



SIR GEORGE WILLIAMS UNIVERSITY

MONTREAL 25, CANADA

DEPARTMENT OF PHYSICS

620 Graham Blvd.
Dorval, Quebec
Canada
April 30, 1967

Dear Dr. Bahadur:

It was nice to hear from you. It is too bad that Nature and Science think that your work is too specialized for them. It seems to me that in view of the very important issues that your ^{work} raises, wide publicity is important. In this way the issues would be resolved. I have not yet repeated your work but hope to do so this coming summer. I am a physicist by training and so feel a little timid in the face of sterile procedures, etc. ^{However,} This origin of life problem demands stepping out of the usual water tight disciplines.

The whole problem of how a person who is a physicist by training can best contribute to the understanding of biogenesis has been on my mind for a while. It seems that most of the work ^{concerns} ~~is on~~ chemicals. My work up to the present has been concerned with forming coacervates from biochemicals. We have succeeded in forming coacervates from even such small molecules as nucleosides and the conditions are consistent with hypothetical prebiological conditions. The manuscript is being prepared for publication.

In the future, I would like to start with known biochemicals and then try to form complicated systems from them. However here too, we run into problems. For example, sterile techniques, chemical analyses for which I have no equipment. I am now collecting literature on the mitogenetic radiation. I would like to see the literature both pro and con. In this way I can get a better idea of the difficulties involved.

It seems that the issue is whether or not there is an ultraviolet component of bioluminescence. The anti-mitogenetic radiation people say that the UV component is due to a chemiluminescence of the vapors given off by a growing tissue. I have to see more of the anti literature before I can really be in a position to evaluate the experimental situation. Would you be so kind as to send me the reference to the Gurwitsch work in Enzymologia. We don't have this journal in our library so it will necessary to get it on interlibrary loan. Perhaps, the distinction of whether the ultraviolet radiation comes from the organ or its vapors is unimportant. I don't know yet. How important is the radiation to your work?

Do you know the work of A.L. Herrera? He was a Mexican scientist who worked in the 1930's and claimed to synthesized life-like cells from formaldehyde. We are repeating some of the formaldehyde reactions.

Best wishes,

Joseph E. Smith

P.S. My home address is on top. ^hemail comes there a day or so sooner.



SIR GEORGE WILLIAMS UNIVERSITY

MONTREAL 25, CANADA

DEPARTMENT OF PHYSICS

620 Graham Blvd.
Dorval, P.Q.
Canada
Jan. 4, 1968

Dear Krishna,

I returned the other day from a convention in New York City of the American Association for the Advancement of Science where there was a session on "Self Assembly of matter" chaired by S. Fox. One of his group presented his work and there was little if anything new. There was a talk by John Keosian which was quite interesting. He presented an idea which is gaining popularity. The transition from simple gases to polymers is direct. The amino acids which are obtained by seen upon the hydrolyiss of polymers usually. Keosian's ideas will be presented in his ~~in~~ the new edition of his little paperback book "Origin of Life". The new edtion comes out next March or April. At the meeting I heard that there was a N.A.S.A. report written about your work by Dr. Cyril Ponnampereuma of the Exobiology Laboratory of N.A.S.A. at Moffet Field, California. I am writing to Ponnampereuma for a copy. The grant situation in the U.S. is now tougher than it has been for many years and I heard lots of complaints from the scientists at the convention. The stationary state described by Prigogine is one in which the entropy production is at a minimum. It is described in his book on irreversible thermodynamics.

We haven't done much yet with our electron microscope because we don't have the equipment for preparing specimens. Our department ran out of money for this year and I have to wait a few months before ordering the preparation equipment.

In between your letters I read about the language difficulties in India. It seems to me that this whole business of language is greatly exaggerated in importance in the minds of people. I find it hard to believe that disintegrating forces and the struggle for existence make for better people either in the short or long term. I know that in science the greatest advances ahve been made by unitarian approaches, that is, finding the common denominator. I can give a few examples from physics; Maxwell found the common basis for electricity and magnetism, Einstein for space and time and energy. ~~xx~~ And the real advance of Darwin seems to be in the recognition of the common factors between the animals and humans and not the differences.

Write me as soon as you have some readtions to the Ponnampereuma repetitions of your experiments. This may be a good opportunity to being the matter before the scientific public.

