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A Definition of Caricature and Caricature and Recognition

A DEFINITION OF CARICATURE AND CARICATURE AND RECOGNITION¹

DAVID PERKINS

PART I A DEFINITION OF CARICATURE

The existence of caricatures has proved something of a nuisance to philosophers and psychologists bent on analyzing pictorial representation (Gibson 1971). The contrast between caricature and customary "realistic" representation poses part of the problem. A portrait caricature clearly represents a certain layout of spatial form, a face-like layout with nose so long, mouth so wide, and so forth. This spatial layout typically diverges substantially and in calculated ways from the true form of the subject's head. What sort of picture is this? It is deliberately inaccurate, yet the subject is often quite recognizable—perhaps more recognizable than in an accurate portrait or photograph. It lies about its subject's shape, but in doing so often comments delightfully on that shape. If conventional picturing is to be analyzed in terms of the picture conveying information to the viewer about its subject, then caricature is not strictly part of, but builds on, that convention, bending it to special purposes. What *exactly* is going on?

Another part of the puzzle is the variety of pictures sometimes called caricatures, but which deviate in obvious respects from the most typical usage of the term. Political cartoons in general need not represent any known political figure. Grotesque faces such as Da Vinci's famous set (Gombrich 1961:95) need depict no actual individual or class of individuals. A child's cartoon monster labelled "teacher" may offer a funny face without satirizing that teacher's specific physiognomy. Mergings of human and animal features as in Figure 1 by Levine (1969) are a bonus: caricature allows but does not demand such a mix.

The natural attack on these problems is a quest for definition, a framing of conditions for caricature which would on the one hand specify its relation to realistic

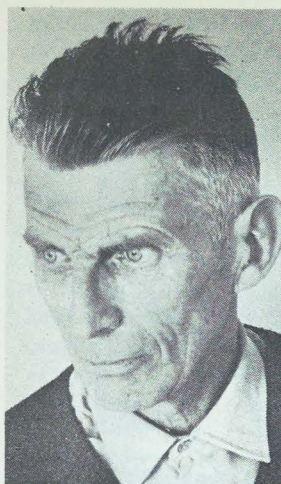


Figure 1 —Samuel Beckett

portraiture, and on the other admit or exclude, and in any case elaborate the relation of caricature to, the various sorts of pictures which sometimes are so named.

Two concepts merit special attention in the search for definition. One is *exaggeration*: a caricature typically exaggerates features of its subject. The second is *individuation*: a caricature typically exaggerates so as to differentiate the subject from his fellows. Exaggeration and individuation alone promise some unscrambling of the problems sketched above. Exaggeration seems a meaningful concept only in a symbol system where one can also tell the truth. This might illuminate caricature's dependence on and relation to a tradition of realistic portraiture. Individuation commands that the caricature remain true to the subject's physiognomy at some level, reflecting the intuition that *mere* distortion, as in the child's cartoon monster, is not caricature.

Such factors prompt a preliminary and very traditional definition: a caricature is a symbol that exaggerates individuating characteristics of its subject. Indeed, a refinement of this will provide the final formulation. But along the way some major difficulties demand attention. First, prior writers have proposed other conditions in addition to exaggeration

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Rassenschuh



Was Gott zusammengepuft, soll der Mensch nicht trennen,
Was er geschieden, nicht zusammenmanchen!



Der rote Drache

Wie kommt die Welt denn je zum Stehen,
Bist man das Ungeheuer wüten?

Figure 2 —Nazi caricatures of Jews

and individuation; for instance, a caricature must be humorous. On what grounds are these additional constraints dismissed? Second, individuation and exaggeration are themselves concepts hardly clearer than caricature. The definition

becomes little more than a game of word substitution unless these terms themselves can be explicated, particularly as they relate to realistic representation. Third, it is not enough that a definition simply stake out roughly the class of pictures usually called caricatures. Many definitions could do about equally well *statistically*, including the above, the above with "humor" also required, or "grotesque drawings which represent real subjects." The discussion will argue that the above definition and its elaboration, far from being arbitrary, illuminate the essential psychology of perceiving caricatures.

FURTHER CONDITIONS?

Prior definitions of caricature are mainly introductions, asides and ornaments to a body of work with quite a different focus. Most of the surprisingly extensive literature on caricaturing deals with the evolution of the form, biographies of caricaturists, and presentation of examples without technical discussion. The range of art treated is generally wider than portrait caricature, encompassing also the political cartoon or grotesque figures. "Caricature" is sometimes used synonymously with either of these. The details of the relation between drawing and subject are persistently neglected. Rarely does one even find a portrait and a caricature of an individual side-by-side. For some happy exceptions, see Berger (1952), Gombrich (1963), Rother (1966).

Definitions, when attempted at all, have their favorite vocabulary. Besides "individuation" and "exaggeration," key words are "humor," "idealization," "defects," and "personality" as well as near synonyms of these. Whether such terms can add to the conception of caricature sketched above demands appraisal. The conclusion will be that they cannot.

Humor

Humor stands in an intimate relationship to caricature, often figuring in the definitions put forth by various writers. Proposals that caricature is the exaggeration of an individual's characteristic features to comic effect, or the like, appear frequently (*American Heritage Dictionary* 1969; Murray, quoted in Ashbee 1928:1, 25; Berger 1952:7; Davies 1928:1). But humor seems dubious as a condition for caricature.

First of all, there are drawings which clearly deserve the label but are of doubtful humor. Figure 2 from Gombrich (1963) illustrates caricatures of Jews devised by the Nazi propaganda effort, caricatures which are too vicious to be funny. Commonly, one finds political cartoons incorporating portrait caricatures which in themselves are at best very mildly humorous. They primarily serve as reference mechanisms for the real joke of the caption or whole cartoon. It seems strange to place the humor of the caricatured face so much in the center of things by definition when it is often rather peripheral to the entire comic effect. Figure 3 points up another problem. Some artists such as James House (Figure 3), and Oscar Berger (1952) often emphasize likeness of personality rather than humor; the product is not intended to prompt a laugh. Finally, there are contrast enhancement techniques in photography and caricature-style drawings of complex machinery (Ryan and Schwartz 1956).

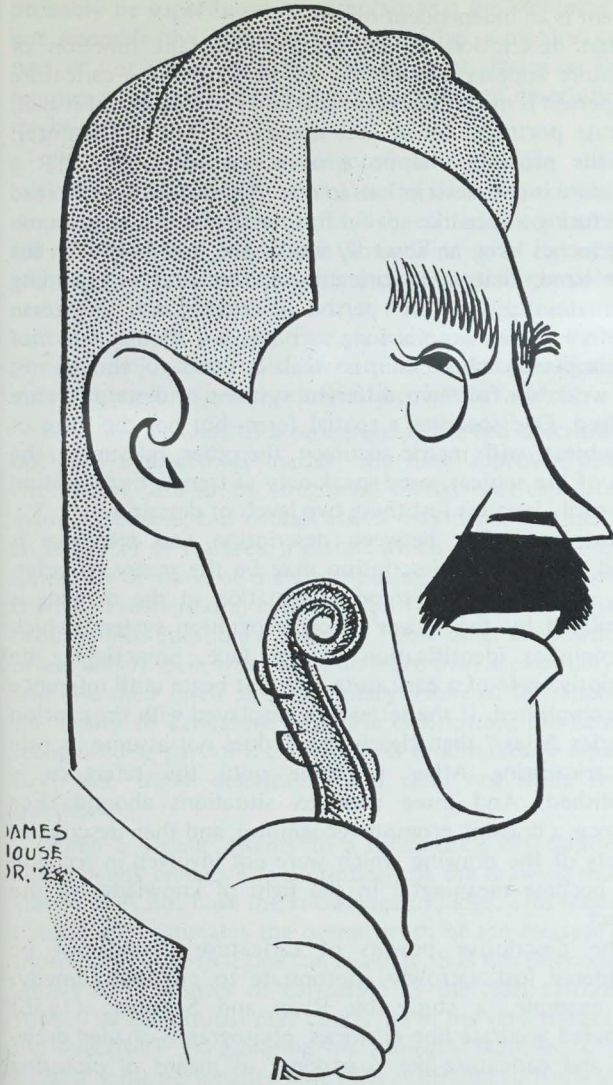


Figure 3 —Fritz Kreisler

These are hardly comic subjects, but the term caricature, if humor is not a condition, seems an illuminating name for such pictures.

If one's area of interest is portrait caricatures, the added condition of exaggeration "to comic effect" would narrow very little the class of drawings satisfying the requirements; exaggeration and individuation fix the range of the term adequately. And a requirement of humor would connect caricature logically with the snarl of philosophical and psychological issues surrounding the topic of humor. It seems prudent to stay as much on the periphery of that as possible.

Furthermore, there is a certain tension between the aim of humor and the aim of individuation. The political cartoonist Paul Szep, of the *Boston Globe*, has emphasized to me the particular difficulty of producing a caricature in which the human face is merged with an animal form. The combination can be marvelously appropriate, but the amount of differentiating information available is certainly reduced. Worse, a long nose for an inquisitive but short-nosed person may be

in keeping with his behavior, but can injure the likeness. All the above considerations sum to the conclusion that humor is best considered a contingent property of some caricatures.

If humor should not be a necessary condition for caricature, then what accounts for its undeniable close association with the form? A historical answer is, in part, legitimate: caricature has in fact been persistently used to humorous ends. But such a reply is incomplete if it does not confess that caricature lends itself to just such use. The point is that exaggeration, a prime tool of the caricaturist, is also a key device of the humorist. This does not mean that all exaggerated faces are funny, any more than it means that all exaggerated faces are identifiable. Exaggeration in various cases may serve a humorous end, an individuating purpose, both, or neither. That it so often serves both, reflects the psychology and the individual culture of the human perceiver and the caricaturist's happy exploitation of both psychology and culture.

Idealization and Defects

Idealization seems intuitively the very contrary of caricature. Both depart from faithful portraiture, but somehow in opposite directions. Roughly speaking, idealization means producing a picture of a subject so as to emphasize various canons of beauty, masculinity, or whatever, established in the artist's society. As such, idealization is one form of exaggeration. This encourages the complementary view that ugliness is as central to caricature as idealization is counter to it. Caricature is seen as the exaggeration of the *defects* of a physiognomy (Davies 1928; Balducci, quoted in Gombrich 1961:344; Grose, quoted in Lynch 1927:9; Bergson, quoted in Lynch 1927:5; *Random House Dictionary* 1968).

But such a formulation reflects a philosophy in which any departure from an ideal counts as a defect. The usage of these terms is more tolerant today. Individuality itself carries certain positive values. There is a large middle ground between what counts as ideal and what counts as defective. Exaggeration of individuating features may not produce ideal types, but need not produce ugliness. Oscar Berger (1952) presents a number of benign caricatures of various public figures, done in sittings with their cooperation. In sum, exaggeration of defects is simply too specialized a requirement to be called a necessary condition for caricature; there are too many pictures called caricatures that would not be so described.

Furthermore, ugly caricatures are not really needed to satisfy our hunch that caricature runs contrary to idealization. Another symmetry besides beauty and ugliness serves as well. Idealization is a transformation that blurs the distinctiveness of the particular face; a range of individuals all idealized are depicted as sharing many features that comprise the ideal standard and hence are less differentiated. Thus while caricature individuates, idealization disindividuates.

Personality

Many caricaturists often emphasize conveying personalities through their art (Low 1932). In their work, this aim accompanies or replaces humor. Those that take this approach must gather information about a subject's character; the personal interview and/or sitting is a favorite device

(O'Connell 1970; Berger 1952). But Paul Szep has explained that personal contact is often impossible where major political figures are concerned. First of all a physiognomic likeness is the goal. Next, the political cartoonist must generally work from his target's public character, not his "home" character—both because that is what is accessible and that is what the public knows. Finally, the aspects of character to be emphasized naturally turn on the particular, and generally critical, function of the cartoon. Thus the extent to which conveying personality is a primary aim varies considerably from artist to artist and from circumstance to circumstance. Personality is not the focus consistently enough for it to serve as a further necessary condition for caricature.

