we require a name which is more inclusive than 'molecular biology'.

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Feather Lipids

THE plumage of fourteen widely differing species of birds excepting that of a ratite, the emu (*Dromaeus novae-hollandiae*), contained approximately 2 per cent of lipids which were readily extractable with ether or chloroform. The primitive plumage of the flightless emu yielded only 0.4 per cent lipids.

These feather lipids were found to contain cholesterol, cholestanyl stearate and other steroids. Cholesterol and its esters contaminated by cholesterol were found in all fourteen species examined in amounts of about 7–15 per cent of the total feather lipids expressed as cholesterol¹. Non-steroid esters, the alcoholic components of which varied with species, were also present. For the duck these consisted mainly of octadecanol and eicosanol. However, the greater part of the feather lipids was made up of free optically inactive fatty acids, with a chain-length of 7–22 carbon atoms. The most prominent of these were palmitic and stearic acid.

The outstanding features of the chemical composition of the bird's feather lipids are their unexpectedly high cholesterol content and the large amount of free fatty acids. Usually, cholesterol is but a small fraction of the cholesterol present in vertebrate tissue and the bulk of the fatty acids is esterified.

Feather lipids are of dissimilar qualitative composition to preen or oil gland secretion, except for the octadecanol fraction of some birds. In these cases this fraction is still quantitatively different as, for example, in the duck, where octadecanol esters comprise about 90 per cent of the entire oil-gland secretion² and the total feather lipids only contain about 10 per cent.

The quantitative composition of feather lipids from any one bird varies according to the type of the feather and the part of the feather examined. For example, in the duck, small feathers have a relatively high octadecanol-eicosanol ester content (17 per cent) while the large tail and wing feathers contain only about 1 per cent of this fraction. The compact shafts of large feathers are characterized by a large amount of free cholesterol (16 per cent), while the barbs contain only about 4 per cent (Table 1).

Table 1. COMPOSITION OF FEATHER LIPIDS (DUCK)

	Cholesterol (per cent)	Cholestanyl esters (per cent)	Octadecanol fraction (per cent)	Fatty acids (per cent)
Small feathers	5	12	17	57
Large feathers	10	7	2	82
Barbs of large feathers	4	7	1	90
Shafts of large feathers	16	6	1	76

With no sebaceous glands in the bird's skin other than the preen gland, which may not be present (dove, emu, etc.³) the feather lipids found in the plumage are considered to be a by-product of the keratinization process apparently being formed with the feather as it develops. They are water-repellent enough to take the place of the secretion of the preen gland. Thus, water birds which had their oil gland removed surgi-

cally remained dry⁴, because the feather lipids functioned as water-repellents. In the controversy about the water-repellent properties of bird-feathers the role of the feather lipids has apparently been overlooked.

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¹ Bolliger, A., and Varga, D., *Austral. J. Exp. Biol.*, **38**, 265 (1960).

² Weitzel, G., and Lennert, K., *Z. physiol. Chem.*, **288**, 251 (1951).

³ Elder, W. H., *Wilson Bull.*, **66**, 6 (1954).

⁴ Fabricius, E., *Wildfowl Trust*, **10**, 105 (1959).

α -Conarachin

It is generally considered that the major globulins of dicotyledons and the prolamins and glutelins of monocotyledons are reserve proteins, that is, they are digested enzymatically on germination, whereupon the amino-acids and peptides are made available for protein synthesis¹. Actually, all the protein in the storage organ of the seed eventually disappears, as does the organ itself. But the label of reserve protein has been put on those proteins, small in number, which comprise a relatively large percentage of the total protein, which change early in germination, and which possess no obvious biological activity. Reserve proteins would be expected to have a characteristic pattern of metabolism on germination; ultracentrifuge patterns of protein extracts of pea-seeds at various stages of germination showed more rapid disappearance of the globulins², but this technique is not sufficiently discriminating to identify specific proteins with the pattern of change.

We have been able to achieve better identification of changes on germination with specific protein fractions of the peanut (*Arachis hypogaea*) by means of chromatography on DEAE cellulose. One fraction that changes its properties early on germination was isolated and named α -conarachin. It approaches monodispersity by standards of chromatography and ultracentrifugation.

The two major groups of globulins mentioned most often in the literature on peanut proteins are arachin, precipitated at 40 per cent saturation with ammonium sulphate from a salt extract of the peanut, and conarachin, precipitated by 85 per cent saturation of the supernatant after removal of arachin³. Both these fractions prepared from NC2 variety peanuts were dissolved in phosphate buffer, pH 7.9, $\mu=0.06$, and chromatographed on DEAE cellulose ('Selectacel', Brown Co.) by the procedures of Sober *et al.*⁴. Elution was with a linear gradient of 0.0–0.6 M sodium chloride; protein analysis was by the method of Lowry *et al.*⁵.

Chromatography patterns of the two fractions are shown in Fig. 1A; a pattern of an extract of the globulins from peanut cotyledons in the same buffer is shown in Fig. 1B. We have grouped the proteins into four arbitrarily selected fractions: the first is that which is not adsorbed on the cellulose; the second is eluted by salt concentrations up to 0.14 M; the third is eluted in the range of 0.14 to 0.23 M; and the fourth by concentrations of salt above 0.23 M. Arachin is mostly of group IV; conarachin comprises groups I, II, and III.

With the same chromatographic techniques, observations were made of changes in the proteins of peanut cotyledons after three days germination at