L. Szilard

Theory

Folder 49

If lost:

Return to 1155 E

57th Street Chicago

Student Building; South Portion
Alan Kenyon
Office on Growth
N.Y. Found. Infantile Paralyses
Nat. Inst. of Health.
(Beds for summer)

Train 2.40 pm

Nierman - Pat. Atty
Essex 5-1223

Rockefeller
The Commonwealth Fund
Dr Lester Evans
41 E. 57th Str.
N.Y. NY.

Dr. Alan Gregg
Div. of Med.
Sciences.
Rockeffel.
49 W 49 St.
NY

Stone
Dr. H.C. Nicholson
Exec. Sect. Office on Growth
2101 Constitution Ave Wash

Rdr 49

Reaction rates:
are kind of

.4μ/l growth rate at 37°C
about $\tau = 2$ hrs

tryptophane per bacterium (10^{-12} cc)

$$\frac{0.4\ 10^{-9} \times 10^{-12}}{200} \simeq 2\ 10^{-24} \text{ mol}$$

($M \simeq 200$)

rate of uptake τ = amount in / amount in bug $= 2\ 10^{-15}$ bug $= 10^{-17}$ mol

rate of uptake in mols $= \frac{10^{-17} \text{ mol}}{7{,}200 \text{ sec}} =$

rate mol/sec $= 1.4\ 10^{-21}$

$$\frac{\text{rate}}{\text{amount}}/\text{sec} = \frac{1.4 \times 10^{-21}}{2 \times 10^{-24}} = 700/\text{sec}$$

$2\ 10^{-24}$ mol (at $0.4\ 10^{-6}$ gm/liter) is 1.2 Molecules of tryptophane

rate $< 10^{13} e^{-\frac{E}{RT}} \frac{1}{N}$

~~Where rate of reaction groups [illegible] molecules~~ N gives how many molecules per active group are present. Taking $N \geq 10^4$ we have

$700 < 10^{13} e^{-\frac{E}{RT}} 10^{-4}$ || $e^{\frac{E}{RT}} < \frac{1}{7} 10^{5} = 14.3\ 10^{5}$

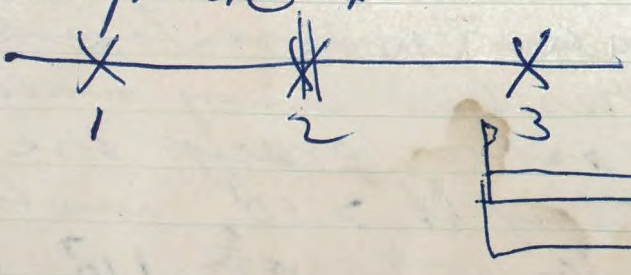
Back mutations plans:

1.) pick enzyme negatives.—
2.) establish allelism by Lederberg cross
check absence of pink colonies
3.) determine mutation to lactose positive
rate

Could work equally well with any
biochemically deficient mutant (esp
since when cross is made in
the absence of UV, no colonies grow
up

Back mutations (X-ray induced)
cause this elongated colonies of
~~some part~~ part of progeny of
affected cell is prototroph and
part remains mutant. How about
U.V. + light to give high percent back mutants?

Recording in Lederberg cross
on the plate.



22

$\frac{\varepsilon}{RT} = \ln 14.3 + 5 \times 2.3 = 2.66 + 11.5 = 14.16$

266

$\varepsilon = 600 \times 14.16 = \underline{8500 \text{ cal}}$

for 100° rise we get increase by factor e for 18,000 cal

and ~~[illegible]~~ increase by factor 1.5 for 7000 cal

We could of course assume $N >> 10^4$ and also 10^{13} factor is an upper limit so activation energy is probably much below [8500]

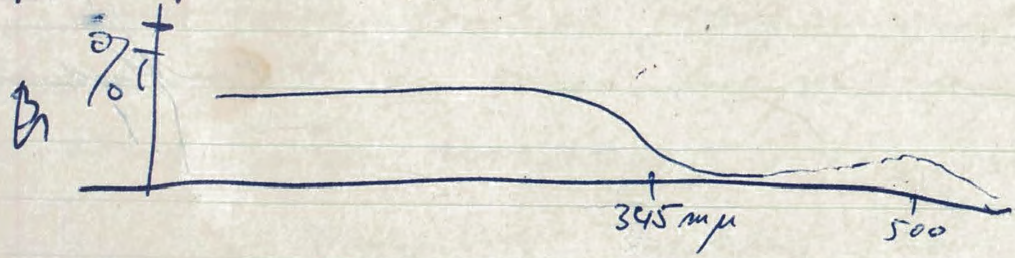
folter sizes 6½ inch x 6½ inch

WRATTEN LIGHT Filters
Eastman Kodak Co   Rochester N.Y.
1 W 39 Str. N.Y.C.