Indeed, expression of personality competes considerably with physiognomic individuation. Topffer and numerous other artists of the eighteenth and nineteenth centuries systematically explored variations in cartoon and normal portraits that yield various personality impressions (Gombrich 1961, ch. 10). More recently, psychological research employing photographs and sometimes composite line faces reveals that observers will readily—and often consistently across observers—attribute personality traits to strange faces (Shoemaker, South, and Lowe 1973; Hochberg 1964:105-110; Secord 1958; Secord and Muthard 1955). But these personality attributions do not accurately reflect the true personalities of the photo's subjects; that is, a subject's face will likely suggest a personality not in keeping with his actual personality. A caricature or portrait which is both recognizable without labels or context and also a faithful expression of the subject's true personality (not the superficial personality projected by his face) must be counted as an especially fine achievement.

REFERENCE AND DESCRIPTION

If humor, ugliness and expression of personality are inessential to caricature, then exaggeration and individuation by themselves must resolve this art form's paradoxes. Two symbolic functions of special concern are *reference*—a caricature is *of* a person—and *description*—a caricature delivers certain shape information about the subject's face.

In order for the caricature to speak about its subject, the subject must be designated. Sometimes audaciously direct means are employed: human figures in pictures are simply labelled with their names, or relatively unambiguous contextual cues are provided—a white house in the background. Another major means is to provide a picture recognizable from the face as representing a particular individual. Indeed, some caricaturists hold it an obligation of their art to eschew other techniques, especially when a familiar, plausibly recognizable, public figure is the subject.

Nonabstract pictures, the sorts of concern here, will be said to *describe*. This will simply mean that they provide to the viewer information specifying spatial forms and surface properties—the shapes, textures, colors of chairs, houses, faces, or whatever. This quite deliberately ignores the often important distinctions between pictorial and linguistic means of symbolizing discussed by Goodman (1968, ch. 4). It should be mentioned that in general a description, linguistic or pictorial, need not be a description *of* any actually

existent thing; whether the description is ascribed to a referent is an independent matter.

That description should be an important function of caricature appears implausible, considering that a caricature of a person is manifestly and necessarily inaccurate (if it is an accurate portrayal we do not normally call it a caricature). But the problem disappears once one recognizes that a caricature is two descriptions in one. A caricature can be read as picturing a face-like spatial form with, for instance, a nose three inches long, an absurdly weak chin, and so on. On the other hand, that same caricature can be read as providing information about the person it stands for, a person therefore whose nose is long as noses go, though not *that* long, a person whose chin is weak as chins go, though not *that* weak. In fact two different systems of description are involved. One specifies a spatial form—but not the form of the subject—with metric accuracy; the other, relevant to the form of the subject, need speak only of trends. Exaggeration necessarily involves just these two levels of description.

The interaction between description and reference is varied. Sometimes, description may be the means of reference. The descriptive trend information in the drawing is assimilated by the viewer's face recognition system, which accomplishes identification of the face. Sometimes, the descriptive role of a caricature may not begin until reference is accomplished. If the letter T is displayed with the caption "Charles Atlas," then clearly the T does not assume its role of caricaturing Atlas' physique until the reference is established. And more complex situations abound. For instance, a drawing prompts recognition, and then descriptive aspects of the drawing which were not involved in recognition become meaningful in the light of knowledge of the subject.

The descriptive powers of caricature should not be considered just narrowly appropriate to pictorial comedy. For example, a study by Ryan and Schwartz (1956) compared accurate line drawings, photographs, shaded drawings, and caricature-like "cartoons" as means of picturing complex spatial layouts, including machinery. The pictures were exposed tachistoscopically and the caricatures most successfully conveyed the general organization of the spatial layouts at shorter exposures.

Furthermore, caricature-like techniques of exaggeration are actually employed in a number of communications contexts. Relief maps amplify the vertical scale. Photographers utilize contrast enhancement methods. Examples occur among pictograms used in international traffic warning signs, although however clear and emphatic these may appear to the acculturated viewer, Kolars (1969) warns us to be wary of any claim that such signs are universally readable.

TRUTH AND REVELATION

A true description is simply a description that specifies properties true of a referent. Portrait caricature, involving exaggeration as it does, is never a true description as far as metric accuracy is concerned. But a caricature may be a true trend description of its subject. Indeed, if a viewer remarks that a caricature doesn't look like its subject, he is not likely to mean that the drawing lies about the subject's exact metric shape; that is taken for granted. Similarly, if a drawing

depicts a political figure with a bulldozer body, it would probably be superfluous to complain that the bulldozer does not resemble the subject's body. Whether a picture, caricature or not, offers true descriptions must always be judged relative to an analysis of the multiple *kinds* of descriptions it might offer.

The aesthetic functioning of a caricature depends critically on the viewer's evaluation of its truth *and* falsity as description. (A corollary of this is that a caricature cannot be fully appreciated unless one is familiar with its subject's physiognomy). Humor in caricature serves as an example. If a caricature is not taken as a true trend description, then it becomes simply a funny face, lacking a manifest kernel of physiognomic truth. But if only the trend description is noted, there is no perceived overstatement to laugh at.

A viewer's assent to a caricature as a trend description is not just a piecemeal matter, the nose approved but the cheeks not, and so on. Judgments of that sort can often be made, of course, but overall assent may depend as much on an interplay of features, a gestalt which itself cannot appear unless all or most of the contributing trends are themselves correct. Furthermore, a description false in some respects is brought into question as a whole. Those other propositions it offers which seem true, seem no more than accidentally true and lose their merit as commentary. None of this applies to the falsity of caricature as metric description; this falsity is recognized as part of the art form, is *systematically* separable from the trend description and does not bring it into question.

When a viewer assents to a caricature's description, his assent lends credence to ascriptions of the drawing that the viewer does not have the knowledge to judge. This is entirely natural; one estimates the overall truth of the message from those parts of it that one can evaluate. But this phenomenon allows such misuses of caricature as the Nazi cartoons of Jews. The caricaturist may couch lies in the very visage itself, by selectively exaggerating his subject's features so as to suggest some personality trait such as meanness. If the viewer knows the subject, but has seen in his face or behavior no contrary personality indications, the viewer, recognizing the face, is likely to take the meanness as an aspect of the true face he had not noticed before, exposed by the art of the caricaturist. On the other hand, the sophisticated viewer will have learned to distrust ascriptions of personality in caricature. That is a part of being sophisticated.

In sum, the viewer's assent to, dissent to, or inability to evaluate a caricature's trend description plays an intimate role in his whole reaction to the work. In many cases of humor in caricature, the viewer's judgment of the falsity of the picture as metric description plays just as important a role. Further, the viewer's reaction is highly individual, depending on the prior knowledge and the habits of categorizing that he brings to his encounter with the picture, on his familiarity or lack of familiarity with the subject's face, his preconceptions about the subject's personality, the degree to which he separates physiognomic, political, personality, and other ascriptions, and separates metric from trend descriptions. The viewer's response is as much bound up in the information he has available and his general habits of information processing as it is in any exclusively aesthetic

capacities he might have (if exclusively aesthetic capacities exist at all).

This theme can be carried further yet. The fine caricature of Beckett as a buzzard, done by Levine and displayed in Figure 1, exemplifies "revelation." Levine has delivered a construction that reveals an unexpected visual affinity between Beckett's physiognomy and that of a buzzard, an affinity that gains depth because of Beckett's morose literary works. The example will be discussed further later, but certainly revelation is not limited to cases of representing a person as an animal, or as anything else at all. I particularly recall a caricature of Pushkin by Levine, where the exaggeratedly large and limpid eyes led me suddenly to realize how those eyes dominated Pushkin's face in realistic portrayals. In sum, a caricature reveals when it exposes unnoticed physiognomic relationships, or the unrealized influence of particular features on the whole face, or the like.

Accordingly, revelation is a frequent achievement of, but not a requirement for, caricature. In political cartoons, the same public figure may recur again and again in the same style. His reappearances, offering little further physiognomic revelation, accomplish other functions within the cartoon, such as reference or expression.

Some requirements of revelation can be specified in terms introduced earlier. First, revelation is part of caricature as a description; that is, a caricature offers a proposition about a subject's physiognomy, such as, that it is like a buzzard's in certain respects. Second, the viewer must affirm the proposition; he does not reserve judgment or accept the proposition on faith as one might do when viewing a caricature of an unfamiliar subject. And third, the affirmation is not of an often entertained and tiresomely familiar proposition, but of freshly revealed truth. In sum, the caricature entices the viewer into affirming a novel proposition.

Why is a novel proposition affirmed? Relating the proposition to accumulated knowledge is required: for instance, the proposition may complete a pattern of other propositions; it may neatly sum up a collection of subordinate propositions, as does the Buzzard-Beckett equation; it may bring into focus a series of half-realized prior observations, as with my reaction to Pushkin's eyes. Whatever the relation to prior knowledge, it is a characteristic of revelation that the very organization of the viewer's perception is changed. Just as, after identifying a camouflaged figure, it is very difficult to recover one's original naive perception, so Pushkin and Beckett will never appear as they did, or not for a long time. In its very rapid, but long-term, reorganization of the viewer's perceptions, revelation contrasts with more gradual and painful means of shifting one's perceptions of the world.

Revelation, important throughout the arts, is related to discovery as the word would be used in science or philosophy. Both revelation and discovery involve apprehending a new structure or coherence in a body of accumulated information. Revelation emphasizes some agent's role in serving up the novel proposition, whereas discovery emphasizes the creative role of the apprehender in devising his own coherence. A discovery "comes as a revelation" just when the creator is largely unconscious of his own constructive role. Recent research (Muller, Kennedy, and Tanimoto 1972) has demonstrated that persons prefer

viewing sequences of pictures where initially distorted, unrecognizable letters become recognizable over viewing the reverse sequences, even though they judge the unrecognized distorted letters as by themselves more interesting than undistorted but readily identifiable letters. Discovery, that is, is valued for itself, independently of the value attached to the content discovered. Each of us can echo this subjectively; discovery and revelation are rewarding, often exciting experiences. This is one source of affect in caricature and in art in general.

In considering revelation, there is no need to confine the viewer to a passive role. If he does not invent the proposition that the caricaturist lays before him, at least he must read it out of the caricature, and furthermore he must relate it to his own knowledge and perceive that the proposition does lend that knowledge coherence or structure. These operations of the viewer are themselves active, constructive, and creative. Every revelation by an agent is to that extent a discovery by the recipient. Again, a viewer's response to a caricature emerges as a highly judgmental process very concerned with fact and logic; his prior information and information processing habits will determine whether he discovers what the caricaturist aimed to reveal.

EXAGGERATION AND INDIVIDUATION

In discussing how caricatures are "read," the previous sections have underscored the central roles of exaggeration and individuation. In employing exaggeration, caricatures provide a trend description but not a metric description of their subjects. And by providing a true trend description, caricatures individuate.

At once it is clear that exaggeration must not be taken narrowly, for instance, to mean "making larger." Caricatures of aggressive chins may be larger, but weak chins are rendered weaker yet. Some general techniques of exaggeration are: making darker or lighter, larger or smaller, longer or shorter, and accentuating contours—special cases of this include rendering hair curlier or the profile more pronounced. Non-physical traits, as of personality or expression, can also be exaggerated.

In all these cases, exaggeration involves displacement along a scale measuring (if crudely) some property. More generally, exaggeration could be defined in terms of a partial ordering relation on mutually exclusive classifications of some classification system. If a symbol exaggerates, it refers to a certain subject, but read according to convention, it also implies a measurement (classification) of the subject not in fact correct, but greater than or less than the correct measurement.

