Neural systems have two innate requirements~~—~~communication and computation. Any large-scale neuromorphic system will need to be optimized for both. This has led to the proposal of optoelectronic neuromorphic platforms that leverage the complementary properties of optics and electronics. Optical communication allows for direct connections between neurons which removes bottlenecks associated with network traffic. Electronic computation allows for synaptic and neural computation ~~of significant complexity~~. Starting from the hypothesis that future large-scale neuromorphic systems will utilize optics for communication ~~and~~ electronics for computation, we analyze and contrast two possible paths towards achieving this vision. The first is a semiconductor platform based on analog CMOS circuits and waveguide-integrated photodiodes. The second is a superconducting approach that utilizes Josephson Junctions and waveguide-integrated superconducting nanowire single photon detectors (SNSPDs). These two platforms are compared from a variety of different viewpoints: power consumption, speed, area, scalability, memory constraints, system overhead, and cost. Additionally, given that many of the enabling technologies associated with both platforms are still emerging, we propose a set of benchmarks that can be used to gauge the community's progress towards making large-scale optoelectronic neuromorphic computing a viable paradigm.