DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Specific gravity data from granitic rocks of the southern Sierra Nevada, California

by

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U.S. Geological Survey [1]

Open-File Report 88-72

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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1988

CONTENTS

ILLUSTRATIONS

Figures

Tables

INTRODUCTION

In the course of a geologic study of granitic and metamorphic rocks of an extensive area of the southern Sierra Nevada, California (north to lat 36 00' N), more than 1500 granitic samples have been collected. The bulk specific gravity of most of these granitic samples has been recorded in modal tables in Ross (1987a). The specific gravity of other samples is recorded here (Table 1) and keyed to geologic units and index maps in Ross (1987a). In addition, the specific gravity and color index of about 100 samples collected in 1987 are used in the various plots of this report, but the data are as yet unpublished.

Specific gravity determinations have been made on many granitic specimens in the central Sierra Nevada as one of the parameters measured in the course of regional geologic investigations. These specific gravity measurements also have been used to support gravity geophysical studies (Oliver, 1977), and more recently in studies of the internal structure and depth of the Sierra Nevada batholith (Oliver, and others, 1987). The specific gravity data from the southern Sierra Nevada are intended to further supplement these studies.

This report will summarize graphically the specific gravity distribution for all samples and for each rock type (Fig. 1). In addition the distribution of specific gravity is shown for some of the larger plutons (Fig. 2). Data on the character and distribution of the granitic units mentioned throughout this report can be found in a test accompanying a generalized geologic map at a scale of 1:250,000 for the southern Sierra Nevada (Ross, 1987b).

MEASUREMENTS

Specific gravity determinations for those granitic samples recorded in Ross (1987a) were by the lever arm balancing method where the specific gravity value is interpreted from a graduated scale on the balance beam. The other specific gravity values reported here and those yet unpublished were determined by a somewhat more advanced method of measuring samples in air and water with a digital read out of specific gravity. Practice suggests that the latter method is more accurate because it reduces the effect of minute cracks and surface pore-space (H.W. Oliver, written commun., 1987.)

INTERPRETATION OF SPECIFIC GRAVITY DATA

A simplistic assumption is commonly made (or assumed) in studying granitic terranes that a sawed surface is representative of a hand specimen and that a hand specimen is representative of a granitic body. This assumption is, of course, far from true in the real world where heterogeneity of granitic bodies, even when they "look" homogeneous, is a fact of life. Any determination of specific gravity, color index, silica content, and all other "facts" from a hand specimen are point sources that give a piece of information about a granitic body, but what it means for the body as a whole is open to much interpretation. However, large numbers of determinations do give groupings and linear trends that define characteristics of a body as the figures in this report show. The "spread" of data in many of the following figures can be due in part to misreading of specific gravity results or inaccuracy in point counting, but most spread is probably caused by weathered samples, rock pore space, or the heterogeneity inherent in granitic rocks.

A plot of the specific gravity for the entire granitic sample population of the southern Sierra Nevada is shown by a histogram (fig. 1). This same figure also shows the distribution of specific gravity by rock type. It shows a predictable increase in specific gravity from granite to quartz diorite that is largely a function of the varying mafic mineral content of these rocks.

Histograms of specific gravity distribution for selected plutons (fig. 2) reflect the strong influence of mafic mineral content (color index) of the various bodies. Quartz also influences the specific gravity, but quartz variation is generally not as obvious in hand specimens of granitic rocks, and only becomes evident in modal analyses (fig. 5).

The granite plots (Fig. 2-A) show that the darker Kern River mass has distinctly higher specific gravities than the coarser, more felsic Tejon Lookout mass. The Kern River mass also has a distinctly wide spread of specific gravity values reflecting its more variable nature. In contrast the Tejon Lookout specific gravity values are more tightly bunched, indicating its more homogeneous nature. The granodiorite bodies (Fig. 2-B) likewise show distinct specific gravity distribution patterns. For example, in the field and from petrographic studies, the Lebec and Gato-Montes masses were considered correlative. The similar pattern of the specific gravity distribution of the two bodies certainly supports the postulated correlation. The other granodiorite masses plotted all have patterns separable from the Lebec and Gato-Montes masses, and generally separable from each other. Similarly, the selected tonalite masses (Fig. 2-C) show a variety of patterns. Note that the texturally and mineralogically similar Bear Valley Springs and Dunlap Meadow masses have rather similar specific gravity distribution patterns (Fig. 2-C). The other tonalite masses have distinctly different and separable pattern of specific gravity distribution.

None of the above observations are surprising, and, in fact, they fairly obviously follow, based on extensive modal analyses and petrographic study. Nevertheless, they point out the value of specific gravity alone in correlating and separating granite masses. This might be particularly valuable in a rapid reconnaissance study where modal and petrographic studies were limited.

The general assumption of a positive correlation between specific gravity and color index (in these rocks, basically the sum of biotite and hornblende) is graphically presented in Fig. 3. Although there is some spread of data for each rock type, there is a remarkable overall alignment, particularly on the composite plot (fig. 3A). The quartz diorite field is rather diffuse reflecting the wide range of color index values in this heterogeneous group of rocks. Nevertheless, though diffuse, the quartz diorite field still shows a fairly good linear trend.

When the color index average is plotted against the average measured specific gravity for each granitic unit (Fig. 4) the field is considerably tightened, but the more diffuse pattern of the quartz diorites is still obvious. The quartz diorites in general are somewhat anomalous; four quartz diorite units seem to be related to the mafic gneissic complex in the Sierran tail, and the other two are Triassic. Not surprisingly, they do not conform to the sharp linear pattern of the granites, granodiorites, and tonalites. The accuracy of a color index is dependent on the modal determination of bionome and hornblende, generally the only significant mafic constituents. Although the distinction between hornblende and biotite is difficult to determine in the modal analysis of some rocks, the total of the two minerals (color index) is generally easy to determine.

Specific gravity measures a property of a whole hand specimen of whatever size you choose to haul. Nevertheless, inhomogeneity and particularly weathered condition make an individual specific gravity determination only an approximation - a local spot in a body. Nevertheless, a large number of samples measured for both specific gravity and color index do make remarkably linear trends (Figs. 3, 4, and 5) and provide valuable information on the character of rock bodies and, in combination with gravity data, give an indication of their depth extent (Oliver and others, 1987).

For the more than 100 chemically analyzed samples, plots show the relation of specific gravity to the amount of the various modal minerals (Fig.

5). Samples selected for chemical analysis were chosen for their freshness (weathered rinds were taken off before the samples were submitted for a chemical analysis). Therefore the trend of the plot of color index against specific gravity should be somewhat better defined than the plot where all the modal samples are used (fig. 3-A). Nevertheless there is still substantial spread in figure 5-6. Particularly noticeable in the plot are a number of points considerable lower in specific gravity than would be predicted from the color index. This suggests that these specimens were not as fresh as presumed, or that minute pore spaces and cracks have lowered the specific gravity. Two tonalite samples on several plots had anomalously high measured specific gravities of 2.91 and 2.89, considering their color indices of 28 and 24. A re-run of the specific gravities for these samples gave reduced values of 2.78 and 2.76. This points out one of the advantages of having a large mass of data - - anomalous points suggest some problem; in this case a couple of misdetermined specific gravity readings. The re-run specific gravities nestled nicely back into the mass of data on the relevant plots.

Each modal mineral amount for the chemically analyzed samples was plotted against specific gravity (Fig. 5-1 through 5). The plot of each mineral makes a readily identifiable trend. However, both plagioclase (Fig. 5-1) and K-feldspar (Fig. 5-2) make rather diffuse trends. Quartz makes a rather striking trend from 10 to 20 percent in the heavier rocks to 20 to 30 percent in the lighter rocks (Fig. 5-3). I, for one, was surprised at the pronounced "tilt" of this trend. From casual field and petrographic observation I thought many of the tonalites had as much quartz as the granites. This is true for some samples, but the overall trend for all samples clearly shows a pronounced enrichment in quartz in the granites. The amounts of biotite (Fig. 5-4) and hornblende (Fig. 5-5) show the best correlation with specific gravity; possibly biotite has a slightly tighter trend. Samples from the Antimony Peak and Tehachapi Mountain units, closely related to the mafic gneiss complex, are notably anomalous in these plots. The color index (biotite plus hornblende) plot against specific gravity (Fig. 5-6) shows a good linear trend and reflects the dominant effect of the mafic minerals on the specific gravity of these rocks. Color index is very easy to determine from a stained slab (no worry about biotite and hornblende distinction) and seemingly (from these rocks anyway) would make prediction of the specific gravity relatively accurate without a separate measurement. Also, it appears from these plots (Fig. 5-1 through 6) that biotite amount is the single best "indicator" of specific gravity of all the individual major minerals.

All these plots, even biotite, have enough spread so that any one sample would have only limited correlative value. For example, rocks containing from 6 to 14 percent biotite all have measured specific gravities of 2.70, and samples containing 10 to 21 percent biotite all have specific gravities of 2.75. Some of these variations probably reflect the difficulty in accurately reading the specific gravity from the "balance point" in the older measurements. Also an everpresent problem is the assumption that a mode from a sawed and stained surface accurately measures the mineral content of a hand specimen. Inaccuracies of modes due to sporadic distribution of minerals are particularly a problem in smaller slabs. Nevertheless, the trend line for a large number of samples is meaningful for correlating modal biotite and specific gravity (fig. 5-4).

The chemically analyzed samples can also be used to test the relation (interdependence) of specific gravity, and silica content. Specific gravity plotted against silica content makes a good linear belt with only a few notably anomalous points (Fig. 6). The trend is consistent enough to enable one to grossly predict the silica value of a sample where specific gravity was known, and vice versa.

Specific gravities can also be computed relatively accurately for these rocks using the modal mineral content and an average specific gravity for the major minerals. The granitic rocks of the southern Sierra Nevada are dominated by plagioclase, quartz, and K-feldspar whose specific gravities are relatively consistent (Deer et al., 1965). Choosing average values for biotite and hornblende is not nearly as easy as they are both characteristically variable and not many specific gravity determinations are available. The nearest determinations are from biotites and hornblendes from the California Coast and Transverse Ranges near the San Andreas fault (Dodge and Ross, 1971). The mafic mineral specific gravities are mostly from tonalites and some granodiorites whose relation to the granitic rocks of the southern Sierra Nevada is presently controversial. The biotite and hornblende are optically and physically similar to the mafic minerals in the southern Sierra Nevada. The specific gravities of the biotites (9 samples) range from 2.97 to 3.07 and average 3.03. The hornblende (8 samples) range from 3.21 to 3.27 and average 3.24.