But merely distortion is involved if for the same subject and circumstances "greater than" and "less than" are not differentiated. Overstating the role of alcohol in accidents is exaggerating that role, but an understatement does not exaggerate the role. Neither is what counts as exaggeration a question of conventional "greater than" scale directions for various scales; as mentioned above, exaggerated strong chins are stronger, exaggerated weak chins are weaker. Rather, exaggeration seems to involve implicit reference to a "normal point" on a scale; the exaggerated symbol indicates a

measurement for a subject which is, starting from the normal point, beyond the subject's correct measurement. When the scale has an endpoint (e.g., zero on a length scale), in some contexts this endpoint serves as the norm and there is only one direction of exaggeration. In other contexts exaggeration is relative to interior normal points suggested by population averages, or by conventions of beauty or health, or the like.

Exaggeration aside, how can scales and normal points individuate? Common usage provides a clue. We speak of people as tall or short, fat or thin, and so forth, with implicit reference to an average height or build. In this way, a scale like height and a normal point like the average height allow us to individuate members of a population. Of course, many scales and norms have no individuating value. In a cartooning context where all noses get longer, the normal point for exaggeration is zero nose length. But no one has less than zero nose length, the scale and norm do not divide the population, and the cartoons exaggerate without truly caricaturing. From a standpoint of general informational efficiency, the population median provides the most individuating norm. But for any number of reasons, other normal points may be used in sorting: the basketball coach's professional standards for "tall" versus "short" will be high.

Caricature involves a triad: the cartoon itself, the subject caricatured, and scales and individuating norms (often determined by a standard population) against which the subject is measured. The caricaturist selects certain of these scales and exaggerates along these scales the departure of his subject from the normal points. Accordingly, the same subject against a different population might be caricatured quite differently; Gulliver is a giant among the pygmies and a pygmy among the giants. Another consequence is the traditional remark that people with especially ordinary features are hard to caricature; many of their measurements fall on the norm points and no proper direction for exaggeration is defined.

Even for other subjects, the circumstances may not unambiguously suggest the scales and norms against which an artist should work; he may have to choose. For example, suppose an artist aims to caricature a profile which is rather flat as profiles go (Figure 4, center). Among many alternatives, he might choose to work from the human average, and render the profile flatter yet (Figure 4, right). Or he might take a straight line—the average of all wavy lines—as his origin, and accentuate the contours (Figure 4, left). It seems plausible that either manipulation, in its own way, might contribute to a recognizable caricature.

The viewer as well as the artist has problems and options. In seeing how a caricature is exaggerated, he faces the task of determining the scales and norms with respect to which exaggeration was attempted. Does a certain drawing depict a nose exaggerated in length, an ear-nose distance exaggerated, a tip-of-nose exaggerated, or what? Such questions are resolved (with an element of arbitrary choice perhaps) by cues in the pictures themselves, by knowledge of conventions of picturing and caricaturing, and through intuitions about what sorts of scales and norms are psychologically likely. To say just that much is to touch a complex matter lightly. Although "reading" a picture as exaggerated is a largely automatic and unconscious accomplishment, substantial cognitive activity is clearly involved.

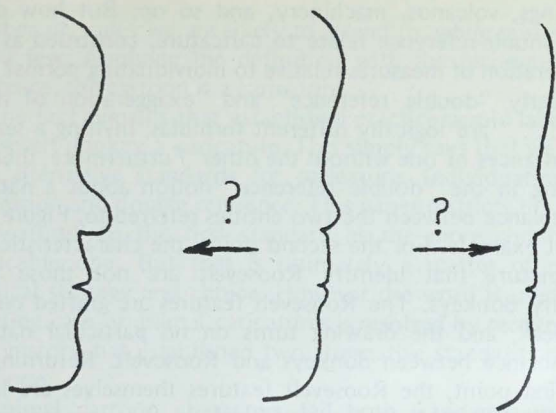


Figure 4 —Exaggeration relative to different norms

But just that much is enough for the present purpose, illuminating caricature. The thrust of this section can be condensed into two definitions. *A scale and norm, relative to a given population, are individuating just when the members of the population do not all have measurements on the scale less than, equal to, or greater than the norm. And a symbol referring to an individual, describing a measurement along a scale, and relative to a given norm, exaggerates just when the individual's true measurement on the scale lies between the described measurement and the norm.* Of course, this is an abstract from the realities of the human condition, where judgments of degree are uncertain and normal points indefinite intervals.

DEFINITION

The prior sections lend support to a formal definition. *A symbol referring to an individual and relative to a given scale, norm, and population is a caricature just when the scale and norm relative to the population are individuating and the symbol relative to the individual scale and norm exaggerates.* Of course, a symbol is called a caricature not just because of one—perhaps coincidental—measurement. Therefore, *a symbol referring to an individual and relative to a whole set of scales, norms, and populations is a caricature just when it is a caricature with respect to some of those scales, norms, and populations and accurate with respect to the others.* For a capsule statement and leaving some terms implicit, a caricature is a symbol that exaggerates measurements relative to individuating norms. This definition is not new; an essential equivalent was given by Samuel Johnson (Lynch 1927:1). Nor is it a radical departure from the trend of prior proposals. It simply says a little less than some, for instance in omitting humor, and a little more than others, for instance in insisting on the central role of exaggeration for individuation's sake.

The definition functions by paring away pretenders to the name "caricature," to reduce the concept to its most central core. First of all, the definition requires reference. Certain sorts of pictures are at once excluded: grotesque faces, gargoyles, harpies, monsters of various breeds, and so forth. Referring to no subject, they cannot ascribe properties to that subject and hence cannot deliver humor, revelation, or expression of personality in the manner of true caricature.

Of course, realistic pictures and photographs refer to and describe their subjects. But such pictures are not usually called caricatures, and the exaggeration requirement excludes these. Also, exaggeration emphasizes that caricatures occur in the context of an established system of "more accurate" representation. Caricature is not simply a trend description, but a trend description by means of exaggeration, a means which uses as its instrument the metric descriptive powers of picturing.

Exaggeration by itself leaves some problems, however. Portraying a person of average or smaller nose length and ear size as having a long nose and large ears might prompt a laugh, but cannot gain the viewer's affirmation of true description that is so intimately involved in humor in caricature, as discussed earlier. Such exaggeration does not provide description differentiating between that particular subject and any other, information necessary for most of the other functions of caricature as well as humor. The insistence that caricature exaggerate with respect to individuating norms excludes drawings which do not attempt such differentiation.

Just as caricature denies transformations which exaggerate without individuating, so it denies transformations which individuate without exaggerating. For instance, an artist may eliminate details of a face in order to throw the broader structural features into prominence. True, the manipulation packages some individuating properties of the subject for easy perceptual access. But the means of packaging is critically different. Many portraits which would never be called caricatures use such simplification, and though caricaturists often simplify as well as exaggerating, everything a caricaturist does need not be strictly caricature.

Finally, the relation between caricature as an abstraction and caricature in a human context must be explored. In light of the formal definition, the casual question "Is such-and-such symbol a caricature?" is badly formed, incomplete unless symbol systems, scales, norms, and so forth are specified. Most any symbol will be a caricature with respect to some trumped up specifications. But informally asking whether a symbol is a caricature makes implicit reference to our system of pictorial representation, the populations out of which subjects must be differentiated, and the scales and norms we routinely employ in perceiving and making judgments about pictures or real world scenes.

Certainly to be avoided is an oversimple conception of seeing a picture as a caricature, where a visual system methodically and exhaustively checks through some list of norms and scales to see whether the picture fits the definition. A prime concern of the viewer is to make sense of the picture, to determine its referent, and the relation between referent and subject. If the viewer can discover several scales and norms with respect to which the picture is a caricature, and notices few other scales and norms where the picture seems *merely* distorted (though there are almost bound to be many) then he will construe the picture as caricature. Therefore, whatever scales, norms and so forth a psychologist might list as "usually attended to," some pictures would formally be caricatures with respect to this list without always being recognized as such, some pictures would not formally be caricatures without the discrepancies always being noticed, and some pictures would be caricatures

with respect to scales not on the list, but brought to the attention of the viewer by the caricaturist's skill.

ANIMAL CARICATURES AND CARTOONS

The definition of caricature, abstracted from several crucial examples, should now prove its ability to analyze cases not figuring in its conception. Previously, various sorts of pictures were placed relative to caricature: portraits refer, describe their referents, but do not exaggerate; grotesques may exaggerate norms of ugliness but do not refer to or exaggerate an individual; and so on. Now the definition may be tried on a fresh domain, the cluster of problems surrounding the use of animal-like figures in caricatures and cartoons. Levine's buzzard caricature of Beckett has already been introduced, but the logical status of such a mix of human and animal characteristics was not discussed and remains puzzling.

Drawings wherein a recognizable subject is presented wearing the clothes—as it were—of an animal, are often especially engaging. Such drawings are generally called caricatures, but whether or not they merit the name in the technical sense proposed here is a subtle issue. A further example appears in Figure 5 from Gombrich (1963:213-214), who comments on its economy. Establishing reference with such a drawing depends on (1) a few effective clues—the cigarette holder, the smile, the tilt of the chin, (2) a context of current events and conventional symbols—the donkey, and (3) absence of counterevidence. The interplay between (1) and (3) is worth stressing. Recognition can take place with very few clues so long as features in the picture serving solely humor or other purposes (e.g., the ears of the donkey) are not taken to be attributes of the subject's real face.

Cartoons of this sort have at their heart a pun-like double reference, both to Beckett and buzzard, to Roosevelt and donkey, and so forth. In Goodman's terms (1968:27-41), Figure 1 denotes Beckett but is also a buzzard picture, and pictures may represent individuals not only as animals, but as

buildings, volcanos, machinery, and so on. But how does such double-reference relate to caricature, construed as the exaggeration of measures relative to individuating norms?

Clearly "double reference" and "exaggeration of measures . . ." are logically different formulas, inviting a search for instances of one without the other. Furthermore, there is nothing in the "double reference" notion about a natural resemblance between the two entities referred to. Figure 5 is an apt example. For the second point, the characteristics of the picture that identify Roosevelt are not those that identify donkeys. The Roosevelt features are grafted on, so to speak, and the drawing turns on no particular natural resemblance between donkeys and Roosevelt. Returning to the first point, the Roosevelt features themselves are little exaggerated, at least as compared to the accompanying photograph. There is the lengthened cigarette holder, but on the whole the picture is not much "caricatured" in our sense.

Levine's Beckett-as-Buzzard (Figure 1) is a contrasting case. Here several characteristics of the drawing perform double duty, describing both buzzards and Beckett. The beak-nose, the neck and chin, the facial wrinkles, and even the collar, are examples. Further, the portraying of the buzzard, accomplishing the animal reference, goes hand in hand with exaggeration of individuating trends of Beckett's face. Finally, implicit in the choice of buzzard is the exaggeration of personality characteristics of Beckett as reflected in his work.

In qualification, it is worth noting that the ears, so emphasized in the caricature of Beckett on the right of Figure 1, are reduced in the buzzard-Beckett so as to avoid an absurdly large-eared buzzard; the buzzard's ears seem even smaller than Beckett's true ears. Further, the buzzard version is certainly less recognizable all in all than the other, and functions particularly well when placed beside it. As always, there is this tension between manipulations for the sake of humor or personality comment and manipulations for the sake of individuation. As remarked earlier, many drawings caricaturing several measurements would merely distort others. But in the balance, the Beckett-buzzard caricatures a



Figure 5 —F. D. Roosevelt

number of scales we are likely to attend to, while missing on but a few. Applying the definition with the recommended tolerance, the cartoon is a caricature.

The fact remains that established practice would label the Roosevelt-donkey a caricature. This simply says that we have two alternative standards for caricature: individuating exaggeration and double reference. This paper restricts the term "caricature" to the first standard as the more commonly applicable one. But that is ultimately a matter of philosophical strategy and choice. However the word is used, the puzzling case of animal caricatures is resolved by recognizing that history has established two alternative standards rather than one.

