means of comparing its properties and those of the corresponding amino acid with the behavior of authentic samples of these substances. The nitrophenobarbital of melting point 279–280° must therefore be a *m*-nitro compound.

Residues obtained by evaporation of the alcohol used for purification of the crude nitration product will be examined for ortho and para nitro-derivatives.

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THE ACTION OF ELECTROLYTES ON WOOL FIBER

Sir:

During an x-ray investigation of the mordant dyeing of wool, an interesting phenomenon was observed. Using monochromatic radiation (Cu K_α) and mounting the fiber in a box type Laue camera in place of the usual crystal, pure wool fiber gives a very indistinct fiber diagram as contrasted with that obtained from the coarser keratin fibers [W. T. Astbury, *Trans. Faraday Soc.*, **29**, 193 (1933)] such as hair, quills and feathers. However, when this wool has been treated with certain electrolytes, two quite sharp and distinct rings appear. The inner ring is the more intense of the two, corresponding to a spacing of 4.08 Å., while the outer and lighter ring corresponds to a spacing of 3.72 Å. In the case of some of the wool samples, a broad ring quite close to the primary beam was observed corresponding to a spacing of 12.9 Å. Table I is a summary of the results obtained with all of the electrolytes that have been used. The third column indicates in a very approximate manner the visibility of the two lines (4.08 and 3.72 Å.) as observed on diagrams obtained after various treatments, relative to the type of treatment. It is interesting to note that wool which has been dyed as in a regular industrial process shows these two rings. The dye used throughout this work was commercial Orange II furnished through the courtesy of the Dupont Dye Company. NaX signifies the sodium salt of this dye. The wool fiber used was also furnished by the Dupont Dye Company.

It is suggested that the action of electrolytes, particularly those of an acid character, causes the wool protein to become crystalline to some extent and that these crystallites so formed are unoriented along the fiber axis as evidenced by the character of the rings. Table II shows the results of a calculation that would lead one to believe that these three rings are but high orders of a period of 77.8 Å. in length. The data in Table II are averages of all the observations made on many films. The rings on the

TABLE I

Nature of electrolyte	Treatment	Relative visibility of rings on diagram
NaX (5%)	Boiled 5 hours and rinsed in dist. water	Very good
NaX (5%)	Boiled 5 hours and washed 10 hours in boiling water	Faint but distinct
$AlCl_3$ (5%) and NaX (5%)	Boiled in $AlCl_3$ 2 hours, NaX 10 min. rinsed	Good
$CrCl_3$ (5%) NaX (5%) and HCl (1.5 *N*)	Boiled in $CrCl_3$ 30 min. NaX 10 min. (soln. 1.5 *N* HCl) boiled in water for 1 hour	Faint but distinct
$CrCl_3$ (5%) NaX (5%) HCl (1.5 *N*)	Boiled in $CrCl_3$ 2 hours NaX 10 min. rinsed (all solns. 1.5 *N* HCl)	Good
HCl (1 *N*)	Boiled 24 hours, rinsed	Very good
$HC_2H_3O_2$ (1 *N*)	Boiled 16 hours, rinsed	Very good
H_2SO_4 (0.5 *N*)	Boiled 16 hours, rinsed	Good
NaOH (3% of wool weight)	Boiled 3 hours, rinsed	Not definite but seems indicated
Na_2CO_3 (3%)	Boiled a few minutes until considerably decomposed	Not definite but seems indicated
NaCl (10%)	Boiled 16 hours, rinsed	Very faint
KI (10%)	Boiled 16 hours, rinsed	Good
$NaC_2H_3O_2$ (10%)	Boiled 16 hours, rinsed	Faint but distinct
Na_2SO_4 (1 *M*)	Boiled 16 hours, rinsed	Very faint
NaH_2PO_4 (1 *M*)	Boiled 16 hours, rinsed	Faint but distinct
$AlCl_3$ (1 *M*)	Boiled 5 hours, rinsed	Very faint
$AlCl_3$ (1 *M*)	Boiled 20 hours, rinsed	Faint but distinct
$AlCl_3$ (1 *M*)	Boiled 48 hours, rinsed	Good
Mordant and dye baths	Mordanted and dyed as in commercial process	Faint but distinct

various plates were precisely the same within the experimental error of measurement. Astbury gives 2.8 Å. as the length of a protein residue in wool. The length 77.8 Å. could be divided into 28 periods of 2.78 Å. each, which is very nearly Astbury's value for one protein residue.

TABLE II

Sin Θ	*d* (*n* = 1)	Intensity	Assumed *n*	$\frac{\sin \Theta}{n}$	% Deviation from average
0.05960	12.9	Strong	6	0.00993	+0.4
0.18824	4.08	Medium	19	.00991	+0.2
0.20677	3.72	Weak	21	.00985	−0.4

$$\text{Average } \sin \Theta/n = 0.00989$$
$$d = 1.54/(2 \times 0.00989) = 77.8\ \text{Å.}$$

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