

Papermaking, Ink Chemistry and Printability of “United States Three-Cent Bank Note”



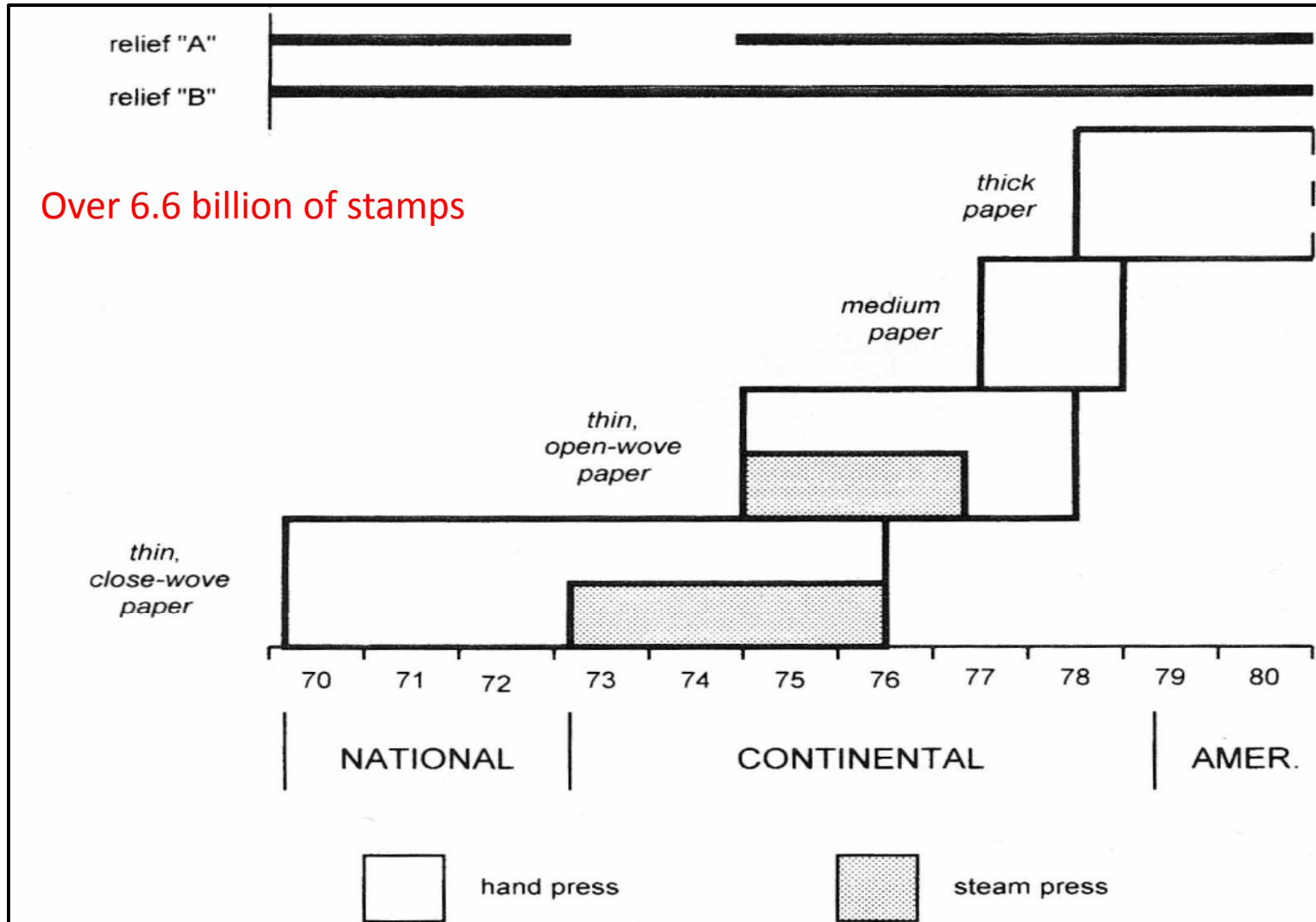
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Pekarovicova¹, Jan Pekarovic¹ and
John Barwis²**

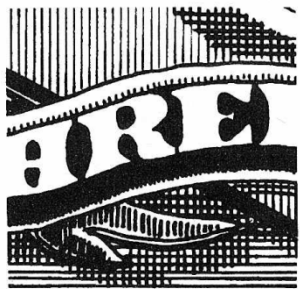
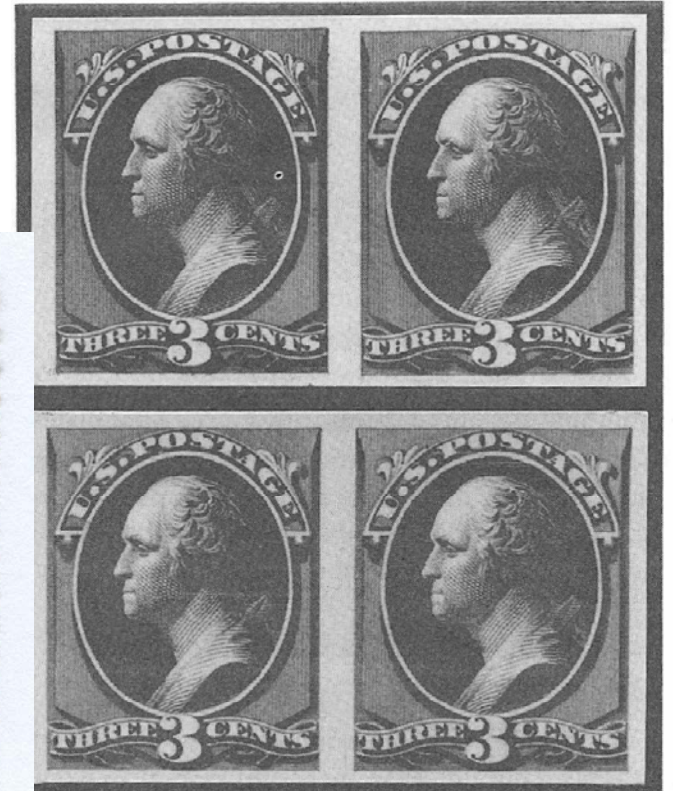
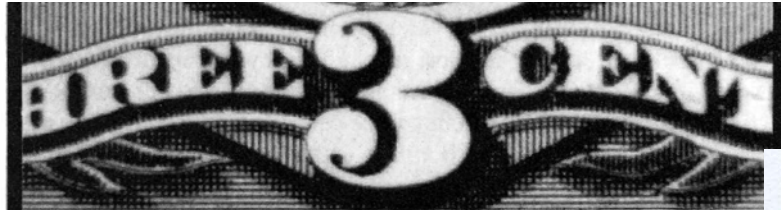


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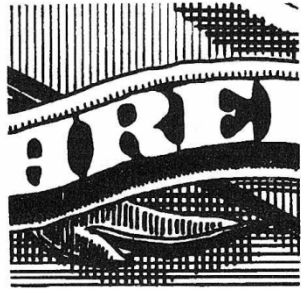
²Institute for Analytical Philately, PO Box 751833,
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Production of 3-Cent Stamp