The average specific gravity of each rock type was calculated using the above discussed mineral specific gravities and the mineral modal averages (Table 2). Some caution must be exercised in using the modal averages, as bodies of widely disparate sizes are averaged. For example, in the granodiorites some bodies only cover from 1 to 10 Km^2, whereas the Castle Rock body covers 890 Km^2. Likewise in the tonalites, some bodies cover less than 10 Km^2 whereas the Bear Valley Springs unit covers 875 Km^2. To test the effect of this difference in areal coverage, a weighted specific gravity was computed to compare with the modal average specific gravity for each rock type. Weighting for size made no significant difference in specific gravity for granodiorite and tonalite which have the biggest discrepancy in unit sizes. A small 0.01 difference was noted in granite and quartz diorite presumably chiefly from differences in biotite content in the weighted computations. The granite difference appears larger because of rounding. The actual difference is 0.004, (2.644 to 2.648). Likewise, without rounding, the quartz diorite difference is only 0.001 (2.805 to 2.804). For practical purposes, for these rocks, weighting makes no difference in the specific gravity computations.

For the major plutonic units the measured average specific gravity of the modal samples was compared with a computed specific gravity using the modal averages for each mineral multiplied by assumed average specific gravities for each mineral (Table 2). In almost all cases the measured specific gravity was 0.01 to 0.03 lower than that computed (Table 3). Probably the major cause of this difference is the weathered nature of assumed "fresh" samples. The Bishop Ranch unit emphasizes this point. Although an effort was made to collect relatively fresh material, the Bishop Ranch is notoriously weathered and the measured specific gravity was not surprisingly 0.05 lower than the computed value. Other reasons for a difference between calculated and measured specific gravity are differences between assumed and actual specific gravities for biotite and hornblende, and also the probability of tiny fractures and minute pore spaces in even the most fresh-appearing rocks.

Given the well known variation in chemical composition and specific gravity of biotite and hornblende--notable chemical wastebaskets--we should not assume too much from a chosen average specific gravity. In summary, the granites are generally the most weathered, but they have low color indexes and the difference between computed and measured specific gravity is mostly due to the weathering. Granodiorites, generally, have more closely comparable computed and measured values, reflecting their generally fresher condition, and, although they have higher color indexes, most are hornblende poor and the specific gravity is strongly influenced by the quartz and feldspar contents whose specific gravities are more constant. Tonalites and quartz diorites overall have the greatest differences between measured and computed specific gravity for reasons not yet understood. Nevertheless, there is a general consistency to the values and for the southern Sierra Nevada a specific gravity computed from average mineral specific gravities seems to be about 0.02 higher than a specific gravity measured by the "immersion method". The calculated specific gravity from the mode is probably somewhat equivalent to the "grain density", which does not take into account "porosity" in the form of tiny fractures in the measured samples. In most granitic rocks, long immersion in water will somewhat raise the specific gravity, indicating that even fresh granitic rocks have some porosity. This is at least in part (maybe in large part) the reason for discrepancies between measured and calculated specific gravities.

ACKNOWLEDGMENTS

I want to thank Meade Norman, Hector Villalobos, Jenny Metz, Deborah Goaldman, and Steve Glass for the specific gravity determinations. Small recompense for this repetitious, laborious work! Also, much thanks to Meade, Hector, Jenny, and Deborah for performing the tedious modal analyses on many of these rocks.

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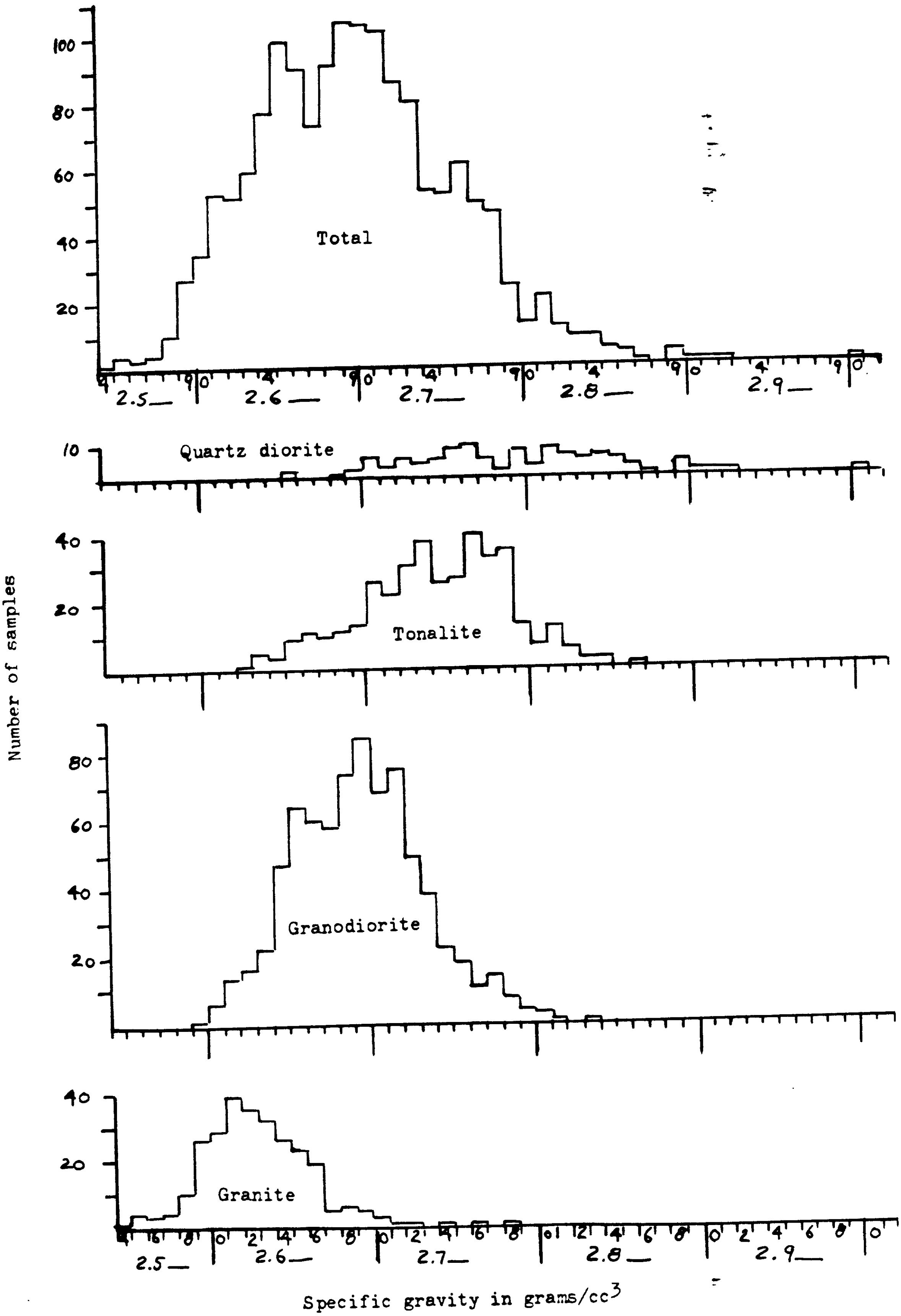


Figure 1. Specific gravity distribution by rock type of 1531 granitic samples from the southern Sierra Nevada, California

Figure 2. Specific gravity distribution for selected individual plutons of the southern Sierra Nevada, California

2-A. Granite

2-B. Granodiorite

2-C. Tonalite

GRANITE

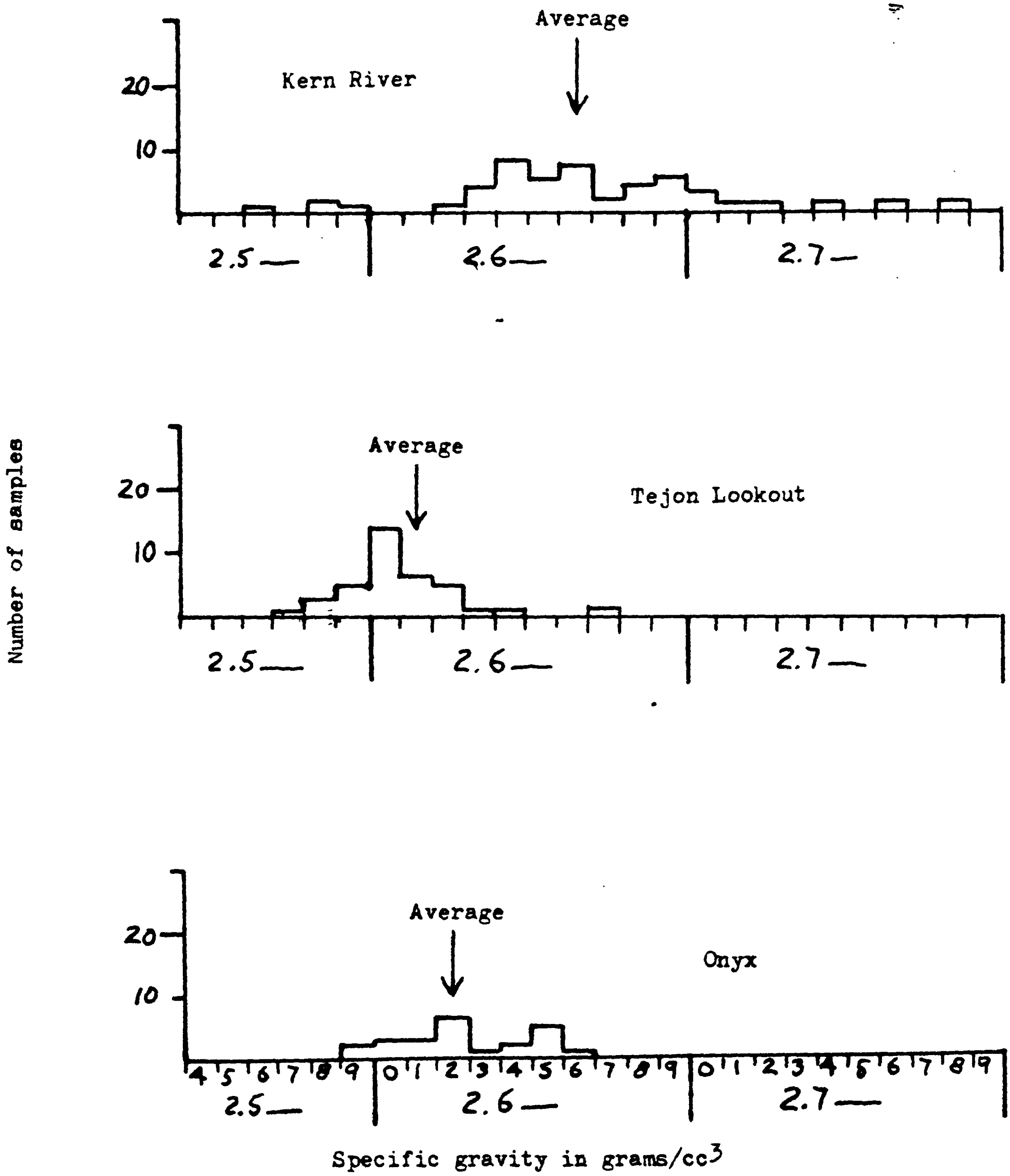


Figure 2-A.

