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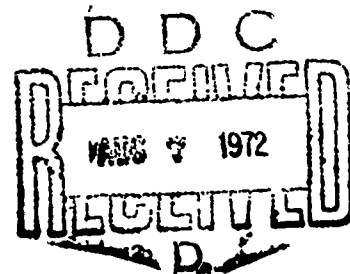
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**APPLICATIONS OF TEXTURE PERCEPTION IN THE
ANALYSIS OF COMPLEX OPTICAL IMAGERY**

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HARVARD SCHOOL OF PUBLIC HEALTH

MAY 1972

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13. ABSTRACT These studies examine the feasibility of using texture perceptions in scientific or technical analyses of complex optical imagery. Section I illustrates that reliable quantitative data can be derived from texture perceptions, provided appropriate psychometric techniques are employed. The perceptual data have to be standardized and scaled and then pooled and averaged over several independent observations. Section II illustrates, in the context of medical imagery screening, a procedure which may often be required to translate the idiosyncratic visual assessments of expert observers into standardized psychometric procedures, some of which might then be carried out by untrained observers. The language used by cytotechnicians in prescreening Pap smears for evidence of cancer is surveyed. Dimensions of description are abstracted and incorporated in psychometric scaling tasks. Section III reports studies of reliability and validity when observers follow psychometric procedures in measuring the over-all appearance of Pap smears. The results show that several of the texture measures obtained are reliable, and that at least one of the measures may be a valid discriminator of cancer. In addition to presenting evidence that texture perceptions may be effective, other considerations of cost and administrative convenience are presented which indicate that texture perceptions may be of practical value for routine screening operations. The report suggests that applications of texture perception could be made in a wide range of situations requiring scientific or technical analyses of complex imagery, particularly where automated assessment is not available or prohibitively expensive. A thesaurus of descriptors of complex optical imagery with 1707 entries is attached.			

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language						
visual description						
subjective scaling						

FOREWORD

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This technical report has been reviewed and is approved.

CLINTON L. HOLT, Colonel, USAF, MC
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SECTION I INTRODUCTION AND RATIONALE

This program was designed to study the role of texture perception in complex imagery analysis. It was aimed at developing techniques whereby texture perception can be used in imagery analysis in a wide variety of scientific and technical contexts; including contexts as diverse as medical imagery screening, aerial surveillance, and solar observing.

In visual screening of imagery, the observer usually has the option either of scanning the display in a highly focused search for critical details, or of looking more casually at the display to gain an impression of its general configuration and texture. Which option he chooses depends on the situation, which may often require a combination of the two. For example, in screening a smear of exfoliated cells for evidence of cancer, a cytotechnician will follow both options. The whole configuration and texture of a smear may provide relevant information because it can have in it residual evidence regarding histological structure of the parent tissue, which may be significantly altered if the tissue is malignant.

The textural analysis is followed by a search for critical details, such as an occasional cell with a very large nucleus. The textural analysis may serve mainly to set the tone of the detailed scan, affecting the intensity and pattern of scanning. It can make the observer more or less suspicious that the parent tissue is malignant and more or less suspicious that certain regions in the smear may contain critical signs of disease.

A two-stage approach to imagery screening is probably also common in aerial surveillance tasks as well, although not yet tested. Here, the critical details sought in the imagery may be such features as tanks or trucks, but the search for these details may be toned by impressions of the overall configuration and textures in broad regions of the display.

The same combination of diffuse and detailed analysis may occur in solar observing as well (Pickett, 1971). The solar observer scans a very complex telescopic display of the sun, trying to predict, or at least quickly detect, occurrence of a solar flare. His attention is focused on such critical cues as the shape and position of a filament lying close to an active sunspot region. But, he may also rely on diffuse impressions of the configuration of the active region as a whole. Here, however, the combined strategy may not be deliberately chosen. The observer may fall into it with experience, without being able to justify it or even articulate what he is doing. As Firor and Liliequist (1965) phrase it, the experienced observer may ultimately rely on "a certain feeling," on a recognition of characteristics of the active region that "often go unrecorded except in his mind."

Our concern in this study is the possibility of harnessing these diffuse textural and configurational analyses in a more positive way, so that they can contribute to imagery analyses, not just in setting the tone of the search for critical details, but in providing information in their own right, information that can be separately interpreted and related to other parameters of the phenomena under study. There is ample evidence that the human observer can

sense shifts in a wide variety of texture variables (Pickett, 1968, 1970). When psychometrically tested, he can produce discriminating and reliable assessments. Further, by pooling subjective reports over a number of observers, the assessments can be made more precise, and in many situations the grouped data may be useful in detecting and scaling a texture quality which individual observers would never confidently report.

The degree of precision that can be achieved in subjective assessments of texture is illustrated in a study by the author (Pickett, 1967). Figure 1 shows the computer-generated texture that the observers had to assess. The quality of coarseness that obviously varies over the three samples is controlled and specified in terms of the transition probability of a Markov process that assigned dots or spaces to adjacent cells across the rows of the matrix.

The observer's task was to assess the texture in individual samples generated at various values of transition probability (TP), and to indicate whether the texture was more or less EVEN than the criterion generated at $TP=.5$. The observers were told nothing about the generating process but were simply shown the criterion (MEDIUM) and the two extremes (COARSE and EVEN), as shown in Figure 1, and then allowed to work. Typically they took less than 2 seconds to process each sample, and from that fact alone we can suspect that they relied on a casual impressionistic analysis. The results, pooled over 20 observers, are shown in Figure 2. The relationship that it shows between probability of the response "EVEN" and transition probability is remarkably sensitive and systematic.

Immediately relevant to the present discussion, though not the aim of that study, is the possibility of using response probability as a subjective measure of texture. If, for example, we lost the label from one of the test samples and needed to find out what its transition probability was, we could have put it in front of our subjective measuring devices (our 20 observers) and had them make repeated independent assessments of its evenness within the confines of that psychometric task. Then, if the response probability turned out to be, say .85, we could have concluded, with a practical degree of confidence, that the transition probability of the patch was close to .56. Such is the potential for precise psychometric assessment of a texture variable.

Clearly, subjective measures of texture with this degree of precision could be scientifically and technically useful. For those many situations where automated texture analysis is beyond the state of the art, or economically prohibitive, the human observer might serve very well as the texture analyzer. For any particular problem area, it would take exploratory studies to determine whether observers could see any textural properties in the imagery that might contribute to the analysis. Then, where that was the case, psychometric tasks would have to be developed that focused assessments on the texture qualities of interest and provided appropriate response media for reading out the resulting impressions.

1. AN ILLUSTRATION OF TEXTURE PERCEPTION IN SOLAR IMAGERY ANALYSIS.

The psychometric approach is illustrated in some studies of texture perception in the context of solar observing, recently reported by the author (Pickett, 1971). The aim of these studies was to determine whether there were any

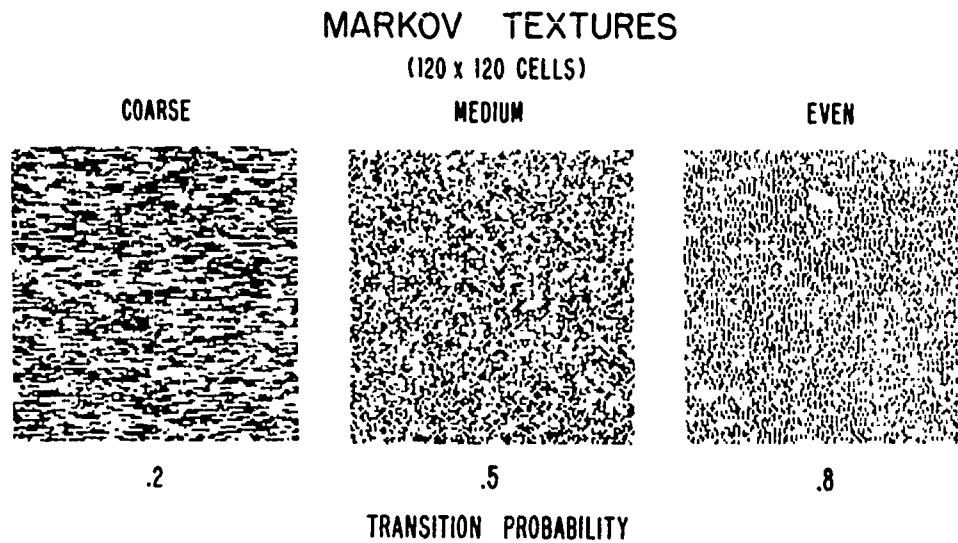


Figure 1. Examples of Markov Texture Generated in a 120 x 120 Matrix. The actual displays used were negatives of this and had considerably less sharpness of detail. (From Pickett, 1967).

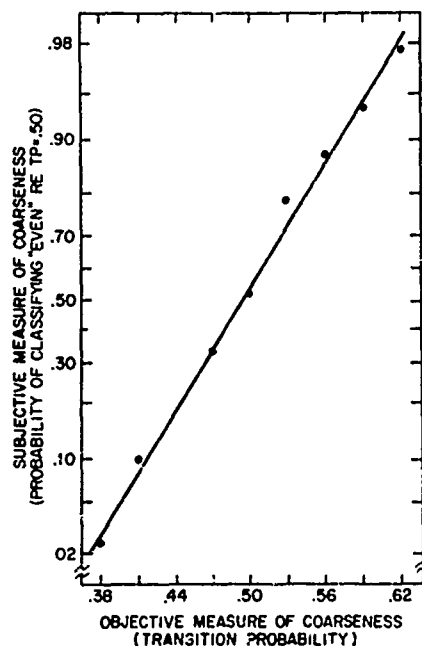


Figure 2. Response Probability. Group performance function showing the probability of EVEN responses as a function of TP for discriminations of Markov texture in a 120 x 120 matrix. (From Pickett, 1967).

visible changes in the texture of active solar regions related to the imminence of a solar flare. The observers were college students, untrained in solar physics, unaware of the problem of flare prediction, and unaware that they were examining pictures of the sun. They were shown pictures of active sunspot regions at three points in time; 9, 5 and 1 minute prior to the occurrence of a flare. In exploratory studies, conducted in a classroom setting, observers were asked to assess the texture of the active region along three dimensions, called: ABRASIVENESS, PACKABLENESS, AND SWIRLINGNESS. These dimensions were selected arbitrarily,¹ to serve simply as a way of getting the observers to assess the texture in a variety of ways, one of which might prove relevant.

One of the requirements in this psychometric approach to imagery analysis is to program each observer to carry out as nearly as possible the same perceptual task. What we seek is a situation in which precision is gained by pooling the responses of individual observers so that a desired level of precision is converged upon as the number of pooled observations is increased. If the observers are not well-coordinated, the number of observations required to achieve a discrimination at a desired level of precision may be economically prohibitive for routine screening operations. It is important, therefore, to sharply focus the analysis of each individual observer and to devise an explicit standardized task so that pooled responses converge quickly to the desired level of precision. Hence, we attempted to make explicit perceptual operations² for each observer to follow in making his judgments of the solar imagery.

In judging the three texture qualities, the observers were instructed to consider that the object they saw in the pictures (the solar disc) was actually about two feet in diameter, thus guiding each of them to see the object at the same scale. With regard to ABRASIVENESS, they were asked to imagine rubbing their fingers over the surface in the active sunspot region, and to estimate from the way it looked how abrasive it would feel in that tactual operation. Then they were to rank order the three time samples for each flare sequence in terms of that anticipated tactual sense of abrasiveness. To assess PACKABLENESS, they were asked to imagine dipping their hands into the material in the region of the sunspot, withdrawing a handful, and packing it like a snowball. The quality of SWIRLINGNESS was not operationally defined. They were simply asked to judge that quality based on their own individual operations.

The data showed that the observers, as a group, could sense a change in texture between nine and five minutes prior to a flare. The same statistically significant pattern of ranking was found with respect to all three qualities,

1. In this situation as well as most others, there may be some nonarbitrary approaches. One approach is to look to theoreticians for suggestions about relevant textural dimensions. Another approach is to get hunches from experienced observers.

2. This term was chosen to suggest an analogy between operational definitions of objective measures and operational definitions of subjective ones. Every subjective measure would have to have an operational definition to be scientifically useful.

leading to the added conclusion that the observers were probably responding to a shift in the same underlying property, perhaps to a shift in a quality akin to photographic clarity or SHARPNESS.

Data from a subsequent study (Pickett, 1971) aimed specifically at the assessment of image SHARPNESS reveal statistically significant effects consistent with those earlier conclusions. The results from that study, shown in Figure 3, provide evidence that detail in active regions tend to sharpen between nine and five minutes prior to a flare and then return to a duller state just before a flare occurs.

2. DEVELOPING PSYCHOMETRIC METHODS FOR IMAGERY DESCRIPTION.

Our studies of the application of texture perception in solar imagery analysis provide some evidence that the move can be made from theory to practice. They also help to point out two steps that have to be taken. The first is to find a language of textural description appropriate to the specific application. In the exploratory studies mentioned above, we chose the descriptions arbitrarily, but as we pointed out, there are some nonarbitrary ways, one of which is to get hunches of relevant textural descriptions from experienced observers. The next step is to carry out psychometric tests to determine the reliability, validity, manipulability, and cost of the proposed subjective texture analyses. We consider points relevant to each step here in brief general discussions. In the other two sections of this report we show how we have taken each step in applying subjective texture analysis to a specific problem in medical imagery screening.

As we undertook the work described in Section II, we had in mind several ideas about the role of language in pattern perception. We had first in mind that there is abundant evidence to support the view that language affects what a person sees (Gibson, 1969). The usual explanation is that the observer rarely abstracts all the information in a pattern in the process of recognizing or discriminating it, that language can affect which part he takes and, accordingly, affect what he sees. Descriptive labels presumably bias the way the observer looks at the pattern, how he scans it and what feature he notices.

Another explanation of the effect of language, perhaps more pertinent to the present discussion, is that language may affect how the optical information is processed. Processing the information in a pattern may be compared to processing the information in a table of numbers. There are obviously many ways that the data in the table can be processed to obtain a descriptive abstract. Even if the observer were to take into account the great bulk of features in an image, as we suggest in the process of texture perception, he may have alternate ways of processing that data that are determined by language. In our solar imagery studies, we considered such a possibility, and attempted to program the observers to process the same texture data; one way with the ABRA-SIVENESS instruction, and another way with the PACKABLENESS instruction.

Another point we had in mind was that language may affect perception by keeping the observer's descriptions more or less close to his phenomenal experiences. For example, the author has been fascinated to find solar observers describing a change in brightness of a feature on the solar disc as a movement. What they mean is that the change in brightness is due to a Doppler shift which

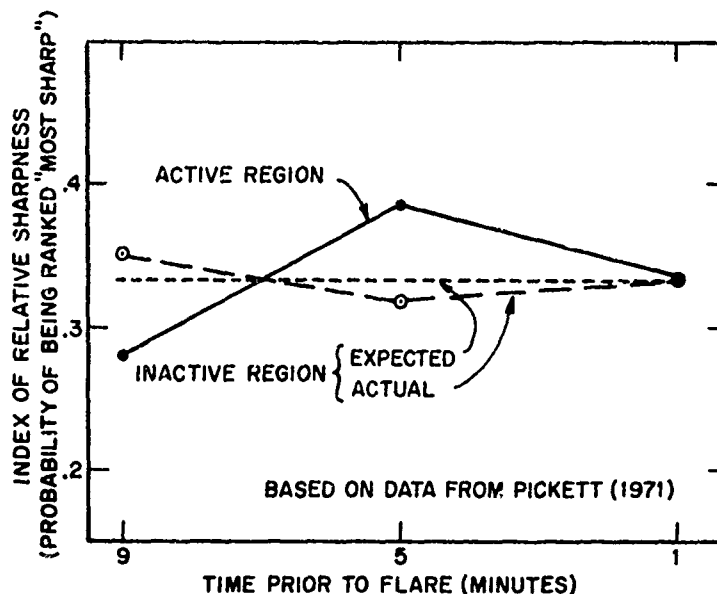


Figure 3. Psychometric Evidence of a Visible Change in the Texture of Active Regions Shortly Before Occurrence of a Solar Flare. Data from subjective impressions of image SHARPNESS at three points in time preceding a flare, for: (a) active regions; and (b) inactive regions on the same frame of the film record. Also shown is the expected index, if SHARPNESS varies randomly over time and is unrelated to flare occurrence. Based on data from Tables 5 and 7 in Pickett (1971).

in turn, indicates that the feature is moving vertically. This is a good example of a situation that is probably very common in many scientific and technical contexts where language of theory displaces the language of phenomenal experience. In this particular example from solar observing, it poses no problem beyond confusing neophytes, but in other situations such translations may pose serious problems; for example, problems in training. Instruction about relevant dimensions and features of the imagery could become so steeped in theoretical language that teachers and students alike might lose some capacity to talk about what the display really looks like in phenomenal terms.

The translation could be ultimately problematical, of course, if the theory underlying the theoretical descriptions was wrong. For psychologists, this problem is perhaps most succinctly described by referring to the classical issue of the stimulus error, i.e., describing the stimulus in terms of its logically expected properties as opposed to describing the actual phenomenal experience.

Another important consideration was selecting languages compatible with the basic functions of texture perception. In previous reports (Pickett, 1968,

1970) the author has suggested that texture perception may serve the basic purpose of providing impressions of substance, structure, and perspective in the terrestrial visual world. If so, then the most efficient way to harness texture perception may be to frame the imagery processing task into some kind of substantive or structural description of the image. This view has tempered, but not dominated, the otherwise empirical approach.

As far as the work covered in Section III is concerned, the general considerations were largely traditional for the kind of psychometric studies reported there. With the language work completed and the observers equipped with appropriate perceptual operations, the next step is to evaluate their performance. This is done in the same general sense that one would test an objective measuring device. First, there is the need to establish whether the observers can discriminate variations in the imagery under study and do that reliably. Next is the need to determine whether their discriminations are valid, in the sense of relating to properties of the phenomenon being displayed that are of scientific or technical interest. Then, it would be important to see whether their analyses can be finely tuned or focused in systematic ways to maximize sensitivity to the relevant textural variations. Finally, there is the need to check on effects of several factors peculiar to the human observer, namely: learning, motivation and fatigue. Each of these aspects of performance can be evaluated in appropriately designed psychometric studies, and several are, in fact, considered in the work reported in Section III.

SECTION II
STUDIES OF THE LANGUAGE OF TEXTURE PERCEPTION IN
MEDICAL IMAGERY SCREENING
(Pap Smear Description)

Detection of disease through microscopic inspection of smears of exfoliated tissue has been recognized as an invaluable clinical technique (Koss, 1968). Its increasing routine use in medical examinations accounts for a large part of the phenomenal growth in the workload of medical laboratories over the last 20 years. This technique capitalizes on the fact that dead cells, shed from tissue, can provide evidence of disease in the tissue from which they were shed. To study the cells under a microscope, they are smeared over a microscope slide and then stained and fixed in a variety of ways, most commonly by the Papanicolaou (1954) method (Pap smear).

What is particularly valuable about Pap smears is that they provide a way to study the condition of internal organs without surgical exploration because exfoliated cells accumulate in accessible body fluids that derive from a number of organ systems. This technique is particularly valuable in searching for evidence of cancer, and while it is useful in detecting that disease in a number of organ systems, including the stomach and lungs, it has proved to have its greatest use in the detection of uterine cervical cancer. The screening of Pap smears for this purpose alone has become a task of enormous and growing proportion.

Pap smear screening is primarily a matter of visual assessment of the cellular specimens under a microscope. They appear as masses of cellular designs characterized by various qualities of coloring, shape and arrangement (see Figure 4). Through extensive training and on the job experience, cytotechnicians learn how to scan and interpret such visual patterns to detect and identify disease in the sampled tissue. The technique may have its personalized variations, but typically the screener starts with comprehensive analysis of the display, which we refer to here as prescreening, and then goes on to more detailed and localized analyses.

Prescreening serves two multifaceted functions. One function is to provide a basis for tempering subsequent detailed interpretations of the display by taking into account the conditions under which the specimen was taken and prepared. Variations in the conditions may have effects on the appearance of the specimens that are unrelated to the presence or absence of disease and so detailed interpretations have to be tempered by taking those normal variations into account. The other function is one of gaining some general feelings or hunches about whether the sampled tissue is normal or abnormal. The basis for such hunches may be very difficult for the screener to express in purely visual terms, let alone justify in terms of medical theory. Yet those hunches may have a practical degree of validity in themselves, and undoubtedly have effects on the detailed scanning that follows.

Our concern in the ensuing work here, and in Section III, was to see whether we could sharpen and enrich the prescreening assessment through appropriate psychometric techniques. The aim of Study I was to determine whether cytotechnicians had a consistent language for describing background qualities

relevant to the presence or absence of disease. In Study II we asked naive observers to describe the appearance of Pap smears to check whether cytotechnicians were describing properties of the image as they saw it or whether their

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Figure 4 A Microscopic View of a Papanicolaou Smear of Uterine Tissue, Photomicrographed at 100x.

descriptions were based on other scientific and technical knowledge privy to them as professionals.

1. STUDY I. A SURVEY OF THE ADJECTIVES USED BY CYTOTECHNICIANS TO DESCRIBE THE OVERALL APPEARANCE OF PAP SMEARS.

a. Subjects. The subjects were 38 cytotechnicians (including 10 students) working in hospital laboratories in the Boston area who served voluntarily and without pay. Forty cytotechnicians were contacted; two declined taking the test.

b. Method. The test was administered in the form of a questionnaire consisting of a checklist of 62 adjectives. The subjects were asked to work on the questionnaire independently, checking each adjective as a visible or non-visible quality in the overall appearance of a smear seen at 100x magnification. For an adjective checked as visible, the format called for an additional categorization with respect to whether: (a) it suggested the smear was

negative, (b) it made them suspicious or (c) it suggested the smear was positive. The questionnaire is included with this report as Appendix A. The data were tabulated to determine for each adjective the number of subjects who checked each of the possible categories. (The data from categories b and c were pooled.) We then identified each adjective in which there was a statistically significant preponderance of votes in one or another of the categories.

c. Selection of Adjectives. Several of the adjectives were suggested in prior discussions with a cytologist. Most of them, however, were chosen from a much longer list of adjectives; an early version of the lexicon included with this report as Appendix B. We tended to choose adjectives that would be descriptive of apparent substantive and mechanical properties of the material. This tendency was largely dictated by the consideration, mentioned in Section I, of the basic function of texture perception. We assume that one of the natural and reflexive responses of the visual system to any complex display is to provide immediate impressions of its substantive and mechanical meanings. These impressions, we assume, are what provide the observer in the normal terrestrial environment with a physical sense of objects in his immediate field of view and which provide, in real time, a basis for safe and efficient physical behavior. Textural impressions, we assume, are answers to implicit questions raised and answered automatically in a context of chronic uncertainty about the immediate physical environment, an uncertainty which is shared by all observers, scientifically sophisticated and naive alike, and which is largely unaffected by an intellectual understanding that the display has no environmental significance (see Pickett, 1968, 1970 for further discussion).

d. Results. The results are shown in Table I. Listed are each of the adjectives which received a statistically significant majority of votes by a Binomial test ($p < .05$, two-tailed) in each of the possible categories.

e. Discussion. Perhaps most informative is the surprisingly large number of qualities which the observers claim are visible (32 out of 62) and relate to the presence or absence of cancer (21 out of 32). Also of possible significance is the fact that there are a greater number of positive than negative descriptions. But, perhaps most relevant to the present aim is the possibility of abstracting several qualitative dimensions for psychometric study. The approach was to make several obvious pairings between the positive and negative lists in the visible category, e.g.:

	<u>Negative</u>	<u>Positive</u>
	Calm	- Explosive
	Clean	- Dirty
Qualitative dimension	Consistent	- Variable
	Dull	- Bright
	Loose	- Tight
	Transparent	- Opaque

In this way several dimensions of textural description presented themselves for psychometric study. Others, like the quality Pliable-Extrudable, which placed in neither the visible nor the nonvisible category, were chosen by the author for psychometric study on the basis of his own hunches.

TABLE I
RESULTS OF A WORD SURVEY ON A SAMPLE OF CYTOTECHNICIANS

Agreed on, by the majority of those who said they were visible, to suggest: Not agreed by those who said they were visible to suggest either positive or negative

Qualities Agreed* on by the Majority as <u>VISIBLE</u>	NEGATIVE	POSITIVE	
	Calm	Bright	Cohesive
	Clean	Clumped	Compact
	Consistent	Dirty	Fatty
	Dull	Enmeshed	Filmy
	Loose	Explosive	Fragile
	Regular	Fibrous	Granular
	Transparent	Lumpy	Lustrous
		Matted	Shrunken
		Opaque	Shiny
		Pearly	Spongy
		Puffy	Waxy
		Thick	
		Tight	
		Variable	
Qualities Agreed* on by the Majority as <u>NOT VISIBLE</u>	Gummy		Creamy
	Leathery		Doughy
	Pulpy		Droopy
	Ropy		Slippery
			Starchy
Qualities Not Agreed on by a Statistically Significant Majority as either visible or not visible	Firm	Crumbly	Brittle
	Pliable	Extrudable	Elastic
	Silky	Gluey	Floating
	Soft	Hard	Milky
	Velvety	Raw	Oily
		Slimy	Pasty
		Soapy	Rubbery
		Stiff	Sticky

*Significant at the 5% level assuming equiprobability of assignment to the two alternative classifications.