National
original die



Continental
etched die

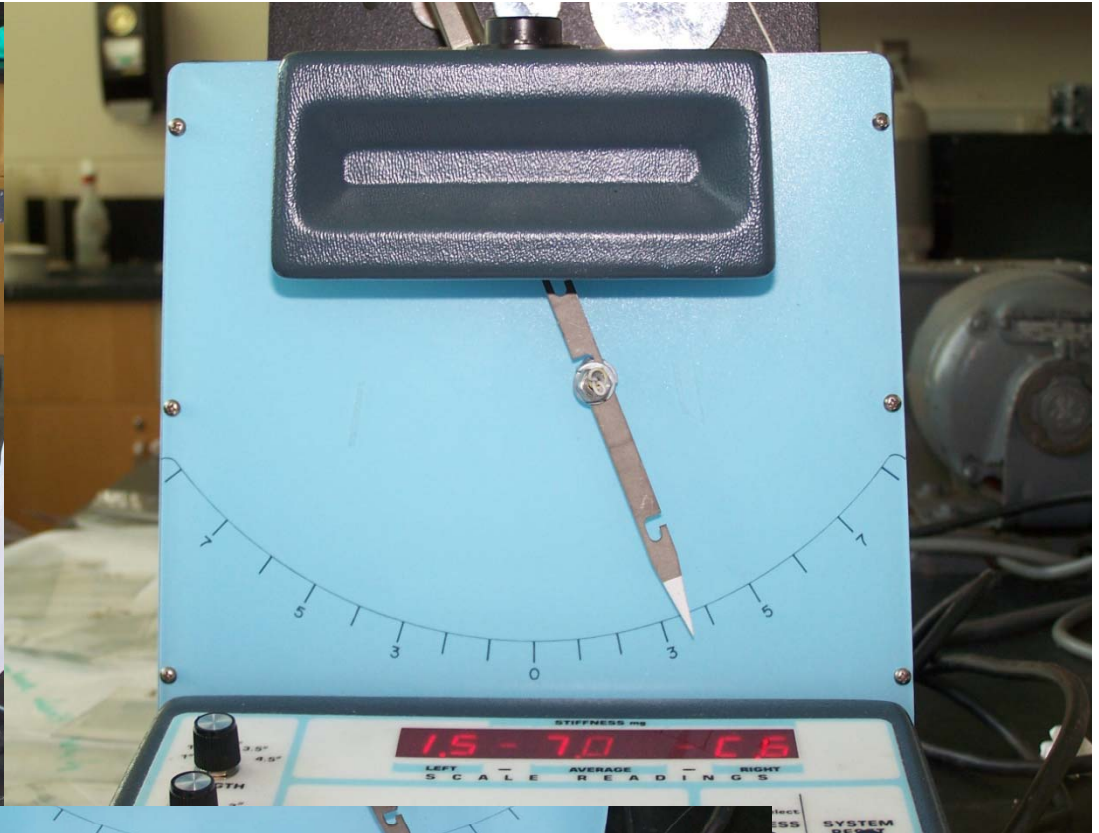


Relief B
basic design



Relief A
altered design

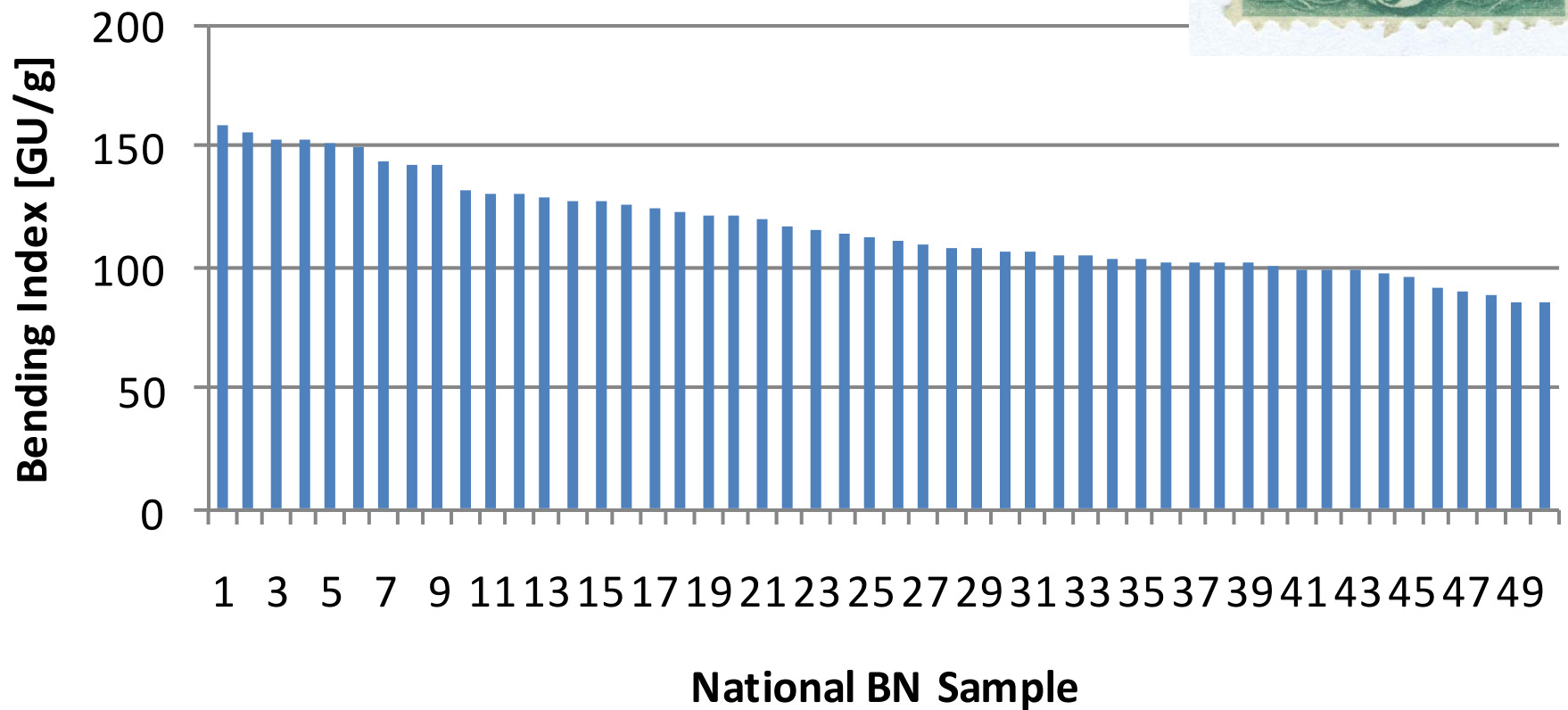
Issue	Printer	# Stamps	Analysis	Question
1870	National Co.	81	Paper	How many paper types?
1870	National Co.	9	Ink	The cause of color variation?
1873	Continental Co.	74	Paper	How many paper types?
1873	Continental Co.	14	Ink	The cause of color variation?
1878	American Co.	75	Paper	How many paper types?
1878	American Co.	9	Ink	The cause of color variation?
1881	American Co., re-engraved	115	Paper	Same paper as 1878 issue?
1881	American Co., re-engraved	11	Ink	The cause of color variation?



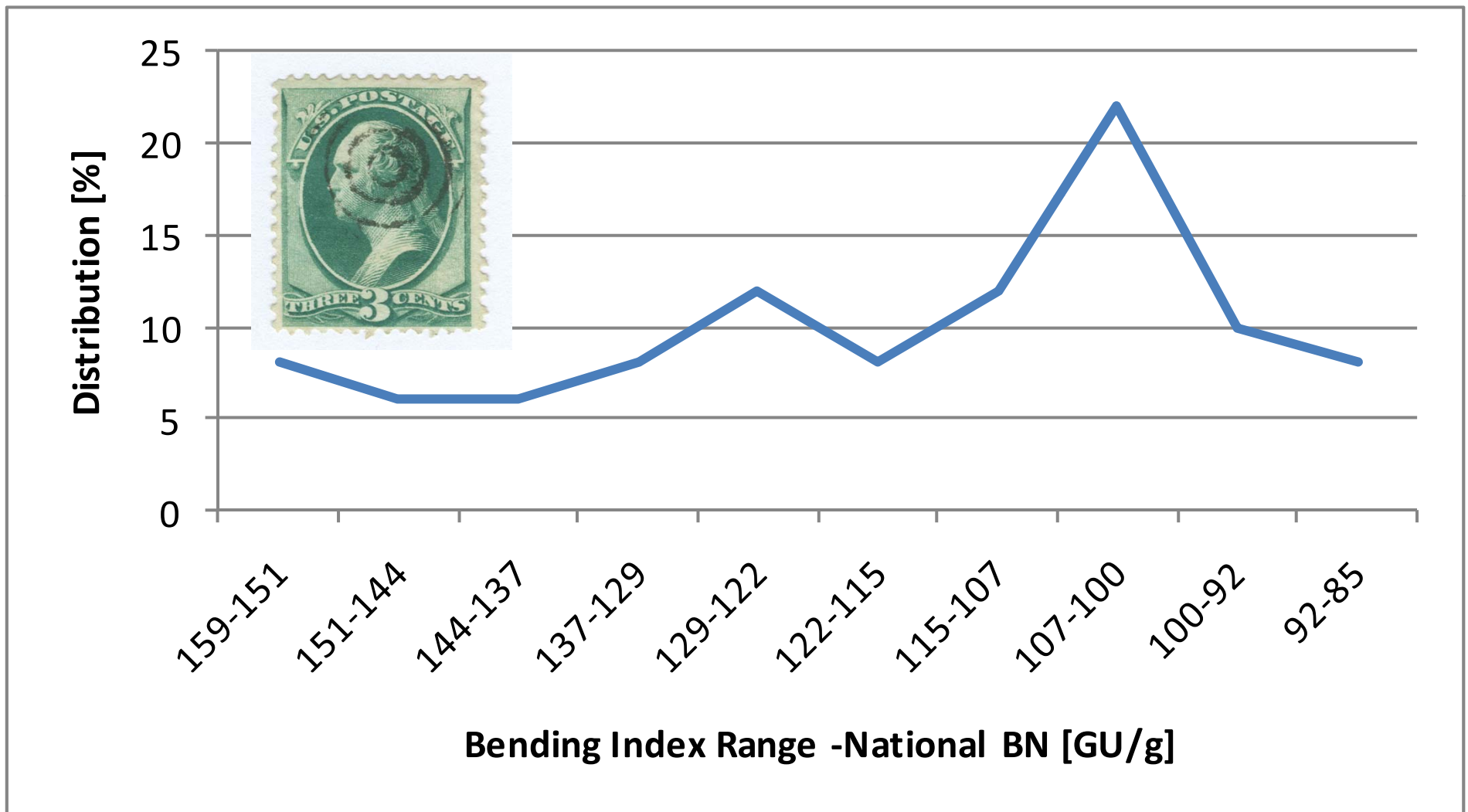
Customary Bending Index:

Bending Resistance/Stamp Weight

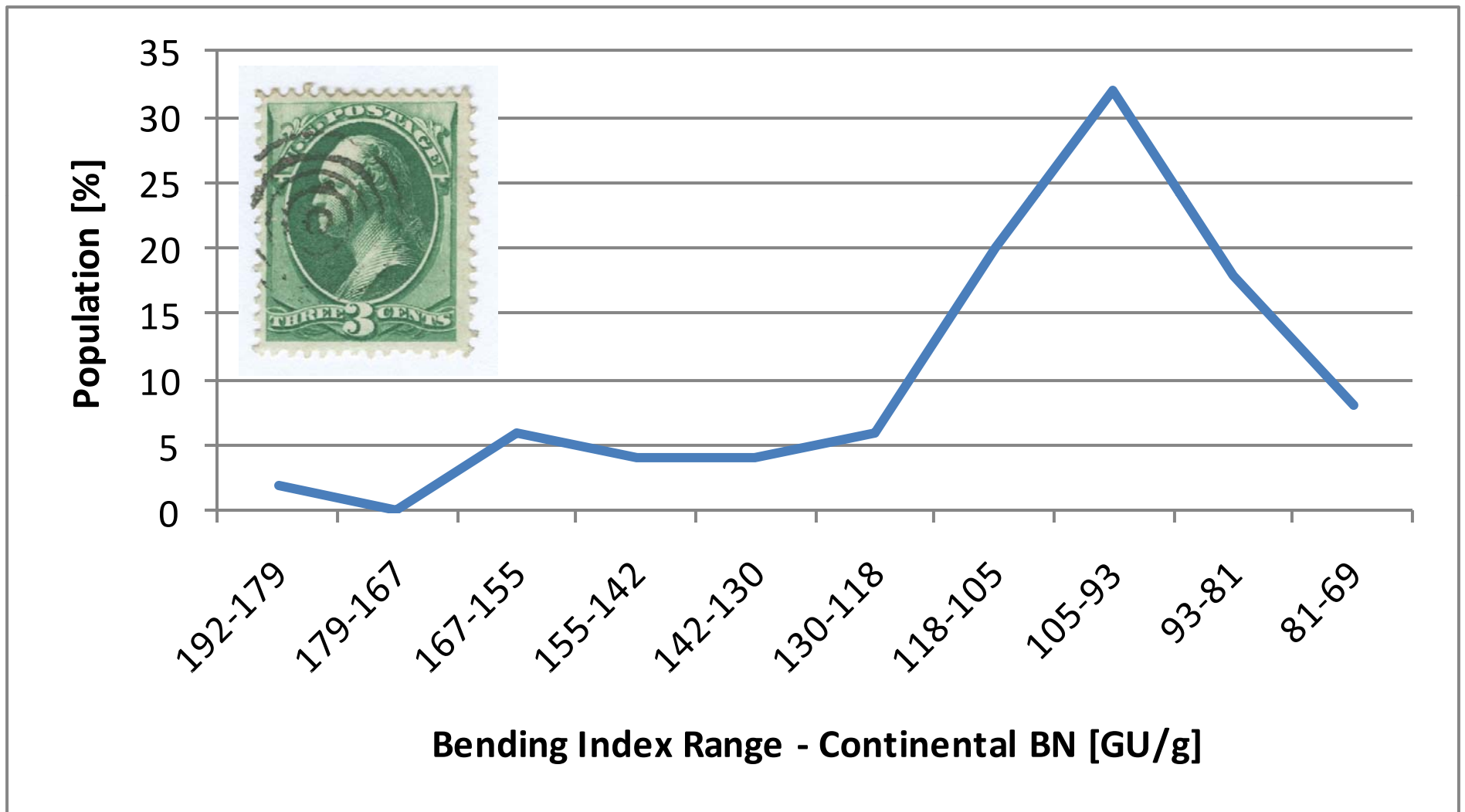
Bending Indices of National Stamps



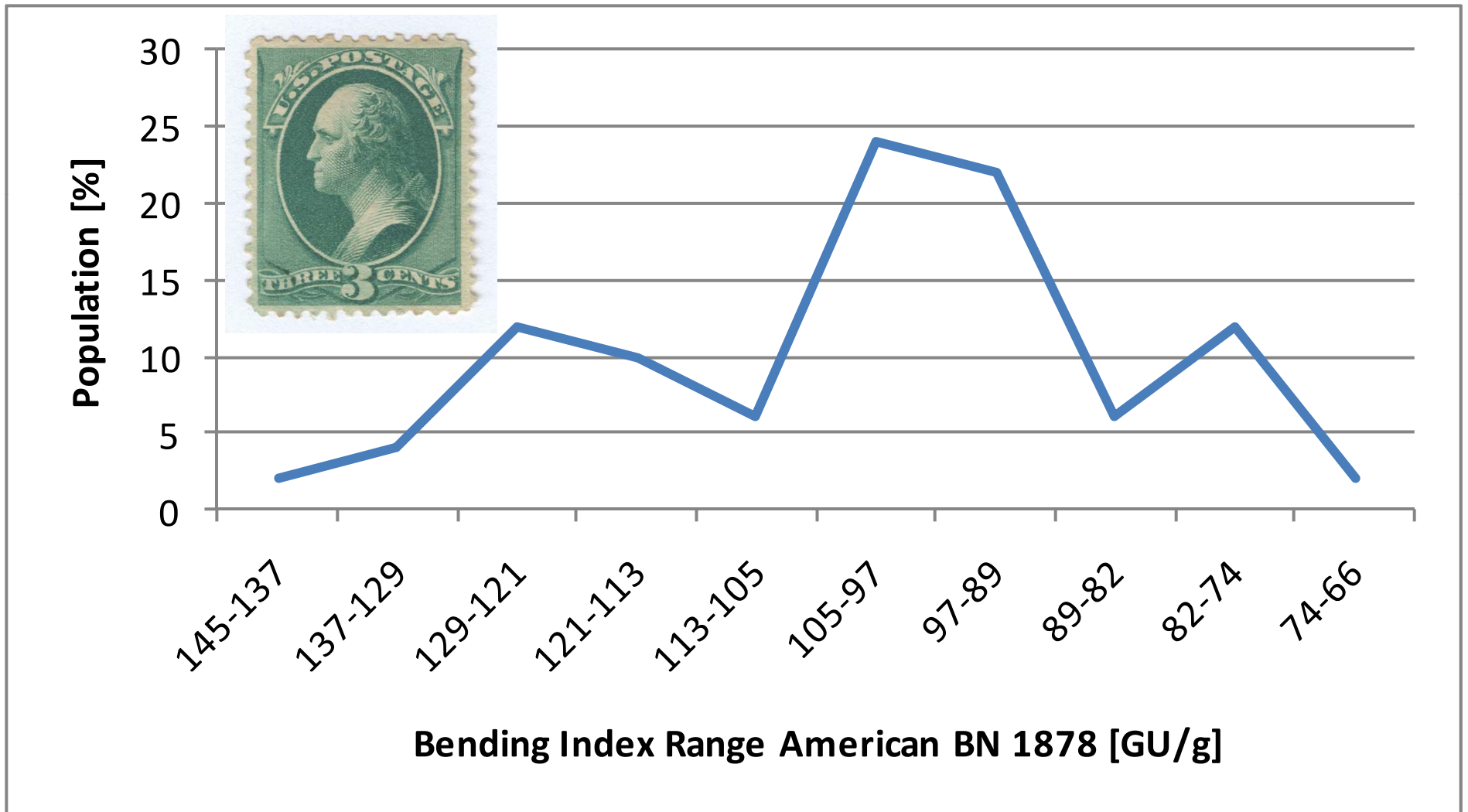
Population Distribution of National Stamps (GU Gurley Units)



