

# THE PROCRUSTEAN FIT— A Useful Statistical Tool For Decision Making

David T. Mage  
Chapel Hill, NC



1834 LITHOGRAPH, by Honoré Daumier.

Procrustes (1) performed the first recorded series of anthropological measurements. Until his conceptual breakthrough, height was only measured subjectively in the "eye" units, as still extant in Oklahoma for measuring corn e.g. as high as an elephants eye (2). Procrustes realized that if people were laid down, that he could objectively measure their length, and with a 90° rotation of coordinates, a linear transformation could convert the length to the height. For this purpose, Procrustes recruited subjects (3) for a single blind study (4) using a simple questionnaire administered verbally (5). Those subjects successfully completing the questionnaire were chosen for the measurement cohort. A study of the heights of the non-responders is reported elsewhere (6) and no difference of mean height between subjects and non-responders was found using a classical "Student tea" test (7).

Each subject chosen was placed on a calibrated bed which was exactly one lectaria (from which the french word 'lit' is derived) or, in the vulgate 'litter' from which the modern unit liter is derived (8).

Procrustes (a registered democrat) formulated the null hypothesis that "all men are created equal" (*homo sapiens est homo sapiens*) and carefully designed his experiment to minimize (eliminate) false positives and false negatives. All false negatives were stretched to fit the bed (9) and all false positives were amputated to fit the bed (10), from which the modern statistical terms of "bootstrap", "trimmed mean" and jack-knife" are derived. Procrustes work continued up until the time that he attempted to recruit Theseus (11) into his cohort.

The spirit of Procrustes survives today in the field of air pollution statistics where several different schools of thought assume that air quality data have a given distribution *a priori* and that it is not necessary to test whether or not this assumption is valid by use of a goodness-of-fit test. One such school assumes that "air quality data are lognormally distributed for all pollutants for all averaging times" and makes predictions about future air quality. (The lognormal or gaussian Distribution of logarithms, so named after a famous German mathematician (12)). Another school of air quality analysts suggest that air quality data, due to a single isolated source, are exponentially distributed and suggest "using a least squares fit for a straight line between the highest value and the percentile corresponding to the value of concentration below which the fit is not a straight line."

The beauty of these Procrustean fits is that they give statistical license to the use of straight line models forced fit to highly curved plots of data. This technique may then be useful for helping the USA to cut through its miasma in the acid rain controversy that won't allow control of power plant emissions until we can predict exactly and precisely what increase in pH will result. With this philosophy mankind would have starved to death long ago since we couldn't eat unless we could measure exactly how hungry we were.

## REFERENCES AND NOTES

1. Procrustes FX. "Corpus Longus Singularis Est", J. Antiq. Physio. LIX, xiv to xxii, -MLCXI
2. Rogers R, and Hammerstein O. "Observations of Corn Height", Oklahoma State U. Ag. Ext. Bull., 17, 1944
3. Uninformed consent was obtained
4. All subjects were blindfolded
5. "Tu pecunia o tu vivo"?
6. Procrustes FX. "Corpus Mortus Longus Singularis Est", J. Antiq. Pathol., MCX, ix to xx, -MLCX
7. Reading of tea leaves for portents whether to take an exam or call in sick and take a make-up exam.
8. A liter is the volume of water exactly 1.00000 meters long that has a mass of one kilogram
9. Procrustes FX. "Laccio per scarpe: statistica utensile trascurare" J. Imp. Rome Stat Soc. B, Appl., CX, i - iii, -MLCIX
10. Procrustes FX. "Truncus Data Singularis est". J. Olymp. Stat. Soc. XX, ix - xii, -MLCIX
11. Theseus NMI. "Les Rejection des Procrustes Theorem", J. Cretan Acad. Alchemy, XXI, v - vi, -MLCIIIX
12. Karl Freiderich Distribution, 1777-1855.