Best wishes,

Adolph



SIR GEORGE WILLIAMS UNIVERSITY

MONTREAL 25, CANADA

DEPARTMENT OF PHYSICS

620 Graham Blvd.
Dorval, P.Q.
Canada
Jan. 8, 1968

Dear Krishna,

I just received a carbon copy of the invitation sent to you by the Canadian Commonwealth Scholarship and Fellowship Committee. The news is great and I hope that the terms are good. Will your university give you leave? In anticipation of a favorable answer, the following questions arise.

- a. Are the ~~times~~ dates suitable? I would like to try to arrange a stay here as long as possible. I think that the Fellowships go up to 12 months. Could you come before Sept. 1st or stay later?
- b. What about equipment? The electron microscope accessories will be here in a few months but what about biochemical instruments such as fraction collectors, etc. My boss promised me ~~a few~~ ^{several} thousand dollars to buy equipment for you. We already have a visible - U.V. spectrophotometer and the Chemistry dept. does I.R. work for us. In regard to chromatography, we recently purchased thin-layer equipment. What do you have in mind?
- c. Do you plan to come with your wife and children? When I find out, I can keep my eyes open

for an apartment. As in all other large cities of the world, there is a housing shortage. Two of my colleagues in the physics department are from India so I will go to them for advice on apartments. Or maybe you can come here first and then your wife + children will come after you have found a place.

The climate here is cold in winter so I will remember the fact that some money will have to be spent for clothes. When you are here, we could do some travelling about and see people active in origin of life work, such as Gary Steinman, John Kossian, and whoever else is around. (Fox excepted!)

I am very happy about the invitation and I look forward to planning for a fruitful year.

Best wishes

Adolph

P.S. Thanks for the nice Christmas card.

In a few weeks my photomultiplier setup will be ready and we can think about trying to detect mutagenetic rays.



SIR GEORGE WILLIAMS UNIVERSITY

MONTREAL 25, CANADA

DEPARTMENT OF PHYSICS

620 Graham Blvd.
Dorval, PQ
March 8, 1968

Dear Krishna,

Have you heard anything from Ponnamperuma yet? I am very interested in his response. I received your reply to him. It is very interesting and contains many good points but I am afraid that it is far too long to be published in most journals. Perhaps there is an optimistic side to this affair. Your work may now receive a lot of attention if the reply gets as much publicity as Ponnamperuma's memorandum.

I looked around for a furnished apartment downtown. It may be cheaper to rent an unfurnished apartment and then buy furniture for a few hundred dollars and then sell it when you leave. In this way you will probably save money over the stay. It isn't a pressing matter at this time, so we'll discuss it again later.

Have you tested for the presence of ATP in Jeewanu? or ATP ase activity? I am going to test for these in the microspheres produced from NH_4SCN .

What do you think of the possibility of trying to turn the photochemical production of proteins into a commercial process. Do you have any idea of the dollars and cents of the proposition at the present time?

Our article with Steinman appeared in the Jan. 15 issue of Experientia appeared. I will send you a reprints when they arrive.

The term is rather hectic now and I have to set some examinations. I don't like this exam business but I suppose that it's necessary.

With regard to your wife finding employment while she is here I don't know of any fellowhip. She might go over to some of the universities when you arrive and ask for something.

Have you ever written to Dr. John Oro? I met him over a year ago and I had the impression that he is a good person to ask for criticism.

Adolph

Could she make up a curriculum vital similar to yours? I could show it around and try to find something now.



SIR GEORGE WILLIAMS UNIVERSITY

MONTREAL 25, CANADA

April 5, 1968

Dear Krishna,

Your last letter took about 8 days to arrive here so I think that sail^{boats} or something are being used instead of jet planes.

This Monday I am taking a trip to Houston, Texas to attend the Proteins and Nucleic Acid Symposium where there is a session on Abiosynthesis of ^Amino Acid Polymers. The program is 1) Possible prebiotic formation of peptides by Ponnampereuma, 2) Non-enzymatic synthesis of biologically pertinent peptides, 3) Formation of amino acid polymers on inorganic templates by E. Degens, 4) Experiments on the origin of proteins by S.W. Fox. I quote the program in order to give you an idea of how the show is going here. I am going to speak to Steinman about a joint meeting of us three when you arrive. I don't know if you are aware that Steinman is going to Israel ~~to~~ for about a year. I hope that the meeting can be arranged as he is leaving some time later in the year. More details about this when I see him next week.