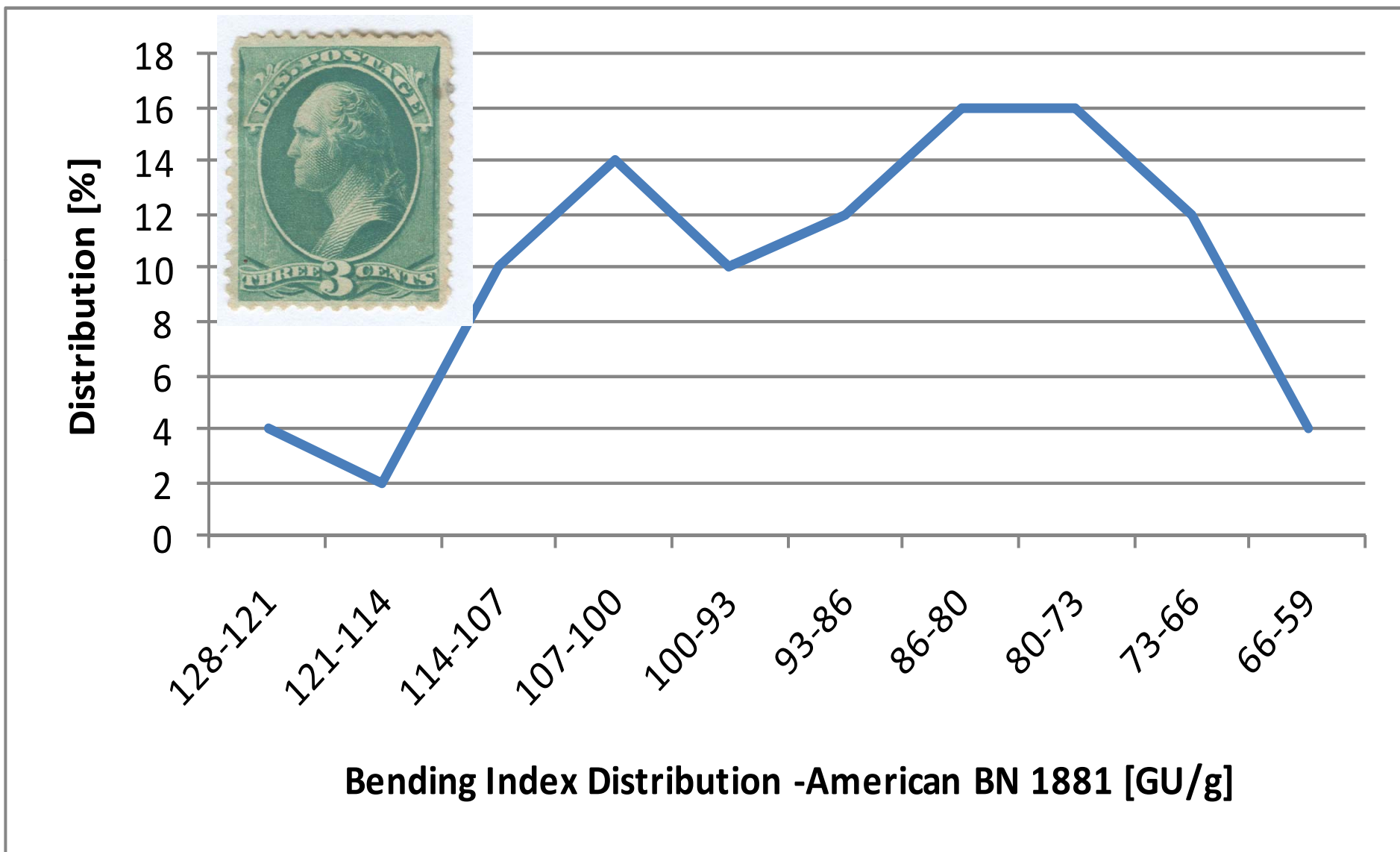
Bending Index Population Distribution of Continental Stamps



Bending Index Population Distribution of American 1878 Edition



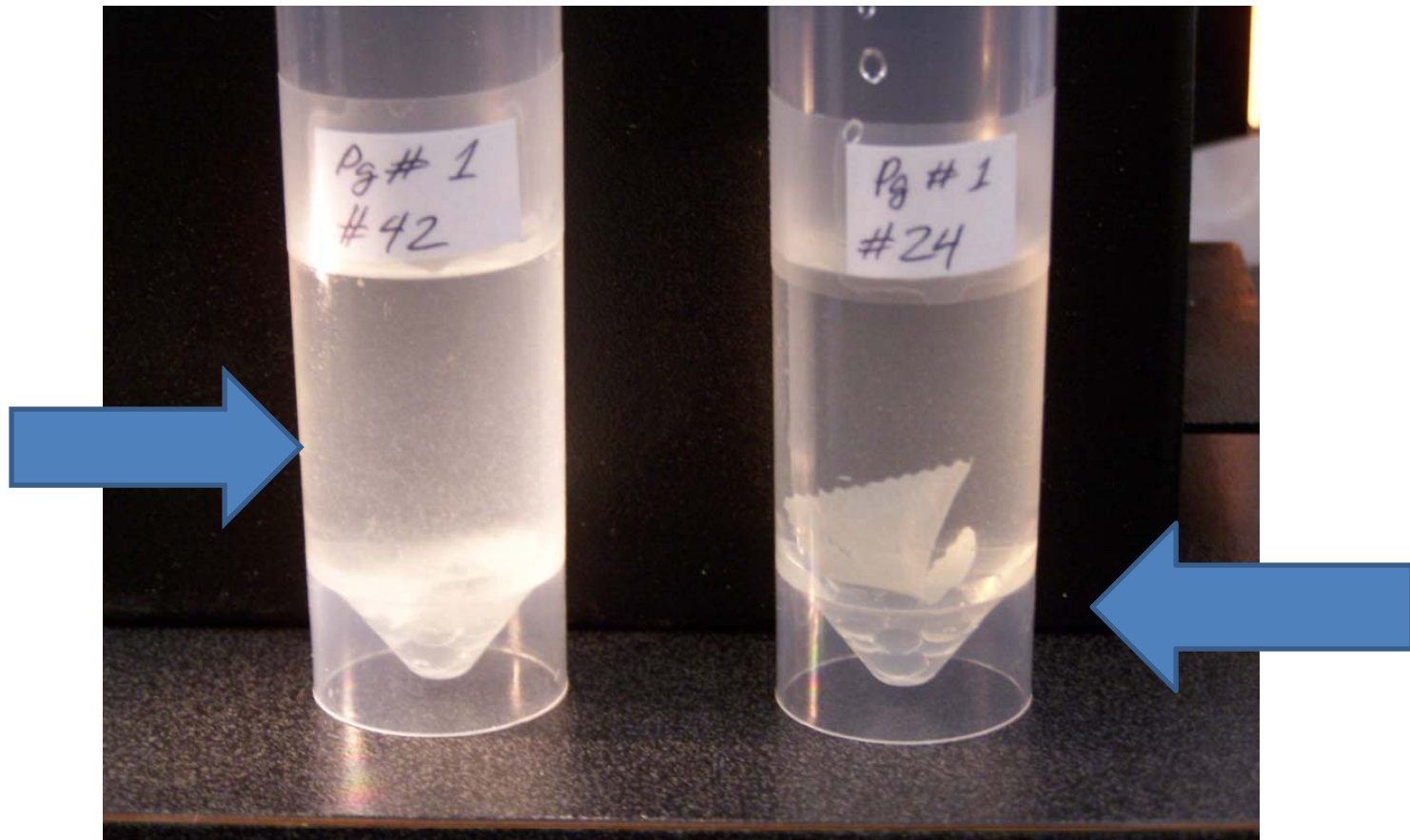
Bending Index Population Distribution of American 1881 Edition



Selection of Stamps for Fiber Analysis

Type	Range of BI [GU/g]	Stamp Number
National	122-129	3
National	100-107	25
Continental	155-167	43
Continental	93-105	4
American 1878	121-129	20
American 1878	97-105	27
American 1878	74-82	26
American 1881	100-107	40
American 1881	73-80	47