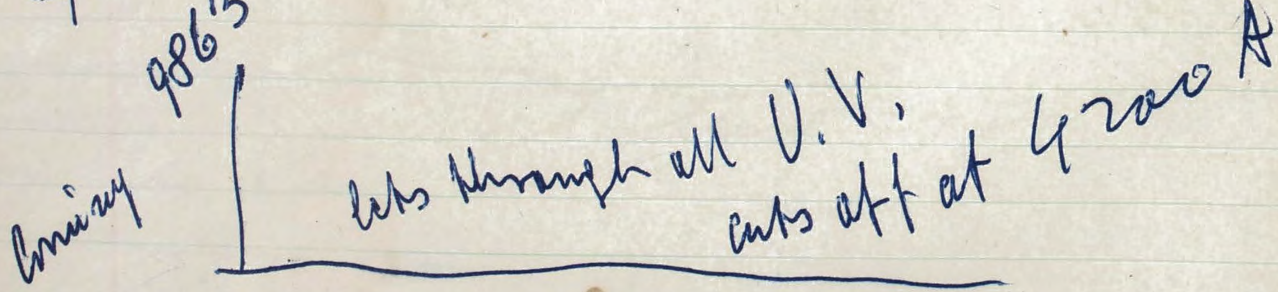
Heat filter (Corning) 3962 (Photovolt)

Lamp. G.E. Projection Lamps 500 Watt
Photovolt broad band folters
B 420, 530, 590, 660

Liquid filter photovolt 1 3/8"

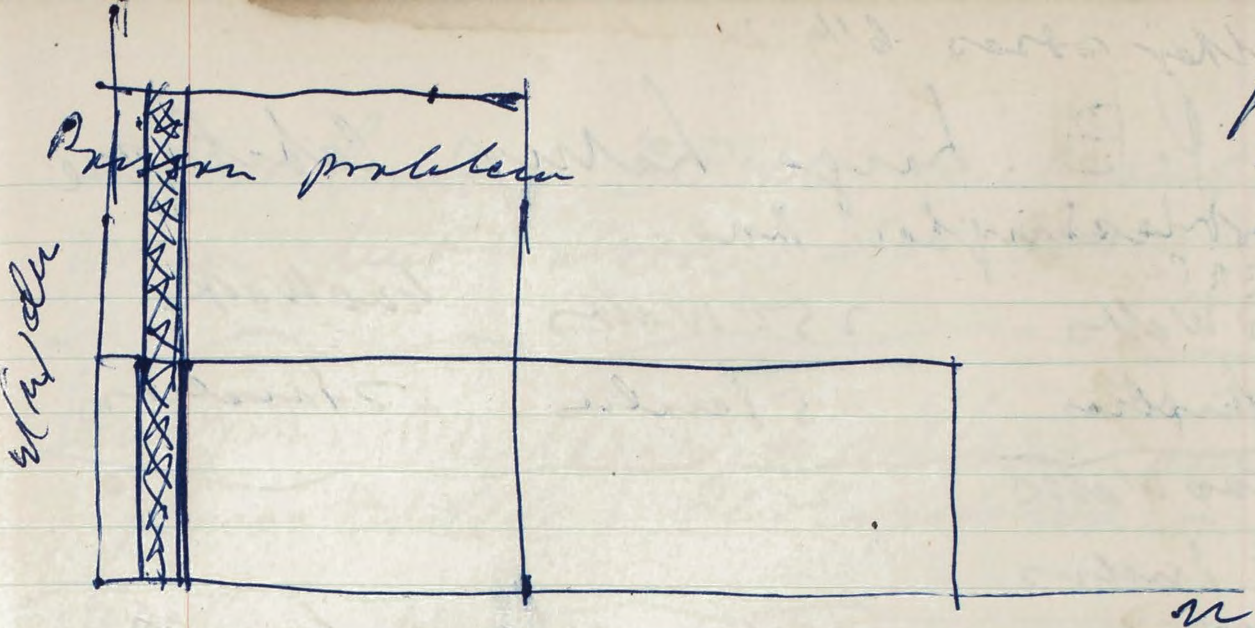


+
o



cuvetts: tubes Corex D.