2. STUDY II. A SURVEY OF ADJECTIVES USED BY NAIVE OBSERVERS TO DESCRIBE THE OVERALL APPEARANCE OF PAP SMEARS.

The aim of this study was to give a test to naive observers, equivalent to that administered to cytotechnicians, so that we could compare their descriptive languages. As noted in Section I, it is probable that professional observers contaminate descriptions of their phenomenal experiences with descriptions based on other theoretical and technical knowledge of the phenomenon under study.

a. Observers. The observers were 47 undergraduates in two psychology classes at Northeastern University, 24 in one class and 23 in the other. They participated in the survey as a class exercise.

b. Method. The 24 students in one class were shown views only of negative Pap smears while 23 students in the other class saw similar views, only of positive smears. Each of the observers was given a checklist containing the same 62 adjectives used in Study I, but in this case the format called only for classifications of visible and nonvisible. They were asked to study the pictures that were shown, and then to check those adjectives only with respect to whether they were descriptive of visible or nonvisible qualities. The subject matter of the pictures was not described to them in any way, and they were asked to avoid any discussions among themselves about the pictures. Inquiries after the test revealed that many of the students felt sure they were looking at microscopic displays, and some were sure they were looking at biological specimens of some kind. None mentioned any knowledge of Pap smears or Pap smear screening.

The observers were told that their performance was going to be compared to that of a large number of professional observers, very experienced from looking at thousands of such pictures, who also had taken this test. They were also told that the professional observers had selected about half of the words as describing a visible quality in pictures of this kind. Then they were told that they would be paid, on the basis of their individual performance, 2¢ for each case where their classification was in agreement with the professional observers. They were actually scored in terms of their agreement with the statistically significant classifications shown in Table I. The data were analyzed in the same way as in Study I.

c. Stimuli. The stimuli were color photomicrographs taken from selected regions on 20 different Pap smears obtained from one of the local teaching hospitals. They had been previously screened in the cytology laboratory for evidence of uterine cancer with 10 of the smears classed as positive (squamous carcinoma) and 10 negative. The smears were standard preparations on microscope slides, photographed in color at 100x magnification. Photographs were made of 10 systematically selected areas on each smear according to the plan shown below:

ID#	1	2	3	4	5
	6	7	8	9	10

Thus, there was a working sample of 100 negative and 100 positive images which were prepared as 35mm projection transparencies, and used for all the studies described in this report. From one study to the next the same smears were used, but the particular views were varied. In this study views 3, 4, 5, 6, 7 and 8 were used. The 60 images (six views of 10 negative or 10 positive smears) were shown two at a time on a screen at the front of the classroom, by use of two Kodak Carousel projectors. The sequences were arranged such that a different smear was represented in each of the paired views, and the 10 smears were represented on each sequence of 10. The 60 images were cycled continuously as the test proceeded, with each pair displayed for approximately 10 seconds. The test was completed in one class hour.

d. Results. Wherever the majority of the observers in both groups agreed on the same word, we pooled their data. If the majorities did not agree, we treated their data separately. If a word received a statistically significant majority ($p < .05$, two-tailed) in one way or another, it is listed in Table II. In the top row of Table II are those words agreed upon by a majority in both the positive and the negative group to be visible qualities of the Pap smears. There was one word, "creamy," where the majorities did not agree but where the separate and oppositely voting majorities were statistically significant.

e. Discussion. Perhaps the most interesting finding is that there is considerable disagreement between the naive and professional observers. (The asterisked words in Table II are those on which they disagree.) The naive observers say, in disagreement with the cytotechnicians, that "doughy" and "slippery" describe visible qualities of Pap smears. This may only mean that the cytotechnicians see these qualities but use other words to describe them. On the other hand, there are interesting possibilities that the cytotechnicians do not see these qualities or, if they do, that for one reason or another, they inhibit describing them. If the latter situation is true, then the cytotechnician may be inhibiting descriptions of qualities that are potential discriminators. We have one possible example of that here with the quality, "creamy."

In row two of Table II we see that the naive observers claim that "consistent," "dirty," "dull," "lustrous," "regular," "tight," and "waxy" do not describe visible qualities, whereas the cytotechnicians say they do. Again, this may be due to differences in use or meaning of these words. On the other hand cytotechnicians may be reading into smears qualities which are not there but which they are led to believe are there from other knowledge acquired in their professional experience.

Our interpretation of these findings has to be tempered by at least three general considerations. Even if there were no real effects in the data, we would expect to find statistically significant effects at the 5% level about 5% of the time. Perhaps more important, the sample of positive and negative smears that the naive observers based their judgments on may be far from typical of the vastly larger sample of smears that the cytotechnicians based their judgments on. Finally we need to consider limitations on the adjective checklist. It certainly is not an exhaustive, nor even a representative list, of all adjectives which might be useful for describing smears. A thorough language inventory would require a comprehensive checklist and the approach would be to take a series of surveys beginning with a survey of general categories of description and ending with a survey of fine distinctions within

TABLE II

RESULTS OF A WORD SURVEY ON A SAMPLE OF NAIVE OBSERVERS

Qualities Agreed** on by the Majority as <u>VISIBLE</u>	Bright Clumped Cohesive *Doughy Emmeshed Filmy Floating Granular	Loose Opaque Pliable Slimy *Slippery Transparent Variable
Qualities Agreed** on by the Majority as <u>NOT VISIBLE</u>	Brittle *Consistent *Dirty Droopy *Dull Firm Hard Leathery	*Lustrous *Regular Ropy Stiff *Tight Velvety *Waxy

Qualities Agreed** on by the Majority of:

- (1) Those who viewed positive slides as VISIBLE; and
- (2) Those who viewed negative slides as NOT VISIBLE

*Opposite to the judgment of cytotechnicians.

**Significant at the 5% level assuming equiprobability of assignment to the two alternative classifications.

those categories found to be relevant. The development of a lexicon of visual descriptions would be the first step in that direction, which we have since attempted to take (see Appendix II). Despite the limitations, however, these studies exemplify a systematic approach to an inventory, and they did yield productive leads for the studies reported in Section III.

SECTION III
PSYCHOMETRIC STUDIES OF TEXTURE PERCEPTION
IN MEDICAL IMAGERY SCREENING
(Prescreening Pap Smears)

The studies reported below are an attempt to put into practice the ideas outlined in Section I. The immediate goal is to determine whether there is any potential for practical applications of texture perception in prescreening Pap smears for evidence of cancer.

There are several ways to carry out psychometric tests of subjective qualitative descriptions. A comprehensive treatise on psychometric methods is provided in Guilford (1954) and two approaches are illustrated in Section I of this report. Here we take yet a third approach employing a set of standardized subjective scaling tasks. The observers are instructed to focus their attention on the imagery in various ways to gain impressions of particular texture qualities. They then indicate the degree of the quality that each image has by assigning it a number on a scale from 0 to 9. Their subjective measures are then run through statistical analyses to evaluate reliability and validity. Some comparisons of effects across studies also provide evidence of the effects of instructions and training.

We report three studies, coded in the report as Studies III, IV, and V. In each study the observers make several individual textural assessments of the same set of positive and negative smears. In Study III, naive observers make six textural assessments. In Study IV, other naive observers make four assessments, two of which are the same as in Study III, except for minor variations in scale format and instructions. In Study V, the observers are student cytotechnicians who make the same judgments and carry out the same tasks as the naive observers did in Study IV. In Test 1 of Study V, we report assessments made by those students on their first day of training, so that, at that point, they too can be considered naive observers. In Test 2 of Study V, we report their assessments in an identical test made after six months of classroom and on the job training.

1. GENERAL METHOD.

Group testing techniques were employed. Where the observers were college undergraduates, they took the test as part of a classroom exercise. The general approach was to show pictures of smears in the form of 35mm slides, which were projected on a screen at the front of the group testing room. Each slide was a partial view of a smear photomicrographed at 100x. Over the series of slides, the observer saw several different views of 10 positive and 10 negative smears. Each slide was displayed for approximately 12 seconds, during which time the observer was required to make two separate texture appraisals, and mark the subjective scale number derived from those appraisals on an answer sheet. Depending on the study, the observer went through the whole set of slides two or three times to make all of the required appraisals which were counterbalanced to control the effects of fatigue, i.e., half of the appraisals of a particular quality were made in the first part of the test and half in the last part of the test.

a. Stimuli. The stimuli were the same ones described in Section II 2.

b. Data Reduction and Analysis. The general approach to data reduction is to determine the mean subjective scale value for each smear over all views and all observers. The first step in data analysis is to perform statistical tests of reliability. For each individual study, evidence of reliability is indirectly assessed by computing a matrix of Spearman Rank Order correlations (see Siegel, 1956, pp. 203-213) for all possible pairings of dimensions. A significant correlation is considered evidence of reliability in the sense that, if observers were unreliable in their individual assessments, it would preclude the inter-observer consistency required for such a correlation. Direct estimates of reliability are made in two situations, where the mean scale values derived from separate studies could be correlated.

The second step in data analysis is to perform tests of validity. In each of the studies we first look for differences between positive and negative smears in distribution of the mean scale reading for each dimension. We employ Mann-Whitney U tests to determine the statistical significance of those differences.

We next consider the possibility that differences between positive and negative smears might be evident in interactions between dimensions; their distribution in 2-space is now examined. The data are first plotted in each of the 2-spaces formed by all possible pairings of the dimensions and then the plots are inspected for evidence of separation between positive and negative smears. The tendency to separate is defined by the following objective procedure: (1) A straight line is drawn through the space in such a way that the smears are maximally separated, i.e., divided into the most unlikely partition, in the sense of Fisher's exact test (see Bradley, 1968, pp. 195-196); and (2) Those spaces are accepted as indicating evidence of separation if the probability of the partition is less than $p < .05$, two-tailed. Note that this probability measure is not presented as an index of the true probability of the partition, but merely as an objective criterion of separation. Statistical significance of the separation has to be sought in determining the likelihood of its repeated independent occurrence.

Beyond these two basic tests, there are a number of comparisons between performance on positive and negative smears where differences can be treated as evidence of validity. For example, a systematic difference between positive and negative smears in consistency or reliability would indicate that the observer in some sense saw the positive smears differently than the negative smears. Such comparisons are made where appropriate.

2. STUDY III. A PSYCHOMETRIC EVALUATION INVOLVING SIX DIMENSIONS OF TEXTURE ASSESSMENT MADE BY NAIVE OBSERVERS.

In this study the observers assessed background qualities along six dimensions: DIRTINESS and DULLNESS of the scene as a whole; EXPLOSIVENESS and LOOSENESS of clusters of cells in general; and DOUGHINESS and BRITTLINESS of cells in general. Each of these dimensions was defined by a pair of words suggested in Study I, representing extreme positions along the dimension. No anchor points, such as the position of common objects along the scale were provided, nor was any unit of measurement provided. Aside from general directions on how to proceed and guidelines regarding the three levels of analysis, no perceptual

operations of any kind were suggested. The observers were left to their own devices and had to develop their perceptual operations independently. The primary aim of this study was to establish a base line of task definition, a level beyond which, presumably, one could improve performance by providing explicit perceptual operations.

a. Observers. The observers were 24 undergraduates at Northeastern University, untrained in cytology, who volunteered to participate in the experiment as part of a class exercise in a psychology course on perception.

b. Method. Views 1, 3, 4 and 8 were used as the stimuli. The first 20 presentations, View 1 from each of the 20 smears, was a practice run. The next 60 presentations (Views 3, 4 and 8) were test stimuli. Within each sequence, views of the positive and negative smears were randomly ordered and the sequence of 80 views was presented three times. For half of the observers, the first time through the 80 presentations they made Scene analyses, the second time through, Cluster analyses, and the third time through, Cell analyses. For the rest of the observers the order was reversed (Cell, Cluster, Scene). Discarding the practice sequence, each observer made a total of 60 judgments (three for each of the 10 positive and 10 negative smears) on each dimension.

c. Instructions. The observers were told: (1) That the experiment was aimed at harnessing "natural" perceptions for scientific and technical purposes; (2) That they would be looking at some tissue photographed through a microscope; (3) That some of the slides would be from patients who had cancer and some from healthy controls; (4) That the test would be tedious and they did not have to participate (a few of the students did choose to take that option and left before the experiment started); (5) That the experimenter would be back to explain further about the experiment and show them the results.

The observers were then supplied with answer sheets and the scaling format shown in Table III. The levels of analysis were illustrated by pointing out features on several sample views of the smears. They were asked to make the two assessments at one level of analysis of each view each time it was presented and to indicate their assessments of each view by marking on the answer sheet the positions that they felt it occupied on the appropriate scales. No definitions or criteria regarding the dimension or the assessment procedure were provided beyond what was evident in the scaling format. Each observer had to determine his own criteria and perceptual operations and apply them independently.

d. Results. The mean scale value for each smear, averaged over all views and observers, is shown in Table IV.

Evidence of Reliability. If the observers were assigning scale values to the smears randomly and independently, we would expect homogeneity among the mean scale readings in Table IV with the scores tending to be near a scale value of 4.5. Inspection reveals, to the contrary, considerable variability both within and between dimensions, providing our first subjective indication that the assessments probably are discriminating and reliable. The inhomogeneities between dimensions suggest that the observers are doing different things in analyzing the different dimensions, but doing those different things with sufficient consistency from one observer to another for the inhomoge-

TABLE III .

FORMAT FOR SCALING TEXTURES (STUDY III)

		<u>SCENE</u>											
1	Clean	0	1	2	3	4	5	6	7	8	9	Dirty	1
2	Bright	0	1	2	3	4	5	6	7	8	9	Dull	2
		<u>CLUSTER</u>											
3	Calm	0	1	2	3	4	5	6	7	8	9	Explosive	3
4	Sticky	0	1	2	3	4	5	6	7	8	9	Loose	4
		<u>CELL</u>											
5	Filmy	0	1	2	3	4	5	6	7	8	9	Doughy	5
6	Pliable	0	1	2	3	4	5	6	7	8	9	Brittle	6

TABLE IV
MEAN SUBJECTIVE SCALE VALUES (STUDY III)

Slide #	DIRTINESS	DULLNESS	EXPLOSIVE-	LOOSENESS	DOUGHINESS	BRITTLENESS
			NESS			
			Positive Smears			
2	5.74	4.38	5.55	4.17	5.38	5.67
9	5.57	6.31	3.81	5.39	4.03	4.66
12	5.18	3.97	4.99	3.93	4.04	4.26
15	4.77	4.42	4.21	5.06	4.43	4.86
18	5.44	4.38	6.46	2.56	4.54	3.38
19	5.99	4.55	5.10	4.45	4.91	4.50
24	6.36	4.78	5.37	3.64	4.48	4.68
26	6.72	4.92	6.36	3.16	4.82	4.32
38	6.00	4.30	5.80	3.93	4.91	4.85
45	5.67	4.74	5.08	4.35	4.55	4.12
			Negative Smears			
3	5.86	5.23	4.59	4.63	4.74	4.54
4	4.07	4.28	3.99	4.56	3.73	5.59
5	5.76	6.01	3.88	4.92	3.47	3.91
7	6.65	5.07	5.96	3.07	4.07	4.81
10	3.50	3.72	3.67	4.11	4.21	5.25
11	4.62	4.16	4.80	3.65	4.78	5.34
13	4.89	4.44	4.10	4.11	4.48	4.33
14	4.60	4.46	4.31	3.78	3.96	4.24
16	6.63	5.61	5.90	2.26	5.63	3.59
20	5.81	3.63	6.33	2.07	4.46	3.77

neities to become apparent. The same can be said for the inhomogeneities within dimensions. They suggest that the observers see differences among the smears but see those differences with sufficient consistency from one observer to another for the inhomogeneities within dimensions to become apparent.

Our first step in providing objective evidence of these effects is to compute correlations between dimensions, pointing out that significant correlations would not be expected to occur unless the observers were seeing differences among the smears and seeing those differences in consistent fashion from smear to smear and dimension to dimension. The matrix of correlations between dimensions in Table V shows that there is a statistically significant correlation between LOOSENESS and EXPLOSIVENESS in both negative and positive smears; a significant correlation between EXPLOSIVENESS and DIRTINESS in the negative smears and between EXPLOSIVENESS and DOUGHINESS in the positive smears. Beyond those particular effects, there is general evidence of consistency in the fact that 14 out of 15 cells above the diagonal have matching sign counterparts below the diagonal. This similarity in patterns of correlation between the two sets of data is further indirect evidence of reliability.

Evidence of Validity. We sought evidence of validity first by conducting Mann-Whitney U tests of difference in distribution between the mean scale value for positive and negative smears. There were no statistically significant effects.

The next step in testing validity was to plot the data in all possible 2-spaces. We then inspected those plots for evidence of separation of positive and negative smears, in the sense described in the General Method section (III-1b). Only three of the 15 possible 2-spaces provided such evidence, and they are shown in Figure 5.

TABLE V
SPEARMAN RANK ORDER CORRELATIONS BETWEEN DIMENSIONS (STUDY III)
(Correlations for positive smears lie above the diagonal;
those for negative smears lie below)

	DIRTINESS	DULLNESS	EXPLOSIVENESS	LOOSENESS	DOUGHINESS	BRITTLENESS
DIRTINESS	--	.38	.54	-.38	.57	.14
DULLNESS	.54	--	-.20	.25	-.21	-.09
EXPLOSIVENESS	.72*	-.05	--	-.83**	.64*	-.18
LOOSENESS	-.35	.36	-.80**	--	-.20	.39
DOUGHINESS	.35	-.08	.49	-.46	--	.25
BRITTLENESS	.52	-.39	-.34	.33	-.16	--

*Significant at $p < .05$, two-tailed

**Significant at $p < .01$, two-tailed

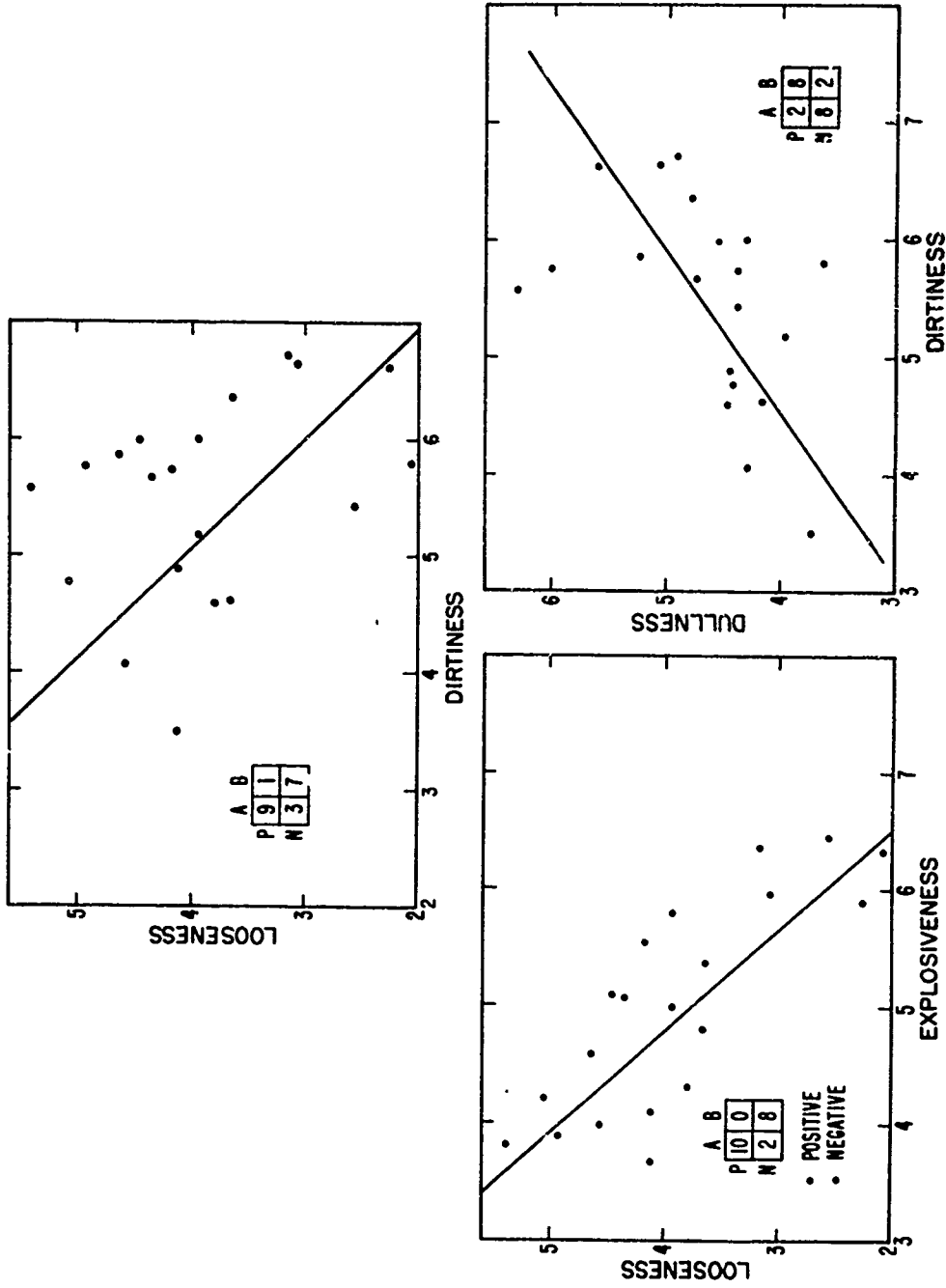


Figure 5. Potentially Useful Decision Boundaries for Identifying Suspicious Smears in Prescreening. The straight line drawn through each space partitions most of the positive from most of the negative smears. The number of positive and negative smears falling above or below the decision boundary are shown in a 2x2 table. (Study III)

In each case, inspection of the plot revealed the possibility of drawing a straight line through the space, which would partition most of the negative from most of the positive smears. For example, in the 2-space defined by EXPLOSIVENESS and LOOSENESS, 10 out of 10 positive smears lie above the line and eight out of 10 negatives lie below the line. If repeated tests with other smears showed that a boundary drawn through the space in this same way repeatedly described the same form and degree of separation, then such a boundary could prove useful in prescreening. Any smears falling above the line could be considered more suspicious than those falling below the line and, hence, to be treated to a more thorough evaluation in subsequent screening.

3. STUDY IV. A PSYCHOMETRIC EVALUATION INVOLVING FOUR DIMENSIONS OF TEXTURE ASSESSMENT MADE BY NAIVE OBSERVERS EQUIPPED WITH RUDIMENTARY PERCEPTUAL OPERATIONS AND SCALING ANCHORS.

In this study another group of naive observers assessed four texture qualities in the Pap smears: OPACITY, EXTRUDABILITY, EXPLOSIVENESS and LOOSENESS. The procedure was similar in all respects to that followed in Study III, except that in this study the observers were provided with a more definite task and some rudimentary perceptual operations.

a. Observers. The observers were 70 young women, all untrained in cytology, and students at Northeastern University in programs for nursing or dental technology. They participated voluntarily as part of a class exercise in an Introductory Psychology course.

b. Method. The observers assessed the texture qualities in six views (1, 2, 4, 5, 6, 8) for each smear. Views 1 and 2 were for practice. A counterbalanced design was employed to control effects of fatigue. The observers practiced scaling OPACITY and EXTRUDABILITY on views 1 and 2, and then were tested with views 4 and 5. They then practiced scaling EXPLOSIVENESS and LOOSENESS on views 1 and 2 and were tested with views 4, 5, 6 and 8. They then were retested on OPACITY and EXTRUDABILITY, scaling views 6 and 8. Discarding the practice sequences, each observer made a total of four assessments on each smear for each dimension.

c. Instructions. In addition to the same general instruction provided in Study III, the observers were given the following brief definitions of the dimensions while the experimenter pointed to relevant features in sample views of the imagery:

- (1) OPACITY is a quality of see-throughness. Water is transparent. If a material is opaque you can't see any light through it.
- (2) EXTRUDABILITY is a quality that makes a material deform and flow when it is squeezed. Think of the cells as about as big as your hand. How would they feel if you picked them up and squeezed them. Would they extrude like a pancake, or would they crumple up like Saran® wrap?
- (3) To assess EXPLOSIVENESS, think of the way the material was laid down. Were the cells shot explosively into their locations, or were they

gently wafted into place?

- (4) **STICKINESS** is a quality that makes a material cling to itself. Think of Saran® wrap. It clings to itself. Cellophane stays loose. Think of the cells as about as big as your hand. Think of picking up some that are lying together. Would they cling to each other? How would it feel to pull them apart?

