
CELL-MATRIX MECHANICS

Homework #1

Figure 1 shows the density of bone at three levels of a hip prosthesis in a postmenopausal woman three years after the device was implanted. (The black central zone of sections "a," "b," and "c" is cross-section of the prostheses.) A "control" section shows a typical section of the bone before the prosthesis was implanted and before the patient entered menopause.

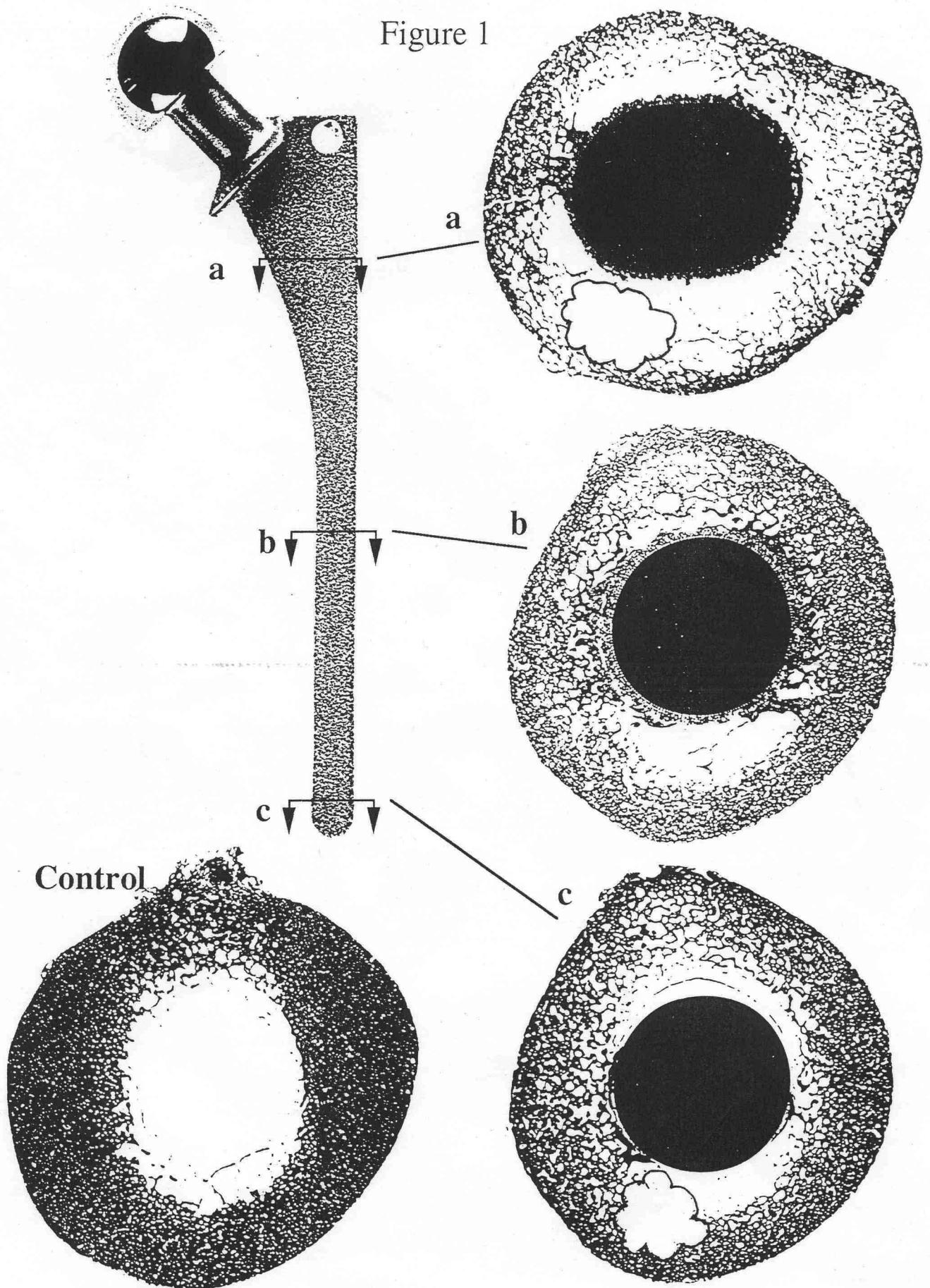
Ignore the scalloped features in the images in "a" and "c" in Fig. 1.

The following gives the relative force (stress) in the bone as a result of implanting the device (F_n is the force that normally occurs in bone):

$$F_a < F_b < F_c = F_n$$

- Write the unit cell processes that might explain the loss of bone density (*i.e.*, bone mass) at sections a and b as a result of implantation of the prosthesis.
- Note in the unit cell processes in answer to (a) what factor(s) might explain the loss of bone in section "c" (ignore the scalloped region). Explain.

Figure 1



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2.785J / 3.97J / 20.411J Cell-Matrix Mechanics
Fall 2014

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