Dr. Birth's presentation

1. in biological materials, K is usually $\ll 10^4$

10^4 is the value of K where surface reflectance start to become appreciable

dry materials have air inside the cells, so diffusion of the radiation occurs more rapidly. Living cells have water inside, so less reflectance occurs between cell walls & cytoplasm..

a thickness for material can be determined at which transmitted light becomes completely diffuse. (compare 0 & 45°) This is related to scatter coefficient of K-M theory. This concept was tested with glass beads in gelatin

A regular array of balls did not result in diffuse transmittance, while a random array did. ∴ results from artificial samples should be looked at with suspicion. Dr Birth used fresh potatoes (10 samples) to test theories. The diffusion thickness measured by $\frac{T_0}{T_{45^\circ}} = \frac{1}{S}$, where S = scatter coefficient determined by K.M. equation & measuring T, R_∞ R_0. Thus, it is necessary to use a sample at least as thick as $\frac{1}{S}$, to ensure that the radiation becomes diffused within the sample.

Recommended definition of scatter is redistribution of light, without reference to the mechanism causing the scatter.

It ~~is~~ ~~still~~ has still not been done, to ~~calculate~~ scatter coefficient ~~[illegible]~~ in the case where many particles are close together & interact with radiation simultaneously.

An equation has been derived to test KM theory by moving detector across sample surface and determining the distribution.

Another has been derived as a function of sample thickness.

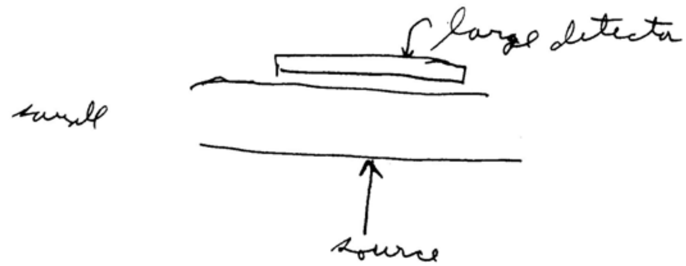
Note that if light enters the center of a spherical sample, it would, of necessity follow an inverse square law, but if the sphere is cut, there are ~~[illegible]~~ excess losses at the cut surface

The equation relating the distribution across the face of the sample is a more reliable way of determining S & K than the thickness. S should be kept constant, in order to determine K comment made – introducing ground glass between source + a leaf caused correlation of moisture content + reflectance to go from .7 ~~to~~ .9. In this case, 2 effects are probably occurring: the value of $Sd \approx 1$ so that within leaf the light is barely able to become diffused; + also there may be "holes" in the leaf.

"~~[illegible]~~ ~~is~~ 'Body reflectance" is recommended terminology for that light that enters the sample + is diffusely reflected.

Books: "Longhurst

Norris plans to measure S + K as follows:



+ measure light transmitted at different sample thicknesses

An important effect is the way particles pack.

If you can pack more + reduce the scatter, radiation will penetrate deeper + interact with more material.

Slurrys are good but the only suitable liquids are CCl_4 + CS_2 which are undesirable for health reasons.

Directed radiation is O.K. as long as light becomes diffused inside sample.

Scatter may be measured by 2 detectors at different distances

TRANSCRIPT OF NOTES – for searchability

Dr.Birth's presentation

1. In biological materials, K is usually $<< 10^4$

10^4 is the value of K where surface reflectance starts to become appreciable

Dry materials have air inside the cells, so diffusion of the radiation occurs more rapidly. Living cells have water inside, so less reflectance occurs between cell walls and cytoplasm

A thickness for material can be determined at which transmitted light becomes completely diffuse: compare 0 and 45^o. This is related to scatter coefficient of K-M theory. This concept was tested with glass beads in gelatin

A regular array of balls did not result in diffuse transmittance, while a random array did. Results from artificial samples should be looked at with suspicion. Dr. Birth used fresh potatoes (10 samples) to test theories. The diffusion thickness measured by $To/T_{45} = 1/S$, where S = scatter coefficient determined by K.M. equation and measuring T, R_∞, and R_0. Thus, it is necessary to use a sample at least as thick as 1/S, to ensure that the radiation becomes diffused within the sample.

Recommended definition of scatter is redistribution of light, without reference to the mechanism causing the scatter.

It has still not been done, to calculate scatter coefficient in the case where many particles are close together and interact with radiation simultaneously.

An equation has been derived to test KM theory moving detector across sample surface and determining the distribution.

Another has been derived as a function of sample thickness. Note that if light enters the center of a spherical sample, it would, of necessity follow an inverse square law, but if the sphere is cut, there are excess losses at the cut surface.

The equation relating the distribution across the face of the sample is a more reliable way of determining S & K than the thickness. S should be kept constant in order to determine K.

Comment made – introducing ground glass between source and a leaf caused correlation of moisture content and reflectance to go from .7 to .9. In this case, 2 effects are probably occurring: the value of $S \approx 1$ so that within leaf the light is barely able to become diffused; & also there may be "holes in the leaf.

“body reflectance” is recommended terminology for that light that enters the sample and is diffusely reflected.

Norris plans to measure S & K as follows:

[see diagram on page 3]

& measure light transmitted at different sample thicknesses.

An important effect is the way particles pack.

If you can pack more and reduce the scatter, radiation will penetrate deeper & interact with more material.

Slurrys are good but the only suitable liquids are CCL_4 & CS_2 which are undesirable for health reasons.

Directed radiation is OK as long as light becomes diffused inside sample.

Scatter may be measured by 2 detectors at different distances.