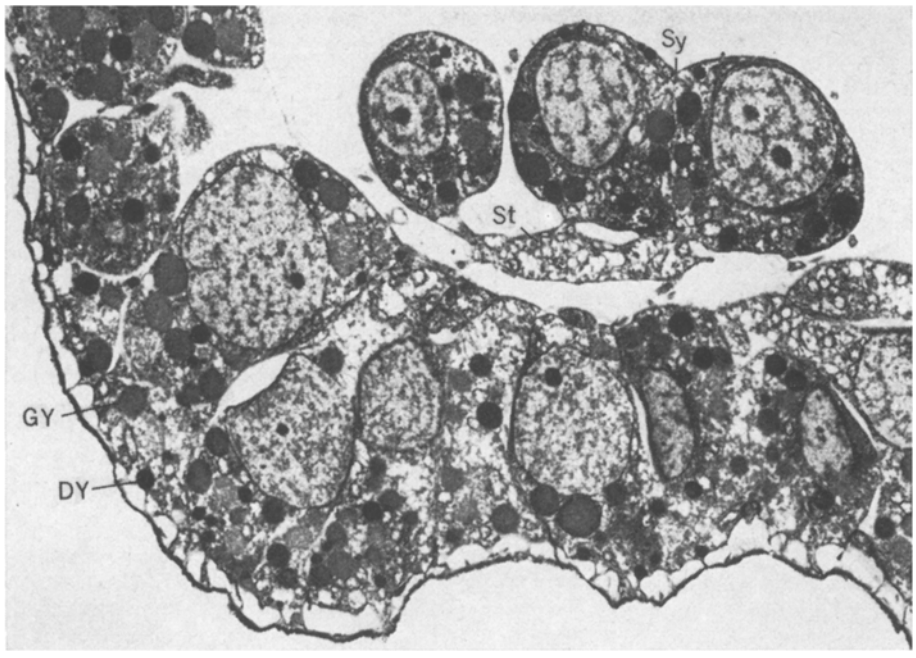

Fig. 4. Larva from the same female as in Figure 3. Treatment from before hatching in 10^{-4} *M* tolbutamide, fixed 18 h later. Gastrula with primary mesenchyme cells forming a syncytium (Sy) and a cytoplasmic stolon (St)[12]. Two kinds of yolk granules (dense yolk, DY; granulated yolk, GY) can be identified. ×6,000.

treated according to the descriptions given above. The ultramicrographs revealed that the structural changes inflicted by tolbutamide are small and in most respects there are no deviations from the normal structure.

However, the yolk granules seem to become changed and there appears to be two distinct kinds of yolk; one type of granules is very electron dense and appears dark in the micrographs, whereas the other type of granules have the normal greyish granulated appearance (Figures 3 and 4, DY resp. GY).

Counts were also made of the different cell organelles. Blastulae treated in 10^{-4} *M* tolbutamide for 4 h before hatching contain considerably more yolk granules than control embryos of the same age. In tolbutamide the hatching blastulae were found to have almost 30% more yolk granules than the larvae of the corresponding control. This difference is entirely confined to the yolk since the number of mitochondria is equal in control and tolbutamide.

Discussion. The general impression of the action exerted by tolbutamide is in most respects positive. In concentrations below 10^{-5} *M* there is no deleterious effect on cleavage and hatching is enhanced and facilitated. The studies of fertilization indicate that tolbutamide promotes fertilization.

With this background it is therefore of interest that tolbutamide has a clear deleterious influence on the differentiation of the endoderm. The fact that the formation of the skeleton takes place more or less unharmed, whereas the intestine is clearly affected, intimates that there is a selective action of tolbutamide on the endoderm. The skeleton develops in a fairly normal way, whereas the endoderm, which is differentiating a little after the appearance of the primary mesenchyme, becomes reduced. We therefore conclude that tolbutamide acts specifically on the growth and the differentiation of the endoderm. This is rather exceptional, since, as a rule, most substances have an unspecific inhibiting effect on differentiation, whereas observations of a specific effect on some clearly defined part of the embryo are uncommon.

It is still unclear if the teratogenic action of tolbutamide in warmblooded animals is inflicted by the drug or a metabolite of the drug, or if it is related to a general metabolic change in the pregnant female. In our experiments the action of tolbutamide is probably a direct one exerted by the drug itself.

[12] B. E. HAGSTRÖM and S. LÖNNING, Protoplasma *68*, 271 (1969).
[13] E. HULTIN and B. E. HAGSTRÖM, Expl Cell Res. *10*, 294 (1956).

OECOLOGICA HUMANA

Redactional remark. The founder of the Experimental Gerontology Fritz Verzár gives to Experientia for the rubric 'Oecologica' humana some fundamental reflections concerning the phenomenon life – death, evoked by the 10th International Congress of Gerontology.

Basic Research in Experimental Gerontology

F. VERZÁR
Gempenweg 1, 4144 Arlesheim (Switzerland), 18 March 1976.

The concept of basic research is an expression of the most important task of the biological sciences for the future. But it cannot be said to describe the present day program of those sciences. Over 4,000 titles in the Year Book of the biological publications show an immense diversity of themes of a physico-chemical nature of ever-increasing complexity, as a reflection of the day-to-day publications in the different scientific journals.