H



A B
A B
A B
A B

Kim Atwood   Synthesis in Pantothenicless
Pantothenateless, PABAless

1% lactose
0.1% sucrose } for Neurospora

G.E. Large Lamps Catalogue

570 Leadingham Ave.

100 Watts	250 Watts	400 Watts
3 inches	5 inches	7 inches

3000 Watts

2 inches.

Also small number marked lamps

1000 Watts (not listed!)

another burning 5840 cut out green but absorbs also below 3100

Lamps: Phillips capillary arc.
James Biddle Philadelphia.—

Western Union
Zirkandum arc. up 110 Volts | Central Laboratories

Hanovia Newark N.J.

Carbon arcs Bausch and Lomb
H. W. Dietert

Information: Electrical testing laboratories.
Dr. Little or Miss Horn

4 Sunlamps
H up to 1000 Watts (watercooled for 1000 Watts)

We ~~must~~ also must be

$$\rho_o D\, 4\pi R\, \tau = \left\{\frac{F}{d3}\right\} 4\pi R^2 d$$

$\left\{\frac{F}{d3}\right\}$ = ~~pressure~~ constant in gm/cc in B = ρ

$$\rho_o D\, 4\pi R \tau = \rho\, 4\pi R^2 d$$

or

$$\boxed{R = \frac{\rho_o D \tau}{\rho d}}$$

for hypothesis ~~#1~~ $\rho = \frac{1}{500}$ $d = 10^{-4}$

$$R = \frac{10^{-6}\, 10^{-5}\, 4\times 10^{3}}{\frac{1}{500}\, 10^{-4}} = 20\times 10^{3}\, 10^{-5} =$$

$$= \frac{2}{10} \text{ cm}$$

Experiment with B/lt gave surface !!
for 100 mgm/l and 30 mgm/l
same size surface colonies
but 10 mgm/l was smaller

0.1 mgm/l just barely visible
0.03 mgm/l barely visible and appearing very late

0.3 mgm/l recommended for packing
nutrients ref. in hypothesis

Colony size
with diffusing enzyme.
F is production of B (gm/Bacterium)
τ is multiplication time
We assume colony ceases to grow
when peripheral single cell layer can
not grow at normal rate. — ρ_0 is
density of growth factor in medium
We have

$$\rho_0 D 4\pi R \tau = \frac{F 4\pi R^2}{d^2}$$

where $d = \sqrt[3]{\text{Volume of cell}}$

$$R = \frac{\rho_0 D \tau d^2}{F}$$

for cell $d = 10^{-4}$
for tryptophane $F = 2\,10^{-15}$ gm/B
$D = 10^5$
$\tau = 4000$ sec
This gives for 1 mgm/l tryptophane

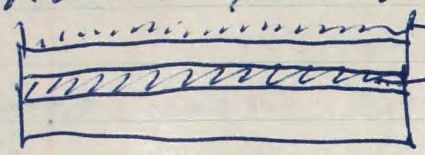
$$R = \frac{10^{-6}\ 10^{-5}\ 4\times10^{3}\ 10^{-8}}{2\times10^{-15}} = 2\ 10^{-19} = \frac{2}{10}\ \text{cm}$$

$F = 2\,10^{-15}$ corresponds to 20% dry weight
and 1% of dry weight tryptophane

$$\frac{1}{5}\ 10^{-12}\ 10^{-2} = 2\,10^{-15}$$

and can determine the order of the
"blocks"

For plating of colonies and testing
of strains use double layer technic



Kelner (Albert) Acta | Proc. Nat. Acad Sc. Vol 35 p. 73 1949

Nasda lamp 500 Watt
ills at 5 cm from lens
20 to 30 min at 37° gives x 10000
survival rate. —

Difficulty in picking the
mutant which is blocked in
glycolysis | for colonies will
usually grow up on the basis of symbiosis

The Krebs cycle:

We take one strain and let it go through a mutation so that it can not glycolize: Strain A. Now the original strain we let go through one mutation so it cannot live on lactate any more but still can live on glucose: Strain B.

