we want to understand how science embodies, advances, and conveys understanding, we need to acknowledge and account for the ineliminable role that exemplification plays in science. Epistemology impoverishes itself by ignoring non-denotational reference.

References

Banes, S. 2003. Gulliver's Hamburger: Defamiliarization and the Ordinary in the 1960s Avant Garde, in *Reinventing Dance in the 1960s*, ed. Sally Banes. Madison: University of Wisconsin Press.

Capdevila Werning. R. 2009. *Construing Architecture, Constructing Philosophy.* Unpublished

doctoral dissertation. Department of Philosophy, Universitat Autonoma de Barcelona.

Elgin, C. 2007. Emotion and Understanding, in *Epistemology and Emotions,* ed. Georg Brun, Uvli Dogouglu and Dominique Kunzle. London: Ashgate.

Elgin, C. 2010. Exemplification et la Danse, in *Philosophie de la Danse*, ed. Julia Beauquel and Roger Pouivet. Rennes: presses Universitaires de Rennes.

Goodman, N. 1968. *Languages of Art*. Indianapolis: Hackett Publishing Co.

_____ 1978. *Ways of Worldmaking.* Indianapolis: Hackett Publishing Co.

Catherine Z. Elgin

Graduate School of Education

Harvard University

Cambridge, MA 02138 USA

catherine_elgin@harvard.edu

1 If we follow Goodman, talk of properties, features and the like is to be cashed out nominalistically in terms of labels. So rather than saying that a feature of the swatch is exemplified, we say that a label that applies to the swatch is exemplified. Converting from property-talk to label-talk is straightforward so long as we recognize that not all labels are verbal, and that we can contrive a label, verbal or not, for any extension we like.

2 Benjamin Zander uses this phrase to describe the piece.

3 And no introduction of further symbols in their normal position would destroy density, the system is dense throughout (see Goodman, 1968: 136). Density throughout can apply to both syntax and semantics

4 Strictly, of course, a system cannot be 'somewhat dense'. But in some scientific contexts both the exemplars and their referents may belong to systems with a relatively wide range of closely related alternatives. These are the cases I call 'somewhat dense.', The critical feature is that it may be relatively hard to tell exactly what items exemplify and exactly which properties are exemplified.