Repulping of National Stamps Prior to Fiber Analysis

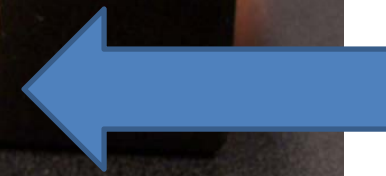
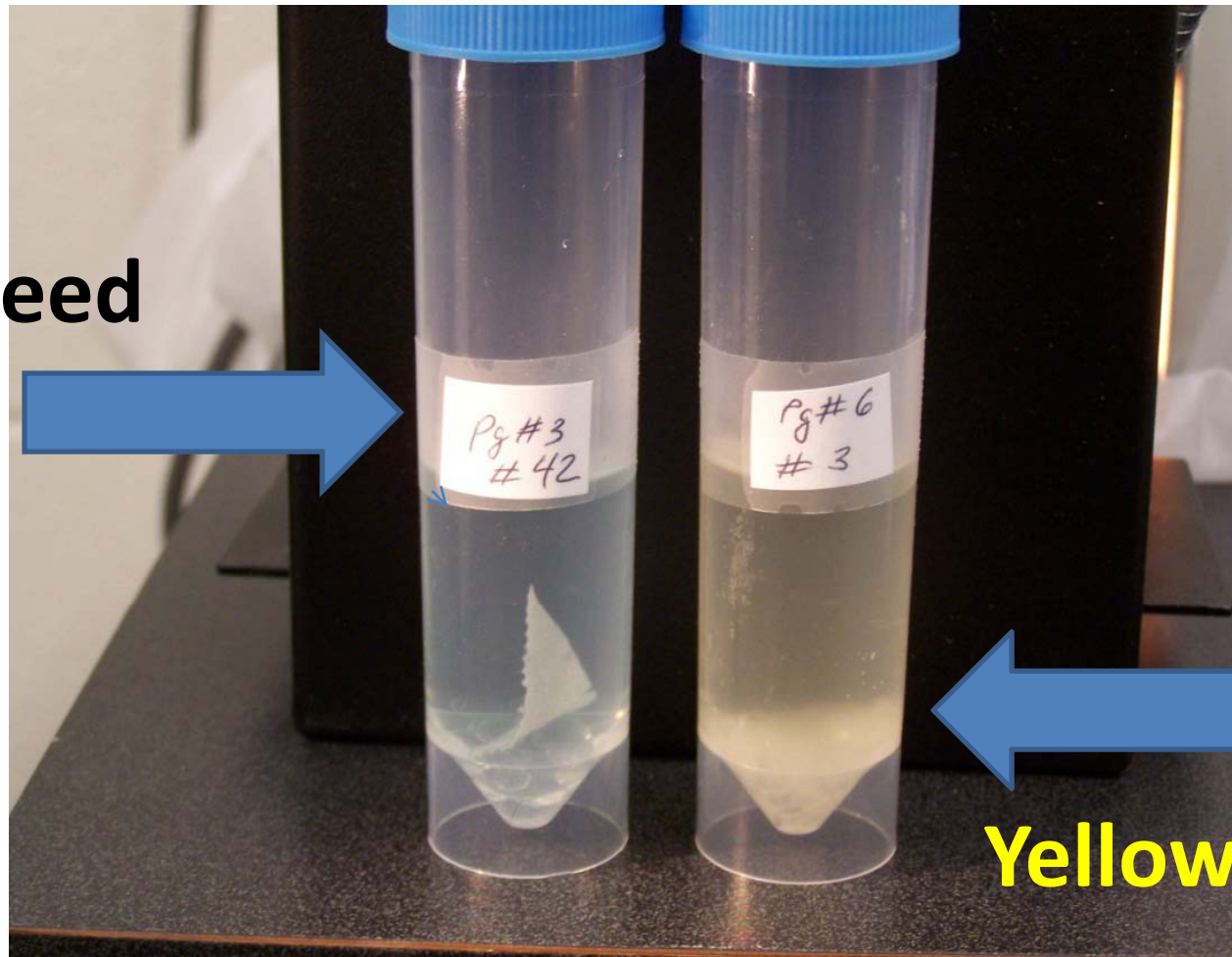
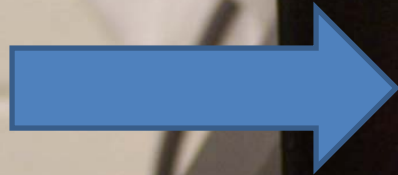


Easy repulping

Repulping difficulties

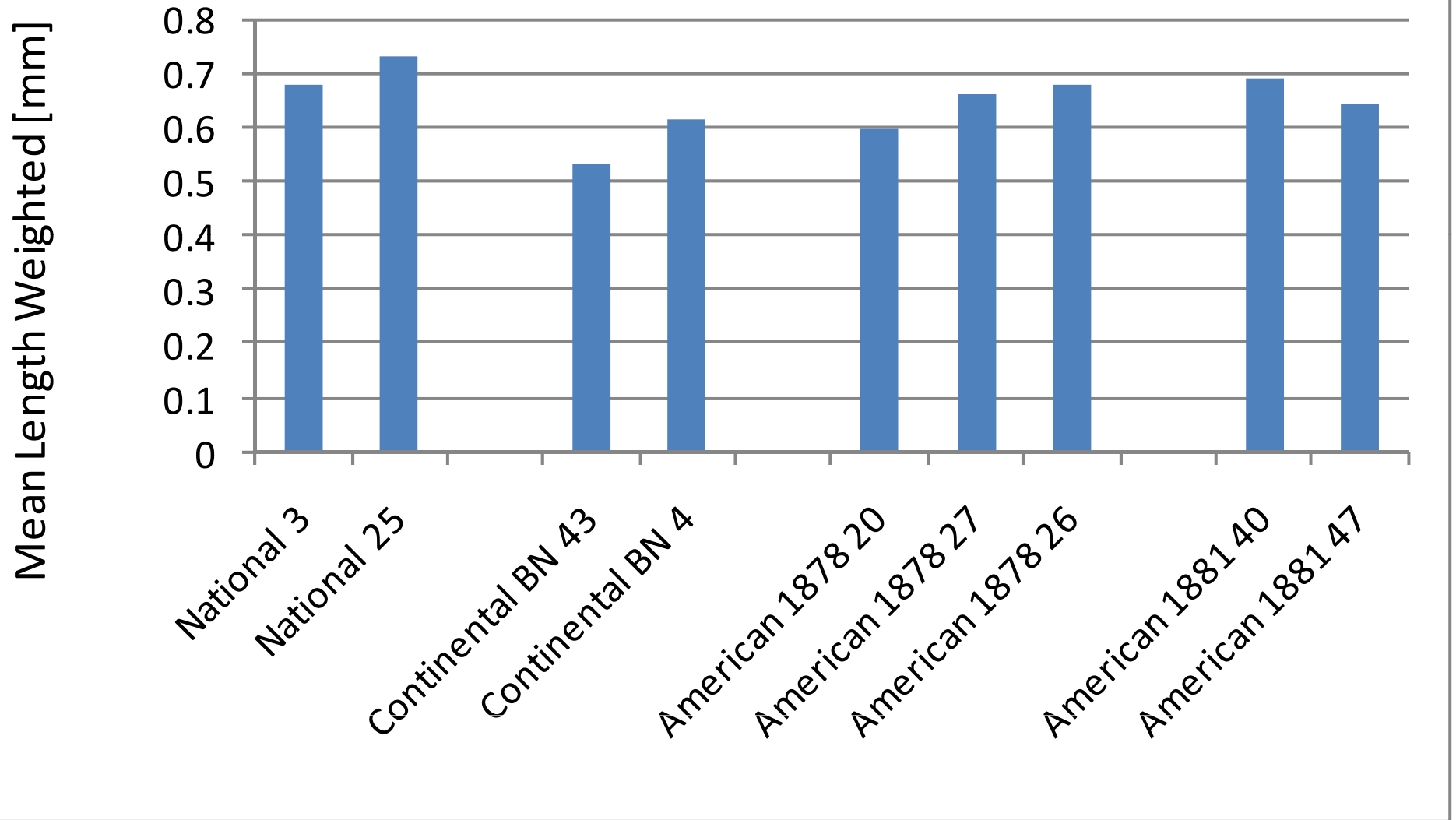
Repulping of Continental (Left) and American Stamps 1878 (Right)