Animal cartoon characters fail both standards; usually they do not involve double reference, nor are they usually caricatures in the present sense. A drawing of Donald Duck is not intended to be identified as anybody but Donald Duck (a fictional construct created by a series of such pictures) and is certainly an accurate, not an exaggerated, portrayal of him. True, Donald and many other cartoon characters exhibit a mixture of various animal and human features, often distorted—web feet and too-wide bill, the frontally located eyes, and arms with four-fingered hands. The result of course is a creature that is neither much of a duck or much of a human, as *Mad* cartoonist Bill Elder points out in Figure 6.

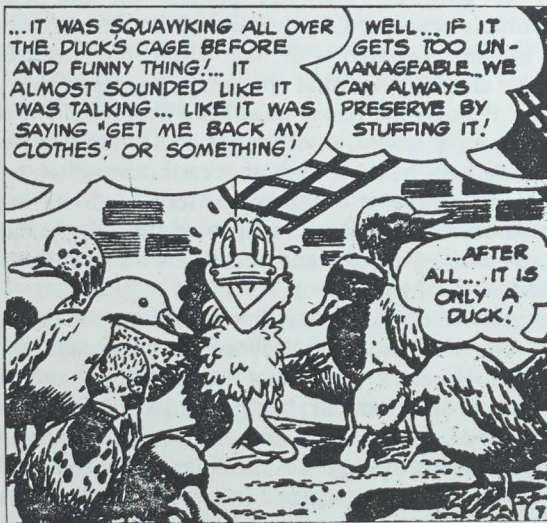


Figure 6 —Donald and other ducks

But Donald in shape is no effort to caricature either a duck or a human, though his actions may caricature human foibles. The distortions and mixing of human and animal features must be attributed to different aims. One of these is clearly the anthropomorphizing of the animal form, so that it will appear less alien (the frontal eyes are important here!), can manipulate objects with hands, and so on.

CONCLUSIONS

The context so far has been the pictorial caricaturing of individual physiognomies. But the term caricature has a wider application than that. First of all, a caricature need not

be pictorial. A mimic may offer an overblown version of his subject's voice and gestures; a writer may satirize another's work by exaggerating his idiosyncracies of style. Such efforts can certainly be called caricatures. And the usage does not reveal limitations in the present definition, because that definition nowhere requires pictorial symbols. The generalization is already there.

Caricatures of fictive individuals—Clark Kent, for instance—also occur. A generalization to accommodate this case comes fairly easily. If pictures of Clark Kent denote nothing, at least they are still descriptions of three-dimensional shapes which collectively and pretty consistently establish what the Clark Kent face shape *is*. Accordingly, that shape can be caricatured much as any other face shape. Such a caricature, of course, can't be said to denote Clark Kent any more than a "realistic" picture of Clark Kent does. But both can be treated as fictive representations, for instance, in the manner discussed by Goodman (1968:21-26).

However, some fictive individuals—Donald Duck, perhaps—may be quite difficult to caricature in any strict sense. With Clark Kent, the usual norms of human appearance may be invoked. But what norms apply to Donald Duck, when he is one of a kind? Certainly one can make distorted pictures of Donald Duck, but the distinction between individuating exaggeration and mere distortion tends to collapse.

This leaves the present formulation constrained to caricatures of individuals, real or fictive. But caricatures of classes are commonplace. The Nazi caricatures of Jews from Gombrich (1963) have already been mentioned. Today blue collar workers, hippies, intellectuals, and dozens of other groups are routinely lampooned by the caricaturist's art. Figure 7 offers a contemporary example. Ideals like "beauty" or concepts like "cold war" can also be caricatured. Unfortunately, the easy substitution of "class" for "individual" in the present definition does not yield an adequate generalization. Caricatures of classes simply involve more complex symbolic relationships, and require a more general construal of the concepts exaggeration and individuation.



Figure 7 —A caricature of classes

These concepts, as well as those of describing, revealing, truth judgments, and so on discussed earlier, have been the instruments for drawing a fairly sharp line around the notion of caricature of individuals. Certainly that line's placement has been guided by a personal intuition, but not an arbitrary one. The aim has been to systematically respect evident gulfs between the T which is not a description and the hulking T labelled Charles Atlas; between grotesques depicting no subject and equally monstrous images lampooning a victim; between the mere lie of the child's monster picture labelled "teacher" and the truth-in-lie of caricature; between drawings that in simplifying characterize and drawings that in exaggerating caricature; between pictures merely half-animal, half-man—the Roosevelt-donkey—and pictures with parts simultaneously animal and man—the Beckett-buzzard. The logic of the analysis hopefully does not blur or ignore, but rather delineates and explains, caricature as a unique art form.

PART II CARICATURE AND RECOGNITION

With all their distortions, we recognize caricatures. The puzzle is how. But perhaps the emphasis on caricature as the thing to be accounted for is wrong. Caricature recognition need not be explained as some adaptation, adjustment or success-in-the-face-of-adversity of the normal recognition process. One can turn the issue upside down and suggest that caricature recognition is a full manifestation of the normal recognition process, which is itself to be explained. And caricatures provide a means of investigation. The caricaturist is a natural experimenter, exploring distortions for the sake of satire, expression of personality, and so forth, while also meeting the need to deliver an identifiable image. In diverging from accuracy but preserving identity, his works provide a measure of which facial properties are important to identification.

The aim here is to explore these physiognomic invariants, these constancies between caricature and subject and between one caricature and another of the same subject. The approach is analogous to that of J. J. Gibson (1950, 1966) who bases his analysis of visual processes on invariants in the optic array. But the sources of perturbation across which constancies are sought are not only the shifting perspectives of the viewer and changing illumination. The transformations are provided by the caricaturist, and the search for constancies encouraged by his need to supply an identifiable work in spite of these transformations, or even by means of them.

E. J. Gibson's work (1969:102-105) provides a framework for restating the subject in another way. She, like myself, feels that the recognition of caricatures can be explained via the normal face recognition process. Caricaturists exaggerate "distinctive features" of the human face, those features by means of which viewers discriminate face from face and identify individuals. Choosing its own terminology, this paper will speak of individuating "properties" or "attributes" of the face, taking the terms in the broadest sense and as synonymous.

Like sonnet or sonata, this approach is a form needing explicit content to be meaningful. Of necessity, recognition depends on individuating properties of the stimulus. On what else could it depend? The essential questions are which and what sorts of attributes contribute to identification. Many alternative sets of properties may be *logically* adequate bases for discrimination over a given range of stimulus materials. Which properties are psychologically relevant must be determined. These could vary from culture to culture, or even from perceiver to perceiver. But the very phenomenon of caricature recognition suggests that at least within a culture, constancies prevail and await discovery.

Any such quest must acknowledge that a caricature incorporates many devices irrelevant to recognition. Certain features of caricatures are better accounted for as purely comic devices, as conventions of cartooning, as means of expressing personality, or in like ways. Furthermore, some apt caricatures require the assistance of labels and other cues, because the subject is not well known or because the caricature abstracts too far from the subject's appearance—consider a large capital T labelled "Charles Atlas." If recognition from the image itself plays an important role in caricature, there is no pretense that it is the only role. But that role is the focus of this study.

A search for individuating attributes also demands respect for the alternative hypothesis, that caricature recognition occurs in spite of, and not because of, the selective transformations wrought by the caricaturist. Perhaps a viewer must become familiar with the distortions caricaturists generally employ, so that he may discount this false evidence. Perhaps the viewer must learn that certain information is generally absent, in order not to be confused by that absence. Perhaps he must learn that caricatures often tell lies in ways not involving exaggeration, such as displaying the wrong number of wrinkles on a forehead. In short, possibly a successful reading of caricatures depends on a sophisticated familiarity with the genre.

The argument will be that this is not true to any great extent. The circumstantial evidence points strongly to this conclusion. However, the gleeful exploration of the caricaturist is not the methodical manipulation of the scientist. Neither is the response of his audience carefully surveyed and quantified. Perfectly rigorous findings must emerge from more engineered circumstances, in which both the drawings presented and the responses of viewers are subject to systematic control and analysis. The present paper will perhaps point directions into such research, and anticipate some of its conclusions.

AN EXAMPLE

As leader of the United States government, the President seems always to acquire the uncomfortable status of "most caricatured person." When this work began in 1970, cartoons representing President Richard Nixon proved far more available than those of anyone else, and a large collection of these provided the basis for the study. Later on, some tentative generalizations will be made from consideration of this one case; the reader may judge their plausibility for himself. But one point deserves emphasis: this study concerns recognition of very well known faces and hence

concerns highly practiced acts of identification. Results will require at least minor adjustments if applied to recognition of less familiar or just learned faces. The caricaturist is well aware of this difference. Paul Szep, political cartoonist for the *Boston Globe*, has remarked to me that he can exercise much more freedom in his treatment of a very well known face. Less prominent public figures allow less latitude and require more care if the caricaturist's effort is to prompt recognition.

Mapping the relationships between caricature recognition and the recognition of normal faces requires first of all answers to two questions: which attributes of caricatures of the President distinguish them from caricatures of other individuals, and do those attributes represent exaggerated properties of the President's true face? The treatment of the nose is particularly interesting here. Figures 8(a-l) are in most respects typical. First of all, the nose is long, but also quite narrow. Such a shape is remarkably uncommon in caricature in general, the usual "big nose" being much broader at the base, large but not as thin. But the properties of thinness and elongation are common to almost all caricature presentations of President Nixon's nose. There is a further attribute, common again to nearly all caricatures of the President, but also not infrequent in caricature in general: the nose slopes downward from the root.

The swelling toward the tip of this example and the upward curl of the bridge are properties not as persistent as the above, but nevertheless common devices occurring in somewhat better than half of the cartoons examined. A final feature frequent in caricatures of the President is the vertical seam in the tip of the nose.

These observations argue that the treatment of the nose does not merely invoke general conventions like an eye represented by a dotted circle. Rather, several properties of the nose are relatively specific to caricatures of the President. The next section will pursue how important these properties are to recognition. Here, the question remains whether the attributes are simply conventions specific to the President, or whether the caricatures reflect features of the real face. If they do, this supports the interpretation that caricature recognition borrows the normal recognition process.

Figures 9a through 9f present profile, three-quarter, and full-face photographs of the President. The representation-in-caricature of the nose as long and narrow seems amply justified by the profile and three-quarter views. These properties are not as evident in the full face photographs, which instead display the rather broad structure of the nose. More on this later. Most views show that the bottom edge of the nose slopes markedly down toward the lip, a feature common to most of the caricatures investigated. The occasional vertical seam in the tips of caricature noses is evident in Figures 9d, though few of the photos examined were sharp enough to contain this detail. An upward curl is also apparent in the photographs. The bridge of the nose near the eyes is distinctly more vertical than near the tip. Examination of photographs of other men reveals that this is not generally so.

However, the bulb end is dubious as a caricatured feature of the real face. Photographs 9a and 9d offer no signs of such a physiognomic structure. Photographs 9b and 9c might be



Figure 8a —by Haynie



Figure 8b —by Szep



Figure 8c —by Feiffer

Figure 8d —by Feiffer

thought to do so. But this is an illusion, a consequence of the dark nostril denting the profile of the nose. Just the same effect is apparent in photographs of other men with varying types of noses. Whether the bulb end contributes at all to recognition still remains somewhat uncertain. The bulb might express some property other than shape—a fleshy quality for example. But of course, there is no need to account for everything in terms of recognition. Comedy is reason enough in caricature. Such features as the seam, the elongation, the downward slope, the curl, are on the face of it aspects



Figure 8e —by Oliphant



Figure 8f

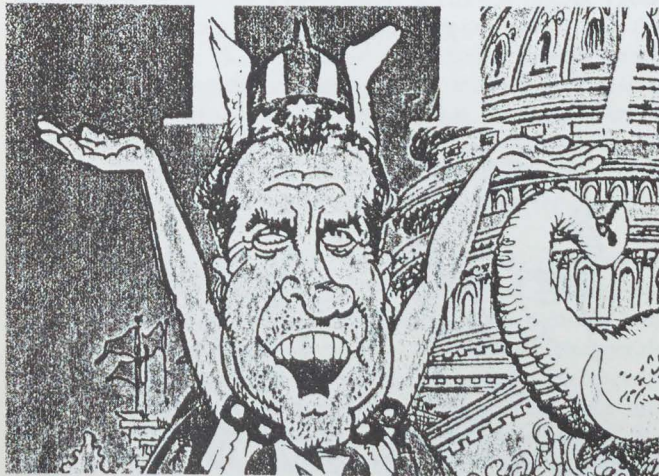


Figure 8g —by Drucker

common to caricature and man. If this is not so of the bulb, or at least not obviously so, then the feature can readily be ascribed to objectives other than recognizability.

