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UNDERSTANDING: ART AND SCIENCE

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Abstract:

This paper explores exemplification in art and science. Both scientific experiments and works of art highlight, underscore, display, or convey some of their own features. They thereby focus attention on them, and make them available for examination and projection. The Michelson-Morley experiment exemplifies the constancy of the speed of light. Pollock's *Number One* exemplifies the viscosity of paint. Still, science is said to adhere to facts; art, to be indifferent to them. I argue otherwise. Science, like art, often scorns fact to advance understanding through fiction. Thought experiments are scientific fictions; literary and pictorial fictions, aesthetic thought experiments.

I

Attempts to assimilate aesthetics to epistemology are often dismissed out of hand. Mary Mothersill writes, 'in such a light, the arts make a poor showing: as a means of acquiring new truths about the world or the soul, they are in competition with the sciences and with philosophy'¹. She's right. If our overarching epistemic objective is the acquisition of new truths, we'd be ill-advised to turn to art.

We'd also be ill-advised to turn to science or to philosophy. The abundance of anomalies and outstanding problems confronting any science is reason to doubt that currently available scientific theories are true. And since science faces the tribunal of experience as a corporate body², we cannot hope to separate a science's constituent truths from its falsehoods. Philosophy is no more reliable. Outside formal logic, few if any philosophical theses have been firmly established. Some may be true, but none supplies the level of justification needed for knowledge.

If our goal is simply to augment our stock of justified true beliefs, we should stick to the more pedestrian claims of common sense. That there have been black dogs, though uninspiring, readily admits of confirmation.

Still, science and philosophy are plainly cognitive enterprises. An epistemology that cannot accommodate them is too anemic to serve. But an epistemology robust enough to account for their cognitive contributions cannot, I suggest, avoid accommodating the arts. For the arts make many of the same

contributions. If I'm right, the issue is not whether, but how the arts function cognitively.

Cognitive excellences and deficiencies are many. We value good questions, apt remarks, illuminating experiments, as well as potentially fruitful hypotheses, insightful studies, significant discoveries. We disparage irrelevant or obvious statements, tortuous, tenuous, or tendentious arguments, unimaginative hypotheses, ad hoc explanations.

But obvious statements are more likely than intriguing ones to be true and justifiable. Routine continuation of the multiplication tables is a far surer source of justified true beliefs than investigation of a bold but risky hypothesis. So if what we want is to increase the number of justified truths we believe, our cognitive values are badly misplaced.

If, however, we seek quality rather than quantity, the aforementioned excellences are genuinely valuable. For they provide or promote the development of interesting and important insights.

Because of its narrow focus on the conditions for knowledge, contemporary epistemology cannot say what makes insights interesting or important, thus cannot say what sort of knowledge is worth having and seeking.³ By broadening our vista to include understanding of all sorts, we will be better equipped to deal with the issue.

Not being restricted to facts, understanding is more comprehensive than knowledge ever hoped to be. We understand rules and reasons, actions and passions, objectives and obstacles, techniques and tools, forms and functions and fictions as well as facts. We also understand pictures, words, equations, and diagrams. Ordinarily these are not isolated accomplishments; they coalesce into an understanding of a subject, discipline, or field of study.

Understanding need not be couched in sentences. It might equally be located in apt terminology, insightful questions, effective nonverbal symbols. A mechanic's understanding of carburetors or a composer's understanding of counterpoint, is no less epistemically significant for being inarticulate.⁴

Even a scientist's understanding of her subject typically outstrips her words. It is realized in her framing of problems, her design and execution of experiments, her response to research failures and successes, and so

on. Physics involves a constellation of commitments that organize its objects and our access to them in ways that render those objects intelligible. Understanding physics is not merely or mainly a matter of knowing physical truths. It involves a feel for the subject, a capacity to operate successfully within the constraints the discipline dictates or to challenge those constraints effectively. And it involves an ability to profit from cognitive labors, to draw out the implications of findings, to integrate them into theory, to utilize them in practice. Understanding a particular fact or finding, concept or value, technique or law is largely a matter of knowing where it fits and how it functions in the matrix of commitments that constitute the science. And neither knowing where nor knowing how reduces to the knowing that that traditional epistemology explicates.

Aesthetic understanding is similar. It is not primarily a matter of knowing truths about art or truths that art discloses, but of using art effectively as a vehicle for exploration and discovery.

