From: Dr. Dwight J. Ingle

Re: New Journal
PERSPECTIVES IN BIOLOGY AND MEDICINE

Reg. U. S. **GBI** Pat. Off.

AMINO ACIDS

acetyl DL-tryptophane
DL-alpha alanine
beta alanine
L-alanine
L-arginine Hydrochloride
D-asparagine monohydrate
L-asparagine
D-aspartic acid
DL-aspartic acid
L-aspartic acid
betaine Hydrochloride
L-carnosine
creatin (anhydrous)
creatinine
DL-crystathionine
L-cysteine Hydrochloride
L-cysteine (free base) C. P.
L-cystine
3,5-diiodotyrosine
L-Dopa
DL-Dopa
djenkolic acid
L-glutamic acid
glutamine
glycine (aminoacetic acid)
glycine ethyl ester Hydrochloride
glycylglycine
DL-histidine Hydrochloride
L-histidine Hydrochloride
L-histidine (free base)

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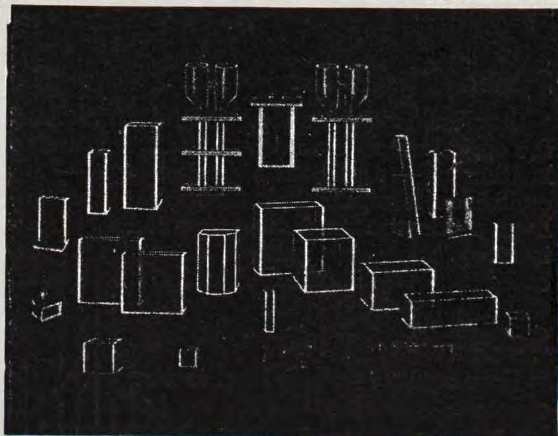

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NEW CHEMICALS AND SPECIALTIES

Radioactive Materials

Radioactive carbon compounds are available from Nuclear Instrument and Chemical Corp. These radiochemicals are the radioactive counterparts of compounds supplied in stable form through other sources. As a result of the radioactive labeling the finished product continuously emits rays which can be detected and measured with the use of special electronic equipment.

The company points out that while many of its tagged compounds will be produced by chemical synthesis, the present major emphasis will be in providing chemicals produced by the forces of nature in living plants and tissues, and known as biosynthesized chemicals. At the present time glucose, sucrose, and fructose are being produced. These are commonly used for tracing the mechanism of nourishment, blood circulation, and other studies in the body of an animal.

Major application of Nuclear's radioisotopes is expected to be found in medicine, biochemistry, organic chemistry, and studies of living tissues. **CS 1**

Tryptophan-Free Casein Hydrolyzate

A preparation that is expected to enable nutrition researchers to determine the tryptophan requirements in the diet of animals, particularly poultry, is now available from Winthrop-Stearns, Inc. The preparation is a tryptophan-free casein hydrolyzate, offering all of the essential amino acids with the exception of tryptophan.

Company chemists point out that, by feeding it in a controlled diet and adding amounts of tryptophan and tryptophan precursors, experimenters can determine the requirements in animals with various pathological conditions. **CS 2**

Plastic for Flotation Equipment

United States Rubber Co. has developed an expanded plastic for use in making life rafts, life ring buoys, and other flotation equipment. Additional applications for the material are sun helmets and commercial fishing floats.

Known as Expanded Royalite, the product is honeycombed with nonconnecting cells which make it extremely light. The manufacturer says it is strong, is not affected by sun or salt water, and will stay afloat indefinitely.

In addition to its flotation qualities, the plastic also is a thermal insulator. Its most important applications in this field have been those that require insulating material for structural strength. Because this material has little or no moisture absorption, its thermal insulating properties are said to remain effective for years. It is also said to have dielectric properties.

For further information on any item or process mentioned here, see coupon on page 1773

It is manufactured in flat sheets which can be formed by conventional thermoplastic forming technique or it can be molded to shape. Its density can be varied for the application desired from five pounds per cubic foot to 35 pounds per cubic foot. Standard sheets available are 46 inches by 70 inches in one-quarter, one-half, three-quarter, and one-inch thicknesses. **CS 3**

Latex for Textiles, Paper, Paint

A vinyl latex for use in the paper, textile, and paint industries is offered by the Dow Chemical Co. Called Dow Latex 744-B, the product is the result of research on vinyl chloride and vinylidene chloride monomers and their copolymers.

The latex is designed to serve both as a functional coating material and as a pigment binder. It gives resistance to moisture, chemicals, and grease in functional paper coatings and will produce durable fire- and chemical-resistant paints, fabrics, and coated wallboard, the company says. It is also weather resistant, a desirable property for tent, awning, and tarpaulin coatings. **CS 4**

Ramming Material For Steel Furnace Construction and Maintenance

Permanente 165, produced by the Kaiser Aluminum & Chemical Corp., is claimed to be an important contribution to steel furnace construction and maintenance. It is a self-bonding periclase ramming material which tests 95 to 96% magnesium oxide and is comparatively free of fluxing agents.

