We thank the Reviewer for reading this lengthy manuscript and providing helpful feedback. Below are responses to the individual comments.

Reviewer Comment 1: In Figure 3 (b), where multiple synaptic integration (SI) loops are coupled to a neuronal receiving (NR) loop, does the current in the NR loop accumulated from one SI loop affect the SI loop from a different synapse and generate a circulating current in that loop? Does this cause leakage of current in NR loop into several SI loops? Similar issue with dendritic processing of Figure 7.

Response: We have added the following text to section 2.2: "Cross talk between synapses is small in this configuration, primarily because the self-inductance of each SI loop (L_{si}) is much larger that the mutual inductance between each SI loop and the NR loop (M_{sy}). For example, a typical value for L_{si} is on the order of 100 nH, while a typical value for M_{sy} is on the order of 100 pH. To arrive at analytical expressions for the cross talk between two SI loops coupled to the same NR loop, we assume one synapse experiences a synaptic firing event, current is added to that SI loop, and we ask how much current is induced in the other SI loops due to their mutual coupling to the same NR loop. In the limit that $L_{si} >> M_{sy}$, this induced current scales as $M_{sy}/(N_{sy}L_{si})$, where N_{sy} is the total number of SI loops coupled to the same NR loop. For typical values of M_{sy} and L_{si}, this quantity is on the order of 10^{-3} for n = 1 and decreases as synapses are added to the loop. Therefore, cross talk between SI loops coupled to the same NR loop is not problematic with this fan-in design. We may also ask about the ratio of the intended current induced in the NR loop to the parasitic current induced in adjacent SI loops. This quantity is independent of N_{sy}, and in the same limit of $L_{si} >> M_{sy}$ we find the ratio of the current induced in adjacent SI loops to the current induced in the NR loop is M_{sy}/L_{si}, which again is on the order of 10^{-3} for typical circuit parameters."

Reviewer Comment 2: One possible disadvantage is stated (i.e. optoelectronics at a small wavelength of a few microns face a power/area trade-off). Are there any other known disadvantages with using optoelectronics for interconnections?

Response: Yes, there are two primary disadvantages. First, more energy is required for a neuronal firing event if light must be generated versus simply generating a single-flux-quantum pulse or switching a transistor. Second, hardware integration becomes more complex. We have added the following paragraph to Sec. 4.5 in response to this comment: "As we have seen in this section, production of light during each neuronal firing event requires an amplifier chain that consumes considerable energy relative to the Josephson circuits comprising the synapses and dendrites of the neuron. The choice to communicate with light brings this energy cost and necessitates the integration of superconductors with semiconductors. These costs are important to consider as one weighs options for advanced cognitive hardware. It would be simpler if all computation and communication could be achieved with electronic circuits, but an all-electronic communication infrastructure that can feasibly interconnect large numbers of neurons at the scale necessary for cognition has yet to be proposed. While photonic communication adds to the energy per neuronal firing event as well as to hardware requirements, the analysis of this section indicates that the total energy of a neuronal firing event is still quite reasonable, and if silicon light sources can be demonstrated to meet the specifications of these circuits, hardware integration will be tractable."

Reviewer Comment 3: What is the effect of flux noise on these circuits?

Response: We have added the following paragraph to Sec. 2.4 to address this question: "An important area of future investigation regards the resilience of the proposed circuits to flux noise. There are several reasons why flux noise is less likely to be problematic in this context than in superconducting digital circuits or superconducting qubits. First, loop neurons are likely to utilize flux storage loops with large inductance (high β_L), and thermal current noise scales as $L^{-1/2}$. Second, during a synaptic firing event, tens to hundreds of flux quanta are generated. Therefore, thermal fluctuations that result in the production of order one flux quantum at a synaptic firing junction are of little consequence. This form of noise will lead to a reduction in the resolution of synaptic weights (reduced synaptic bit depth), but will otherwise maintain viability. Third, this form of information processing is classical, so issues related to noise in the phase of the superconducting wave function that are relevant to superconducting qubits are not pertinent to loop neurons. Fourth, many of the loops used in these computational circuits have L/r leak rates by design. Flux that may be trapped in loops during initial cooling will be dissipated rapidly. The synaptic storage loops (to be discussed in Sec. 3) are intended to store memories without leak, and therefore these loops may be susceptible to unwanted flux trapping. However, even this effect will not be particularly problematic, as this will simply result in a statistical distribution of initial synaptic weights, and the plasticity mechanisms to be discussed next will adapt the network's synapses to a functional operating point. Nevertheless, these qualitative arguments regarding resilience to noise require more rigorous theoretical and experimental investigation, which will be the subject of future work."

In addition to these changes in response to the reviewer comments, we have changed the word "gain" in Fig. 1 and Fig. 23 to the word "reach" to avoid confusion with the gain response function of the neuron. We have changed the same word in the text as necessary.