I cannot hope to do justice here to the full range of epistemically important affinities between art and science. So I shall focus on a single device -- *exemplification*-- and show some of the ways it enhances understanding in arts, the sciences, and elsewhere.

II

The Michelson-Morley experiment demonstrates that the speed of light is constant. Jackson Pollock's *Number One* highlights the viscosity of paint.⁵ Neither states a truth. Neither needs to. Each makes its case effectively without saying a word.

The experiment affords instances of light's unvarying speed. There's nothing remarkable about that, though. Every working flashlight does the same. But by measuring the time it takes light to travel equal distances in different directions, the experiment underscores the invariance of the speed of light.

Number One supplies instances of paint's viscosity. So does every other painting. But through its clots and streaks, dribbles and spatters, the Pollock makes a point of viscosity. Most other paintings do not. They use or tolerate viscosity, but make no comment on it.

To highlight, underscore, display, or convey involves reference as well as instantiation. An item that at

once refers to and instantiates a feature may be said to *exemplify* that feature.⁶ In what follows, I shall call such an item *an exemplar*, and its referent *a feature*. It should be noted that under this usage a feature may be a substance, an attribute, a relation, a pattern, etc..

Since exemplification is a mode of reference, anything that exemplifies is a symbol. Not only do experiments exemplify theoretically significant features, and works of art, formally significant features, ordinary samples and examples exemplify the features they display. A fabric swatch exemplifies its pattern, color, texture, and weave. A sample problem worked out in a textbook exemplifies reasoning strategies to be used in the course. Examples, samples, experiments and abstract paintings then all serve as symbols. Though they denote nothing and state nothing, they refer by means of exemplification.

Since exemplification requires instantiation, a symbol can exemplify only features it instantiates. *Number One* can exemplify neither the constancy of the speed of light or the pattern of a herringbone tweed, for it does not instantiate these features. Nor can it exemplify *all* the properties it instantiates. For exemplification is selective. *Number One* exemplifies paint's capacity to drip, spatter, blot, and clot, but not its capacity to depict, portray, record, and evoke. Other paintings about painting -- seventeenth century gallery pictures, for example -- make the opposite selection, exemplifying paint's capacities as a medium, while merely instantiating its material capacities.

Although a symbol must instantiate the properties it exemplifies, its instantiation need not be literal. Thus an experiment can metaphorically exemplify properties like power, elegance, panache, and promise; a painting, properties like electricity, balance, movement, and depth.

The features an object exemplifies are a function of the categories that subsume it. So opportunities for exemplification expand as new categories are contrived. Some are the benefits of hindsight. When his works were first exhibited, it was, for obvious reasons, impossible to see Cezanne as a harbinger of cubism. Now his paintings practically cry out for such a reading, so plainly do they exemplify the shapes of things to come. When it was first performed, the Michelson-Morley experiment was not recognized as the death knell of classical mechanics. But through its stubborn resistance to Newtonian interpretation, it came to exemplify the

inadequacies of the Newtonian world picture. We rightly read it in retrospect as the beginning of the end of classical physics.

New categories often reconfigure a domain, connecting previously isolated features to form patterns, focusing on factors hitherto unworthy of attention. Not long ago, weak joints, curved spines and blurred vision were just additional afflictions befalling certain tall, thin, heart patients. But with the identification of Marfan's syndrome, they coalesced into a clinical picture, their exemplification affording a basis for diagnosis and treatment. Similarly, the introduction of feminist categories in literary criticism discloses new contours in fictional works, exemplifying long overlooked patterns and relationships. And the introduction of Freudian categories gives both life and art a new look. Once we recognize the possibility of unconscious drives, we have to go beyond sincere avowals to discover motivation. Dreams, jokes, oversights and slips of the tongue acquire salience, often exemplifying desires the (real or fictional) agent can neither acknowledge nor control.

Exemplification of unsuspected features may, moreover, induce reconception. When *The Rite of Spring* exemplifies tonal patterns classical music cannot accommodate, or the Michelson-Morley experiment exemplifies phenomena classical physics cannot coherently describe, the inadequacies of available conceptions are made manifest. Such revolutionary works both attest to the need for and supply constraints on the reconfiguration of their domains. They serve as exemplary instances of categories whose extensions and interrelations remain to be developed.