The scaling format, shown in Table VI, was also different from that used in Study III with anchor points of familiar materials added to two of the dimensions.

TABLE VI

FORMAT FOR SCALING TEXTURES (STUDY IV)

1	Transparent	0	1	2	3	4	5	6	7	8	9	Opaque	1
2	Pliable	0	1	2	3	4	5	6	7	8	9	Extrudable	2
		Saran® Wrap					Molding Clay						
3	Calm	0	1	2	3	4	5	6	7	8	9	Explosive	3
4	Sticky	0	1	2	3	4	5	6	7	8	9	Loose	4
		Saran® Wrap					Cellophane						

d. Results. The mean scale value for each smear, averaged over all views and all observers, is shown in Table VII.

Evidence of Reliability. Inspection of the data in Table VII reveals a degree of inhomogeneity, both within and between dimensions, which suggests that the observers are assigning scale values nonrandomly and with some degree of consistency from observer to observer. We refer to the discussion in the results of Study III for an outline of the logic behind that inference. We again seek indirect but objective evidence of consistency in correlations between dimensions. A matrix of Spearman Rank Order Correlations is presented in Table VIII, which shows significant correlations in all cases.

Beyond that general interpretation, we can also point out that there is a greater proportion of pairs of dimensions in this study than in Study III that are significantly correlated. This could be because the variations along the two new dimensions tested here are more discriminable. It could also be due to the fact that the assessments are more precise here, due to two factors: (1) The observers based their judgments on four views of each smear here, whereas in Study III they based their judgments on only three views, and (2) There were nearly three times as many observers participating. These factors both add up to each assessment being based on nearly four times as

TABLE VII
MEAN SUBJECTIVE SCALE VALUES (STUDY IV)

Slide #	OPACITY	EXTRUDABILITY	EXPLOSIVENESS	LOOSENESS
		Positive Smears		
2	5.22	4.93	5.04	5.40
9	4.31	4.73	4.60	5.06
12	4.32	4.97	4.76	5.25
15	3.88	4.56	3.78	5.59
18	5.93	5.28	5.01	3.37
19	4.87	4.96	4.38	5.05
24	5.64	5.10	5.50	4.17
26	5.12	5.23	5.36	4.38
38	5.18	5.22	5.53	4.47
45	5.84	5.22	6.32	3.19
		Negative Smears		
3	5.20	5.09	5.14	4.18
4	4.62	4.96	4.81	4.27
5	4.63	4.95	4.97	4.94
7	5.64	5.25	6.18	3.25
10	4.63	4.91	4.97	4.80
11	5.44	4.97	5.45	4.06
13	5.29	5.11	5.61	4.37
14	4.99	4.90	4.88	4.62
16	5.28	5.12	5.63	3.92
20	5.61	5.33	5.87	3.63

TABLE VIII

SPEARMAN RANK ORDER CORRELATIONS BETWEEN DIMENSIONS (STUDY IV)
 (Correlations for positive smears lie above the diagonal;
 those for negative smears lie below)

	OPACITY	EXTRUDABILITY	EXPLOSIVENESS	LOOSENESS
OPACITY	--	.74*	.74*	-.78**
EXTRUDABILITY	.79**	--	.66*	-.83**
EXPLOSIVENESS	.92***	.90***	--	-.69*
LOOSENESS	-.78**	-.85**	-.82**	--

*Significant at $p < .05$ two-tailed

**Significant at $p < .01$ two-tailed

***Significant at $p < .001$ two-tailed

many individual assessments (280 to 72). We also have to consider that the observers here were provided with rudimentary perceptual operations, and anchor points on two of the scales. Each of these factors could also have contributed toward increasing precision of the subjective estimates. But to determine whether the overall record of reliability is better here than in Study III because of greater discriminability along the dimensions or more precise assessments would require further study.

Evidence of Validity. We again sought evidence of validity, first through Mann-Whitney U Tests which revealed no statistically significant difference between positive and negative smears on any of the four dimensions.

The next step in testing validity was to plot the data in all possible 2-spaces. We then inspected these plots for evidence of separation in the manner described previously in the general method section. Three of the six possible pairings gave evidence of separation and are shown in Figure 6. In each case inspection reveals that a straight line, drawn through the space, can partition most of the negative from most of the positive smears. The implications for these separation schemes, if they were to prove reliable, have already been discussed for similar results in Study III.

Evidence of Effects of Instructions and Anchor Points. We look first at the effects of a variation in instructions. In Study III, the observers were

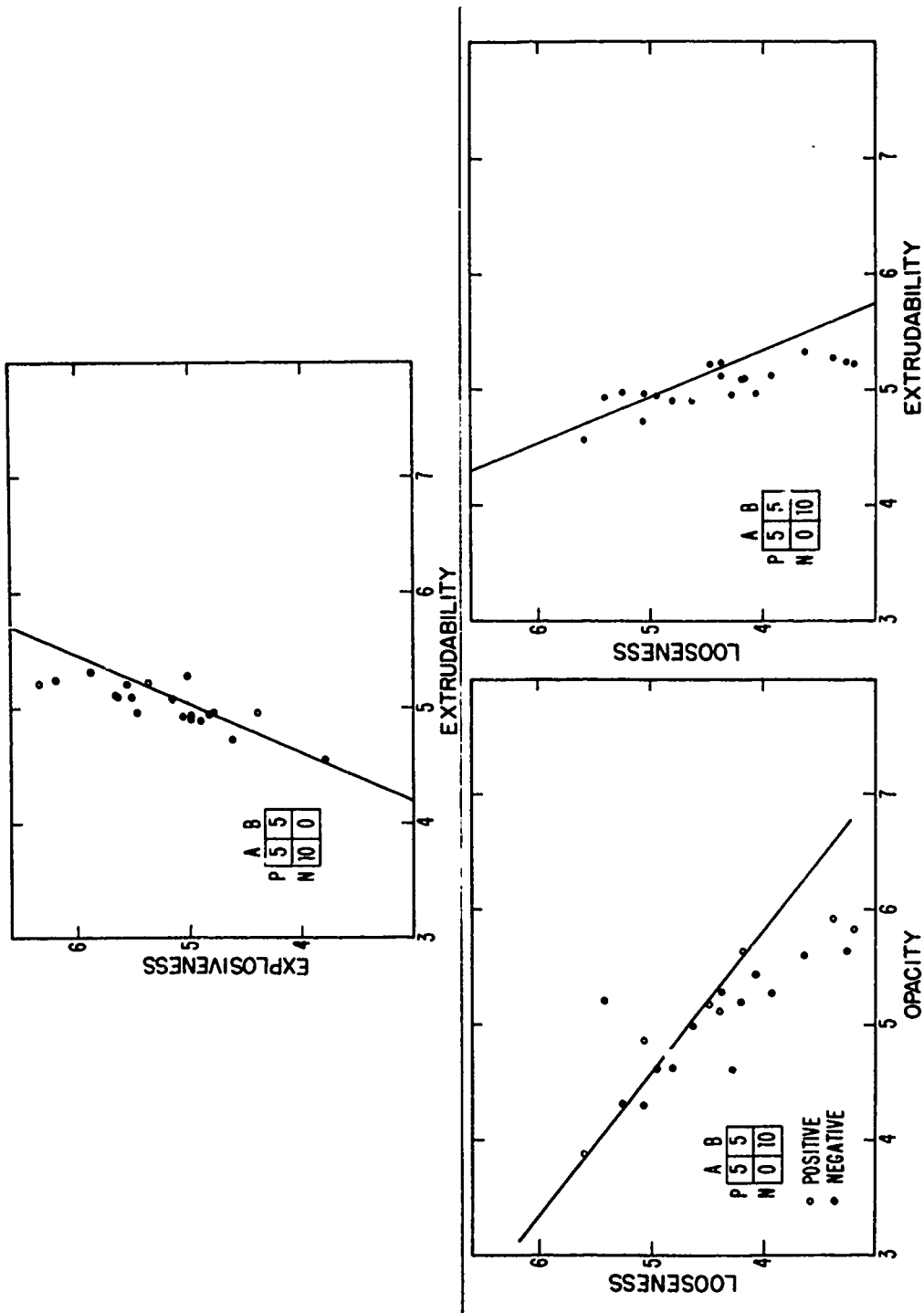


Figure 6. Potentially Useful Decision Boundaries for Identifying Suspicious Smears in Prescreening. The straight line drawn through each space partitions most of the positive from most of the negative smears. The number of positive and negative smears falling above or below the decision boundary are shown in a 2x2 table. (Study IV)

left to define and evaluate EXPLOSIVENESS in their own individual ways. In this study they were given a definition which provided them with a standard way of visualizing EXPLOSIVENESS. The effect of this variation in instructions is tested by a Wilcoxon matched pairs signed ranks test (Siegel, 1956, pp. 75-83). In that test, the mean scale values of EXPLOSIVENESS for each of the negative smears obtained in Study III were paired with those obtained in this study. The same test was made on the positive smears. There was no statistically significant difference between assessments of the positive smears, but assessments of the negative smears were significantly effected ($T = 5, p < .02$, two-tailed). The same smears tended to get higher assessments of EXPLOSIVENESS in this study than they did in Study III. The most likely cause of this effect is the change in instructions. However, different observer populations were involved, which might also account in whole or in part for the effect. Whatever the case, this result demonstrates how sensitive these assessments can be to task or observer variables. This could either indicate unreliability or suggest the positive quality that these assessments can be shaped by means of observer selection, instruction and training.

In an examination of the combined effects of a difference in instructions and a difference in anchor points, the observers were given: (1) a definition of LOOSENESS, (2) a rudimentary perceptual operation for assessing it, and (3) anchor points on the 10 point scale. We looked for statistically significant effects, again using a Wilcoxon matched pairs signed ranks test. No statistically significant difference was found for the positive smears, but assessments of the negative smears were significantly affected ($T = 7, p < .05$, two-tailed). The same smears tended to get higher ratings of LOOSENESS in this study than they did in Study III with the most likely causes of this effect the changes in instructions and scaling format. But, again, this interpretation has to be tempered by consideration of differences in the observer populations.

4. STUDY V. A PSYCHOMETRIC EVALUATION OF FOUR DIMENSIONS OF TEXTURE ASSESSMENT MADE BY CYTOTECHNICIANS BEFORE AND AFTER TRAINING.

The observers in this study were student cytotechnicians. We had an opportunity to study their performance both before and after training. In each test they performed the same task as in Study IV, except that they saw two more views of each smear. This study examines the performance of a small group of highly motivated observers and the effects of training on their performance.

a. Observers. There were 10 observers, students in the Boston School of Cytotechnology who participated in the study voluntarily as part of their training.

b. Method. Views 1, 2, 3, 4, 5, 6, 7 and 8 were used as the stimuli. Views 1 and 2 from each of the 20 smears were used for practice. Other than the addition of Views 3 and 7 to the test series, the procedure was the same as in Study IV. Test 1 was administered on the first day that the students attended classes at the Boston School of Cytotechnology with Test 2 administered approximately six months later, after the students had largely completed their classroom studies and were training on-the-job in cytology laboratories at several hospitals in the Boston area.

c. Results of Test 1. The mean scale value for each smear, averaged over all views and all observers, is shown in Table IX.

(1) Evidence of Reliability. The data in Table IX reveal, as they did in the previous studies, a degree of inhomogeneity that indicates the observers were not responding randomly, and which provides evidence of a certain degree of inter-observer consistency. Objective, but still indirect evidence of reliability is presented in Table X, which shows Spearman Rank Order Correlations between dimensions.

Statistically significant correlations occur in eight cases. A comparison of the correlation matrix obtained here in Study V, Test 1 with that in Study IV reveals a greater proportion of statistically significant correlations in Study V, probably because each assessment here is based on only 60 observations in contrast to 280 in Study IV. Therefore it appears that there are detectable effects on the reliability of performance due to changing the number of observations, at least four-fold. It is important to note also that this effect was probably attenuated by two factors: (1) the observers in Study V, Test 1 saw two more views of each smear than the observers in Study IV and (2) the observers in Study V, Test 1 had some vested interest in what they were doing and were probably highly motivated.

Direct evidence of reliability is available in correlations between the mean scale values obtained in this study and those obtained in Study IV. Spearman Rank Order Correlations were computed for positive and negative smears separately and are shown in Table XI.

(2) Evidence of Validity. Mann-Whitney U Tests revealed no statistically significant differences between distributions of the mean scale values for positive and negative smears. The data were next plotted in all possible 2-spaces, and evidence was sought, in the plots, of separation of positive and negative smears. Following the procedure outlined in the General Method section herein, five spaces were found in which separation occurred as shown in Figure 7.

d. Results of Test 2 (After Six Months Training). The mean scale values for each smear, averaged over all views and all observers, are presented in Table XII.

Evidence of Reliability. The same observations can be made regarding inhomogeneities between and within dimensions that were made in previous discussions. They imply a certain degree of consistency over observers. We turn again to correlations between dimensions for objective evidence of consistency with Spearman Rank Order Correlations between all possible pairs of dimensions shown in Table XIII. In all but one case, the correlations are statistically significant.

It is also possible to obtain direct evidence of reliability by correlating the mean scale values obtained here, with those obtained in Test 1. The indices of reliability are shown in Table XIV. In a pure sense the assessments made in the two studies are not independent and the legitimacy of the measure of reliability could be questioned. For all practical purposes, however, they probably are independent, since it is very unlikely that observers, in taking

TABLE IX

MEAN SUBJECTIVE SCALE VALUES (STUDY V, Test 1)

Slide #	OPACITY	EXTRUDABILITY	EXPLOSIVENESS	LOOSENESS
Positive Smears				
2	5.93	5.58	5.85	3.27
9	3.70	4.75	4.93	5.27
12	3.83	4.83	5.83	4.35
15	3.25	4.40	4.52	6.23
18	4.82	5.37	5.87	2.67
19	4.23	5.05	5.32	5.03
24	4.05	5.02	5.98	3.42
26	4.33	5.60	6.55	3.08
38	4.70	5.17	5.78	3.68
45	5.45	5.57	5.43	3.73
Negative Smears				
3	5.13	5.33	5.15	4.13
4	4.57	4.17	4.87	4.35
5	3.10	4.08	3.90	6.25
7	3.53	4.85	5.88	4.08
10	4.48	4.53	4.00	5.38
11	5.65	5.50	5.62	2.52
13	5.05	5.28	4.75	4.55
14	3.85	4.52	4.67	5.07
16	6.40	6.18	5.30	2.07
20	4.30	4.66	6.00	3.12

TABLE X

SPEARMAN RANK ORDER CORRELATIONS BETWEEN DIMENSIONS (STUDY V, Test 1)
 (Correlations for positive smears lie above the diagonal;
 those for negative smears lie below.)

	OPACITY	EXTRUDABILITY	EXPLOSIVENESS	LOOSENESS
OPACITY	--	.88***	.44	-.71*
EXTRUDABILITY	.79**	--	.64*	-.79**
EXPLOSIVENESS	.29	.58	--	-.90***
LOOSENESS	-.53	-.78**	-.89***	--

*Significant at $p < .05$, two-tailed

**Significant at $p < .01$, two-tailed

***Significant at $p < .001$, two-tailed

TABLE XI

RELIABILITY OF MEAN SCALE READINGS BETWEEN STUDY IV AND STUDY V, Test 1.
 (Spearman Rank Order Correlations)

	<u>Positive Smears</u>	<u>Negative Smears</u>
OPACITY	.81***	.10
EXTRUDABILITY	.65*	.56*
EXPLOSIVENESS	.53	.75**
LOOSENESS	.54	.90***

*Significant at $p < .05$, one-tailed

**Significant at $p < .01$, one-tailed

***Significant at $p < .001$, one-tailed

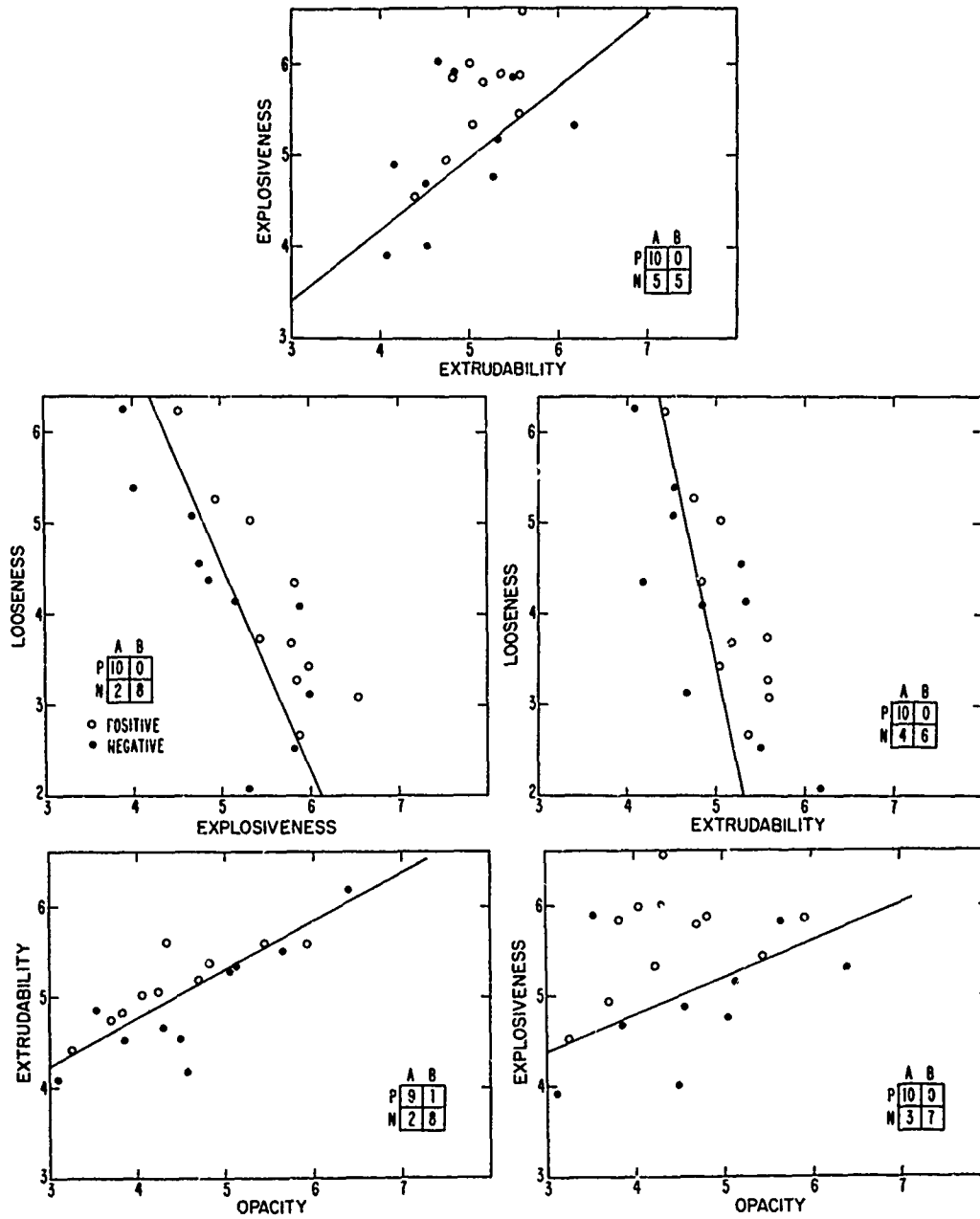


Figure 7. Potentially Useful Decision Boundaries for Identifying Suspicious Smears in Prescreening. The straight line drawn through each space partitions most of the positive from most of the negative smears. The number of positive and negative smears falling above or below the decision boundary are shown in a 2x2 table. (Study V, Test 1)

TABLE XII

MEAN SUBJECTIVE SCALE VALUES (STUDY V, Test 2)

Slide #	OPACITY	EXTRUDABILITY	EXPLOSIVENESS	LOOSENESS
Positive Smears				
2	7.33	7.52	6.72	2.73
9	5.67	6.28	5.02	4.23
12	4.63	5.47	5.17	4.67
15	3.47	4.55	3.75	5.92
18	5.63	6.65	6.17	2.57
19	4.28	5.53	4.80	4.77
24	4.57	5.67	5.98	3.72
26	5.68	6.58	6.30	3.28
38	6.72	7.02	6.28	3.05
45	6.78	6.88	6.06	3.61
Negative Smears				
3	6.27	6.55	5.30	4.12
4	4.32	4.40	4.74	5.27
5	4.38	5.02	3.80	5.22
7	3.46	4.62	5.35	5.07
10	3.90	3.85	3.45	6.07
11	5.60	5.90	5.80	3.47
13	4.93	5.48	4.78	5.17
14	3.50	3.72	4.08	5.83
16	7.00	7.00	5.70	2.70
20	4.17	4.93	5.47	4.65

TABLE XIII

SPEARMAN RANK ORDER CORRELATIONS BETWEEN DIMENSIONS (STUDY V, Test 2)
 (Correlations for positive smears lie above the diagonal;
 those for negative smears lie below.)

	OPACITY	EXTRUDABILITY	EXPLOSIVENESS	LOOSENESS
OPACITY		.92***	.82**	-.73*
EXTRUDABILITY	.91***		.86**	-.88***
EXPLOSIVENESS	.45	.65*		-.90***
LOOSENESS	-.68 ⁺	-.88***	-.92***	

*Significant at $p < .05$, two-tailed

**Significant at $p < .01$, two-tailed

***Significant at $p < .001$, two-tailed

TABLE XIV

RELIABILITY OF MEAN SCALE READINGS BETWEEN STUDY V, TEST 1 AND
 STUDY V, TEST 2
 (Spearman Rank Order Correlations)

	<u>Positive Smears</u>	<u>Negative Smears</u>
OPACITY	.78**	.80**
EXTRUDABILITY	.76**	.76**
EXPLOSIVENESS	.73*	.88***
LOOSENESS	.88***	.89***

*Significant at $p < .05$, one-tailed

**Significant at $p < .01$, one-tailed

***Significant at $p < .001$, one-tailed

Test 2, could remember what the smears looked like and how they assessed them in Test 1. Note, in comparing these indices with those in Table XI, that we are correlating assessments made by the same observers in Table XIV and different observers in Table XI.

Evidence of Validity. Mann-Whitney U tests were performed to determine whether there were any statistically significant differences in mean scale values between positive and negative smears. They revealed a difference in only one case where assessments of EXTRUDABILITY on positive smears are higher than on negative smears ($p < .05$, two-tailed). This variable suggests itself, therefore, as a valid discriminator of positive and negative smears.

We next sought evidence of separation in plots of the data in all possible 2-spaces. Evidence of separation was found in four cases shown in Figure 8.

Evidence of the Effects of Training. Two effects of training are evident from Wilcoxon tests of difference in distribution between the mean scale values in Test 1 and Test 2, which reveal differences in positive smears on two dimensions. After training, the same smears receive lower assessments of OPACITY and EXTRUDABILITY ($p < .001$, two-tailed, in both cases). Another effect of training is suggested in a comparison of the correlation matrix in Table XIII with that in Table X. There is a greater number of statistically significant correlations between dimensions in Study V, Test 2 than in Study V, Test 1 and in every case but one (in which there is a tie) the correlation indices are higher in Study V, Test 2 than in Study V, Test 1, suggesting that training tends to increase reliability of the assessments.