According to the company, operators of basic open hearth and electric furnaces using 165 have realized such beneficial results as: shorter installation time, less damage to other furnace refractories during burning-in, fuel economy, elimination of necessity for chilling furnace and filling cracks, superior resistance to erosion from iron oxide and basic slag, and reduction of maintenance materials needed. **CS 5**

Gasketing Material For High Vacuum

Under the trade-mark Myvaseal, a synthetic rubber gasketing material with low vapor pressure has been developed by Distillation Products Industries. The material is a synthetic elastomer product which is quite soft and has high abrasion resistance.

Under standard test conditions, the material has been found to have a low outgassing pressure. In most high vacuum systems it does not prevent attainment of pressure down to approximately 10 to 7 mm. Hg.

Myvaseal is being used by DPI in the parts of the electron tube exhaust machines manufactured by the company, which reports that longer lasting tubes result because the low vapor pressure of the gasketing material means higher vacuum with less pumping. Television picture-tube pumping systems and rotary exhaust systems are also being equipped with this material.

In addition to its use in equipment which DPI manufactures, Myvaseal, the company says, will be available in molded, extruded, or sheet form to the individual specifications of physicists and other high vacuum users. **CS 6**

PRODUCT NOTES

Ammonium Sulfate and Asbestos Fiber. Forbex Corp. is offering for prompt delivery ammonium sulfate, nitrogen content 20 to 21%, and asbestos fiber, J-6, 4-Z, and 4-M. **CS 7**

Lacquer for Coating Polystyrene. The United Lacquer Mfg. Corp. has developed a lacquer known as Base C 5123 that provides a lasting smooth coating to the plastic. It may be applied with standard spray equipment, and gives good adhesion and durability. The company claims that an all-over uniform finish with high gloss can be applied to polystyrene without any "crazing" or wrinkling. These properties make the lacquer valuable for finishing products like toys, novelties, lamps, imitation pearls, and office and desk supplies. Base C 5123 is available in all colors, in gloss, semigloss, and flats. It air dries, as other standard lacquers, in about 15 min., says the manufacturer. **CS 8**

Perlite Fines. Ozark-Mahoning Co. has made perlite fines available as a by-product of expanded perlite production. These fines, size range essentially between 100 and 200 mesh, have an apparent bulk density of approximately 13 lb./cu. ft. Available in moderate quantities, the fines are used as an ingredient in insulating cements and blocks and as a filler for certain paints. Possible other uses are in scouring powders and cleansers, as filter aids, and as insecticide carriers. **CS 9**

Parapas. Gold Leaf Pharmacal Co.'s brand of PAS (*p*-aminosalicylic acid), known as Parapas, has been accepted by the Council on Pharmacy and Chemistry of the American Medical Association. Both Parapas and Parapas sodium (the sodium salt) have proved effective in the treatment of tuberculosis and are available in the following two council-accepted forms: Parapas tablets 0.5 gm., uncoated; Parapas sodium tablets 0.69 gm., sugar-coated. Gold Leaf also markets Parapas acid and sodium salt powder, enteric-coated (0.5 gm.) tablets, and Parapas sodium sirup for oral use. **CS 10**

I personally would regard it as not too surprising and quite proper if in the end it should turn out that the existence of life rests on four-letter words.

Note to Tatum a[illegible]

Write Delbrück

Write Prusoff

Urey

Weaver

Brown

Harrison

Weisskopf

Purcell

Ralph Blatt

Powell

Arginine to Purines?

Frank

L.M.

Kotloff and Putnam Jour. of Biolog. Chem Vol 182 p 229 1950

soluble Phosphates per cell total 10^{-8} μ of P

low mol weight 20% mostly Phosphate

Arthur Koch etc.

2.75
4

dry weight (2% is P.)

25% is dry weight of this 2/3 Prot.

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PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

June 17, 1957

DEAR MR. Mayer

We wish to acknowledge receipt of your manuscript entitled How May Amino Acids Read the Nucleotide Code? by Leo Szilard

which we are scheduling to appear in the August issue of the *Proceedings*.

MARY D. ALEXANDER
Production Editor

~~Case β > α~~.

Hirondo June 14/57

$$y(t) = \frac{1}{\beta-\alpha}(\beta e^{-\alpha t} - \alpha e^{-\beta t}) , \qquad \frac{dy}{dt} = \frac{\alpha\beta}{\beta-\alpha}(e^{-\beta t} - e^{-\alpha t}) .$$

Now $\int_0^T t \frac{d}{dt}(1-y(t))^m dt = [t(1-y(t))^m]_0^T - \int_0^T (1-y(t))^m dt$

and $\int_0^T (1-y(t))^m dt = \int_0^T (1-y(t))^{m-1} dt - \int_0^T y(t)(1-y(t))^{m-1} dt$

and $\int_0^T y(t)(1-y(t))^{m-1} dt = \int_0^T [\frac{\beta}{\beta-\alpha}(e^{-\alpha t} - e^{-\beta t}) + e^{-\beta t}](1-y(t))^{m-1} dt$

$$= \int_0^T \frac{-1}{\alpha}\cdot\frac{dy}{dt}\cdot(1-y(t))^{m-1} dt + \int_0^T e^{-\beta t}(1-y(t))^{m-1} dt$$