An exemplar affords epistemic access to the features it exemplifies. From a fabric swatch one can discover the look and feel of a herringbone tweed; from *Guernica*, the horrors of war; from a blood test, the presence of antibodies. An exemplar then is a telling instance of the features it exemplifies. It presents those features in a context contrived to render them salient. This may involve unraveling common concomitants, filtering out impurities, clearing away unwanted clutter, presenting in unusual settings. If motives are ordinarily mixed, it may be hard to find among our fellows a clear example of unmitigated malevolence. But in *Iago* the feature shines forth. If ores ordinarily contain impurities, we may be unable to extract a sample of pure copper from the mine; but we can readily refine one in the lab. Stage setting can also involve introduction

of additional factors. Thus a biologist stains a slide to bring out a contrast, and a composer elaborates a theme to disclose hidden harmonies.

It might seem that instantiation is all that matters -- that for epistemological purposes at least, reference is otiose. Not so. For not all instances are telling. A flashlight beam affords an instance of, but no epistemic access to, light's constant speed; Botticelli's *Birth of Venus*, an instance of, but no access to paint's viscosity.

Perhaps what is wanted then is a conspicuous instance, one that makes the feature all but impossible to overlook. This won't do either. Conspicuous instances of a feature frequently fail to exemplify it. A can of house paint spilled on the rug presents an all too vivid instance of paint's viscosity. But it is unlikely to exemplify viscosity or anything else. Moreover, exemplars often convey obscure or elusive features while glossing over glaring ones. The most obvious feature of an experiment may be the complexity of its apparatus; of an opera, the implausibility of its plot. Yet neither is apt to be exemplified. The experiment may exemplify all but undetectable differences among allotropes of sulphur; the opera, nearly indiscernible distinctions among types of love. Even a fabric swatch can exemplify a less than obvious feature, like the difference in drape a bias cut makes. Inordinately inconspicuous features are often exemplified in works of art and science -- subtle nuances, almost indistinguishable differences, abstruse kinships, patterns and regularities that elude all but the most attentive gaze.

An effective exemplar can also revivify the obvious. *Number One* does not exemplify unfamiliar or recondite properties. Quite the opposite. It exemplifies features so obvious that we routinely look right past them. The Pollock forces us to focus on aspects of paint we've overlooked since early childhood. And a significant psychological study may tell us something we've never thought to doubt -- for example, that early deprivation leads to lifelong difficulties.

What is wanted then is not just an instance or an obvious instance, but a telling instance -- one that reveals, discloses, conveys aspects of itself. And it is by referring to those aspects that an exemplar points them up, singles them out, focuses on them. It thereby presents them for our scrutiny.

III

Exemplars, being symbols, require interpretation. To understand a painting, an experiment, even a paint sample, requires knowing which of its aspects exemplify and what features they refer to. If we take paint samples as our paradigm, interpretation seems straightforward. For the system such samples belong to is regimented, its application routine. But exemplars operative in the arts and sciences are generally not so well behaved.

The features a symbol exemplifies depend on its function. And a single symbol often performs a variety of functions. A painting that exemplifies viscosity in a gallery might exemplify volatility in an investment seminar. A chemical reaction that exemplifies acidity in the lab might exemplify economy in a manufacturing process. Function, moreover, varies with context. A picture that does not normally exemplify the heavyhandedness of its imagery may be brought to do so through juxtaposition with works with a surer, more delicate touch. The acidity exemplified in one experiment may be mere byproduct in another, even though the same chemical reaction occurs in both.

The intention of its producer does not determine an exemplar's interpretation. For its producer has neither privileged access to nor a monopoly on the symbol's function. He may just be wrong. Van Gogh intended his *Bedroom* to exemplify comfort, security, and repose. What it actually exemplifies is a restless, feverish agitation. Michelson and Morley intended their experiment to exemplify the presence and magnitude of ether drift. Through its failure to oblige, it exemplified not only the nonexistence of luminiferous ether but also the incapacity of classical categories to accommodate electromagnetic phenomena -- something Michelson and Morley found inconceivable. Even commercial samples can decline to exemplify what their makers intend. A swatch that immediately begins to fray may exemplify a fabric's shoddiness rather than the understated elegance the manufacturer intends it to convey.

