demic community in the crucifixion of Vietnam.

Yours faithfully,

KNUT ROGNES

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Who was HeLa?

SIR,—It is twenty-one years since George Gey established the famous HeLa cells in culture. It has been estimated that the weight of these cells in the world today exceeds that of the American negro from whose cervical tumour they originated. That lady has achieved true immortality, both in the test-tube and in the hearts and minds of scientists the world over, since the value of HeLa cells in research, diagnosis, etc., is inestimable. Yet we do not know her name! It has been widely stated that He and La are the first letters of her names but whereas one textbook says the names were Helen Lane another says Henrietta Lacks. My letters to the authors, inquiring the source of their information, like the letter to the hospital from which Gey's paper emanated, remain unanswered. Does anyone know for sure? Would it be contrary to medical ethics in the HeLa cell's coming-of-age year to authenticate the name and let He . . . La . . . enjoy the fame she so richly deserves?

Yours faithfully,

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Entropy and Vitalism

SIR,—Without even having read my book[1], Van Kley[2] refers to it as "a new form of vitalism" such that for evolution "different forms of the laws of thermodynamics apply". This is such a gross misinterpretation that I am compelled to object.

On page 22 I state: "I think our classical notions of entropy as they come to us from the presently established laws of physics and chemistry are totally inadequate in dealing with the living system. This does not mean that there is anything mysterious, supernatural, or vitalistic about the living system. It simply means that our classical notions are inadequate".

I should like to stress the word inadequate. For example, the laws of Newtonian mechanics are totally inadequate in explaining the shift in the perihelion of Mercury. Einstein's equations, which explained this quantitatively, are different in the sense that they are more general; Newton's equations are just a special case.

The concept of entropy in information theory is far more general than in classical thermodynamics. Specifically, the entropy, H, as defined by Shannon[3], is

$$H = -K \sum_i p_i \log p_i \qquad (1)$$

where the p_i are probabilities of elementary events on a finite probability space and K is an arbitrary constant. If the p_i are all equal, then

$$H = -K \log p_i \qquad (2)$$

or

$$H = k \log W \qquad (3)$$

where W is the total number of elementary events on the space. But (3) is Boltzmann's definition of the thermodynamic entropy which appears as a special case under Shannon's more general definition.

Schrödinger[4] foresaw that we have given a positive name, entropy, to a negative concept—a measure of a kind of disorder. He proposed that we use the negative value of the entropy, the "negentropy", as a measure of the order or organization. I believe that Schrödinger was wrong. The true measure of the organization is the maximum value of the entropy, H^{Max}, minus the value we actually observe, H^{Obs}. H^{Obs} as a measure of the disorder has no structure, but $H^{Max} - H^{Obs}$ as a measure of the organization is rich in mathematical structure which classical theory neglected but which my theory stresses. It is in this sense a redefinition and extension of the entropy concept.

Consequently, I believe my work reduces the aura of vitalism man has always associated with the living system.

Finally, Van Kley certainly cited the wrong reference for any anti-evolutionary statement. Chapter 9 of my book is initiated by the following quotation from "The Giants" by Kahlil Gibran.

"I am among those who believe in the Law of Evolution; I believe that ideal entities evolve, like brute beings, and that religions and governments are raised to higher planes.

"The Law of Evolution has a severe and oppressive countenance and those of limited or fearful mind dread it; but its principles are just, and those who study them become enlightened."

Yours faithfully,

LILA L. GATLIN

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1 Gatlin, L. L., *Information Theory and the Living System* (Columbia University Press, New York, 1972).
2 Van Kley, H., *Nature*, **240**, 365 (1972).
3 Shannon, C. E., *The Mathematical Theory of Communication* (University of Illinois Press, Urbana, 1949).
4 Schrödinger, E., *What is Life?* (Cambridge University Press, London, 1944).

Synthetic Food

SIR,—The present is an especially opportune time for the initiation of a massive, interdisciplinary programme of research and development on the total synthesis of food.

Political as well as scientific leaders are coming to realize that agriculture, in the race with population, can at best only maintain the present 2,000-calorie-a-day diet in the developing countries. The "Green Revolution" and other recent advances are serving to gain time, but in a few years the population will outstrip the food supply *unless* the growth of population is quickly checked—an unlikely possibility—or unless an independent source of food is developed—a possibility that can be realized.

Two circumstances favour the immediate initiation of a major programme for the total synthesis of food. First, there is the availability of many scientists, engineers, and other experts who are now unemployed and would respond with alacrity to a new and challenging opportunity. Second, industry is at a stage at which it could adapt the vast fund of scientific knowledge and engineering experience amassed in the manufacture of synthetic polymers to the production of food.

Why has not a start been made? The answer lies in the problem of securing support for a programme of sufficient magnitude and duration to assure success. Experience in the administration of research has shown that support for a major, imaginative new programme can be obtained only after those proposing the programme have already made a significant beginning on their own resources. Research laboratories today that are competent to undertake a programme on the total synthesis of food already have a full complement of productive projects. Thus a new programme could be undertaken only at the sacrifice of currently successful activities.

The situation is similar to that which led to the beginning of the plantation rubber industry in 1876. Henry Wickham, later Sir Henry, discovered the unusually quick germinating characteristics of the seed of the *Hevea brasiliensis*. He chartered a steamer to bring seedlings growing in baskets of earth from the Amazon to London. Sir William Hooker, Director of Kew Gardens, threw out a collection of rare orchids to make space for the tender, little known seedlings until they should be ready to send to Ceylon, and later to Malaya. Since that time the billions of rubber trees on plantations have all been descendants of these original specimens.

Are there Britons today who have the