Route 1, Box 39
Kimberly, Idaho
83341
Nov. 8,1968

Dear Michel:

Thank you for your most welcome letter expressing your interest and work in the order of flake and blade removal, as well as the behavior of lithic material when subjected to force. The drawings you enclosed are extraordinarily magnificent and I thank you for them. These will be of great value to me in my lithic technology work.

You have, indeed, posed some difficult and important questions, and the answers will be equally difficult and certainly incomplete. At this time, I can only give you the conclusions based on my present experiments. Many additional experiments are necessary before I can augment, verify, and validate these conclusions.

Experiments reveal that the shock waves (undulations) are determined, in part, by the nature of the lithic material. The more vitreous (glassy) the material, the more accentuated will be the waves of shock. Vitreous material can be compared to a viscous liquid and the degree of viscosity seems to determine the amount, intensity, and spacing of the undulations (shock waves).

Also to be considered is the type of force delivered to the lithic material to cause fracture(rupture) to occur. Applied force, whether percussion or pressure, must exceed the elastic limits of the material to result in its fracture. It would seem, therefore, that tests of the elastic properties of materials would be in order. Quartzites do not seem to be as elastic as fine-grained flints or obsidian.

The manner of applying force must also be considered. The interval of contact between the percussor and the objective piece determines the difference in the character of the waves of force. For example: a blow of high velocity with a hard hammerstone greatly increases the amount of kinetic energy and will lessen the contact interval - thereby causing the waves to be closely spaced. But, if a soft percussor is used and the velocity of the blow decreased, then the interval of contact will be prolonged and the waves of force will be more widely spaced. If the velocity of the blow is decreased sufficiently, then the applied percussion force will closely approximate that of pressure. However, when the velocity of the blow is <u>decreased</u>, the size of the percussor must be <u>increased</u>. I have further observed that when blades are detached by the pressure technique and the pressure implement is allowed to flex and vibrate, undulations and waves will result on both blade and core.

I have also noted that when the percussion force is directed at an angle which corresponds with the fracture plane of the cone of percussion, the shock waves in the material will be reduced. Further, if the platform is freed (isolated) by the removal of small flakes: (1) Fracture will start at the proximal end and progress toward the distal end with a lessened amount of molecular distortion, (2) Shock waves will be reduced in definition, size and number. The surface of the core is also important, for any irregularity will cause a differential resistance of the material to the applied force and, therefore, waves will be formed on the ventral surface of the blade and on the blade scar of the core which will be more apparent.

These are but a few of the features and conditions to be considered to determine the presence or absence of force waves and compression rings on cores

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and flakes. Each individual specimen must be evaluated to determine why these force waves do or do not occur. There is certainly a great need for experiments under controlled laboratory conditions to resolve this enigma.

I am sorry that I can not be of help to you with your study of the molecular structure of materials. I am very much aware of these differences when working lithic material, but I can not explain or determine them. Maybe there will be some clue in what I have said that may be of help to you. Certainly, when Bordes and Tixier are working here with me, we shall discuss this matter and do some experiments and see what conclusions we reach. I am very much looking forward to their visits and the experiments we can do together.

Michel, the work you are doing will be a great contribution to further understanding the rhythms and muscular motor habits of the toolmaker in relation to the type of material being worked and its response to subjected force. This type of analysis applied to cores and implements will, undoubtedly show diagnostic traits and technological traditions of men of prehistory. Please keep me informed of your progress in this work, for I shall be intensely interested in your results.

Please give my regards to Tixier and I hope he can answer your questions better than I have.

Am enclosing a little paper which you may find of interest.