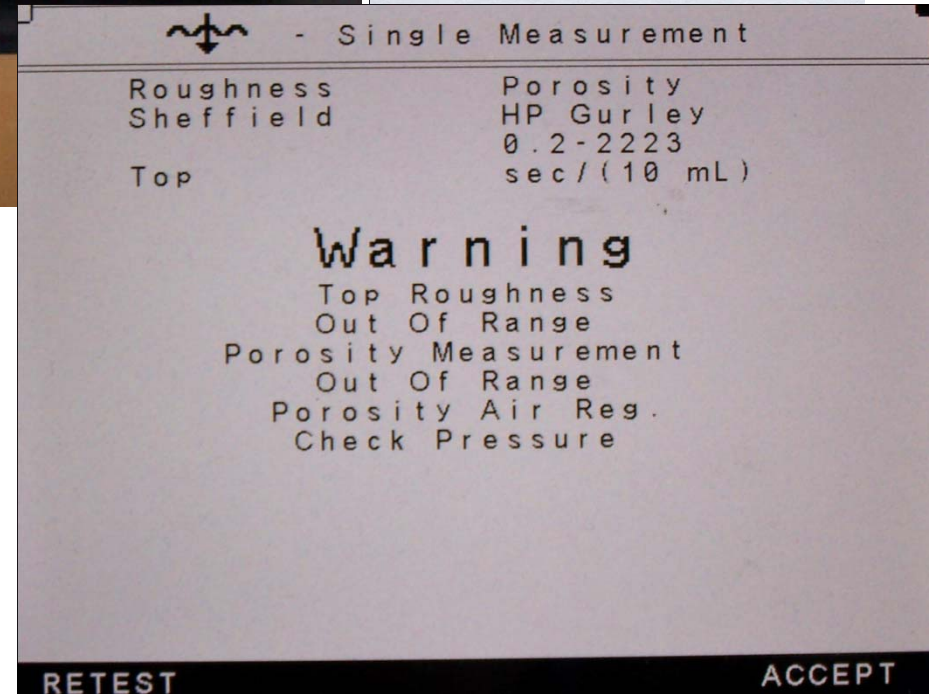
Bluish bleed



Yellow bleed

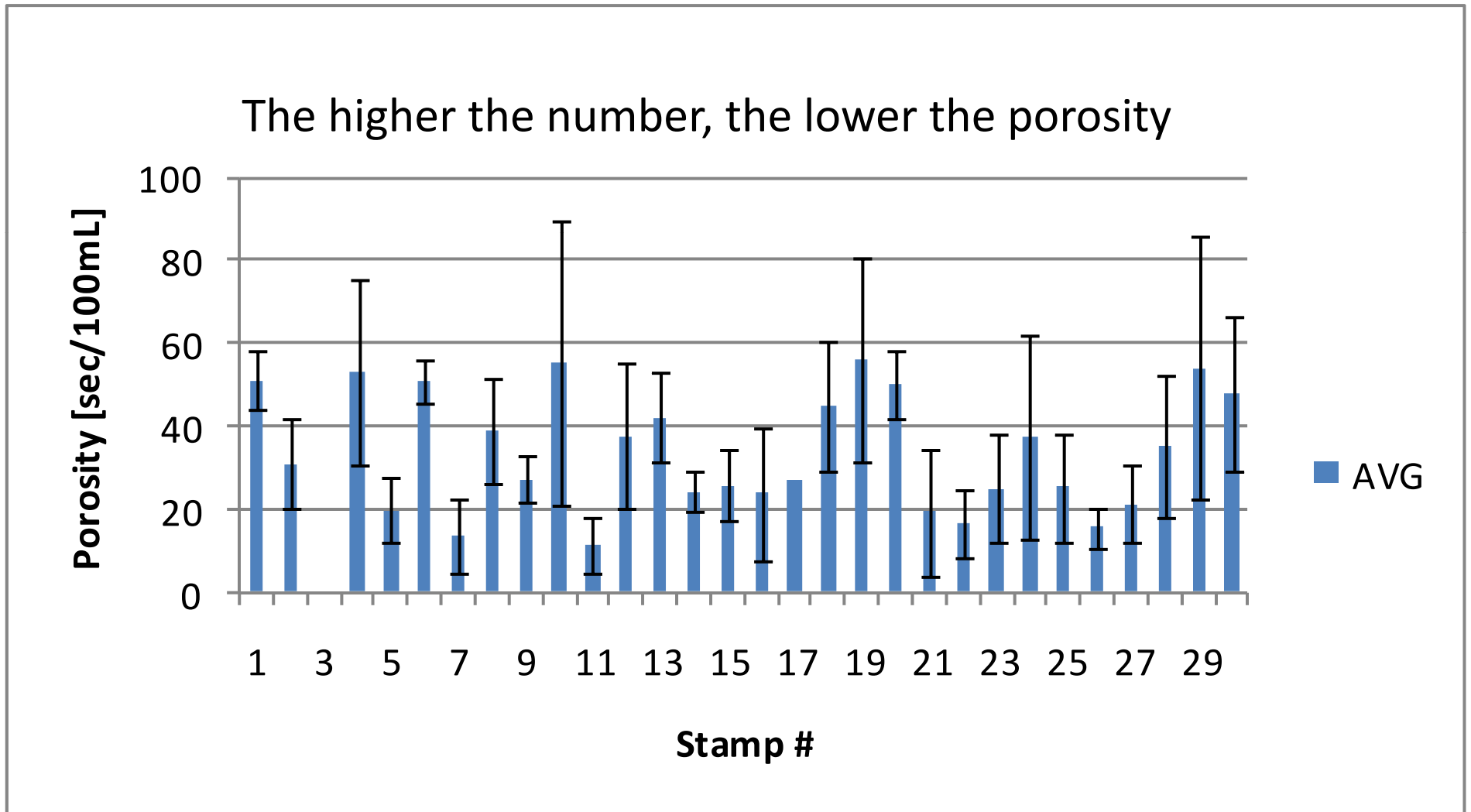
Mean Weighted Fiber Length of Analyzed Stamps