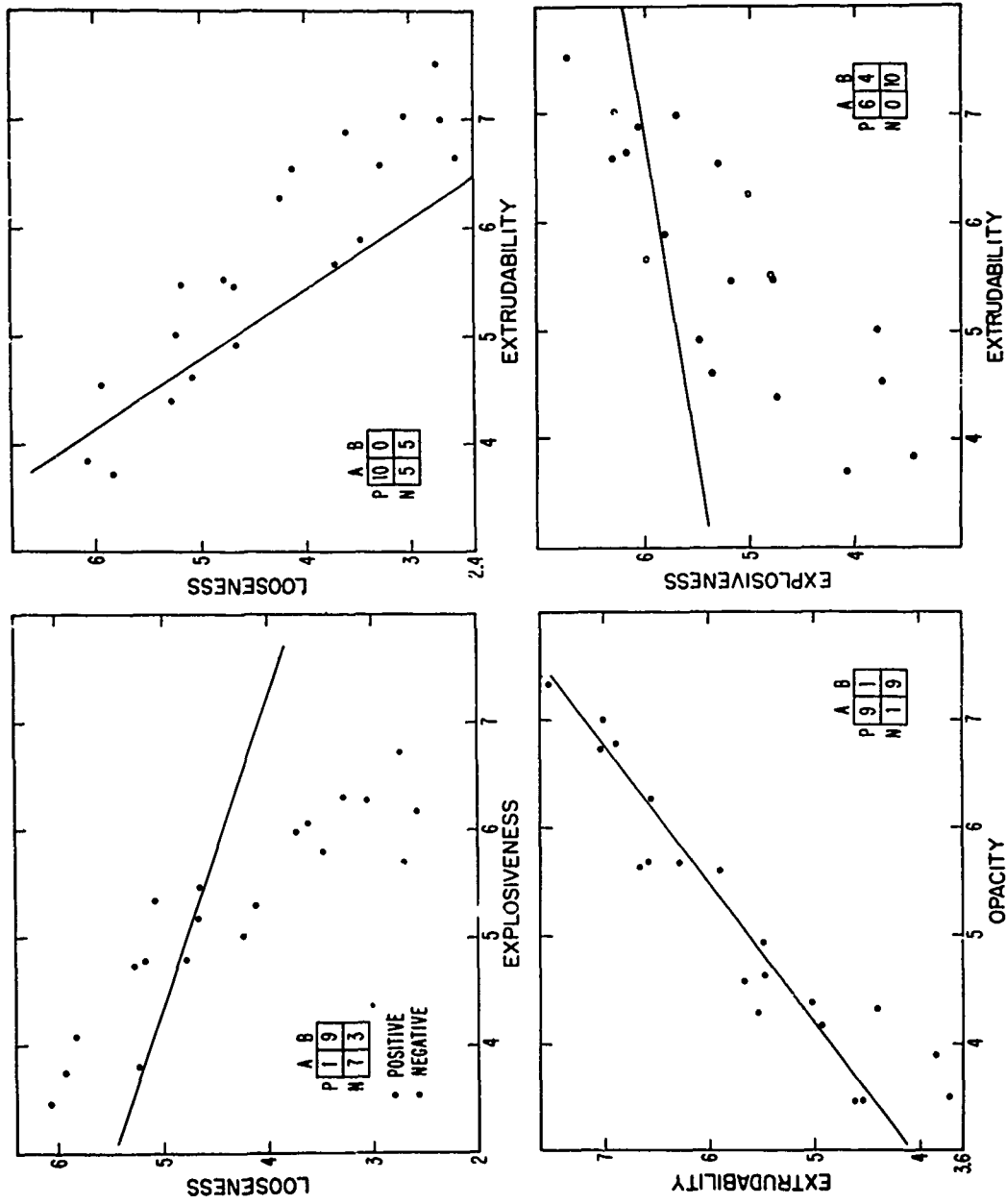


Figure 8. Potentially Useful Decision Boundaries for Identifying Suspicious Smears in Prescreening. The straight line drawn through each space partitions most of the positive from most of the negative smears. The number of positive and negative smears falling above or below the decision boundary are shown in a 2x2 table. (Study V, Test 2)

SECTION IV
SUMMARY OF RESULTS AND DISCUSSION

The most firmly established and general finding is that observers can reliably discriminate and scale variations in several qualities of the total appearance of smears seen at low microscopic power. Evidence of reliability has been presented in each study in the form of a matrix of correlations between dimensions and we give, in Table XV, a summary of the significant correlations that were found in each of those matrices. It shows that there were eight pairs of dimensions that correlated significantly in one or another study,

TABLE XV
SUMMARY OF SIGNIFICANT CORRELATIONS BETWEEN
DIMENSIONS FOUND IN EACH STUDY

	Positive Smears				Negative Smears			
	III	IV	V(1)	V(2)	III	IV	V(1)	V(2)
EXPLOSIVENESS X DIRTINESS	o	.	.	.	+	.	.	.
X DOUGHINESS	+	.	.	.	o	.	.	.
X LOOSENESS	-	-	-	-	-	-	-	-
X OPACITY	.	+	o	+	.	+	o	o
X EXTRUDABILITY	.	+	+	+	.	+	+	+
EXTRUDABILITY X LOOSENESS	.	-	-	-	.	-	-	-
X OPACITY	.	+	+	+	.	+	+	+
LOOSENESS X OPACITY	.	-	-	-	.	-	o	-

+ = positive correlation
- = negative correlation

o = no significant correlation
. = no test

in either the positive or the negative smears. Two of those cases (EXPLOSIVENESS X DIRTINESS and EXPLOSIVENESS X DOUGHINESS) were only tested once, in Study III, and in each case the correlations did not occur in both the positive and the negative smears. The evidence of reliability of judging DIRTINESS and DOUGHINESS is, therefore, marginal. In the other six cases there were multiple tests, and the same direction of correlation was repeatedly found in both the positive and the negative smears. These six cases were made up of combinations of four dimensions: EXPLOSIVENESS, LOOSENESS, EXTRUDABILITY and OPACITY. We conclude that variations along those four dimensions definitely

are correlated, and that observers can reliably see and scale variations along each of those dimensions. The evidence of correlations within dimensions presented in Tables XI and XIV provide additional and consistent evidence of reliability. We can see an obvious similarity of assessment across the three groups of observers, and that permits the generalization that similar assessments would be made by other similarly constituted groups of observers. We can also see similar patterns of correlations in two independent groups of smears, the 10 positive and the 10 negative, which provide a slim but clear basis for generalizing this result to all smears.

Evidence of validity was sought in each study; first with Mann-Whitney U tests of difference between positive and negative smears on individual dimensions, and second with tests of separation in 2-space. In only one of the Mann-Whitney U tests performed over the three studies was a statistically significant difference found between positive and negative smears. That difference, positive higher than negative on the EXTRUDABILITY dimension was found in Study V, part 2. In view of its probability ($p < .05$) and the total number of tests performed (18), that difference could reasonably be attributed to chance.

A summary of the tests of separation in 2-space is presented in Table XVI, with each separation coded for the form it assumed. In general, the decision boundary is drawn through the long axis of the scatter plot, and within each 2-space, then, it has roughly the same orientation from one experiment to the next, but the proportion of positives and negatives which fall above and below the line can vary. Each separation can be characterized as having the majority of positive smears above or negative smears below the decision boundary (coded 1), or vice versa (coded 2) (see Table XVI).

There were eight spaces in which separation occurred, and six of those spaces were subjected to repeated tests. To establish whether these separations might reasonably have occurred by chance, we considered first that if positive and negative smears were randomly mixed in the scatter plots, then separations of the kind we have defined would be expected to occur less often than not. We have, therefore, selected .5 as a conservative upper bound on the chance probability of separation. We also considered that if separations were a matter of chance, when they did occur they would assume one or the other form with equal probability. Our statistical analyses are based, therefore, on the following chance probabilities for the outcome of each experiment:

no separation, (0),	$p(0) = .5$
separation of form 1, (1)	$p(1) = .25$
separation of form 2, (2),	$p(2) = .25$

Based on these probabilities, separation in any individual experiment would not be significant ($p < .5$, two-tailed), but evidence of repeated separation could be significant. We proceeded therefore to determine the probability of each set of results obtained in the repeated tests. Table XVI shows, for example, that separation was found in the LOOSENESS X EXPLOSIVENESS space in three out of four experiments. There were two separations of form 1 and one of form 2. We calculated the chance probability of obtaining a sequence with

at least that number of separations and with at least that proportion of more or less frequent form (consistency of separation). This was achieved by determining the combined probability of the following sets of possible results, in any order: 1111, 1112, 1110, 1120

$$\begin{aligned}
 p(1111) &= .25^4 \times 1 = && .0039 \\
 p(1112) &= .25^4 \times 4 = && .0156 \\
 p(1110) &= .25^3 \times .50 \times 4 = && .0312 \\
 p(1120) &= .25^3 \times .50 \times 12 = && \underline{.0937} \\
 &&& .1444
 \end{aligned}$$

The two-tailed probability is then determined by doubling that combined probability. Thus, for a set of results with at least the number and consistency of separations found for the LOOSENESS X EXPLOSIVENESS space, the probability of chance occurrence is $p < .29$. This same method of calculation was applied to each set shown in Table XVI, and the associated probabilities are shown at the right.

We can conclude from the analysis that there is at least one space, LOOSENESS X EXTRUDABILITY, in which positive smears probably do separate from negative smears. The evidence in sum, though based on a very crude test of separation, warrants the conclusion that subjective assessments of the overall appearance can separate positive from negative smears in our small test sample. We have to be cautious, however, in generalizing that conclusion to all smears. A confident generalization would have to depend on evidence from studies employing a much larger sample of smears. The important point, however, is that observers can reliably sense and scale variations in the overall appearance of smears, and if some of those variations do relate to the presence or absence of cancer, it is simply a matter of more extensive studies of the kind reported here to identify them.

With regard to other findings from these studies, comparisons between experiments were also made to check on various effects of instructions, scaling format and training. Several findings are presented in the results sections of Experiments IV, V, Test 1 and V, Test 2. Statistically significant differences in performance between Experiments III and IV were found that were probably due to differences in instructions and scaling format. A drop in reliability between Study IV and Study V, Test 1 was interpreted as caused by a four-fold decrease in the number of assessments per smear. Greater reliability in Study V, Test 2 over Study V, Test 1, also other differences in scaling, were attributed to the effects of training.

We consider now implications of these findings for the specific problem of interpreting and screening Pap smears. Psychometric assessments of the kind we report here may help in providing more sensitive and quantitative assessments of background variations which have to be taken into account in interpreting cellular changes, perhaps also in contributing directly to the diagnosis of cancer. These techniques might also be used to generate sets of quantified visual standards of background variation systematically related to such

TABLE XVI

SUMMARY OF SEPARATIONS IN 2-SPACE FOUND IN EACH STUDY

2-Space	STUDY				
	III	IV	V 1	V 2	
DULLNESS X DIRTINESS	2	—	—	—	p < .50 two-tailed*
DIRTINESS X LOOSENESS	1	—	—	—	p < .50 " "
LOOSENESS X EXPLOSIVENESS	1	0	1	2	p < .29 " "
LOOSENESS X OPACITY	—	1	0	0	p < .63 " "
LOOSENESS X EXTRUDABILITY	—	1	1	1	p < .04 " "
EXTRUDABILITY X EXPLOSIVENESS	—	2	1	1	p < .13 " "
EXTRUDABILITY X OPACITY	—	0	1	1	p < .25 " "
EXPLOSIVENESS X OPACITY	—	0	1	0	p < .63 " "

— = no test

0 = no separation (see text p. 17 for criteria)

1 = separation with majority of positives above or negatives below the decision boundary.

2 = separation with majority of negatives above or positives below the decision boundary.

* The two-tailed probability of obtaining a sequence with at least that number of separations and at least that proportion of more to less frequent form of separation (see text for further explanation).

variables as age, menstrual cycle, and acute infection as well as to the course of chronic diseases, which might prove helpful particularly in training cytotechnicians.

We can also consider the possible value of psychometric assessments in cytological research. Identifying variations in background qualities and in determining correlations among those variations may contribute to cytological or histological theory. Finally, we can suggest the potential role of psychometric assessments in discovering disease related optical properties in the background, subject to automated analysis. Automated analysis of background qualities might prove to be more easily achieved than automated analysis of cellular characteristics.

Our findings are also significant from a general standpoint. They show that human assessments of complex optical imagery can be discriminating, quantitative and reliable. They suggest that there may be much more information available in subjective assessments of imagery than is usually assumed. Those investigators concerned with imagery analysis are quick to acknowledge that the human observer is a most elegant pattern recognizer, but, at the same time, many would be quick to consider abandoning him for the most primitive automatic optical analyzer. There is an understandable scientific prejudice that human assessments are unreliable and insensitive, which may be true to a degree for observers who operate individually according to their own idiosyncratic procedures and internal standards. These studies illustrate, however, that observers can be programmed to follow standard perceptual operations and gauge their judgments against common standards. By pooling and averaging repeated independent assessments, we can generate sensitive and reliable data. The central question may not be whether human assessments can be sufficiently sensitive and reliable for scientific purposes, but whether we can tolerate the potentially cumbersome and costly procedures that may be required to achieve sensitivity and reliability: namely, the coordinating and pooling of assessments from a number of observers. These studies, however, show that the approach may be practical. In Study V, for example, remarkably reliable and sensitive discrimination was achieved by pooling the assessments of only 10 observers. Furthermore, each assessment on each smear took less than seven man minutes, and considering the potential for increasing the rate of display presentation and response recording by automated techniques, that time could probably be halved. These techniques, therefore, could be of value, not only in research, but in routine screening situations as well.

The studies reported in Section III lead to the conclusion that subjective assessments of texture may be of practical use in the analysis and screening of Pap smears. With similar studies of texture assessments in solar observing reported elsewhere (Pickett, 1971), they support the general conclusion that psychometric techniques may be of practical use in a wide range of imagery screening contexts. Of particular significance to the Air Force is the possibility of using subjective texture assessments in intelligence screening of aerial photographs.

APPENDIX I
CHECKLIST USED TO SURVEY DESCRIPTORS OF TEXTURE
IN 100X VIEWS OF PAP SMEARS

Name: _____

Laboratory: _____

Instructions:

- (1) write name and laboratory on pp. 1 & 2;
- (2) Place a check mark in only one of the columns for each word;
- (3) Be sure to check every word;
- (4) Add and classify at bottom of p. 2 any other descriptive adjectives that come to mind;
- (5) Please work independently.

	Describes a visible quality which:			Does not describe a visible quality
	suggests negative	makes you suspicious	suggests positive	
Bright				
Brittle				
Calm				
Clean				
Clumped				
Cohesive				
Compact				
Consistent				
Creamy				
Crumbly				
Dirty				
Doughy				
Droopy				
Dull				
Elastic				
Enmeshed				
Explosive				
Extrudable				
Fatty				
Fibrous				
Filmy				
Firm				
Floating				
Fragile				
Gluey				
Granular				
Gummy				
Hard				
Leathery				
Loose				
Lumpy				
Lustrous				

Name: _____ Laboratory: _____

	Describes a visible quality which:			Does not describe a visible quality
	suggests negative	makes you suspicious	suggests positive	
Matted				
Milky				
Oily				
Opaque				
Pasty				
Pearly				
Pliable				
Puffy				
Pulpy				
Raw				
Regular				
Ropy				
Rubbery				
Shrunken				
Shiny				
Silky				
Slimy				
Slippery				
Soapy				
Soft				
Spongy				
Starchy				
Sticky				
Stiff				
Thick				
Tight				
Transparent				
Variable				
Velvety				
Waxy				

APPENDIX II
A THESAURUS OF DESCRIPTORS OF COMPLEX OPTICAL IMAGERY

1. GENERAL DESCRIPTION AND SUGGESTED APPLICATIONS.

Presented below is a word list of potential use in surveying and enhancing the descriptive vocabulary of workers who screen complex optical imagery. The list consists of 1707 entries (1058 different words) organized under 177 subheadings and 130 major headings keyed to Roget's Thesaurus (The Original Roget's Thesaurus of English Words and Phrases, St. Martins Press, New York, 1965). It provides a comprehensive list that should be helpful in assembling checklists for surveys of specialized visual description such as those reported in Section II. The researcher can feel confident that in scanning this list he has been reminded of a very broad range of potential visual description without having to carry out a systematic survey of a standard dictionary or thesaurus.

The list is presented in two forms: one with the 1058 base words presented in alphabetical order; the other with the 177 subheadings presented in alphabetical order. With the first form, one or two descriptors which may come to mind in scanning samples of complex imagery can be looked up to determine the subheadings under which they occur in the second form. By examining the word families listed under those subheadings, the viewer may then discover descriptors which more sharply capture the sensed visual qualities than the words that first came to mind. Scrutiny of the word families may also reveal gradations of meaning that suggest a basis for scaling the imagery along qualitative dimensions; and inter-family comparisons may suggest frameworks for multidimensional scaling.

2. SPECIFIC DESCRIPTION AND METHOD OF PREPARATION.

This specialized thesaurus was prepared because it became obvious at the start of the work reported in Section I that a systematic approach to selection of words for the checklist was required. The problem was to assure that the checklist was efficient in the sense of including mostly relevant descriptors, and comprehensive in not leaving many out. Our first effort was an attempt to assemble a master list of all adjectives of visual description from which one could abstract most of the potentially relevant descriptors for any particular problem of visual description that came along. The criteria for including a word in that master list were that it describe any directly visible quality of an object or batch of material, e.g., mottled or marbled; or any quality of a substantive or structural nature which might be inferred from its appearance, e.g., flexible from its wrinkled or droopy appearance, or brittle from its fragmented appearance. Beginning with a list of all adjectives we could recall that fit the criteria, we continued with a systematic scan of relevant sections of Roget's Thesaurus for all words we could recognize that fit the criteria. At this stage it became apparent that the task was unmanageable, first, for the sheer number of words that had to be examined in the obviously relevant broad categories in Roget's Thesaurus, and second, because there was no logical basis for identifying all of the less obviously relevant narrow categories which we kept discovering. At this point we stopped the process to devise a more manageable approach.

In our revised approach, we searched in two stages, using two thesauruses. In the first stage, we scanned March's Thesaurus (March's Thesaurus and Dictionary of the English Language, Doubleday, New York, 1968), to make a fine-grained identification of all relevant categories. In the second stage, we returned to Roget's Thesaurus, this time equipped with a manageable but comprehensive scheme. March's Thesaurus is suited to a systematic screening for all relevant categories because it is not hierarchically organized. It is basically a dictionary, but at frequent intervals in the alphabetic listing it treats a word as a reference word, organizing under it, as in Roget's Thesaurus, a family of related words. Because of this non-hierarchical arrangement, March's Thesaurus permits making a systematic scan. One can go through it from A to Z, looking not at every word, but at least at every reference word. Under every reference word is a small clearly segregated list of related adjectives, so that, at a glance, one can tell whether words in that narrow category fit the criteria for visual descriptors.

Our systematic scan of March's Thesaurus yielded 146 narrow categories of visual description (See Table XVII). At this point we listed all the adjectives in March's Thesaurus found under those categories that fitted our criteria. We then combined that list with the partial list we had already assembled by the first procedure. That combined interim list was then subjected to some editing. We decided to focus primarily on descriptors of masses of visible material as opposed to descriptors of particular objects or specific visual patterns; to exclude, e.g., specific descriptors like square, circular and octagonal, and to retain general descriptors, e.g., angular, curly, and bumpy. Some specific descriptors may still appear in the list, but generally we sought adjectives for mass nouns. We also decided to exclude most of the words for colors, and words for describing dynamic qualities, e.g., churning, scintillating. When edited, the combined interim list totaled 514 words.

In the next stage, we looked up in Roget's Thesaurus each of the 514 words in the interim list, and scanned the paragraphs of adjectives in which they occurred, looking for other adjectives that fit our criteria. The original look-up word from the interim list (identified by an asterisk) plus any other words we found in that paragraph were then entered in column 1 of the master list. The initial italicized word in the paragraph in which each entry was found serves as that entry's subheading, and is listed across from it in column 2. The number of the heading under which the paragraph appears serves as the major heading for each entry and is listed across from it in column 3.

TABLE XVII
LIST OF VISUALLY RELEVANT REFERENCE WORDS
FROM MARCH'S THESAURUS

ACTION-PASSIVENESS	EXCESS-LACK
ACTIVITY-INDOLENCE	EXCITABILITY-INEXCITABILITY
ADDITION-SUBTRACTION	EXCITATION
ADMISSION-EXCLUSION	FAULTLESSNESS-FAULTINESS
ADMISSION-EXPULSION	FEELING-INSENSIBILITY
ADVANCE-RETROGRESSION	FORM-FORMLESSNESS
AGITATION	FRIABILITY
ANGULARITY	FRICTION-LUBRICATION
AIM-ABERRATION	GATHERING-SCATTERING
ANTERIORITY-POSTERITY	GRAY-BROWN
APERTURE-CLOSURE	GREATNESS-LITTLENESS
ARCHITECTURE	GROOVE
ATTRACTION-REPULSION	HARDNESS-SOFTNESS
BEAUTY-UGLINESS	HARSHNESS-MILDNESS
BETTERMENT-DETERIORATION	HEAVINESS-LIGHTNESS
BLUENESS-ORANGE	HURRY-LEISURE
BORDER	IMPETUS-REACTION
BOUNDARY	INCLUSION-OMISSION
BREADTH-NARROWNESS	INCREASE-DECREASE
CACOPHONY	INCREMENT-REMNANT
CIRCLE-WINDING	INDENTATION
CIRCUITION	INFANCY-AGE
CLEANLINESS-FILTHINESS	INJECTION-EJECTION
CLEARNESS-OBSCURITY	INSTRUMENT
COHESION-LOOSENESS	INSTRUMENTALITY
COLOR-ACHROMATISM	INTERSPACE-CONTACT
COMPOSITION-RESOLUTION	KEEPING-RELINQUISHMENT
CONCENTRATION-RADIATION	LAMINA-FIBER
CONFINEMENT	LASTING-TRANSIENTNESS
CONNECTION-INDEPENDENCE	LATERALITY-CONTRAPOSITION
CONTENTS-RECEIVER	LEADING-FOLLOWING
CONTINUITY-INTERRUPTION	LENGTH-SHORTNESS
CONVEXITY-CONCAVITY	LEVELNESS
COVER-LINING	LIGHT-DARKNESS
CRASH-DRUMMING	LIQUEFACTION-VOLATILIZATION
CROSSING	LIQUID-GAS
CURVATION-RECTILINEARITY	LUMINARY-SHADE
DAMPNESS-DRYNESS	MAGNITUDE-SMALLNESS
DIAPHANEITY-OPAESCENCE	MANIFESTATION-LATENCY
DIAPHANEITY-OPAQUENESS	MIDDLE
DIMNESS	MINERALOGY
DRESS-UNDRESS	MIXTURE-HOMOGENEITY
ELASTICITY-INELASTICITY	MOVEMENT-REST
ELEVATION-DEPRESSION	MULTIPLICITY-PAUCITY
EMBELLISHMENT-DISFIGUREMENT	MUTABILITY-STABILITY
ENLARGEMENT-DIMINUTION	MUTATION-PERMANENCE
ENTIRETY-DEFICIENCY	NEED
ERECTNESS-FLATNESS	NUMBER

NUMBERING
OBSTRUCTION-HELP
ORGANIZATION-DISORGANIZATION
OUTLINE
OUTSIDE-INSIDE
PARALLELISM-INCLINATION
PERIODICITY-IRREGULARITY
PLICATURE
PRECEDENCE-SUCCESSION
PREPARATION-NONPREPARATION
PROPORTION-DEFORMITY
PROVISION-WASTE
PULPINESS-OILINESS
PULPINESS-ROSI
PURITY-CRUDENESS
PUSH-PULL
RECURRENCE
REDNESS-GREENNESS
REFUGE-PITFALL
REGULARITY-IRREGULARITY
RE MOTENESS-NEARNESS
REVERSAL
RIVER-WIND
ROUNDNESS
SAMENESS-CONTRAST

SCULPTURE
SHARPNESS-BLUNTNES
SMOOTHNESS-ROUGHNESS
SOLIDITY-RARITY
STRENGTH-WEAKNESS
SUPREMACY-SUBORDINACY
SUSPENSION-SUPPORT
SWIFTNES-SLOWNESS
TEXTURE
TOUGHNESS-BRITTLENESS
TURBULENCE-CALM
UNIFORMITY-DIVERSITY
UNIFORMITY-MULTIFORMITY
UNION-DISUNION
USEFULNESS-USELESSNESS
VARIATION
VIBRATION
VARIEGATION
VIGOR-INERTIA
VISCIDITY-FOAM
VISIBILITY-INVISIBILITY
WATER-AIR
WHITENESS-BLACKNESS
WHOLE-PART
YELLOWNESS-PURPLE