'Present-day research' is not 'fundamental research', and it moves further and further away from true 'basic research'. The state of present-day biological research can be seen, for example, in the program of the important 10th International Gerontological Congress in June 1975. The different contributions are already published in 2 volumes[1]. There are 660 lectures on social and clinical gerontological studies and about 110 reports on theoretical research in more than 20 different aspects of the functions of different organs in ageing.

One has the impression of a growing and endless diversion from what had started as a few certain facts, and one wonders whether this is the way to a fundamental understanding of the subject? More and more single problems are differentiated, and the distance from the central core of the question becomes rapidly greater.

The large subject of the behaviour of atoms, molecules, ions, protons, neutrons and radiation, as it is known to us in the discipline of cosmic and terrestial physics, up to the mystery of gravitation which dominates our whole environment, is hardly touched – unless in the publications of HINES[2], the astro-physicist, which of course are not in the field of biological problems.

We have come to the stage as if a plant had grown out from the seed and produced twigs and branches; the continually changing effects of the developing structure can no longer give us any information as to the basic *forces* which are at work.

Examples of the path of real research are (amongst many others, ofcourse) two deeply thought out studies: one by BERNAL and SYNGE[3] on the development of the animal species, worked out with the greatest knowledge and logic; and the other by WOOLHOUSE[4] which describes in a similarly admirable way the development of plant organisms. Both these authors are unconcerned by the fact that they must work with periods of time in the order of 1,000 million years, and with no certain data in space or time. The development and progress of animals not less than plants spreads into endless variation of form and function.

In this mass of reactions, there is not a comprehensible order. Unexpected new reactions lead to new products, the mutations', without us finding any other cause than 'chance'. New forms appear: many are instable and are immediately changed. Others retain their new characteristics, and retain them so long as they are not again changed in a new 'chance' situation. A particular situation may lead to a very stable combination and to one which will repeat itself in a long series of reproductions.

In this way, perhaps, that new combination arose which had the characteristic 'Life'.

We know some of the conditions for the appearance of life, which would require relatively low temperatures (below 60–90 °C), water and the presence of certain inorganic and possibly organic substances to react with one another.

For the phenomenon 'Life' there does not seem to be one specific physico-chemical characteristic. But the factor 'Life' can under some circumstances survive, and then it forms 'new life'.

When and where does Life occur? No one will doubt that great changes in dispersion of energy may have nothing to do with Life: the fall of a rock in the Alps represents a change of energy, but not life.

Life appears first when the concept of 'non-living' or 'death' appears. The concept of 'Life' is bound to the notion of something arizing in an environment which is non-living, which is dead.

Conditions for the production of life have been sought. For instance, oxygen was believed to be one of the essential conditions of life, as observations on vertebrates with their blood circulation and tissue respiration indicated. Now we know, however, that in the depths of the sea, where living organisms exist, the oxygen pressure would not be sufficient to provide the cells with oxygen and support oxydation.

Some years ago, it was found that in the interstellar space there are simple amino acids, which could by a chemical synthesis form proteins.

Such the *conditions* of life are known, but when and where they first arose is unknown. Of all the different systems known to us, there is none which is identical with life. Must we consider life to be a unique form of energy?

'Life' is only to be conceived where there is an environment of 'death'. The concept of 'death' is the negative of the concept of 'Life'. Life represents a particular and unique form of energy, which is a concept in the field of philosophy.

The problem *Death–Life* remains a totally unsolved mystery within our astro- and geo-physical universe. Basic research must be recognized as the path towards its ultimate understanding.

[1] Verhandlungen des 10. Int. Gerontologen-Kongresses, Jerusalem 1975, vol. 1 and 2.

[2] C. O. HINES, Geophysical Monograph No. 18 (Am. Geophysical Union, Washington D.C. 1974).

[3] J. D. BERNAL and A. SYNGE, *Origin of Life* (Oxford University Press, Oxford 1972), Biology Readers No. 30.

[4] H. W. WOOLHOUSE, *Aging Processes* (Oxford University Press, Oxford 1972), Biology Readers No. 13.

PRO EXPERIMENTIS

An 'Ultra' Rapid Golgi Method for Vertebrate Neuroanatomy

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Summary. A modification of the hardening solution of the rapid Golgi method permits constant successful impregnations of the brain of several vertebrate representatives in only 24 hours.

The Golgi method is a descriptive anatomical technique which, when compared to other histological methods, provides the image that most distinctively characterizes the nervous system: the shape and the spatial arrangement of isolated nerve units. Its greatest advantage is selectiveness as only 1 to 5% of the elements in a field appear impregnated, often with startling completeness and clarity on a nearly colourless background.

There are three main methods of GOLGI[2] himself and multiple modifications of the procedure used have been developed for many years[3], but the rapid method of Golgi is the one most frequently used on fresh animal