Moreover, many symbols admit of multiple right interpretations. Theorems common to classical and intuitionistic mathematics exemplify different logical forms in each. Under different, equally correct interpretations, Shakespeare's *Henry V* exemplifies positive and negative attitudes toward war. Whether such

multiplicity was originally intended makes no difference.⁷

Exemplars operate against a constellation of background assumptions. And an interpreter ignorant of those assumptions may be incapable of interpreting or even recognizing the symbols. An experiment in superconductivity involves assumptions about electricity and temperature, about what has been shown or suggested or left open by earlier investigations, about the capacities and limitations of the experimental apparatus, and so on. A nativity scene is grounded in assumptions about theology, iconology, religious and artistic tradition, as well as assumptions about the representational and expressive ranges of the medium, style, and subject. These assumptions need not be articulate. Nor need the works presuppose their truth or adequacy. Like an indirect proof, a work of art or science may undermine its grounding assumptions. But without an appreciation of what those assumptions are, an interpreter is ill-equipped to tell which features the work exemplifies, ill-equipped therefore to understand the work.

Not all background assumptions are propositional. Syntactic and semantic assumptions are also made. These delimit the forms of symbols and the categories in terms of which they are to be construed. The periodic table of the elements supplies categories for the interpretation of chemical samples; plane geometry, categories for the interpretation of cubist works. The forms of classical music and classical mathematics dictate the significant structures of symphony and proof. Vocabulary and grammar need not, of course, be verbal. Properties and patterns exemplified in the arts and sciences frequently have no exact verbal formulation. What we can't quite put into words is often captured in equations or harmonies or diagrams or designs.

With a change in background assumptions, a symbol can come to exemplify new features. The advent of relativity theory caused the Michelson-Morley experiment to exemplify features that were unrecognized, hence unavailable for exemplification under the Newtonian framework. New categories of mass, energy, space, time, and acceleration were brought into play. Later classical music provides a new framework for understanding Haydn. Harmonies, textures, tonal patterns and dynamics clearly exemplified, sharply articulated, and fully developed by Mozart are found exemplified in the works of his predecessors. An attentive ear that has heard Mozart's symphonies listens for, and hears in, Haydn's work patterns Mozart

prepared it to find. Nor is it only explicitly artistic development that affects the background for interpreting art. After the Vietnam War, the lighthearted lunacy of Heller's *Catch 22* took on a darker, more sardonic tone.

I have urged that exemplification depends on and varies with context, function, and background assumptions. Although examples from art and science back my claim, commercial samples seem to belie it. The system of conventions governing the interpretation of paint samples apparently treats them as as neutral, invariable, and unambiguous.

I demur. Rather than denying the relevance of context, function, and background assumptions, the system privileges a particular set. It can do so because it presupposes its audience shares a well defined interest in paint. The normal function of paint samples is to aid in the selection of house paint. We are, presumably concerned about the color of the paint we select, and our interest is restricted to available alternatives. So the system is designed to supply easy epistemic access to these. That's all it does. In view of what we use the samples for, it's enough.

The very same samples might, of course, exemplify other features as well: the contemporary preference for rich colors, the unavailability of a warm brown, or the muddiness of one manufacturer's colors as compared with the vibrancy of another's. They may even exemplify features having nothing to do with color -- for example, sloppy workmanship and inattention to detail exemplified by paint chips that peel off the sample cards. But to see the samples as exemplifying such features requires overstepping the boundaries the conventional rules define. And outside those boundaries, interpretation proceeds without rules.

Paint samples, as normally interpreted, are thus atypical. Interpretation is rarely a matter of routine application of fixed rules. For exemplars are highly sensitive to context, function, and background assumptions, and these admit of enormous variation. Nevertheless, interpretation is neither arbitrary nor hopelessly difficult. Traditions, rules of thumb, accepted interpretive practices and precedents guide us, though they provide no recipes. And despite their unruliness, context, function and background assumptions often suffice to determine or narrowly circumscribe interpretation of particular exemplars. We don't need an algorithm for interpreting experiments to infer that an experiment consisting of an apparatus hooked up to a

volt meter exemplifies voltage. (It may, of course, exemplify other things as well.)

Interpretation of denoting symbols, it's worth noting, also proceeds without rules. As the census bureau recognizes to its regret, we have no nonvacuous rule for determining the extension of the term 'household'. We go by practice and precedent, drawing on available contextual cues, background assumptions, conversational implicatures, and functional roles, resorting to guesswork where necessary to assign referents to our terms. Indeed, we may have an easier time with exemplars. For they are subject to a constraint that denoting symbols are not. An exemplar can exemplify only features it instantiates. But a denoting term can refer to anything or nothing at all.