Full face caricatures of President Nixon pose an interesting problem for cartoonists. Above, it was remarked that the long nose, a nearly universal feature of the caricatures, was not apparent in the full face photographs. Logically it should not occur in full face caricatures. The natural expectation is that the cartoonist would caricature a view as seen, indicating the wide nose with the tip dipping well below the sides, but sacrificing indication of length. But only one cartoonist to my present knowledge has taken this course, Jules Feiffer (Figure 8c).

What is the alternative? An obvious ploy is for the caricaturist to avoid the full face view, and indeed the full face view proves quite uncommon. But there are other means. Figure 8g displays a caricature that is unquestionably full face except in one respect. The artist, Mort Drucker, has cocked the nose slightly to the right in order to portray its length. Challenging the geometry of the viewpoint, he insists on displaying an attribute he thinks to be important for his caricature.

Feiffer does much the same in reverse. Just as Drucker brings his particular conception of the nose, suggested by three-quarter or profile views, to full face caricature views, so does Feiffer employ his wide nose style in three-quarter caricature views as well as full face. Figure 8d is an example. Thus each artist emphasizes different properties of the nose, and extends this emphasis to viewpoints where, in a photograph, these properties would not be as apparent.

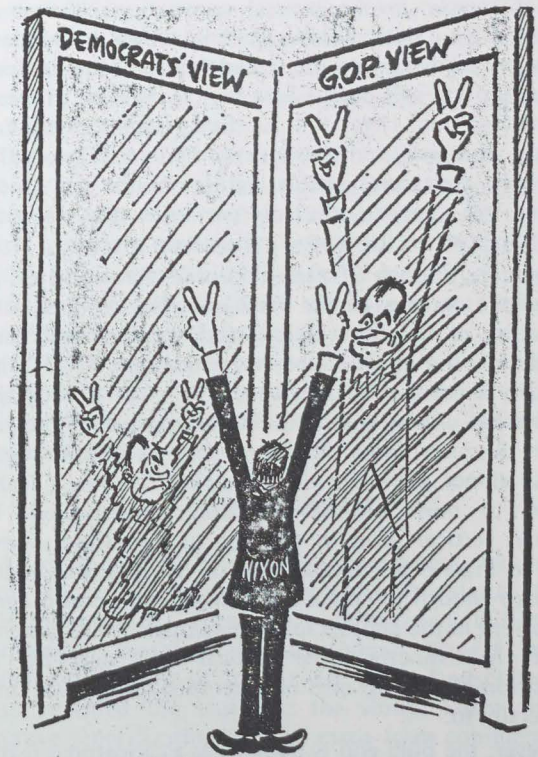


Figure 8h —by Hungerford

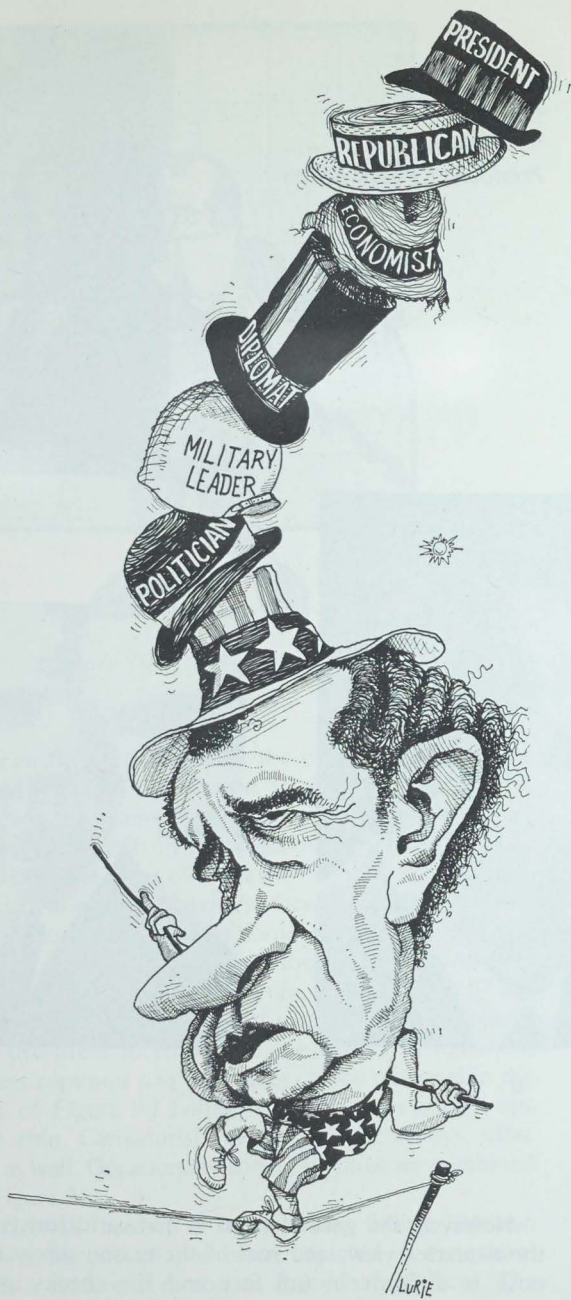


Figure 8i —by Lurie



Figure 8j —by Drucker

Figure 8k —by Szep



Figure 8l —by Herblock



The hairline and hair also appear to contribute to recognition. The photographs present the contour of the hairline clearly. A very distinctive lock runs back along the center of the forehead, a lock surrounded on either side by bays. Viewing photos of other men of similar age reveals that such a hairline contour in this pronounced degree is quite unusual. Almost all cartoonists drawing the President have capitalized on the uniqueness of the hairline by rendering it in their cartoons. A deepening and rounding out of the bays is the most prevalent means of exaggeration. Almost all caricaturists do this. Slightly narrowing the center lock is another common device. Fairly often cartoonists will also represent waves in the hair, glossiness, and highlights (Figure 8a). Indeed properties of the real hair as photographs 9c and 9d illustrate, often are not indicated at all.

Well worth stressing is that the hairline with the nose, or even by itself, seems remarkably distinctive of the President. Caricaturist Haynie offers us in Figure 10a President Nixon clearly recognizable from just the nose up. Concealing either the hair or the nose with a finger gives some idea of the relative importance of the two features, suggesting that the hair, for a single feature, provides the viewer with a considerable amount of distinguishing information.

The modest jowls evident in the photographs are treated by virtually all caricaturists. The jowls, like the nose, are subject not only to accentuation for recognition's sake, but for humor's sake as well. In the popular three-quarter view, the jowls are rendered by indicating the bulge in the profile of the cheek, and, near the mouth, by proper manipulation of the facial creases from the nose to the tip of the mouth and from the tip of the mouth down toward the chin. Sometimes one of these creases is omitted, or the two are combined into one. Essentially the same technique serves in full face views (Figure 8g). The degree of exaggeration varies from the relatively benign Figure 8a, to the utterly grotesque, as in Figures 8e or 8f.

Earlier the awkwardness of portraying the elongate nose in full face caricatures was discussed. Problems of full face versus three-quarter versus profile views arise again with the

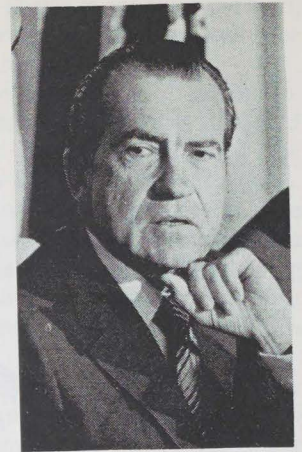


a



b

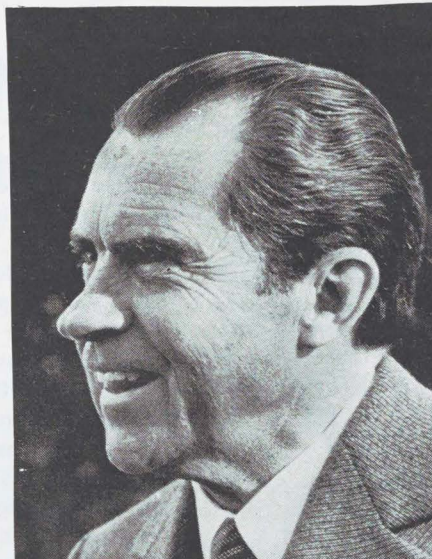
Figures 9a-f
—Photographs of
President Richard Nixon



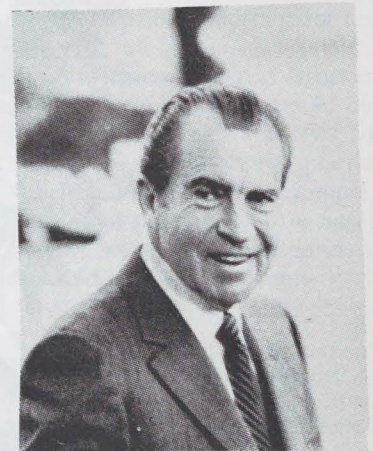
e



c



d



f

cheeks. In photographs, neither the full face nor the profile view displays the jowls distinctly. In full face, this situation has dismayed caricaturists not at all. They proceed to employ their normal techniques for the cheeks as mentioned above, ignoring the fact that the jowls are less visible in full face.

The profile photographs, however, suggest difficulties; in these the jowls though visible are apparent largely through shading, a device not so much in the cartoonist's repertoire as is pure line. Near omission (Figure 8j) or extreme exaggeration so that the cheek profile shows (Figure 8k), are two resolutions. Caricaturist Herblock offers a third of particular interest. The lacing of wrinkles apparent in Figure 8l serves to indicate the jowls even in a profile view. These wrinkles are not at all evident features of the real face. In a few of the photographs examined, there was the hint of a single crease dropping from the eye along the side of the cheek. Even in those cases, there was only one. The truth-in-lie nature of caricature was never so bald. These creases, lying as they do about themselves as specific features, nevertheless succeed in conveying the slump of the cheek.

However, the general trend is that caricaturists employ a three-quarter view, and part of the reason surely is that the nose is difficult in full face and the cheeks awkward in profile. Of some 38 caricatures of the President examined for this work, only five were full face or nearly full face, and only six were profile views. Paul Szep has told me that in general a three-quarter likeness is usually easier than one in profile or full face. Rother (1966), in a "how-to-do-it" article promotes the three-quarter view. Berger says that the profile comes easiest—a minority opinion (Berger 1952). At least in examples presented here, advantages of the three-quarter view relate to particular difficulties in representing specific properties of the face.