GRANODIORITE

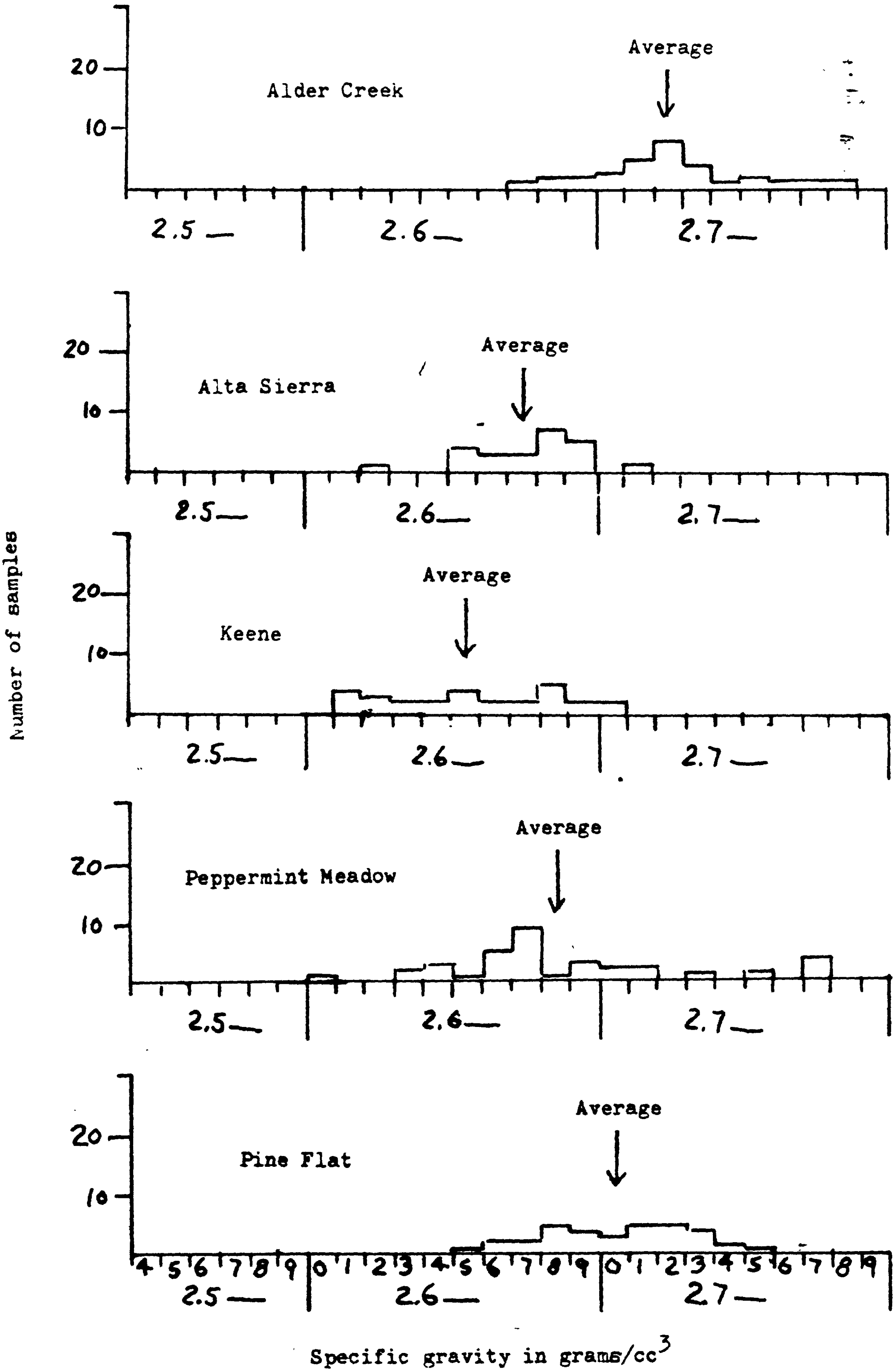


Figure 2-B.

GRANODIORITE (CONT.)

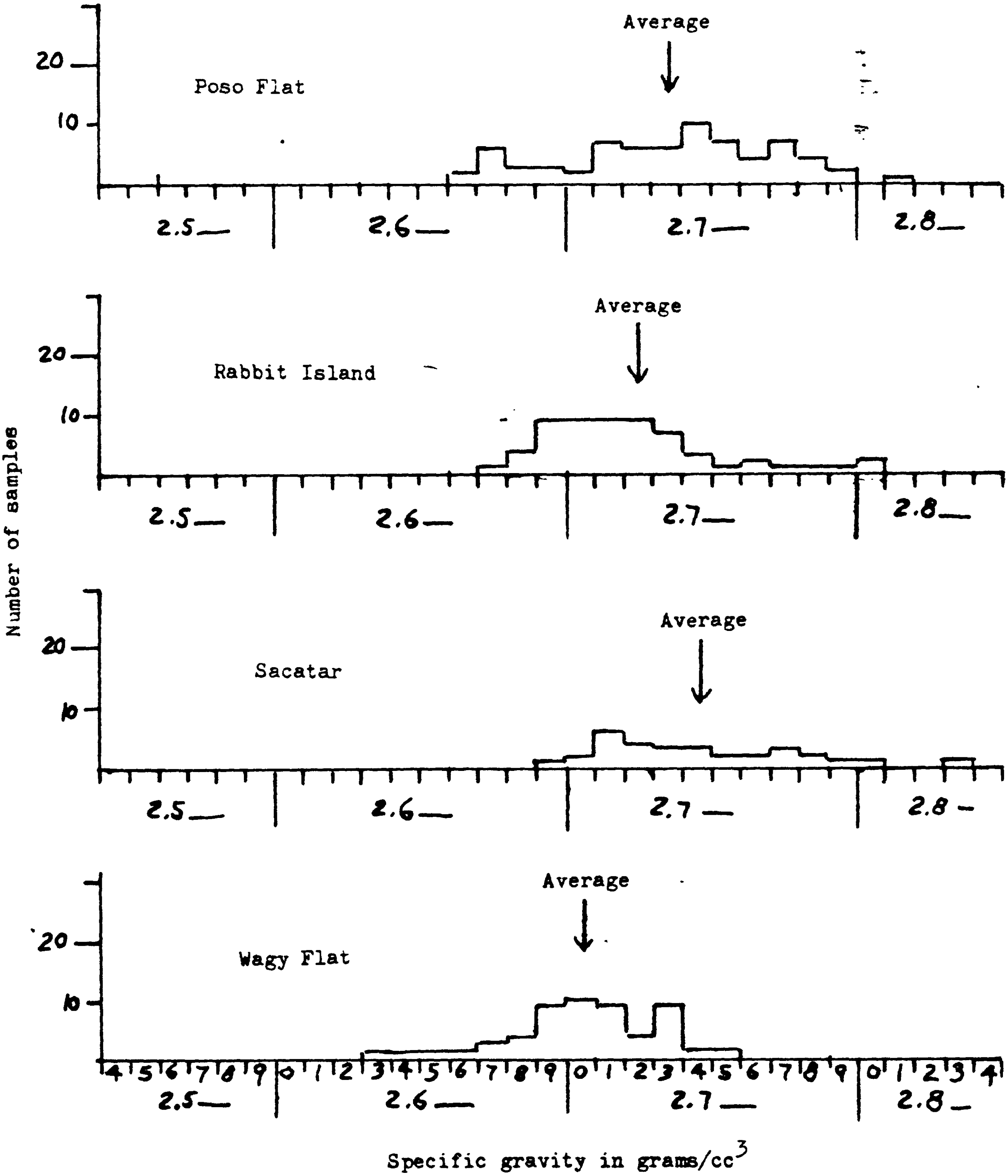


Figure 2-B.

GRANODIORITE (CONT.)