There are of course no guarantees. What a symbol exemplifies or denotes may permanently elude us, or remain forever in dispute. Perhaps we'll never know what Schrodinger's cat or Giorgione's *Tempest* exemplifies, or who, if anyone, 'Shakespeare's dark lady' or 'the fifth man in the Cambridge spy ring' denotes.

IV

If we focus exclusively on illustrative or pedagogical cases, exemplars may seem mere heuristics. We provide examples in class to enliven our subject. But if students truly understand the material, we're apt to think, examples aren't really necessary. A student has all she needs to do the problem sets when she's mastered geophysics, and all she needs to analyse the *Eroica* when she's mastered music theory.

I doubt it. Every theory admits of multiple models in a given universe.⁸ So a student could grasp a theory without knowing how it applies. One role of examples is to select among admissible models. To be sure, an example won't fix interpretation uniquely. For models that diverge elsewhere may agree about a particular case. Still, an example grounds a theory in its domain and gives the student a purchase on applications.

In any case, not all exemplars function primarily as heuristics. Experiments do not. Their main function is to test -- to disclose whether phenomena have the features a theory attributes to them. Anyone who contended that experiments are superfluous once we master chemistry would profoundly misunderstand empirical science. Without experiments there would be no chemistry. Experiments do not just convey what is

already understood, they engender further understanding.

Nor is art primarily heuristic. Like science, it provides telling instances that show that, how, and to what effect particular features are instantiated. No more than in science is this always a matter of illustrating what is already known. *A Doll's House* exemplifies what, many years later, *The Feminine Mystique* describes -- the stifling limitations on women's lives that conventional middle class marriages enforce. When *The Feminine Mystique* was published, critics doubted that the predicament is as painful as Friedan makes it out to be. They did not realize that Ibsen had already answered their doubts. Nora's predicament demonstrates that a gilded cage is still a cage and that the denizens thereof, however pampered, are still trapped. It took nearly twenty years and a scientific revolution to produce a framework that accommodates the features the Michelson-Morley experiment exemplifies, over eighty years and a social revolution to produce one that accommodates the predicament exemplified in *A Doll's House*.

Works of art often bring out hitherto unnoticed or poorly differentiated features. We might think, for example, that there's no difference (except, perhaps, in degree) between sorrow and grief. We need only compare Michelangelo's *Pieta* with the figure at the left in Picasso's *Guernica* to learn otherwise. Each portrays a woman holding her dead child. The Michelangelo expresses incalculable sorrow; the Picasso, unmitigated grief. Sorrow evidently can be as profound as grief. There need be no difference in degree. But grief, we discover, is grittier; it is tinged with anger. Sorrow, on the other hand, is smooth. The comparison effects a refinement of the sensibilities, leaving us unlikely again to conflate or confuse the two emotions.

Science functions similarly, bringing overlooked features to the fore and drawing distinctions among them. With the articulation of a clinical picture, for example, characteristics that were once considered medically insignificant acquire the status of symptoms. A patient comes to exemplify qualities he previously only instantiated. As the clinical picture is refined, conditions that had been conflated come to be differentiated.

In my haste to recognize parallels between the arts and the sciences, I may seem to neglect a significant difference. Science purports to concern matters of fact. Art does not. Indeed, fiction makes a fetish of

indifference to fact. This suggests two difficulties -- one semantic, the other epistemic.

The semantic problem is this: an item can't exemplify features it doesn't instantiate. Works of art are inanimate. Thus, it would appear, they are constitutionally unable to instantiate emotions, feelings, or other states of mind. If so, they are incapable of exemplifying such features. *A Doll's House* then cannot exemplify Nora's discontent, nor (assuming it is fictional) can the *Guernica* figure exemplify grief. Such works can, of course, exemplify features having to do with style, genre, technique, and the like. For they evidently instantiate such features. But their exemplification of properties like these hardly suits them for the significant epistemic role I've cast them in.

It's quite true that inanimate objects cannot literally instantiate states of mind. But they can and often do instantiate them metaphorically. And metaphorical instantiation, though it is not literal instantiation, is none the less real instantiation. The semantic difficulty dissolves. For works of art can and often do exemplify features they metaphorically instantiate. In that case they metaphorically exemplify those features. *A Doll's House* metaphorically exemplifies discontent; the *Guernica* figure, grief.