A further attribute common to almost all caricatures of President Nixon is a "box chin." Figure 8g exemplifies, portraying the tip of the chin as protruding below the basic line of the jaw. The effect is often quite pronounced in the caricatures, so that as in this example, the borders of the box chin become vertical before touching the jawline. A look at the photographs supports the box chin as a property of the

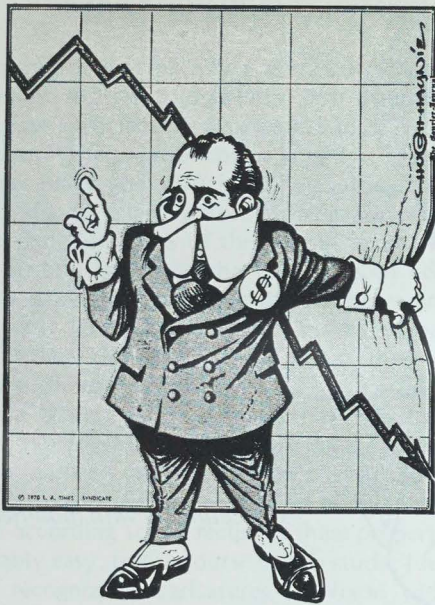


Figure 10 —A partial view

true face. The tip of the chin in the photographic profiles clearly depends below the jawline. In the three-quarter and full-face views, the seams dropping from either side of the mouth, and a slight shift in the angle of the jawline, serve to set off an area in the front of the jaw.

Several attributes of Nixon's face in caricature and in fact have been considered in some detail. Several others deserve brief mention. Prominent in the former President, as in many others, are the creases running from the sides of the nose to the sides of the lips. Caricaturists generally represent these, and use them to emphasize the cheeks as remarked earlier. A less common pair of creases can be observed in the photograph of Figure 9d falling from the sides of the lips toward the chin. Caricaturists often, but not always, offer these lines as well. Occasionally these two lines are combined into one—Figure 8f.

The horizontal crease, or near-crease, falling between Nixon's lower lip and chin is often depicted in caricature; this again is a feature common to many human faces. The cartoonists further generally supply crow's feet and furrows in the forehead. These are rarely apparent in photographs, but are real enough and can be seen in the particularly sharp photograph of Figure 9d. There seems little effort to replicate the exact patterns of these creases.

Further features near the eyes are of interest. The eyebrows are dark, and have a distinctive shape, rising from the middle toward the sides, peaking and then hooking down again. A number of caricaturists represent this contour (see, for example, Figure 8g). But better than half do not, even though it would seem a plausible contribution to recognition—indeed, Rother (1966) claims that the eyebrows are often an especially effective point of identification. Almost all photographs reveal distinct bags under the eyes. Some caricaturists represent these, but just as often not. Again this is somewhat surprising, since this feature like the eyebrows seems *a priori* fully as evident and characteristic as the nose

and perhaps more so than the box chin. Thus there are various potentially distinguishing features of the President's physiognomy that are just as often omitted as used by caricaturists.

THE QUESTION OF NECESSITY

The four attributes, elongate nose, jowls, contoured hairline, and box chin, occur persistently in caricatures of President Nixon and not in caricatures of others. The features reflect real properties of his face. These observations suggest that the attributes make a genuine contribution to recognition. But a more careful test is in order. In logical terms, to what extent are these attributes necessary for a portrait caricature to be recognized as the former President, and to what extent are they sufficient for a portrait caricature to be so recognized? The first half of this question is the concern just now.

An interesting observation, but not an answer to the question, is that among the professional caricatures examined, having most of the four properties mentioned above is a necessary and sufficient condition for a portrait caricature to be an effort (however successful) at caricaturing President Nixon. This is simply a rephrasing of the fact that all the samples of Nixon caricatures do have most of these properties and no samples of non-Nixon caricatures have most of them. But fundamentally this is a statement about the behavior of the artists. In spite of their habits, perhaps fewer of these attributes would do.

Then what is the effect of eliminating one or all of the four "key" properties from various "good" caricatures of the President? Figure 11 is a sample. There, 11a represents a tracing of the original caricature (Figure 8a). Figure 11b copies the original except that it has been redrawn to alter all four attributes. Further 11c, d, e, and f copy the original except that, respectively, jowls, hairline, box chin, and elongate nose have been redrawn. Clearly the modifying of all four in 11b utterly destroys its recognizability. For a single attribute, absence of jowls in 4c perhaps most degrades the resemblance, and the hairline in 4d the least impairs it. In all cases, there is a marked detriment. Similar manipulations of other caricatures bear out these observations.

Simple absence of one or more of these four properties is not the degrading factor. Recall the success of Figure 10. It is not the invisibility of the key properties, but their replacement by counter-properties that degrades the resemblance by providing inappropriate clues. But some other properties logically just as distinctive (e.g., the eyebrows) may be completely misrepresented with little if any effect on identification.

What is the conclusion about the necessity of these four properties? One might say casually that they—and perhaps others—are "rather necessary" or "mostly necessary." The equivocation is essential. A cartoon may indicate an attribute, contra-indicate it (i.e., indicate something incompatible with it) or give no information about it. If each of the four features is necessary in any sense, the sense is not that each must necessarily be present. Rather, no feature must be contra-indicated.

Of course, even this is too strong. Contra-indication of one or two attributes may leave a substantial resemblance

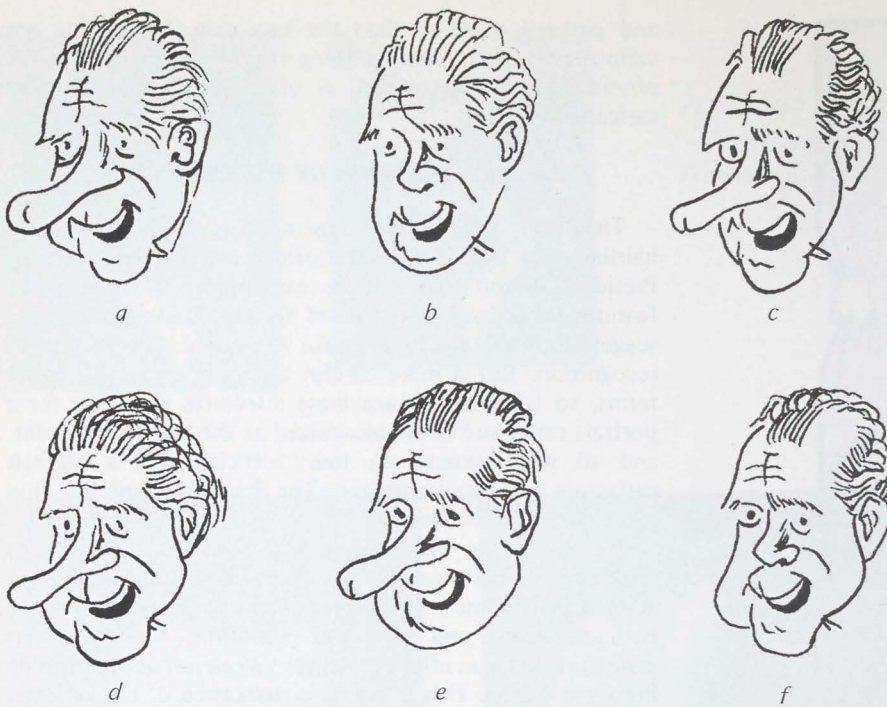


Figure 11
—Caricature 8a with modified features

and permit recognition. The mechanisms of recognition operate with a certain tolerance for and awareness of contra-indication. The four attributes are “rather necessary” in the sense that contra-indication of any one of them degrades resemblance (and presumably recognition) much more than simple absence, and contra-indication of many of them destroys resemblance and recognition.

The tracings that yielded conclusions about “rather necessary” conditions also point to a definitely unnecessary condition: the exact shape of the caricature. The tracing process inevitably introduces minor metric deviations from the proportions of the original caricature. But the traced caricature remains recognizable, as Figure 11a illustrates. Yet such minor distortion can be significant; the effect on photographs is quite different. Figure 12 displays tracings of

photographs 9c and 9d. The resemblance to the President is slight indeed. Two more considerations complete the point: tracings of large photographs are readily recognizable, and even a freehand copy of a caricature is generally quite recognizable. Then as far as recognition is concerned, the caricature is much less sensitive to minor random metric distortion than the true photograph or presumably the true face. Exact metric proportion is not a critical aspect of a caricature.

This finding should not be surprising. Exaggeration is the central technical device of caricature. The caricaturist pushes the distinguishing trends of a subject’s proportions toward extremes. If recognition depends on or is enhanced by these overstated trends, then minor metric variations should not alter the overstatement nor therefore reduce recognition.



Figure 12
—Tracings of Figures 9c and 9d

THE QUESTION OF SUFFICIENCY

The exploration of necessary conditions leaves unsettled the matter of sufficient conditions. Are the four attributes stressed above sufficient for a caricature to be recognizable as the President? The point of course would be to list attributes at once necessary and sufficient. For sufficiency alone, all one need do is select a recognizable caricature and to announce that duplicates of this are sufficient. This tells us nothing. Strictly speaking, the bid for both necessity and sufficiency is already lost, since the attributes under discussion are only "rather necessary" in the elaborate sense discussed earlier. However, perhaps at least there is a concept of "rather sufficient" to match.

But the game really is lost. Neither the four key properties, nor these together with various ancillary features mentioned earlier, are sufficient or even approach sufficiency. A convincing demonstration of this is an effort to caricature according to the recipe of these properties. Failure is remarkably easy. In the course of this study, I have learned to make recognizable caricatures of Nixon with fair reliability (Figure 13) but also have learned how easy it is to miss. Figure 14 exhibits a deliberate miss. The evidence is there: jowls, hairline, nose, box chin, and more. But the visage remains unrecognizable. In this case, reasons are not at all elusive. The line of the profile is too concave and the entire head too squat. Thus there are properties "rather necessary" to a caricature of the President not among those already discussed.

Such failures are not the exclusive province of the amateur. There are a number of quite inadequate professional attempts. This emerged in a striking way after much of the analysis reported here had been completed. Searches through periodicals uncovered caricatures which formerly would not have been collected. A deliberate check of their features revealed that they were efforts at caricaturing the President, efforts which had formerly prompted no recognition. A

careful look at the context (captions, White House in the background, etc.) confirmed these judgments. This remarkable circumstance demonstrates once again that the four attributes fall well short of sufficiency. On the positive side, it stresses again how persistent these attributes are, occurring as they do in both successful *and* unsuccessful professional efforts.

Why do these properties fall so far short of sufficiency, and what chances are there for improvement? An examination of less effective caricatures reveals on the one hand definite directions for refinement, and on the other some extreme difficulties. First, the descriptive predicates used are after all rather vague; they allow too much room for variation. For example, jowls which descend too far but bulge little seem to detract. One course therefore is to narrow definitions of the present properties. Second, there are further "rather necessary" conditions inviting specification, as illustrated above. Some caricatures suffer from a head too squat, or a profile too concave or convex. In general, it is often easy to point to a particular aspect of an inadequate caricature and suggest a specific improvement. A tracing of the caricature, with the aspect then appropriately modified, is more effective. But just as often the failing is an enigma. No approaches for improvement occur, or those that do are ineffective when tried.

A more subtle barrier to refining this approach is that the shape predicates used here are framed in words. Words are singularly inadequate for conveying shape information. One would prefer some sort of notation for shape, a notation in terms of which such conditions as "long nose" or "jowls" could be defined in a narrower and more precise sense. But Goodman (1968) gives reason to doubt that such a notation is possible. His analysis stresses that the infinitesimal variation possible in pictures is incompatible with certain formal requirements for a notation. Perhaps for this purpose, something short of a notation in his sense would do. Certainly, a truly elegant theory of caricature recognition (or

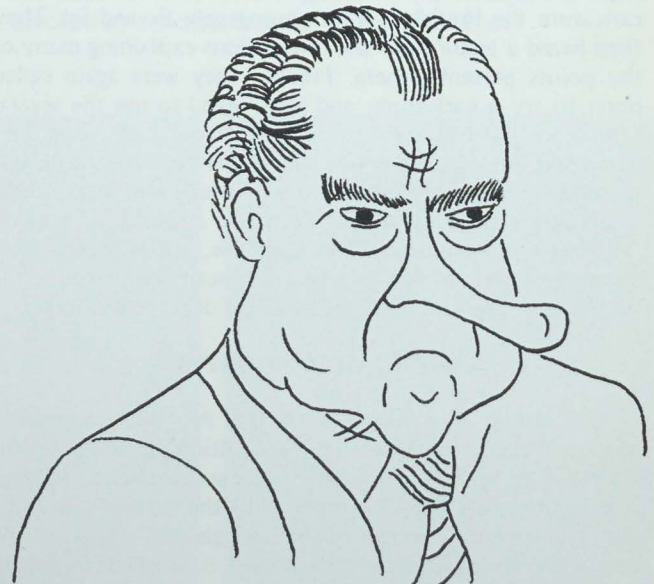


Figure 13 —Caricatures by the author



Figure 14 —A deliberate miss

of recognition in general) would seem to require some language more appropriate than English.

