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## Relationships Between Micronaire, Fineness, and Maturity. Part II. Experimental

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Pages: 89-96  
*Textile Technology*

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In Part I of this series, models were developed and computer simulated to understand the variability in coefficients of determination ( $R^2$ ) between fineness and maturity, micronaire and fineness, and micronaire and maturity of cotton (*Gossypium hirsutum* L.). All plots of the simulated fiber properties produced families of lines rather than a single line because biological or cross-sectional perimeter plays a significant role in interpretation of the relationships. To enhance the  $R^2$  values, this paper revisits the Part I simulation database to obtain information about how to derive diagnostic relationships to fit to a simple linear model. These new expressions incorporate perimeter in the model in a way that families of lines give a single line plot. The diagnostic criteria for fitting data to a model are that plots of the data yield a single line with a high  $R^2$  and with predictable slope and intercept values. A fit of the data provides a proof for the Lord equation for micronaire and for the definitions of fineness and maturity in equation form. It is of special significance that the definitions of fineness and maturity are independent of the experimental methods of measurement and independent of the Lord equation. The diagnostic models were tested on 305 cottons with experimental data produced by the Southern Regional Research Center (SRRC) upgraded Fineness and Maturity Tester (FMT). For all of the diagnostic relationships, plots of the FMT data produced a single line with a high  $R^2$  and with slopes and intercepts that conform to simulation predictions.