This leads directly to the epistemic difficulty. It's not at all clear how -- or even that -- a fiction's metaphorical exemplification can advance understanding of anything beyond the fiction. We cannot infer that the blind obsession metaphorically exemplified by Ahab is anywhere literally instantiated. So what, if anything, could an understanding of Ahab's obsession reveal about the world?

Rather than tackle that question head on, let's turn again to science. For science has fictions of its own -- for example, thought experiments. These are imaginative exercises designed to disclose what would happen if certain conditions were met. Thought experiments may be purely cerebral, as Einstein's were. Or they may be mathematical models or computer simulations. But they are not actual experiments. So they do not literally instantiate the phenomena they concern.

Still, they are obviously informative. Einstein was able to draw out startling implications of the theory of relativity by imagining what one would see if riding on a light wave. And scientists studying superconductivity discover from computer simulations how electric currents would behave in metals cooled to

absolute zero.

Like other fictions, thought experiments instantiate phenomena they concern not literally, but metaphorically. The computer simulation won't run until the computer is warm. Still, what occurs can be metaphorically described as at a temperature of absolute zero. And in the context of inquiry into superconductivity, the simulation exemplifies this description of itself. That the simulation occurs in something metaphorically cold is scientifically significant. That it occurs in something literally warm is not.

The simulation discloses that at absolute zero, electrical resistance disappears. It does not, of course, demonstrate that absolute zero ever in fact is reached, or that resistance ever in fact disappears. But by revealing what would happen in the limit, it enhances our understanding of the connection between resistance and temperature, and suggests avenues for further investigation.

The success of a thought experiment turns on the accuracy and adequacy of its background assumptions. If our computer simulation omits factors that affect resistance or assigns them incorrect functions or weights, its output is not to be trusted. In this regard, thought experiments are no different from other experiments. Unless we are right to assume that only acid turns litmus paper pink, litmus tests are unreliable.

Both literal and metaphorical experiments can, of course, disclose that their background assumptions are faulty. The failure of the Michelson-Morley experiment to detect ether drift undermined the assumption that ether is there to be detected. And the failure of a simulation of radioactive decay to reach equilibrium demonstrates the inadequacy of the assumptions it is based on.

Just as thought experiments are fictions in science, works of fiction are thought experiments in art. Both are vehicles for exploration and discovery, providing contexts in which features may be demarcated, their interplay examined, their implications drawn out. Freed from the demands of factuality, fictions can separate constant companions and commingle traditional rivals. By doing so, they may transform our understanding of features and the conditions of their realization.

To anyone of even a mildly behaviorist bent, it might seem obvious that a person couldn't sincerely resolve to reform, yet continue to behave as badly as ever. Indeed, lack of improvement seems a sure sign that

the resolution wasn't sincere. But through his characterization of Pierre Bezuhov, Tolstoy convinces us otherwise. Pierre truly means to reform his indolent ways, he just never gets around to it. In Pierre is exemplified the capacity of inertia to override resolution. The bond between resolution and action is broken. And how resolution relates to action becomes again an open question.

Love and hate, one would think, are natural enemies. Vacillation between them is surely possible. But it seems obvious that one cannot both love and hate the same person at the same time. Obvious, that is, until one encounters a work like *Who's Afraid of Virginia Woolf?* where the possibility and pain of such a mix are clearly exemplified. The play forces us to recognize that antagonistic attitudes are not mutually exclusive and opens our eyes to configurations of emotions we once would have excluded *a priori*. In so doing, it deepens and enriches our understanding of emotional life.

Like other thought experiments, literary fictions often go to extremes. Ahab's obsession is not a mind set one encounters every day. But by seeing how it plays itself out, how it comes to dominate not just Ahab's mind but also the lives and destiny of his crew, we gain insights that may be applicable to more moderate, more familiar cases of psychopathology.

Features that are salient in extreme situations often are realized but are not salient elsewhere. By going to extremes, fictions bring them to the fore, delineating their characteristics, demarcating their boundaries, disclosing patterns of concurrence and independence. Fiction feeds back on fact. Once we've learned to recognize such features and the possibilities open to them, we often can locate them and their kin in their natural habitats.

An exemplar, I said, is a telling instance -- an instance that discloses the features it refers to. Its embodiment of those features shows something of what they are and something of how they are realized. An exemplar thus facilitates recognition of further instances of the features it exemplifies.