Now we look for mutants of A which can not grow on lactate made by penicillin method and recovered on a plate containing glucose and B.M. (also perhaps tryptone?). This way we get mutants A_{k1}, A_{k2}, A_{k3}, A_{k4} all of which must have a block above krebs (k) because they are fed by a metabolite coming out at krebs (k).

Now we make other mutants from B, B_L, B_M, B_N, etc and by mixing the which of the A_1, A_2, A_3 etc mutants they feed we can see if we caught it a krebs cycle which is at least as deep down as k etc.

In this way we could go with a number of strains A and B

The probability of all of any generation living to the nth is $q(2^n) = (q)^{2^n}$ where $q = 1 - e^{-\frac{c_0}{2^n}}$

and the probability of at least one member of the generation surviving is

$$p_n = (1 - q(2^n))$$

The probability of survival is then

$$P = p_1 p_2 p_3 p_4 p_5 \cdots p_k$$

$$p_n = 1 - \left(1 - e^{-\frac{c_0}{2^n}}\right)^{(2^n)}$$

For mutational varying on Blake probability for no mutation in any member of nth generation

$$(1 - m)^{(2^n)} = \left(1 - \frac{m_1}{2^n}\right)^{(2^n)}$$

and probability of mutational colony

$$M = (1 - m_1)^{2^1} \left(1 - \frac{m_1}{2}\right)^{2^2} \left(1 - \frac{m_1}{2^2}\right)^{2^3} \left(1 - \frac{m_1}{2^3}\right)^{2^4}$$

$$M = 1 - (1 - m_1)(1 - m_1)(1 - m_1)$$

$$M = k\, m$$

$10^8 \rightarrow 10^6 \cdot 1000^3$ ~~[illegible]~~ mutants

~~[illegible]~~

300 viable (~~10[illegible]~~ mutants)

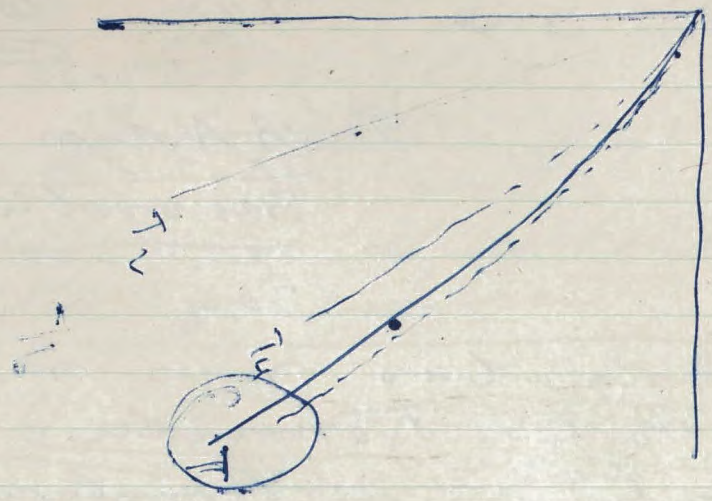
7000

Fumaroles must read:
J.B.C. Tommien
~~Archives of Biochem~~ Vol 20 p. 251
biology

~~[illegible]~~

~~[illegible]~~ Survivals and mutants when served on plate after U.V. radiation:

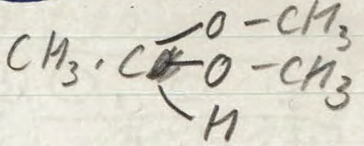
We assume an initial compound is produced with a concentration C (proportional to U.V. dose); this ~~[illegible]~~ compound divides between the progeny and its killing and mutagenic action is proportional to its concentration i.e. it falls off with $\frac{1}{2^n}$. The probability of killing is then put to be $\frac{\alpha}{2^n}$ for one bacterium



UV

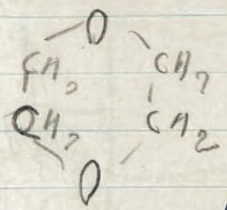
UV x Light

Dulbecco ~~5000~~ $5\ 10^{-4}$ ~~$\frac{1}{2}$~~ 10^{-3} or ~~1~~ ~~5000~~ H
ques drawn ~~1500~~ ques Invaders:
up to 1/10 of original titer



methylal

Del Sol 1946/47



Dioxan

Craig Lyman
Journ. of
Biol.-Chem.