3. THESAURUS WITH BASE WORDS ARRANGED ALPHABETICALLY

ABLAZE	LUMINOUS	417	BALLED	ROTUND	252
ACUTE	SHARP	256	BALLED-UP	CROSSED	222
ADAPTABLE	FLEXIBLE	327	BALLOONING	CONVEX	253
ADHESIVE	* COHESIVE	48	BANDED	MOTTLED	437
ADHESIVE	* RETENTIVE	778	BARBED	SHARP	256
ADHESIVE	* TOUGH	329	BARE	* DRY	342
ADHESIVE	* VISCID	354	BAKE	* PLAIN	573
ADJUSTABLE	CONFORMABLE	83	BARE	* SIMPLE	44
ADULTERATED	MIXED	43	BARE	* UNCOVERED	229
AERATED	HUBBLY	355	BARE	WEAKENED	163
AERIFIED	RARE	325	BARKED	CROSSED	222
AFLAME	LUMINOUS	417	BARKED	MOTTLED	437
AGLOW	LUMINOUS	417	BASTED	UNCTUOUS	357
AIR-PROOF	SEALED-OFF	264	BATED	UNSHARPENED	257
AIR-TIGHT	SEALED-OFF	264	BEADLIKE	ROTUND	252
AIRLESS	TRANQUIL	266	BEADY	ROTUND	252
AIRY	GASEOUS	336	BEAMING	LUMINOUS	417
AIRY	INSUBSTANTIA	4	BECLOUDED	UNLIT	418
AIRY	LIGHT	323	BEDDED	LAYERED	207
AIRY	WINDY	352	BEDRAGGLED	DIRTY	649
ALBINO	COLORLESS	426	BEECHY	ARBOREAL	366
ALIGNED	UNIFORM	16	BEEFY	* FLESHY	195
ALLOYED	MIXED	43	BEFOGGED	UNLIT	418
ALLUVIAL	TERRITORIAL	344	BEGRIMED	DIRTY	649
ALTERABLE	UNSTABLE	152	BELLIED	CELLULAR	194
AMORPHOUS	DISTORTED	246	BELLYING	CONVEX	253
AMORPHOUS	FLUIDAL	335	BENDABLE	SOFT	327
AMORPHOUS	NON-UNIFORM	17	BICOLOR	* VARIEGATED	437
ANHYDROUS	DRY	342	BILLOWING	CONVEX	253
ARCHED	ARCUATE	253	BILLOWY	CONVEX	253
ARCHED	CONCAVE	255	BITUMINOUS	RESINOUS	357
ARKERATED	RARE	325	BLACK	* DIRTY	649
ARID	DRY	342	BLACK	SOFT-HUED	425
ARMORED	HARD	326	BLADDER-LIKE	EXPANDED	197
ARMORED	INVULNERABLE	660	BLANK	CLEAN	648
ARROWY	SHARP	256	BLANK	COLORLESS	426
ASHEN	* COLORLESS	426	BLANK	INSUBSTANTIA	4
ASHEN	* GRAY	429	BLANK	OPAQUE	423
ASHEN-HUED	COLORLESS	426	BLEACHED	COLORLESS	426
ASHY	* COLORLESS	426	BLEACHED	DRY	342
ASHY	* GRAY	429	BLEARY	DIM	419
ASKEW	DISTORTED	246	BLEMISHED	DEFORMED	246
ASPHALTIC	RESINOUS	357	BLEMISHED	INCOMPLETE	55
ASSORTED	UNIFORM	16	BLEMISHED	MOTTLED	437
AWRY	ORDERLESS	61	BLENDED	MIXED	43
BAGGY	RECEPIENT	194	BLINDING	LUMINOUS	417
BAGGY	SPACIOUS	183	BLISTERED	ROUGH	259
BAKED	DRY	342	BLISTERY	CONVEX	253
BAKED	HEATED	381	BLOATED	CONVEX	253
BALD	HAIRLESS	229	BLOATED	DEFORMED	246

BLOATED	EXPANDED	197	BULBOUS	EXPANDED	197
BLUFF	UNSHARPENED	257	BUMPY	* DISCONTINUOU	72
BLUNT	UNSHARPENED	257	BUMPY	* NON-UNIFORM	17
BLUNT-NOSED	UNSHARPENED	257	BUMPY	* ROUGH	259
BLUNTED	UNSHARPENED	257	BUOYANT	LIGHT	323
BLURRED	* AMORPHOUS	244	BURNED	DRY	342
BLURRED	* DIM	419	BURNED	HEATED	381
BLURRY	SHADOWY	419	BURNISHED	UNDIMMED	417
BLUSHING	LUMINOUS	417	BUSHY	ARBOREAL	366
BOB-TAILED	INCOMPLETE	55	BUSHY	DENSE	324
BOGGY	MARSHY	347	BUSHY	VEGETAL	366
BOMB-PROOF	INVULNERABLE	660	BUTTERY	FATTY	357
BOMB-PROOF	UNYIELDING	162	CAKED	DIRTY	649
BONY	HARD	326	CALLOUS	HARD	326
BORED	PERFORATED	263	CALLOUSED	HARD	326
BOWED	ARCUATE	253	CAMBERED	ARCUATE	253
BRAMBLY	SHARP	256	CAMERATED	CELLULAR	194
BRANCHING	SPACIOUS	183	CANALLED	FURROWED	262
BRANCHING	UNASSEMBLED	75	CANESCENT	GRAY	429
BRANDED	HEATED	381	CARIOUS	UNCLEAN	649
BRANNY	POWDERY	332	CARTILAGINOUS	HARD	326
BREAKABLE	BRITTLE	330	CAST-IRON	HARD	326
BRIERY	* SHARP	256	CAVERNOUS	CONCAVE	255
BRIGHT	* CLEAN	648	CELLULAR	* CELLULAR	194
BRIGHT	COLOR	425	CELLULAR	* CONCAVE	255
BRIGHT	* FLORID	425	CEMENTED	FIRM-SET	45
BRIGHT	* LUMINESCENT	420	CHALKY	TERRITORIAL	344
BRIGHT	* LUMINOUS	417	CHAMELEON	IRIDESCENT	437
BRIGHT	* UNDIMMED	417	CHANGEABLE	TRANSIENT	114
BRILLIANT	COLOR	425	CHANGEFUL	TRANSIENT	114
BRILLIANT	FLORID	425	CHANNELED	FURROWED	262
BRILLIANT	LUMINOUS	417	CHARRED	HEATED	381
BRINDED	MOTTLED	437	CHECKERED	PIED	437
BRINDLED	* MOTTLED	437	CHILLY	COLD	380
BRISTLING	SHARP	256	CHUNKY	FLESHY	195
BRISTLY	* HAIRY	259	CLAMMY	COHESIVE	48
BRISTLY	* SHARP	256	CLAMMY	* VISCID	354
BRITTLE	* BRITTLE	330	CLARIFIED	UNMIXED	44
BRITTLE	FLIMSY	163	CLAYEY	TERRITORIAL	344
BRITTLE	INSUBSTANTIA	4	CLEAN	PLAIN	573
BRITTLE	POWDERY	332	CLEAN	* UNMIXED	44
BROKEN	DISCONTINUOU	72	CLEANED	CLEAN	648
BROKEN	* ROUGH	259	CLEAR	* ORDERLY	60
BROKEN	WEAKENED	163	CLEAR	* PERSPICUOUS	567
BROWN	* DRY	342	CLEAR	* TRANSPARENT	422
BROWNE	UNCOOKED	670	CLEAR	* UNDIMMED	417
BUBBLING	BUBBLY	355	CLEAR	* UNMIXED	44
BUBBLY	AIRY	340	CLEAR	* WELL-SEEN	443
BUCKLED	* CONVOLUTED	251	CLEFT	SPACED	201
BUCKLED	DISTORTED	246	CLINGING	* COHESIVE	48

CLINGING		RETENTIVE	778	COLORLESS	*	COLORLESS	426
CLINGING	*	TOUGH	329	COLORLESS	*	DIM	419
CLOSE		COHESIVE	48	COLORLESS	*	DULL	840
CLOSE		DENSE	324	COLORLESS		INSUBSTANTIA	4
CLOSE		FIRM-SET	45	COLORLESS	*	WEAK	163
CLOSE-FITTING		ADJUSTED	24	COLUMNAR		ROTUND	252
CLOSE-PACKED		DENSE	324	COMBLIKE		SHARP	256
CLOSE-SET		FIRM-SET	45	COMPACT		COHESIVE	48
CLOSE-TEXTURE		DENSE	324	COMPACT		DENSE	324
CLOSE-WOVEN		TEXTURAL	331	COMPARTMENTAL		CELLULAR	194
CLOSE-WOVEN		TOUGH	329	COMPLICATED		COMPLEX	61
CLOSED		CONTRACTED	198	COMPOSITE		MIXED	43
CLOTTED	*	DENSE	324	COMPRESSED		CONTRACTED	198
CLOTTED	*	DIRTY	649	COMPRESSIBLE		CONTRACTED	198
CLOTTED	*	SEMILIQUID	354	COMPRESSIBLE		RARE	325
CLOUDED		OPAQUE	423	COMPRESSIBLE		SOFT	327
CLOUDLESS		UNDIMMED	417	COMPRESSIVE		CONTRACTED	198
CLOUDY	*	CLOUDY	355	CONCRETE		COHESIVE	48
CLOUDY	*	DIM	419	CONCRETE		DENSE	324
CLOUDY	*	HUMID	341	CONCRETE		HARD	326
CLOUDY	*	IMPERSPICUOUS	568	CONCRETE		MATERIAL	319
CLOUDY	*	MOTTLED	437	CONDENSED		CONTRACTED	198
CLOUDY	*	OPAQUE	423	CONDENSED		DENSE	324
CLOUDY	*	SEMITRANSPARANT	424	CONFORMABLE		REGULAR	81
CLOUDY	*	UNLIT	418	CONFORMING		CONFORMABLE	83
CLOVEN		SPACED	201	CONSISTENT		UNIFORM	16
COAGULATE		COHESIVE	48	CONSPICUOUS		WELL-SEEN	443
COARSE	*	ROUGH	259	CONTORTED		CONVOLUTED	251
COARSE	*	TEXTURAL	331	CONTRACTIBLE		CONTRACTED	198
COARSE	*	UNCLEAN	649	CONTRACTILE		CONTRACTED	198
COARSE-GRAIN		ROUGH	259	CONVEX		CELLULAR	194
COARSE-GRAIN		TEXTURAL	331	CONVEX		EXPANDED	197
COATED		OPAQUE	423	CONVOLUTED		FIBROUS	208
COBBLEBY		DIRTY	649	COOL		COLD	380
COGGED		TOOTHED	256	COOL		GRAY	429
COHESIVE	*	COHESIVE	48	COPY		ARBOREAL	366
COHESIVE	*	FIRM-SET	45	CORIACEOUS		TOUGH	329
COHESIVE		RETENTIVE	778	CORNEOUS		HARD	326
COHESIVE		TOUGH	329	CORRUGATED	*	ROUGH	259
COHESIVE		VISCID	354	CORRUGATED	*	UNDULATORY	251
COILED		COMPLEX	61	COTTONY		FIBROUS	208
COLLIED		DIRTY	649	CRACKED	*	BLEMISHED	845
COLLOIDAL		SEMILIQUID	354	CRACKED	*	DILAPIDATED	655
COLORED	*	COLORED	425	CRACKED	*	IMPERFECT	647
COLORED		LUMINOUS	417	CRACKED	*	SPACED	201
COLORFUL	*	COLORED	425	CRAGGY		DIFFICULT	700
COLORFUL	*	FLORID	425	CRAGGY	*	ROUGH	259
COLORFUL	*	LUMINESCENT	420	CRAGGY	*	SHARP	256
COLORFUL	*	LUMINOUS	417	CREAMY	*	FATTY	357
COLORFUL	*	VARIEGATED	437	CREAMY	*	SEMILIQUID	354

CREAMY				DECOLORED	COLORLESS	426
CREASED		* SOFT-HUED	425	DECOMPOSED	NON-ADHESIVE	49
CREASY		FOLDED	261	DEEP	FLORID	425
CRENATE		FOLDED	261	DEEP-COLORED	COLORED	425
CRIMPED		NOTCHED	260	DEEP-COLORED	FLORID	425
CRINKLED		UNDULATORY	251	DEFECTIVE	DEFORMED	246
CRINKLY		ANGULAR	247	DEFICIENT	INCOMPLETE	55
CRISP		UNDULATORY	251	DEFICIENT	INSUFFICIENT	636
CRISS-CROSS		BRITTLE	330	DEFICIENT	UNEQUIPPED	670
CROSS-GRAINE		CROSSED	222	DEFINITE	* PERSPICUOUS	567
CROSSED		ROUGH	259	DEFINITE	* WELL-SEEN	443
CRUMLED		TEXTURAL	331	DEFLATED	CONTRACTED	198
CRUMBLING		POWDERY	332	DEFLATED	WEAKENED	163
CRUMBLING		POWDERY	332	DEHYDRATED	DRY	342
CRUMBLY		WEAKENED	163	DELICATE	BRITTLE	330
CRUMBLY		BRITTLE	330	DELICATE	FLIMSY	163
CRUMPLED		POWDERY	332	DELICATE	SOFT-HUED	425
CRUMPLED		CONVOLUTED	251	DELICATE	TEXTURAL	331
CRUMPLED		FOLDED	261	DENSE	* DENSE	324
CRUSHED		FOLDED	261	DENSE	* FIRM-SET	45
CRYSTAL		TRANSPARENT	422	DENSE	* UNYIELDING	162
CRYSTALLINE	*	DENSE	324	DENTATE	* NOTCHED	260
CRYSTALLINE	*	HARD	326	DEPRESSED	CONCAVE	255
CRYSTALLINE	*	SYMMETRICAL	245	DESICCATED	DRY	342
CRYSTALLINE	*	TRANSPARENT	422	DETECTABLE	VISIBLE	443
CRYSTALLIZED		DENSE	324	DETERIORATED	BLEMISHED	845
CURDLED		SEMILIQUID	354	DETERIORATED	CONTRACTED	198
CURLY	*	HAIRY	259	DETERIORATED	INCOMPLETE	55
CURLY	*	UNDULATORY	251	DEWY	* CLEAN	648
CUSHIONY		SOFT	327	DEWY	* HUMID	341
CUSPED		SHARP	256	DIAPHANOUS	UNDIMMED	417
DAINTY		LITTLE	196	DILAPIDATED	BRITTLE	330
DAINTY		SMALL	33	DIM	COLORLESS	426
DAMAGED		BLEMISHED	845	DIM	OPAQUE	423
DAMP		HUMID	341	DIMMED	UNLIT	418
DAMP-PROOF		DRY	342	DINGY	* COLORLESS	426
DAMP-PROOF		UNYIELDING	162	DINGY	* DARK	418
DANGLING		NON-ADHESIVE	49	DINGY	* DIM	419
DANGLING		PENDENT	217	DINGY	* DIRTY	649
DANK		HUMID	341	DINGY	* SOFT-HUED	425
DAPPLED		MIXED	43	DIRT-FREE	CLEAN	648
DAPPLED		PIED	437	DIRTY	BLEMISHED	845
DARK	*	DARK	418	DIRTY	BUBBLY	355
DARK	*	IMPERSPICUOUS	568	DIRTY	DIM	419
DARK	*	INVISIBLE	444	DIRTY	* DIRTY	649
DARK		SOFT-HUED	425	DIRTY	MARSHY	347
DARKISH		DIM	419	DIRTY	* OPAQUE	423
DAZZLING		LUMINOUS	417	DIRTY	POWDERY	332
DECAYED		ANTIQUATED	127	DIRTY	COLORLESS	426
DECAYING		WEAKENED	163	DISCOLORED	CLEAN	648
DECKED		LAYERED	207	DISINFECTED		

DISSOLUBLE	LIQUIFIED	337	DUN	* DIM	419
DISTENDED	EXPANDED	197	DUNGY	UNCLEAN	649
DISTINCT	WELL-SEEN	443	DUSKY	DIM	419
DISTORTED	UNEQUAL	29	DUST-COVERED	POWDERY	332
DISTORTED	UNSIGHTLY	842	DUSTY	* DIRTY	649
DISTORTED	WEAKENED	163	DUSTY	* DRY	342
DOG-EARED	DILAPIDATED	655	DUSTY	* MOTTLED	437
DOG-EARED	FULFED	261	DUSTY	* POWDERY	332
DOG-EARED	USED	673	DUSTY	* SOFT-HUED	425
DOUGHY	LIGHT	323	DYED	COLORLED	425
DOUGHY	SOFT	327	EDDYING	FLOWING	350
DOWNY	* DOWNY	259	EDGED	SHARP	256
DOWNY	* FIBROUS	208	EDGELESS	UNSHARPENED	257
DOWNY	HAIRY	259	EEL-LIKE	SNAKY	251
DOWNY	* SMOOTH	258	EFFERVESCENT	BUBBLY	355
DOWNY	* SOFT	327	EFFERVESCENT	WATERY	339
DRAB	* DILAPIDATED	655	EFFULGENT	LUMINOUS	417
DRAB	* DULL	840	EGGSHELL	BRITTLE	330
DRAB	* SOFT-HUED	425	ELASTIC	RARE	325
DRAB	* UNIFORM	16	ELASTIC	SOFT	327
DRAINED	DRY	342	ELEMENTAL	SIMPLE	44
DRAWN	CONTRACTED	198	ELONGATED	LONG	203
DREGGY	DIRTY	649	EMBOSSSED	SAPIENT	254
DREGGY	MARSHY	347	EMBRYONIC	EXIGIOUS	196
DRENCHED	FULL	54	EMPTY	INSUBSTANTIA	4
DRIEPLING	HUMID	341	EMULSIVE	* SEMILIQUID	354
DRIEPLING	SMALL	33	ENAMELED	ORNAMENTED	844
DRILLED	PERFORATED	263	ENAMELED	SMOOTH	258
DRILLED	UNIFORM	16	ENTANGLED	* COMPLEX	61
DRIPPING	FLOWING	350	EQUILATERAL	EQUAL	28
DRIPPING	HUMID	341	EQUILATERAL	UNIFORM	16
DRIZZLING	HUMID	341	ESTENSILE	FLEXIBLE	327
DRIZZLY	HUMID	341	ETHEREAL	GASEOUS	336
DROOPING	PENDENT	217	EVAPORABLE	VAPORIFIC	338
DROOPING	WEAK	163	EVAPORATED	DRY	342
DROPPING	FLOWING	350	EVEN	FLAT	216
DROUGHTY	DRY	342	EVEN	* SMOOTH	258
DROWNED	DRENCHED	341	EVEN	* STRAIGHT	249
DRUMLY	OPAQUE	423	EVERGREEN	UNYIELDING	162
DRY	* DRY	342	EVERGREEN	VEGETAL	366
DRY	* HOT	379	EXPANDED	CONVEX	253
DRY	* NON-ADHESIVE	49	EXPANDING	EXPANDED	197
DRY	* UNPRODUCTIVE	172	EXTENDED	LONG	203
DRY	WEAK	163	EXTENSIVE	LONG	203
DUCTILE	FLEXIBLE	327	EYE-CATCHING	WELL-SEEN	443
DULL	* COLORLESS	426	FADED	* COLORLESS	426
DULL	* DIM	419	FADED	DIM	419
DULL	* GRAY	429	FADED	DRY	342
DULL	* SOFT-HUED	425	FADED	* SOFT-HUED	425
DULL	UNSHARPENED	257	FADING	COLORLESS	426

FADING	TRANSIENT	114	FLABBY	WEAK	163
FAINT	DIM	419	FLACCID	SOFT	327
FAINT	* INCONSIDERAB	33	FLACCID	WEAK	163
FAIR	* UNDIMMED	417	FLAGELLIFORM	FIBROUS	208
FANGED	TOOTHED	256	FLAKY	BRITTLE	330
FAST	FIRM-SET	45	FLAKY	LAYERED	207
FAST	TIED	45	FLAMING	LUMINOUS	417
FAT	FATTY	357	FLAPPING	NON-ADHESIVE	49
FAT	FLESHY	195	FLARING	FLORID	425
FEATHERY	* DOWNY	259	FLARING	LUMINOUS	417
FEATHERY	HAIRY	259	FLASHING	LUMINOUS	417
FEATHERY	* LIGHT	323	FLASHY	FLORID	425
FEATURELESS	INSUBSTANTIA	4	FLAT	SMOOTH	258
FECAL	UNCLEAN	649	FLAT	SOFT-HUED	425
FENNY	HUMID	341	FLAT	UNIFORM	16
FENNY	MARSHY	347	FLAT	UNSHARPENED	257
FERRO-CONCRE	HARD	326	FLATTENED	UNSHARPENED	257
FESTERING	UNCLEAN	649	FLAUNTING	FLORID	425
FETID	UNCLEAN	649	FLAWED	BLEMISHED	845
FIBROUS	TOUGH	329	FLAWLESS	PERFECT	646
FIERY	LUMINOUS	417	FLEECY	FIBROUS	208
FILAMENTOUS	FIBROUS	208	FLEECY	HAIRY	259
FILMY	* DIM	419	FLEECY	SMOOTH	258
FILMY	* LAYERED	207	FLEECY	SOFT	327
FILMY	* OPAQUE	423	FLESHY	CONVEX	253
FILMY	* TEXTURAL	331	FLESHY	EXPANDED	197
FILTHY	DIRTY	649	FLESHY	* FATTY	357
FINE	* DRY	342	FLESHY	* FLESHY	195
FINE	* RARE	325	FLESHY	* PULPY	356
FINE	* TEXTURAL	331	FLEXIBLE	CONFORMABLE	83
FINE	* TRANSPARENT	422	FLEXIBLE	* FLEXIBLE	327
FINE-GRAINED	TEXTURAL	331	FLIMSY	* BRITTLE	330
FINE-SPUN	FIBROUS	208	FLIMSY	* RARE	325
FINE-SPUN	TEXTURAL	331	FLINTY	HARD	326
FINE-WOVEN	TEXTURAL	331	FLOCCULENT	* POWDERY	332
FIRE-PROOF	INVULNERABLE	660	FLOCCULENT	* SOFT	327
FIRE-PROOF	UNYIELDING	162	FLOOD-LIT	LUMINOUS	417
FIRM	* DENSE	324	FLOPPING	NON-ADHESIVE	49
FIRM	* FIRM-SET	45	FLOPPY	NON-ADHESIVE	49
FIRM	* FIXED	153	FLOPPY	SOFT	327
FIRM	* HARD	326	FLOPPY	WEAK	163
FIRM	RETENTIVE	778	FLORAL	VEGETAL	366
FIRM	RIGID	326	FLORID	* FLORID	425
FIRM-PACKED	DENSE	324	FLORID	VARIEGATED	437
FIRM-PACKED	RIGID	326	FLORID	* POWDERY	332
FIRM-SET	RIGID	326	FLOURY	VEGETAL	366
FIXED	FIRM-SET	45	FLOWERY	FLUIDAL	335
FIZZY	BUBBLY	355	FLOWING	UNSTABLE	152
FLABBY	* PULPY	356	FLUENT	FLUIDAL	335
FLABBY	* SOFT	327	FLUFFY	HAIRY	259

FLUID	* AMORPHOUS	244	FROZEN	DENSE	324
FLUID	* FLOWING	350	FULL-COLORED	FLORID	425
FLUID	NON-ADHESIVE	49	FURCATE	* ANGULAR	247
FLUID	* UNSTABLE	152	FURCATE	* CROSSED	222
FLUIDAL	SOFT	327	FURKY	* HAIRY	259
FLUORESCENT	* LUMINESCENT	420	FUSED	HEATED	381
FLUSH	FLAT	216	FUSED	MIXED	43
FLUSH	SMOOTH	258	FUSTY	DIRTY	649
FLUSH	UNIFORM	16	FUZZY	AMORPHOUS	244
FLUTED	FURROWED	262	FUZZY	SHADOWY	419
FOAMY	* BUBBLY	355	GASEOUS	* GASEOUS	336
FOAMY	* LIGHT	323	GASEOUS	INSUBSTANTIA	4
FOGGY	DIM	419	GASEOUS	* LIGHT	323
FOGGY	OPAQUE	423	GASEOUS	RARE	325
FOLDED	CONVOLUTED	251	GASSY	GASEOUS	336
FOLDED	FURROWED	262	GASSY	VAPORIFIC	338
FOLIATE	LAYERED	207	GATHERED	TIED	45
FOLIATED	LAYERED	207	GAUDY	FLORID	425
FORESTAL	ARBOREAL	366	GAUZY	INSUBSTANTIA	4
FORESTED	ARBUREAL	366	GELATINOUS	SEMILIQUID	354
FORKED	ANGULAR	247	GIMCRACK	BRITTLE	330
FORKED	CROSSED	222	GIMCRACK	FLIMSY	163
FORMLESS	* AMORPHOUS	244	GIVING	SOFT	327
FOSSILIZED	HARD	326	GIVING	WEAK	163
FOUL	UNCLEAN	649	GLARING	WELL-SEEN	443
FRAGILE	BRITTLE	330	GLASSY	* BRITTLE	330
FRAGILE	FLIMSY	163	GLASSY	* COLORLESS	426
FRAGILE	INSUBSTANTIA	4	GLASSY	* DIM	419
FRAIL	BRITTLE	330	GLASSY	* HARD	326
FRAIL	EPHERMERAL	114	GLASSY	* SMOOTH	258
FRAIL	FLIMSY	163	GLASSY	* TRANSPARENT	422
FRAIL	UNSAFE	661	GLASSY	* UNDIMMED	417
FRANGIBLE	BRITTLE	330	GLAZED	SMOOTH	258
FRANGIBLE	FLIMSY	163	GLEAMING	UNDIMMED	417
FRAYED	DILAPIDATED	655	GLINTING	LUMINOUS	417
FRECKLED	BLEMISHED	845	GLITTERING	* ORNAMENTED	844
FRECKLED	MOTTLED	437	GLITTERY	LUMINOUS	417
FRESH	CLEAN	648	GLOBULAR	ROTUND	252
FRESH	COLD	380	GLOSSLESS	COLORLESS	426
FRIABLE	BRITTLE	330	GLOSSY	* LUMINOUS	417
FRIABLE	POWDERY	332	GLOWING	COLORED	425
FRIZZY	* HAIRY	259	GLOWING	FLORID	425
FRIZZY	* UNDULATORY	251	GLOWING	LUMINOUS	417
FROST-BOUND	COLD	380	GLUED	* FIRM-SET	45
FROSTED	GRAY	429	GLUEY	COHESIVE	48
FROSTED	OPAQUE	423	GLUEY	RETENTIVE	778
FROSTY	COLD	380	GLUEY	VISCID	354
FROTHY	* BUBBLY	355	GNARLED	AMORPHOUS	244
FROTHY	* LIGHT	323	GNARLED	* DENSE	324
FROZEN	COHESIVE	48	GNARLED	* DISTORTED	246

