structural feature of the Milky Way as its bifurcation can be explained by a superposition of dark nebulæ, why should we consider this cloud-like appearance of the Milky Way as real? It is a natural consequence to suppose that less luminous spacings in the Milky Way, which are responsible for the separate appearance of, say, the cloud in Cygnus, are nothing else than the effects of obscuring matter, superposed on the otherwise continuous galactic train. From this point of view, the general cloud-like appearance of the Milky Way is just an illusion.

It seems preferable to think of our galaxy as a flattened system with the star density varying as a continuous function of the distance from the centre in Sagittarius (allowance being made for some local irregularities, like star clusters, etc.). On this distribution is superposed in our vicinity such a distribution of absorbing matter, which produces the appearance of the Milky Way clouds and of the 'local system'. Imagine ourselves located in one of the long dark patches in the Andromeda nebula, which are so similar to the obscurations of Ophiuchus and Taurus in our galaxy. In such a location we certainly would get a rather strange picture of this galaxy—its bright nucleus would disappear for us, while some minor portions of stellar distribution would appear as isolated bright star clouds. Immersed in this deceiving shadowy absorbing matter, even the best Andromedian astronomer certainly would prefer at the beginning a composite, instead of a unitary, model of his galaxy.

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Determination of Particle Weight and Shape from Diffusion and Viscosity Data

FROM a knowledge of the diffusion constant and viscosity of protein solutions, it has been found possible to estimate molecular weight and shape. By combining W. Kuhn's equation[1]

$$\eta = \eta_0\left[1 + 2{\cdot}5\,G + \frac{G}{16}\left(\frac{b}{a}\right)^2\right]$$

with Arrhenius's equation[2]

$$\eta/\eta_0 = \alpha^n,$$

we obtain:

$$\ln\alpha = \eta_0\left[2{\cdot}5\,G + \frac{G}{16}\left(\frac{b}{a}\right)^2\right];$$

where η is observed viscosity,

η_0 is viscosity of the dispersion medium,

$\ln\alpha$ is viscosity increment at infinite dilution,

G is total volume of material in 1 c.c. of solution,

b/a is ratio of the long to short axis of a rod.

By substituting the value of a/b obtained from the latter equation in the Herzog, Illig and Kudar equation[3] for the diffusion constant of an elongated ellipsoidal particle,

$$\frac{D}{D_0} = \frac{1}{2}\left(\frac{\sqrt[3]{\frac{a^2}{b^2}}}{\sqrt{1-\frac{a^2}{b^2}}}\ \ln\frac{1+\sqrt{1-\frac{a^2}{b^2}}}{1-\sqrt{1-\frac{a^2}{b^2}}}\right);$$

where D is the observed diffusion constant,

D_0 is the diffusion constant the particle would have if spherical,

a/b is the ratio of the short and long axis of the particle.

We are thus able to determine the ratio D/D_0 and from this ratio and the diffusion constant we can calculate the molecular weights of proteins.

In the accompanying table we give results for several proteins. The diffusion constants were measured at 20° C. by the refractometric method of Lamm[4] and the viscosities were measured at the same temperature with an Ostwald viscosimeter. The viscosity increments are those determined for the proteins at their isoelectric points.

The last column, giving the ratio M_η/M (sed.), shows that these values are constant, having a value around 0·71. In calculating the values a/b, I did not consider the hydration of the protein particles. If the hydration accounts for the big difference between the molecular weights determined from viscosity and diffusion data, and those determined from sedimentation data, we must conclude that the hydration factor is approximately constant for the proteins investigated.

Protein	α	$(a/b)_\eta$	$(D/D_0)_\eta$	$D \times 10^7$ cm.²/sec.	$D_0 \times 10^7$ cm.²/sec.	$r \times 10^7$ cm.	M_η	M (sed.)	M_η/M (sed.)
Ovalbumin	1·043	0·142	0·73	7·76	10·60	2·01	27,500	40,500[5]	0·68
Lactoglobulin	1·045	0·134	0·716	7·25	10·12	2·10	31,300	40,000	0·78
Serumalbumin	1·050	0·123	0·69	6·10	8·84	2·41	47,400	67,100	0·71
Amandin	1·056	0·124	0·70	3·62	5·17	4·12	238,000	330,000	0·72
Thyroglobulin	1·064	0·100	0·65	2·70	4·15	5·14	469,000	676,000	0·69
Octopus hæmocyanin	1·065	0·100	0·65	1·65	2·54	8·39	2,020,000	2,780,000	0·73
								Average	0·71

$(a/b)_\eta$ is value of a/b calculated from viscosity data.
M_η „ „ „ M „ „ „ „
M(sed.) „ „ M „ „ ultracentrifuge data.

The constancy of the ratio of the molecular weights calculated from diffusion and viscosity data and those from sedimentation data shows that we have a new method for the determination of the molecular weights of proteins.

A fuller report of this work will be published later on.

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[5] Unpublished determination by K. O. Pedersen.