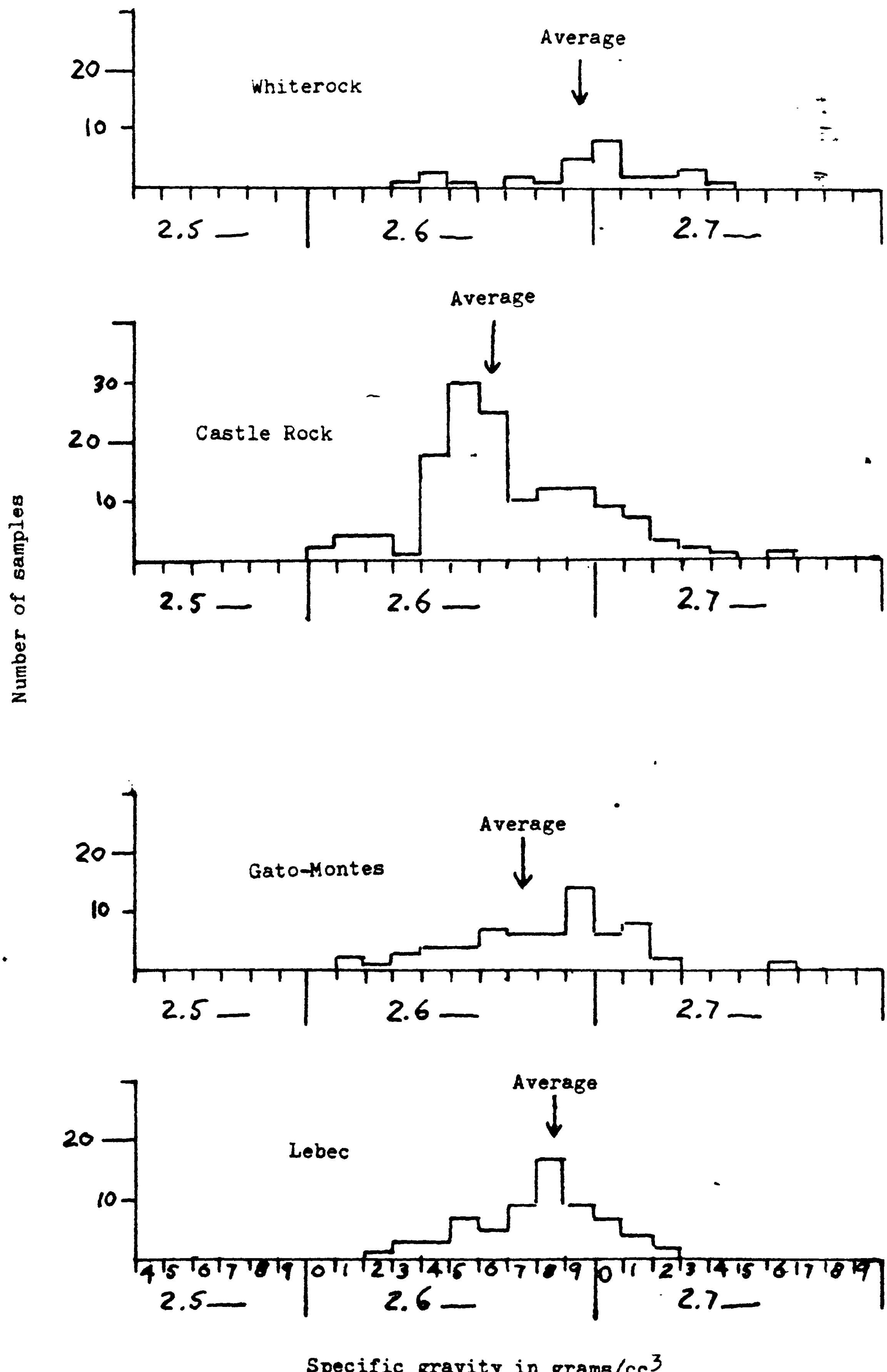


Figure 2-B.

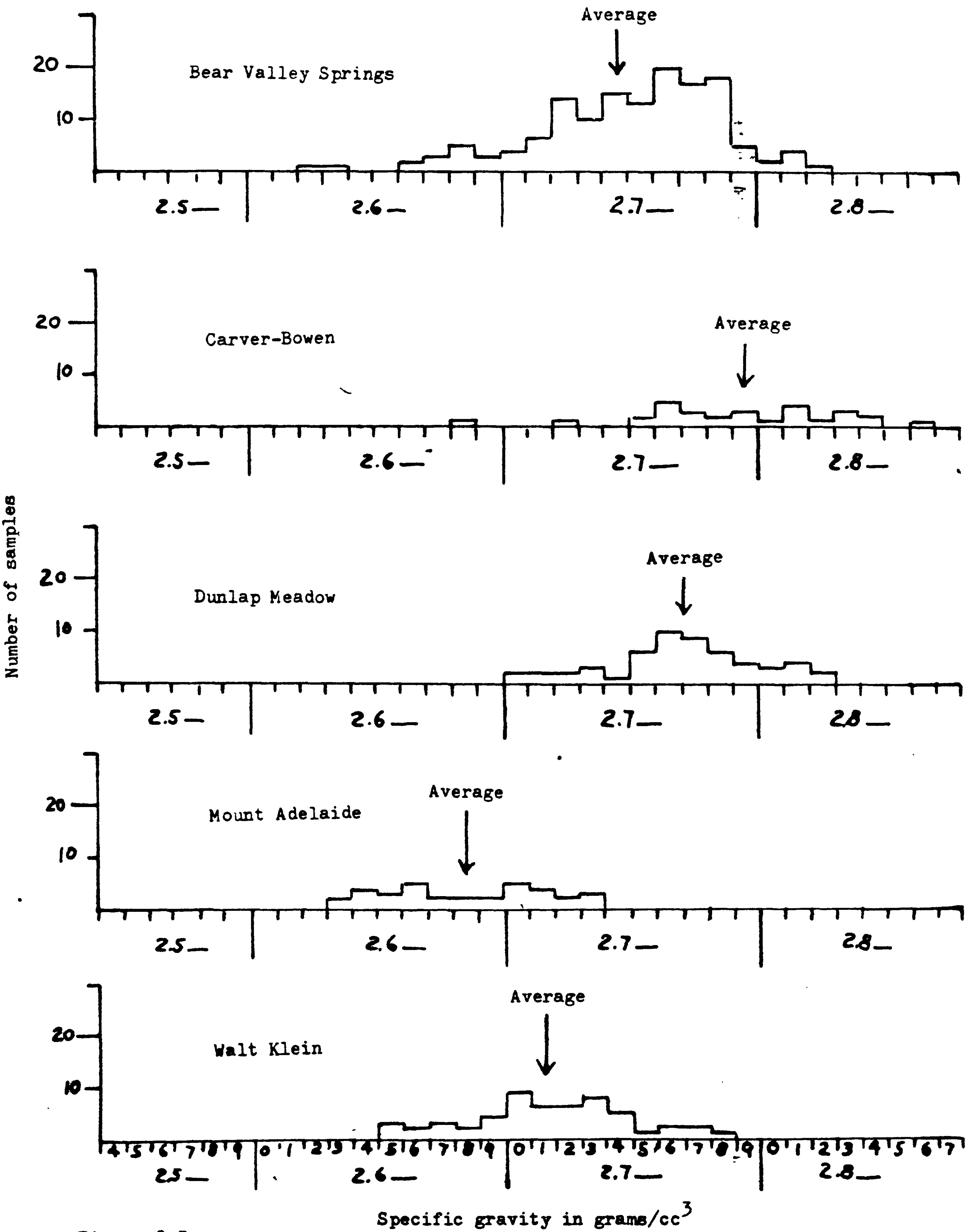

Bear Valley Springs
Carver-Bowen
Dunlap Meadow
Mount Adelaide
Walt Klein
Average
Number of samples
20
10
2.5
2.6
2.7
2.8
Specific gravity in grams/cc³

Figure 2-C.

Figure 3. Specific gravity plotted against color index for samples from the southern Sierra Nevada, California.

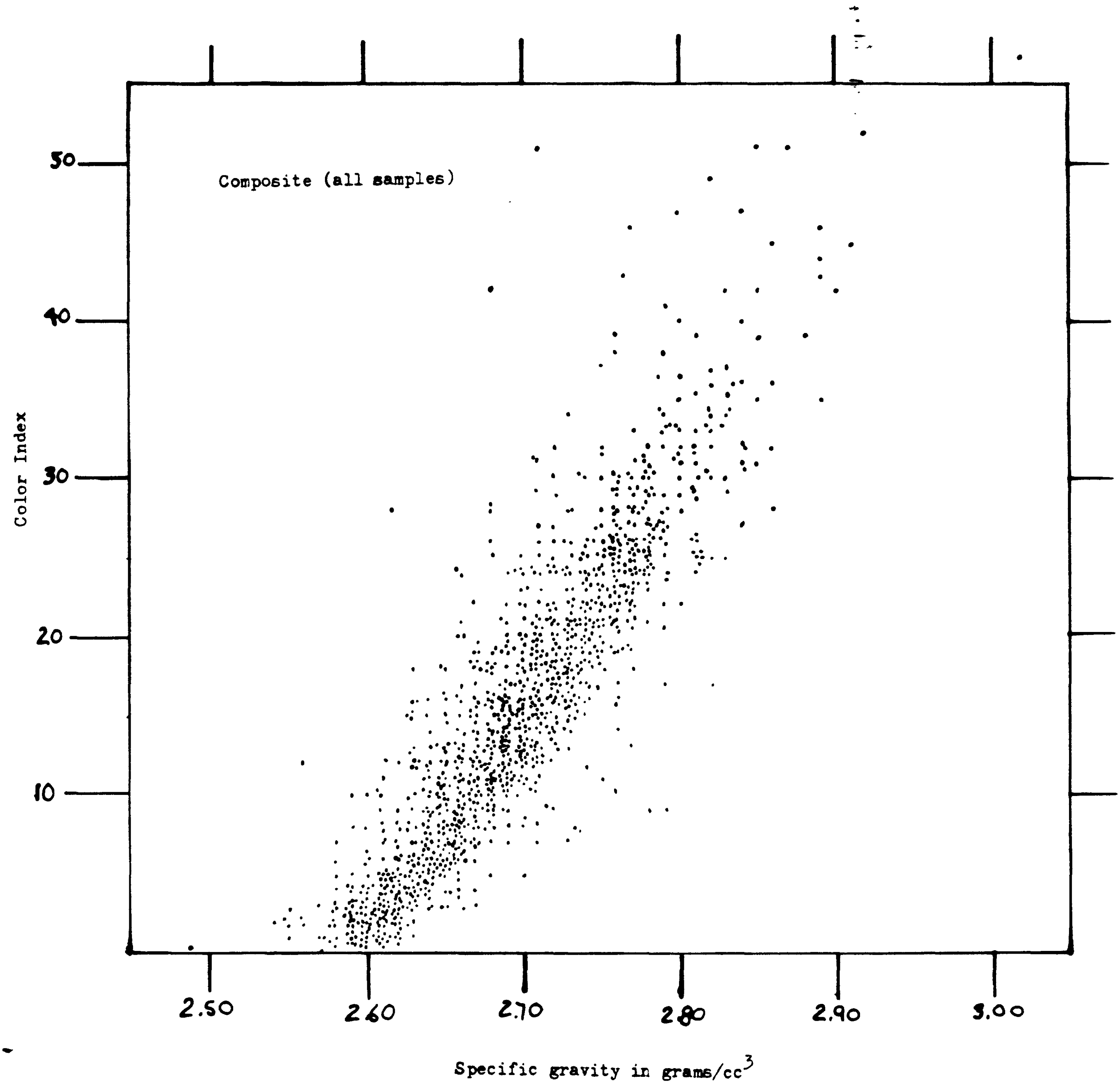
A. Composite (all samples)