It's really sad that scientists today are so discourteous as not to answer a fellow scientist. I have never even seen Ponnampereuma but Steinman has ~~apparently~~ even possibly worked in the same lab as him.

I really am puzzled as to what to do. I mean about all these similar happenings. My ~~ms~~ about the possible abiogenic origin of the precambrian fossils was rejected by Science with a mixed up criticism. The one on the ability of nucleosides to form cocervates was rejected without even the courtesy of a criticism. Our current Experinetia paper with Steinman was also rejected by Science.

Probably the best thing to do is just to keep working. When we start working together next fall, I wonder if it is a good idea to look for the formation of ATP in the Jeewanu. Not being a chemist, I don't know the details but could we look for the steps which are gone through in the path to ATP. Of course, maybe this reasoning is not fruitful, because Matthews reports that peptides can be formed without the usual intermediaries thought necessary.

In regard to the apartment, I thought of perhaps the following. When you and your family arrive, you could stay at my house for 2 or 3 days while we look for an apartment. In September the weather is warm and my two boys would think it as a treat if they could sleep in a tent in the back yard. I wouldn't like to see you spend a lot on an ~~apart~~ apartment because two of my Indian colleagues tell me that you probably would want to save some money, and on the other hand two other colleagues tell me the opposite, so... The apartments would cost from \$ 150 to \$ 200 per month.

I am getting the curriculum vitae of Rangan typed by our secretary, and plan to visit some laboratories around here with it. Seeing the people in person is always preferable to writing.

Why don't you write Dr. John Oro about what to do about Pon. NASA piece. He has a good grasp of what the situation is here, and is a good guy.

Best wishes
Adolph



SIR GEORGE WILLIAMS UNIVERSITY

MONTREAL 25, CANADA

April 15, 1968

Dear Krishna,

I enclose a copy of the program of the symposium which I attended in Houston, Texas last week. Cyril Ponnaemperuma was not there since his wife was ill. There was not very much new material presented. Gary Steinman and I discussed your situation. We agreed that the best thing at this time would be just to keep working on your microspheres and obtaining more results. Actually you don't have to worry very much about the NASA Technical Memorandum. It really isn't part of the scientific literature.

I am not an organic chemist and so don't know what tests you can run to prove your results more rigorously. However, in conversations with organic chemists, they spoke about separation of amino acids, peptides, etc, and derivatization, vapor phase chromatography, amino acid analyzers, etc. We have some of this equipment at Sir George and maybe you can avail yourself of them. Here, like elsewhere, the chemists are not sympathetic to origin of life research.

There is an exchange program between the U.S. and India for science teachers. Maybe the following year I will try to take advantage of this.

This coming summer I am going to take a trip to Europe. I will be going in the beginning of August and be back at the end of the month, two or three days before you arrive. There is a possibility of renting the house of a vi professor from Sir George who is going to teach in Thailand for a year. However, he is interested in renting the house for the entire year so we are going over arrangements, to see if we can work something out. As I told you the winter here is cold so you should bring along your warmest clothing.

I too am busy with exams this time of the time. Most of the students here are undergraduates so we are less liberal with them than with the graduates. I wonder if this is the best way to learn. I doubt it.

Arnold



SIR GEORGE WILLIAMS UNIVERSITY

MONTREAL 25, CANADA

May 17, 1968

Dear Krishna,

Your letter arrived after 6 days so maybe the ~~amil~~ service is improving. I agree with you that the psychological background is the factor that prevents much more rapid advances in our field. There is no doubt that any scientist who talks about the transformation of inanimate objects in animate objects puts himself in a prejudiced position. I look forward to discussing this question further when you come.

Meanwhile, I am enclosing a letter for your wife. Actually there is no money in my budget to pay someone but maybe this letter will be sufficient to obtain leave.

I don't want to sound like a crass materialist, pragmatist, positivist, etc. etc. but we have to think of what we can do that is acceptable in the sense which I have described. I ~~am~~ think that if we can prove that various new chemical compounds are being formed in our particulate bodies, then we will have publishable material. What is the point of having the best ideas if one doesn't have the funds to do anything about them, buy equipment, and just function as a scientist? The world is interested in chemicals. From my training as a physicist and my outlook, I think that the actual chemicals produced are not as important as the processes. Imagine describing the flow of electric current in a wire by specifying the chemical constituents of the battery, the wires, the resistors, the paint. The process would become as complicated as biochemistry is today. In the past few months I have been studying ~~the~~ metabolic cycles, etc. and the business is just ~~me~~ breaking my head. I have come across a very beautiful of photosynthesis called the chemiosmotic theory of Mitchell and Jagendorf. This theory holds that the fundamental process of the existence of a chemical gradient and the biochemicals are just carriers. This ~~in~~ line with your thinking. So far as I know, Steinman looks for the amino acid combinations which results when dicyanamide is used as a condensing agent. I don't know what will happen if the physico-chemical conditions are changed.