Hence $\int_0^T (1-y(t))^m dt = \int_0^T (1-y(t))^{m-1} dt + \frac{1}{\alpha}\int_0^T (1-y(t))^{m-1}\frac{dy}{dt} dt - \int_0^T e^{-\beta t}(1-y(t))^{m-1} dt$

$$= \int_0^T (1-y(t))^{m-1} dt - \left[\frac{(1-y(t))^m}{\alpha m}\right]_0^T - \int_0^T e^{-\beta t}(1-y(t))^{m-1} dt$$

$$= \int_0^T dt - \sum_{n=1}^{m}\left[\frac{(1-y(t))^n}{\alpha n}\right]_0^T - \sum_{n=1}^{m}\int_0^T e^{-\beta t}(1-y(t))^{n-1} dt$$

Hence $\int_0^T t\frac{d}{dt}(1-y(t))^m dt = T(1-y(T))^m - T + \sum_{n=1}^{m}\frac{(1-y(T))^n}{\alpha n} + \sum_{n=1}^{m}\int_0^T e^{-\beta t}(1-y(t))^{n-1} dt$

But $\lim_{T\to\infty} T(1-y(T))^m - T = 0$, $\lim_{T\to\infty} y(T) = 0$.

Hence $\int_0^\infty t\frac{d}{dt}(1-y(t))^m dt = \frac{1}{\alpha}\sum_{n=1}^{m}\frac{1}{n} + \sum_{n=1}^{m}\int_0^\infty e^{-\beta t}(1-y(t))^{n-1} dt$

$$\doteqdot \frac{1}{\alpha}\{\log(m+1) + C\} + \int_0^\infty e^{-\beta t}\cdot\frac{1-(1-y(t))^m}{y(t)} dt .$$

if $\beta \gg \alpha$

And $\frac{1}{\beta} < \int_0^\infty e^{-\beta t}\frac{1-(1-y(t))^m}{y(t)} < \int_0^\infty \frac{e^{-\beta t}}{y(t)} dt$. (They become closer as $m\to\infty$)

And $\frac{1}{\beta} = \int_0^\infty \frac{\beta-\alpha}{\beta} e^{(\alpha-\beta)t} dt < \int_0^\infty \frac{e^{-\beta t}}{y(t)} dt < \int_0^\infty e^{(\alpha-\beta)t} dt = \frac{1}{\beta-\alpha}$.

Therefore $\int_0^\infty t\frac{d}{dt}(1-y(t))^m dt \doteqdot \frac{1}{\alpha}\{\log(m+1) + C\} + \Delta$,

$C = 0.577$ where C is Euler's constant and $\frac{1}{\beta} < \Delta < \frac{1}{\beta-\alpha}$.

If $\alpha > \beta$, since $y(t)$ is symmetric in α and β, we get same result with α & β interchanged.

If $\alpha = \beta$, then $y(t) = e^{-\alpha t}(1+\alpha t)$.

Applying above technique, we get:

$$\int_0^\infty t\frac{d}{dt}(1-y(t))^m dt = \frac{1}{\alpha}\sum_{n=1}^{m}\frac{1}{n} + \int_0^\infty \frac{1-(1-y(t))^m}{1+\alpha t} dt .$$

The last integral converges, but the estimate I get is not practicable.

Hirondo

combining units

~~[illegible]~~

Pz uninduced = 25

g z fully ind = 100 and in fully induced Pz = 12·5

Mel Cohn and Anne Marie Torriani

Biochimica Biophysica Acta Vol 10 p. 280 (1953

Final June 12/57

$$y^*(t) = \frac{1}{\beta-\alpha}\left[\beta e^{-\alpha t} - \alpha e^{-\beta t}\right]$$

Then $\dfrac{dy^*}{dt} = \dfrac{\alpha\beta}{\beta-\alpha}\left(e^{-\beta t} - e^{-\alpha t}\right)$, $\quad \dfrac{d^2y^*}{dt^2} = \dfrac{\alpha\beta}{\beta-\alpha}\left(\alpha e^{-\alpha t} - \beta e^{-\beta t}\right)$

Now solve $\dfrac{d^2}{dt^2}(1-y^*(t))^m = 0$.