B. Granite samples

C. Granodiorite samples

D. Tonalite samples

E. Quartz diorite samples



Composite (all samples)
50
40
30
20
10
Color Index
2.50
2.60
2.70
2.80
2.90
3.00
Specific gravity in grams/cc3

Figure 3-A

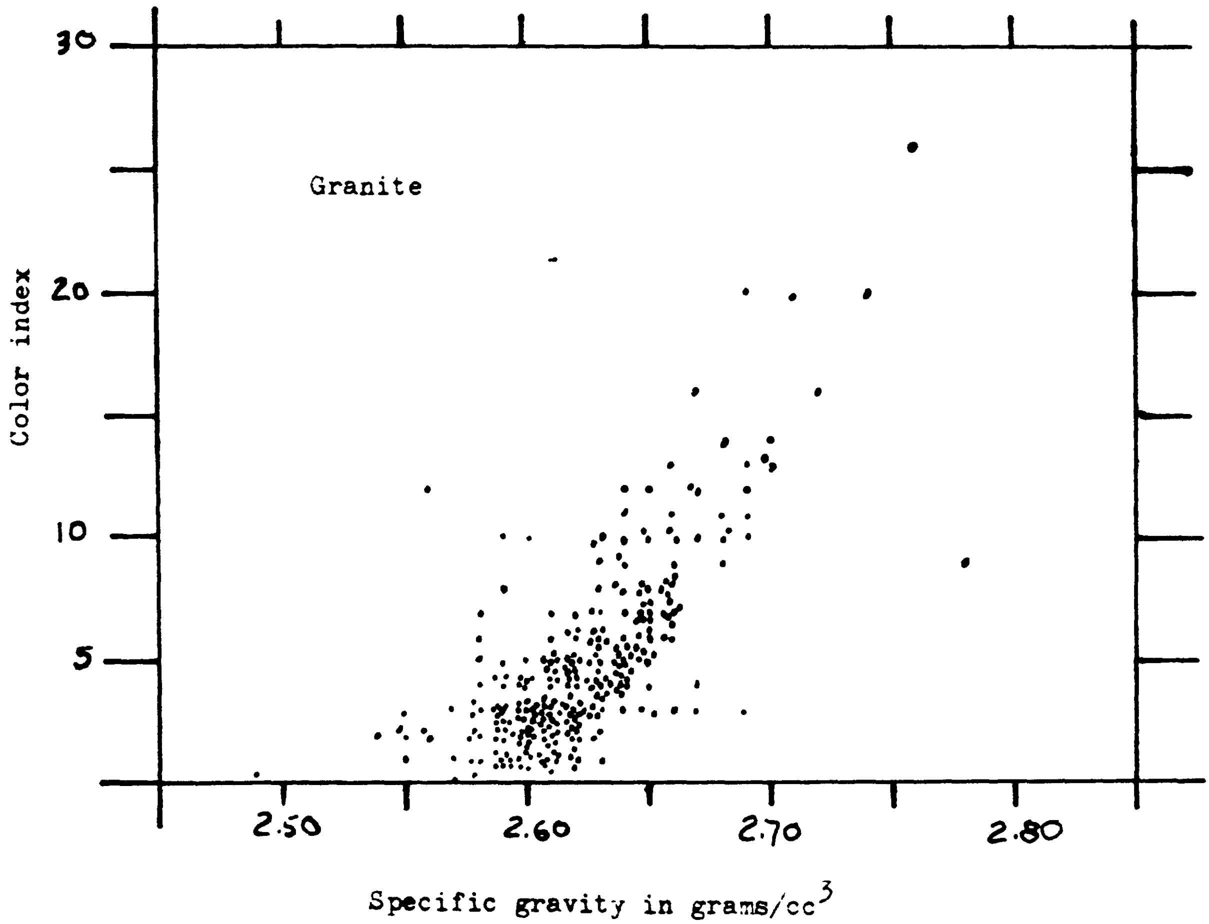

30
Granite
20
Color index
10
5
2.50
2.60
2.70
2.80
Specific gravity in grams/cc3

Figure 3-B

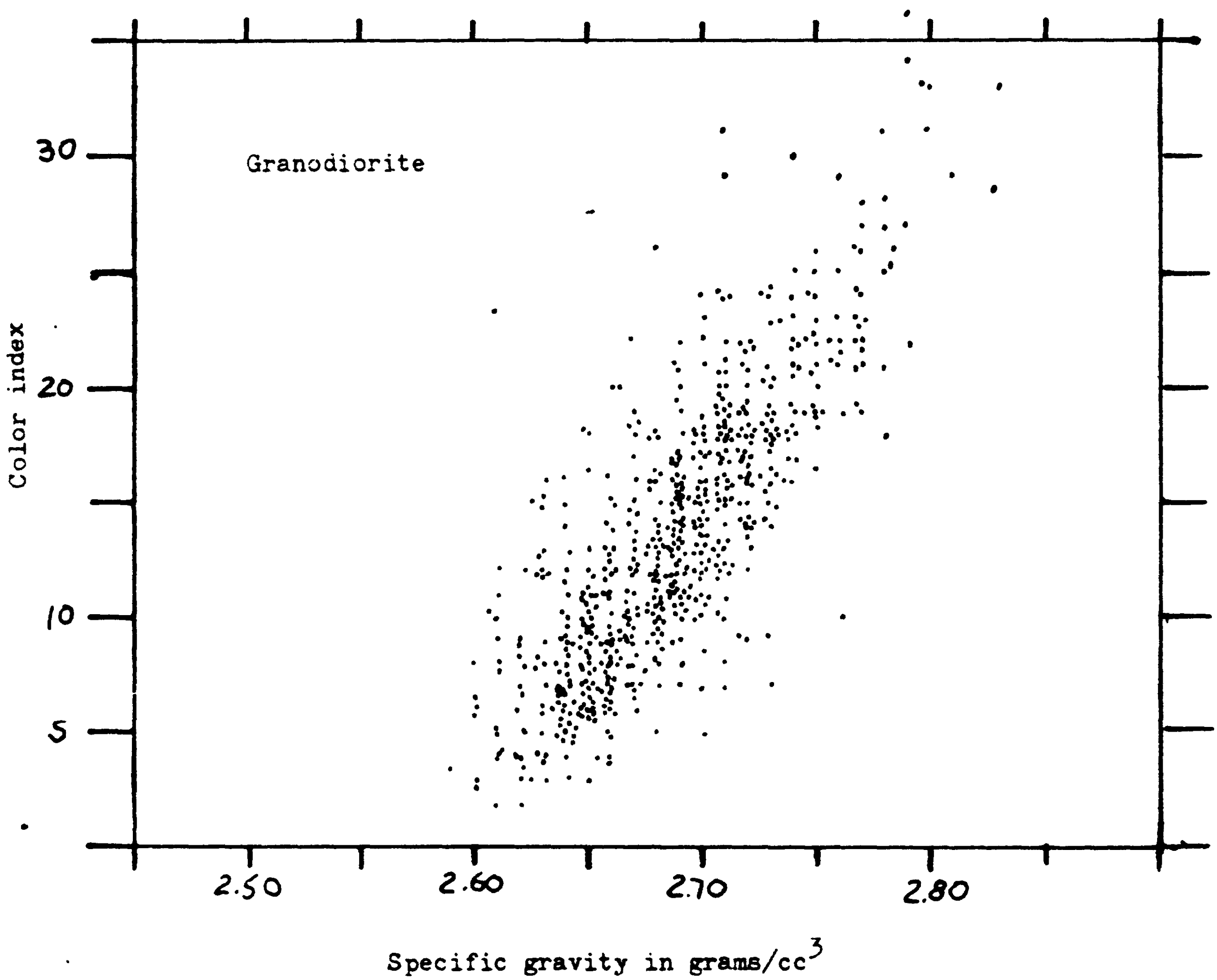
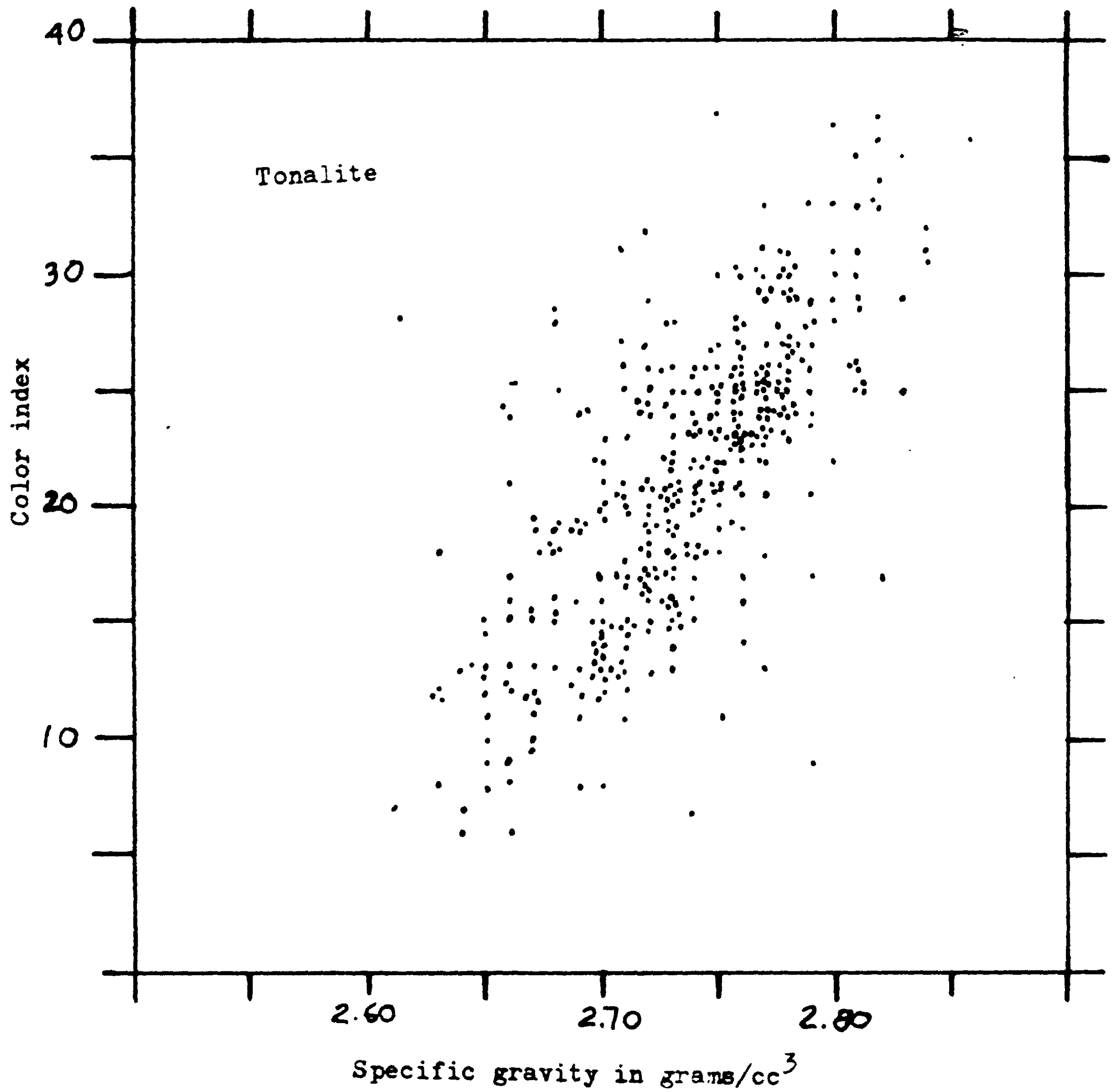