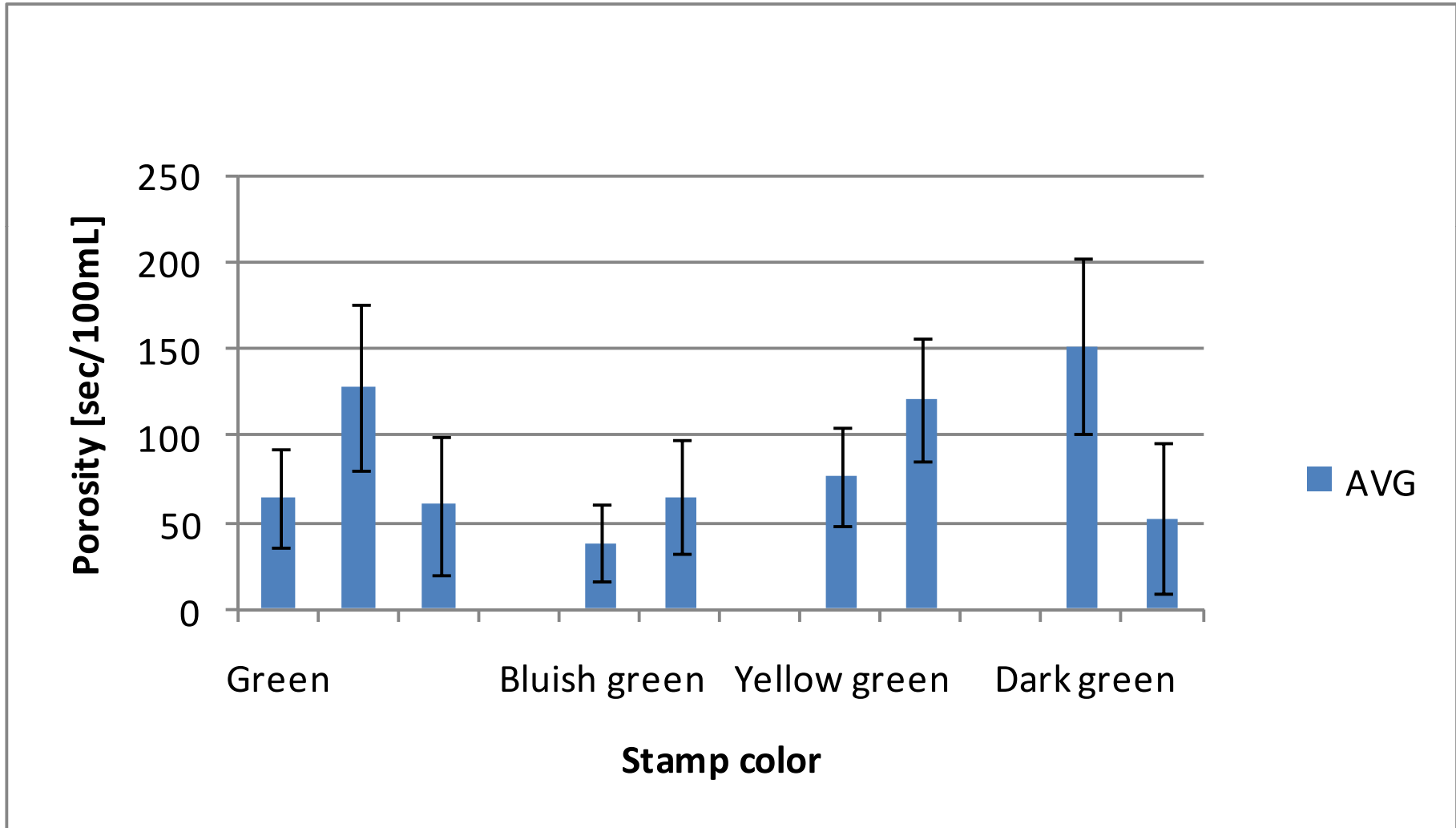


Technidyne Profile Plus instrument

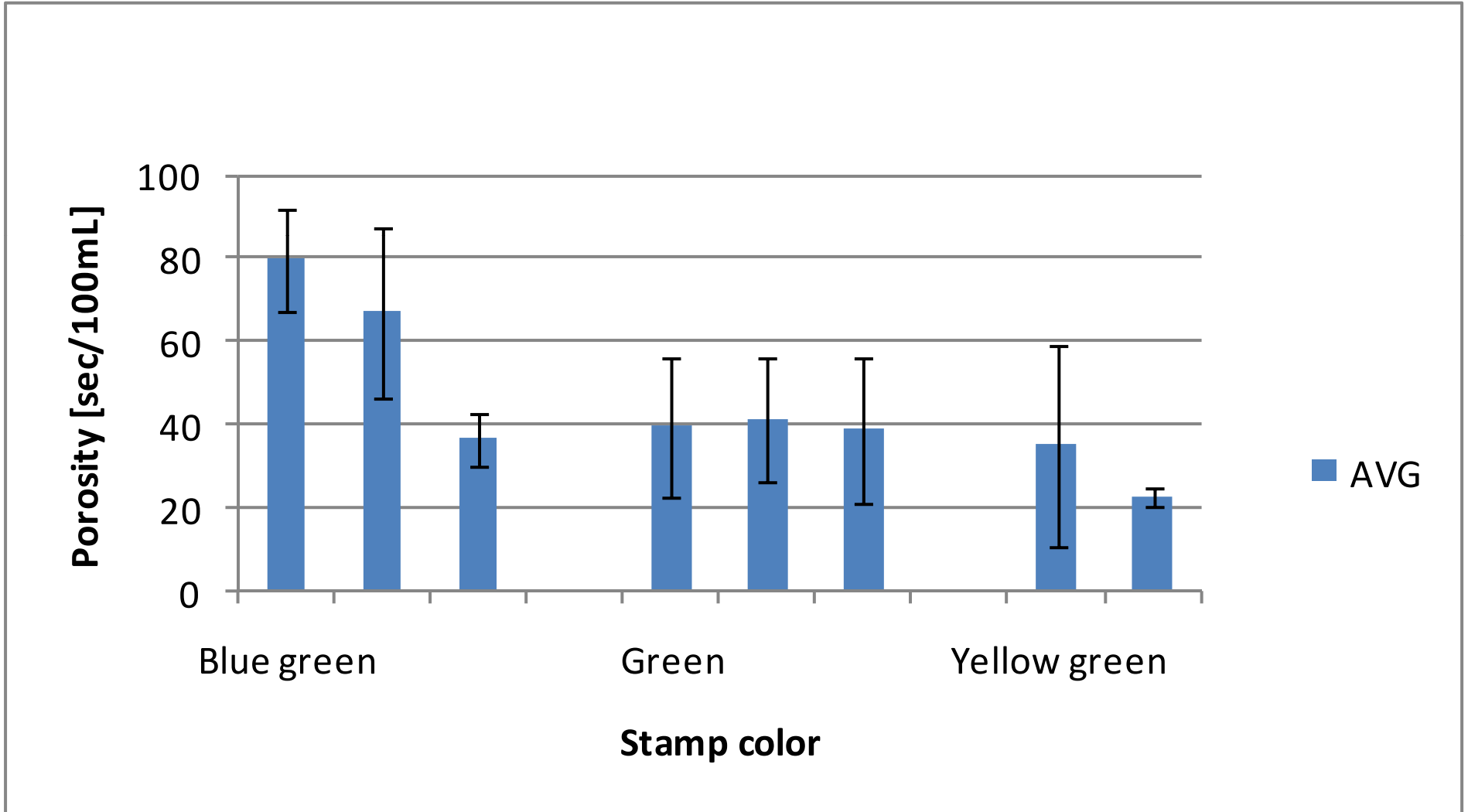
Oil Gurley Porosity of National Stamps



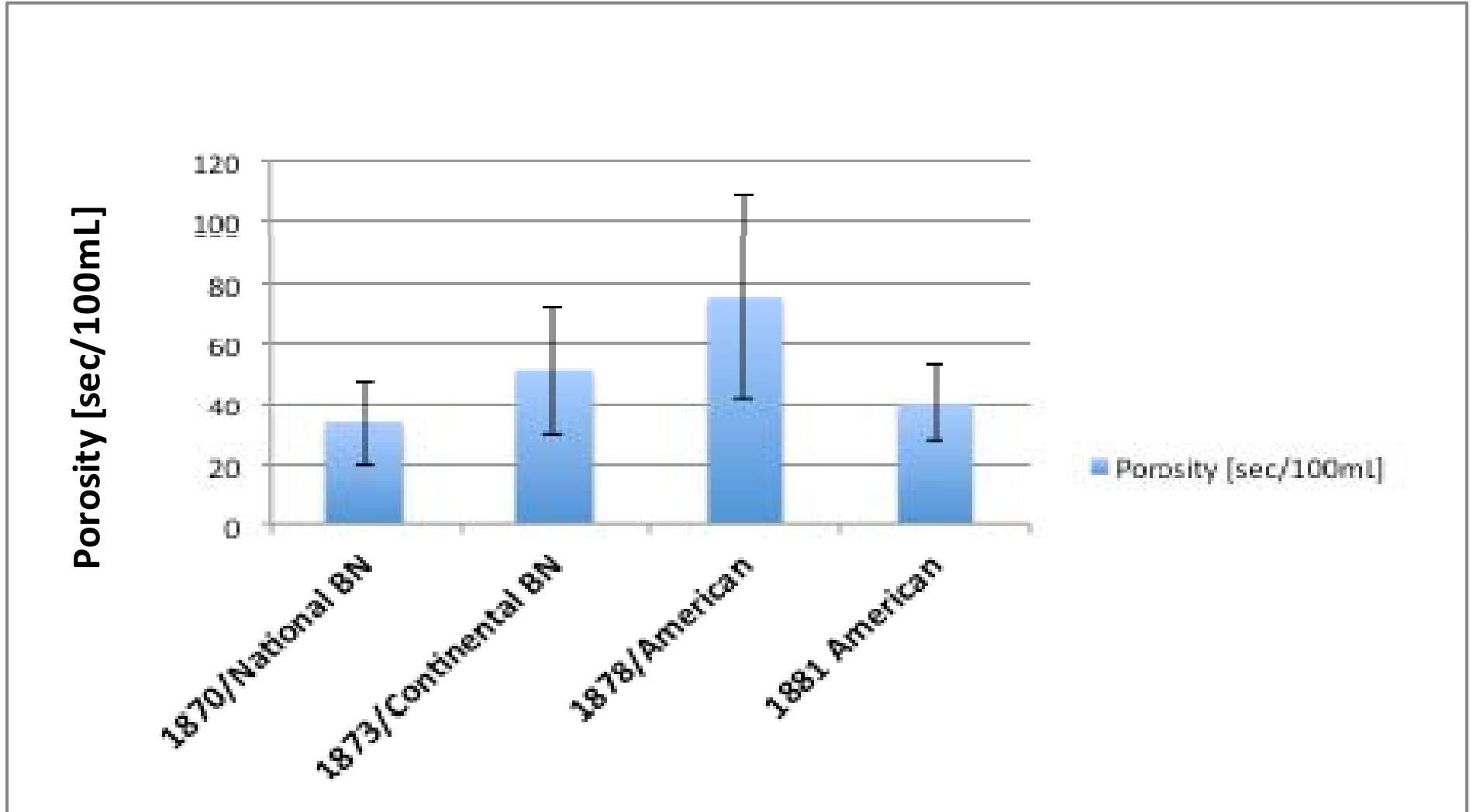
Oil Gurley Porosity of Continental 1873 Stamps