I haven't made any agreement with the professor who is leaving Montreal because I don't know yet if your wife will get leave. Please notify me as soon as you hear because he is probably getting anxious to rent his home.

Did you see the report by Hodgson and Ponnamparuma on the synthesis of porphyrin rings. This is of interest to us because now we have more justification to use ~~the~~ a protoporphyrin or something similar.

In regard to a lecture tour, we shall try to contact some people at other universities and see what can be done. Unfortunately, as you know, most scientists aren't even very curious about our work.

I suspect that they can be more interested by publishing results

about their ~~xxxx~~ favorite little chemical. But then again,
perhaps I am becoming bitter.

Adolph



SIR GEORGE WILLIAMS UNIVERSITY

MONTREAL 25, CANADA

June 13, 1968

Dear Krishna,

I took on summer teaching and have been very busy as a consequence. I guess that you must be all through with your duties. What has happened with your wife's application for a leave of absence? Unfortunately, this professor from Sir George who is leaving for a year has decided to rent his house to someone who is staying for a whole year. I looked around for accommodations but the real estate agencies don't have anything for September 1 yet. They said to come back next month. I am keeping my fingers pressed about paying a lot of rent.

I have received most of the equipment needed for gas chromatography. A chemist from a local hospital is also interested in the equipment for use in amino acid analysis and he is going to work with me to help me get started. I wonder whether it is necessary to make derivatives of the amino acids before making the methyl or ethyl esters.

We have been operating our little electron microscope for the past two weeks. It is a Japan Electron Optics 50 model. It is really a toy when compared with the big EMs now in use but for our purposes it will serve adequately. The whole field of protocell morphology is so untouched that anything will be an ~~infinite~~ big advance over the present state of knowledge. We are receiving our vacuum evaporator in two weeks, I hope.

Have you been reading about the scientific grant situation in the states? It really sounds grim, and I understand that the job situation is tough.

We are trying to rework our piece on the possible abiotic origin of precambrian fossils.

What are you doing this summer? Did you think of any new equipment that you will need. What about thin layer chromatography stuff?

Adolph

Dorval,
30.6.68

Dear Krishna,

I received your letter after 7 days so maybe the mail is travelling faster now. But mine took 9 days to reach you.

I, too, am disappointed that the ~~potential~~ furnished house was rented to someone else. After the beginning of July, I am going to put my search into high gear. I already have found that it is impossible to obtain a furnished 3 bedroom apartment even close to the university. I now am thinking of trying for a three bedroom unfurnished apartment. We can go together and buy furniture which we can sell when you leave. I would need to find a place with refrigerator and stove provided. Maybe a two bedroom place with someone sleeping in the living room and a convertible is possible. What are the ages of your children?

It would be a good idea if you renewed your driving license so it would be easier for us to travel by car. Steinman will probably leave for Isteal in October or November so maybe we can drive to see him this Sept.

We have two good optical microscopes, a Reichert Zetopan which is equipped for phase contrast, and a Zeiss/Jena NU model with automatic exposure meter. We can go up to 2,000 x with the Jena but the resolution is unfortunately poor.

Our electron microscope is a Japan Electron Optical Model 50. It only goes up to 4000 x direct magnification but the resolution is supposed to be ~~only~~ 50 \AA so it is possible to get good enlargements by photography. In order to prepare the specimens for EM, it

I have a margin by
is necessary to have a vacuum evaporator which we received ~~last~~ week. Now the problem is to know how to use it best. We plan to shadow the specimen with a metal, probably platinum, in order to bring out the morphology. A scanning electron microscope is our best bet but that costs about \$70,000. The Japan Electron Opt. Co. representative has offered us the use of his company's scanning EM in Boston for a few specimens. That's another reason for renewing your driving license. But don't worry about it ~~xxx~~ because both my graduate students and I have licenses so the driving won't be too tough. It's only a six hour drive anyway.

for about
I have a Volkswagen right now but it ~~is~~ getting pretty rusty and I expect to buy another car by the time you come.

