Recent advances in soft electronics have attracted great attention due in large to the potential applications in personalized, bio-integrated healthcare devices. The mechanical mismatch between conventional electronic/optoelectronic devices and soft human tissues/organs causes many challenges, such as the low signal to noise ratio of biosensors because of the incomplete integration of rigid devices with the body, inflammations and excessive immune responses of implanted stiff devices originated from frictions and foreign nature to biotic systems, and the huge discomfort and consequent stress to users in wearing/implanting these devices. Ultraflexible and stretchable electronic and optoelectronic devices utilize the low system modulus and the intrinsic system-level softness to solve these issues [1,2]. We describe our unique strategies in the synthesis of nanoscale materials, their seamless assembly and integration, and corresponding device designs toward wearable and implantable healthcare devices [3-5]. Good examples include wearable quantum dot light emitting diodes (QLEDs) potentially used for medical information input/output routes of integrated healthcare sensors and transdermal therapeutic devices as well as the multifunctional implantable electronic stent and minimally invasive surgical tools to solve specific cardiovascular and colorectal diseases respectively. These implantable and wearable bioelectronic systems combine recent breakthroughs in unconventional soft electronics to address unsolved issues in the clinical medicine, which provides new opportunities the personalized healthcare.