

UNIVERSITY OF SOUTHERN CALIFORNIA
DEPARTMENT OF CHEMISTRY
3518 UNIVERSITY AVENUE
LOS ANGELES 7

July 8, 1956

Rec'd 16/7 not ack'd
LB

Dear Francis,

I trust you are now back home safe and sound, and hope that the weather on our east coast wasn't too oppressive while you were there. I have delayed writing until I thought you'd be back.

I'm sorry that you feel my PNAS paper gives the wrong impression, as I thought I was careful to use the term "polynucleotide" everywhere except in reference to yours and Jim's structure. You probably recall that just about everything described in the paper was done while I was in Cambridge, so I was rather amused to learn that Alex (in a letter of last April 18, in answer of a note of mine about RNA) said he had fussed a bit with the alternate pairings and had come up with the one in my Fig. 2 at the time your structure was first suggested because "Pauling was very skeptical" (He was at CalTech at the time, I presume.). How he did this without models I can't imagine, ~~xxx~~ He would like to find a DNA model with mixed right and left handed turns, to get around the uncoiling difficulty, but this looks like a pretty tough nut to crack to me. He also described in some detail the Rich-Crick-Watson structure for polyA, the ^{one} you also mentioned in your last letter to me. One point I thought interesting, which you didn't mention, was that this single strand helix is, according to Alex, "a very tight one". Does he mean that there are some uncomfortable van der Waals contacts? or that there isn't any large helical hole as in DNA?

After finding the True Solution of the Secret of Life, Gunther dashed off to someplace in the east -- perhaps your paths crossed there, I have yet to hear from him. He ^{and} Max Delbrück had been oscillating between here and Berkeley, writing some sort of phage thing. What he and I have been working on is a two stranded identical duplex (as contrasted to the two stranded complementary duplex for DNA) as a possible RNA formulation. It makes use of some of pairings in the PNAS paper.

For genetic reasons an identical duplex is preferable for RNA, and it looks o.k. structurally -- although the determination of a complex structure with no x-ray data is to me a somewhat peculiar procedure. Since he (Gunther) is leaving for Japan shortly after he gets back to Berkeley, we really won't have too much time to work this out in as much detail as we would like, but I wonder if it would be all right with you if your quoted yours and/or Alex's letters, as a private communication, about your proposed RNA structure in our preliminary note, just to point up the fact that what x-ray data there is apparently indicates something else.

This would keep the biologists from going off the deep end and accepting the speculative as gospel, don't you agree?

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As for polyglycine, Pauling has been sitting on it, but in the meantime, as you suggested, I think also it is a good idea for us to exchange results. Dick and I calculated spacings and G^2 values out to 25^9 using your lattice constants and positional parameters. We get calculated spacings at 4.16, 3.80, 3.10, 2.48, 2.32, 2.13, 2.08, 2.03, 1.90, 1.86, and 1.82 as compared with our observed of 4.15, 3.80, 3.10, 2.47, 2.11, and 1.88. The corresponding values of $G^2/100$ (no temperature factor) are 72, 14, 66, 27, 11, 15, 22, 1, 34, 53, 9, and 23. Now, we all three shall be most interested in comparing: (1) how our measurements on the print in "Nature" compare with your measurements on the actual photographs; and (2) how your calculated structure factors agree with ours. Is there any indication on the photographs of the missing lines at 2.40, 2.32, and 2.03? Frankly, it is my feeling that when someone discovers a structure then that one is obligated to disclose to the world the nature of the evidence for it -- even in a note to "Nature", but if for some reason you do not wish ~~to~~ us to discuss the results you send us of your polyglycine results with anyone else, we of course shall not.

Would you please send me also reprints of your paper with Jim, and the one following it, on small viruses. I was rather surprised to read in it that you had found it necessary to point up the fact that the number of polyhedral point groups -- as opposed to the cyclic and dihedral -- was finite (and small), or even that you can't cover a sphere with hexagons, but then I suppose that the works of Euler and Fedorov are not well known to virologists and their ilk. By sheer coincidence I have for some months been amusing myself by constructing models of the general and special forms, and their combinations, of the seven polyhedral point groups. They are esthetically quite pleasing, and imagine my surprise when last spring I ran across a small-stellated-dodecahedron in Tijuana, made of tin and glass, about 2 feet across, intended for use as a lighting fixture, and very handsome, too. Have you tried, by the way, calculating the transforms of the general forms of the point groups $O - 432$ or $T - 23$? ~~It~~ It scarcely seems as though you can demonstrate the presence of a five fold axis by stating that one particular arrangement with point symmetry I_h gives maxima in reciprocal space in the directions observed, unless you show that this is the only such arrangement that does -- the general forms of both T and O also have a sort of five-ishness to them, so your argument is actually quite incomplete. By the way, what is your source for the Hermann-Mauguin type symbol 532 for I_h ? I had been under the impression that the numerical point group symbols had been defined for crystallographic groups only, so it came as rather a jar when I saw that you had included the dodecahedron and the icosahedron in the cubic system.

my favorite of the moment is the rhombic triacontahedron

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We just received a nice letter from Barbara Dunitz, and they seem to be settled in a good location in London, but there was no news at all about what Jack is doing at the R.I. Today's radio reports that most of southern England is under water -- I hope that there is no serious damage anywhere. Two inches of rain in twenty four hours is quite a downpour, although last January we had seven inches in the same interval, but then Southern California is used to being washed away every fifth winter or so.

We have been subscribing to the "Observer" for over a year now, and except when they devote whole issue, as they did recently, to K's speech, it generally contains mere interesting reading matter that the Los Angeles Times, which is at least twenty times larger in bulk. We were quite surprised to see the small viruses work written up in the "Oberver". Remembering how DNA hit the "Sunday Times", please do not let your next field of operations break into the "News of the World".

Pat joins me in sending regards to Odile.

Yours ever,

