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Further Evaluation of the Scale Count of Human Hair

Joseph Beeman

FURTHER EVALUATION OF THE SCALE COUNT OF HUMAN HAIR

Joseph Beeman†

Three articles have appeared in this Journal dealing with the scale count of human hair. In the latest of these Gamble and Kirk (3) are critical of Beeman's article (2) which objected to certain features of their original paper (1). In their most recent article (3) they state: "It seems evident that the conclusions drawn by Beeman were based partially on improper statistical sampling, and partially on an incomplete comprehension of the necessary method of treating the data." With the latter half of this statement we are in complete accord.

We believe that the fundamental question involved is not one of statistical methods, formulae, and their comprehension, but rather: "Is the scale count of a human crown hair characteristic of all the crown hairs of the individual, and does the scale count differ significantly from individual to individual?" In other words, "Is the scale count of a single human hair of value in individualizing or eliminating a suspect in a criminal investigation?"

A fundamental rule governing any mathematical study is that the accuracy of any calculated figure cannot be greater than that of the observed data. Those familiar with the appearance of hair scale structure are cognizant of the possible variation in scale count in any given area, due to the angle of observation, pseudo scale structure, marginal overlapping of scales, and the question as to whether or not a given scale shall or shall not be included in the scale count. Only by strict objectivity can a series of scale counts be comparable within their own series. With optimal conditions of observation, an inherent observational error of one to two scales per unit is unavoidable. The reporting of such scale counts to the second decimal place is meaningless and unnecessary. A variation in scale counts in the same hair of $\pm$ 2 units is not significant; the examination of any biological material in a manner such as is done here is subject to an inherent variation. It is of interest to note that no unusual degree of manipulative or observational skill is required of the operator in making these observations.

We are not concerned with Gamble and Kirk's explanation of an "abnormal" hair (3) in our case No. 3 (2). The fact remains that such a hair was present. We have encountered several such "abnormalities" in examination of scale count data. It is of interest to note the remarkable uniformity in the scale counts of the hairs examined by Gamble and Kirk. These figures are not in conformity with ours (2). For this phenomenon we have no satisfactory explanation.

† Director, Crime Detection Laboratory, Department of State Police, University of Oregon Medical School, Portland, Oregon.