GNARLED	* ROUGH	259	HAZY	* CLOUDY	355
GORY	FLUIDAL	335	HAZY	* DIM	419
GOSSAMER	INSUBSTANTIA	4	HAZY	* ILL-SEEN	444
GOSSAMERY	TEXTURAL	331	HAZY	* OPAQUE	423
GRAINED	TEXTURAL	331	HEAVY	DENSE	324
GRANITIC	HARD	326	HOARY	GRAY	429
GRANULAR	* POWDERY	332	HODDEN	TEXTURAL	331
GRANULAR	* TEXTURAL	331	HOLEY	DILAPIDATED	655
GRANULATED	POWDERY	332	HOLEY	PERFORATED	263
GRASSY	* SOFT	327	HOLLOW	INSUBSTANTIA	4
GRASSY	* VEGETAL	366	HOLLOW	RARE	325
GRATED	POWDERY	332	HOMESPUN	SIMPLE	44
GRAVELLY	HARD	326	HOMESPUN	TEXTURAL	331
GRAVELLY	POWDERY	332	HOMOGENEOUS	SIMPLE	44
GRAY	* COLORLESS	426	HONEYCOMBED	CONCAVE	255
GRAY	* DIM	419	HONEYCOMBED	PERFORATED	263
GRAY	* UNIFORM	16	HORIZONTAL	FLAT	216
GREASED	SMOOTH	258	HORNED	TOOTHED	256
GREASED	UNCTUOUS	357	HORNY	HARD	326
GREASY	* DIRTY	649	HUELESS	COLORLESS	426
GREASY	* SMOOTH	258	HULKY	UNWIELDY	195
GREASY	* UNCTUOUS	357	HYALINE	TRANSPARENT	422
GREEN	* VEGETAL	366	HYDROUS	WATERY	339
GRIMY	DIM	419	ICE-CAPPED	COLD	380
GRIMY	DIRTY	649	ICY	COLD	380
GRISTLY	HARD	326	IMMACULATE	CLEAN	648
GRISTLY	TOUGH	329	IMMISCIBLE	NON-ADHESIVE	49
GRITTY	HARD	326	IMMOBILE	STILL	266
GRITTY	POWDERY	332	IMMOVABLE	FIRM-SET	45
GRITTY	TEXTURAL	331	IMMOVABLE	STILL	266
GRIZZLED	* GRAY	429	IMPENETRABLE	CLOSED	264
GRIZZLED	* PIE'D	437	IMPERMEABLE	CLOSED	264
GRIZZLY	* GRAY	429	IMPERMEABLE	DENSE	324
GROUND	* POWDERY	332	IMPERMEABLE	SCREENED	421
GROVY	ARBOREAL	366	IMPERMEABLE	UNYIELDING	162
GUMMOUS	RESINOUS	357	IMPERVIOUS	* CLOSED	264
GUMMY	* COHESIVE	48	IMPERVIOUS	* DENSE	324
GUMMY	RETENTIVE	778	IMPERVIOUS	* OPAQUE	423
GUMMY	* TOUGH	329	IMPERVIOUS	* SCREENED	421
GUMMY	* VISCID	354	IMPOROUS	CLOSED	264
HAIRY	* FIBROUS	208	IMPOROUS	DENSE	324
HAIRY	* HAIRY	259	IMPRESSIBLE	SOFT	327
HAIRY	SHARP	256	INCANDESCENT*	LUMINESCENT	420
HAND-WOVEN	CROSSED	222	INCANDESCENT	LUMINOUS	417
HANGING	PENDENT	217	INCOMPRESSIB	DENSE	324
HARD	* HARD	326	INCOMPRESSIB	RIGID	326
HARD	* IMPERSPICUOUS	568	INDENTED	CONVOLUTED	251
HARD-GRAINED	ARBOREAL	366	INDENTED	UNDULATORY	251
HARD-GRAINED	VEGETAL	366	INDISSOLUBLE	RETENTIVE	778
HARDENED	HARD	326	INDISTINCT	* DIM	419

INDISTINCT	* ILL-SEEN	444	KNOTTED	TIED	45
INDISTINCT	SHADOWY	419	KNUTTY	* DENSE	324
INELASTIC	DENSE	324	LACK-LUSTER	* COLORLESS	426
INELASTIC	* RIGID	326	LACK-LUSTER	* DIM	419
INELASTIC	* TOUGH	329	LACQUERED	SMOOTH	258
INELASTIC	UNYIELDING	162	LACTEAL	SEMILIQUID	354
INEXTENSIBLE	RIGID	326	LACTESCENT	SEMILIQUID	354
INEXTRICABLE	FIRM-SET	45	LAMBENT	LUMINOUS	417
INEXTRICABLE	TIED	45	LAMELLAR	LAYERED	207
INFLEXIBLE	RIGID	326	LAMINATED	LAYERED	207
INFLEXIBLE	STRAIGHT	249	LANATE	SMOOTH	258
INFRANGIBLE	UNYIELDING	162	LANCE-SHAPED	TAPERING	256
INSOLUBLE	* INDISSOLUBLE	324	LARDY	FATTY	357
INSUBSTANTIA	BRITTLE	330	LASHED	TIED	45
INSUBSTANTIA	RARE	325	LASHLIKE	FIBROUS	208
INSUBSTANTIA	WEAK	163	LATHERY	BUBBLY	355
INTERCONNECT	CORRELATIVE	12	LATTICED	CROSSED	222
INTERLACED	CROSSED	222	LATTICED	SPACED	201
INTERLOCKING	CORRELATIVE	12	LAX	NON-ADHESIVE	49
INTERVOLVED	TIED	45	LEADEN	* COLORLESS	426
INTERWOVEN	CROSSED	222	LEADEN	* DIM	419
INTRACTABLE	RIGID	326	LEADEN	* GRAY	429
INTRICATE	COMPLEX	61	LEADEN	* WEIGHTY	322
INVARIABLE	UNIFORM	16	LEAKY	POROUS	263
IRIDESCENT	* IRIDESCENT	437	LEATHERY	* TOUGH	329
IRIDESCENT	MIXED	43	LEVEL	FLAT	216
IRON	HARD	326	LEVEL	SMOOTH	258
JAGGED	* ANGULAR	247	LEVEL	UNIFORM	16
JAGGED	* NOTCHED	260	LIGHT	HUBBLY	355
JAGGED	* ROUGH	259	LIGHT	* LIGHT	325
JAGGY	NOTCHED	260	LIGHT	LUMINOUS	417
JAGGY	SHARP	256	LIGHT	* RARE	325
JAMMED	FIRM-SET	45	LIGHT	SHALLOW	212
JAMMY	VISCID	354	LIGHT	* SOFT	327
JASPERED	MOTTLED	437	LIGHT	* SOFT-HUED	425
JELLIED	SEMILIQUID	354	LIGHT	WEAK	163
JUICELESS	DRY	342	LIGHT-COLORED	COLORLESS	426
JUICY	HUMID	341	LIGHT-WEIGHT	LIGHT	323
JUICY	SEMILIQUID	354	LIGHTWEIGHT	INSUBSTANTIA	4
JUICY	SOFT	327	LIGHTWEIGHT	WEAK	163
JUMBLED	MIXED	43	LIMP	* SOFT	327
JUNGLY	ARBOREAL	366	LIMP	WEAK	163
KALEIDOSCOPE	MIXED	43	LIMPID	PERSPICUOUS	567
KEEN	SHARP	256	LIMPID	* TRANSPARENT	422
KINKY	UNDULATORY	251	LINED	FURROWED	262
KNORRY	ROUGH	259	LINED	MOTTLED	437
KNOTTED	COMPLEX	61	LINSEY-WOOLS*	MIXED	43
KNOTTED	* CROSSED	222	LINSEY-WOOLS*	TEXTURAL	331
KNOTTED	* DENSE	324	LIQUEFIABLE	LIQUIFIED	337
KNOTTED	* ROUGH	259	LIQUEFIED	FLUIDAL	335

MOSSY	MARSHY	347	OILED	* SMOOTH	258
MOSSY	* SOFT	327	OILED	* UNCTUOUS	357
MOSSY	VEGETAL	366	OILY	* DIRTY	649
MOTH-EATEN	DILAPIDATED	655	OILY	* SMOOTH	258
MOTH-EATEN	DIRTY	649	OILY	* UNCTUOUS	357
MOTLEY	MIXED	43	OOZY	* FLOWING	350
MOTLEY	MULTIFORM	82	OOZY	* HUMID	341
MOTLEY	VARIEGATED	437	OOZY	* MARSHY	347
MOUSY	* COLORLESS	426	OPACIOUS	OPAQUE	423
MOUSY	* GRAY	429	OPALESCENT	* IRIDESCENT	437
MUCILAGINOUS	* VISCID	354	OPALESCENT	* SEMITRANSPAR	424
MUCKY	DIRTY	649	OPALINE	* IRIDESCENT	437
MUCKY	MARSHY	347	OPALINE	* SEMITRANSPAR	424
MUCOUS	* VISCID	354	OPAQUE	IMPERSPICUOUS	568
MUDDY	* DIM	419	OPAQUE	UNLIT	418
MUDDY	* DIRTY	649	PADDED	SOFT	327
MUDDY	* HUMID	341	PALE	* COLORLESS	426
MUDDY	* MARSHY	347	PALE	DIM	419
MUDDY	* OPAQUE	423	PALE	INSUBSTANTIA	4
MUDDY	* SEMILIQUID	354	PALE	* SOFT-HUED	425
MULTICOLORED	VARIEGATED	437	PALE	* WEAK	163
MULTIFOLD	MULTIFORM	82	PALLID	COLORLESS	426
MULTIFORM	MIXED	43	PALPABLE	VISIBL	443
MULTIFORM	VARIEGATED	437	PANED	VARIEGATED	437
MUMMIFIED	DRY	342	PANELED	VARIEGATED	437
MURKY	* DARK	418	PAPER	INSUBSTANTIA	4
MURKY	* DENSE	324	PARCHED	DRY	342
MURKY	* OPAQUE	423	PARTICOLORED	VARIEGATED	437
MUSHY	MARSHY	347	PASTEL	SOFT-HUED	425
MUSHY	SEMILIQUID	354	PASTY	* COLORLESS	426
MUSHY	SOFT	327	PASTY	* PULPY	356
MUSTY	* DIRTY	649	PATCHED	DIRTY	649
MYRRHY	RESINOUS	357	PATCHED	MIXED	43
NAPLESS	* HAIRLESS	229	PATCHED	VARIEGATED	437
NAPPY	* DOWNY	259	PATCHY	* MIXED	43
NAPPY	HAIRY	259	PATCHY	PIED	437
NEEDLELIKE	SHARP	256	PATINATED	SOFT-HUED	425
NEON	LUMINESCENT	420	PATTERNED	UNIFORM	16
NETTED	CROSSED	222	PATTERNLESS	NON-UNIFORM	17
NEUTRAL	GRAY	429	PEACHY	* DOWNY	259
NODULAR	ROUGH	259	PEACHY	HAIRY	259
NON-DURABLE	EPHERMERAL	114	PEARLY	* GRAY	429
NOTCHED	ANGULAR	247	PEARLY	* IRIDESCENT	437
NOTCHED	CONVOLUTED	251	PEARLY	* SEMITRANSPAR	424
NOTCHED	SHARP	256	PEARLY	* SOFT-HUED	425
NOTCHED	* TOOTHED	256	PEBBLY	HARD	326
NOTCHY	NOTCHED	260	PECTINATED	SHARP	256
NUBBLY	ROUGH	259	PELLUCID	UNDIMMED	417
OBDUKATE	RIGID	326	PENDENT	NON-ADHESIVE	49
OBSCURED	UNLIT	418	PENDULOUS	NON-ADHESIVE	49

PENDULOUS	PENDENT	217	PRICKLY	SHARP	256
PENSILE	PENDENT	217	PUCKERY	FOLDED	261
PEPPERED	PERFORATED	263	PUDDLED	OPAQUE	423
PERCEPTIBLE	VISIBLE	443	PUFFY	* EXPANDED	197
PERCOLATING	POROUS	263	PUFFY	* FLESHY	195
PERISTALTIC	SNAKY	251	PUFFY	* UNSTABLE	152
PETRIFIED	HARD	326	PULPY	* PULPY	356
PETRIFIED	STILL	266	PULPY	* SEMILIQUID	354
PHLEGMATIC	VISCID	354	PULPY	* SOFT	327
PHOSPHORESCENCE	LUMINESCENT	420	PURE	CLEAN	648
PIEBALD	* PIED	437	PURE	UNMIXED	44
PIED	* PIED	437	PUSSY	FLUIDAL	335
PILLOWY	SOFT	327	QUAGGY	MARSHY	347
PIMPLED	* CONVEX	253	RADIANT	* LUMINESCENT	420
PIMPLY	CONVEX	253	RADIANT	* LUMINOUS	417
PINCHED	CONTRACTED	198	RADIANT	* RADIATING	417
PINTO	PIED	437	RAGGED	CONVOLUTED	251
PITCHY	* DARK	418	RAGGED	UNDULATORY	251
PITCHY	* RESINOUS	357	RAINBOW	VARIEGATED	437
PITHY	SOFT	327	RANK	VEGETAL	366
PITTED	* BLEMISHED	845	RAVELED	CROSSED	222
PITTED	* ROUGH	259	RAW	AMORPHOUS	244
PITUITOUS	VISCID	354	REFLECTING	LUMINOUS	417
PLAID	VARIEGATED	437	REFLECTING	* RADIATING	417
PLAIN	* WELL-SEEN	443	REFRACTIVE	LUMINOUS	417
PLAITED	CROSSED	222	REFULGENT	LUMINOUS	417
PLANE	FLAT	216	REGULAR	UNIFORM	16
PLASMATIC	FLUIDAL	335	RELAXED	NON-ADHESIVE	49
PLASTIC	* FLEXIBLE	327	RELAXED	WEAK	163
PLASTIC	* UNSTABLE	152	RESINY	RESINOUS	357
PLIABLE	* FLEXIBLE	327	RIBBED	* TEXTURAL	331
PLIANT	CONFORMABLE	83	RICKETY	WEAK	163
PLIANT	FLEXIBLE	327	RIDDLED	PERFORATED	263
PLUMP	* FLESHY	195	RIFLED	FURROWED	262
PLUMPISH	FLESHY	195	RIGID	DENSE	324
PLUSHY	SOFT	327	RIGID	STRAIGHT	249
PLUVIAL	HUMID	341	RIGID	TOUGH	329
POACHY	MARSHY	347	RIPPLED	FURROWED	262
POCK-MARKED	BLEMISHED	845	RIPPLING	FLOWING	350
POCKMARKED	MOTTLED	437	RIPPLING	ROUGH	259
POLISHED	CLEAN	648	ROAN	* PIED	437
POLISHED	ORNAMENTED	844	ROCKY	HARD	326
POLISHED	SMOOTH	258	ROCKY	UNSTABLE	152
POLISHED	UNDIMMED	417	ROPY	* DENSE	324
POROUS	CONCAVE	255	ROPY	* FIBROUS	208
POT-HOLED	ROUGH	259	ROPY	* SEMILIQUID	354
POUCHY	EXPANDED	197	ROPY	* THICK	205
POWDERY	* BRITTLE	330	ROTTED	UNCLEAN	649
POWDERY	* DRY	342	ROTTEN	DILAPIDATED	655
POWDERY	* POWDERY	332	RUTTEN	WEAKENED	163

ROUGH	* AMORPHOUS	244	SERRATED	ANGULAR	247
ROUGH	* NON-UNIFORM	17	SERRATED	NOTCHED	260
ROUGH	* ROUGH	259	SERRATED	TOOTHED	256
ROUGH	TEXTURAL	331	SET	FIRM-SET	45
ROUGH-HEWN	* ROUGH	259	SEVERABLE	BRITTLE	330
ROUND	FLESHY	195	SEWN	TIED	45
RUBBERY	TOUGH	329	SHABBY	DILAPIDATED	655
RUDDY	* FLORID	425	SHADED	SHADOWY	419
RUGGED	* AMORPHOUS	244	SHADOWLESS	UNDIMMED	417
RUNNING	FLUIDAL	335	SHADOWY	AMORPHOUS	244
RUNNING	UNSTABLE	152	SHADOWY	INSUBSTANTIA	4
RUNNY	FLUIDAL	335	SHADOWY	SCREENED	421
RUNNY	LIQUIFIED	337	SHADY	SCREENED	421
RUNNY	NON-ADHESIVE	49	SHADY	SHADOWY	419
RUSTED	DIM	419	SHAGGED	HAIRY	259
RUSTING	WEAKENED	163	SHAGGY	HAIRY	259
RUSTY	DILAPIDATED	655	SHAKY	FLIMSY	163
RUSTY	* DIM	419	SHALY	LAYERED	207
RUSTY	* UNSHARPENED	257	SHARP	NOTCHED	260
RUTTY	FURROWED	262	SHATTERY	* BRITTLE	330
SANDY	* DRY	342	SHATTERY	* FLIMSY	163
SANDY	* POWDERY	332	SHEENY	LUMINOUS	417
SAPLESS	DRY	342	SHEER	* TRANSPARENT	422
SAPPY	FLUIDAL	335	SHINING	CLEAN	648
SAPPY	SEMILIQUID	354	SHINING	LUMINESCENT	420
SATINY	SMOOTH	258	SHINING	LUMINOUS	417
SATINY	TEXTURAL	331	SHINING	WELL-SEEN	443
SATURATED	DRENCHED	341	SHINY	* CLEAN	648
SCABBY	ROUGH	259	SHINY	* LUMINOUS	417
SCABBY	UNCLEAN	649	SHINY	* SMOOTH	258
SCALLOPED	UNDULATORY	251	SHIVERY	BRITTLE	330
SCALY	* LAYERED	207	SHODDY	FLIMSY	163
SCARRED	BLEMISHED	845	SHRIVELED	DRY	342
SCINTILLATING	LUMINOUS	417	SHRUBBY	ARBOREAL	366
SCLEROTIC	HARD	326	SHRUNK	* CONTRACTED	198
SCREENED	UNLIT	418	SHUFFLED	ORDERLESS	61
SCRUBBY	* ARBOREAL	366	SIFTED	POWDERY	332
SCUMMY	HUBBLY	355	SILKEN	SMOOTH	258
SEAMED	LAYERED	207	SILKY	FIBROUS	208
SEBACEOUS	FATTY	357	SILKY	* SMOOTH	258
SECURE	FIRM-SET	45	SILKY	* SOFT	327
SECURE	TIED	45	SILKY	* TEXTURAL	331
SEPARATED	NON-ADHESIVE	49	SILTY	MARSHY	347
SEPARATED	SEMILIQUID	354	SILTY	SEMILIQUID	354
SEPARATED	TOUGH	329	SILVERY	GRAY	429
SEPARATED	NON-ADHESIVE	49	SIMILAR	UNIFORM	16
SERE	DRY	342	SINUOUS	* CONVOLUTED	251
SERE	LEAN	206	SLABBY	* MARSHY	347
SERPENTINE	LABYRINTHINE	251	SLABBY	* SEMILIQUID	354
SERPENTINE	SNAKY	251	SLACK	* NON-ADHESIVE	49

SLACK	* ORDERLESS	61	SOFT	* SOFT	327
SLACK	* WEAK	263	SOFT	SOFT-HUED	425
SLATY	* LAYERED	207	SOFT	* UNSTABLE	152
SLEAZY	FLIMSY	163	SOFT	* WEAK	263
SLEEK	* SMOOTH	258	SOFT-GRAINED	ARBOREAL	366
SLICK	SMOOTH	258	SOFT-GRAINED	VEGETAL	366
SLIGHT	WEAK	163	SUGGY	MARSHY	347
SLIMY	* DIRTY	649	SOGGY	* PULPY	356
SLIMY	HUMID	341	SOGGY	SOFT	327
SLIMY	MARSHY	347	SOILED	BLEMISHED	845
SLIMY	SEMILIQUID	354	SOILED	DIRTY	649
SLIPPERY	* NON-ADHESIVE	49	SOLID	COHESIVE	48
SLIPPERY	* SMOOTH	258	SOLID	DENSE	324
SLIPPERY	* UNCTUOUS	357	SOLID	FIRM-SET	45
SLITHERY	SMOOTH	258	SOLID	THICK	205
SLOPPING	DRENCHED	341	SOLIDIFIED	DENSE	324
SLUMMY	UNCLEAN	649	SOLIDIFIED	FIRM-SET	45
SLUSHY	HUMID	341	SOLUBLE	FLUIDAL	335
SLUSHY	MARSHY	347	SOLUBLE	LIQUIFIED	337
SLUSHY	SEMILIQUID	354	SOLVENT	LIQUIFIED	337
SMALL	CONTRACTED	198	SOOTY	* DIM	419
SMALL	WEAK	163	SOOTY	* DIRTY	649
SMOKY	* DIM	419	SOOTY	* OPAQUE	423
SMOKY	* DIRTY	649	SOOTY	POWDERY	332
SMOKY	GRAY	429	SOUPY	SEMILIQUID	354
SMOKY	* OPAQUE	423	SPARKLING	* BUBBLY	355
SMOKY	* POWDERY	332	SPARKLING	LUMINOUS	417
SMOKY	* VAPORIFIC	338	SPECKLED	MOTTLED	437
SMOOTH	FLAT	216	SPIDERY	LEAN	206
SMOOTH	HAIRLESS	229	SPIKED	SHARP	256
SMOOTH	* NON-ADHESIVE	49	SPIKY	* SHARP	256
SMOOTH	* ORDERLY	60	SPINDLY	LEAN	206
SMOOTH	* REGULAR	81	SPINOUS	SHARP	256
SMOOTH	* SMOOTH	258	SPINY	* SHARP	256
SMOOTH	* SOFT	327	SPIRAL	COILED	251
SMOOTH	TEXTURAL	331	SPIRALING	COILED	251
SMOOTH	* UNIFORM	16	SPLINTERY	* BRITTLE	330
SMOOTH-TEXTU	SMOOTH	258	SPLIT	SPACED	201
SNAGGY	* SHARP	256	SPOILED	BLEMISHED	845
SNAKY	* SNAKY	251	SPONGY	* MARSHY	347
SNARLED	* COMPLEX	61	SPONGY	POROUS	263
SNUB	UNSHARPENED	257	SPONGY	* PULPY	356
SOAKED	DRENCHED	341	SPONGY	RARE	325
SOAPY	BUBBLY	355	SPONGY	* SOFT	327
SOAPY	* FATTY	357	SPOTLESS	CLEAN	648
SOAPY	* SMOOTH	258	SPOTTED	BLEMISHED	845
SODDEN	DRENCHED	341	SPOTTED	MOTTLED	437
SOFT	* FLUIDAL	335	SPOTTY	* BLEMISHED	845
SOFT	LUMINOUS	417	SPOTTY	* MOTTLED	437
SOFT	* SMOOTH	258	SPRINGLESS	RIGID	326