Very sincerely yours,

Don E. Crabtree

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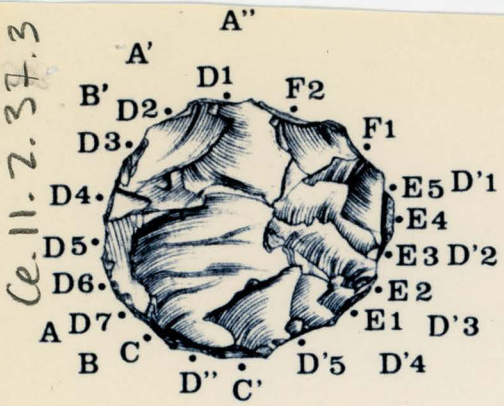
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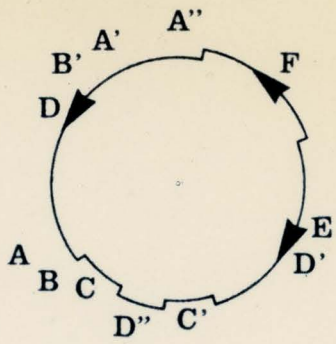
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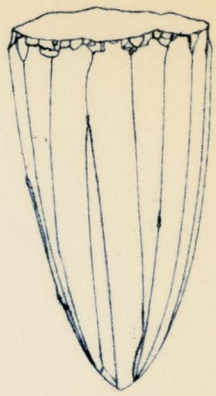