30
20
10
5
Granodiorite
Color index
2.50
2.60
2.70
2.80
Specific gravity in grams/cc3

Figure 3-C



40
30
20
10
Tonalite
Color index
2.60
2.70
2.80
Specific gravity in grams/cc3

Figure 3-D

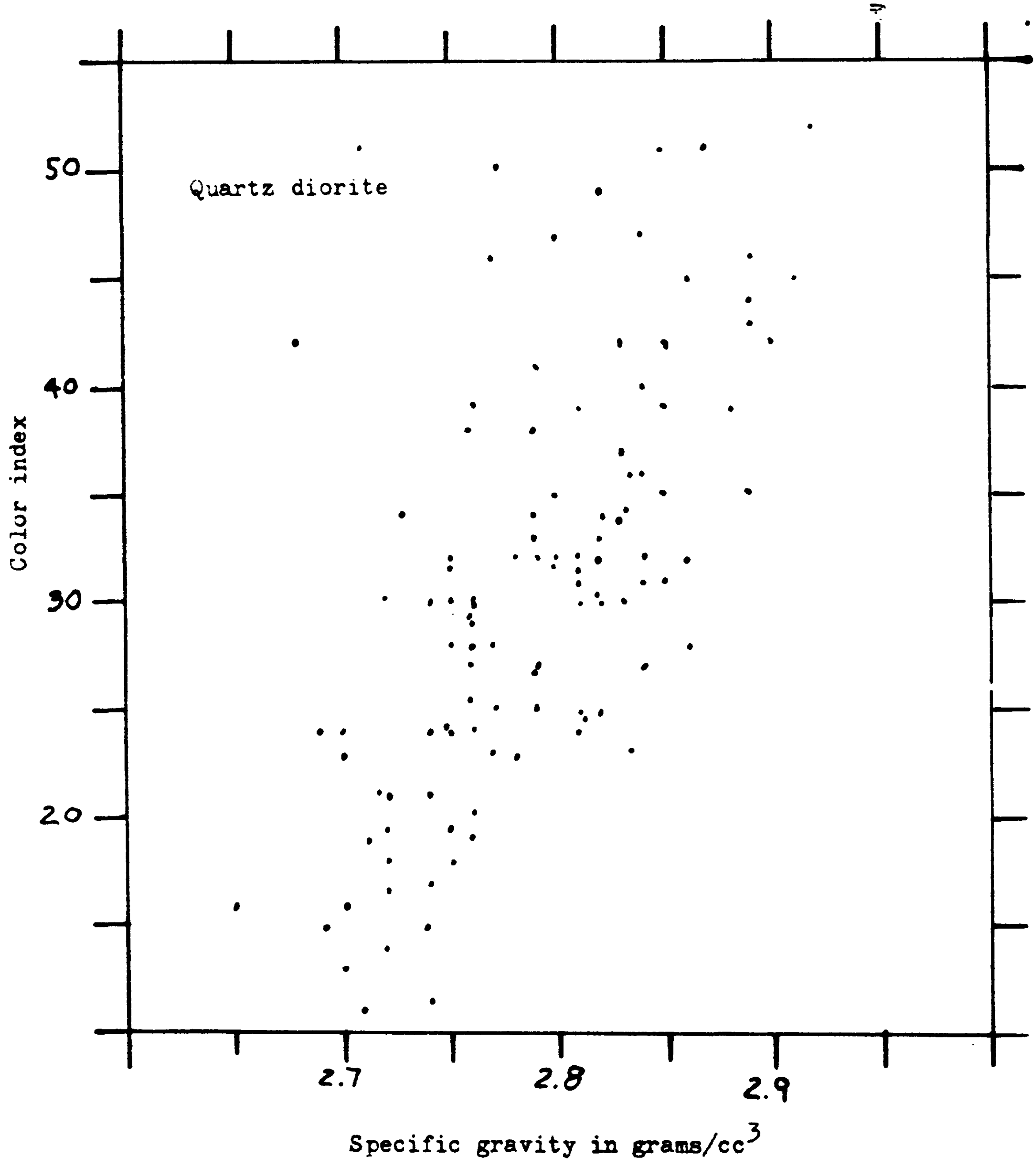

50
40
30
20
Quartz diorite
Color index
2.7
2.8
2.9
Specific gravity in grams/cc3

Figure 3-E

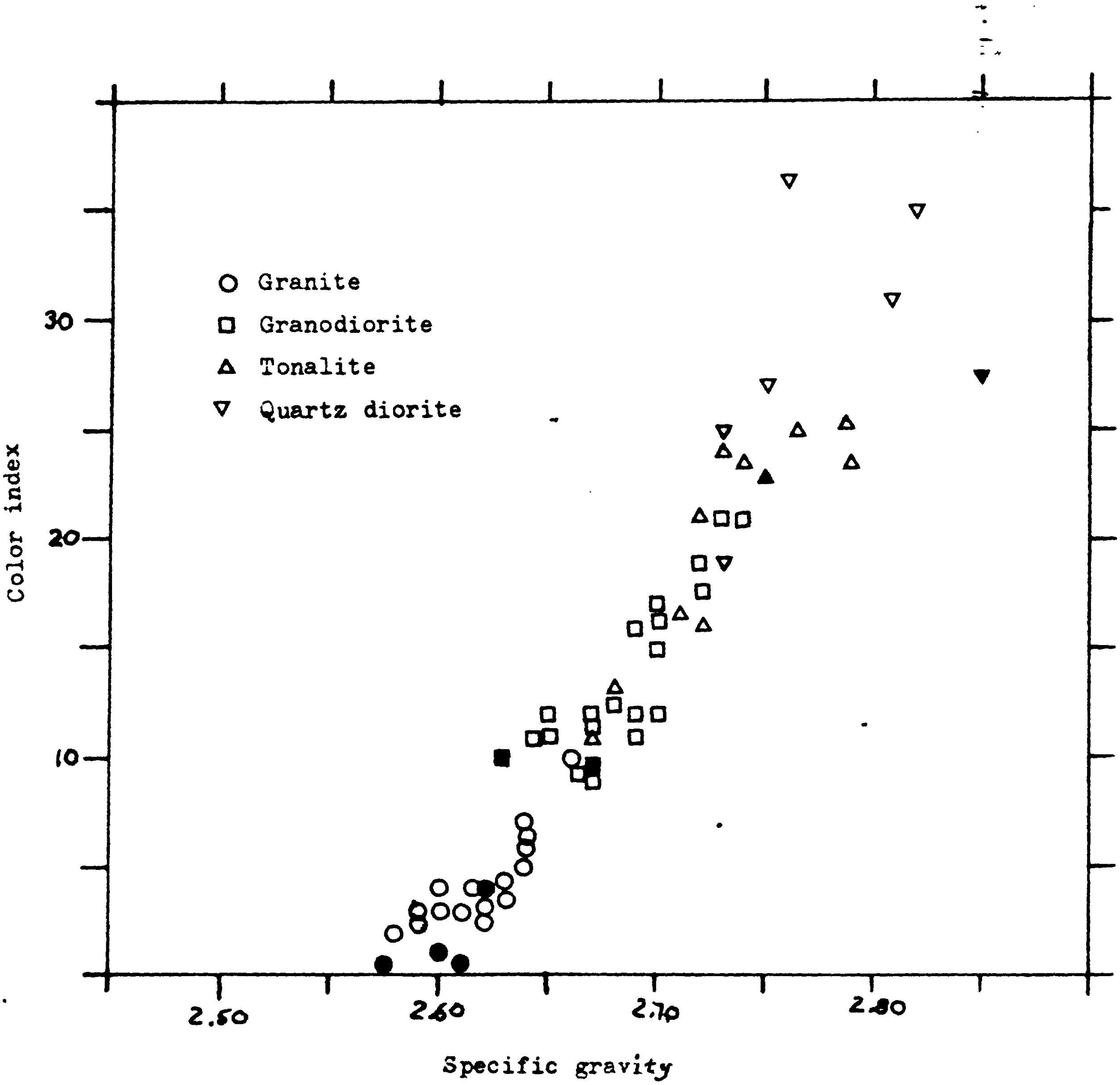


Figure 4. Average specific gravity plotted against average color index for each granitic unit of the southern Sierra Nevada. (solid symbols, units with fewer than 5 samples)