This is equivalent to $(m-1)\left(\dfrac{dy^*}{dt}\right)^2 = (1-y^*)\dfrac{d^2y^*}{dt^2}$

$$\therefore (m-1)\alpha\beta\left(e^{-2\beta t} - 2e^{-(\alpha+\beta)t} + e^{-2\alpha t}\right) = \left(\alpha e^{-\alpha t} - \beta e^{-\beta t}\right)(\beta-\alpha) - \left[\alpha\beta e^{-2\alpha t} - (\alpha^2+\beta^2)e^{-(\alpha+\beta)t} + \alpha\beta e^{-2\beta t}\right]$$

$$\therefore \alpha\beta m\left(e^{-\beta t} - e^{-\alpha t}\right)^2 = \left(\alpha e^{-\alpha t} - \beta e^{-\beta t}\right)(\beta-\alpha) + (\alpha-\beta)^2 e^{-(\alpha+\beta)t}$$

$$\therefore \alpha\beta m\left(1 - e^{(\alpha-\beta)t}\right)^2 = (\beta-\alpha)\alpha e^{\alpha t}\left[1 - \frac{\beta}{\alpha}e^{(\alpha-\beta)t} + \frac{\beta-\alpha}{\alpha}e^{-\beta t}\right]$$

$$\therefore \frac{\beta m}{\beta-\alpha} = e^{\alpha t}\left[1 + \underbrace{\frac{\left(2-\frac{\beta}{\alpha}\right)e^{(\alpha-\beta)t} + \frac{\beta-\alpha}{\alpha}e^{-\beta t} - e^{2(\alpha-\beta)t}}{\left(1-e^{(\alpha-\beta)t}\right)^2}}_{\Phi_{\alpha,\beta}(t)}\right] \quad *$$

Assume $\beta = 5\alpha$.

Then $$\left|\Phi_{\alpha,5\alpha}(t)\right| = \left|\frac{-3e^{-4\alpha t} + 4e^{-5\alpha t} - e^{-8\alpha t}}{\left(1-e^{-4\alpha t}\right)^2}\right| \leq \frac{4e^{-4\alpha t}}{\left(1-e^{-4\alpha t}\right)^2}$$

Hence if $e^{-4\alpha t} < 5-\sqrt{24}$ i.e. if $e^{\alpha t} > 1.8$, then $\left|\Phi_{\alpha,5\alpha}(t)\right| < \frac{1}{2}$

Suppose $e^{\alpha t} < 1.8$. Then $e^{-\alpha t} > 0.56$

By putting $1-x = e^{-\alpha t}$ we have $0 < x < 0.44$.

Then $$\left|\Phi_{\alpha,5\alpha}(t)\right| = (1-x)^4\left|\frac{-3+4(1-x)-(1-x)^4}{\left[1-(1-x)^4\right]^2}\right| = (1-x)^4\left|\frac{\varphi(x)}{\psi(x)}\right|$$

where $\varphi(x) = \cancel{-6+4x}\ -6+4x-x^2$, $\quad \psi(x) = \left(4-6x+4x^2-x^3\right)^2$.

In $0 \leq x \leq 0.44$ $\quad \operatorname{Max}|\varphi(x)| = |\varphi(0)| = 6$

$\operatorname{Min}|\psi(x)| < |\psi(\tfrac{1}{2})| = 3.5$ $\quad \therefore \operatorname{Max}\left|\Phi_{\alpha,5\alpha}\right| < 2$

From this, we see $e^{\alpha t} < 1.8$ cannot satisfy $*$ unless $m < 4.4$.

If $m > 4.4$, $\quad 0.5e^{\alpha t} < \dfrac{\beta m}{\beta-\alpha} < 1.5e^{\alpha t}$. i.e. $\dfrac{\beta}{\beta-\alpha}m \doteqdot e^{\alpha t}$

$$t \doteqdot \frac{1}{\alpha}\log\frac{\beta m}{\beta-\alpha}$$

$t = \frac{1}{\alpha}\left[\ln\frac{m}{1-\frac{1}{m}}\right] \doteqdot \frac{1}{\alpha}\ln m\left(1+\frac{1}{m}\right) \doteqdot \frac{1}{\alpha}\ln m + \frac{1}{\alpha m}$

$\beta = 0$

$x = 1 - y =$

$1 - e^{-\beta t}$

$$W(\lambda) = 1 - e^{-\alpha\lambda} \qquad \frac{dw}{d\tau} = \alpha e^{-\alpha\lambda}$$

$$\int_0^{\lambda=t} e^{-\beta(t-\lambda)} \frac{dw}{d\lambda} d\lambda$$

$$= \alpha e^{-\beta t} \int_0^{\lambda=t} e^{(\beta-\alpha)\lambda} d\lambda$$

$$= \frac{\alpha}{\beta-\alpha} e^{-\beta t} \left[e^{(\beta-\alpha)\lambda} \right]_0^t$$

$$= \frac{\alpha}{\beta-\alpha} e^{-\beta t} \left[e^{(\beta-\alpha)t} - 1 \right]$$

$$= \frac{\alpha}{\beta-\alpha} \left[e^{-\alpha t} - e^{-\beta t} \right]$$

$$m = \frac{(\beta-\alpha)}{\beta} e^{\alpha t} \frac{1 - \frac{\beta}{\alpha} e^{(\alpha-\beta)t} + \frac{\beta-\alpha}{\alpha} e^{-\beta t}}{(1 - e^{(\alpha-\beta)t})^2}$$