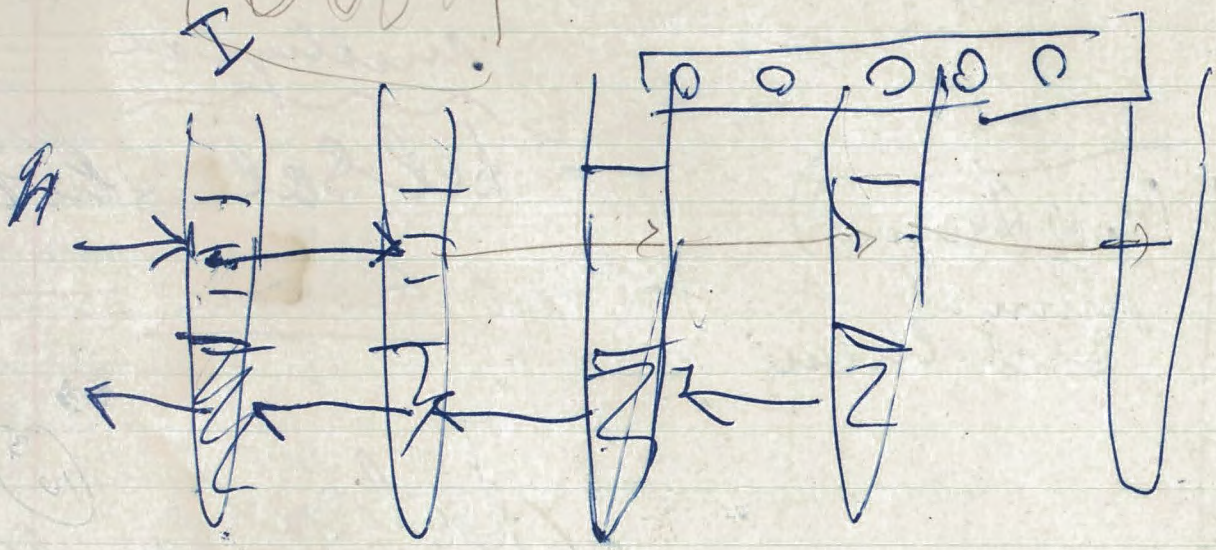
Delsol
Bull. Soc. Chim.
Biol.
29 690 (1947)

Dulbecco
To order out ~~40~~ he
~~which~~ 3600 mercury line
Corning 5860
7380

Lefty Schwartz el. engineer
Kornblith

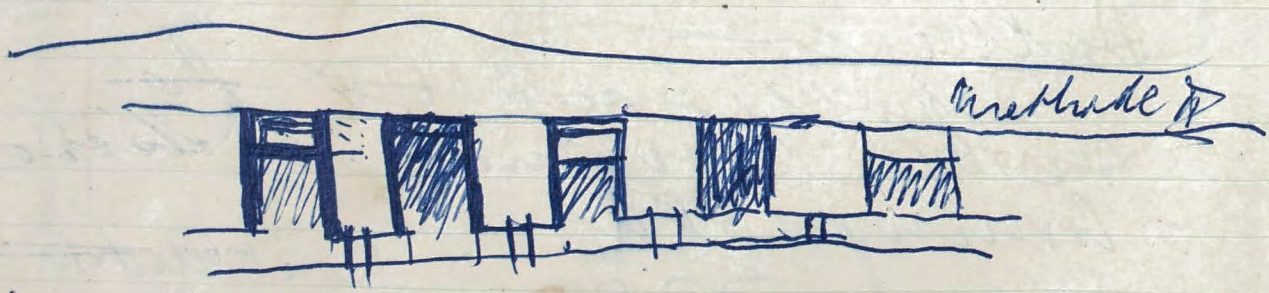
Russel Electric
Romberg

(Fineen &Co chem. eng. news advertisers)