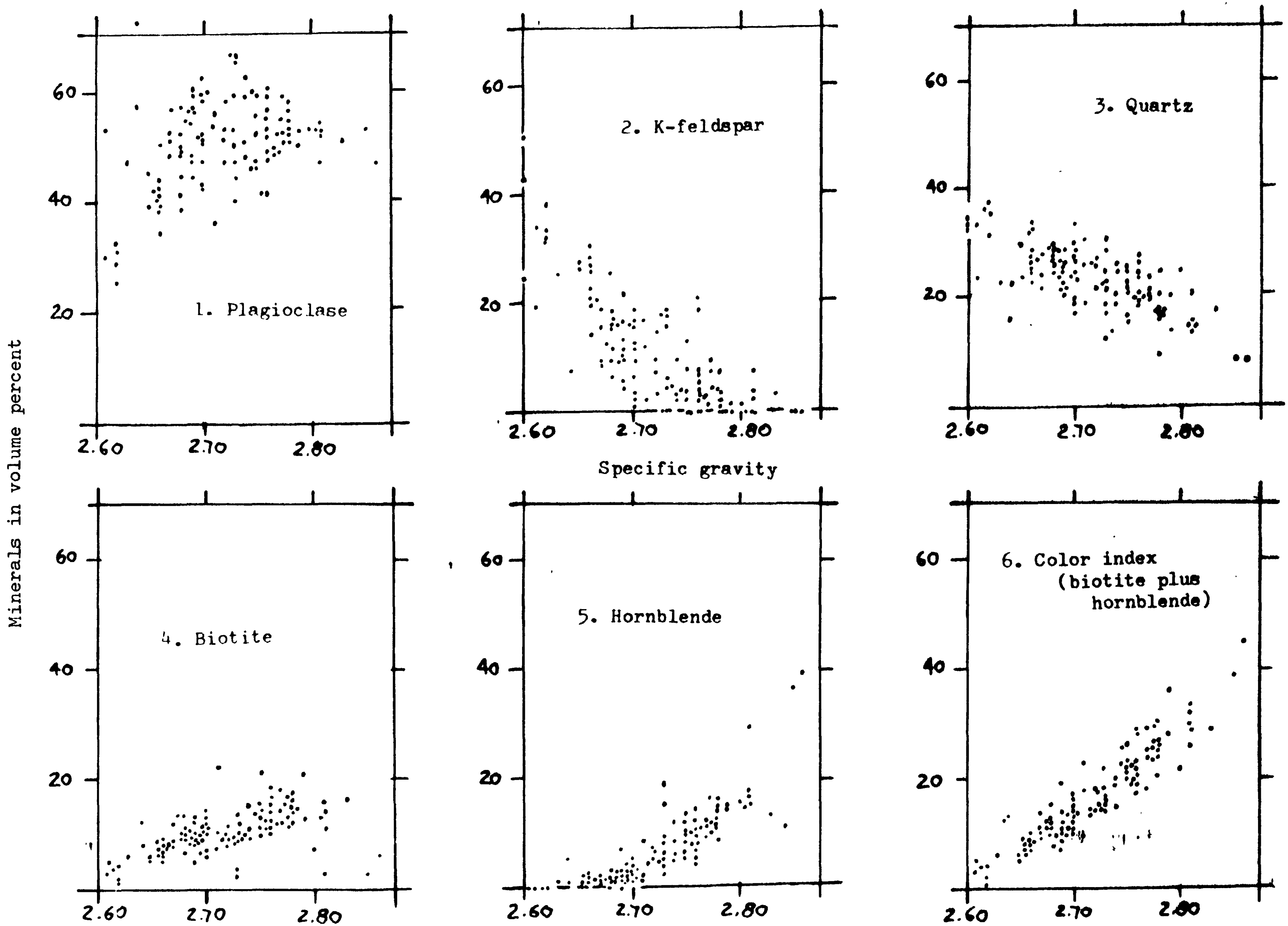


Figure 5. Specific gravity plotted against modal minerals for chemically analyzed samples

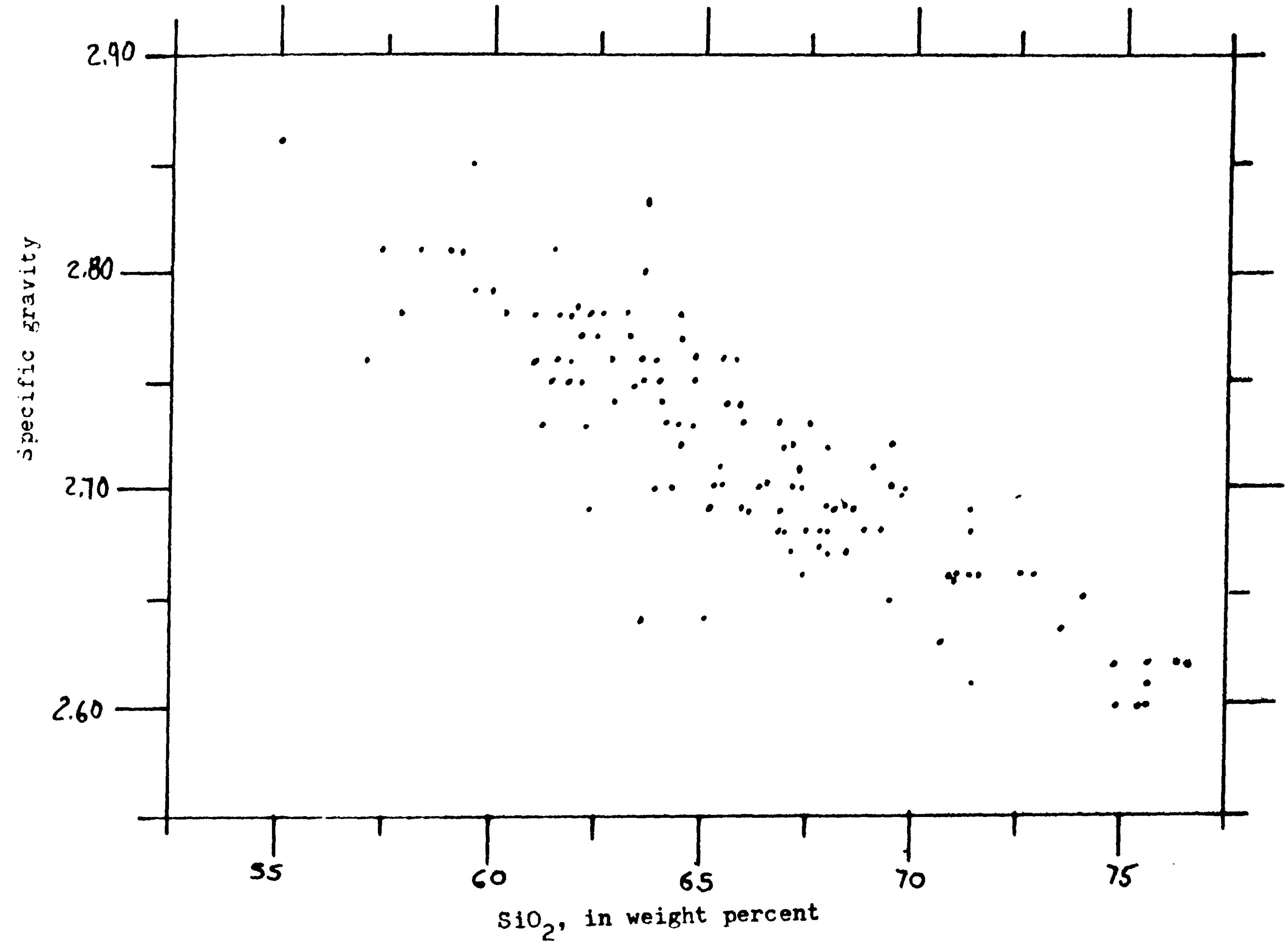


Figure 6. Specific gravity plotted against silica content for chemically analyzed samples, southern Sierra Nevada, California

Table 1. Supplement to specific gravity determinations recorded in U.S.G.S Open-File Report 87-373 (Ross, 1987). Table keyed to units and modal samples in that report.

Unit	Sample number	Specific gravity (2.__)
	Granite	
Baker Point	4625R	63
	5281	62
	5283	63
Black Mtn	5506	56
	5512	55
	5556	57
Bob Rabbit	5599	65
	5600	66
	5602	60
	5604	66
	5606A	63
	5638	64
	5641	64
	5643	62
	5648A	61
	5648B	67
Five Fingers	6204	61
	6207	63
	6208	66
	6380	67
	6387	63
	6388	65
	6405	59
	6407	68
	6415	68
	6417A	65
	6420B	66
	6493A	61
	6535	66
Kern River	5113	64
	5117C	66
Kern River (cont.)	5120B	66
	5266	65
	5268	64
	5272	69
	5274	63
	5279	70
	5286C	72
	5286R	76
	5288	74
	5290R	70
	5297	70
Long Meadow	5379	64
	5408	61
	5410	64
	5411	64
	5413	63
	5414	61
Noname Canyon	6442A	59
	6448B	63
	6451	63
	6457	62
	6468	62
	6536C	60
	6538	63
	6543	62
Onyx	5315C	60
	5328	64
	5332	65
	5678	66
	5682	62
	5700	65

Table 1 (cont.)