Oil Gurley Porosity of American 1881 Reengraved Stamps



Average Oil Gurley Porosity of Stamps



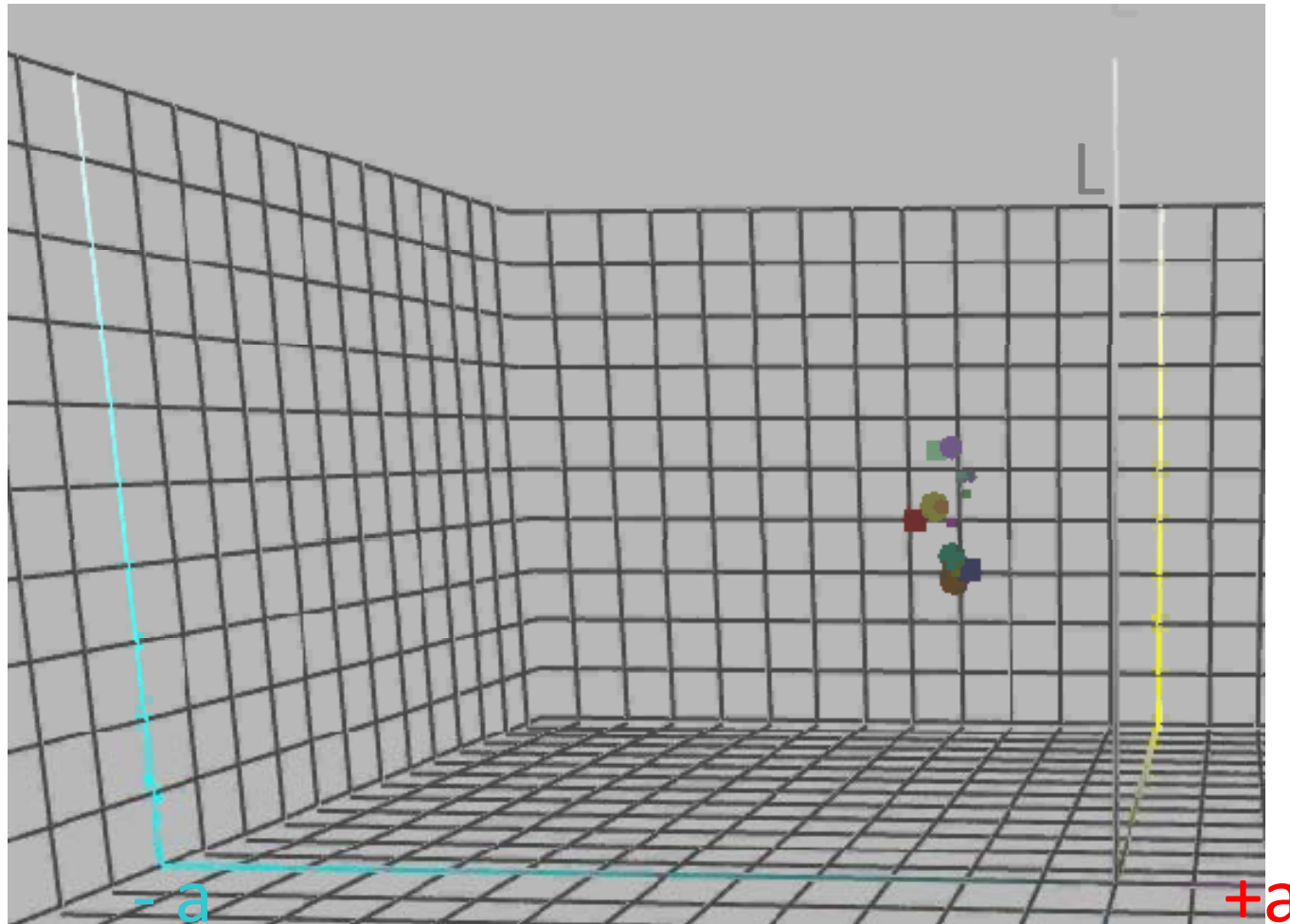
Colors shades from Scott Specialized Philately Catalogue

Green Family	Record use
Olive green	October 1873
Yellowish olive green	October 1873
Yellow green	May 1874
Deep yellow green	May 1874
Green	July 1873
Light green	July 1873
Deep green	July 1873
Emerald green	N/A

Average CIELAB Color values for Continental Stamps

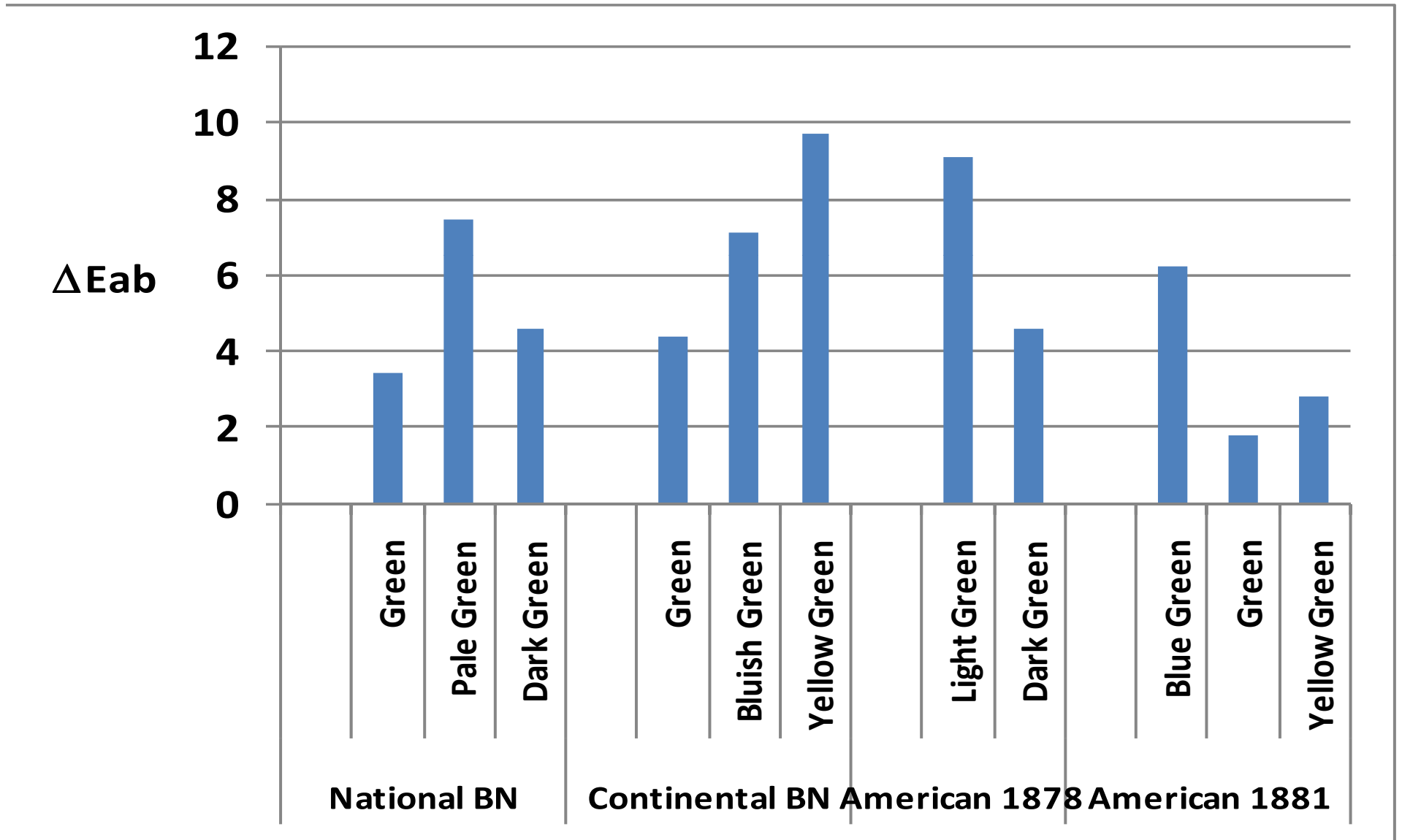
Color	L	A	B
Green	45.7	-22.4	9.6
Bluish Green	41.1	-21.3	3.3
Yellow Green	54.0	-24.2	12.9
Dark Green	42.5	-19.2	8.1
Olive Green	49.9	-15.5	11.6
Avg Continental	47.5	-23.8	7.5

CIELAB values of stamps



National - large squares; Continental - large circles;
American 1878 - small squares; American 1881 - small circles

ΔE_{ab} Color Difference of Average CIELAB from Designated Color



Conclusion

- Bending index analysis, fiber length analysis, and porosity analysis showed that all three companies used different types of paper.
- Within a company, National and Continental used two discrete types of papers, as was revealed by bending indices characteristics, and fiber length analysis.
- Three different papers were used in American within first period (1878), re-engraved edition (1881) was printed on two different paper substrates, as confirmed by bending indices analysis, and fiber analysis.

Conclusion

- Color “Green” as described by Scott catalogue is different for every manufacturer.
- Average CIELAB value of **National** stamp show $\Delta E_{ab} = 3.4$ color difference from National “Green”.
- **Continental** average stamp has CIELAB value 47.5, -23.8, 7.5 and its color difference from Continental “Green” $\Delta E_{ab} = 3.0$.
- **American 1787** has $\Delta E_{ab} 4.6$ from American 1787 “Dark green” , and **American 1881** has $\Delta E_{ab} = 1.8$ from American 1881 “Green”.



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THANK YOU!

