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Qijun He* (qh4nj@virginia.edu), **Andrei Bura** and **Christian Reidys**. *Homology of a pair of RNA structures.*

A riboswitch is a regulatory RNA that can switch between two alternate secondary structures. We interpreted a riboswitch as a bi-secondary structure. A bi-secondary structure is represented by drawing its respective secondary structures in the upper and lower half-plane. An RNA secondary structure has a loop decomposition, where a loop corresponds to a boundary component when the secondary structure is interpreted as an orientable fatgraph. In bi-secondary structures, the intersection of loops is more complex and is of importance in current algorithmic work in bioinformatics and evolutionary optimization. We constructed a simplicial complex capturing the intersection relations of a bi-secondary structure's loops. We showed that only the zeroth and second homology groups are nontrivial and, furthermore, that the second homology group is free. We identified certain distinct combinatorial structures in the arc diagram of the bi-secondary structure which we called crossing components. We showed that the total number of these crossing components equals the rank of the second homology group. (Received September 17, 2021)