SPRINGLESS		TOUGH	329	STREAKY		MOTTLED	437
SPRINGY	*	SOFT	327	STREAMING	*	NON-ADHESIVE	49
SPRINKLED		HUMID	341	STRETCHABLE		FLEXIBLE	327
SPUMY		BUBBLY	355	STRETCHED		EXPANDED	197
SPURRED		SHARP	256	STRIATED		FURROWED	262
SQUELCHY		HUMID	341	STRIATED		MOTTLED	437
SQUALID		UNCLEAN	649	STRIKING		WELL-SEEN	443
SQUAMOUS	*	LAYERED	207	STRINGY	*	FIBROUS	208
SQUASHY	*	FLUIDAL	335	STRINGY	*	TOUGH	329
SQUASHY	*	HUMID	341	STRIPED		MOTTLED	437
SQUASHY	*	MARSHY	347	STRIPPED		WEAKENED	163
SQUASHY	*	SEMILIQUID	354	STRONG		THICK	205
SQUASHY	*	SOFT	327	STRONG-FIBER		TOUGH	329
SQUELCHY		MARSHY	347	STUBBY	*	THICK	205
SQUELCHY		SEMILIQUID	354	STUBBY	*	UNSHARPENED	257
SQUELCHY		SOFT	327	STUDED		ROUGH	259
STAGNATING		QUIESCENT	266	STUDED		SHARP	256
STAINED		BLEMISHED	845	SUBTILE		RARE	325
STAINED		DIRTY	649	SUBTILE		TEXTURAL	331
STAINLESS	*	CLEAN	648	SUNDRIED		DRY	342
STANDARDIZED		REGULAR	81	SUPPLE		FLEXIBLE	327
STANDARDIZED		UNIFORM	16	SUSPENDED		PENDENT	217
STARCHED		CLEAN	648	SWAMPY		MARSHY	347
STARCHED		RIGID	326	SWOLLEN		EXPANDED	197
STARCHY	*	HARD	326	SYLVAN		ARBOREAL	366
STARCHY		RIGID	326	SYMMETRICAL		UNIFORM	16
STARCHY	*	SEMILIQUID	354	SYRUPY		VISCID	354
STEAMING		HUBBLY	355	TABBY		MOTTLED	437
STEAMY		BUBBLY	355	TABULAR		LAYERED	207
STEAMY		GASEOUS	336	TACKY		VISCID	354
STEAMY		VAPORIFIC	338	TANGLED	*	DENSE	324
STEELY		GRAY	429	TANGLED		MIXED	43
STEELY	*	HARD	326	TANGLED	*	TIED	45
STEELY	*	STRONG	162	TARNISHED		DIRTY	649
STICKY	*	COHESIVE	48	TAKKY		RESINOUS	357
STICKY		RETENTIVE	778	TATTY		DILAPIDATED	655
STICKY		TOUGH	329	TAUT	*	RIGID	326
STICKY	*	VISCID	354	TAUT	*	TIED	45
STIFF	*	RIGID	326	TEARABLE		BRITTLE	330
STIRRED		MIXED	43	TEARABLE		FLIMSY	163
STITCHED		TIED	45	TEMPERED		HARD	326
STODGY		SEMILIQUID	354	TENDER		SOFT	327
STONY	*	HARD	326	TENDER	*	SOFT-HUED	425
STONY	*	ROUGH	259	TENSE		RIGID	326
STORIED		LAYERED	207	TENSE		TIED	45
STRANGLER		CONTRACTED	198	TENUOUS		FLIMSY	163
STRANGULATED		CONTRACTED	198	TENUOUS		INSUBSTANTIA	4
STRATIFIED		LAYERED	207	TENUOUS		RARE	325
STRATIFORM	*	LAYERED	207	TEXTILE		CROSSED	222
STREAKED		MOTTLED	437	TEXTILE		TEXTURAL	331

TEXTURAL	* TEXTURAL	331	TRANSPARENT	* UNDIMMED	417
THAWING	SEMILIQUID	354	TRANSPICUOUS	TRANSPARENT	422
THICK	BUBBLY	355	TREACLY	VISCID	354
THICK	* DENSE	324	TRICOLOR	* VARIEGATED	437
THICK	* DIM	419	TUFTY	HAIRY	259
THICK	DIRTY	649	TUMBLEDOWN	BRITTLE	330
THICK	FIBROUS	208	TUMESCENT	EXPANDED	197
THICK	* OPAQUE	423	TUMID	EXPANDED	197
THICK	* SEMILIQUID	354	TURBID	OPAQUE	423
THICK-GROWING	DENSE	324	TURFEN	VEGETAL	366
THICK-RIBBED	THICK	205	TURFY	VEGETAL	366
THICKSET	* DENSE	324	TURFY	SOFT	327
THICKSET	* THICK	205	TURGESCENT	EXPANDED	197
THIN	HAIRLESS	229	TURGID	* EXPANDED	197
THIN	INSUBSTANTIA	4	TURNING	LABYRINTHINE	251
THIN	RARE	325	TUSKED	TOOTHED	256
THIN	* TRANSPARENT	422	TUSKY	TOOTHED	256
THIN	WEAK	163	TWEEEDY	CROSSED	222
THISTLY	SHARP	256	TWILIGHT	DIM	419
THORNY	* SHARP	256	TWILLED	TEXTURAL	331
THREADBARE	* DIRTY	649	TWINING	CONVOLUTED	251
THREADBARE	* HAIRLESS	229	TWISTED	CONVOLUTED	251
TIED	COMPLEX	61	TWISTING	LABYRINTHINE	251
TIGHT	* COHESIVE	48	UMBRAGEOUS	SCREENED	421
TIGHT	CONTRACTED	198	UNATTACHED	UNSTABLE	152
TIGHT	* DRY	342	UNBENT	STRAIGHT	249
TIGHT	EXPANDED	197	UNDILUTED	UNMIXED	44
TIGHT	* FIRM-SET	45	UNHEWN	AMORPHOUS	244
TIGHT	* RIGID	326	UNIFIED	SIMPLE	44
TIGHT	TIED	45	UNIFORM	COHESIVE	48
TIGHT-STRUNG	RIGID	326	UNIFORM	SIMPLE	44
TIMBERED	ARBOREAL	366	UNIQUE	NON-UNIFORM	17
TINGED	COLORED	425	UNRAVELED	SIMPLE	44
TINTED	COLORED	425	UNSTABLE	WEAK	163
TOOTHED	NOTCHED	250	VACUOUS	INSUBSTANTIA	4
TOOTHLESS	UNSHARPENED	257	VAGUE	SHADOWY	419
TOOTHY	TOOTHED	256	VAPORABLE	VAPORIFIC	338
TOTTERY	WEAK	163	VAPORISH	VAPORIFIC	338
TOUGH	COHESIVE	48	VAPORIZABLE	VAPORIFIC	338
TOUGH	* HARD	326	VAPOROUS	* GASEOUS	336
TOUGH	* STRONG	162	VAPOROUS	* INSUBSTANTIA	4
TOUGH	* TOUGH	329	VAPOROUS	* OPAQUE	423
TOUGHENED	STRONG	162	VAPOROUS	* VAPORIFIC	338
TOUGHENED	TOUGH	329	VAPORY	VAPORIFIC	338
TRACTILE	FLEXIBLE	327	VARIFORM	MULTIFORM	82
TRANSLUCENT	* TRANSPARENT	422	VARNISHED	RESINOUS	357
TRANSLUCENT	* UNDIMMED	417	VARNISHED	SMOOTH	258
TRANSPARENT	* INSUBSTANTIA	4	VEINED	MOTTLED	437
TRANSPARENT	PERSPICUOUS	567	VELVETY	* DOWNY	259
TRANSPARENT	* TRANSPARENT	422	VELVETY	HAIRY	259

VELVETY	* SMOOTH	258	WELL-LIT	LUMINOUS	417
VELVETY	* SOFT	327	WELL-MARKED	WELL-SEEN	443
VERDANT	VEGETAL	366	WELL-THUMBED	USED	673
VERSCOLOR	IRIDESCENT	437	WELL-TIED	TIED	45
VISCID	COHESIVE	48	WELL-WORN	DILAPIDATED	655
VISCID	* THICK	205	WELL-WORN	USED	673
VISCID	TOUGH	329	WET	HUMID	341
VISCOUS	* COHESIVE	48	WET	WATERY	339
VITREOUS	HARD	326	WETTED	HUMID	341
VITREOUS	TRANSPARENT	422	WHETTED	SHARP	256
VIVID	COLORED	425	WHIFFLING	UNSTABLE	152
VIVID	FLOPID	425	WHIPPED	LIGHT	323
VIVID	LUMINOUS	417	WHIPPY	FLEXIBLE	327
VOLATILE	TRANSIENT	114	WHISKERY	FIBROUS	208
VOLATILE	VAPORIFIC	338	WHORLED	COILED	251
VULCANIZED	TOUGH	329	WIDESPREAD	EXPANDED	197
WAN	DIM	419	WILD	ARBOREAL	366
WANING	DIM	419	WIND-DRIED	DRY	342
WARTY	CONVEX	253	WINDING	COMPLEX	61
WATER LOGGED	MARSHY	347	WINDING	* CONVOLUTED	251
WATERED	MIXED	43	WINDY	* AIRY	340
WATERLESS	DRY	342	WINDY	* GASEOUS	336
WATERLOGGED	DRENCHED	341	WIRE-DRAWN	FIBROUS	208
WATERY	FLUIDAL	335	WIRY	* FIBROUS	208
WATERY	* HUMID	341	WISPY	FLIMSY	163
WATERY	MAKSHY	347	WISPY	RARE	325
WATERY	* NON-ADHESIVE	49	WITHERED	DRY	342
WATERY	* WATERY	339	WITHERED	WEAKENED	163
WATERY	* WEAK	163	WOBBLING	UNSTABLE	152
WAVY	UNDULATORY	251	WOBBLY	WEAK	163
WAXED	SMOOTH	258	WOOD	ARBOREAL	366
WAXEN	* FATTY	357	WOODED	ARBOREAL	366
WAXY	* FATTY	357	WOODEN	ARBOREAL	366
WAXY	* SOFT	327	WOODLAND	ARBOREAL	366
WEAK	BRITTLE	330	WOODY	ARBOREAL	366
WEATHER-HEAT*	DILAPIDATED	655	WOODY	VEGETAL	366
WEATHER-HEAT*	WEAKENED	163	WOOLLY	* HAIRY	259
WEATHERED	SOFT-HUED	425	WOOLLY	* SMOOTH	258
WEBBED	CROSSED	222	WOOLLY	UNDULATORY	251
WEBBY	CROSSED	222	WOOLY	FIBROUS	208
WEDGED	FIRM-SET	45	WORN	* DILAPIDATED	655
WEEDY	VEGETAL	366	WORN	* USED	673
WEIGHTED	WEIGHTY	322	WORN	* WEAKENED	163
WEIGHTLESS	LIGHT	323	WOVEN	* CROSSED	222
WEIGHTY	DENSE	324	WOVEN	* TEXTURAL	331
WEIGHTY	MATERIAL	317	WRIGGLING	SNAKY	251
WELL-BRUSHED	SMOOTH	258	WRINKLED	FURROWED	262
WELL-DEFINED	WELL-SEEN	443	WRINKLED	ROUGH	259
WELL-KNIT	COHESIVE	48	WRINKLED	UNDULATORY	251
WELL-LIT	LUMINESCENT	420	WRINKLY	FOLDED	261

YEASTY	* BUBBLY	355
YEASTY	* LIGHT	323
YIELDING	SOFT	327
YIELDING	UNSTABLE	152
YIELDING	WEAK	163
ZIGZAG	* ANGULAR	247
ZONED	LAYERED	247

4. THESAURUS WITH SUBHEADINGS ARRANGED ALPHABETICALLY

CLOSE-FITTING	ADJUSTED	24	FRECKLED	BLEMISHED	845
BUBBLY	AIRY	340	MARKED	BLEMISHED	845
WINDY	* AIRY	340	PITTED	* BLEMISHED	845
BLURRED	* AMORPHOUS	244	POCK-MARKED	BLEMISHED	845
FLUID	* AMORPHOUS	244	SCARRED	BLEMISHED	845
FORMLESS	* AMORPHOUS	244	SOILED	BLEMISHED	845
FUZZY	AMORPHOUS	244	SPOILED	BLEMISHED	845
CHARLED	AMORPHOUS	244	SPOILED	BLEMISHED	845
LIGUID	* AMORPHOUS	244	SPOTTED	* BLEMISHED	845
RAW	AMORPHOUS	244	STAINED	BLEMISHED	845
ROUGH	* AMORPHOUS	244	BREAKABLE	BRITTLE	330
RUGGED	* AMORPHOUS	244	BRITTLE	* BRITTLE	330
SHADOWY	AMORPHOUS	244	CRISP	BRITTLE	330
UNHEWN	AMORPHOUS	244	CRUMBLY	BRITTLE	330
CRINKLED	ANGULAR	247	DELICATE	BRITTLE	330
FORKED	ANGULAR	247	DILAPIDATED	BRITTLE	330
FURCATE	* ANGULAR	247	EGGSHELL	BRITTLE	330
JAGGED	* ANGULAR	247	FLAKY	BRITTLE	330
NOTCHED	ANGULAR	247	FLIMSY	* BRITTLE	330
SERRATED	ANGULAR	247	FRAGILE	BRITTLE	330
ZIGZAG	* ANGULAR	247	FRAIL	BRITTLE	330
DECAYED	ANTIQUATED	127	FRANGIBLE	BRITTLE	330
MILDEWED	* ANTIQUATED	127	FRIABLE	BRITTLE	330
BEECHY	ARBOREAL	366	GIMCRACK	BRITTLE	330
BUSHY	ARBOREAL	366	GLASSY	* BRITTLE	330
COPSY	ARBOREAL	366	INSUBSTANTIA	BRITTLE	330
FORESTAL	ARBOREAL	366	POWDERY	* BRITTLE	330
FORESTED	ARBOREAL	366	TEARABLE	BRITTLE	330
GROVEY	ARBOREAL	366	WATERY	* BRITTLE	330
HARD-GRAINED	ARBOREAL	366	SHIVERY	BRITTLE	330
JUNGLY	ARBOREAL	366	SPLINTERY	* BRITTLE	330
SCRUBBY	* ARBOREAL	366	TEARABLE	BRITTLE	330
SHRUBBY	ARBOREAL	366	TUMBLEDOWN	BRITTLE	330
SOFT-GRAINED	ARBOREAL	366	WEAK	BRITTLE	330
SYLVAN	ARBOREAL	366	AERATED	BUBBLY	355
TIMBERED	ARBOREAL	366	BUBBLING	BUBBLY	355
WILD	ARBOREAL	366	DIRTY	BUBBLY	355
WOOD	ARBOREAL	366	EFFERVESCENT	BUBBLY	355
WOODED	ARBOREAL	366	FIZZY	BUBBLY	355
WOODEN	ARBOREAL	366	FOAMY	* BUBBLY	355
WOODLAND	ARBOREAL	366	FROTHY	* BUBBLY	355
WOODY	ARBOREAL	366	LATHERY	BUBBLY	355
ARCHED	ARCUATE	253	LIGHT	BUBBLY	355
BOWED	ARCUATE	253	SCUMMY	BUBBLY	355
CAMBERED	ARCUATE	253	SOAPY	BUBBLY	355
CRACKED	* BLEMISHED	845	SPARKLING	* BUBBLY	355
DAMAGED	BLEMISHED	845	SPUMY	BUBBLY	355
DETERIORATED	BLEMISHED	845	STEAMING	BUBBLY	355
DIRTY	BLEMISHED	845	STEAMY	BUBBLY	355
FLAWED	BLEMISHED	845	THICK	BUBBLY	355

YEASTY	* BUBBLY	355	SPIRALING	COILED	251
BELLIED	CELLULAR	194	WHORLED	COILED	251
CAMERATED	CELLULAR	194	CHILLY	COLD	380
CELLULAR	* CELLULAR	194	COOL	COLD	380
COMPARTMENTA	CELLULAR	194	FRESH	COLD	380
CONVEX	CELLULAR	194	FROST-BOUND	COLD	380
BLANK	CLEAN	648	FROSTY	COLD	380
BRIGHT	* CLEAN	648	ICE-CAPPED	COLD	380
CLEANED	CLEAN	648	ICY	COLD	380
DEWY	* CLEAN	648	BRIGHT	COLORLED	425
DIRT-FREE	CLEAN	648	BRILLIANT	COLORLED	425
DISINFECTED	CLEAN	648	COLORLED	* COLORLED	425
FRESH	CLEAN	648	COLORFUL	* COLORLED	425
IMMACULATE	CLEAN	648	DEEP-COLORED	COLORLED	425
POLISHED	CLEAN	648	DYED	COLORLED	425
PURE	CLEAN	648	GLOWING	COLORLED	425
SHINING	CLEAN	648	TINGED	COLORLED	425
SHINY	* CLEAN	648	TINTED	COLORLED	425
SPOTLESS	CLEAN	648	VIVID	COLORLED	425
STAINLESS	* CLEAN	648	ALBINO	COLORLESS	426
STARCHED	CLEAN	648	ASHEN	* COLORLESS	426
IMPENETRABLE	CLOSED	264	ASHEN-HUED	COLORLESS	426
IMPERMEABLE	CLOSED	264	ASHY	* COLORLESS	426
IMPERVIOUS	* CLOSED	264	BLANK	COLORLESS	426
IMPOROUS	CLOSED	264	BLEACHED	COLORLESS	426
CLOUDY	* CLOUDY	355	COLORLESS	* COLORLESS	426
HAZY	* CLOUDY	355	DECOLORLED	COLORLESS	426
MISTY	* CLOUDY	355	DIM	COLORLESS	426
ADHESIVE	* COHESIVE	48	DINGY	* COLORLESS	426
CLAMMY	COHESIVE	48	DISCOLORLED	COLORLESS	426
CLINGING	* COHESIVE	48	DULL	* COLORLESS	426
CLOSE	COHESIVE	48	FADED	* COLORLESS	426
COAGULATE	COHESIVE	48	FADING	COLORLESS	426
COHESIVE	* COHESIVE	48	GLASSY	* COLORLESS	426
COMPACT	COHESIVE	48	GLASSLESS	COLORLESS	426
CONCRETE	COHESIVE	48	GRAY	* COLORLESS	426
FROZEN	COHESIVE	48	HUELESS	COLORLESS	426
GLUEY	COHESIVE	48	LACK-LUSTER	* COLORLESS	426
GUMMY	* COHESIVE	48	LEADEN	* COLORLESS	426
MOLDING	COHESIVE	48	LIGHT-COLORED	COLORLESS	426
MONOLITHIC	COHESIVE	48	LUSTERLESS	COLORLESS	426
SCALD	COHESIVE	48	MOUSY	* COLORLESS	426
STICKY	* COHESIVE	48	PALE	* COLORLESS	426
TIGHT	* COHESIVE	48	PALLID	COLORLESS	426
TOUGH	COHESIVE	48	PASTY	* COLORLESS	426
UNIFORM	COHESIVE	48	COILED	COMPLEX	61
VISCID	COHESIVE	48	COMPLICATED	COMPLEX	61
VISCOUS	* COHESIVE	48	ENTANGLED	* COMPLEX	61
WELL-KNIT	COHESIVE	48	INTRICATE	COMPLEX	61
SPIRAL	COILED	251	KNOTTED	COMPLEX	61

MAZY	COMPLEX	61	TWINING	CONVCLUTED	251
SNARLED	* COMPLEX	61	TWISTED	CONVOLUTED	251
TIED	COMPLEX	61	WINDING	* CONVOLUTED	251
WINDING	COMPLEX	61	INTERCONNECT	CORRELATIVE	12
ARCHED	CONCAVE	255	INTERLOCK	CORRELATIVE	12
CAVERNOUS	CONCAVE	255	BALLED-UP	CROSSED	222
CELLULAR	* CONCAVE	255	BARRED	CROSSED	222
DEPRESSED	CONCAVE	255	CRISS-CROSS	CROSSED	222
HONEYCOMBED	CONCAVE	255	FORKED	CROSSED	222
PCROUS	CONCAVE	255	FURCATE	* CROSSED	222
ADJUSTABLE	CCNFORMABLE	83	FANC-UCVEN	CROSSED	222
CCNFORMING	CCNFORMABLE	83	INTERLACED	CROSSED	222
FLEXIBLE	CONFORMABLE	83	INTERWOVEN	CROSSED	222
MALLEABLE	* CCNFORMABLE	83	KNOTTED	* CROSSED	222
PLIANT	CCNFORMABLE	83	LATTICED	CROSSED	222
CLCSED	CONTRACTED	198	LCCMED	CROSSED	222
COMPRESSED	CONTRACTED	198	MATTED	CROSSED	222
CCMPRESSIBLE	CONTRACTED	198	MESHED	CROSSED	222
CCMPRESSIVE	CONTRACTED	198	NETTED	CROSSED	222
CONDENSED	CONTRACTED	198	PLAIYED	CROSSED	222
CONTRACTIBLE	CONTRACTED	198	RAVELED	CROSSED	222
CONTRACTILE	CONTRACTED	198	TEXTILE	CROSSED	222
DEFLATED	CONTRACTED	198	TWEEDY	CROSSED	222
DETERIORATED	CONTRACTED	198	WEBBED	CROSSED	222
DRAWN	CONTRACTED	198	WEBBY	CROSSED	222
PINCHED	CONTRACTED	198	WCVEN	* CROSSED	222
SHRUNK	* CONTRACTED	198	DARK	* DARK	418
SMALL	CONTRACTED	198	CINCY	* DARK	418
STRANGLER	CONTRACTED	198	MURKY	* DARK	418
STRANGULATED	CONTRACTED	198	PITCHY	* DARK	418
TIGHT	CONTRACTED	198	BLEMISHED	DEFORMED	246
BALLOONING	CONVEX	253	BLGATED	DEFORMED	246
BELLYING	CONVEX	253	DEFECTIVE	DEFORMED	246
BILLOWY	CONVEX	253	BUSHY	DENSE	324
BILLWING	CCNVEX	253	CLCSE	DENSE	324
BLISTERY	CONVEX	253	CLCSE-PACKED	DENSE	324
EXPANDED	CCNVEX	253	CLCSE-TEXTUR	DENSE	324
FLESHY	CCNVEX	253	CLCTEC	* DENSE	324
PIMPLED	* CONVEX	253	COMPACT	DENSE	324
PIMPLY	CCNVEX	253	CONCRETE	DENSE	324
WARTY	CONVEX	253	CONCENSED	DENSE	324
BLGATED	CONVEX	253	CRYSTALLINE	* DENSE	324
BUCKLED	* CONVOLUTED	251	CRYSTALLIZED	DENSE	324
CCNTORTED	CONVOLUTED	251	DENSE	* DENSE	324
CRUMPLED	CCNVCLUTED	251	FIRM	* DENSE	324
FCLDEC	CONVOLUTED	251	FIRM-PACKED	DENSE	324
INDENTED	CCNVOLUTED	251	FRCZEN	DENSE	324
NOTCHED	CONVOLUTED	251	GNARLED	* DENSE	324
RAGGED	CONVOLUTED	251	HEAVY	DENSE	324
SINUOUS	* CONVOLUTED	251	IMPERPEABLE	DENSE	324

IMPERVIOUS	* DENSE	324	FILMY	* DIM	419
IMPORCUS	DENSE	324	FCGGY	DIM	419
INCOMPRESSIB	DENSE	324	GLASSY	* DIM	419
INELASTIC	DENSE	324	GRAY	* DIM	419
KNOTTED	* DENSE	324	GRIMY	DIM	419
KNCTTY	* DENSE	324	HAZY	* DIM	419
LUMPY	* DENSE	324	INCISTINCT	* DIM	419
LUXURIANT	DENSE	324	LACK-LUSTER	* DIM	419
MASSEC	DENSE	324	LEACEN	* DIM	419
MASSIVE	* DENSE	324	MILDEWED	DIM	419
MASSY	* DENSE	324	MISTY	* DIM	419
MATTED	DENSE	324	MUCCY	* DIM	419
MURKY	* DENSE	324	PALE	DIM	419
RIGID	DENSE	324	RUSTED	DIM	419
RCPY	* DENSE	324	RUSTY	* DIM	419
SOLID	DENSE	324	SMCKY	* DIM	419
SOLIDIFIED	DENSE	324	SOCTY	* DIM	419
TANGLED	* DENSE	324	THICK	* DIM	419
THICK	* DENSE	324	TWILIGHT	DIM	419
THICK-GROWIN	DENSE	324	WAN	DIM	419
THICKSET	* DENSE	324	WANING	DIM	419
WEIGHTY	DENSE	324	BECRAGGLED	DIRTY	649
CRAGGY	DIFFICULT	700	BEGRIMED	DIRTY	649
CRACKED	* DILAPICATED	655	BLACK	* DIRTY	649
CCG-EARED	DILAPICATED	655	CAKED	DIRTY	649
DRAB	* DILAPICATED	655	CLOTED	* DIRTY	649
FRAYED	DILAPICATED	655	COBWEBBY	DIRTY	649
HOLEY	DILAPICATED	655	COLLIED	DIRTY	649
MILDEWED	DILAPICATED	655	DINGY	* DIRTY	649
MCSS-GROWN	* DILAPICATED	655	DIRTY	* DIRTY	649
MOTH-EATEN	DILAPICATED	655	DREGGY	DIRTY	649
ROTTEN	DILAPICATED	655	DUSTY	* DIRTY	649
RUSTY	DILAPICATED	655	FILTHY	DIRTY	649
SHABBY	DILAPICATED	655	FUSTY	DIRTY	649
TATTY	DILAPICATED	655	GREASY	* DIRTY	649
WEATHER-BEAT*	DILAPICATED	655	GRIMY	DIRTY	649
WELL-WORN	DILAPICATED	655	MARSHY	* DIRTY	649
WORN	* DILAPICATED	655	MATTED	DIRTY	649
BLEARY	DIM	419	MOTH-EATEN	DIRTY	649
BLURRED	* DIM	419	MUCKY	DIRTY	649
CLOUDY	* DIM	419	MUCCY	* DIRTY	649
COLORLESS	* DIM	419	MUSTY	* DIRTY	649
CARKISH	DIM	419	OILY	* DIRTY	649
DINGY	* DIM	419	PATCHED	DIRTY	649
DIRTY	DIM	419	SLIMY	* DIRTY	649
DULL	* DIM	419	SMOKY	* DIRTY	649
DUN	* DIM	419	SCILED	DIRTY	649
DUSKY	DIM	419	SOOTY	* DIRTY	649
FADED	DIM	419	STAINED	DIRTY	649
FAINT	DIM	419	TARNISHED	DIRTY	649

