**(https://www.youtube.com/watch?feature=player\_detailpage&v=CDsNZJTWw0w)**

Herr mentions computational methods that …………………………., ………………………. Prostheses in the realms of genetics, ………………………… medicine, ……………………….. biology bionics explores the …………………….. between biology and design. It helps ……………………… the gap between disability and ability bionics has defined Herr’s ……………………. both Herr’s legs were amputated due to …………………. incurred during a mountain climbing accident the three bionic interfaces on Herr’s body are: ……………………, ……………………… and ………………….. optimal support and flexibility without ever causing …………………. synthetic skins with …………………… variations that …………………. underlying tissue biomechanics to achieve that ………………… first developed a mathematical model of biological limb to that end used imaging tools such as ……………………… also used robotic tools such as a …………………. to first measure the ………………………. shape of the limb and then push on the tissues to measure tissue …………………………. at each anatomical point combined imaging and robotic data to build a ……………….. description of limb shown on the left is a bunch of points or ……………………. at each ………………. there is a colour that represents tissue ………………….. then a mathematical transformation is done to design the synthetic skin (shown on the right) it was discovered that where the body is ………………………. the synthetic skin should be soft and where the body is soft the synthetic skin is ………………………… this …………………… occurs across all tissue …………………… with this framework produced are the most comfortable bionic limbs that Herr has ever ………………… in the future our clothing, our shoes, our braces, our ………………….. will no longer be designed and manufactured using ………………… strategies, but rather data-driven, ……………….. frameworks in the future our shoes will no longer give us ………………….. scientist are also ………………. sensing and smart materials into the synthetic skins material developed by SRI International uses the ………………………. effect to change stiffness under zero voltage the material is …………………….., it’s …………………….. like paper but when the voltage is applied, it becomes ……………………… as a board ………………….. into synthetic skin it allows for greater manoeuvrability of the bionic limb also building exoskeletons that become …………………… and soft in just right areas of the running cycle to protect the biological ………………….. from high ………………….. and degradation ………………. interface: how to make bionic limbs move like ………………… and bone study at MIT on how humans with normal physiologies stand, walk and run what the muscles are doing and how they are controlled by the …………………… this information is necessary to build body parts, …………………., knees and hips, from the ground up bionic limbs called BiOMs, under computer control, at ……………….. strike the system controls the ……………………. to …………………… the shock of hitting the ground then at mid-stance the bionic limb ……………………. high …………………… and ………………….. to lift the person into the walking stride, comparable to how muscles work in the …………………….. region this bionic ……………………… is clinically very important to patients because passive devices fail to …………………….. normal muscle function. Bionics also allows for extraordinary athletic ……………………… also building exoskeletal structures using the same principles, applying muscle-like ……………… and …………………. so that biological muscles need not apply them thus first exoskeleton in history to actually ………………… human walking, significantly reducing …………………….. cost …………………….. interface: how bionic limbs communicate with the nervous system across Herr’s …………………… limb are placed electrodes that measure the electrical pulse of Herr’s muscles, which is ………………….. to his bionic limb, so that when he thinks about moving his ……………………. limb, the robot ……………………….. those movement desires the diagram shows how the bionic limb is controlled they have discovered how reflexes of the …………………. are controlling the muscles and that capability is ………………… in the chips of the bionic limb next they ………………………… the sensitivity of the spinal reflex with the ………………………. signal when Herr relaxes his muscles in his ………………… limb, he gets very little ……………………. but when he fires his muscles, he gets more ………………….. and he can even run to give the first demonstration of a running …………………. under ………………….. command Herr wants to go a step further, to close the ……………………. between the human and the external bionic limb doing experiments on growing ……………………… nerves through micro-channel …………………. on the other side of the channels each nerve ……………………. to skin and muscle cells in the channels and motor channels we can …………………. how the person wishes to move this can be sent out ………………………… to the bionic limb then sensors in the bionic limb can be converted into stimulations in ………………………, sensory channels when this is fully developed for human use, persons like Herr will not only have synthetic limbs that move like ………………… and bone but actually feel like …………………. and bone.