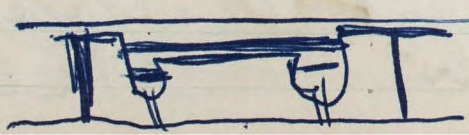


$(n) = 25$

W. Weidel



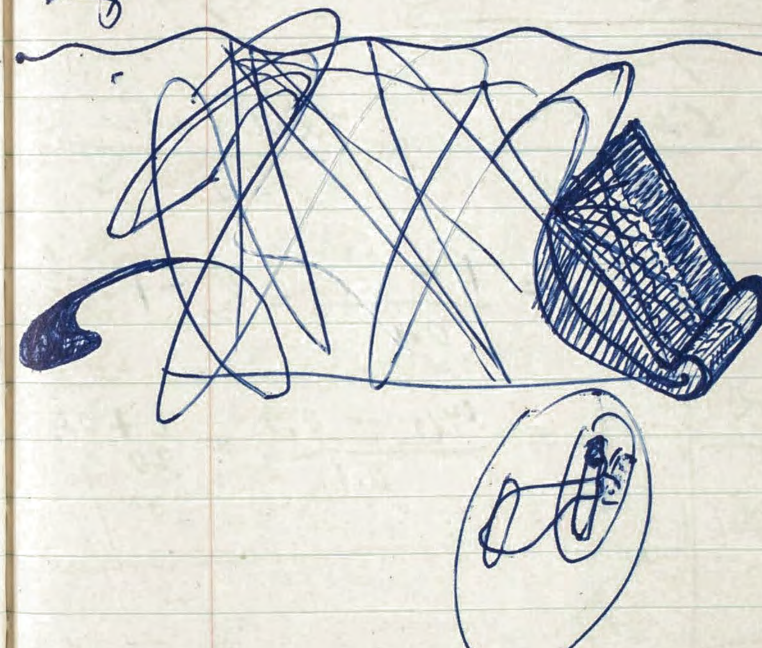
Methode I:



T. E. Anderson
J. B. C. 1948

mobility of plunge
after V. V. Broberson

Bulbecco
(T2) V.V. $2 \cdot 10^6$ ergs/mm² for 8 hits
multiple hits this goes up to ~~xxxx~~ 10%
or 2.3 hits



e^8 $10^{8/3}$ (10^3)

Sommarom:
X-ray Westermann Opal. Bubbleder
Kindbeck in Promenade in "Penudes" in Breas

Ansatz $l_1 = x + y$

$l_2 = \alpha x + y$

$x = \frac{l_1 - l_2}{1-\alpha}$

$y = \frac{l_2 - \alpha l_1}{1-\alpha}$

$x + y = \frac{l_1 - l_2 + l_2 - \alpha l_1}{1-\alpha} = l_1$

$\alpha \frac{\alpha l_1 - \alpha l_2}{1-\alpha} + \frac{l_2 - \alpha l_1}{1-\alpha} = \frac{-\alpha^2 l_2 + l_2}{1-\alpha} = l_2$

Hier

$\frac{x}{l_1} = \frac{1 - \frac{l_2}{l_1}}{1-\alpha}$ | $\frac{l_2}{l_1} = \frac{1 - \frac{l_2}{l_1}}{0.1} = \frac{1}{20} - 1 = -\frac{l_2}{l_1}$

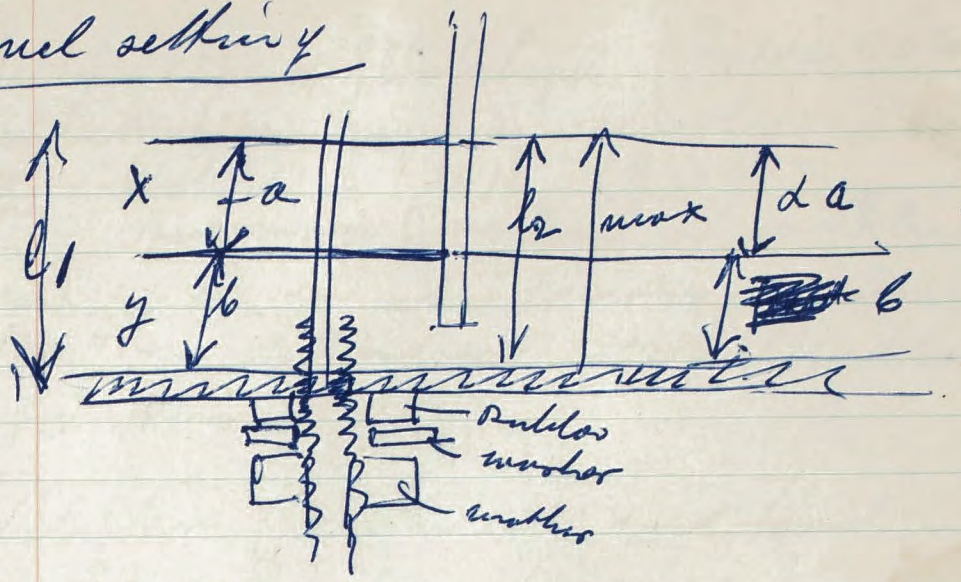
$\frac{y}{l_1} = \frac{l_2/l_1 - \alpha}{1-\alpha}$ | $\frac{l_2}{l_1} = \frac{l_2/l_1 - 0.9}{0.1} = \frac{l_2}{20} + 0.9$