$$(1 - e^{(\alpha-\beta)t})^2 \doteqdot ((\alpha-\beta)t)^2$$

$$e^{\alpha t}\left(1 - \frac{\beta}{\alpha} e^{(\alpha-\beta)t} + \frac{\beta-\alpha}{\alpha} e^{-\beta t}\right) = e^{\alpha t}\left[\frac{\alpha-\beta}{\alpha} + \frac{\beta}{\alpha}(1 - e^{(\alpha-\beta)t})\right] + \frac{\beta-\alpha}{\alpha} e^{(\alpha-\beta)t}$$

$$= (\alpha-\beta)\left[e^{\alpha t}\left(\frac{1}{\alpha} - \frac{\beta t}{\alpha}\right) - \frac{1}{\alpha} e^{(\alpha-\beta)t}\right]$$

$$m = \frac{1}{\beta t^2} \frac{\left[e^{\alpha t}\left(\frac{\beta t}{\alpha} - \frac{1}{\alpha}\right) + \frac{1}{\alpha} e^{(\alpha-\beta)t}\right]}{}$$

$$m = \frac{1}{\alpha\beta} \frac{e^{\alpha t}(\beta t - 1) + e^{(\alpha-\beta)t}}{t^2} \doteqdot \frac{e^{\alpha t}}{\alpha t}$$

$\alpha = \beta = 1$

$$m = \frac{1}{t^2}\{e^t(t-1) + 1\}$$

~~large m~~

$$m \approx = \frac{1}{t} e^t$$

$\ln m = t - \log t$ $\qquad$ $m = 1000$

(7) $= t - \ln t$

Sausage method (12)

$$W(\lambda) = \left[1 - e^{-\alpha\lambda}\right] \qquad e^{-\beta t}$$

$$\int_0^t e^{-\beta(t-\lambda)} \frac{dW}{d\lambda}\, d\lambda$$

$$P_r(B) = e^{-\alpha t}$$

$$P_r(B \text{ went out at } \lambda) = \frac{dW}{d\lambda}$$

P_r(No white)

$$= P_r(B) + \sum_\lambda e^{-\beta(t-\lambda)} \frac{dW}{d\lambda} \Delta$$

$$\left[e^{-\alpha t} + \int_0^t e^{-\beta(t-\lambda)} \frac{dW}{d\lambda}\, d\lambda \right] = g^*(t)$$

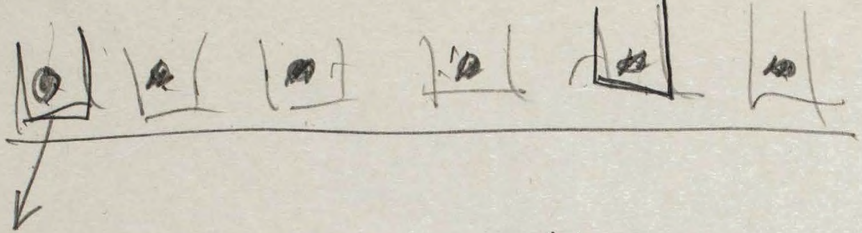
$$\boxed{g^*(t) = \frac{\alpha}{\beta-\alpha}\left[\frac{\beta}{\alpha} e^{-\alpha t} - e^{-\beta t}\right]}$$

$$1 - g^*$$

$$\left\{1 + \frac{\beta-\alpha}{\alpha}\right\} e^{-\alpha t} +$$

$$\overline{\tau}_1 = \int_0^\infty t \,\frac{d}{dt}\left\{(1-g^*)^m\right\} dt$$

$$(1-g^*)^m$$



↓ 0 hit rate
evaporation
rate ● $= \alpha$

$$W(\lambda) = 1 - e^{-\alpha\lambda}$$

probable that there is no solute in one ~~a~~ given box ;)

$$\int_0^{\lambda=t} e^{-\beta(t-\lambda)} \frac{dW}{d\lambda}\, d\lambda = y(t)$$

$$y(t) = \frac{\alpha}{\beta-\alpha}\left[e^{-\alpha t} - e^{-\beta t}\right]$$

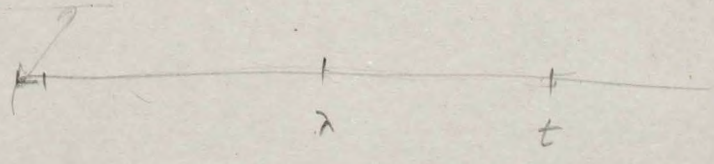
$\lambda,\ \lambda + d\lambda$

$$\int_0^\infty \alpha e^{-\alpha\lambda}\, d\lambda = 1$$

τ

$e^{-\beta\tau}$

$\approx \frac{(At)^n}{n!} e^{-At}$



$$\alpha e^{-\alpha\lambda} e^{-\beta(t-\lambda)}\, d\lambda$$

$$\alpha(1-\alpha\lambda)(1-\beta(t-\lambda))\, d\lambda \qquad \approx \frac{\alpha}{\beta-\alpha}\left[\left(\frac{\beta-\alpha}{\alpha}+1\right)e^{-\alpha t} - e^{-\beta t}\right]$$

