TECHNICAL PAPERS

Confirmatory Analysis of the "Lost" Italian Varnish

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The old Italian violin makers such as Stradivari, the Guarneris, and the Amatis applied a varnish on their instruments that has not been equaled for beauty, transparency, and permanence. Unfortunately, they did not leave to posterity any record concerning its composition.

In a previous paper (*2*) confirmatory evidence of the rediscovery of the "lost" Italian varnish was presented from the results of spectrographic and microchemical analyses. However, all of the 10 specimens available for analysis at that time were brown in color. Subsequently, a good specimen of a brown-red varnish from a Francesco Ruggieri cello (1691) was obtained through the courtesy of Otto Lang, of St. Louis County, Missouri. As the red-colored varnishes of the old Italian violin makers were highly characteristic and as it has not been possible heretofore to produce red varnishes of similar transparency and permanence, spectrographic and microchemical analyses of this specimen should be informative.

Microchemical analysis. The theory was recently advanced by the writer (*1*) that the red color of the old Italian varnish was due to the presence of madder, which was the most important dyestuff known in those eras. A test for this coloring agent was developed, using varnishes containing madder (*1*). The presence of madder in the varnish from the Ruggieri cello was indicated by this test.

The behavior of this varnish upon solution in dilute alkali followed by precipitation with dilute acetic acid suggested the presence of resinous and/or fatty acids.

Spectrographic analysis. The Ruggieri specimen displayed the presence of a colored outer varnish and a yellow subvarnish, a combination frequently employed by the old Italian violin makers. As it was possible to separate the strata cleanly, spectrographic analyses were made of each layer. Shaw reported the following results for the two analyses: brown-red outer varnish—large amount of Ca, small amount of Si, Cu, Al, K and Mg, and trace amount of Na, Mn, and Fe; yellow subvarnish—large amount of Ca, small amount of Si, Cu, Al, K, Mg, Na, Mn, and Fe, and trace amount of Pb, Sn, and Ni.

The presence of calcium alone in relatively large amounts and of madder in a brown-red old Italian varnish is highly significant. It had been previously shown (*1*) that varnish films of madder-calcium rosinate are brown-red in color. Both analysis and synthesis have supplied some confirmatory evidence of the rediscovery of the "lost" Italian varnish.

The similarity of the analysis of the brown-red outer varnish to that of the subvarnish is also noteworthy. This would indicate that the subvarnish was converted to the color varnish by the addition of the coloring agents in madder, which is easily accomplished.

The other elements revealed by the spectrographic analyses may be due to the use of wood ashes, which the ancients could have employed to "harden" rosin and make it more suitable for varnish-making.

It was at first reported (*1*) that, if raw linseed oil is used with madder-calcium rosinate, the color is destroyed. However, by pretreating the oil, applying the varnish in thin films, and exposing these at once to light, the color becomes permanent. A brown-red varnish composed of alizarine-calcium rosinate and linseed oil, with turpentine as the solvent, has been prepared that possesses the desired depth of color, transparency, and permanence in its dried and aged films.

[1] The cooperation of Otto Lang in supplying the specimen of varnish and of Everett J. Shaw in making the spectrographic analyses is gratefully acknowledged.

References

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2. MICHELMAN, JOSEPH. *Amer. Paint J.*, February 16, 1948, 62.

An Experimental and Theoretical Approach to the Mechanism of Cocaine Action[1]

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The mathematical theories of excitation developed by Hill (*5*) and others regard the rate of development of the excitatory process under the stimulating electrode to be of great importance. A certain group of blocking agents, including cocaine, act without appreciably altering the "resting" state of polarization of nerve (*1*, *2*), and these appear to reduce permeability (cf. *6*). In view of these considerations an hypothesis has been set up with the postulate that the rate of transport of potassium from within to outside the fibers (e.g. under the cathode on "make") is a controlling factor in stimulation. On this basis, cocaine and related compounds would be expected to act by reducing membrane permeability to potassium. The following is a summary of some of the experiments which have been designed to test for such permeability

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