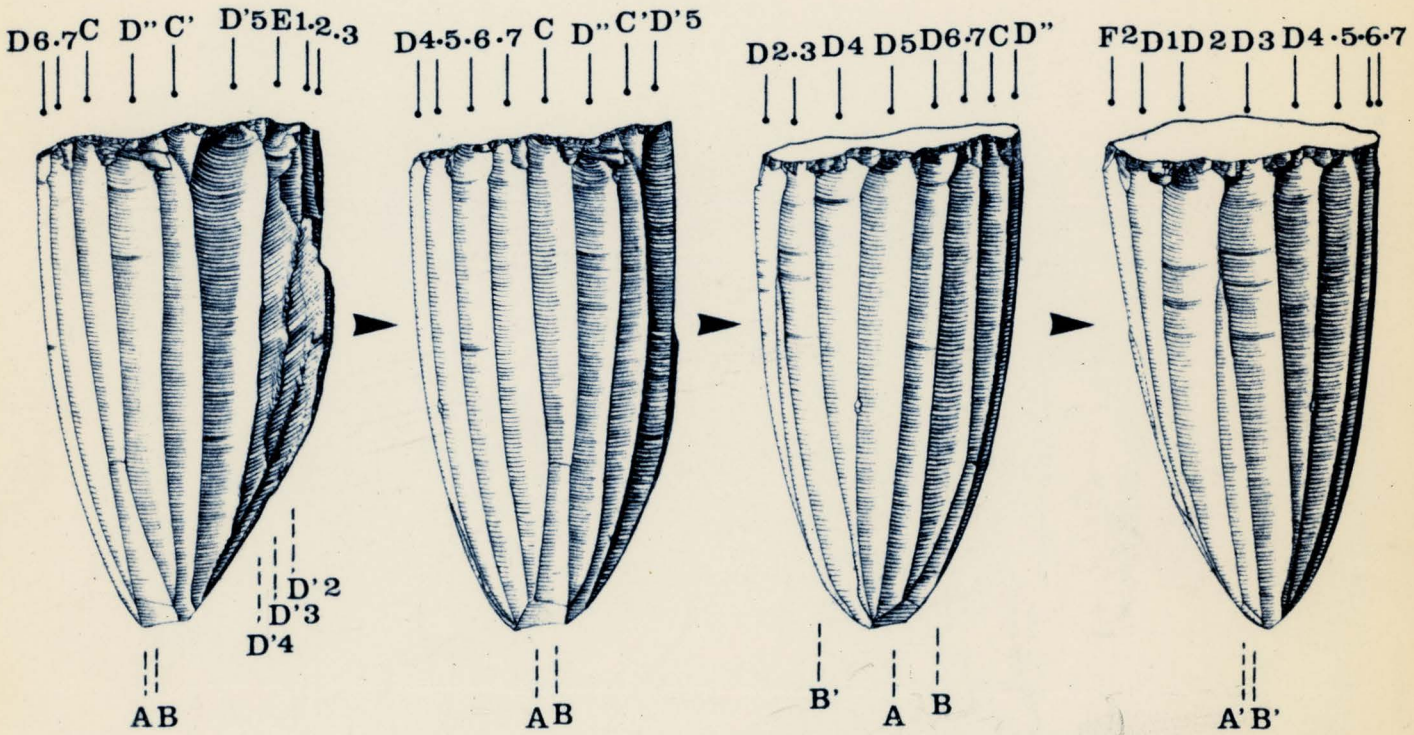
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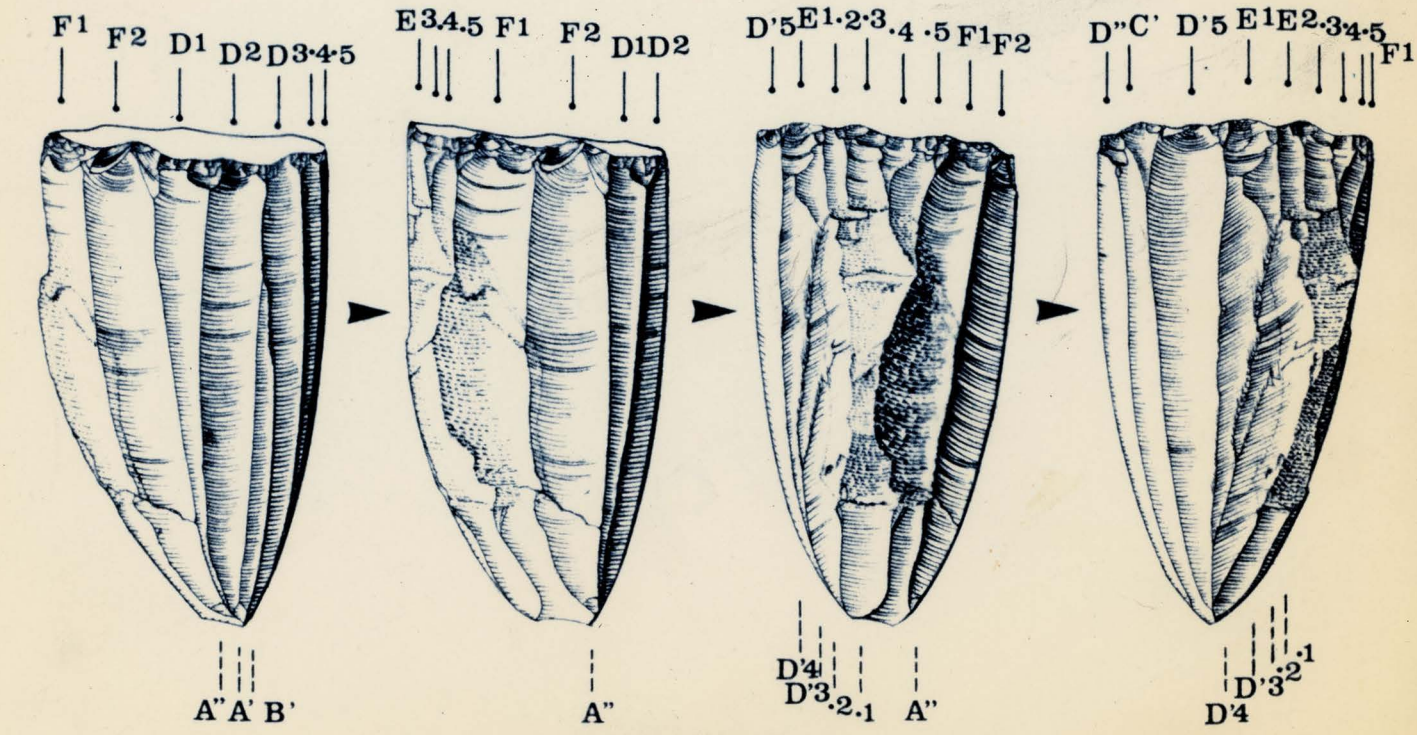
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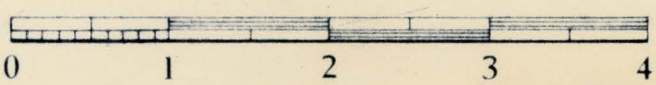
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