February 24, 1972

Dear Beets,

After receiving your letter of February 17 I realized that you should have more information on the chromosome knob studies of Kato and Blumenschein. This was recognized by mention in this letter of the table you had constructed of chromosomal knob positions in teosintes and in maize, based on Ting's report and on that of Longley and Kato. To clarify this, I am enclosing some maps, most of which were made by Kato for his written report, and also a table from this report that shows knob distributions and sizes among the teosintes of Mexico.

There is a set of maps that show the exact geographic locations from which the examined maize originated. You will note that the coverage is extensive. Also enclosed is a set of diagrams of knob positions and sizes in various basic knob complexes. Kato's Text Figure 1 is a diagram showing knob positions that he has observed in each of the ten maize chromosomes. I have added a teosinte knob at position 2 in the long arm of chromosome 1. Kato's Text Figures 4, 6, 8, 9, 10, 12, 14, and 16 illustrate knob positions and sizes that characterize the various basic complexes--those early combinations that have contributed so much to present day maize through subsequent hybridizations, migrations, and introductions. In addition, I have enclosed several maps showing distributions either of particular knobs or of particular chromosomes. In two maps, the knobs are those in the long arm of chromosome 10. Both knobs are always small. The maps of chromosomes include Abnormal-10 and the B-type chromosome. In addition, there is a rough map that I made to show restricted distributions of "teosinte knobs." A cluster of these knobs characterize the maize race known as Zapalote chico (see diagram of the Zapalote chico knob complex, Figure 6, page 17 of the Kato report), and these are indicated on the map. The distribution of each of the "teosinte" knobs can be noted by symbol. Within the Americas, the distributions of these knobs are restricted. They follow the Zapalote chico and Pepitilla routes north and south. We have been able to uncover routes of migration of the various complexes and also into what geographic areas a particular complex has been introduced. We have made maps illustrating the individual routes, introductions, and subsequent hybridizations that have occurred in the past. These cover North America, South America, and the Caribbean Islands.

Now, I wish to show why I chose to include the two maps illustrating the distribution of knobs in the long arm of chromosome 10. This relates to the diagrams on page 13 of the H.K.Jain report on Sikkim maize. (Bill Brown sent me a copy of this report.) The diagrams are supposed to illustrate the chromosomes and their knobs in the two exotic races, SP 1 and SP 2. Neither diagram is accurate and the

other chromosome analyses make one tremble--horrendous! Nevertheless, it is possible to recognize that these two races have many of the teosinte knobs in them. In this regard, the two knobs in the long arm of chromosome 10 are highly diagnostic. In the Americas, only in Chalco teosinte, in Zapalote chico, and in two maize collections in the highlands of Guatemala has the presence of both knobs been recognized. I suspect that the "primitive" appellation given to these races relates to the amount of teosinte in them. They could truly be primitive or they could reflect a later occurring hybridization between maize and teosinte whose characters had been "fixed" subsequently--like Argentine Pop. The maps would suggest that these two "primitive" races could have been imported from the highlands either of Mexico or of Guatemala. On this, your guess is as good as mine!

I will comment on other parts of your letter later. Just now, I would like to get the enclosed material to you without delay.

Regards,