$\alpha\, d\lambda$

$$\frac{\beta}{\alpha}(1-\alpha t) - (1-\beta t) \qquad \frac{\alpha}{\beta-\alpha}\left[\frac{\beta}{\alpha} e^{-\alpha t} - e^{-\beta t}\right]$$

$$\frac{\beta}{\alpha} - \beta t - 1 + \beta t \quad \left(\frac{\beta}{\alpha} - 1\right)\frac{\alpha}{\beta-\alpha}$$

Paper

Appendix RR(1)

fraction of code words freed from loaded trinucleotides at time $t = \lambda$

$$W(\lambda) = 1 - e^{-\alpha\lambda} \qquad \boxed{\alpha = 2AK} \qquad \frac{\beta}{\alpha} = \frac{\rho}{2K}$$

~~Above~~ probability that a code word is not occupied by loaded trinucleotides

$$y(t) = \int_0^{\lambda = t} e^{-\beta(t-\lambda)} \frac{dW}{d\lambda}\, d\lambda \qquad \boxed{\beta = A\rho}$$

$$y(t) = \cancel{\frac{\alpha/\beta}{1-\frac{\alpha}{\beta}}\left[e^{-\alpha t} - e^{-\beta t}\right]} = \frac{\alpha/\beta}{1-\frac{\alpha}{\beta}}\, e^{-\beta t}\left[e^{\beta(1-\frac{\alpha}{\beta})t} - 1\right]$$

q = probability that all m code words are covered by loaded nucleotides

$$(1 - y(t))^m$$

for the average time τ_2 needed to fill all memory words

$$(1 - y(\tau_2))^m = e^{-\frac{1}{g}} \quad \text{where } 1 < g < 10$$

$$1 - y(\tau_2) = e^{-\frac{1}{gm}} \approx 1 - \frac{1}{gm}$$

$$gm = \frac{1}{y(\tau_2)}$$

$$gm = \frac{1-\alpha/\beta}{\alpha/\beta}\, e^{\beta\tau_2}\, \frac{1}{e^{\beta(1-\frac{\alpha}{\beta})\tau_2} - 1}$$

$$\ln gm = \ln \frac{1-\alpha/\beta}{\alpha/\beta} + \beta\tau_2 + \ln \frac{1}{e^{\beta(1-\frac{\alpha}{\beta})\tau_2} - 1}$$

$$y(t) = \frac{\alpha}{\beta - \alpha}\left[e^{-\alpha t} - e^{-\beta t}\right] =$$

$$\frac{A}{1+\frac{y_0}{k}+\frac{\eta}{k}} - \frac{A}{1+\frac{y_0}{k}} =$$

$$\frac{\cancel{1}+\cancel{\frac{y_0}{k}} - \cancel{1} - \cancel{\frac{y_0}{k}} - \frac{\eta}{k}}{\left(1+\frac{y_0}{k}\right)^2 + \frac{\eta}{k}\left(1+\frac{y_0}{k}\right)}$$

$$\left.\begin{array}{l} x_0 - \xi \\ y_0 + \eta \end{array}\right\} \text{initial cond.}$$

$$\frac{dx}{dt} = \frac{A}{1+\frac{y_0+\eta}{k}} - \frac{(x_0-\xi)}{\tau}$$

$$= \frac{A}{1+\frac{x_0-\xi}{k}} - \frac{y_0}{\tau} - \frac{\eta}{\tau} = 0$$

$$A\tau = (y_0+\eta)\left(1+\frac{x_0-\xi}{k}\right)$$

$$\frac{A\tau}{y_0+\eta} - 1 = \frac{x_0-\xi}{K}$$

$$K\left(\frac{A\tau}{y_0+\eta} - 1\right) = x_0 - \xi = \text{initial } x$$

$$\xi = x_0 - K\left(\frac{A\tau}{y_0+\eta} - 1\right)$$

$$\frac{dx}{dt} = \frac{KA}{K+\frac{y_0+\eta}{\cancel{K}}} + \frac{K}{\tau} - \frac{KA}{y_0+\eta}$$

~~Appendix~~ p. 2

$$\ln \frac{1}{e^{\beta(1-\frac{\alpha}{\beta})\tau_2} - 1} = -\ln\left\{e^{\beta(1-\frac{\alpha}{\beta})\tau_2} - 1\right\} = -\ln(e^x - 1)$$

for $\beta\tau_2 \gg 1$ $\quad \beta \gg \alpha$ $\quad \left.\begin{matrix}\beta = A\rho \\ \alpha = 2AK\end{matrix}\right\}$

$$= -\ln e^x\left(1 - \frac{1}{e^x}\right) = -x - \ln\left(1 - \frac{1}{e^x}\right)$$

$$x = \beta\left(1-\frac{\alpha}{\beta}\right)\tau_2 \qquad \cong -x + \frac{1}{e^x}$$

$$\ln gm = \ln \frac{1-\alpha/\beta}{\frac{\alpha}{\beta}} + \cancel{\beta\tau_2} - \cancel{\beta\tau_2} + \alpha\tau_2 + \frac{1}{e^{\beta(1-\frac{\alpha}{\beta})\tau_2}}$$