auch für $y = 0$

$0 = \frac{l_2/l_1 - \alpha}{1-\alpha}$

$l_2/l_1 = \alpha$

level setting



$\alpha < 1$

$l_1 = a + b = x + y$

$l_2 = \alpha x + y$

$l_2 < l_1$

$l_1 - l_2 = x(1-\alpha)$

$\frac{l_1}{l_2} - 1 = \frac{x}{l_1}(1-\alpha)$

$\frac{l_1}{l_2} = \frac{x}{l_1}(1-\alpha) + 1$

for $\frac{x}{l_1} = \frac{1}{2}$; $\frac{l_1}{l_2} = \frac{1}{2}\,0.1 + 1$

$l_2 = 1 + 0.05$

$\alpha l_1 = \alpha x + \alpha y$

$l_2 = \alpha x + y$

$(1-\alpha)y = l_2 - \alpha l_1$

$y = l_2 - \alpha l_1$

$y/l_1 = \frac{l_2/l_1 - \alpha}{1-\alpha}$

$l_1 - l_2 = (1-\alpha)x$

$x = \frac{l_1 - l_2}{1-\alpha}$

$\alpha l_1 = \alpha x + \alpha y$

$l_2 = \alpha x + y$

$l_2 - \alpha l_1 = y(1-\alpha)$

$y = \frac{l_2 - \alpha l_1}{1-\alpha}$

$\frac{y}{l_1} =$

$\frac{x}{l_1} = \frac{1 - \frac{l_2}{l_1}}{1-\alpha}$

$\frac{y}{l_1} = \frac{\frac{l_2}{l_1} - \alpha}{1-\alpha}$

$\frac{l_2}{l_1} >> \alpha$

for instance $\frac{y}{l_1} = \frac{1}{2}$; $\alpha = 0.9$

$\frac{l_2}{l_1} = 0.9$

0.1

Lechdan 240

Lechdan 1560 of G.E. Catalogue | Lechdan 1102 (ACA type)
for Induction Frequency converters.

Wabash 2 5611 (G.E.)
Buchanan [mr. Ryan or mr. Schultz]
variable speed motor / motor-generator / motor
4 H.P. 850 Westinghouse mr. Maddox
Franklin 2 55-20

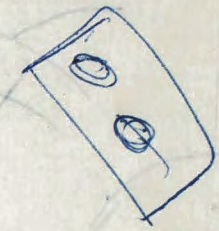
Motor-Generator and load
Ac. Dc.

~~5551~~
5330 6" nickel frame 1,080
5659 Ellis Ave

$$\frac{25}{80 \times 5R} = 10^{-14}\, 10^{-8}\, 10^{20} = 10^{-2}$$

$$= R$$

$$\frac{25}{40}$$



$$RT \quad \frac{Z_r Z_g \varepsilon^2 \varphi}{DR} \quad \frac{4\pi R}{} \quad \textcircled{1} = 5\,10^{-14}$$

$$\frac{25\,10^{-20}}{80\, D R 10^{-8}} = 5\,10^{-14}$$


$3 AU \frac{e^2}{DR} \sim 10^5$ cal
$RT \sim 6 \times 10^2$ cal
200 AU
3 AU
Maser

Diffusion limited reaction.

