fixed constants is generally unable to describe even the entire lifetime of one cell community. The first of these serious difficulties suggests that an equation may be too committing and limited and is thus unable to grasp the "common denominator" of all growth. A promising solution to this problem is to fix attention on the form of the differential or integro-differential equation. This point of view has been argued elsewhere.[2] The function most commonly used, and for which there is considerable theoretical justification, is the polynomial in N,

$$\frac{dN}{dt} = h_1 N^{\gamma_1} + h_2 N^{\gamma_2} + \ldots\ldots\ldots + h_m N^{\gamma_m} \qquad (1)$$

where N is the cell number (or some parameter linearly proportional to it), and the h_j are aptly[3] called the vital coefficients. In recognition of the first-mentioned difficulty of the growth problem, it is to be understood that only some of the terms in (1) will appear, depending on what sort of growth is being analyzed. The second difficulty—with which this paper is concerned—leads to the further admission that the h_j are in some way dependent on time. This situation has been clearly realized by Kostitzin (*ibid.*), who has suggested an analytic treatment based on dividing up the life span of the colony into physiological phases. He then writes for each phase one equation with constant vital coefficients. The values of these constants, however, change discontinuously from phase to phase, while the final value of N in one phase becomes the initial value of N in the next. While in a qualitative sense the notion or discrete physiological phases is useful, it is obvious that a full treatment of the problem must be based on analyzing continuous changes. This involves giving rational interpretations to the vital coefficients, and therefore explicitly predicting how they shall vary in time. An attempt of this sort has been made elsewhere.[4] In certain cases the resulting differential equation is directly integrable. Such a procedure is what might be called the direct solution of the growth problem.

Usually, however, it is impossible to solve the differential equation by any practical method, and one must wait upon the evolution of other procedures. In the meantime the following simple analysis can be of considerable value.

Let us suppose that on the basis of a knowledge of the physical situation one writes the differential equation of the system as,

$$\frac{dN}{dt} = \sum_{j=o}^{j=m} h_j N^{\gamma_j} \qquad (2)$$

Defining two differential operators, H:

$$H^o \equiv 1$$

$$H^1 \equiv \frac{1}{\frac{dN}{dt}} \frac{d}{dt}$$

We may generate from (2) the set of equations by successive application of the H:

$$H^i\left(\frac{dN}{dt}\right) = \sum_{j=o}^{j=m} h_j \left[\frac{\gamma_j!\, N^{\gamma_j - i}}{(\gamma_j - i)!}\right], \quad i = 0, 1, 2 \ldots\ldots \qquad (3)$$

So far as the h_j are concerned (3) is a linear set. Letting i run to the value m, it is evident that the values of all the h_j *at the point* (N, t) can be determined by usual methods as,

$$h_j = \frac{\begin{vmatrix} p_{oo} & p_{o1} & \ldots\ldots p_{jo-1} H^o \frac{dN}{dt} & \ldots\ldots p_{on} \\ \ldots\ldots & \ldots\ldots & \ldots\ldots & \ldots\ldots \\ p_{io} & p_{i1} & \ldots\ldots p_{ij-1} H^i \frac{dN}{dt} & \ldots\ldots p_{in} \\ \ldots\ldots & \ldots\ldots & \ldots\ldots & \ldots\ldots \\ p_{mo} & p_{m1} & \ldots\ldots p_{mj-1} H^m \frac{dN}{dt} & \ldots\ldots p_{mm} \end{vmatrix}}{|p_{ij}|}$$

where $p_{ij} = \frac{\gamma_j!\, N^{\gamma_j - i}}{(j-i)!}$ or 0 according as $j \geqq i$ or $j < i$, provided that N and all the $H^1\left(\frac{dN}{dt}\right)$ be known. This is by no means a hopeless task. The experimental curve of the growth gives N. Well-known graphical methods give $\frac{dN}{dt}$ and by the indicated combinations of these it is possible to obtain all the products of the operator H. These operations are then performed for as many points as are consistent with accuracy and convenience.

The result is that by straightforward and simple methods it is possible to follow the time changes in the vital coefficients, and therefore to support or disprove the theoretical interpretation that has been assigned to them. This in turn substantiates or vitiates the differential form (1) attempted.

MANUEL F. MORALES, *Ensign, U.S.N.R.*

[2] M. F. Morales and N. W. Shock, *Bull. Math. Biophys.*, 4: 63, 1942.

[3] V. A. Kostitzin, "Mathematical Biology," George S. Harrap, London, 1939.

[4] M. F. Morales and F. L. Kreutzer, submitted.

