point per 1 per cent area is defined; etc. The author has found that searching for more than three overlaps consumes more time than contouring with the tool. The grid or Schmidt method is particularly useful in contouring large numbers of points.[11,18,25]

Kamb (Ref. 28, p. 1908) has prepared contoured diagrams by a novel procedure such that statistical inferences can be drawn directly from the diagrams. The area (A) of the contouring tool is so chosen that, if the population is randomly oriented, "the number of points (E) expected to fall within a given area (A) is three times the standard deviation of the number of points (n) that will actually fall within the area under random sampling of the population.... Observed densities that differ from E/A by more than two or three times the standard deviation σ (for random orientation) are then likely to be significant.... The observed densities are therefore contoured in intervals of 2σ at values 0, 2σ, 4σ, etc., the expected density = E/A for random orientation being 3σ."*

For a random population in which the distribution of n values for random samples of size N is binomial,

$$\frac{\sigma}{E} = \sqrt{\frac{(1 - A)}{NA}} ,$$

where E = NA, A is a given area expressed as its fraction of the total area of the diagram, and N is the total number of points on the scatter diagram. By setting σ/E = 1/3, one computes the appropriate area A of the counter to be used in preparing the diagram. Once A is obtained it is used to contour the point diagram by the Schmidt method. Kamb states that diagrams prepared in this way have a smoothed appearance in comparison with conventional contours because most of the irregular detail of the latter is of no statistical significance, the conventional A = 0.01 being usually much too small.**

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*Here σ is used to designate both the standard deviation and stresses in accordance with conventions in statistics and stress analysis, respectively.

**All three contouring techniques contain a common source of error. Although the contoured points are plotted on an equal-area net, Statistics

The orientation of fabric elements as illustrated on petrofabric diagrams can be treated in a purely statistical manner to determine whether the observed distribution significantly deviates from one which is randomly oriented. This implies statistical, but not necessarily geological, significance. Pincus[29] fully discussed the application of statistical methods to the analysis of aggregates of orientation data. Little can be added to his treatment here. Flinn[27] re-examined several of the more popular tests of significance as applied to petrofabric diagrams and found them generally unsuitable. He suggested that fabric diagrams should be compared to artificially prepared "random" diagrams and significant differences attributed to the rock fabric.

The contouring method of Kamb[28] allows statistical inferences to be made directly, but one possible drawback may be that the contours based on areas considerably larger than 1 per cent could tend to average or mask two or more closely spaced concentrations which may be geologically significant.

Another means of utilizing a contoured diagram as the basis for statistical inference has been employed by the author with some success. The probability of obtaining concentrations on a point diagram which deviate from a random distribution is approximated by the Poisson exponential binomial limit.[30] This has been confirmed by the author from tests of goodness of fit between this distribution and apparently random diagrams of fabric elements in rocks. The probability of obtaining at least a given number of points in any 1 per cent area of a fabric diagram is given by the following equation:

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there is an unavoidable, progressive distortion of the equal areas on this net from the center outward. Fully accurate contouring, therefore, would require continual changes in the shape of the contour from circular at the center to elliptical at the periphery as recognized by Mellis and Strand (in Flinn, Ref. 27, p. 532). This error is considered to be negligible in light of the accuracy with which any given point is plotted and the nature of the interpretation of contoured fabric diagrams.