$$\alpha\tau_2 = \ln gm - \ln\left(\frac{\beta}{\alpha} - 1\right) - \frac{1}{e^{\beta(1-\frac{\alpha}{\beta})\tau_2}}$$

$$\tau_2 = \frac{1}{\alpha}\left\{\ln m + \ln g - \ln\left(\frac{\beta}{\alpha} - 1\right) - \frac{1}{e^{\beta(1-\frac{\alpha}{\beta})\tau_2}}\right\}$$

$$\alpha = 2AK = \cancel{2A\rho\frac{K}{\rho}}\; A\rho \times 2\frac{K}{\rho} = \beta\,\frac{2K}{\rho}$$

$$\tau_2 = \frac{1}{\beta}\frac{\rho}{2K}\underbrace{\left\{\ln m + \ldots\right\}}_{6}$$

$$\tau_1 = \frac{1}{\beta}\frac{m}{1 + \frac{\rho}{K}}$$

$$\tau_0 = \tau_1 + \tau_2$$

minimum for τ_0 when

$$\frac{\rho}{K} = \sqrt{\frac{2m}{B}} - 1 \qquad \boxed{\frac{\rho}{K} \approx 10}$$

Appendix page 3

$$\tau_0 \cong \frac{1}{A\rho}\left\{\frac{300}{11}+30\right\} \sim \frac{60}{A\rho} \sim \frac{50}{A\rho}$$

$$\ln m \cong 1 + 2\times 2.3 = \cancel{5.6}\ 6$$

$$\frac{1}{\tau_0} \cong \frac{A\rho}{50}$$

Number of bits = $A\rho$ ①

K is defined as concentration when $1/2$ is free one half is complexed

hit rate $AK\rho$ = evaporation rate =

$$= \frac{1}{2} \cancel{\beta}\, \alpha$$

$$\alpha = 2AK = 2A\frac{K}{\rho}\rho = 2A\rho\frac{K}{\rho}$$

$$A\rho = \beta$$

$$\alpha = 2\frac{K}{\rho}\beta$$

$$W(\lambda) = 1 - e^{-\alpha\lambda}$$

$$y(t) = \int_0^{\lambda = t} e^{-\beta(t-\lambda)} \frac{dW}{d\lambda} d\lambda$$

$$y(t) = \frac{\alpha/\beta}{1-\alpha/\beta} e^{-\beta t}\left\{e^{\beta(1-\frac{\alpha}{\beta})t} - 1\right\}$$

$\underbrace{\cup\cup\cup\cup\cup}_{m}$

$$(1-y(t_1))^m = e^{-\frac{1}{g}} \quad 1 < g < 10 \quad \text{much}$$

$$1 - y(t_1) = e^{-\frac{1}{gm}} \approx 1 - \frac{1}{gm}$$

$$y(t_1) = \frac{1}{gm}$$

$$gm = \frac{1}{y(t_1)}$$

[illegible]

(2)

$$gm = \frac{1-\alpha/\beta}{\frac{\alpha}{\beta}} e^{\beta\tau_1} \frac{1}{e^{\beta(1-\frac{\alpha}{\beta})\tau_1}-1}$$

Hinweise

$$\ln gm = \ln\frac{1-\alpha/\beta}{\frac{\alpha}{\beta}} + \beta\tau_1 + \ln\frac{1}{e^{\cdots}-1}$$

$$\ln \frac{1}{e^x-1} = -\ln(e^x-1)$$

$\cancel{\beta\tau_1 >> 1}$

$\beta >> \alpha$

$e^{\beta\tau_1} >> 1$

$\beta\tau_1 >> 1$

$$= -\ln e^x\left(1-\frac{1}{e^x}\right)$$

$$= -\beta\left(1-\frac{\alpha}{\beta}\right)\tau_1 - \ln\left(1-\frac{1}{e^x}\right)$$

$\ln(1+y) = y$

$$+\frac{1}{e^x}$$

$$= -\beta\left(1-\frac{\alpha}{\beta}\right)\tau_1 + \frac{1}{e^{\beta(1-\frac{\alpha}{\beta})\tau_1}} \approx \cancel{-\beta\left(1-\frac{\alpha}{\beta}\right)\tau_1}$$

$$-\beta\tau_1 + \alpha\tau_1 + \cancel{\frac{e^{\alpha\tau_1}}{e^{\beta\tau_1}}}$$

(6)

$e^{+(\alpha-\beta)\tau_1}$

$\boxed{\alpha = 2AK}$ if $\rho = 10K$

$\beta = A\rho$

$e^{-4\alpha\tau_1} = e^{-24}$

$\boxed{\beta = 5\alpha}$

$\tau_1 = \frac{30}{A\rho}$

$\alpha\tau_1 = \frac{2KA\,30}{A\rho} = 6$

$m = 300$

$$\ln gm = \ln\frac{1-\frac{\alpha}{\beta}}{\frac{\alpha}{\beta}} + \beta\tau_1 - \beta\tau_1 + \alpha\tau_1 + \cancel{0}$$

