Fig. 1. Viscosity of polystyrene in toluene. $\eta_{sp}/c = f(c)$. $M \sim 500\,000$.

dimetrically against that of the remainder of the solution. It was evident that the bending down of the curve could not be explained as due to concentration change only. The adsorption was only about 3 % at the lowest concentration, whereas a linear relationship had demanded 14 %. Also upon critical examination the shape of the curve indicated that an adsorption of the size in question is unacceptable, as the 'bending down' would have a considerably flatter progress then.

Very recently some other measurements of viscosity of very dilute polymer solutions have been published, where the results have been quite different from those described here. For polystyrene in toluene, Streeter and Boyer³ have found that the curve in question bends upwards and passes through a maximum. Possibly the different results are due to the different manipulation of the solution before the measurement, so that the higher viscosity from the measurements of these authors depends on the very long shaking of the solution during which a certain expansion of the molecules is possible. On the other hand the results they obtained upon concentrating the solutions indicate that it is not probable that the bending down of the curve found by the present author is due to some molecular breakdown.

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A New Sarsasapogenin Glucoside from *Narthecium ossifragum* (L.) Huds.

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The occurrence of a saponin fraction from *Narthecium ossifragum* was reported in a recent communication¹. The saponin was obtained by concentration of a diluted methanolic extract, which previously had been extracted with petroleum ether. Further work has led to the following observations. During evaporation under reduced pressure the main portion of the saponin precipitated in the form of minute white scales, which were filtered off. The mother liquor was successively extracted with ether, and small quantities of chloroform, which removed α -methoxy- $\Delta\alpha,\beta$ -butenolide². By continued extraction with more chloroform a sticky, greenish extract was obtained, which was evaporated to dryness and dissolved in ethanol. On careful addition of water a second crop of saponin could be obtained.

After repeated recrystallisation from hot diluted ethanol the saponin formed glistening, white platelets, a small quantity of which was further purified by chromatography on wet silica gel³. The purified saponin, when heated appreciably above 200°C, gradually darkened and finally melted to a dark brown syrup. The highest m.p. obtained lay in the neighbourhood of 285°. The saponin had a hemolytic index of about 110 000.

The purified saponin was submitted to mild hydrolysis and samples were withdrawn from the hydrolysis mixture at intervals. Paper chromatography of the samples showed that the hydrolysis led to an almost immediate liberation of arabinose, more slowly followed by galactose. After complete hydrolysis also xylose and glucose could be spotted on the chromatograms.

The crude saponin, as could be shown by paper chromatography⁴, yielded on hydrolysis one single saponogenin, which after repeated recrystallisation from methanol melted at 197–99°. $[\alpha]_D^{20} - 72^\circ$. (Found: C 75.0; H 10.70. Calc. for $C_{27}H_{44}O_8$ +

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CH_3OH : C 75.0; H 10.78. Found, after drying: C 77.2; H 10.64. Calc. for $\text{C}_{27}\text{H}_{44}\text{O}_5$: C 77.8; H 10.65.)

The acetylated sapogenin, after recrystallisation from methanol, melted at 128–30°. $[\alpha]_D^{20}$ –67°. (Found: C 73.2; H 10.21. Calc. for $\text{C}_{29}\text{H}_{46}\text{O}_4 + \text{CH}_3\text{OH}$: C 73.4; H 10.27. When dried by melting in vacuum, the acetate had m.p. 142–44°. (Found: C 76.2; H 10.19. Calc. for $\text{C}_{29}\text{H}_{46}\text{O}_4$: C 75.9; H 10.11.)

The chemical and physical properties of the substance are close to those of sarsasapogenin. The melting point of the sapogenin showed no depression on admixture with an authentic sample of sarsasapogenin. The identity of the two substances was further confirmed by the infrared spectra.

I wish to express my thanks to Professor N. A. Sørensen for his kind interest, and for determining the I. R. spectra.

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The Carotenoids of *Shepherdia canadensis* (L.) Nutt.

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Through the courtesy of Mr. Olav Gjærevoll, Museum of the Royal Norwegian Society of Sciences, Trondheim, a small sample of the fruits of *Shepherdia canadensis* has been obtained. The fruits were collected by Mr. Gjærevoll in Alaska, where they are called "soap berries". They are eaten by the natives, after being whipped with sugar to a fluffy mass.

An aqueous extract of the fruits indeed gave an extremely rich and stable foam on

shaking. The fruits had a moderately bitter taste. Work on isolation of the saponin, and, if possible, of the bitter principle will be attempted.

The fruits were intensely red in colour, due to substances of carotenoid nature, and it was considered worth while first to examine these substances. The carotenoids of other members of the *Elaeagnaceae* have already been subjected to such investigation. From the fruits of the sea buckthorn, (*Hippophaë rhamnoides* L.) zeaxanthin (Karrer and Wehrli¹) and physaliene (Winterstein and Ehrenberg²) have been isolated. More recently cryptoxanthin, lycopene, β -carotene and γ -carotene have been added to the list by Bielg³. In *Elaeagnus longipes* Gray, lycopoxanthin, lycopene and γ -carotene have been found by Geiger-Vifian and Müller⁴.

By chromatographic separation of the carotenoids of *Shepherdia canadensis* the fractions shown in Table 1 were obtained.

Table 1.

Zone No.	Colour	Absorption maxima, m μ , solvent petroleum ether		
1	Colourless	365	346	330
2	Diffuse khaki	475	447	425
3	Pale yellow	425	400	379
4	Khaki	477	448	
5	Pale yellow	425	399	378
6	Yellow-orange	485	455	432
7	Yellow	466	437	414
8	Yellow-orange	485	456	432
9	Orange	496	462	434
10	Red	504	473	444
11	Dark red	503	473	445
12	Salmon	485	452	
13	Pale yellow	425	399	378
14	Pale salmon	472	443	420
15	Yellow	448	425	400
16	Mauve	490	455	430
17	Salmon	Single max. at 450		
18	Yellow	450	421	400
19	Yellow	450	422	400

The zones are numbered in order of increasing absorptive power. The zones 1–11 were chromatographed on calcium hydroxide, the other zones on calcium carbonate.

The fractions 6 and 9–11 (printed in italics), contained the main bulk of the carotenoids. The fractions 12–19 contained very small amounts of pigments.

Fraction 11 gave after several recrystallisations from benzene-methanol dark, bluish

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