MAN MADE RIVERS
A summarization of the Evening Address delivered
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In Missouri we are blessed with two of the largest rivers in the world. We share a
small part of the 553 miles of the Missouri River with Kansas and Nebraska, but we
"own" all of the 367 miles across the middle of the state. The Mississippi River
is three different rivers in one. From St. Louis north to Iowa we share 159 miles
of river-lakes created by low navigation dams with Illinois. Below St. Louis the
Mississippi River is similar to the canalized Missouri for about 200 miles to the
Ohio River. Below the Ohio River the Mississippi River is a giant river, broad and
impressive. We share 127 miles of the giant with Kentucky and Tennessee. So all
totaled, Missouri has a big stake - over 1,000 miles - in our Big Rivers.

In our studies of the Missouri and Mississippi Rivers, we have found tremendous man
made changes. From the time the early settlers arrived when the rivers were wild,
with numerous productive back waters, side channels, cutoffs and sand bars, to the
present we have lost a tremendous acreage of habitat for fish and wildlife. There
is still a remnant of the Missouri River above Sioux City, Iowa, in which we can
see what the river must have been like.

Man's early efforts were to remove snags and shoals to eliminate hazards to shallow
draft vessels. Later the Corps of Engineers was authorized to develop navigation
channels on the Mississippi River, and to stabilize the river banks and provide for
navigation on the Missouri River. These early efforts were with pile dikes and
proved to be fairly effective. As an example of the work done, the two maps of the
Missouri River depict the loss of aquatic habitat and channel capacity for flood
waters.

In later years the Corps switched from pile dikes to stone dikes. Stone dikes are
very effective tools in canalizing sediment carrying rivers. Where dikes fail to
produce adequate channel depths the Corps moves in and dredges sand and gravel from
the river bottom. This material is usually dumped adjacent to the navigation
channel with some further loss of channel capacity and aquatic habitat.

Millions of dollars have been spent to canalize our rivers for navigation and
millions more have been spent for flood control. The step by step canalization of
the Missouri River can be depicted in slides of various reaches of the river. At
times we suspect engineers dream of a rock lined canal with uniform height levees
and gravel roads for maintenance of the canal. My suspicions were confirmed one
day when visiting the University of Wyoming, I noticed the following inscription
over the Engineering Building front door, "Strive on...The control of nature is
won, not given". Why must we "control nature"? Can't we accommodate into our
system of life natural forces?

In Missouri in 1973 nature took control and flood waters covered many thousand acres
of bottomland along the Missouri and Mississippi River. Levees built too close to
the channel were topped and broken, homes and farms were flooded. The flood was
far from a record in the amount of water that passed St. Louis (850,000 cubic feet
per second), but the height of the water (43.5 feet) was a record, surpassing the
previous record (42.7 feet) set in 1846, when 1,300,000 cfs. flowed past St. Louis
in what must have been a wider floodway. Data have been collected that indicate a
serious trend in the loss of flood channel capacity due to navigation works like stone dikes, and levees placed too close to the river channel. In the 1973 flood, one of the key purposes of canalizing the rivers was disrupted when navigation closed for several weeks. Long reaches of the Missouri and Mississippi Rivers have been subjected to canalization. The end result is an aggravation of flooding and cessation of navigation during flood periods. The consequences of continuing the canalization of our large rivers are severe. It seems apparent that we must begin with nature in mind, rather than continuing our faltering efforts to control nature.

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BIOSYNTHESIS OF CHLOROPHYLL

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The following is a laboratory exercise that I developed for my Plant Physiology course, based on an exercise in Experimental Plant Physiology, ed., San Pietro. The purpose of the exercise is to make the students aware of the fact that plastids contain DNA and their own protein synthesizing machinery. The results of this experiment will allow the students to draw some conclusions as to the source of the mRNA for certain enzymes and also the site of synthesis of these enzymes.

The students need to be informed that δ-aminolevulinic acid (δ-ALA) is a precursor of chlorophyll and that (1) rifamycin inhibits the RNA polymerases which function in plastids, (2) chloramphenicol inhibits protein synthesis on the 70S ribosomes found in plastids, and (3) cycloheximide inhibits protein synthesis on the 80S ribosomes found in the cytoplasm.

Biosynthesis of chlorophyll:

δ-aminolevulinic acid → \text{number of intermediates} \rightarrow \text{protochlorophyllide (porphyrin ring)}

\begin{center}
\begin{tikzpicture}
\node[draw] (a) {δ-aminolevulinic acid};
\node[draw] (b) [right=of a] {protochlorophyllide (porphyrin ring)};
\node[draw] (c) [below=of a] {chlorophyllide};
\node[draw] (d) [right=of c] {chlorophyll};
\node[draw] (e) [above=of c] {+ phytol chain};
\draw[->] (a) -- (b);
\draw[->] (c) -- (d);
\draw[->] (c) -- (e);
\end{tikzpicture}
\end{center}

Materials:

0.2 M sucrose
0.01 M δ-ALA in 0.2 M sucrose
50 μg/ml cycloheximide in 0.2 M sucrose
same but containing 0.01 M δ-ALA
3 mg/ml chloramphenicol in 0.2 M sucrose
same but containing 0.01 M δ-ALA
1 mg/ml rifamycin in 0.2 M sucrose
same but containing 0.01 M δ-ALA
methanol
7 day old dark grown bean seedlings
small petri dishes

Method:

Unless otherwise indicated all work with the etiolated plants must be done in a darkened room.