TRANSLITERATION OF RUSSIAN NAMES AND WORDS

IN the course of the past months a number of notes appeared in SCIENCE in relation to transliteration of Russian names and words into English. The latest of these is that by C. S. Hoare (April 21 issue of SCIENCE).

I wish to point out that one factor appears to escape the discussion in most cases. It is simply this: Is the transliteration to be used for filing purposes and be independent of the language of the user, or is it to be a guide for writing the proper sound of the

Russian words in the language of the user and thus make him able to pronounce the words reasonably accurately?

If the former is the case, then, of the number of systems which have been presented, there does not seem to be a single one which is adopted universally, which is unfortunate.

If the latter, however, is the case, then surely no point is gained in using Chech alphabet to signify Russian words to an English-speaking person. The latter would have to learn Chech to learn Russian. Surely, the direct process is simpler and more direct. I wish to point out that for the purposes of both reasonably correct pronunciation and ready filing, the system used by the *Chemical Abstracts* (readily obtainable by writing to the editor) is by far the simplest and reduces Russian to English letters and not to some third intermediate or synthetic language.

G. M. KOSOLAPOFF

DAYTON, OHIO

EDITORIAL CHANGES OF SCIENTIFIC PAPERS

THE discussions on editorial changes of scientific papers which have appeared in SCIENCE[1] have been very valuable—not alone because they have discussed equine serum and horse serum but because they have brought out several worthwhile points of view. May I add to the discussion for what it may be worth, and may I by way of introduction suggest that the *Proceedings* of the American Society for Horticultural Science, to which I am referring and in which I have a hand, is not being held up as an example of superior editing. It has, however, over a period of years developed an editorial policy which leaves to the author the final decision in controversial matters. And this has come about in part through a number of sad experiences.

First, about twenty-five years ago a manuscript was submitted by a young scientist, which was rejected by our editorial committee and later published in an experiment station bulletin. The bulletin has become a classic in the literature of plant science. Second, about ten years ago, a paper by a recognized authority in genetics was submitted anonymously to another recognized authority in genetics for review. The reviewer termed the paper inconsequential and branded the author as knowing little about the field of genetics. The author in turn replied that the reviewer did not understand the paper and evidently was not a geneticist. Experiences such as these leave an editor shuddering and horrified. Needless to say, they affect one's viewpoint.

And so, the editorial policy of the American Society for Horticultural Science has been to throw the responsibility back upon the author. We say to the reviewer, "Final approval or rejection of suggestions lies with the author. . . . Suggestions are to be considered from the standpoint of being helpful to the author in presenting the data." We say to the author, "You are at liberty to accept or reject the criticisms." Obviously, editorial supervision is exercised over elementary spelling and grammar, but these are hardly matters of controversy. And, where an author prefers, "scion" becomes "cion," "clone" becomes "clon" and "sweetpotato" becomes two words. By common standards this is, of course, poor editing.

But we do try to have the material understandable, and we try to help the author to this end. We lean, though we do not encourage it, towards the side of letting a man "make a fool of himself in his own way." And sometimes he proves to be not so much of a fool as was at first suspected.

In short, our policy is focused around an attempt to be helpful; we try to humanize the relation between editor and author; we suggest changes and leave to the author the final judgment and control of the situation. The result is a very gratifying response, close understanding and excellent working relations.

To be sure, the topic of editorial supervision and control is not quite so simple as this point of view might seem to imply. There are such matters to consider as cost of printing, space on library shelves, cluttering of the literature, nature of the publication medium, nature of the material to be published, audience to be served, helpfulness to the reader and even protection of the author from himself. They carry different weights in different situations.

Stuart P. Sherman once said to his class in English at the University of Illinois, following an address by Sergeant Alvin C. York, in which there was some criticism of the grammatical expressions used by Sergeant York in addressing the German machine gunners, "They understood him, didn't they?" The point is that part of the effectiveness of Sergeant York's reply was in the way he said it—it was distinctly his way, and as such it may have carried far clearer meaning than had it been altered by an editorial committee to suit some arbitrary standards. At least, "he got results."

H. B. TUKEY,
Secretary, American Society for Horticultural Science

GENEVA, N. Y.

PROPOSAL FOR ACCELERATED DISSEMINATION OF SCIENTIFIC KNOWLEDGE

AFTER three years of blockade, which strangled the inflow of scientific literature, the gift of microfilms has been most warmly welcomed by Chinese research-

[1] SCIENCE, August 27, 1943, January 21, 1944, and March 24, 1944.