THICK		DIRTY	649	CRAB	* DULL	840
THREACBARE	* DIRTY	649		FRAIL	EPHERMERAL	114
BRCKEN		DISCONTINUOU	72	NCN-DURABLE	EPHERMERAL	114
BUMPY	* DISCONTINUOU	72		EQUILATERAL	EQUAL	28
AMORPHOUS		DISTORTED	246	EMBRYCNIC	EXIGUOUS	196
ASKEW		DISTORTED	246	BLACDER-LIKE	EXPANDED	197
BUCKLED		DISTORTED	246	BLCATED	EXPANDED	197
GNARLED	* DISTORTED	246		BULBOUS	EXPANDED	197
DOWNY	* DCWNY	259		CCNVEX	EXPANDED	197
FEATHERY	* DCWNY	259		DISTENDED	EXPANDED	197
NAPPY	* COWNY	257		EXPANDING	EXPANDED	197
PEACHY	* DOWNY	259		FLESHY	EXPANDED	197
VELVETY	* COWNY	259		PCUCHY	EXPANDED	197
DROWNED		DRENCHED	341	PUFFY	* EXPANDED	197
SATURATED		DRENCHED	341	STRETCHED	EXPANDED	197
SLOPPING		DRENCHED	341	SWOLLEN	EXPANDED	197
SOAKED		DRENCHED	341	TIGHT	EXPANDED	197
SODDEN		DRENCHED	341	TUMESCENT	EXPANDED	197
WATERLOGGED		DRENCHED	341	TUMID	EXPANDED	197
AMHYDRCUS		DRY	342	TURGESCENT	EXPANDED	197
ARID		DRY	342	TURGIC	* EXPANDED	197
BAKED		DRY	342	WICESPREAD	EXPANDED	197
BARE	* DRY	342		BUTTERY	FATTY	357
BLEACHED	DRY	342		CREAMY	* FATTY	357
BRCWN	* CRY	342		FAT	FATTY	357
BURNED	DRY	342		FLESHY	* FATTY	357
CAMP-PROCF	CRY	342		LARCY	FATTY	357
DEHYDRATED	DRY	342		MILKY	* FATTY	357
DESICCATED	DRY	342		SEBACECUS	FATTY	357
DRAINED	CRY	342		SCAPY	* FATTY	357
DROUGHTY	DRY	342		WAXEN	* FATTY	357
DRY	* DRY	342		WAXY	* FATTY	357
DUSTY	* DRY	342		CCNVOLUTEC	FIBROUS	208
EVAPORATED	CRY	342		COTTONY	FIBROUS	208
FADED	DRY	342		DCWNY	* FIBROUS	208
FINE	* CRY	342		FILAMENTCLS	FIBROUS	208
JUICELESS	DRY	342		FINE-SPUN	FIBROUS	208
MUMMIFIED	DRY	342		FLAGELLIFCRM	FIBROUS	208
PARCHED	DRY	342		FLEECY	FIBROUS	208
PCWDERY	* CRY	342		HAIRY	* FIBROUS	208
SANDY	* CRY	342		LASHLIKE	FIBROUS	208
SAPLESS	DRY	342		RCPY	* FIBROUS	208
SERE	DRY	342		SILKY	FIBROUS	208
SHRIVELED	DRY	342		STRINGY	* FIBROUS	208
SUNDRIED	DRY	342		THICK	FIBROUS	208
TIGHT	* CRY	342		WHISKERY	FIBROUS	208
WATERLESS	DRY	342		WIRE-CRAWN	FIBROUS	208
WIND-CRIED	DRY	342		WIRY	* FIBROUS	208
WITHERED	CRY	342		WCCLY	FIBROUS	208
COLORLESS	* CULL	840		CEMENTED	FIRM-SET	45

CLOSE	FIRM-SET	45	DELICATE	FLIMSY	163
CLOSE-SET	FIRM-SET	45	FRAGILE	FLIMSY	163
COHESIVE	* FIRM-SET	45	FRAIL	FLIMSY	163
CENSE	* FIRM-SET	45	FRANGIBLE	FLIMSY	163
FAST	FIRM-SET	45	GIMCRACK	FLIMSY	163
FIRM	* FIRM-SET	45	SHAKY	FLIMSY	163
FIXED	FIRM-SET	45	SPATTERY	* FLIMSY	163
GLUED	* FIRM-SET	45	SHODDY	FLIMSY	163
IMMOVABLE	FIRM-SET	45	SLEAZY	FLIMSY	163
INEXTRICABLE	FIRM-SET	45	TEARABLE	FLIMSY	163
JAMMED	FIRM-SET	45	TENUOUS	FLIMSY	163
SECURE	FIRM-SET	45	WISPY	FLIMSY	163
SET	FIRM-SET	45	BRIGHT	* FLORID	425
SOLID	FIRM-SET	45	BRILLIANT	FLORID	425
SCIFICIFIED	FIRM-SET	45	COLORFUL	* FLORID	425
TIGHT	* FIRM-SET	45	DEEP	FLORID	425
WEDGED	FIRM-SET	45	DEEP-COLORED	FLORID	425
FIRM	* FIXED	153	FLARING	FLORID	425
EVEN	FLAT	216	FLASHY	FLORID	425
FLUSH	FLAT	216	FLAUNTING	FLORID	425
HORIZONTAL	FLAT	216	FLORIC	* FLORID	425
LEVEL	FLAT	216	FULL-COLORED	FLORID	425
PLANE	FLAT	216	GAUCY	FLORID	425
SMOOTH	FLAT	216	GLOWING	FLORID	425
BEEFY	* FLESHY	195	RUCCY	* FLORID	425
CHUNKY	FLESHY	195	VIVID	FLORID	425
FAT	FLESHY	195	CRIPPING	FLOWING	350
FLESHY	* FLESHY	195	CROPPING	FLOWING	350
LUMPISH	FLESHY	195	EDDYING	FLOWING	350
LUMPY	FLESHY	195	FLUIC	* FLOWING	350
MEATY	FLESHY	195	MEANDERING	FLOWING	350
PLUMP	* FLESHY	195	OCZY	* FLOWING	350
PLUMPISH	FLESHY	195	RIPPLING	FLOWING	350
PUFFY	* FLESHY	195	AMORPHOUS	FLUIDAL	335
ROUND	FLESHY	195	FLUIC	FLUIDAL	335
ADAPTABLE	FLEXIBLE	327	FLUENT	FLUIDAL	335
DUCTILE	FLEXIBLE	327	GCRY	FLUIDAL	335
ESTENSILE	FLEXIBLE	327	LICLIFIED	FLUIDAL	335
FLEXIBLE	* FLEXIBLE	327	LICLIC	FLUIDAL	335
LITHE	FLEXIBLE	327	MATTERY	FLUIDAL	335
MOLDABLE	FLEXIBLE	327	MELTING	FLUIDAL	335
MALLEABLE	* FLEXIBLE	327	PLASMATIC	FLUIDAL	335
PLASTIC	* FLEXIBLE	327	PUSSY	FLUIDAL	335
PLIABLE	* FLEXIBLE	327	RUNNING	FLUIDAL	335
PLIANT	FLEXIBLE	327	RUNNY	FLUIDAL	335
STRETCHABLE	FLEXIBLE	327	SAPPY	FLUIDAL	335
SUPPLE	FLEXIBLE	327	SOFT	* FLUIDAL	335
TRACTILE	FLEXIBLE	327	SOLUBLE	FLUIDAL	335
WHIPPY	FLEXIBLE	327	SQUASHY	* FLUIDAL	335
BRITTLE	FLIMSY	163	WATERY	FLUIDAL	335

CREASED	FOLDED	261	DOWNY	HAIRY	259
CREASY	FOLDED	261	FEATHERY	HAIRY	259
CRUMPLED	FOLDED	261	FLEECY	HAIRY	259
CRUSHED	FOLDED	261	FLUFFY	HAIRY	259
DOG-EARED	FOLDED	261	FRIZZY	* HAIRY	259
PUCKERY	FOLDED	261	FURRY	* HAIRY	259
WRINKLY	FOLDED	261	HAIRY	* HAIRY	259
DRENCHED	FULL	54	MATTEd	HAIRY	259
CANALLED	FURROWED	262	NAPPY	HAIRY	259
CHANNELED	FURROWED	262	PEACHY	HAIRY	259
FLUTED	FURROWED	262	SHAGGED	HAIRY	259
FOLDED	FURROWED	262	SHAGGY	HAIRY	259
LINED	FURROWED	262	TUFTY	HAIRY	259
RIFLED	FURROWED	262	VELVETY	HAIRY	259
RIPPLED	FURROWED	262	WOOLLY	* HAIRY	259
RUTTY	FURROWED	262	ARMORED	HARD	326
STRIATED	FURROWED	262	BONY	HARD	326
WRINKLED	FURROWED	262	CALLUS	HARD	326
AIRY	GASEOUS	336	CALLUSED	HARD	326
ETHEREAL	GASEOUS	336	CARTILAGINOUS	HARD	326
GASEOUS	* GASEOUS	336	CAST-IRON	HARD	326
GASSY	GASEOUS	336	CONCRETE	HARD	326
STEAMY	GASEOUS	336	CORNEOUS	HARD	326
VAPOROUS	* GASEOUS	336	CRYSTALLINE	* HARD	326
WINDY	* GASEOUS	336	FERRUGINEOUS	HARD	326
ASHEN	* GRAY	429	FIRM	* HARD	326
ASHY	* GRAY	429	FLINTY	HARD	326
CANESCENT	GRAY	429	FOSFORIZED	HARD	326
CCOL	GRAY	429	GLASSY	* HARD	326
DULL	* GRAY	429	GRANITIC	HARD	326
FROSTED	GRAY	429	GRAVELLY	HARD	326
GRIZZLED	* GRAY	429	GRISTLY	HARD	326
GRIZZLY	* GRAY	429	GRITTY	HARD	326
HCARY	GRAY	429	HARD	* HARD	326
LEADEN	* GRAY	429	HARDENED	HARD	326
MCLE	GRAY	429	HORN	HARD	326
MCUSY	* GRAY	429	IRON	HARD	326
NEUTRAL	GRAY	429	PEBBLY	HARD	326
PEARLY	* GRAY	429	PETRIFIED	HARD	326
SILVERY	GRAY	429	ROCKY	HARD	326
SMOKY	GRAY	429	SCLEROTIC	HARD	326
STEELY	GRAY	429	STARCHY	* HARD	326
BALD	HAIRLESS	229	STEELY	* HARD	326
HANGY	HAIRLESS	229	STONY	* HARD	326
NAPLESS	* HAIRLESS	229	TEMPERED	HARD	326
SMOOTH	HAIRLESS	229	TOUGH	* HARD	326
THIN	HAIRLESS	229	VITREOUS	HARD	326
THREADBARE	* HAIRLESS	229	BAKED	HEATED	381
BRISTLY	* HAIRY	259	BRANDED	HEATED	381
CURLY	* HAIRY	259	BURNED	HEATED	381

CHARRED	HEATED	381	GAUZY	INSUBSTANTIA	4
FUSED	HEATED	381	GCSSAMER	INSUBSTANTIA	4
DRY	* HOT	379	HOLLOW	INSUBSTANTIA	4
CLOUDY	* HUMID	341	LIGHTWEIGHT	INSUBSTANTIA	4
CAMP	HUMID	341	MISTY	* INSUBSTANTIA	4
DANK	HUMID	341	PALE	INSUBSTANTIA	4
DEWY	* HUMID	341	PAPER	INSUBSTANTIA	4
DRIBBLING	HUMID	341	SHADOWY	INSUBSTANTIA	4
DRIPPING	HUMID	341	TENUCUS	INSUBSTANTIA	4
DRIZZLING	HUMID	341	THIN	INSUBSTANTIA	4
DRIZZLY	HUMID	341	TRANSPARENT	* INSUBSTANTIA	4
FENNY	HUMID	341	VACUOUS	INSUBSTANTIA	4
JUICY	HUMID	341	VAPOROUS	* INSUBSTANTIA	4
MARSHY	* HUMID	341	DEFICIENT	INSUFFICIENT	636
MISTY	* HUMID	341	DARK	* INVISIBLE	444
MOIST	* HUMID	341	ARMORED	INVULNERABLE	660
MUDDY	* HUMID	341	BOMB-PROOF	INVULNERABLE	660
OCZY	* HUMID	341	FIRE-PROOF	INVULNERABLE	660
PLUVIAL	HUMID	341	CHAMELEON	IRIDESCENT	437
SLIMY	HUMID	341	IRIDESCENT	* IRIDESCENT	437
SLUSHY	HUMID	341	MOIRE	* IRIDESCENT	437
SPRINKLED	HUMID	341	OPALESCENT	* IRIDESCENT	437
SQUELCHY	HUMID	341	OPALINE	* IRIDESCENT	437
SQUASHY	* HUMID	341	PEARLY	* IRIDESCENT	437
WATERY	* HUMID	341	VERSICOLOR	IRIDESCENT	437
WET	HUMID	341	MAZY	LABYRINTHINE	251
WETTED	HUMID	341	MEANDERING	LABYRINTHINE	251
HAZY	* ILL-SEEN	444	SERPENTINE	LABYRINTHINE	251
INDISTINCT	* ILL-SEEN	444	TURNING	LABYRINTHINE	251
MISTY	* ILL-SEEN	444	TWISTING	LABYRINTHINE	251
CRACKED	IMPERFECT	647	BEDDED	LAYERED	207
CLOUDY	* IMPERSPICUOUS	568	BECKED	LAYERED	207
DARK	IMPERSPICUOUS	568	FILMY	* LAYERED	207
DARK	* IMPERSPICUOUS	568	FLAKY	LAYERED	207
HARD	* IMPERSPICUOUS	568	FOLIATE	LAYERED	207
OPAQUE	IMPERSPICUOUS	568	FOLIATED	LAYERED	207
BLEMISHED	INCOMPLETE	55	LAMELLAR	LAYERED	207
BOB-TAILED	INCOMPLETE	55	LAMINATED	LAYERED	207
DEFICIENT	INCOMPLETE	55	MEMORANOUS	LAYERED	207
DETERIORATED	INCOMPLETE	55	SCALY	* LAYERED	207
FAINT	* INCONSIDERABLE	33	SEAMED	LAYERED	207
INSOLUBLE	* INDISSOLUBLE	324	SHALY	LAYERED	207
AIRY	INSUBSTANTIA	4	SLATY	* LAYERED	207
BLANK	INSUBSTANTIA	4	SQUAMOUS	* LAYERED	207
BRITTLE	INSUBSTANTIA	4	STORIED	LAYERED	207
COLORLESS	INSUBSTANTIA	4	STRATIFIED	LAYERED	207
EMPTY	INSUBSTANTIA	4	STRATIFORM	* LAYERED	207
FEATURELESS	INSUBSTANTIA	4	TABULAR	LAYERED	207
FRAGILE	INSUBSTANTIA	4	ZONED	LAYERED	207
GASEOUS	INSUBSTANTIA	4	SERE	LEAN	206

SPIDERY	LEAN	206	FLASHING	LUMINOUS	417
SPINDLY	LEAN	206	FLGCO-LIT	LUMINOUS	417
AIRY	LIGHT	323	GLINTING	LUMINOUS	417
BUOYANT	LIGHT	323	GLITTERY	LUMINOUS	417
DOUGHY	LIGHT	323	GLOSSY	* LUMINOUS	417
FEATHERY	* LIGHT	323	GLOWING	LUMINOUS	417
FOAMY	* LIGHT	323	INCANDESCENT	LUMINOUS	417
FROTHY	* LIGHT	323	LAMBENT	LUMINOUS	417
GASEOUS	* LIGHT	323	LIGHT	LUMINOUS	417
LIGHT	* LIGHT	323	LUSTROUS	* LUMINOUS	417
LIGHT-WEIGHT	LIGHT	323	RADIANT	* LUMINOUS	417
WEIGHTLESS	LIGHT	323	REFLECTING	LUMINOUS	417
WHIPPED	LIGHT	323	REFRACTIVE	LUMINOUS	417
YEASTY	* LIGHT	323	REFULGENT	LUMINOUS	417
DISSOLUBLE	LIQUIFIED	337	SCINTILLATING	LUMINOUS	417
LIQUEFIABLE	LIQUIFIED	337	SHEENY	LUMINOUS	417
MELTEN	LIQUIFIED	337	SHINING	LUMINOUS	417
RUNNY	LIQUIFIED	337	SHINY	* LUMINOUS	417
SOLUBLE	LIQUIFIED	337	SOFT	LUMINOUS	417
SOLVENT	LIQUIFIED	337	SPARKLING	LUMINOUS	417
DAINTY	LITTLE	196	VIVID	LUMINOUS	417
ELONGATED	LONG	203	WELL-LIT	LUMINOUS	417
EXTENDED	LONG	203	BOGGY	MARSHY	347
EXTENSIVE	LONG	203	DIRTY	MARSHY	347
BRIGHT	* LUMINESCENT	420	CREGGY	MARSHY	347
COLORFUL	* LUMINESCENT	420	FENNY	MARSHY	347
FLUORESCENT	* LUMINESCENT	420	MARSHY	* MARSHY	347
INCANDESCENT	* LUMINESCENT	420	MIRY	MARSHY	347
LUMINESCENT	* LUMINESCENT	420	MCCRISH	MARSHY	347
LUMINOUS	* LUMINESCENT	420	MCCRY	MARSHY	347
MEAN	LUMINESCENT	420	MCCSSY	MARSHY	347
PHOSPHORESCENCE	LUMINESCENT	420	MUCKY	MARSHY	347
RADIANT	* LUMINESCENT	420	MUDDY	* MARSHY	347
SHINING	LUMINESCENT	420	MUSHY	MARSHY	347
WELL-LIT	LUMINESCENT	420	CCZY	* MARSHY	347
APLAZE	LUMINOUS	417	PCACHY	MARSHY	347
AFLAME	LUMINOUS	417	CUAGGY	MARSHY	347
AGLOW	LUMINOUS	417	SILTY	MARSHY	347
BEAMING	LUMINOUS	417	SLABBY	* MARSHY	347
BLINDING	LUMINOUS	417	SLIMY	MARSHY	347
BLUSHING	LUMINOUS	417	SLUSHY	MARSHY	347
BRIGHT	* LUMINOUS	417	SCGGY	MARSHY	347
BRILLIANT	LUMINOUS	417	SPONGY	* MARSHY	347
COLORED	LUMINOUS	417	SQUASHY	* MARSHY	347
COLORFUL	* LUMINOUS	417	SQUELCHY	MARSHY	347
DAZZLING	LUMINOUS	417	SWAPPY	MARSHY	347
EFFULGENT	LUMINOUS	417	WATER LOGGED	MARSHY	347
FIERY	LUMINOUS	417	WATERY	MARSHY	347
FLAMING	LUMINOUS	417	CONCRETE	MATERIAL	319
FLARING	LUMINOUS	417	MASSY	* MATERIAL	319

WEIGHTY	MATERIAL	319	FLOPPY	NON-ADHESIVE	49
ADULTERATED	MIXED	43	FLUID	NON-ADHESIVE	49
ALLOYED	MIXED	43	IMMISCIBLE	NON-ADHESIVE	49
BLENDED	MIXED	43	LAX	NON-ADHESIVE	49
COMPOSITE	MIXED	43	LIQUID	NON-ADHESIVE	49
DAPPLED	MIXED	43	LOOSE	* NON-ADHESIVE	49
FUSED	MIXED	43	LOOSE-KNIT	NON-ADHESIVE	49
IRIDESCENT	MIXED	43	PENDENT	NON-ADHESIVE	49
JUMBLED	MIXED	43	PENDULOUS	NON-ADHESIVE	49
KALEIDOSCOPE	MIXED	43	RELAXED	NON-ADHESIVE	49
LINSEY-WOOLS*	MIXED	43	RUNNY	NON-ADHESIVE	49
MOTTLED	MIXED	43	SEMI-CONTACTED	NON-ADHESIVE	49
MULTIFORM	MIXED	43	SEPARATE	NON-ADHESIVE	49
PATCHED	MIXED	43	SLACK	* NON-ADHESIVE	49
PATCHY	* MIXED	43	SLIPPERY	* NON-ADHESIVE	49
STIRRED	MIXED	43	SMOOTH	* NON-ADHESIVE	49
TANGLED	MIXED	43	STREAMING	* NON-ADHESIVE	49
WATERED	MIXED	43	WATERY	* NON-ADHESIVE	49
BANDED	MOTTLED	437	AMORPHOUS	NON-UNIFORM	17
BARRED	MOTTLED	437	BUMPY	* NON-UNIFORM	17
BLEMISHED	MOTTLED	437	PATTERNLESS	NON-UNIFORM	17
BRINDED	MOTTLED	437	ROUGH	* NON-UNIFORM	17
BRINDLED	* MOTTLED	437	UNIQUE	NON-UNIFORM	17
CLOUDY	* MOTTLED	437	CRENATE	NOTCHED	260
DUSTY	* MOTTLED	437	DENTATE	* NOTCHED	260
FRECKLED	MOTTLED	437	JAGGED	* NOTCHED	260
JASPERED	MOTTLED	437	JAGGY	NOTCHED	260
LINED	MOTTLED	437	NOTCHY	NOTCHED	260
MARbled	MOTTLED	437	SERRATED	NOTCHED	260
POCKMARKED	MOTTLED	437	SHARP	NOTCHED	260
SPECKLED	MOTTLED	437	TIGHTED	NOTCHED	260
SPECKLEDY	MOTTLED	437	BLANK	OPAQUE	423
SPOTTED	MOTTLED	437	CLOUDED	OPAQUE	423
SPOTTY	* MOTTLED	437	CLOUDY	* OPAQUE	423
STREAKED	MOTTLED	437	COATED	OPAQUE	423
STREAKY	MOTTLED	437	DIM	OPAQUE	423
STRIATED	MOTTLED	437	DIRTY	* OPAQUE	423
STRIPED	MOTTLED	437	CRUMPLY	OPAQUE	423
TABBY	MOTTLED	437	FILMY	* OPAQUE	423
VEINED	MOTTLED	437	FEGGY	OPAQUE	423
MANIFOLD	* MULTIFORM	82	FROSTED	OPAQUE	423
MOSAIC	MULTIFORM	82	HAZY	* OPAQUE	423
MOTTLED	MULTIFORM	82	IMPERVIOUS	* OPAQUE	423
MULTIFOLD	MULTIFORM	82	MISTED	OPAQUE	423
VARIABLE	MULTIFORM	82	MISTY	* OPAQUE	423
DANGLING	NON-ADHESIVE	49	MUDDY	* OPAQUE	423
DECOMPOSED	NON-ADHESIVE	49	MURKY	* OPAQUE	423
DRY	* NON-ADHESIVE	49	OPACIOUS	OPAQUE	423
FLAPPING	NON-ADHESIVE	49	PUCLED	OPAQUE	423
FLOPPING	NON-ADHESIVE	49	SMOKY	* OPAQUE	423

SOOTY	* OPAQUE	423	DUST-COVERED	POWDERY	332
THICK	* OPAQUE	423	DUSTY	* POWDERY	332
TURBID	OPAQUE	423	FLOCCULENT	* POWDERY	332
VAPOROUS	* OPAQUE	423	FLOURY	* POWDERY	332
AWRY	ORDERLESS	61	FRIABLE	POWDERY	332
SHUFFLED	CRDERLESS	61	GRANULAR	* POWDERY	332
SLACK	* CRDERLESS	61	GRANULATED	POWDERY	332
CLEAR	* CRDERLY	60	GRATED	POWDERY	332
SMOOTH	* CRDERLY	60	GRAVELLY	POWDERY	332
ENAMELED	ORNAMENTED	844	GRITTY	POWDERY	332
GLITTERING	* CRNAMENTED	844	GRUNC	* POWDERY	332
POLISHED	CRNAMENTED	844	MILLED	POWDERY	332
DANGLING	PENDENT	217	POWDERY	* POWDERY	332
DROOPING	PENDENT	217	SANDY	* POWDERY	332
HANGING	PENDENT	217	SIFTED	POWDERY	332
LOOSE	* PENDENT	217	SMOKY	* POWDERY	332
PENDULOUS	PENDENT	217	SOOTY	POWDERY	332
PENSILE	PENDENT	217	FLABBY	* PULPY	356
SUSPENDED	PENDENT	217	FLESHY	* PULPY	356
FLAWLESS	PERFECT	646	MARSHY	* PULPY	356
BOREH	PERFORATED	263	PASTY	* PULPY	356
DRILLED	PERFORATED	263	PLIPY	* PULPY	356
HOLEY	PERFORATED	263	SCGGY	* PULPY	356
HONEYCOMBED	PERFORATED	263	SPONGY	* PULPY	356
PEPPERED	PERFORATED	263	STAGNATING	QUIESCENT	266
RIDDLED	PERFORATED	263	RADIANT	* RADIATING	417
CLEAR	* PERSPICUOUS	567	REFLECTING	* RADIATING	417
DEFINITE	* PERSPICUCUS	567	AERIFIED	RARE	325
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