$4\pi \rho_\infty R D$ is flux

$R = 6 \times 10^{-8}$ cm $\quad D = 10^{-5}$

$\rho_\infty = 1/\text{Bact}$ or 10^{+12}/cc

Number of Enzymes in one $B = N$

rate $= 4\pi N \times 6\,10^{-8} \times 10^{-5}\, 10^{12} \approx 75 N\, 10^{-13}\, 10^{12}$

for Tryptophane rate $= 400$/sec

$$N = \frac{400}{4\pi \times 6 \times 10^{12}}\, 10^{13}$$

$$= \frac{400}{75}\, \frac{10}{10\pi/3}$$

$$N = 3 \times \frac{4000}{75} = \frac{4000}{25}$$

$$N = 40 \times 4 = 160$$

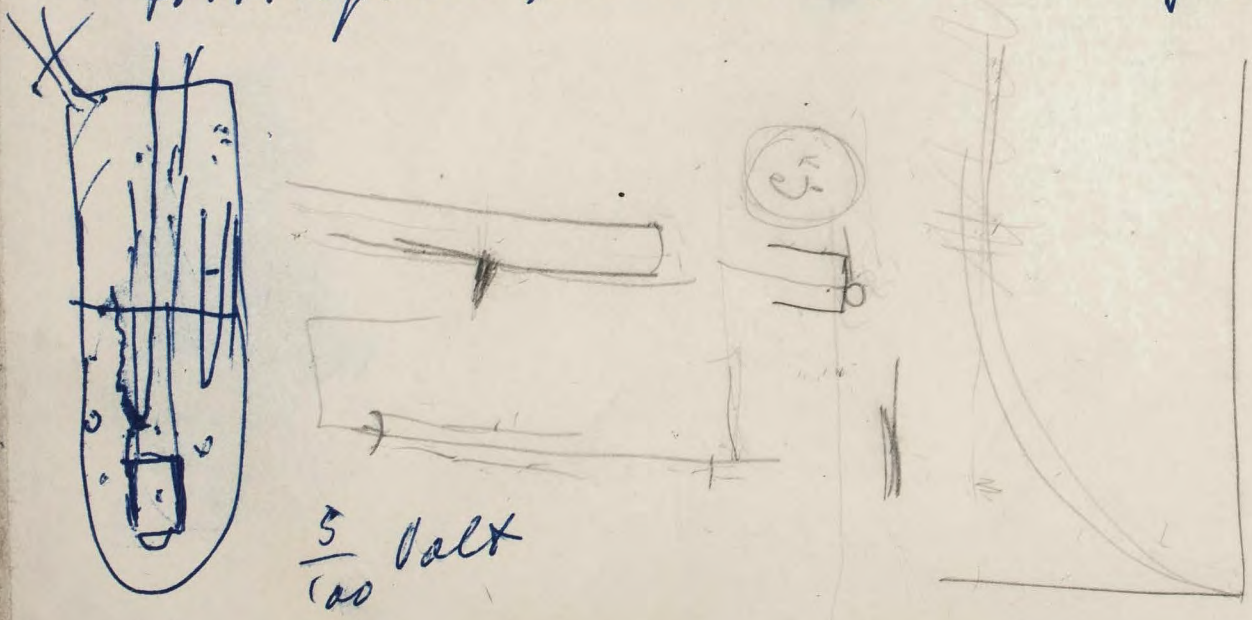
This is for porphobilinogen coeff. One

H. Kullmann SCEL
Fort Monmouth N.J.

c/o Mark 325 Ocean Ave. Brooklyn

P. W. Davis c/o Mark.

Analytical Adalid'an
Industr. and Engg. Chem.
Mark two or three years
ago
Pennington Daniels [Pedering]



5/100 Volt

Albert Kallner Cold Spring office Harb. 2980 (2207)

Mrs Kollner Bureau of Nursing

1130 to 1230
130 to 3 pm Ext 212
U.W.J. own office after 5 pm MO5 6425

[[redacted] Physics Dept. Univ. of Penn. Jehle]

12 30

Income		Tax for 47
	9000	1960
	10000	2300
	11000	2640
	12000	3020

~~[illegible]~~ Wilkins

North Country
Community Hospital
Glen Cove. L.I.
-4-200

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33 W 60th Street

Jof