Features often belong to families of alternatives. And the exemplification of one member provides indirect access to others. We acquire the ability to recognize additional instances not only of the exemplified feature, but also of its kin. From a leaden cadence that exemplifies sadness, we readily infer the spritely sound

of joy.

Exemplars thus equip us to go on -- to apply the categories they highlight to new cases. This is not always easy or automatic. To follow where innovative exemplars lead often requires radical reorientation and reorganization. The stranglehold of habit can be difficult to break.

The insights exemplars afford are tested by further applications. Experimental results are acceptable only if repeatable. But mere repetition is not enough. That would control for dishonesty and negligence, but not for misleading results. By holding exemplified features fixed and varying unexemplified ones, we perform a more stringent test. A result that recurs under such circumstances is one we have reason to trust.

Something similar occurs in the arts. The adequacy of an aesthetic 'experiment' is tested not by trying to produce exactly the same effect in exactly the same way, but by trying to project the exemplified feature or family beyond the work that first exemplifies it. Constable did not continually paint the same cloud configuration. He projected his vision of clouds through a variety of configurations. And the viewer confirms that vision by coming to see actual clouds and other cloud pictures as having the forms Constable's works exemplify.

Not all exemplars afford a valid basis for projection. But even those that do not may enlighten. When we realize that the moral absolutes exemplified in cowboy films do not extend beyond the fictive realm, we learn something about the moral ambiguities and complexities of human life, and about the simplifying assumptions of the genre. And when we realize that the fuel economies exemplified in test situations are not matched by cars on the road, we come to appreciate both the effects of driving conditions and techniques on fuel consumption, and the deceptiveness of advertising.

Exemplification's epistemic contribution has little to do with justified true belief. Justification in the sense of argument from accepted premisses is out of place. An exemplar is vindicated not by what backs it up, but by what it brings forward. If it illuminates features that are worthy of attention (a contextual matter, to be sure), humble origins are no handicap. If not, the most patrician pedigree is no help.

Nor is truth crucial. Experiments and pictures, paint samples and fabric swatches inform by means of

exemplification. Being non-verbal, such symbols are neither true nor false. Their success in advancing understanding thus does not turn on their truth. Nor need epistemically effective verbal exemplars be true. Effectiveness sometimes depends on non-semantic features such as syntax, style, inflection, or emphasis. And even where semantics is involved, a telling falsehood may be as revealing as a truth. If no one ever said, 'Give me liberty or give me death!', someone should have.

An illuminating exemplar need not even affect belief. Its cognitive contribution may consist in augmenting one's conceptual repertoire, refining one's discrimination, honing one's ability to recognize, synthesize, reorganize, and so on. Even if extant beliefs remain in place and no new ones are formed, it is hard to maintain that exemplars that perform such functions are epistemically inert.

V

In this paper, I have sketched some of the cognitive functions common to exemplars in the arts and the sciences. My goal is not to reduce the arts to the sciences or the sciences to the arts. Nor is it to construe either as underlaborer to the other. Rather, I suggest that the disciplines complement one another, each contributing to the advancement of understanding. That there are differences between them is plain. But these are differences within the cognitive realm, not between things that are cognitive and things that are not. If I'm right, they are differences it is the business of epistemology to discern.

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Notes

¹Mary Mothersill, *Beauty Restored* (Oxford: Clarendon Press, 1984), p.8.

²W. V. Quine, 'Two Dogmas of Empiricism', *From a Logical Point of View* (Cambridge: Harvard University Press, 1980), p. 41.

³See Nelson Goodman and Catherine Z. Elgin, *Reconceptions* (Indianapolis: Hackett Publishing Co., 1988), pp. 135-152.

⁴*Ibid*, pp. 161-166.

⁵The that works of art and science I cite throughout this paper are offered by way of example. Nothing in my account hangs on the correctness of any particular example. The reader who disputes my choices can readily provide alternatives.

⁶Nelson Goodman, *Languages of Art* (Indianapolis: Hackett Publishing Co., pp. 52-56. See also, Catherine Z. Elgin, *With Reference to Reference* (Indianapolis: Hackett Publishing Co., 1983), pp. 71-97. It should be obvious that throughout this paper I am enormously indebted to Goodman's discussion of exemplification and, more generally, to his understanding of aesthetics.

⁷Goodman and Elgin, *op. cit.*, pp. 49-65.

⁸Hilary Putnam, 'Models and Reality', *Realism and Reason* (Cambridge: Cambridge University Press, 1983), pp. 1-25.