Although the properties discussed offer no certain formula for recognizable caricatures, most professional caricaturists are persistently successful in their renderings of the President. Each artist has developed his own recipe, his own "sufficient" but not "necessary" approach to caricaturing the President. There is a great variation from artist to artist, but the cartoons by the same artist are very much alike; Figure 15 illustrates. It is not difficult to learn to draw caricatures of the President in the manner of the various artists discussed here. Much harder, even with the help of a list of important properties, is to invent a suitable technique of one's own.

In the light of these remarks, the relevance of the four properties to learning to caricature might be questioned. But recall that these properties were found to be "rather necessary"; omitting them assures failure. Neither do beginners usually include them from the first. In a casual experiment, about ten college students were invited to caricature the President from photographs 9c and 9d. They then heard a lecture and saw illustrations explaining many of the points presented here. Finally, they were again called upon to try a caricature, and were urged to use the several properties that had been stressed in the course of the lecture. The result was not, of course, a set of perfect caricatures. But in almost every case the student included in the second important properties he had formerly omitted. Almost all initial efforts were quite unrecognizable, but in several cases the second attempt began to bear distinct resemblance to the President. Figures 16 (before and after) offer an example.

A MODEL OF RECOGNITION

The study of caricatures of the President suggests a number of generalizations. The recognition of a caricature as representing a particular subject appears to depend in large part upon a few "key" properties of the subject's physiognomy, properties presented in exaggerated form in the caricature. Recognition as that subject is blocked if a few of these key properties are contra-indicated. Some properties weigh more heavily than others in this respect. If not so

Figure 15a —by Zsep



Figure 15b —by Zsep

Figure 15c —by Zsep



Figure 15d —by Oliphant

Figure 15e —by Oliphant



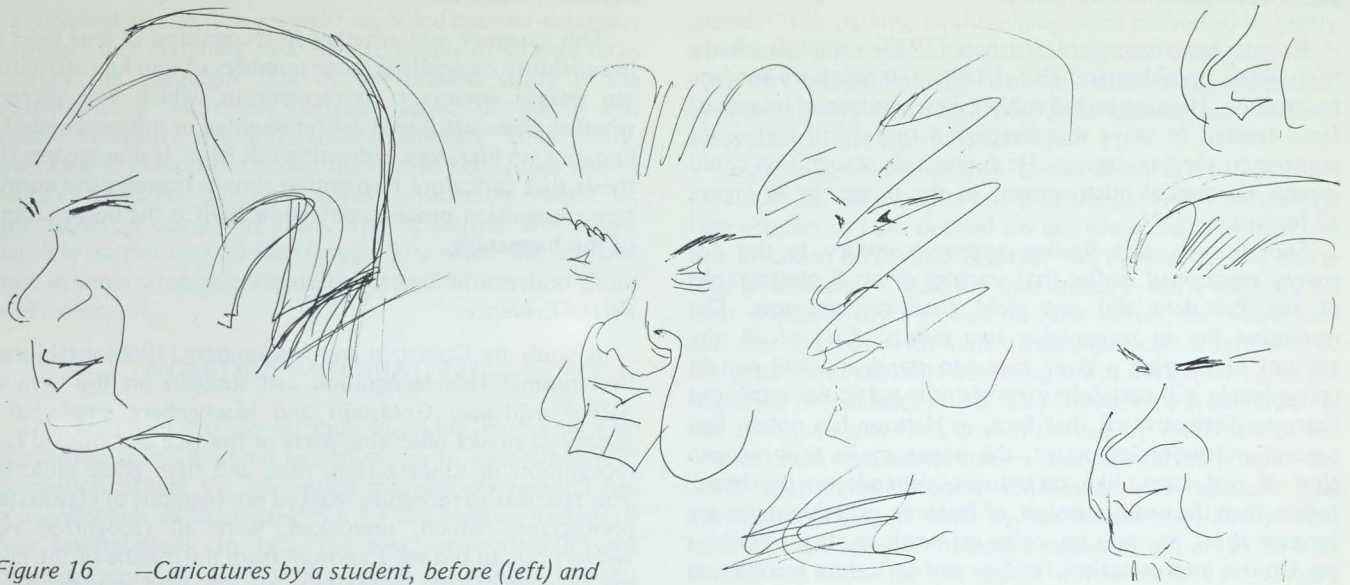


Figure 16 —Caricatures by a student, before (left) and after (right) a lecture on caricatures of the President

blocked, recognition can often take place in spite of the pictured spatial form's divergence from the shape of the subject's face, in spite of the omission of numerous details, in spite of the inclusion of false detail, in spite of concealment of several key properties (as opposed to contra-indication of them), and in spite of the inclusion of properties inconsistent with the viewpoint.

These considerations are reminiscent of identifying an item through a logical conjunction of conditions. Several positive findings may suffice to discriminate that item from other items. But one negative finding suffices to disprove that identification. The same logic appears to underlie the caricature recognition process, a process however which is cautious enough of circumstantial evidence or counter-evidence not to reject an hypothesis on the basis of just one negative finding.

This leaves two questions: whether the same general model of pattern recognition applies to face, as well as to caricature, identification; and further whether the properties caricature and face recognition depend upon are the same. Most broadly, face recognition like caricature recognition can be viewed as a process of checking for certain "key" attributes. To put flesh on that skeleton requires saying something about what kind of attributes. The situation with caricature suggests that in normal face recognition also: (1) precise metric information and fine detail about the face is irrelevant; (2) the key attributes are relatively few; (3) the disposition of non-key attributes, whether presented, concealed, or contra-indicated, is irrelevant to recognition; (4) recognition may take place on the basis of very partial evidence; (5) recognition will be blocked by contra-indication of key attributes.

Figure 17 —The effect of blurring on recognition; pictures blurred as on the right were recognized 85% of the time



Recent experiments of Harmon (1973) establish clearly that metric precision and fine detail are unnecessary for face recognition. Harmon tested subjects' recognition of images of faces treated in ways that destroyed fine detail and exact contour to varying degrees. He found that recognition could survive substantial mistreatment of the image, as in Figure 17 for instance.

Superficially, this finding appears contrary to the discovery mentioned earlier that tracings of small photographs of the President did not yield good resemblances. The resolution lies in recognizing two points. First of all, the amount of blurring a given face can stand and still remain recognizable will certainly vary with the particular attributes that are distinctive of that face, as Harmon has noted. But second and more important, this paper argues that recognition of real faces, like caricatures, depends on the trend, rather than the exact measure, of features—whether noses are long or short as noses go, chins are weak or strong as chins go. On this interpretation, for face and caricature recognition alike, accuracy *per se* would have no value; but inaccuracy to the degree of changing trends would block recognition. Indeed the traced features of the President in Figure 12 do not deliver particularly well three of the four properties isolated: jowls, box chin, and elongated nose.

Few Key Attributes

This issue presupposes that recognition depends on various measures, accurate or crude, of the face, measures such as nose length, nose angle, eye placement, eyebrow thickness. Obviously one could list an enormous number of dimensions which varied across individuals and logically could be used to differentiate them. But the analysis of caricatures suggests that, there at least, relatively few dimensions suffice. The four attributes identified earlier might break down into ten or so dimensions—the nose might involve length, thickness, and upward curl, for instance. Although the attributes proved insufficient for recognition, their obviously important role suggests they reflect ten or so out of 20 or 30 crucial dimensions, not ten buried among 100. Does the same principle apply to recognition of real faces; are key dimensions for a particular face relatively few in number, say 20 or 30?

The question has not been directly studied, but indirect evidence suggests an affirmative answer. Harmon (1973) in another study found that 21 dimensions sufficed to sort very effectively a population of 256 portraits of white unbearded males without glasses from 20 to 50 years old. Some examples of the dimensions are hair from full to bald, forehead receding—vertical—bulging, nose short—medium—long. Indeed subjects' estimates of the ten measures most prominent or differentiating for a particular photograph served quite reliably to single it out from the population, despite the contamination of frequent errors in estimating. Without speaking directly to the process of reflexive recognition of individuals, the findings demonstrate that relatively few attributes suffice to single an individual out of a large population, and also that such attributes can be perceptually judged.

Irrelevant Attributes

This category asks whether in recognition of true faces as in caricature recognition, large numbers of non-key attributes are simply irrelevant to recognition, which will succeed whether those attributes are represented or misrepresented. I know of no literature addressing this issue. If one accepts the thesis that caricature recognition simply borrows the normal face recognition process, caricature itself is the best example of this happening.

Partial Evidence

A study by Goldstein and Mackenberg (1966) established that normal face recognition can succeed on the basis of partial evidence. Goldstein and Mackenberg employed a variety of masks obscuring parts of the face and studied face recognition in kindergarten, first, and fifth grade children. The task was to recognize masked photographs of classmates, photographs which, unmasked, were all recognized two weeks prior to testing. Exposure from the middle of the nose up permitted 95% recognition by the fifth graders. Even exposure from the eyebrows up allowed fifth graders to recognize 70% of the photographs. The stress laid earlier on the hair and the hairline as a cue for recognition receives some support here. Exposure below the center of the nose yielded only about 45% recognition, as did exposure of a horizontal bar-shaped region including the eyes and the bridge of the nose. In summary, it would appear that the face from the eyebrows up offers a great deal of information for recognition; both the muzzle area and the face from the eyebrows to the bridge of nose offer markedly less information and about the same amount, *in isolation*. Recognition evidence from the nose is difficult to assess here, as almost all the masks partly obscured it.

Counter-Evidence

Some encouragement for the role of counter-evidence in perception of faces comes from a study by Bradshaw and Wallace (1971). They utilized stimulus materials assembled with an Identikit—a collection of transparent overlays providing a variety of noses, eyes, and other facial features for the compilation of complete faces; the kit is normally used in criminal identification work. Subjects were presented with pairs of faces, the two of each pair sometimes being identical, or sometimes differing by varying numbers of features. Subjects were to report as quickly as possible whether the faces were identical or not. Bradshaw and Wallace found that responses were more rapid the greater the number of differing features. This supports a serial feature-checking analysis of the matching task at the expense of a parallel "gestalt" analysis, where processing time would not decrease with an increase in differing features. In particular, the data best fit the hypothesis that the process was "sequential, self-terminating, without replacement"—meaning that the process was one of sequentially testing for matching features, that it terminated upon finding a discrepancy, and that features once tested were never tested again for that example.

These results are compatible with the view of face recognition proposed here; the serial finding underscores the

importance of individual attributes and the self-termination is equivalent to the heavy weight accorded counter-evidence. However, this matching task involved pairs of strange faces whereas the paradigm task of the present study is the recognition of extremely familiar faces. Bradshaw and Wallace recognize this difference themselves. Their study, nevertheless, demonstrates that the human perceptual system is highly sensitive to, and accords considerable weight to, mismatches in comparing faces. This sensitivity and weight plausibly carries over to face recognition, where the stimulus must in some sense be compared to stored information about familiar faces.

A GESTALT ALTERNATIVE?