Unit	Sample number	Specific gravity (2.__)
Onyx (cont.)	5708	59
	5710	65
	5719A	62
	5719B	62
	6131	63
	6152	60
	6195	61
	6198	59
	6236	62
	6238	65
	6241	61
	RWK-6B	64
Portuguese Pass	5289	65
	5571B	64
	5574	66
	5582	65
	5595	66
Robbers Roost	6392	61
	6395	61
Sand Canyon	6448A	64
	6450	65
	6454B	60
Sherman Pass	5350	62
	5382	62
	5383	63
	5384	59
	5387	61
	5390	62
	5393A	63
	5400	58

Unit	Sample number	Specific gravity (2.__)
	Granodiorite	
Alder Creek	5256	72
	5259	69
	5261	72
	5427	67
	5492	75
	5499	70
	5503	75
	5527	70
	5530	69
	5562	74
	5586	68
	5587	72
	5591	71
	5705	71
	5987	73
	6242	71
	6245	73
	6249	73
	6254	78
	6269	71
	6272A	73
	6272B	72
Castle Rock	5324	60
	5327	64
	5329	62
	5336	65
	5355	62
	5356	68
	5360	66
	5381	64
	5391	66
	5394	65
	5395	66

Table 1 (cont.)

Unit	Sample number	Specific gravity (2.__)
Castle Rock (cont.)	5403	65
	5605	65
	5609	69
	5644	65
	5647	66
	5654	65
	5656	67
	5658	69
	5659	69
	5665	71
	5669	68
	5672	66
	5675	71
	5689	67
	5691	65
	5711	64
	5716A	65
	5727	64
	5730	65
	5732	65
	6144A	68
	6184A	66
	6196	64
	6212	65
	6237	65
	6239	69
	6401	65
	6513	64
	6539	63
Deer Creek	6008B	71
	6009	71
	6010	71
	6030	72
	6031	69
Deer Creek (cont.)	6032A	68
	6032B	70
	6050	65
	6051	64
	6052	64
	6053	71
	6113	67
	6115	64
	6116	70
	6117	69
	6118	68
	6119	71
Democrat Springs	6372	69
	6374	64
	6375	68
Evans Flat	5494	70
	5495	69
	5496	68
	5497	72
	5524	70
	5526	69
	5563	71
Hatchet Peak	5809A	63
	5810A	66
	5811A	65
	5816	64
	5846	65
	5863	67
	5865A	68
	5867	65
	5868	64
	5869A	64
	5880A	74
	5881	71

Table 1 (cont.)

Unit	Sample number	Specific gravity (2.__)	Unit	Sample number	Specific gravity (2.__)
Hatchet Peak (cont.)	5890	65	Peppermint Meadow (cont.)	5880B	67
	5913A	69		5883	66
	5914	73		5915A	71
	5915B	69	Pine Flat	5801	71
Peppermint Meadow	4703	67		5801R	71
	4995	69		5802	68
	4996	66		5803	69
	5000	70		5804	68
	5001	67		5885B	68
	5033	77		5885R	67
	5034	77		5895A	74
	5302B	71		5895B	74
	5814	64		5897	75
	5815	64		5898	71
	5819	60		5900	66
	5820	67		5901B	72
	5823	63		5902	70
	5824	66		5926	71
	5825	63		5927	72
	5827	67		5929	72
	5829	66		5941	72
	5831	68		5942	67
	5833	64		5945A	68
	5834	65		5946	70
	5835	66		5948	72
	5838	75		5949	65
	5841	67		5950	68
	5849	67		5957B	73
	5852	67		5959	70
	5854	67		5960	71
	5855	69		5964	73
	5862	73		5965	66
	5866	70		5967	69
	5873	69		5969	69
	5875	77		5993	69
				5995	73

Table 1 (cont.)

Unit	Sample number	Specific gravity (2.__)
Poso Flat	5264	78
	5265	74
	6276	74
	6277A	75
	6278A	73
	6279A	71
	6287	73
	6290	75
	6292	74
	6297	72
	6357	79
	6359	77
	6361	76
	6364	78
	6365A	73
	6366A	78
	6368	72
	6373	76
Rabbit Island	5314	72
	5315A	76
	5317	70
	5323	68
	5326	69
	5338	69
	5404	70
	5407	73
	5416	71
	5419A	78
	5421	78
	5623	73
	5624A	74
	5625B	80
	5685	69
	5687	69
	5690	68
Rabbit Island (cont.)	5713	70
	5715A	67
	5721	72
	6124	71
	6157A	68
	6166A	69
Sacatar	6420A	83
	6423	73
	6425	76
	6443	77
	6452A	72
	6456A	71
	6459	71
	6462A	73
	6464	77
	6467	74
	6472A	75
	6472B	74
	6473A	77
	6475A	71
	6477	72
	6480	72
	6481	71
	6482A	75
	6483A	78
	6491A	80
	6491B	72
	6492	69
	6499A	78
	6500A	70
	6501A	79
	6504	71
	6507	71
	6522A	74
	6523A	76

Table 1 (cont.)

Unit	Sample number	Specific gravity (2.__)
Sacatar (cont.)	6526	70
	6537	71
Tonalite		
Bear Valley Springs	5430	70
	5432	78
	5435	75
	5438	74
	5440	76
	5445	74
	6296	67
	6299	76
	6300	78
	6302	78
	6322	77
	6322R	77
	6326	72
	6329	76
	6332	73
	6335	75
	6336	78
	6340	74
	6341	76
	6342	77
	6356	76
	6369	80
	6371	78
	6376	74
Carver-Bowen	5976A	81
	5978	72
	5979	81
	5980	83
	5981	78
	5983A	77
	5988	82
	5989	86

Unit	Sample number	Specific gravity (2.__)
Carver-Bowen (cont.)	5990	76
	5991	76
	6014	75
	6017	50(?)
	6019A	79
	6020A	81
	6028	80
	6029	83
	6036	68
	6037A	76
	6039	79
	6040A	76
	6078	83
	6079A	78
	6082	84
	6094	79
	6101	84
	6110	77
	6111	75
	6114A	76
	7275	81
Dunlap Meadow	5007	79
	5008	79
	5010	81
	5015	73
	5015R	72
	5285	81
	5291	70
	5292	76
	5293	75
	5304	82
	5305	73
	5573	74
	5575	78
	5577	73

Table 1 (cont.)

Unit	Sample number	Specific gravity (2.__)
Dunlap Meadow (cont.)	5581	78
	5584	75
	5805	76
	5807	75
	5870A	79
	5870B	79
	5871	81
	5872	80
	5884	82
	5885A	80
	5885-1	80
	5886A	77
	5887	76
	5916A	78
	5918	75
	5922	77
	5924	78
	5930	76
	5931	78
	5932	77
	5933	77
	5937	75
	5938A	77
	5939A	77
	5939B	76
	5940	77
	5952	71
	5953	70
	5954	77
	5962	76
	5974	75
	5975A	76
	5994	71
	5996	76
Dunlap Meadow (cont.)	5998	76
	5999	76
	6000	72
	6002	79
	6004	78
	6005A	77
Fountain Springs	6024	75
	6055A	74
	6056	72
	6058A	74
	6059	71
	6062	73
	6065	70
	6066	72
	6084	72
	6085	73
	6105	75
	6106	73
	6107	65
Walt Klein	6061	73
	6067	71
	6096A	70
	6070	66
	6072	69
	6073	71
	6074B	74
	6075	73
	6076	67
	6077	70
	6088	70
	6096	76
	6280	71
	6281A	75

Table 1 (cont.)

Unit	Sample number	Specific gravity (2.__)
Walt Klein (cont.)	6283	67
	6285	69
	6308	73
	6309	73
	6312	72
	6314-1	70
	6320	70
	6321	74
	6345	71
	6346A	70
	6353	73
	6354	72
	6355	74
	RWK-1-RA	78
	RWK-2	69
Wofford Heights	5456	77
	5457B	76
	5458B	82
	5460	81
	5507	84
	5513	78
	5514	76
	5534	75
Zumwalt	6120	73
	6121	74
	6123	78
	Quartz diorite	
Caliente	5441A	77
	5787A	71
	5790B	92
	5791	76
	5793	65
Caliente (cont.)	5798	68
	5799B	76
	5800	75
Freeman Junction	6202	74
	6205A	70
	6398A	65
	6433	69
	6434	75
	6438A	76
	6439	72
	6532A	83
Rhymes Campground	6255	86
	6262	84
Walker Pass	5735A	72
	5735B	72
	5735C	75
	6136	70
	6149	75
	6169	71
	6171	74
	6178A	69
	6179	74
	6193A	77
	6220	76
	6226	70
	6391	73
	6402	74
	6498	73

Table 2. Computed specific gravity, by rock type, using modes and average mineral specific gravity

Modal average

	Plag	K-feld	Qtz	Biot	Hbnd	Computed specific gravity
Granite	33	32	31	4	-	2.64
Granodiorite	49	13	25	10	3	2.70
Tonalite	54	4	21	12	9	2.76
Quartz diorite	58	2	12	10	18	2.81

Weighted modal average ⊙

	Plag	K-feld	Qtz	Biot	Hbnd	Computed specific gravity
Granite	34	31	30	5	-	2.65
Granodiorite	49.5	14	23	10.5	3	2.70
Tonalite	54	3	22	12	9	2.76
Quartz diorite	58	2	13	8	19	2.80

Specific gravity values used for minerals

		Source
Plagioclase		Deer, Howie, and Zussman, 1965
Oligoclase	2.65	"
Andesine	2.67	"
K-feldspar	2.58	"
Quartz	2.65	"
Biotite	3.03	Dodge and Ross, 1971
Hornblende	3.24	"

⊙ Taking into account the area of distribution of the various granitic units

Table 3. Comparison of average measured and computed specific gravity for selected granitic units

Rock type	Unit	Specific gravity: Computed from modes	Specific gravity: Measured from hand specimens
Granite	Kern River	2.675	2.66
	Five Fingers	2.64	2.64
	Bishop Ranch	2.63	2.58
	Portuguese Pass	2.66	2.64
	Tejon Lookout	2.64	2.61
Granodiorite	Castle Rock	2.68	2.67
	Poso Flat	2.75	2.73
	Rabbit Island	2.71	2.72
	Sacatar	2.74	2.74
	Wagy Flat	2.705	2.70
Tonalite	Bear Valley Springs	2.77	2.74
	Hoffman Canyon	2.76	2.73
	Mt. Adelaide	2.71	2.68
	Walt Klein Ranch	2.73	2.71
	Dunlap Meadow	2.77	2.765
Quartz diorite	Walker Pass	2.75	2.73
	Tehachapi Mountains	2.84	2.82