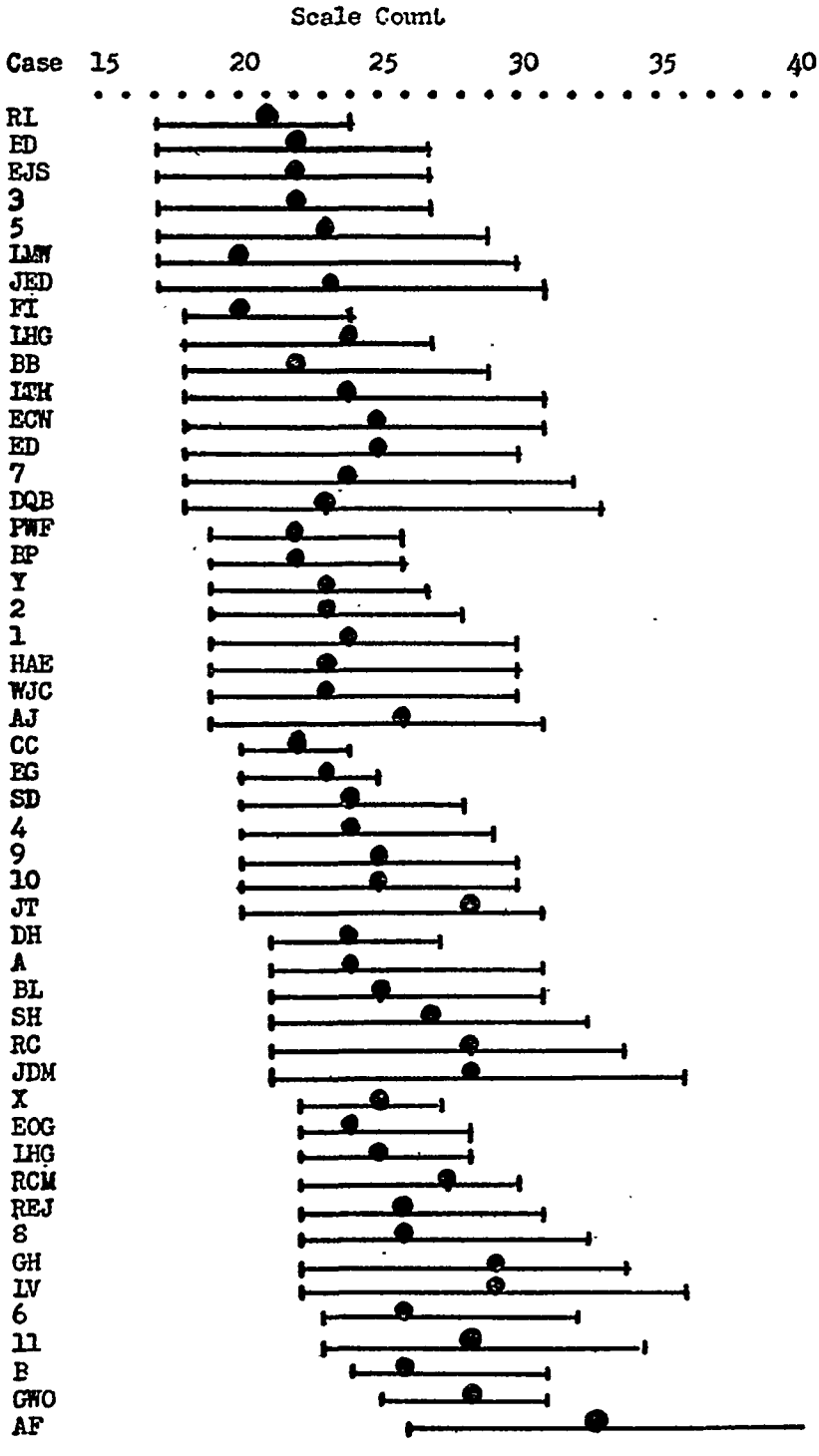
Scale Count
Case
15
20
25
30
35
40
RL
ED
EJS
3
5
LMW
JED
FI
LHG
BB
LTH
ECW
ED
7
DQB
PWF
BP
Y
2
1
HAE
WJC
AJ
CC
EG
SD
4
9
10
JT
DH
A
BL
SH
RC
JDM
X
EOG
LHG
RCM
REJ
8
GH
LV
6
11
B
GWO
AF

Figure 1

Gamble and Kirk state that a mean scale count is not representative unless 75 to 100 or more counts are made on each hair. We are in accord with this statement from the point of view of assembling a frequency curve with its minimum and maximum ranges and the statistical mean calculated therefrom. We seriously question however, whether such a statistical mean value with its ranges is of any more practical importance that the simple arithmetical average based on less extensive samples. In Gamble and Kirk's Table I (3) we note no significant differences in the scale count average, whether made on five or one hundred counts. Here the variation between individual hairs on the same person has been decreased, but we fail to see that this decrease is momentous. In this same table, it is also worthy to note the values for the scale count mean of their eleven individuals—a low of 22.0 and a high of 28.4, or a total range of 6.4 scales.

Figure I is derived from the data in Gamble and Kirk's Table I (1) and Tables I and II (3). We have taken the liberty of graphically representing their range of scale counts by the horizontal line and their scale count statistical mean by the dot. One of their cases (ES) was omitted because of the hair having been permanent waved, this being an essential duplication of their ES case reported. The data is presented to the nearest whole figure. Examination of this table will show that there is very little difference in the range of any of the hairs, with the exceptions of cases CC, X, ES, and possibly GWO (with a high general count). A range of 19 to 32 scale counts allowing a variation of ± 2 scale counts will cover approximately 94% of the hairs they report. If we adopt the statistical mean as a criterion in the identification of hair, a variation from 20 to 28 scale counts will cover approximately 84% of the hairs they report.

We believe that Gamble and Kirk's own tables show very little difference in the scale count of a single hair, regardless of whether five or one hundred counts are made. We feel that the statistical treatment of Gamble and Kirk's data is an interesting contribution to the minutiae of human hair, but we emphatically disagree with them when they state (3) that "the significance of scale counts is not a matter of opinion." In our opinion, the value of such counts in eliminating or individualizing evidence hair with that of a suspect is open to grave doubt.

References

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3. Gamble, Lucy H. and Kirk, Paul L., "Further Investigation of the Scale Count of Human Hair," J. Crim. L. & Criminol. (Pol. Sci. Sec.) *33* (3):276-280 (Sept.-Oct. 1942).