The argument for an attribute-checking model of face recognition seems to stand in opposition to a gestalt view of recognition, where the perceptual mechanisms respond not to a collection of attributes, but to the holistic pattern of their interrelations. In fact, the two perspectives do not compete nearly as much as they seem to. A little thought reveals that the attribute-checking model allows perfectly well for a gestalt interpretation.

First of all, no specific restrictions have been placed on what may count as a key attribute. True, the four properties stressed in the example, jowls, nose, hairline, and box chin, are spatially localized in certain parts of the head and might be called individual features. But this accident of the present analysis does not disallow properties with a more gestalt flavor, properties such as the ratios of distances between the eyes and from eye to mouth, or approximate positions of features in the oval of the head, or the general shape of the head dimensionalized in some manner. Indeed, the contour of the whole seemed to be part of the problem with the "deliberate miss" in Figure 14.

On this interpretation, the attributes, however gestalt-like, still describe the physical shape of the face. But perhaps faces might be encoded in memory and recognized in holistic terms not directly descriptive of shape, in terms of personality for instance. One person might have a spiteful but lazy face, another a visage cloyingly friendly, and so forth. That faces can be encoded reliably in such terms has been demonstrated (Secord 1958; Secord and Muthard 1955; Shoemaker, South, and Lowe 1973). Observers are generally asked to classify the faces presented in terms of a given vocabulary or along dimensions such as sincere-insincere. The classifications are often "objective" within the culture, that is, much the same from judge to judge. However, there is no evidence of correlation between attributed personality and a depicted person's actual personality (Hochberg 1964:105-110).

Such a means of encoding faces may not be especially effective. Yin (1970), in a study where observers tried to describe faces in writing and later match faces to descriptions, found that description of personality did not work well. In any case, far from being contrary to an attribute checking process, readings of personality appear to depend on just the sorts of facial attributes under discussion. For example, Secord and Muthard, in a study of judgments of women's faces, found a frequent clustering of three personality attributions, "conceited," "likes men's attention," and

"demanding," which they termed the "gold-digger syndrome." The making of these judgments proved to be highly correlated positively with a photograph displaying high eyebrows, bowed lips, visible eyelids, tilted head, and narrow eyes, and correlated negatively with square face, widened eyes, untilted head, and straight lips.

A more serious challenge comes from E. H. Gombrich (1972:26-28) who points out that the particular measures a face appears to have depend on the whole shape of the face. For instance, how close together the eyes seem—and therefore how lively or dull the face appears—turns not only on their objective distance but on how widely the whole face and hair extends. This stance really presents a synthesis of the gestalt and attribute-detecting spirits. Acknowledging the relevance of measures of the face, Gombrich's account points out that such measures are influenced by the shape of the whole. Such an interpretation sits comfortably with the attribute-checking process explained here because that attribute-checking is done by the human eye. Recognition research depending on objective measures of human features would not allow for the gestalt influence. But in research such as Harmon's or Secord's, or for instance in the use of an Identikit, the human eye judges the relevant dimensions and gestalt influences come into play automatically.

In summary, no genuine conflict obtains between the gestalt viewpoint and the present description of recognition as a process of checking certain physical attributes of the face. Indeed, the gestalt perspective enriches the concept of how such attributes checking works. This is not to say that differences never emerge between attribute-checking and gestalt theories of recognition, but at least such differences make little trouble for the present argument.

RESEMBLANCE AND RECOGNITION

The available evidence encourages the position that face and caricature recognition are similar processes, depending on the presence of some among a few key attributes, and on the absence of contra-indications of key attributes. The natural step is to conclude that face recognition employs just those same properties that the caricaturist chooses to emphasize; he selects these in order to borrow the normal recognition process.

An alternative interpretation is that caricatures are conventionalized symbols established by the practice of caricaturists within the culture. Indeed, this occasionally happens. Gombrich (1972:12-13) has cited a case where Hjalmar Schacht, Hitler's financial wizard, gradually became represented solely by a high stiff collar. In general, though, a convention for every person does not allow for recognition in-caricature of individuals one has never before seen caricatured, a common event.

A weaker but more plausible version of the convention theory is that observers have learned—at a reflexive automatic level—what information caricatures generally provide and what they leave out. Normal face recognition would use many more properties than caricatures are careful about. For a naive viewer, those "extra" properties not captured in caricatures would act as counter-evidence, blocking recognition. This suggests an experiment. Would naive viewers, familiar with picturing in general but unfamiliar with

caricatures, fail or succeed in identifying familiar faces from caricatures? Such an experiment has not been done. Even so, my bet is that extended adaptation would not be required. Economy of means in psychological functioning argues that the extra information provided by accurate depictions over caricatures is simply extraneous to the recognition process.

The trouble with this tack is that it seems to imply a discrete, categorical perception of the world. Can it be true that out of the richness of visual information offered the eye we draw only a few trends—long noses versus short, weak chins versus strong. Do we see simply by pigeon-holing? Surely any such stand contradicts our everyday experience with the fineness and subtlety of visual discrimination. Indeed, we know a good deal more about a face than a caricature would offer. For one thing, we do not mistake caricatures for accurate conventional portraits; we can readily point out the exaggerations. Even given a conventional portrait, if we are asked (without the model present) "what do you think of this resemblance," we can sometimes point out subtle divergences—the hair too curly, the forehead a little high, and so forth. From this standpoint, a trend-oriented categorical recognition process seems implausible.

The solution lies in realizing that recognition is one thing and resemblance something else again. Nuances of resemblance are at issue when one already knows the identity of the depicted face, by being told or by recognizing it. Recognition involves a rapid reflexive "look-up" system for identifying faces. Streamlined for function, the system operates with relatively few categorizations which taken together differentiate one person from another quickly and effectively, and without requiring extremely precise scanning of the stimulus. When recognition is achieved, one may then find one has available considerable further information about the face, even information contrary to the stimulus.

Accordingly, we may reflexively recognize a caricature of the President with straight hair, no bags under the eyes, and curved eyebrows, even though we know his hair curls a bit, his eyebrows peak, and his eyes have bags. This is part of our knowledge, but not part of that knowledge used by the look-up system. Likewise, we may discover an old friend on the street, only to realize on second glance that it is someone else; the results of the reflexive look-up are checked against the further knowledge made available by the look-up.

In this context, the paradox of caricature recognition disappears. Though relative to our full perceptual capacities, caricatures are grossly inaccurate in depicting the shapes of their subjects, the look-up subsystem exercises much more generous standards. The caricaturist chooses his exaggeration not to achieve a convincing resemblance, but to trigger the look-up system, perhaps to trigger it even more effectively than the real face. He has the freedom to do this, and to pursue aims such as humor and interpretation of the personality at the same time, exactly because there is so little the look-up system really cares about.

On August 24 Associate Editor Larry Gross brought the following news story from the Philadelphia Bulletin (8/23/74) to my attention. Because of its obvious relation to the preceding paper on caricature, I am taking the liberty of adding it as an extra illustration to the paper by Perkins.—SW



Ford Gives Nightmares To Political Cartoonists

The writer is a political cartoonist for the Springfield (Mass.) Daily News.

By JAMES TRELEASE

Newhouse News Service

Springfield, Mass. — Political cartoonists are going to have trouble with President Ford.

There may be something he as President can do to curb inflation, but there is nothing he can do to curb the cartoonists' growing wrath — short of having his face altered.

He is what we call a "nobody." That is, there is nothing distinguishing about his face. If he robbed a bank the teller would be hard-pressed to come up with a description. Outstanding ears? Nose? Hair? Clothes? Nothing!

A 'Nightmare'

By comparison with our three previous Presidents, Mr. Ford is a cartoonist's nightmare. If only he had JFK's hair and pinstripe suits, Johnson's ears and cowboy boots, Mr. Nixon's nose and sagging jowls.

For the next six months, the President's every move will

be closely studied by the Soviets, General Motors, the AFL-CIO, congressmen, governors and mayors.

But the most detailed scrutiny will be by the nation's cartoonists, in search of a prop — a Truman homburg, an FDR cigarette holder, an LBJ beagle, a JFK cowlick, a squint, a scowl — anything.

Fast Aging

There are those who contend that the presidency is such a burden that a President ages five times faster in the Oval Office. But the fastest aging is imposed by the nation's cartoonists, adding a wrinkle here, a crow's foot there, bending a shoulder and jowling a chin—all in search of a caricature.

My guess is that Mr. Ford's balding forehead will loom larger and larger, his eyes will grow baggier, the nose shorter and the upper lip longer and longer.

His smiling face already has proved to be more recognizable than his serious expression. It may, in fact, become his broad toothy trademark. But not until we cartoonists do a lot of work at our work.

NOTE

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I thank Howard Gardner and Nelson Goodman for their perceptive comments on an earlier version; Paul Szep, political cartoonist for the *Boston Globe*, for an enlightening interview on the ins and outs of his art; Graham Roupas for several useful conversations; and John Kennedy, who first drew my attention to the problems of caricature.

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FIGURE CREDITS

- Figure 1 — from caricatures by Levine in *Pens and Needles* (Boston: Gambit, 1969); photograph of Samuel Becket from *Time* (7/26/71).
- Figure 2 — from caricatures reprinted in "The Cartoonist's Armory," E. H. Gombrich, *South Atlantic Quarterly* (spring 1973).
- Figure 3 — from a caricature by James House, Jr., in the *New Yorker*, reprinted in *Caricature of Today*, G. Holme, Ed. (London: The Studio Ltd., 1928).
- Figure 4 — drawings by the author.
- Figure 5 — from caricatures by Fitzpatrick and photograph from "The Cartoonist's Armory," E. H. Gombrich, *South Atlantic Quarterly* (spring 1973).
- Figure 6 — cartoon by Elder in *Inside Mad*, William Gaines (New York: Ballentine Books, 1964).
- Figure 7 — from a caricature by Conrad in the *Los Angeles Times*, reprinted in *Time* (11/9/70).
- Figure 8a — from a caricature by Haynie in the *Louisville Courier-Journal*, reprinted in the *New York Times* (11/11/70).
- Figure 8b — from a caricature by Szep in the *Boston Globe* (2/3/71).
- Figures 8c, d — from caricatures by Feiffer (1970 and 1969, respectively).
- Figure 8e — from a caricature by Oliphant in the *Denver Post*, reprinted in *Time* (12/21/70).
- Figure 8f — from a caricature in the *Toronto Globe and Mail*, reprinted in *Time* (11/2/70).
- Figure 8g — from a caricature by Drucker, *Time* cover (10/26/70).
- Figure 8h — from a caricature by Hungerford in the *Pittsburgh Post-Gazette*, reprinted in the *New York Times* (11/3/70).
- Figure 8i — from a caricature by Lurie in *Life*.
- Figure 8j — from a caricature by Drucker in *Time* (6/1/70).
- Figure 8k — from a caricature by Szep in the *Boston Globe* (7/29/71).
- Figure 8l — from a caricature by Herblock in the *Washington Post*, reprinted in *Time* (4/13/70).
- Figures 9a-f — photographs in *Time* (a, 11/?; b, 2/16/70; c, d, 1/18/71; e, 5/25/70; f, 11/23/70).
- Figure 10 — from a caricature by Haynie in the *Louisville Courier-Journal*, reprinted in *Time* (6/1/70).
- Figures 11a-f — tracings of Figure 8a with modifications by the author.
- Figure 12 — tracing of Figures 9c and 9d by the author.
- Figure 13 — drawings by the author.
- Figure 14 — drawings by the author.
- Figures 15a-c — from caricatures by Szep in the *Boston Globe* (a, 2/3/71; b, 7/29/71; c 1/29/71).
- Figures 15d, e — from caricatures by Oliphant in the *Boston Globe* (2/14/71 and 2/21/71, respectively).

Figure 16 — “before and after” drawings by a member of lecture audience.

Figure 17 — from “The Recognition of Faces,” Leon D. Harmon, *Scientific American* (Nov. 1973, pp. 70-82).

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