270

$$\cancel{\ln g} + \ln m + \ln\frac{\alpha/\beta}{1-\frac{\alpha}{\beta}} = \alpha\tau_1$$

$2.3 + 1 + 4.6$ ~~ln~~

Hwrando

(3)

$$\alpha \tau_1 = \ln q + \ln m - \ln \frac{\beta}{\alpha}$$

$$\alpha \tau_1 \quad 0 \to 2.3 + \ln m \quad - \ln 5 \approx \ln m$$

$$\tau_1 \approx \frac{\ln m}{\alpha} \cancel{= A\rho \frac{k}{\rho} \ln m}$$

$$\alpha = 2AK = 2A\rho \frac{K}{\rho}$$

$$\tau_1 = \frac{1}{A\rho} \times \frac{1}{2} \frac{\rho}{K} \ln m$$

OK.

$$\int_0^T t \frac{d}{dt}(1-e^{-t})^m dt = \left[t(1-e^{-t})^m \right]_0^T - \int_0^T (1-e^{-t})^m dt .$$

Put $f_n(T) = \int_0^T (1-e^{-t})^n dt$

Then
$$f_n(T) = f_{n-1}(T) - \int_0^T (1-e^{-t})^{n-1} e^{-t} dt$$
$$= f_{n-1}(T) - \left[\frac{(1-e^{-t})^n}{n} \right]_0^T$$
$$= f_{n-1}(T) - \frac{(1-e^{-T})^n}{n}$$

$$\therefore \int_0^T t \frac{d}{dt}(1-e^{-t})^m dt = T(1-e^{-T})^m + \left[\frac{(1-e^{-T})^m}{m} + \frac{(1-e^{-T})^{m-1}}{m-1} + \cdots + \frac{(1-e^{-T})}{1} - T \right]$$
$$= T\left[(1-e^{-T})^m - 1 \right] + \left[\frac{(1-e^{-T})^m}{m} + \frac{(1-e^{-T})^{m-1}}{m-1} + \cdots + \frac{(1-e^{-T})}{1} \right]$$

$$\lim_{T\to\infty} T\left[(1-e^{-T})^m - 1 \right] = 0. \qquad \lim_{T\to\infty} (1-e^{-T})^n = 1$$

$$\therefore \int_0^\infty t \frac{d}{dt}(1-e^{-t})^m dt = \frac{1}{m} + \frac{1}{m-1} + \cdots + \frac{1}{1} \doteqdot \log(m+1) - C$$

Dr. Szilard,

For the simplified version of average time, direct computation is possible and is given above. C stands for Euler's constant. $C \doteqdot 0.57$.

Hirondo

volume yeast

Yeast

$$\text{Gal}^* + \text{ATP} \xrightarrow{\text{Galactokinase}} \text{Gal}^*\text{-1-P} + \text{ADP} \quad (1)$$

$$\text{Gal}^*\text{-1-P} + \text{UDPG} \underset{}{\overset{\text{Gal-1-P uridyl transferase}}{\rightleftharpoons}} \text{UDPGal}^* + \text{G-1-P} \quad (2)$$

$$\text{UDPGal}^* \underset{\text{UDPGal-4-epimerase}}{\rightleftharpoons} \text{UDPG}^* \quad (3)$$

The sum of reactions 1, 2, and 3 is

$$\text{Gal} + \text{ATP} \longrightarrow \text{G-1-P} + \text{ADP}$$

$$\text{UDPG} + \text{PP} \rightleftharpoons \text{UTP} + \text{GP}$$

! Bull - Kalckar !

P.T.O.

Dominant mutation

W.)
C. H Morgan Lister Inst.
Human Blood groups
A and B. anti A or anti B

EA   EB

Proc. Nat. Acad. March
Giles   April 5 1957

M. ~~A~~, B.)
Hoagland   Fed. Proc. 1957
~~Mass Gen.~~   Biochemica Biophysica
Acta 1957

(Archibald
mol. weight)

Biochemist in Rochester Todd

C-D-OAA

49

EDITORIAL POLICY

The purpose of this journal is to communicate new ideas and to stimulate original thought in the biological and medical sciences. The orientation is toward man and his diseases, but with appreciation of the fact that the roots of medical theory reach into all fields of biology and all processes of life. The objective is to publish papers dealing with concepts that enlarge biological horizons and to bring the specific medical problems into perspective with investigative work on life processes.

The journal consists of original essays, editorials, letters to the editor, and book reviews. The original essays include the following:

1. New hypotheses and concepts representing informed thinking. (Voluntary and by invitation.)
2. Interpretative essays which take stock of the implications of recent and current research and indicate strategy for the future. (Voluntary and by invitation.)
3. Autobiographical sketches (by invitation only) of great men in biology and medicine.

The "Letters to the Editor" section (voluntary only) is to serve for the brief presentation of ideas and for debate.

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Morris

Carl Bowen