# Synopsis

## Title:

The Chemistry of the War Time Admiral
A spectroscopic study of the red 2¢ Admiral Issue of Canada
and
The identification of a WW I shade solely defined by its spectroscopy

## Purpose of Exhibit:

To show that the shade varieties and production problems seen in this issue can be correlated with major changes in the ink chemistry.

## Exhibit Plan:

The exhibit is non-traditional in that a significant amount of space is devoted to explaining the various spectroscopic techniques that are used to arrive at my conclusions.

**Section 1: Pages 2-4. Reflectance Spectroscopy**: Examples from the entire Admiral series are used to illustrate this type of spectroscopy. Next, the continuum of shades of the 2¢ red carmine is shown to be partitioned into two major groupings based on spectra. Finally, through plate blocks, the dating of the shade transitions is shown.

**Section 2: Pages 5-8. X-Ray Fluorescence (XRF) and Fourier Transform Infra Red spectroscopy (FTIR)**: These are used to show the changes in the ink chemistry that caused the changes in shade. Elements present in the ink are identified by XRF while chemical compounds in the paper and ink are found using FTIR. The major changes in ink chemistry occurred during WW I.

**Section 3: Pages 9-12. A Flow Diagram and the 'Aniline Ink' Variety:** The section details the steps in the production of a quality printing ink at the turn of the 20th century. It identifies the location at which the various compounds enter into the ink making process. It pinpoints the likely reason for a production flaw that causes a serious bleed through of the ink to the gum side ('aniline ink').

**Section 4: Pages 13-16. The 'Aniline Ink Pink' Shade:** Five expertized stamps certified as pink have a chemistry that is pre WWI and very similar to certified rose carmine stamps. Two other certified pink stamps are part of a group of only 2.1% of the 468 in this study. This group has unique features in both their reflectance spectra and chemistry. This group is called the 'aniline pink' shade as detailed in this section.

## Observations:

Most viewers of this exhibit will not have seen or heard of reflectance or Fourier Transform Infrared spectroscopy. Most will recognize X-Ray but not know about its application to elemental analysis. The challenge of the exhibit is to give the philatelist sufficient information about each spectroscopy so that they will be able to understand the types of *changes* in ink chemistry that are occurring with time and how the specific changes may or may not have influenced the changes in shade. Several instrumental type questions may arise when viewing the exhibit.

What information is obtained from reflectance spectroscopy? In the case of the spectra of

reflectance spectrum ( the linear term) is the tilt of the curve in the blue region mentioned earlier. This is explained on page 14. The chromium and zinc levels from XRF are combined with the reflectance parameters to form two three-dimensional plots shown on pages 15 and 16. The parameters from 14 expert certified stamps for shade are plotted in these graphs. Eleven of the fourteen stamps partition into two groups shown by black and green enclosing rectangles. The black rectangles have four certified pink stamp, two rose carmine and one with three certificates as rose carmine/ pink/ carmine. The stamps in this group have large negative linear terms, positive or small negative quadratic terms, high zinc and no chromium. *Stamps in this group are not unique since ~ 50% of the stamps (the rose carmine shades of Page 3) in this study would be included in this grouping.* The green rectangle has two stamps certified as pink and one certified as rose carmine-aniline ink. Four additional uncertified stamps round out the member of this rectangle. All have large negative linear terms, large negative quadratic terms, no zinc and low or no chromium. Shown are 7 of the 10 members that make up this subset that is *2.1% of the full population studied.* The remaining thee certified stamps are outside this specialized group. Whether or not this group deserves a special classification, it is my hope that by putting these stamps together in this context, it will make a contribution to the debate on the Admiral pink shade.

## Items of Impact in this Exhibit:

Plate No 1, certified pink is part of page 15. The paste-up coil of the tile page is a nice illustration of two shades, side by side and is comparatively rare.

## Items not in the exhibit but should be:

There is a reference to an aniline ink variety of plate 37 that is pre-war. I have yet to acquire it but it would complement the arguments used for plate 17 aniline ink especially if I could obtain a normal as well as an aniline ink copy. There are gaps in the time line, notably from around plate 45 to 55 and 114 to 130. However, I expect no deviations from the interpolated line.

## References:


The Admiral Series in General:
Marer, George C. 1982. *The Admiral Series of Canada*. State College, PA. American Philatelic Society

Aniline Ink Plate Blocks:
White, K. Hamilton and Kasimir K. Bileski. 1965. *The Canada Plate Block Catalogue*. Winnipeg, Canada. Baker and Sons.
Reiche, Hans. 1965. *Canada: The Admiral Stamps of 1911 to 1925*. Ottawa, Canada. Hans Reiche; Page 42.

Original Research:
Judge, Richard H. 2016. "The Admiral Issue of Canada: A Colorimetric and XRF Study of the Carmine 2¢ Issue." Proceedings of the Second International Symposium on Analytical Methods in Philately, ed. J. H. Barwis and T. Lera, pp. 21-30. Washington, D.C.: Smithsonian Institution Scholarly Press
Judge, Richard H. 2018. "Chemistry of Aniline Inks, 2-cent Admiral Issues of Canada." Proceedings of the Third International Symposium on Analytical Methods in Philately, ed. J. H. Barwis and S. Smith, In Press. Washington, D.C.: Smithsonian Institution Scholarly Press