Supporting Information

Orbach et al. 10.1073/pnas.1219672110

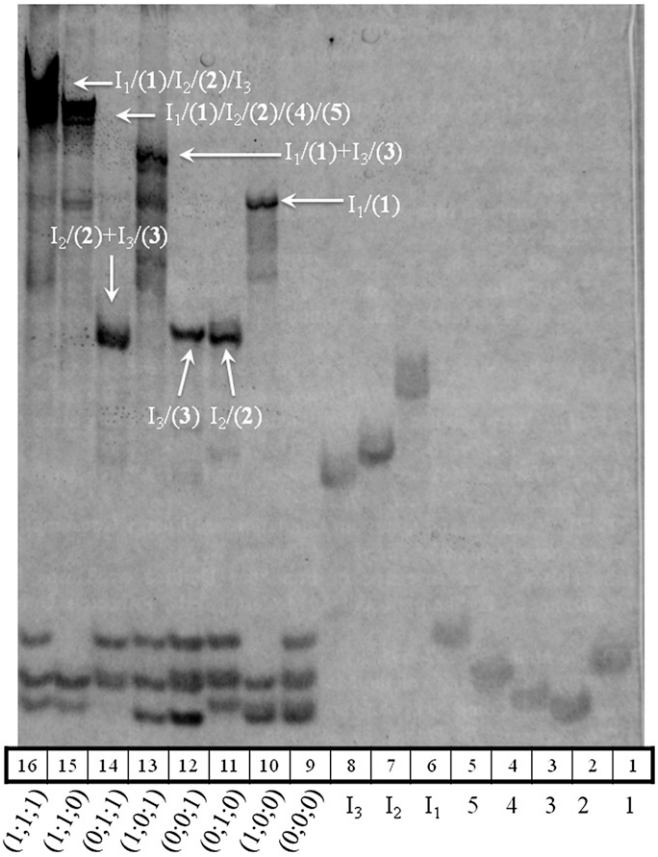

Fig. S1. Native Polyacrylamide-Gel Electrophoresis (PAGE) experiment demonstrating the formation of the different DNAzyme structures shown in Fig. 1 (Toffoli gate). Lanes 1–5 contain the nucleic acids consisting of the library **1**–**5**. Lanes 6–8 correspond to the inputs I_1, I_2, and I_3, respectively. Lanes 9–16 correspond to the structures generated between the library and the respective input. Without any input (0, 0, 0), only the library components are visible (lane 9). In the presence of I_1, I_2, or I_3, the high-molecular-weight full DNAzyme I_1/(**1**), I_2/(**2**), or I_3/(**3**) structure is observed (lanes 10–12), as shown in Fig. 1, *I*. In the presence of inputs $I_1 + I_3$ (lane 13), a bidentate DNAzyme structure I_1/(**1**) + I_3/(**3**) with higher molecular weight, as shown in Fig. 1, *II*, is formed. In the presence of inputs $I_2 + I_3$, two different DNAzyme structures, I_2/(**2**) and I_3/(**3**), of similar molecular weight are formed (lane 14). Finally, in the presence of $I_1 + I_2$, the ultrastructure of I_1/(**1**)/I_2/(**2**)/(**4**)/(**5**), with even higher molecular weight, is formed (lane 15) (Fig. 1, *III*), whereas in the presence of $I_1 + I_2 + I_3$, the high molecular weight hybrid I_1/(**1**)/I_2/(**2**)/I_3 is observed (lane 16) (Fig. 1, *IV*).

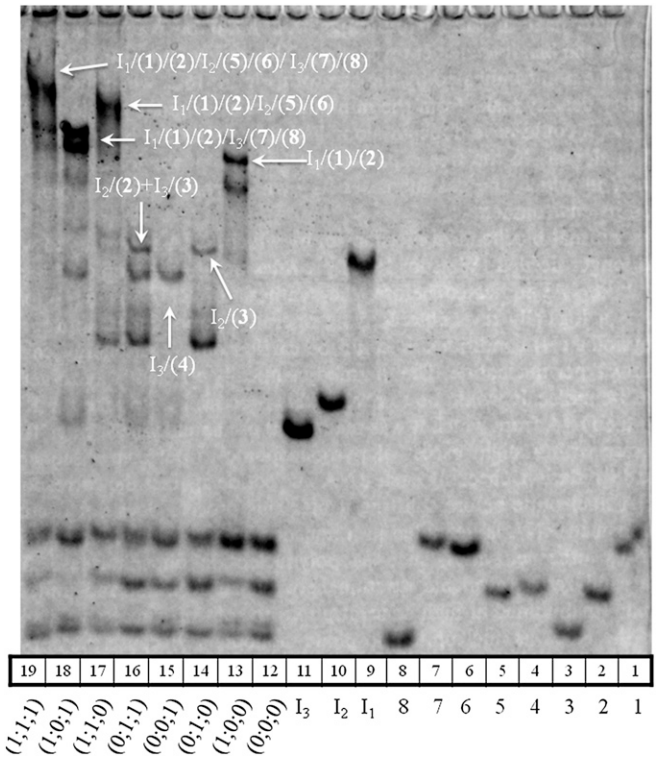

Fig. S2. Native PAGE experiment demonstrating the formation of the different DNAzyme structures shown in Fig. 4 (Fredkin gate). Lanes 1–8 contain the nucleic acids consisting of the library **1**–**8**. Lanes 9–11 correspond to the inputs I_1, I_2, and I_3, respectively. The lanes 12–19 correspond to the structures generated between the library and the respective input. Without any input (0, 0, 0), only the library components are visible (lane 12). In the presence of I_1, I_2, or I_3, the high-molecular-weight full DNAzyme structure I_1/(**1**)/(**2**), I_2/(**3**), or I_3/(**4**) is observed (lanes 13–15) (Fig. 4, *I*). Other structures, with lower molecular weight than the full DNAzyme, are observed; this is caused by the disassembly of part of the DNA structures during introducing high voltage while running the gel. As shown in Fig. 4, *II*, in the presence of inputs $I_2 + I_3$, two different DNAzyme structures, I_2/(**2**) and I_3/(**3**), of different molecular weight are formed (lane 16). In the presence of inputs $I_1 + I_2$ or $I_1 + I_3$, the ultrastructures of I_1/(**1**)/(**2**)/I_2/(**5**)/(**6**) or I_1/(**1**)/(**2**)/I_3/(**7**)/(**8**) are formed (lanes 17 and 18, respectively), as shown in Fig. 1, *III*. Finally, in the presence of $I_1 + I_2 + I_3$, the high-molecular-weight hybrid I_1/(**1**)/I_2/(**2**)/I_3/(**7**)/(**8**) is observed (lane 19), as shown in Fig. 1, *IV*.