The Chemistry dept. here is planning to buy an amino acid analyzer, I think a Beckman. However, if we can get our gas work going, we can get results even more quickly. Each run of the analyzer at the local hospital costs about \$ 200. That's really expensive.

This summer I am a batchelor. My wife and two children have gone to Germany to spend the summer with her relatives. I am going to join them on August 8 and be back by the 30 th. Sept. 2 is a holiday here, so it might be ~~be~~ more convenient to arrive on the 3. But it probably doesn't make much of a difference.

I found out that Fox is also unsympathetic to our work (a euphonism). Oh well , so what.

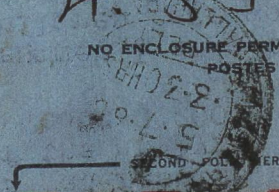
Are you interested in cinemicrophotography? I was thinking of it to record the action of the coacervates, or better yet the particles produced from the NH_4SCN . *Adolph*

P.S. We are in the hot season of the year.
It's 80° F!

SENDER'S NAME AND ADDRESS — NOM ET ADRESSE DE L'ENVOYEUR

Canada
Davel, Quebec
620 Graham Blvd.
Dr. Ardyk E. Smith

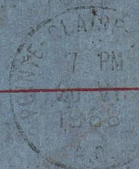
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AEROGRAMME

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68, Dilkusha
New Katra
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INDIA

POUR OUVRIR, COUPER ICI

POUR OUVRIR, COUPER ICI

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Dorval, P.Q.
13, July 68

Dear Krishna,

I received a telephone call from Ottawa yesterday. The Canadian University Association called me about a telegram the External Office received from you. I didn't know anything about it and so couldn't tell them anything. Don't worry about the driving. Right now I have a 62 Volkswagen. The engine is in good shape but the body is badly rusted. I don't think it will go through another winter. The salt which is put on the roads to melt the ice in winter is very hard on the cars.

I heard from Gary Steinman this week. He is leaving for Israel in September or October to become research director of a laboratory which a big US drug manufacturer is setting up there. Sounds like a great opportunity. He said that he will try to continue his work in chemical evolution.

Do you know Michel Labadie from Bordeaux, France? He wrote an article last year and I think that I gave you the reference. I asked him to come over to Montreal for a visit under the France-Quebec cultural exchange treaty. He replied that he is busy completing his doctor's thesis in the next few months. This particular treaty is supposed to be a good one for obtaining funds. I hope to see him while in Europe.

I would appreciate the names of German scientists interested in our field. I met Schram while in Houston, Texas last April. He is on the nucleic acid bandwagon, it seems to me. His condensing agent, metaphosphate doesn't seem geologic-

ically plausible.

I think that engaging in a fight with the NASA people is futile. There are many people who do not wish to be bothered by the facts.

It seems as though senility has come into our field at an early state. In a day or so I am going to ~~xxxxxx~~ visit a food research lab and speak to them. I hope to make a case for synthetic food. Since the academicians in general are not interested in our work, maybe we should consider approaching food manufacturers. We return to our old problem again. How to get general interest in our work.

There are actually very few people who are continuously working in biogenesis. We must do something which is so clear that it cannot be ignored. Maybe taking movie pictures of our microforms coming in existence and then interacting with the environment. Something like what we showed in the *Experientia* paper. Only this time with microforms containing biochemicals. We have to come up with something which both undisputable and sensational. If we can do this, then we have a chance of cracking into the heart of academia.

Right now, we are working hard on an ~~xxxx~~ article which will feature electron micrographs of the NH₄SCN particles and Steinman is supplying the chemical analysis. Let's worry more about improving our work than fighting with narrow-minded characters. I don't want to sound too high-minded and know that arguments are

3
necessary and beneficial for science.
But it is clear that NASA won't give you
a chance to reply. Nevertheless, I prob-
ably would have done the same as you.
Save the documents. Maybe they will be of
interest some day.

Am still looking for a place for you.

Cropley

again

PS. I wrote to Briggs but haven't heard
from him yet.

SENDER'S NAME AND ADDRESS — NOM ET ADRESSE DE L'ENVOYEUR

Dr. A. Smith
620 Graham Blvd.
Doval, Quebec
Canada

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